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Table of Contents
CE Credit Package 11



From Concept to Creation: Drug Discovery, Development and Approval Processes
**Tonsillectomy and Adenoidectomy 101: Procedure and Implications for the Surgical
Technologist**

Advance Directives

Ulnar Collateral Ligament Reconstruction – A Look Inside Tommy John Surgery

Obesity: An American Epidemic

The Role of the Surgical Technologist in Wound Management

Maintaining Patient Confidentiality HIPAA Compliance

An Exercise in Personal Exploration: Maslow's Hierarchy of Needs

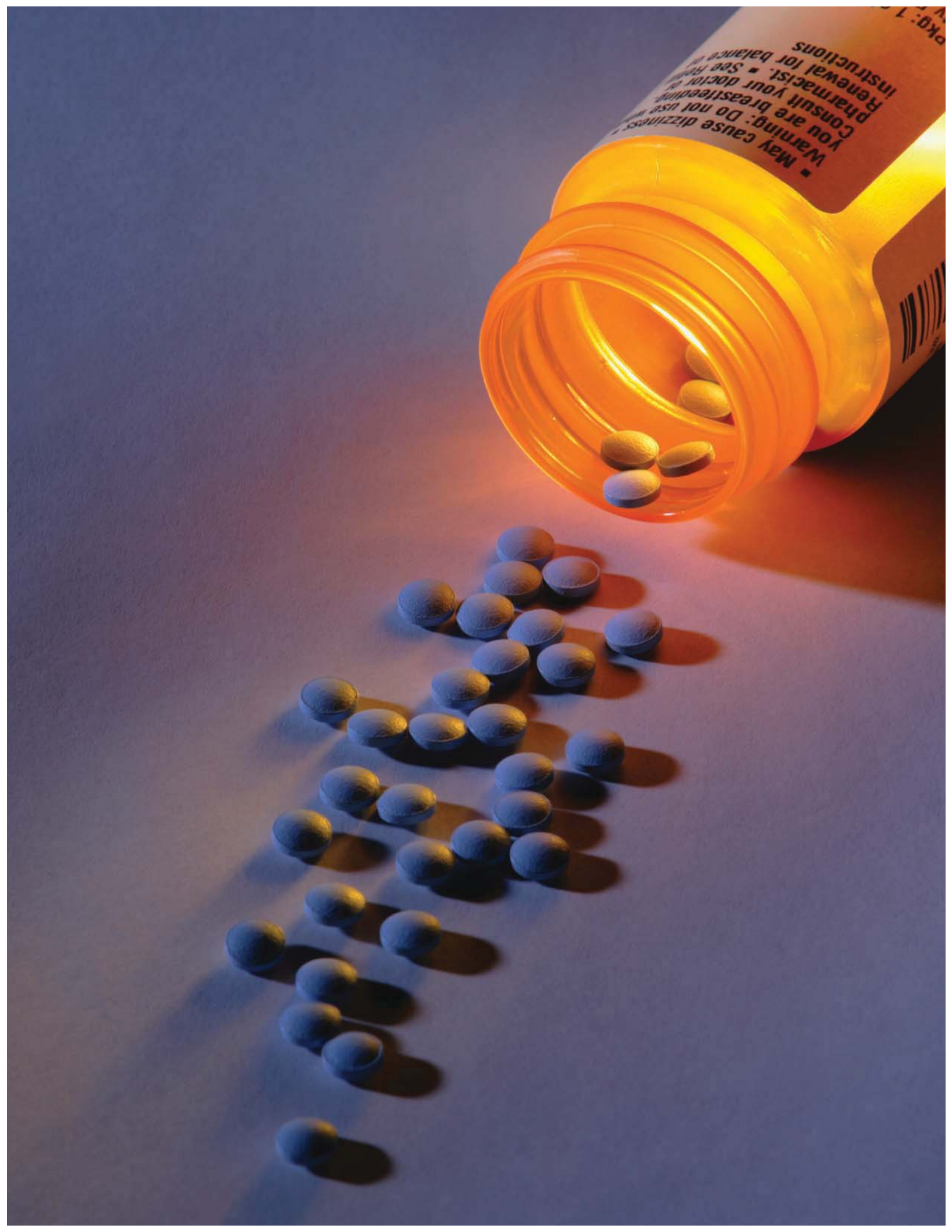
A Surgical Cure for Chronic Blushing: Endoscopic Thoracic Sympathectomy

Bilateral Total Modified Radical Mastectomy and Reconstruction

In-Office Facial Plastic Surgery: Autologous Fat Grafting

Management and Prevention of Infection in Orthopedic Surgical Procedures





pk: 1
Instructions
Renewal for balance
Pharmacist. See
Consult your doctor
You are breastfeeding
Warning: Do not use
May cause dizziness

From concept to creation: A look at the drug discovery, development and approval processes

TERI JUNGE, CST, CFA, BS, FAST

DRUG DISCOVERY

The development of a new drug may be necessitated by an intentional quest for the treatment of a very specific need, such as the ongoing search for a drug that will treat tuberculosis more efficiently.¹ The discovery of a drug can also be totally unintentional. On occasion, the intentional quest for a specific drug can result in findings that are totally unrelated. For example, the drug now known as sildenafil citrate (Viagra®) was originally developed with the hope that it would treat hypertension. When that effort was found to be unsuccessful, the drug was evaluated for its effectiveness in treating angina, at which time an unexpected side effect was noted. Sildenafil citrate is now a popular drug for treatment of erectile dysfunction.²

LEARNING OBJECTIVES

- Examine the process of drug development
- Compare the four phases of clinical trials
- Assess the FDA's role in drug regulation
- Explain the safeguards instituted in clinical trials
- Evaluate the legal challenges faced in clinical trials

DEVELOPMENT

A drug can remain in development for as long as 12-15 years, and the cost for each drug in development is more than 800 million dollars. In addition to the time and expense, the drug must also meet rigid guidelines set forth by the US Food and Drug Administration (FDA) before clinical trials can begin.³

PRECLINICAL TESTING

The preclinical testing of a drug under development may involve research that includes hundreds or thousands of existing compounds or new chemical entities. A new chemical entity (also known as new molecular entity) is a drug



Lab technicians prepare a new drug for a clinical trial.

that contains active molecules that have never been included in any other new drug application.⁴ Each possible chemical or combination of chemicals is purified and systematically tested in the laboratory setting (including short term and long term animal trials) to determine if the chemicals produce the desired effect(s). This is called the pharmacology portion of the study. During this phase, the chemicals are also tested for purity and efficiency while being evaluated for pharmacodynamics. Pharmacodynamics is the interaction of the drug molecules with the target cells. The action of the drug substance

causes an alteration in physiological activity but is incapable of initiating a new function.⁵ Three principal concepts affect drug interaction:

1. Onset—the length of time from administration of the drug until action becomes obvious.
2. Peak effect—The length of time that the drug is most effective.
3. Duration of action—The length of time from administration of the drug until the action is no longer obvious.

The frequency of future doses of the drug is determined by applying these three concepts along with consideration of other patient factors, such as their current condition, any comorbid conditions (other diseases occurring at the same time), the type of drug, route of administration and dosage.⁵

Results of the pharmacology studies are carefully recorded and any chemical that shows promise is advanced to the next step of preclinical testing. The others are abandoned, however, they may be used in development of future drugs.⁶

Next, toxicology studies are conducted to determine the dosage and safety of the potential drug for human use. Toxicology studies are performed on animals and are useful in determining the proper starting dosage for human studies. Any short and long term toxic, side, or adverse effects are noted. The effects may be mild (*eg*, skin rash, irritation at the administration site, etc) to severe (*eg*, hair loss, cancer, reproductive harm, death, etc). Also noted during the toxicology studies are any antagonists (reversal agents) to the drug and if the drug has the potential to be addictive.⁶ Several more chemicals may be eliminated during the toxicology studies.

Pharmacokinetic studies, which encompass the entire process of the drug within the body, while not required, may also be performed during preclinical testing. The process of pharmacokinetics involves absorption, distribution, biotransformation and excretion.⁵ Pharmacokinetic studies provide information concerning the best route of administration (absorption), how the drug is transported to the target cells (distri-

bution), how it is metabolized (biotransformation) and how the byproducts are eliminated from the body (excretion). This information may be very valuable in that it could save time and expense during the human trials by allowing for better predictions concerning the route of administration, size of the dose and timing of future doses.⁶

Only a few of the thousands of possible compounds or new chemical entities that are tested during the pharmacology and toxicology testing will be selected for clinical testing. Toward the end of the preclinical testing phase, the developers seek patent protection and submit an investigational new drug application (IND) to the FDA for those chemicals that show promise.³ The IND must be approved prior to the start of clinical testing of the drug.

CLINICAL TESTING (TRIALS)

Clinical testing on humans cannot begin until all of the pharmacology and toxicology testing is complete and the FDA has approved the IND. Once those requirements are met, the human trial must be designed, protocols established and safeguards put into effect in order for the value of the new drug to be compared to the current standard treatment for the same problem.

TRIAL DESIGNS

Several methods are available to researchers when designing a trial. The most common method, and the one considered to be the “gold standard,” is the randomized control trial (RCT). The word randomized means that the subject or subjects are chosen or placed in groups completely by chance. The word control means that one group of subjects does not receive treatment (or receives a placebo) so that the result of doing nothing can be compared to doing something. And of course the word trial is exactly that—an attempt. When participating in a RCT, the sub-

jects, and sometimes even the administrators of the trial, do not know which group they have been placed in to eliminate biases in reporting the findings. The term “single blind” is applied when the subjects participating in the trial do not

know if they are in the treatment group or the control group. The term “double blind” is applied when both the administrators and the subjects are unaware of the grouping status. Stratification, which is described as separation of the subjects into sub-

groups based on individual differences such as risk factors or severity of the disease/treatment under study, may also be applied.⁷

PROTOCOLS

A protocol is a written plan of action that follows the scientific process. Each trial will have several elements or protocols that must be established to clarify the goals of the trial and to ensure that the results of the trial are valid. There are also

A drug can remain in development for as long as 12–15 years, and the cost for each drug in development is more than 800 million dollars.

Table 1. Overview of the Drug Discovery, Development, and Approval Processes.	
Step	Action
1.	Preclinical testing (pharmacology, toxicology, and pharmacokinetic testing—includes short and long term animal studies)
2.	An Investigational New Drug Application (IND) is submitted to the FDA and must be approved before human trials can begin
3.	A patent is obtained typically at the same time as the IND is submitted
4.	Clinical trials begin on humans (Phases 1, 2, and 3)
5.	Treatment use of an investigational new drug may be granted in urgent situations
6.	New Drug Application (NDA) is filed, reviewed, and approved
7.	Labeling of the new drug is approved
8.	Trademark is obtained
9.	Facilities that will manufacture the drug are inspected by the FDA
10.	Drug is manufactured, marketed, and sold (Phase 4 trials may be implemented)

clauses in the protocol that address withdrawal of a subject from the trial or stopping the trial altogether.⁸

The following list is a summary of the main protocol elements set forth by the FDA:

- General background information about the trial is provided including the statement of purpose.
- Specific objectives are listed.
- The design of the trial is specified.
- The number of subjects is identified.
- Eligibility rules are established.
- Subject selection criteria along with the rationale are set forth.
- The treatment plan (schedule) and duration of the trial is outlined and the subject is informed of the known benefits as well as any known or potential risks, including toxic, side or adverse effects of the trial drug.
- Methods for assessment of efficacy (including follow up visits, number of visits and necessary diagnostic studies) and safety are described.
- Data collection, storage, access and publication methods are defined.
- Any ethical, quality control, or quality assurance concerns are disclosed.
- The endpoint of the trial and rules for withdrawal from the trial are announced.
- Sources and methods of funding the trial and related expenses are made known.⁸

Human trials are conducted in the clinical setting in four phases. Each phase has a specific purpose with the overarching goal to achieve the desired therapeutic effect.

All those involved with the trial, including the subjects, are given a copy of the protocol as part of the process of providing informed consent.

SAFEGUARDS

Numerous safeguards are in place to protect the subjects participating in a trial from human rights abuses that have been noted in the past. Some of the safeguards are listed below:

- The Health Insurance Portability and



Accountability Act (HIPAA) of 1996 Privacy Rule—The privacy rule protects health information of the subjects of a trial. The subject may be asked to sign a release that would allow certain individuals (eg, doctors, nurses, researchers) or groups (eg, insurance providers including Medicaid and Medicare) related to the trial to share protected information about the subject, such as vital statistics

including the subject's name, contact information, social security number, medical diagnosis, treatment, results of diagnostic studies, etc. However, if the results of the clinical trial were to be published, the subject's personal information

would be withheld from the document. The full HIPAA privacy rule, as it applies to participation in clinical trials and other research efforts, is available online at <http://privacyruleandresearch.nih.gov>.⁹

- Informed Consent—The subject will be asked to sign a consent form. Informed consent means that the subject has been provided with information that is typically contained in the protocols that have been established



to accompany the planned study, including the subject's diagnosis, the risks and benefits of the proposed treatment, alternative treatments and of abstaining from treatment. The subject should have the opportunity to ask any questions that may arise.¹⁰

- Establishment of Institutional Review Boards—An institutional review board of at least five members, who meet certain requirements, is established to oversee most clinical trials. The board reviews all protocols, consent forms, advertising, etc. related to the trial and decides whether the materials are approved, need modification or are declined and if the trial can proceed. Once underway, the institutional review board meets to review the progress of the trial at least once a year—more often if necessary. Responsibilities of the review board include minimizing risks to the participants, ensuring that the risk to benefit ratio is appropriate, that selection of the subjects is carried out fairly, that the data produced from the trial is monitored, protecting confidential information, and regulating other safeguards that may be deemed necessary. The institutional review board may discontinue a trial earlier than planned due to unforeseen risks or severe toxic, side or adverse effects.⁸
- Reporting of Adverse Events—Researchers are required to report adverse events to the

institutional review board, the sponsoring organization (holder of the approved IND) and the FDA.⁸

- Audits—An audit of the clinical trial may occur at any phase. Audits are typically conducted by the institutional review board, but may also be accomplished by an outside entity such as the National Institutes of Health.⁸

HUMAN TRIALS

Human trials are conducted in the clinical setting in four phases. Each phase has a specific purpose with the overarching goal to achieve the desired therapeutic effect. Keep in mind that any of the safeguards can be activated during any phase, causing the trial to be delayed, suspended (put on hold) or terminated for a variety of reasons. Each of the four phases is described below:

1. Phase 1—The first phase of a trial is the first human contact with the drug and is conducted on a small group of people (20-80) who qualify. The subjects for phase one trials may be healthy or have the problem that the manufacturers of the proposed drug hope to treat. The protocols for phase one of the human trials are based on the knowledge learned from the pre-clinical trials. The purposes of phase one of the trial include identification of the ideal dosage, determination of the best route of administration, observation of the therapeutic effects

on the body, and notation of any toxic, side or adverse effects. The ideal dosage is considered to be the highest dose with acceptable toxicity. The drug is given via several different routes of administration (eg, oral, intravenous (IV), intramuscular (IM), etc) to determine which is the most effective. The subject is observed or is instructed to note the positive and negative effects of the drug. It may be necessary for the subject to undergo various diagnostic tests during the trial to gain information about the efficacy of the drug. This phase typically lasts one to two years.

2. Phase 2—The second phase of the trial is the second human contact with the drug and is conducted on a larger group of people (several hundred) who qualify. The subjects for phase two trials are selected because they have the problem that the manufacturers of the proposed drug hope to treat. The protocols for phase two of the human trials are based on the knowledge learned from the preclinical trials as well as the results of phase one of the trial. The purposes of phase two of the trial include deter-

Any of the safeguards can be activated during any phase, causing the trial to be delayed, suspended (put on hold) or terminated for a variety of reasons.

mining the effectiveness of the drug and identification of any short term risks (toxic, side or adverse effects) associated with the drug. The study design for phase two trials is usually a double blind randomized control trial.

3. Phase 3—The third phase of the trial is the third human contact with the drug and is conducted on a much larger group of people (several hundred to several thousand) who qualify. The subjects for phase three trials are selected because they have the problem that the manufacturers of the proposed drug hope to treat. The protocols for phase three of the human trials are based on the knowledge learned from the pre-

clinical trials as well as the results of phases one and two of the trial. The purposes of phase three of the trial include determining the effectiveness of the drug in a larger population and identification of any long term risks (toxic, side or adverse effects) associated with the drug. The study design for phase three trials is also a double blind randomized control trial. Drugs in phase three may be approved for treatment use as an investigational new

Table 2. Summary of the Phases of a Clinical Trial

Phase	Goal(s)	Estimated Time	Number of Subjects
1	<ul style="list-style-type: none"> — Identify the ideal dosage — Determine the route of administration — Observe the therapeutic effects on the human body — Note any toxic, side, or adverse effects 	1-2 Years	20-80
2	<ul style="list-style-type: none"> — Determine effectiveness of the drug in subjects with the disease or condition that the drug is designed to treat — Identify short term risks associated with the drug 	1-3 Years	Several hundred
3	<ul style="list-style-type: none"> — Determine effectiveness of the drug in subjects with the disease or condition that the drug is designed to treat — Identify long term risks associated with the drug 	Several Years	Several hundred to several thousand
4	<ul style="list-style-type: none"> — Further evaluation of effectiveness of the drug — Identify long term safety of the drug 	Varies	Varies

drug. Toward the end of phase three, the New Drug Application is filed with the FDA.

4. Phase 4—The final phase of the clinical trial is not a required element, but may be an extension of the third phase in order to evaluate the drug for a longer period of time for safety and effectiveness. Phase four occurs after the New Drug Application (standard use of the drug) has been approved and may be useful in determining alternate (off label) or extended usages of the drug.⁴

DRUG APPROVAL PROCESS

The United States Food and Drug Administration (FDA) is responsible for the approval process of new drugs.

INVESTIGATIONAL NEW DRUG APPLICATION

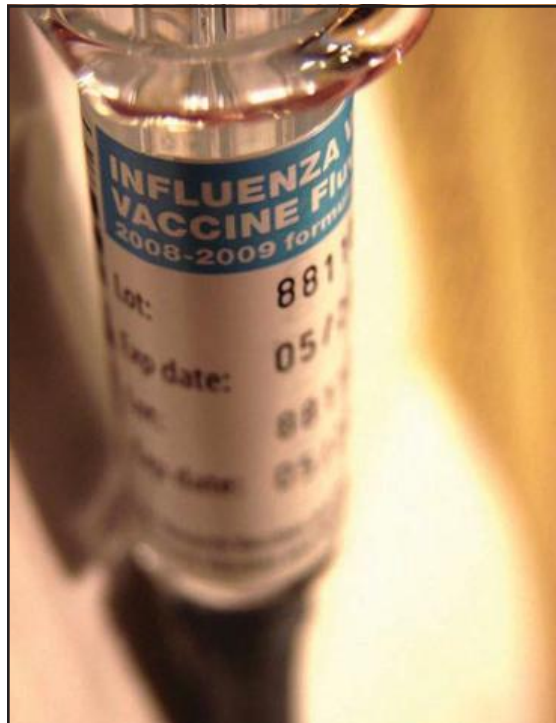
Before clinical testing on humans can occur, an investigational new drug application (IND) is submitted to the FDA. The application calls for reports of all preclinical testing and protocols for the clinical phases of the study of the drug. Additionally, an institutional review board must be set up to oversee the investigational phases of the trial. The FDA retains considerable control over the drug and the trials during the investigational phases.¹¹

TREATMENT USE OF AN INVESTIGATIONAL NEW DRUG

Occasionally, treatment use of an investigational new drug may be approved during the third phase of clinical trials (before the drug is approved for normal use) if the drug shows promise in treating a specific disease or condition. Permission may be granted for the drug to be used for treatment in life-threatening cases (called compassionate exceptions) if other treatments are not available or effective.¹²

NEW DRUG APPLICATION

A new drug application (NDA) is filed with the Center for Drug Evaluation and Research (CDER), which is a branch of the FDA, late in the third phase of the clinical trial. The NDA will contain all information known about the drug, including



Vaccines are also subject to FDA approval.

all test results (laboratory, animal and human), toxicology reports, all that is known about the pharmacodynamics and pharmacokinetics of the drug, and any negative side effects or adverse reactions. Review of the application by the CDER can take up to two years, however, in priority cases, the time can be shortened to approximately six months. Once the CDER review is complete, the information is presented via an advisory committee to the FDA for final approval. Following approval, the final steps involve inspection of the manufacturing site for the drug and the wording for the label of the drug. Upon approval of the label information, the drug is marketable.¹¹

PATENT PROTECTION

Patent protection is typically obtained from the US Patent and Trademark Office (USPTO) during the preclinical testing period. Utility patents are granted to protect the rights of the individual or group of individuals who discover a new use of an existing compound or a new chemical entity that may become a marketable drug. Specifically,

The right conferred by the patent grant is, in the language of the statute and of the grant

itself, "the right to exclude others from making, using, offering for sale, or selling" the invention in the United States or "importing" the invention into the United States. What is granted is not the right to make, use, offer for sale, sell or import, but the right to exclude others from making, using, offering for sale, selling or importing the invention. Once a patent is issued, the patentee must enforce the patent without aid of the USPTO.¹³

A patent is valid for 20 years from the original date of application.¹³ Because of the length of time that a drug is in development, it is important not to file for the patent too soon because the patent may expire shortly after the drug becomes marketable, providing the developer a small window in which to recover their development costs. A drug patent prevents another manufacturer from producing the drug in generic form for the length of the patent.

TRADEMARK

A request for a trademark is filed with the USPTO near the end of the third phase of the clinical trial once the proprietary name of the drug has been determined and approval of the drug is imminent. A trademark is a word, phrase, symbol or design, or a combination of words, phrases, symbols or designs, that identifies and distinguishes the source of the goods of one party from those of others.¹⁴

CONCLUSION

The processes that result in drug discovery, development, and approval are long and expensive. The main goal is to ensure safety of the drug. "Safe," in this sense, means that the benefits of the drug appear to outweigh the risks.¹¹ The final goal is achieved when the cost of the drug has been set, the drug is being manufactured, the marketing of the drug is in process, and sales have begun.

ABOUT THE AUTHOR

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Ethical and legal issues in the administration of clinical trials

TOM BORAK

Before a new drug can be mass produced and distributed in the medical community, it must be thoroughly vetted. One of the most critical steps in the process is the clinical trial phase, during which the drug is administered to human patients to establish, among other things, the ideal dosage and the toxicity level of the drug. The clinical trial phase is not only filled with health implications, but legal implications as well. Over the years, several law suits have been filed against pharmaceutical companies, hospitals organizing the trials and even international organizations that are administering trials abroad.

Because of the unknown variables associated with clinical trials, there are many ethical questions involved in this phase. Consider the Hippocratic Oath, a traditional rite of passage for medical practitioners, which states, in part:

I will follow that system of regimen which, according to my ability and judgment, I consider for the benefit of my patients, and abstain from whatever is deleterious and mischievous. I will give no deadly medicine to anyone if asked, nor suggest any such counsel...¹

If the drug testing is in the trial phase, specifically one that is examining toxicity levels, can it honestly be said that this code is being followed?

Ethics can swing both ways. Others who favor the adage that, “the good of the many outweigh the good of the few,” may argue that the masses will ultimately benefit from the misfortune of few if the trial should go wrong.

Despite many safeguards that are instituted with the patients’ safety and dignity in mind, many clinical trials still come under fire in the legal arena for issues ranging from misrepresentation of risks in the consent form to human rights abuses. These legal threats pose a challenge to those who administer these trials because they must walk a very thin line between what is legal and what is necessary to complete a successful and medically-relevant trial.

According to CenterWatch, a clinical trials listing service in Boston, there were approximately 50,000 clinical trials underway throughout the world in 2005. Increasing at a rate of 8-10 percent per year,² the number in 2008 is likely more than 65,000. According to Alan C Milstein, JD, there hasn’t necessarily been a dramatic increase in clinical trial-related suits, only more publicity about them.²



“When you have a negative outcome,” says J Mark Waxman, JD, “questions are always raised whether [patients] understood the potential for a negative outcome and whether people properly administered the processes of the trial.”²

Waxman believes that the increasing number of clinical trials, coupled with the fact that outcomes are not always positive, is pushing up the number of suits.

The ethical line often comes into play when clinical trial subjects are exposed to a potentially harmful situation as a means by which to test a drug’s effectiveness. In 2001, for example, the Maryland Court of Appeals ruled that researchers at an affiliate of Johns Hopkins School of Medicine could be sued for exposing children to hazardous levels of lead paint during a research project aimed at determining the effectiveness of varying lead abatement procedures.^{2,3}

In another 2001 case, the families of 13 patients in a melanoma study sued the Oklahoma University School of Medicine at Tulsa, the university’s institutional review board and the company that supplied the drug used in a vaccine for fraud. The suit alleged that the defendants failed to follow federal human subject regulations, claiming therapeutic misconception and saying that the study’s principal investigator was convincing the test subjects that the procedure was therapy, as opposed to an experimental process. According to the attorney for the defense, all of the subjects were terminally ill. The doctor didn’t tell them the state of the vaccine trial was in the toxicity stage—to see if it made them sick, not if it worked.^{2,4}

According to professionals in many fields, one of the biggest hurdles in the process is the clarity of informed consent.

“I don’t think the consent forms are worth the paper they’re printed on,” says Milstein. “There’s a real disconnect between what the subjects

understand to be going on and what the consent form says.”

This situation presents a severe conflict of interests, as laid out by pharmaceutical defense attorney, Jay Mayesh, “In our current legal climate, one must err on the side of being very conservative in warnings,” he says. “But on the other hand, the problem is that the FDA doesn’t want you to be overly negative about a drug because then you’re scaring away patients who need the drug, could benefit from the drug and shouldn’t be scared away.”

In short, the language in the consent form must be written both thoroughly and in language

that people can understand—outlining the methods, risks and purpose of the trial—while still generating interest and willing volunteers.

The ongoing battle over informed consent and the overall patient protection in clinical safeguards is a double-edged sword.

The increasing threat of potential legal action can also lead to a decline in the quality of the research. As more investigators and institutions grow less willing to subject themselves to the risk of lawsuits, the protective precautions they take may dilute the quality of the research.

The methodology behind clinical drug trials is still very murky. While regulations and processes are constantly being scrutinized for reform, it remains a difficult and ethically-challenging path to walk.

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“When you have a negative outcome, questions are always raised whether [patients] understood the potential for a negative outcome and whether people properly administered the processes of the trial.” —J Mark Waxman, JD



Tonsillectomy and Adenoidectomy 101:

Procedure and Implications for the Surgical Technologist

TERESA CRISCITELLI CST, RN, CNOR

HISTORY

Tonsillectomies and adenoidectomies are one of the oldest surgical procedures known to man, dating back to before the sixth century.¹ Aulus Cornelius Celsus was a Roman physician and writer who removed tonsils by loosening them up with his finger and then tearing them out.² Vinegar mouthwash and other primitive medications were the only form of hemostasis. The procedure advanced to the hook and knife method, which was followed by the tonsil guillotine, before the use of a scalpel was finally implemented in 1906.²

LEARNING OBJECTIVES

- Compare treatment techniques for tonsillectomy throughout history
- Examine the current spectrum of surgical options for tonsillectomy
- Assess the implications for the surgical technologist during this procedure
- Explain the steps for patient and O.R. preparation for a tonsillectomy
- Evaluate the advancement in technology as it relates to tonsil and adenoidectomy

INTRODUCTION

The incidence of tonsillectomy and adenoidectomy continues to rise – it has been estimated that 200,000 of these operations are being performed annually in the United States.³ Most tonsillectomies and adenoidectomies are performed on children. While teenagers and adults are not exempt, the procedure is less common in these age groups. The main indication for this procedure is a chronic infection as a result of streptococcus or staphylococcus bacteria. Tonsillar hyperplasia, causing airway obstruction, or malignancies are other indications for surgery. The removal of only the adenoids can be performed to treat recurrent ear infections. Due to this prevalence, the surgical technologist must be adept at these procedures to be an intricate part of the surgical team.



ANATOMY

Tonsillectomy is the removal of the palatine or faucial tonsils, which are lymphatic tissue, in the lateral pharyngeal wall of the oralpharynx. Blood supply is provided via the ascending and descending palatine arteries, tonsillar artery and all small branches of the external carotid artery. The tonsillar capsule is a thin layer of fibrous tissue around each tonsil. The tonsillar fossa is composed of three muscles: the palatoglossus muscle,

palatopharyngeal muscle and the superior constrictor muscle. The palatoglossus muscle forms the anterior pillar and the palatopharyngeal muscle forms the posterior pillar. The tonsillar bed is formed by the superior constrictor muscle of the pharynx.

Adenoid tissue is lymphoid tissue located midline in the nasopharynx. The adenoids usually enlarge in patients 2.5-years old to 5-years old and then decrease in size in patients around 11-years old, usually becoming atrophic in teenagers. To this day, there is still controversy over the function of the tonsils and adenoids. Those who have the tonsils and adenoids removed do not have an adverse effect on immune status or health and, in fact, asthmatics have a beneficial effect postoperatively.

TRADITIONAL METHOD

The methods of removing tonsils vary and are related to the surgeon's preference based on the patient's age, indications and technology available. Traditional or extracapsular tonsillectomy refers to the removal of all tonsillar tissue along the capsule. Intracapsular tonsillectomy indicates the removal of 90-95 percent of the tonsillar tissue, where a thin layer of tonsillar tissue is deliberately left intact as a protective shield.⁴ This technique decreases postoperative pain, quickens recovery, and aids in fewer readmissions for complications. The potential does exist for tonsils to grow back, and they may become infected.

Traditionally the mouth is retracted and held open with a self-retaining mouth gag, while the tongue is depressed with a tongue blade of which the distal end is stabilized on the edge of a mayo stand. The posterior and lateral walls of the palate are carefully inspected and palpated to detect abnormally positioned vessels.⁵ The superior pole of the tonsil is grasped with a long curved Allis and the mucosa of anterior and posterior tonsillar pillars are outlined via electrocautery, preserving the posterior tonsillar pillar. Using a Hurd dissector, the plane of the tonsillar capsule is located and the tonsil is removed by careful dissection with electrocautery. Counter traction is applied with the Allis clamp. The attachment

of the inferior portion of the pharyngeal tonsil to the lingual tonsil is transected, also via cautery or tonsil snare, and the tonsil is completely removed.⁵ Plain gut suture can be utilized to ligate small vessels to prevent bleeding. Tonsil ties can be made by creating a slip knot with a free plain gut tie. This is then placed around the vessel that is clamped. Any residual bleeding vessels are addressed at this time and a tonsil sponge is placed for pressure to aid in coagulation. This procedure is then repeated on the opposite side. Upon completion, the pharynx is inspected, the mouth gag is removed, and the jaw is examined prior to extubation.

Intracapsular tonsillectomies can be performed utilizing the same suspension and similar instrumentation, but the blunt dissection is unnecessary due to the fact that the tonsil is vaporized or shaved, leaving a portion of the tonsil behind.

ADDITIONAL METHODS

Other methods can be utilized, such as CO₂, KTP or Nd:Yag laser to vaporize the tonsillar tissue directly or through a microscope or endoscope. Each of these lasers requires safety precautions that must be taken, specific to the type of laser used. All lasers must be operated by a qualified person who has completed specific laser competencies. The operating room must be equipped with laser signs, proper eye wear for not only the staff, but the patient, and appropriate laser instrumentation. It is recommended that water is also available in a basin in order to put out any fire that can quickly ignite when using laser equipment. The laser affords the patient less postoperative pain, more rapid healing, less blood loss, and less operative time.²

A microdebrider which is a powered rotary shaving device with continuous suction can be used to shave out the tonsil using the intracapsular approach. This microdebrider can also be

attached to bipolar cautery to enhance its effect by coagulating while shaving. Often monopolar cautery is used in conjunction with the shaver to control bleeding.

A harmonic scalpel can also be utilized, which is a high-frequency ultrasound vibration of a titanium blade to precisely cut and coagulate tonsil tissue with minimal thermal tissue damage. This blade vibrates at 55.5 kHz and actually breaks hydrogen bonds of proteins to generate heat from

tissue friction.² The thermal tissue damage is less, due to the lower temperature of the harmonic scalpel.

Some surgeons may choose to use the Coblator, which is a bipolar radiofrequency low-level energy device that transfers to sodium

ions, creating a thin layer of plasma.² This shrinks the tonsil tissue and, after 8-12 weeks, the residual tissue is reabsorbed by the body.⁶ This effect is achieved at low levels of temperature causing minimal thermal tissue damage, which in turn alleviates postoperative pain.

A newer technique that is still emerging is the use of the PlasmaKnife. A low-temperature plasma field is created by a triode-tipped instrument with a bipolar coagulation to precisely and hemostatically remove the tonsils with less pain. The process also affords the patient accelerated healing.⁷ This method creates minimal collateral thermal damage to the tonsil fossa and many patients can resume normal eating and drinking quickly after surgery.

Adenoids, being a midline structure and located in the superior nasopharynx, must be visualized by inserting a red rubber catheter nasally and pulling it out through the mouth to retract the soft palate. A laryngeal mirror is utilized to carefully visualize the adenoid tissue during the procedure. A nasal endoscope can also be helpful to visualize the superior adenoid and check for choanal obstruction. Adenoidectomies can be performed via cautery to vaporize the tis-

Aulus Cornelius Celsus was a Roman physician and writer who removed tonsils by loosening them up with his finger and then tearing them out.

sue, an adenotome or curette to scrape the tissue, a microdebriender to shave the tissue or a Coblator to shrink the tissue. After removal of the adenoid, the remaining bed is packed with a tonsil sponge, preferably soaked in saline to avoid the risk of airway fire during cauterization proximal to this site.⁵

PATIENT AND O.R. PREPARATION

The patient is placed on the operating room bed in a supine position with the arms preferably at the sides. General anesthesia is the most common method, especially for children, and is delivered with intravenous sedation and inhalation gases. An endotracheal tube is placed and a shoulder roll may be positioned to gently extend the neck for better surgical exposure. Adults may have the procedure performed under intravenous sedation and local anesthesia, depending on the surgeon and patient preference.

Tonsillectomy and adenoidectomy is a clean procedure and no skin prep is required, but sterile instruments are imperative due to the exposure of blood vessels. A sheet is draped over the patient's body and a head drape is applied. The mayo stand is brought over the patient's chest for the suspension of the mouth gag. It is customary for the surgeon to sit on a rolling stool for the procedure, but it is suggested that the surgical technologist either sit or remain standing for the entire procedure.

Equipment needs will differ from hospital to hospital, but a headlight, electrosurgical unit and rolling chair for the surgeon are necessary. A tonsillectomy tray of instruments will be required and additional supplies, such as surgeon-specific device to remove tonsils, drapes, towels, gloves, suction, basin set and nasogastric tube, are necessary for surgery.

POSTOPERATIVE COMPLICATIONS

Postoperative complications share the general risks of any surgical procedure associated with general anesthesia, bleeding, infection and dehydration. Anesthesia risks are directly related to the health of the patient and are rare. Bleeding, the most prevalent complication, usually occurs five to 10 days postoperatively, when the eschar, or scab, begins to fall off. At this point, it may be necessary to emergently return to the operating room for evaluation and possible cauterization. Low-grade fevers from infections are possible

and antibiotics are usually given intraoperatively and continued at home. Dehydration may also be a concern. Due to the pain associated with this procedure, the patient may not receive enough fluids by mouth to maintain proper hydration and may have to return to the hospital

It is customary for the surgeon to sit on a rolling stool for the procedure, but it is suggested that the surgical technologist either sit or remain standing for the entire procedure.

for intravenous fluids.

Parents of young patients are encouraged to notice, and if necessary, keep a postoperative daily log of amounts of fluids and soft foods ingested, amount of urine output and any bleeding that occurs. This data can be utilized when determining dehydration status, assessing inadequate nutrition needed for proper healing or addressing recurrent bleeding.

IMPLICATIONS FOR THE SURGICAL TECHNOLOGIST

The surgical technologist must keep in mind that the surgeon's preference will dictate the equipment and order of the procedure. Adenoids are generally removed first, unless the size of the tonsils obstructs the visualization of the adenoids. Suction devices should be checked prior to the patient entering the operating room in order to have quick access to suction if needed. Suction must always be available during the entire procedure, especially during dissection, to keep the surgical field visible. Upon completion of

the procedure, it may be needed to suction the stomach prior to emersion from anesthesia. The surgical field must always remain sterile at the completion of the surgery during extubation due to the possibility that a complication may arise, bleeding occurs or possible aspiration.

A competent surgical technologist will time the length of suspension of the mouth gag and keep the surgeon well informed to prevent swelling of the tongue, decreased blood flow to the tongue or excessive jaw pain postoperatively. It is imperative that the surgical technologist be vigilant and careful not to apply any additional tension on the suspended mouth gag by leaning on the mayo stand or even moving the mayo stand during suspension. The surgical technologist must be competent and knowledgeable of the anatomy, surgical procedure and possible complications that may arise in order to provide safe patient care.

CONCLUSION

The evolution of tonsil surgery has been vast and new techniques have emerged improving on the postoperative co-morbidities associated with tonsillectomies and adenoidectomies. The responsibilities of new techniques do not solely lie with the institution or the doctor, but also with the surgical technologist that assists in the procedure. Competencies must personally be maintained through continuing education, staff meetings and personal acquisition of knowledge. New techniques will always be surfacing and it is a challenge for surgical technologists to stay abreast of new information as it becomes available.

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A competent surgical technologist will time the length of suspension of the mouth gag and keep the surgeon well informed to prevent swelling of the tongue, decreased blood flow to the tongue or excessive jaw pain postoperatively.



Advance Directives

TERI JUNGE, CST, CFA, FAST, BS

INTRODUCTION

An advance directive is a personal, legal document that is created in preparation for use during a time when an individual is not able to express his or her own wishes concerning medical care should he or she become incapacitated.¹ The duration of the impairment may be very short or may extend to the end of life. The inability to take care of one's own needs may occur suddenly and unexpectedly or may be the result of an ongoing and worsening illness.² The document gives the patient a say in his or her medical care, even when he or she is unable to make his or her wishes known at the time. Every adult should consider preparing an advance directive, but each individual hopes that the document will never have to be referenced.

LEARNING OBJECTIVES

- Examine the legislation that governs the application of advance directives
- Compare and contrast the different types of advance directive
- Assess the benefits of an advance directive
- Explain the requirements and protocol for a DNR order
- Evaluate the differences between “durable power of attorney” and “limited power of attorney”

PATIENT SELF-DETERMINATION ACT OF 1990

The Patient Self-Determination Act (PSDA) of 1990 requires that health care facilities offering inpatient care, such as nursing homes and hospitals, as well as some home health agencies and health maintenance organizations (HMOs), pro-



vide information concerning advance directives by federal law. There are four basic components to the PSDA:

1. At the time of admission to the health care facility, each patient must be provided with information, in writing, about the way that the facility recognizes advance directives as well as a description of his or her rights to make health care decisions. The content of the written material is determined by each state.
2. A representative of the facility should ask the patient if he or she has prepared an advance directive and document his or her answer in the patient record. If an advance directive has been prepared, it is the patient's responsibility to ensure that a copy of the document is available to the health care facility.
3. The facility should provide educational resources to their patients and staff concerning advance directives.

4. The facility should not show prejudice to patients who have or do not have an advance directive, meaning that an advance directive is not required.³

PATIENT'S BILL OF RIGHTS

Another document that supports the use of the advance directive is the Patient's Bill of Rights that was developed by the American Hospital Association in 1973, and revised in 1992, to support the Patient Self-Determination Act. The fourth right pertains to the advance directive and is as follows:⁴

4. The patient has the right to have an advance directive (such as a living will, health care proxy, or durable power of attorney for health care) concerning treatment or designating a surrogate decision maker with the expectation that the hospital will honor the intent of that directive to the extent permitted by law and hospital policy. Health care institutions must advise patients of their rights under state law and hospital policy to make informed medical choices, ask if the patient has an advance directive, and include that information in patient records. The patient has the right to timely information about hospital policy that may limit its ability to implement fully a legally valid advance directive.⁴

The entire Patient's Bill of Rights document may be viewed on the American Hospital Association's Web site at http://www.patienttalk.info/AHA-Patient_Bill_of_Rights.htm.⁴

TYPES OF ADVANCE DIRECTIVE

Two main types of documentation should be considered when assembling an advance directive. The first type is the durable power of attorney for health care, which is used to indicate that a proxy or surrogate, such as a family member, close friend or other representative (such as an attorney) has been named to make health care decisions if the patient is not able to do so for him or her self. The durable power of attorney for health care is also known in some areas as a health care proxy or a medical power of attorney.

The second type is the living will, which is used to specify the type of care that should be given or withheld should the patient become unable to communicate those wishes in a time of serious illness or injury. In some states, the advance directive is a combination of the durable power of attorney for health care and the living will on one form. The durable power of attorney and living will forms typically include the following general elements. Keep in mind that each state has forms specific to that state and the laws of the state.⁵ Many sources are available for locating the documents specific to each state. The Web site of the United States Living Will Registry, which can be found at <http://www.usliving-willregistry.com/forms.shtml>, provides links to the necessary documents for all 50 states and the District of Columbia.⁶ Some states have translated the documents and made them available in several languages.⁷

DURABLE POWER OF ATTORNEY FOR HEALTH CARE

Prior to completion of a durable power of attorney for health care, the individual preparing the document should carefully consider who should be granted the power of attorney. The term durable means enduring or long lasting, so there is no expiration date assigned to the power of attorney. If there is an expiration date assigned to the power of attorney, it is referred to as limited.⁸ The designee should be someone who is trustworthy, who will have the best interest of the patient at heart, and who is willing to follow the directions of the patient as stated in the document. Ideally, the individual preparing the document should seek permission from the designee and the two should meet to discuss and agree on the contents of the durable power of attorney for health care.⁶ The following example represents the required elements for a durable power of attorney for health care in the state of California. The durable power of attorney is actually part one of the California advance directive.⁹

- The name and other vital information (such as birth date) of the individual for whom the document is created is listed.

- The name and contact information for the individual designated as the proxy is listed, and one or two alternate proxies may also be named. Contact information for the alternates must also be listed.
- A statement authorizing the proxy to make health care decisions for the individual is provided and any exceptions are noted.
- A statement designating whether the proxy has immediate or delayed authority to begin making health care decisions is included. If the authority is delayed, a date or set of conditions is provided. For example, the condition may be that the proxy will take over decision making when a conclusion is made by the patient's physician that he or she is no longer competent.
- The obligations of the proxy are listed, and any special instructions are provided. Typically, the instructions are included in the living will. There may also be a clause indicating the proxy's postmortem responsibilities and instructions that relate to such items as making organ donations, giving permission to conduct an autopsy and making arrangements for care or disposal of the remains.
- A statement may also be included that suggests that the proxy become the legal conservator if court action is necessary.
- The document must be signed by the patient, the proxy and the alternates, and be properly witnessed or notarized according to state law. Typically, the proxy is not allowed to sign as the witness.⁹

LIVING WILL

Prior to completion of a living will, the individual preparing the document should think carefully about the type of health care that he or she would like to receive should the need to implement the document arise. As difficult as it may be, the individual should also consider discussing his or her wishes with family members or close friends prior to or during preparation of the living will so that there are no surprises when the contents of the document are implemented. The document should be specific to the state in which the indi-

vidual resides.⁶ The following example represents the required elements for a living will in the state of California.⁹

- The name and other vital information (such as birth date) of the individual for whom the document is created is listed.
- Specific instructions for care to be given. For example, the living will may contain a clause similar to this one quoted from the California document: “I want my life prolonged as long as possible within the limits of generally-accepted health care standards.”⁹
- Specific instructions for care not to be given. For example, the living will may contain a clause similar to this one quoted from the California document:
*I do not want my life to be prolonged if (1) I have an incurable and irreversible condition that will result in my death within a relatively short time, (2) I become unconscious and, to a reasonable degree of medical certainty, I will not regain consciousness, or (3) the risks and burdens of treatment would outweigh the expected benefits.*⁹
- Specific instructions for care to be retracted, if necessary, are provided, as well as a description of the circumstances that would necessitate implementation of retraction of care. For example, emergency care may be implemented, but if the situation is later deemed hopeless, then treatment that was initiated earlier would be removed.
- A clause may be included in the living will that describes how pain management should be handled.
- Other choices or instructions may be added to the living will.⁹ Additional instructions to consider include (however are not limited to):
 - Intravenous hydration and nutrition
 - Insertion of feeding tubes
 - Mechanical ventilation
 - Dialysis
 - Antibiotic treatment
 - Experimental treatment
 - Surgery
 - Pain management
 - Comfort/hospice care

- The living will may contain a clause with instructions for donation of anatomic structures, which may be as general as to state that any needed structure may be removed, or as specific as listing the structures. Donation of anatomic structures may be related to transplantation, therapy, research or educational purposes.
- The name and contact information for the individual designated as the primary care physician is listed, and one or two alternates may also be named. Contact information for the alternates must also be listed.
- The living will must be signed, dated and witnessed appropriately. Typically, the witness(es) must know the author (or receive proof of identity) of the living will but not be a close relative, not be named as a beneficiary to the estate, not be listed as the proxy and not be responsible for the care of the author.⁹

DO NOT RESUSCITATE

The do not resuscitate (DNR) order is a special type of advance directive that only applies to withholding administration of cardiopulmonary resuscitation (CPR) and advanced cardiac life support (ACLS) in the event of cardiac or respiratory arrest. Care to provide comfort and analgesia to the patient is not withheld. DNR orders are typically implemented by the patient (or his or her health care proxy) when he or she is terminally ill or is suffering from a condition that is not reversible.¹⁰ The DNR order may contain a clause that would allow administration of CPR in the event of choking or if the patient suffers trauma such as from a motor vehicle accident.²²

State laws that apply to DNR orders vary. In some states, DNR orders may apply only to patients confined to a health care facility such as a hospital or a skilled nursing facility. The DNR order must be signed by both the patient (or the health care proxy) and the physician. In some states, the document must also be notarized or contain the signatures of one or more witnesses. In other states, the properly-signed DNR order may apply to prehospital care administered by emergency responders. To alert first responders to his or her wishes the patient may wear an

alert bracelet or necklace containing information about the DNR order. In some states, a database listing patients with DNR orders is maintained and easily accessible by emergency personnel.¹⁰

The care providers must be aware of the DNR order, and in some states the DNR order must be signed by the provider. If a care provider assigned to the patient is not morally or professionally able to carry out the request to withhold this type of treatment, care of the patient must be transferred to a provider who will follow the order.¹⁰

In some states, the DNR order may be suspended during surgery and reinstated afterward. The premise is that a signed surgical consent constitutes permission to perform a life-saving act that supersedes the DNR order.¹¹

DURABLE POWER OF ATTORNEY

Durable power of attorney actually does not have to do with health care, but with all other types of decisions concerning legal matters. When preparing an advance directive that relates to health care, the individual should also consider who will be appointed to take care of his or her business, finances and property if he or she is unable to do so. The durable power of attorney grants the designated individual the power to act on behalf of the author.¹²

LAST WILL AND TESTAMENT

The last will and testament is another legal document that should be prepared in advance of need. The last will and testament provides specific instructions about what the author would like done with his or her estate after death occurs. Instructions for disposal or disbursement of real estate and personal property are included.¹³

EFFECTIVENESS AND AVAILABILITY OF DOCUMENTS

All legal documents are durable (unless otherwise specified), meaning that they are effective continuously from the date that they are originated and properly witnessed or notarized until they are revised or revoked by the author. A copy of a current document is just as effective as the original. Copies of the document should be readily available to the author's attorney, proxy, close family members, friends and health care providers.¹⁴

REVISION AND REVOCATION

All legal documents can be revised or revoked at any time, verbally or in writing. Written documentation is always preferred. The author may destroy the existing forms, update the existing forms, or create new ones. All parties should be



A DNR order applies to withholding CPR and ACLS.

informed of any changes and provided with copies of the most current documents.¹⁵

CONCLUSION

Advance directives are important because an individual's wishes concerning his or her medical care are known to the health care providers and the family members; which may make certain end-of-life decisions easier to make.¹⁶

The following four items are crucial in ensuring that all necessary documentation is completed.

1. Determine which forms will be utilized and obtain all necessary forms that are specific for the state of residence.
2. Determine who will be named as the health care proxy and discuss the responsibilities with that individual.
3. Complete the necessary forms and have them properly witnessed or notarized according to the state regulations.
4. Provide copies as needed to family, friends and medical care providers.¹⁵

The advance directive may be verbal, however a written document provides clear instructions and, if written clearly, does not allow for misinterpretation and misunderstanding. Legal documents may be revoked and revised at any time.

Lack of preparation of an advance directive may lead to unnecessary personal turmoil and legal action.

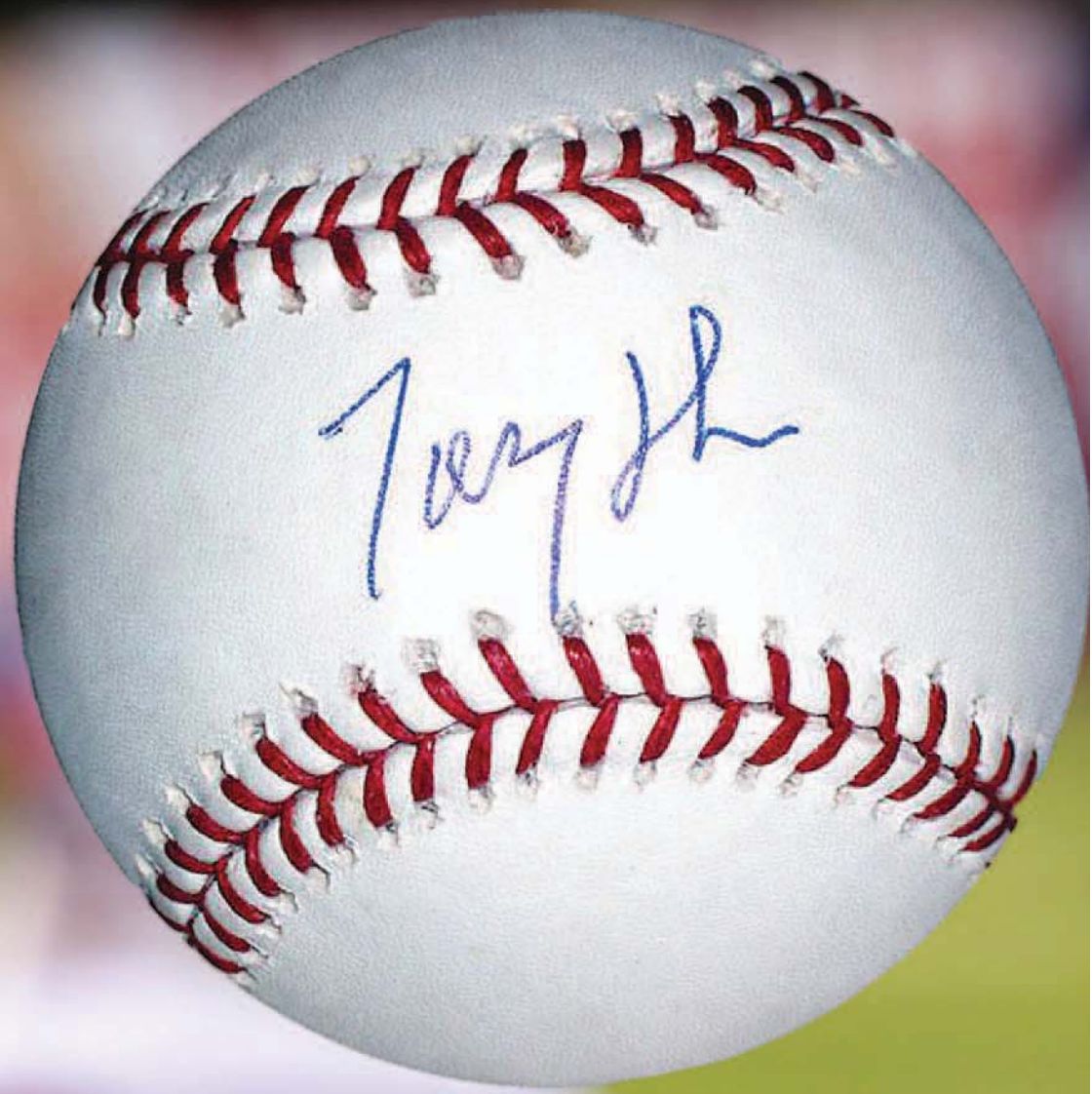
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Troy Jr

Ulnar Collateral Ligament Reconstruction

A Look Inside Tommy John Surgery

TOM BORAK

REVIEWED BY GORDON M SINGER, MD, MS

In the summer of 1974, Los Angeles Dodgers pitcher, Tommy John, was 11 years into his major league career and, with a 13-3 record, well on his way towards a potential CY Young Award-winning season. In the process, however, John permanently damaged the ulnar collateral ligament (UCL), also known as the medial collateral ligament (MCL), in his pitching arm.¹

Cryptically referred to as a “dead arm,” symptoms included a significant decrease in pitch velocity and noticeable discomfort during and after throwing sessions. Little was known about this injury at the time, but it was considered a death sentence for a professional baseball career. In fact, many now believe that an undiagnosed UCL tear ultimately forced fellow-Dodger and Hall of Fame pitcher, Sandy Koufax, into early retirement. By all accounts, John’s career as a big-league pitcher was over.

Undeterred by the prognosis, John consulted the Dodgers’ team physician, noted orthopedist Frank Jobe, MD. Faced with the specter of retirement, John was willing to try anything, including surgery, that might resurrect his career. He asked Jobe to “make up something” to fix his dead arm. The procedure that Jobe devised ultimately became the most revolutionary surgery in the history of professional baseball.

LEARNING OBJECTIVES

- Examine the causes of UCL tear or rupture
- Compare and contrast the types of Tommy John procedures
- Assess the pros and cons of allograft versus autograft tendon
- Evaluate the postsurgical rehabilitation program for UCL reconstruction
- Explain the UCL reconstruction procedure

INJURY OVERVIEW AND ANATOMY

The diagnosis of a “dead arm” is the result of a damaged ulnar collateral ligament (UCL) in the elbow of the athlete’s throwing arm. It primarily occurs in athletes competing in overhead-throwing sports, such as baseball, football and javelin. The vast majority of those affected, however, are baseball pitchers.

How common is this injury? According to *USA Today*, during the 2002 and 2003 Major League Baseball seasons, 75 of the nearly 700 pitchers who made an appearance were recipients of UCL reconstruction—approximately one in every nine pitchers.¹⁴ Today, that number has significantly increased.

The UCL is the primary medial stabilizer of the flexed elbow joint. In full extension, the ligament provides about 30 percent of the elbow’s stability, versus about 54 percent when the elbow is in 90 degrees of flexion—where most pitchers’ arms are positioned during delivery. Some estimates contend that the ligament provides more than 70 percent of the elbow’s stability at 90 degrees of flexion.²

In contrast, the radial head is an important secondary stabilizer in extension as well as flexion, providing approximately 30 percent of the elbow’s stability. Resection of both the UCL and the radial head results in gross instability of the elbow and can produce subluxation or dislocation.²

The UCL is composed of three bands: anterior, posterior and transverse. The anterior band, which arises from the anteroinferior surface of the medial epicondyle and inserts on the sublime tubercle of the ulna, provides the major contribution to valgus stability.³

The acceleration phase of the overhead throwing motion, common in baseball, football and javelin, among other sports, causes the greatest amount of valgus stress to the elbow. Extension occurs at a rate of up to 2,500 degrees per second, and continues to 20 degrees of flexion. Dur-

ing this phase, the forearm lags behind the upper arm and generates valgus stress, while the elbow is primarily dependent on the anterior band of the UCL for stability. During the acceleration phase, valgus stress can exceed 60 Newton meters (Nm), which is significantly higher than the measured strength of the UCL in cadavers. The valgus force can, therefore, overcome the tensile strength of the UCL and cause either chronic microscopic tears or acute rupture.³

TREATMENT OPTIONS

This injury is not necessarily life-altering. A person suffering a strained or partially-torn UCL can maintain a relatively normal lifestyle without losing the ability to perform day-to-day functions. With rest and some light rehabilitation, the average weekend-warrior can still go to the gym, play golf and participate in his or her recreational softball league, however, those patients who aspire to return to a high level of competition will most likely require surgery.

In a 2004 interview, James Andrews, MD, a highly-sought specialist for UCL reconstruction, told *Baseball Digest* that, “The [non-surgical] success rate healing these partial tears is a lot lower than we initially thought. It’s at best a 50-50 chance they’ll heal with conservative treatment.”⁴

The reason many athletes simply opt for the surgery is that while the procedure and subsequent recovery period can take a full season from a pitcher’s professional career, those who don’t opt for surgery can wind up being hampered by the injury for two to three years as they rest the injury and then try to return. Despite the rest, which can allow the body to repair some of the small tears, the ligament never regains its full tensile strength, which is critical in holding the joint together structurally. This makes it much easier to re-aggravate the injury and cause further setbacks.

“They yo-yo back and forth,” says Andrews. “They think they’re well, they throw and they get sore. In a lot of cases, we’ve now become more aggressive to go ahead and reconstruct them earlier.”⁴

DURING THE 2002 AND 2003 MAJOR LEAGUE BASEBALL SEASONS, 75 OF THE NEARLY 700 PITCHERS WHO MADE AN APPEARANCE WERE RECIPIENTS OF UCL RECONSTRUCTION – APPROXIMATELY ONE IN EVERY NINE PITCHERS.

METHODOLOGY OF THE SURGICAL PROCEDURE

The basic idea behind the UCL reconstruction is to replace the damaged ligament with a donor tendon. This tendon can come from many places. If the donor tissue comes from the patient's own body, it is called an autograft.

The ideal scenario is to harvest the *Palmaris longus* tendon from the forearm of the patient's operative arm. However, approximately 10-25 percent of the population lack this extra tendon, with an additional percentage whose tendon is too small to sufficiently replace the damaged UCL.⁵ When the *Palmaris longus* is absent or insufficient, the *gracilis*, *plantaris*, toe extensor tendons or a medial strip of the Achilles tendon are viable autograft options.⁶

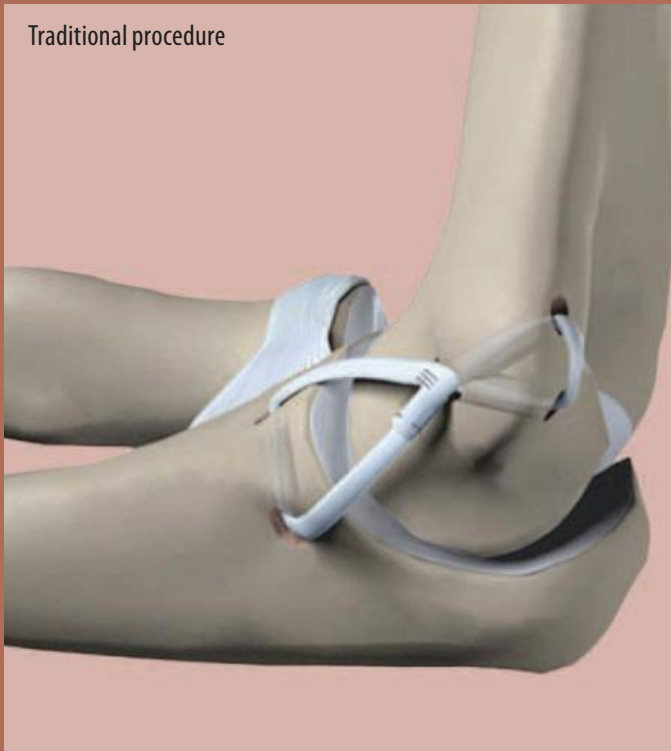
Several advancements have been made since the procedure was first performed in 1974. At the time the surgery was pioneered, there was no precedent for UCL reconstruction surgery in the elbow. When Frank Jobe, MD, first performed the experimental procedure, he detached the major muscles

of the forearm to reach the bone. The damaged ligament was then completely detached and removed to make room for the replacement tendon. In addition, the ulnar nerve was moved out of the way and, in some cases, re-routed in order to protect it.⁷ Nevertheless, complications with the nerve were not uncommon in early procedures. Postoperative nerve damage can result in numbness and tingling in the ring and small fingers.

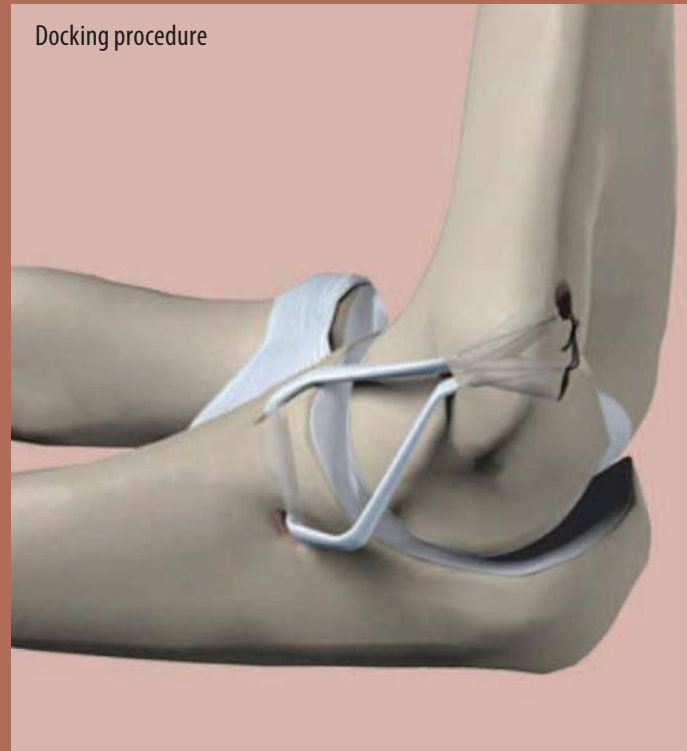
In the "traditional" procedure that Jobe pioneered, the replacement tendon is woven, in a figure-eight pattern, through two pairs of holes—two drilled in the medial epicondyle, and two in the ulna—and then sutured to itself.⁸

More recently, however, David Altchek, MD, who serves as medical director for Major League Baseball's New York Mets, has modified the procedure to be less traumatic than the traditional procedure. His "docking" technique differs from the traditional procedure in several ways. Access to the bone is gained using a muscle-splitting technique that gently pries apart the muscle fibers.⁷ The major muscles are not detached and,

Traditional procedure



Docking procedure



in most cases, the nerve is left intact, which reduces the chances of postoperative nerve damage.

Altchek's procedure also minimizes the holes drilled into the bone, reducing the risk of postoperative bone fracture. Unlike the traditional, figure-eight procedure, the graft in the docking technique relates closer to an "enlongated D."⁷ The graft enters the humerus bone, but never exits. Instead, sutures secure the tendon and exit the bone through much smaller exit punctures.⁷

According to Gordon Singer, MD, another disadvantage of the traditional technique is that the graft loses a lot of its tension when the tendon is looped through two bone tunnels and sutured to itself. The docking procedure is able to maintain greater tension on the graft because the two ends of the tendon are pulled taut with the attached sutures, which are then tied together.

In a study presented at a special session of the American Shoulder and Elbow Surgeons, held during the American Academy of Orthopedic Surgeons annual meeting, the docking technique is shown to be superior to the traditional method

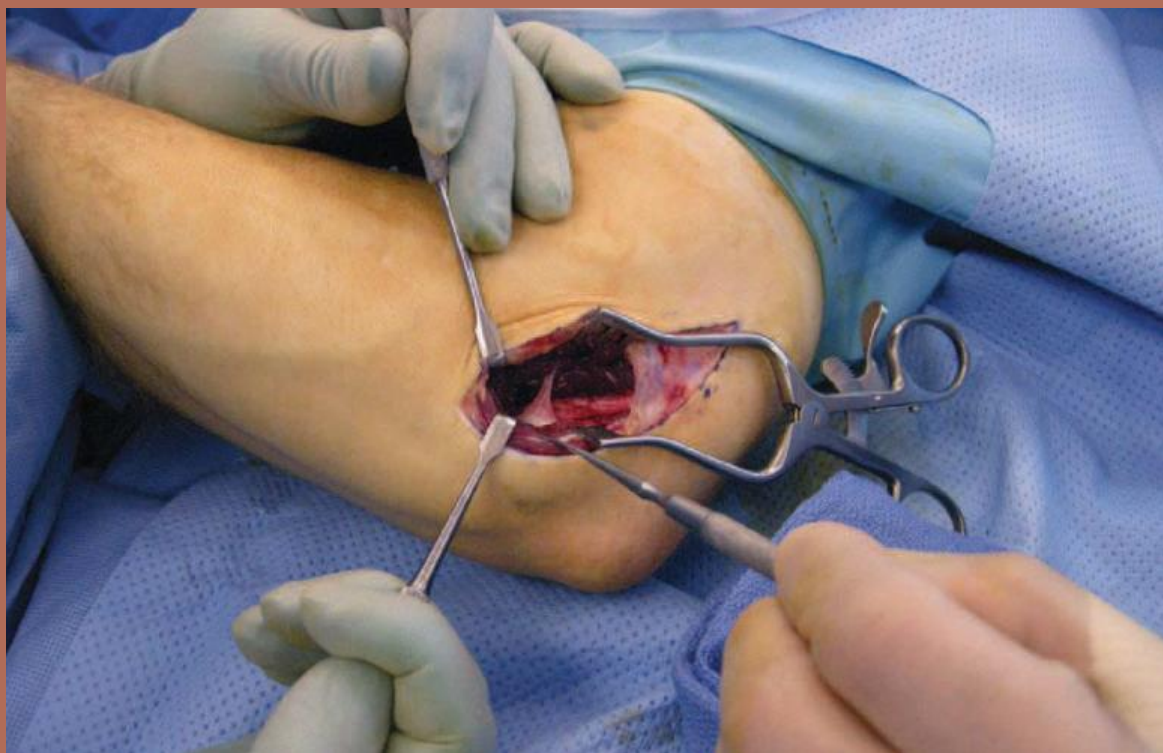
for UCL reconstruction. The study appeared in the December 2006 issue of the *American Journal of Sports Medicine*.

According to the study of 100 athletes (average age 22) who underwent ulnar collateral reconstruction using the docking technique, with an average follow-up of three years, 90 percent had an excellent result (returned to the same or higher level of competition) and 7 percent had a good result (able to compete at a lower level for more than 12 months). Only 3 percent had postoperative nerve complications. With the traditional procedure, studies have shown that only 68 percent of elite-level throwers return to either their prior or a higher level of throwing and 20 percent have nerve complications.⁷

THE PROCEDURE⁹

The patient is taken to the operating room placed in the supine position with the head in alignment. Both arms are extended and the legs are straight. The head and legs are supported by pillows. A safety strap is used for the body, and an

The incision:
Retractors hold the
ulnar nerve out of the
operative area.



arm board, pads and safety strap are used to support the nonoperative arm. The operative arm is positioned on a hand table.

A peripheral nerve block is administered at the surgeon's request for postoperative pain management. In this case, the nerve block is administered with ultrasound guidance. Two grams of cefazolin is administered intravenously, and general anesthesia is also given. A tourniquet is placed on the operative upper arm and the operative upper extremity is prepped and draped in sterile fashion.

In this particular procedure, the patient is receiving an allograft donor tendon. In the event that an autograft tendon is to be used, the extraction site is prepped and draped at the same time as the reconstruction site. The donor tendon is harvested only after the surgeon deems the replacement tendon necessary.

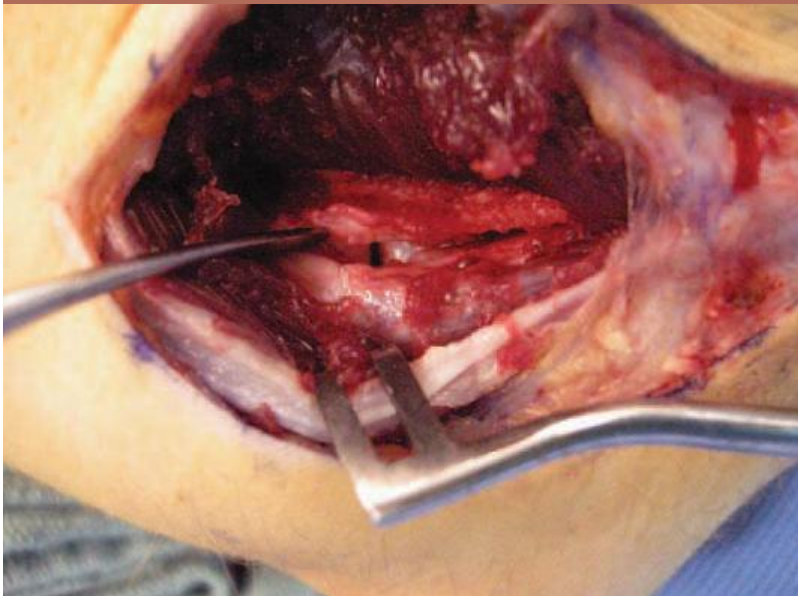
After Esmarch exsanguination, the tourniquet is inflated to the level prescribed by the surgeon.

The procedure is performed under Loupe magnification. A medial incision is made just anteroinferior to the prominence of the medial epicondyle

in a setting from just above the medial epicondyle to just distal to the ulnar tubercle. The incision is carefully carried through the skin only, in order to avoid injuring any branches of the medial brachial cutaneous nerve. The fascia is identified, split along the flexor pronator area, and slipped down back to the medial epicondyle. The ulnar nerve, first identified through a more posterior split (for location), is then moved more anterior.

The dissection is carried down to the proximal ulna and, specifically, the sublime tubercle, which is located just distal to the joint and is the point of insertion for the ulnar collateral ligament. The sublime tubercle is identified and examined to locate the ulnar collateral ligament. The ulnar nerve, located just inferior to the tubercle, is carefully protected, but not retracted.

Using a small burr, holes are drilled just above and below the tubercle to allow for a bone tunnel. A 26-gauge wire is then used to pass a 0 polyglactin suture through the bone tunnel. The proximal tunnels are then made. A 4.5 mm drill bit is used at the origin, a specific point on the medial



The exposed joint capsule:
The surgeon is indicating the
damaged ligament.



Polyglactin is threaded through the humerus,
indicating the location of the bone tunnels above and
below the tubercle. The polyglactin threaded through
the ulna indicates the location of the bone tunnel.

epicondyle to which the ligament is attached, to create a bone tunnel about a centimeter in depth. A 2.0 drill bit is then used, aiming into the tunnel for two anterior holes, distal and proximal to each other. Then, using 26-gauge wire, additional polyglactin suture is used to pass through these bone tunnels. This is for the docking procedure.

The tendon graft is then opened onto the sterile field. The graft is kept in a frozen moist environment until it is needed, at which time it is thawed and prepared for use. It is identified with regards to its thickest portion, and, using a #2 FiberWire®, a four passes with polyglactin-type lead is made and the graft is trimmed with regards to its width.

Adjustments to both the thickness of the graft and the size of the tunnel may be required; a bone curette is used to increase the size of the tunnel. The tendon is attached to the bone tunnel distally, and brought out through one of the tunnels proximally. This allows the surgeon to measure the length of the tendon. A second #2 FiberWire is placed. The graft is secured with a similar weave, cut to length and passed through the tunnel.

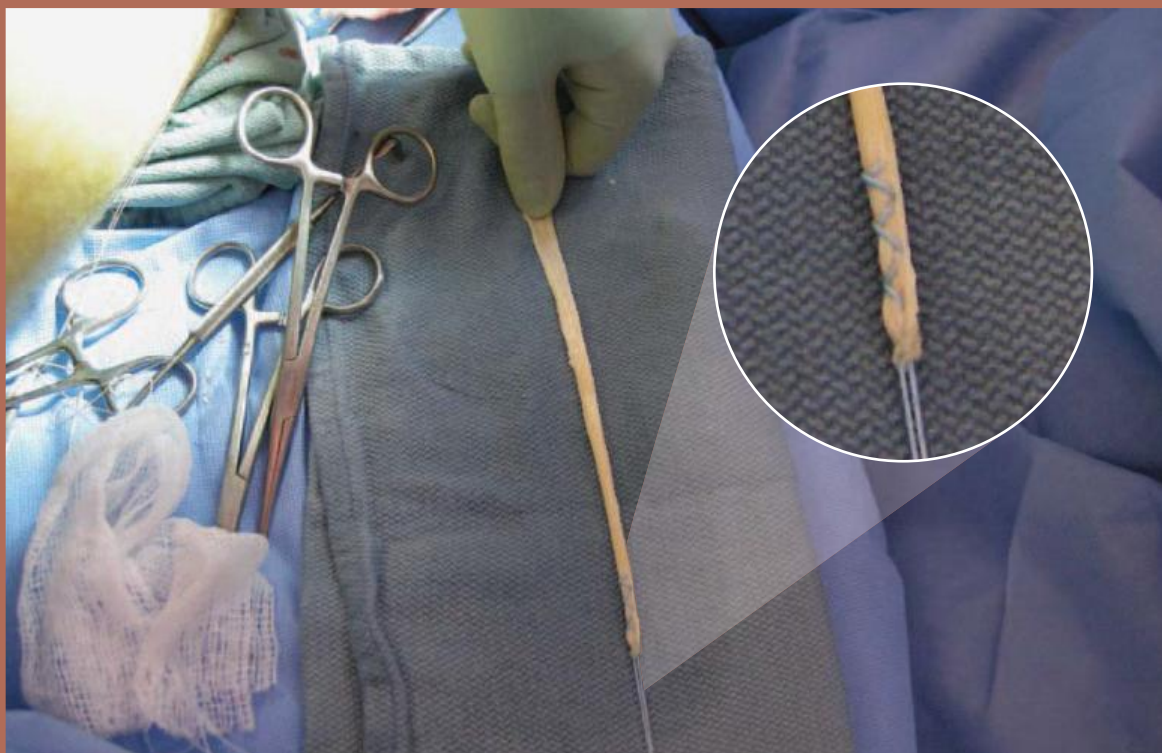
The tendon's position is checked with the elbow in both flexion and extension in order to position it as closely as possible to its normal location, given the appearance of the native ligament. The graft should be as symmetric as possible and significantly tight. The graft is tied in place with the elbow in mild varus.

The wound is irrigated and closed in layered fashion. 0 polyglactin is used to reapproximate the graft within itself to create a single bundle, and the pronator fascia is closed with 0 polyglactin as well. The skin is closed with 3-0 poliglactone. Xeroform and a dry dressing is applied. The dressing is composed of sterile gauze (4x4), a sterile cast pad and a fiberglass splint, which is secured with an ACE wrap. The patient is then transferred to the recovery area.

POSTOPERATIVE TREATMENT AND REHABILITATION¹⁰

Though the surgical procedure itself has been refined, James Andrews, MD, contends that the major advancements in the procedure have come

The allograft tendon is ready to be fitted and trimmed to size.



in the postoperative rehabilitation stage. “We’ve learned how much you can accelerate them and how much you can’t,” he said in an interview with *Baseball Digest*.⁴

The body is essentially converting the grafted tendon into a ligament, which includes getting it to carry blood again and training it to start functioning as a ligament.

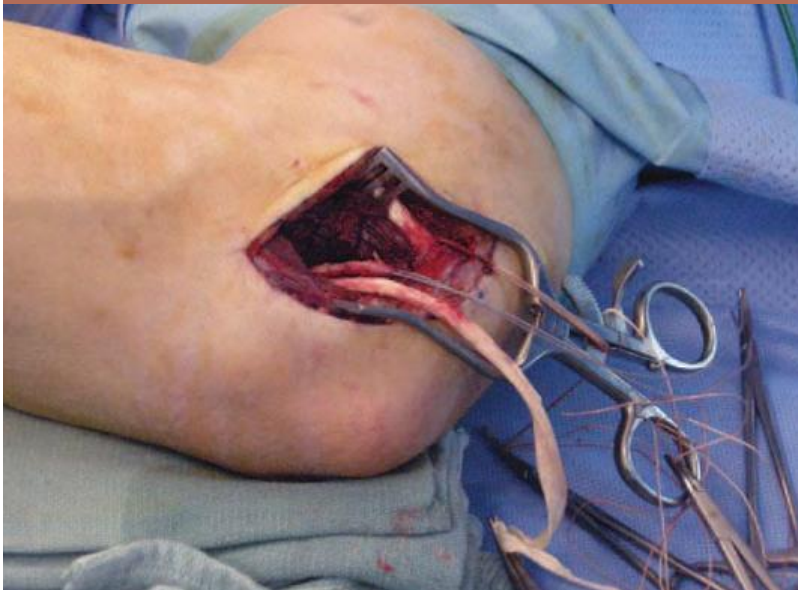
Immediately after the surgery, the affected arm is immobilized in a long-arm splint for 10-14 days. During this time, the wrist is not immobilized and the patient should work on conservative wrist and finger flexion and extension exercises. Grip strengthening is allowed, using putty or a ball. Submaximal bicep isometrics and shoulder isometrics can be initiated, but no external rotation of the shoulder is permitted.

After the splint is removed, the arm is placed in a functional brace, which helps protect the elbow from valgus stress, and limits motion to the prescribed range of flexion and extension. At this time, the patient can begin submaximal wrist isometrics and elbow flexion and extension isometrics.

The functional brace is slowly adjusted over time to increase the range of flexion and extension as the graft becomes more stable. During the second week, the brace restricts motion to 30 degrees flexion and 100 degrees extension. At week three, the brace is opened to allow 15/110 degrees of flexion/extension. Week four allows the patient 10/120 degrees of flexion/extension. This is increased to 0/130 degrees of flexion/extension by week six, and the brace is discontinued after the sixth week.

During weeks four through eight, the patient can begin light resistance exercises, including wrist flexion and extension, forearm pronation and supination, elbow flexion and extension, and a progressive shoulder-strengthening and rotator-cuff program. External rotation of the shoulder should be avoided until week six.

The primary goal of weeks 8-12 is to achieve full range of motion. The patient can begin more eccentric elbow flexion/extension exercises and progress the shoulder and elbow flexion/extension isotonic. The patient can also begin a light, bilat-



The tendon is threaded through the ulna and is now ready to be measured and cut.



The tendon is secured and tied in place with polyglactin, which is knotted and clipped.

eral plyometric program. By week 11, the patient can begin a sports-specific training regimen.

At week 20, the patient can begin an interval throwing program. In the beginning stages, however, this program is more accurately described as a light tossing program. Three times per week, for 15 minutes at a time, the patient can toss a ball 30 feet—half the distance between a regulation pitcher's mound and home plate. The distance is increased at a rate of 10 feet per month. A return to normal throwing occurs at approximately nine months.

While a full return is possible within a year, most pitchers need an additional six months to

a year to regain their pre-injury form, especially in regards to regaining their stamina and the ability to locate their pitches.

For patients who try to take shortcuts in the rehabilitation process, or return to throwing too quickly, there is a substantial risk of re-injuring the arm. In some cases, this may result in a temporary setback that will allow the patient to return to the rehab program after a short layoff. For others, however, it may result in a second surgery.

The success rate for a second procedure is significantly less encouraging. From 1994-2005, James Andrews, MD, performed 1,169 UCL reconstructions. Of those, only 12 were players that were returning for their second surgery. Andrews estimates that of those 12, only two or three—20 percent—had a chance at returning to their pre-surgery level of baseball.¹⁵

The poster child for multiple UCL reconstructions is, without a doubt, Jose Rijo. The Dominican-born pitcher underwent Tommy John surgery five times in his career,¹⁵ and returned to pitch at the Major League level after each injury, including winning World Series Most Valuable Player honors in 1990, and being named to the All Star team in 1994.¹⁶

GROWING CONCERN IN THE WAKE OF GROWING SUCCESS

The future of Tommy John surgery is both bright and daunting. While innovations to the original procedure, such as the improvements made in the docking technique, continue to increase the success rate of the surgery, more and more surgeries are being performed. The most startling statistic, however, is the frequency of this procedure being performed on patients under the age of 18.

Speaking at the 2008 American Orthopaedic Society for Sports Medicine Annual Meeting, E Lyle Cain, MD, fellowship director for the American Sports Medicine Institute, Andrews Sports Medicine and Orthopaedic Center, expressed concern over this trend.

“Before 1997, this surgery was performed on only 12 of 97 patients who were 18 or younger,” said Cain, who co-authored a study that was released at the conference. “In 2005 alone, 62 of the 188 operations performed were on high school athletes—one third of the surgical group.”¹¹

The overall increase in surgical numbers is amazing. From 1996-99, James Andrews, MD performed the operation on 164 pitchers—19 of whom were high-school aged or younger. From 2004-07, that number jumped to 588 pitchers, with 146 presenting as high school or youth-league players, including some as young as 14-years old.¹²

The increased number of UCL reconstructions in minors can be attributed to several factors. On the medical front, improved diagnostic techniques, heightened awareness of the injury and a high-percentage chance of a positive outcome with surgical intervention are all factors. However, many believe the dramatic increase has a direct correlation with the overuse of young throwing arms.

According to Cain, “In the past 10 years, year-round baseball leagues have proliferated, so the best young pitchers are throwing many more pitches and learning to throw more difficult pitches [such as curve balls and sliders]. It's great that the surgery is successful, but prevention of the injury should be the goal.”¹¹ Implementing pitch counts on young pitchers is one way to prevent over-use. While most Little League organizations limit the number of innings a pitcher can

“WHILE A FULL RETURN IS POSSIBLE WITHIN A YEAR, MOST PITCHERS NEED AN ADDITIONAL SIX MONTHS TO A YEAR TO REGAIN THEIR PRE-INJURY FORM, ESPECIALLY IN REGAINING THEIR STAMINA AND THE ABILITY TO LOCATE THEIR PITCHES.”

throw in a week, these rules do not govern players who may also pitch in travel leagues or school programs. The combined pitch count can significantly increase the probability of damaging the arm. Another way to reduce stress on young arms is for coaches and parents to encourage their players to focus on learning less-strenuous pitches, such as a change-up as opposed to a curve ball, until their arms have matured. From a baseball perspective, a good change-up can often be more effective than a good curve ball, so perfecting it early can benefit a pitcher's developing repertoire.

Among the most frequently-cited reasons for athletes seeking the surgery is a desire to throw harder. One of the most common misconceptions about the procedure is that pitchers will come back with greater velocity than they had prior to the surgery. In fact, in some instances, young pitchers and their parents have inquired about having the surgery performed on a healthy arm in an effort to add a few more miles per hour to a fastball.¹³ Others, who have been told that their arm did not require surgery by one physician, have played up their symptoms and undergone the operation at the hands of a second.¹³

According to several prominent orthopedists interviewed for a 2007 article in *The New York Times*, there is no evidence that the surgery has been performed on a completely healthy arm, however, "It's something we all worry about," says Andrews.¹³

According to Brian J Sennett, MD, director of sports medicine for the University of Pennsylvania Health System in Philadelphia, "There's nothing in the literature that you throw harder when you come back."¹³

Force and motion are produced by the contraction of muscles. Ligaments do not make the body move. They are rope-like devices that connect bones and stabilize joints, but they do not have any spring-like function. Tommy John surgery relieves pain, but does not provide an increased ability over a healthy, natural ligament to transfer energy from the body to the ball.¹³

Doctors have suggested several theories behind the claims of increased velocity. Among them are the possibility that pitchers are com-

paring their post-surgical results to the velocity from their injured arm; the fact that young pitchers begin to throw harder as they mature; and that pitchers often correct and improve their mechanics (windup, delivery and follow-through) during the rehabilitation phase, while also working to make their bodies stronger.¹³

"[The surgery's ability to improve velocity] isn't always true by any stretch of the imagination," says Andrews. "For the ones that do it, the reason is all the hard work—all the throwing exercises and the development from all the exercises they'd probably never done before."⁴

Therefore, in theory, a pitcher can maximize his natural abilities without surgery simply by adhering to the rigorous rehabilitation routine prescribed to post-Tommy John patients. Substantial focus on strengthening the shoulders and rotator cuff regions are the biggest difference-makers, and the most likely areas to be overlooked in a typical workout routine.

As far as the future of the procedure is concerned, anything is possible.

"We may be able to develop gene therapy," Andrews hypothesizes, "so that we'll be able to inject a substance into a young kid's ulnar collateral ligament and develop it twice as strong as mother nature would. We would hope that we could grow ulnar collateral ligaments in the lab—and exchange parts."¹⁷

CONCLUSION

Ulnar collateral reconstruction surgery has forever changed the landscape of sports medicine. The procedure has resurrected the careers of scores of professional athletes and revitalized the dreams of thousands of others. As innovations continue to improve the success rate, it will undoubtedly continue to grow in popularity. Thanks to the persistence of Tommy John and the ingenuity of Frank Jobe, MD, the "dead arm" is a thing of the past.

IN THEORY, A PITCHER CAN MAXIMIZE HIS NATURAL ABILITIES WITHOUT SURGERY SIMPLY BY ADHERING TO THE RIGOROUS REHABILITATION ROUTINE PRESCRIBED TO POST-TOMMY JOHN PATIENTS.

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Fast Pitch:

A personal journey through Tommy John surgery

TOM BORAK

I have been playing baseball since I was old enough to pick up a bat. Some of my earliest memories are playing wiffle ball in the backyard with my dad. However, as the oldest of four boys, I was never pushed into organized sports, so I came to the game much later than many kids. I joined my first team with the local YMCA program when I was 10 years old and decided that I wanted to be a pitcher.

In addition to seasonal baseball leagues, my brothers and I played wiffle ball in the backyard just about every day of every summer. We would occasionally all get together for a two-on-two tournament, but most of the time it was my youngest brother, Mark, and I, playing one-on-one. Of course, when it's one-on-one, there is no relief pitcher. Each of us would throw that plastic ball as hard as we could for hours on end, day after day.

I first noticed pain in the elbow of my throwing arm in 1998, my sophomore year of high school. It was toward the end of the season, and because I was also experiencing pain in my knees, I attributed the elbow pain to a growth spurt. The pain was manageable, so I played through it.

I did not play ball in college, opting to focus on academics instead. This time off gave my arm four years of rest.

After I graduated, I took up baseball again in a weekly men's league. I did not factor the four-year layoff into my pre-season workout, and when I started pitching, I was throwing as hard as I could right from the start. About five games into the season, my arm was hurting to the point that I could not throw at all.

I saw a physical therapist, who poked around my elbow a little bit and told me that I had likely torn part of the ligament away from the bone. This assessment was given without any form of diagnostic imaging, such as MRI. She used some gel and an ultrasound machine for therapy treatment and gave

me a brace to wrap around the elbow when throwing. I took another year off from pitching to work on rehab and a training program that focused on core and shoulder strength.

When I started pitching again, my velocity had improved significantly and I had the best season of my life. During the break between the summer and fall seasons, I tried to stay in shape by throwing a couple times a week. During one of these sessions, before which I had not adequately warmed up, I felt a pop in my elbow. I tried to ignore it, but there was



definitely something wrong. In my first start of the fall season, a chilly September morning, my arm felt more fatigued than normal, and I wasn't locating my pitches the way I had a month before. After the third inning, I could not bend my elbow back to pull my jacket over my head. That's when I knew that I was really hurt.

The MRI showed a partially torn ulnar collateral ligament. The doctor I saw, however, recommended rest and therapy. He did not think surgery was necessary to repair my arm. I spent

the prescribed six months in the gym, working my way back. The following season, however, the velocity was gone and after two brief outings, I was designated to the outfield. By the end of the season, however, I could not even make *that* throw. It eventually got to the point that I could not even go to the gym without experiencing discomfort in my elbow due to the instability of the joint.

My appointment with Gordon Singer, MD, was very business-like. I gave him my injury history, my MRI from the previous fall and told him I wanted to throw competitively again. We discussed the risks and benefits associated with the surgery and the very real possibility that I may never get back to my pre-injury level. I assured him that it was a risk that I was willing to take.

Singer explained that he would use the docking technique as opposed to the traditional figure-eight method, citing its success rate and less-invasive nature. We also discussed the source of the donor tendon. I do not have the *Palmaris longus*, so my options were my own hamstring or a cadaver. After weighing the pros and cons of each, I decided on the cadaver in order to avoid dealing with multiple surgical sites and rehab routines.

I underwent surgery on Friday, October 31, 2008. The procedure lasted approximately two hours and there were no complications. The pain was negligible, compared to what I was expecting, after talking to another Tommy John recipient, who had experienced postoperative nerve damage. By Sunday evening, I was only taking Ibuprofen for the pain. I went back to work the following Wednesday, though I was limited in my movement by a hard splint that kept my right arm at a 90-degree angle.

When the hard splint came off, 10 days postoperatively, I began working towards achieving full range-of-motion while confined to the adjustable brace. As scheduled, I was free after six weeks of progressive range of motion increases and had achieved full range of motion two weeks after that. Now, five months since my surgery, my elbow is feeling stronger. The most difficult part of the process for me has been slowly easing my way back into the gym and my throwing program, and trying not to do too much too quickly. It is easy to gain false confidence on days when my arm is pain-free, however, it still lets me know when I am pushing the limits and need to back down.

My goal is a full recovery and a pain-free return to a very active lifestyle, which will ideally include a return to competitive pitching. Thanks to this surgery, I'm almost halfway home.



Obesity:

An American Epidemic

Karen L Chambers, CST

America is facing an epidemic of enormous proportions: obesity. Defined as the state of being above one's normal weight,¹³ a person once had to be diagnosed as being more than 20 percent of their ideal weight to be considered obese. In the present day, the National Institute of Health (NIH) states that a person with a Body Mass Index (BMI) of 30 and above (which relates to 30 pounds) is now considered obese.¹² A person's height, age, sex and build help establish their ideal weight.

Obesity is a condition in which excess body fat has accumulated to such levels that a person's health can be negatively affected. The US Centers for Disease Control and Prevention (CDC) have ranked obesity as the number one health threat in America, with an estimated 400,000 deaths annually.³ (Smoking causes an estimated 440,000 deaths annually.¹⁹) Being simply overweight is not as dangerous as being obese. An overweight person can easily lose a few pounds by monitored diets and exercise, and usually regains a healthy body and mind. Obese people cannot accomplish this as easily, no matter how much effort is exerted.

Obesity not only affects an individual's lifestyle, it also leads to low self-esteem, which leads to depression and discomfort. Negative emotions, such as boredom, sadness, stress and anger, can also jump-start bad eating habits. These and other psychological factors may bring people to use food as medicine.

Numerous research studies have confirmed that poor eating habits, lack of exercise and a sedentary lifestyle are the prime contributors to obesity.¹⁰ Because of on-the-go lifestyles, fast food consumption and microwave meals, people have sacrificed their

LEARNING OBJECTIVES

- ▲ Examine the long-term health risks associated with obesity
- ▲ Compare and contrast the different types of weight-loss surgery
- ▲ Assess the risks and benefits of each surgical option
- ▲ Evaluate the different nonsurgical methods of weight loss
- ▲ Explain the significance of America's increasing rate of obesity

health. Instead of eating pure, wholesome foods, many people opt to eat a diet of packaged, processed and refined foods.

In 1993, endocrine researchers discovered that leptin, a hormone secreted by fat cells, not only controls food intake, but also impacts other functions that are affected

A normal person should not consume more than 65 grams of fat or 2000 calories a day. One meal from Burger King® (a hamburger and french fries), has 50 grams of fat and 2000 calories, which is practically the entire allotment for fat and calories permitted for a day!¹¹

by energy balance that could relate to obesity.⁶ High leptin levels trigger growth and readiness for re-accumulation of leptin in the blood. However, obese patients respond poorly to leptin, which suggests the presence of leptin resistance. With this deficiency, an individual will never feel the urge to stop eating, which leads to overeating. Meals that are high in fat and sugar (*ie* fast food) have excessive amounts of calories, more than the body can burn in a single day. Those calories become stored fat, causing the person to gain more weight.

Through technological advances, food is now produced in mass quantities, lasts longer and tastes better. Unfortunately, the highly-processed and refined products that pack our supermarket shelves are loaded with sugar, hydrogenated oils, and many ingredients that most of us have never heard of. Many of the meals served at fast food restaurants, while convenient, contain practically no nutritional value. While the selections are inexpensive, fast and appealing to many, the saturated fats, highly-refined carbohydrates, high sodium and sugar are the hidden ingredients

Studies, conducted by researchers at the University of North Carolina, Chapel Hill, examined three large, nationally representative surveys on food consumption conducted from 1977 to 1998. The survey collected data on what more than 63,000 people said that they ate. Salty snacks (crackers, chips, pretzels) increased from 1 ounce to 1.6 ounces, adding 93 calories. Mexican food (burritos, tacos, enchiladas) went from 6.3 ounces to 8 ounces, up 133 calories. The studies concluded that people consumed larger portions of one third of the 107 foods analyzed, which included bread,

cookies, cereal, fries, coffee, wine and fresh juices. Also calculated was the average amount of beer consumed by men over 40 years of age, which went from 23 ounces to 32 ounces, an increase of 100 calories. This research was concluded in 1998, so it is quite likely that portions have increased.²⁰

Americans are gaining weight at a frightening rate. Fifty nine million people are obese, and that number is likely to increase to 65 million over the next few years.⁸ Medical experts now believe obesity to be at epidemic proportions.

Cynthia Ogden, PhD, a CDC epidemiologist, published the results of a study of weight in the United States. The results were startling: 31 percent of adults are obese and 15 percent of children from the ages of 6-19 are obese.⁸ This increase will adversely affect the health of these children as they approach adulthood. Childhood obesity is a fast-growing problem. Although Ogden stresses that obesity is a problem for all groups and genders, it is particularly severe among certain ethnic groups, for example, 50 percent of all non-Hispanic black women are obese.¹²



People are eating larger portions of fries, chips and burgers and drinking more soda than they did 20 years ago. According to new research, they are consuming more than 100 extra calories daily than needed!¹¹

BY THE NUMBERS

- ▲ 1500 of us die from cancer every day
- ▲ 1 in 3 women and 1 in 2 men will have cancer in his or her lifetime
- ▲ 1 in 8 American women will be diagnosed with breast cancer
- ▲ Heart disease kills more women than breast cancer
- ▲ 1.3 million Americans have a heart attack each year
- ▲ 23 percent of Americans have hypertension
- ▲ Americans spend \$330 billion per year on heart disease
- ▲ 64 percent of US adults are overweight or obese
- ▲ Diabetes will increase by 165 percent over the next 50 years, with 29 million Americans diagnosed
- ▲ 33 percent of Americans suffer from arthritis
- ▲ Cancer kills more children than any other disease
- ▲ By age 3, children have fatty deposits in their arteries
- ▲ By age 12, 70 percent have developed beginning stages of hardening of the arteries
- ▲ 1 in 4 children is obese
- ▲ Obesity has doubled in the last 20 years
- ▲ Nearly 50 percent of obese adolescents remain obese as adults
- ▲ In the last 20 years, type 2 diabetes has increased 10-fold
- ▲ More than 8 million children have asthma, up 232 percent in the last 40 years
- ▲ Less than 7 percent of children and adolescents consume the recommended 2 servings of fruit and 3 servings of vegetables per day¹¹

MEDIA/DIETS

The seemingly contradictory reports in the media about what people should and should not be eating confuse the issue. For instance, proponents of protein diets argue that all of the accepted wisdom about eating a low-fat diet is wrong.¹⁰ Most experts do not agree with them, but protein diets are being evaluated in studies now. One thing mainstream nutritionists and protein diet proponents do agree on is that the low-fat recommendations of the 1990s did not work.

“People took the low-fat message and decided that it meant that as long as they ate things that were low fat, they could eat as much as they wanted,” says William Dietz, MD, PhD, director for the division of nutrition and physical activity in the National Center for Chronic Disease Prevention and Health Promotion at the CDC. “However, that is not the case, since calories add up, regardless of what form they come in. Even worse, many of the low-fat snacks that companies developed actually contained more calories than their regular fat equivalents,” Dietz observes.¹²

According to food-maker Nestle®, the media has a tendency to report results of scientific studies out of context.

It argues that the relative stability of the dietary and fitness recommendations over the years to eat less fat, more fruits and vegetables and exercise regularly do not interest people as much as exciting stories about radical diets or the effects of particular miracle foods or vitamins.⁶

Fad diets, pills and liquids, all sold as a quick fix to fit into those “skinny jeans” or new designer clothes just do not work. They are tools to help the market and the retailer make more money with little regard for the potential public harm. Americans must focus on the obesity problem and concentrate on what we should do to be healthy, stay fit, and accept the fact that this is a problem.

We are a great country in many ways. We are also great at pointing fingers to place the blame elsewhere. We blame the over-abundance of fast food chains, work and school for not allowing us to eat a healthy meal. We blame

television and video games for corrupting our children – not allowing them to get out and get the proper exercise they need.

We never blame ourselves for not limiting the children’s TV time or video game usage; for not encouraging the children to go out and run around outside for a couple of hours every day; for being too lazy to prepare healthy meals; for a lack of determination to stay healthy and fit. The real significance of being overweight is not just a cosmetic issue. The emergence of obesity-related diseases and disabilities is the real threat.

OBESITY-RELATED CONDITIONS

Medical conditions that affect obese individuals include hypertension, blood clots, diabetes, renal failure, sleep apnea, cardiac failure, fatigue, and breast, colon and prostate cancer.⁵ Obesity also leads to mental health conditions, such as depression and low self-esteem. Not only does obesity affect the major arteries and organs, but the state of mind as well!

People with an excessive amount of body fat have higher levels of triglycerides and low-density lipoprotein cholesterol, as well as lower levels of HDL cholesterol in the blood,

which may cause inflammation and an increased risk for developing types of cardiovascular diseases, including heart attacks, congestive heart failure, sudden cardiac arrest, angina, and abnormal heart rhythm.⁵

More than 80 percent of overweight people have type 2 diabetes.⁵ According to data from the CDC's National Health and Nutrition Examination Survey, "two thirds of adult men and women in the United States diagnosed with type 2 diabetes have a Body Mass Index (BMI) of 27 or greater, which is classified as overweight and unhealthy. Obesity complicates the management of the type 2 diabe-

The average child sees more than 10,000 food ads on TV each year, most of which are high-calorie, high-fat, and high-sugar meals.¹¹

tes by increasing insulin resistance and glucose intolerance, which makes the drug treatment for diabetes ineffective. In addition, hypertension is twice as common in obese adults versus individuals who maintain a healthy weight.⁶

A number of state and local governments are trying to fight the current weight gains in children and adolescents, particularly in the schools. Members of some state legislatures are drafting and adopting laws that reinforce physical education while teaching the importance of nutrition and health in their curriculum.¹⁰ In Texas and California, the struggle to eliminate junk food and soda from being sold in the public school system eventually succeeded.

In 1990, Arnold Schwarzenegger was named chair of the President's Council on Physical Fitness, a program geared toward educating children on the choices they need to make regarding their health with respect to food choices and exercise. These actions to take control over what our children consume are beginning to reach school systems nationwide, but this war is not over.

The trend of being overweight is related to many cultural, economic and environmental factors. The primary concern should be one of health and not appearance. For example, all expectant mothers should be educated about the many benefits that breast fed babies receive, among them that they are less likely to become overweight as they grow older. Breast feeding will also benefit the mother, who returns to her pre-pregnancy weight more quickly.³

TREATMENT OPTIONS

The most common treatment for weight loss is nonsurgical: diet and exercise. Eating fewer calories while increasing physical activity is the best way to lose weight. For most adults, a low-calorie diet of 1200-1500 calories per day for women, and 1500-1800 calories per day for men is recommended. It has been proven that limiting calories, not the types of foods that are consumed, causes more weight loss.⁷ For example, cutting only carbohydrates or fat will not cause any more weight loss than a healthful and balanced low-calorie diet.

Exercise helps burn more calories. One of the best ways to increase activity levels is walking. Most people can walk safely and routinely alone or with family members, friends, co-workers or pets. It is usually easy to work it into a busy daily schedule. When possible, keep track of steps with a pedometer. Wearing the step counter motivates an individual to walk more during the day.

Supplemental weight loss drugs, such as sibutramine, orlistat and phentermine, promote the feeling of fullness, reduce appetite or limit the amount of fat absorbed.⁷ However, without a diet and exercise plan, the weight returns as soon as the medicine is stopped.

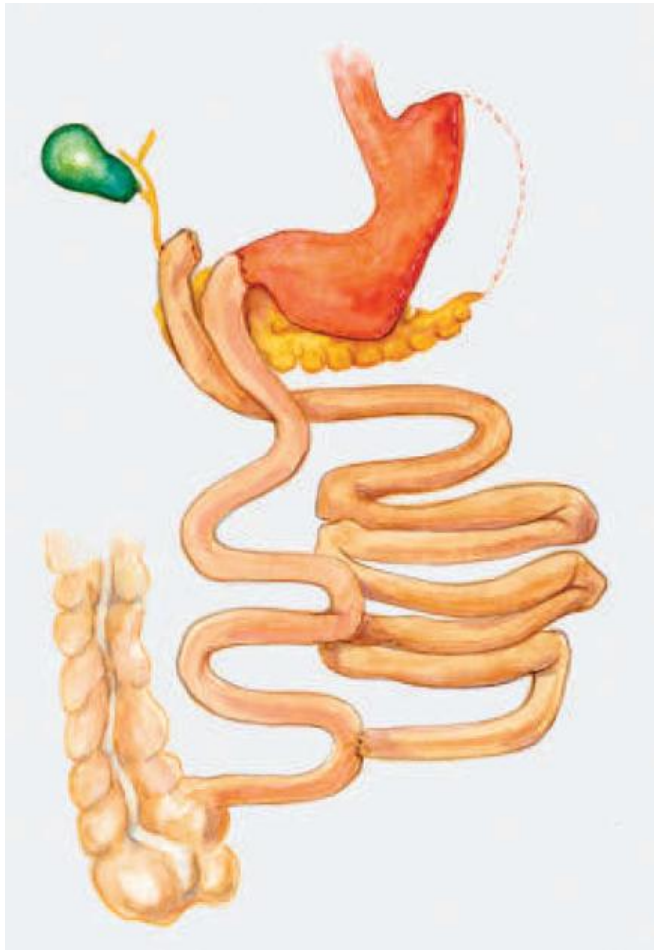
OPTION 2

Medical science and surgery is the second option. Doctors have developed devices and surgical procedures that can help certain candidates with losing weight. These obese candidates have found that their bodies did not respond to the first option of diet and exercise. Doctors today have developed a strict diet and exercise program to be followed after the surgical intervention to keep the weight off.⁵

Obesity surgery is recommended only for patients with a BMI (body mass index) of 40, or a BMI of 35 - 39.9 combined with other serious obesity-related medical conditions.⁵ It is important that patients understand all of the risks and benefits associated with these surgical procedures.

PROCEDURES

Liposuction removes fat from deposits located underneath the skin by using a cannula attached to a vacuum, which collects the fat. This procedure is performed quickly. Formerly, general anesthetics or heavy IV sedation were utilized, but with advances in medicine, it can now be done on a lunch break using a local anesthetic. Although liposuction is a quick and easy procedure, it is not in any way a permanent means of weight loss. Those who opt to have this done must still work to keep the weight off.



Malabsorptive: Biliopancreatic diversion with duodenal switch.

Mesotherapy is a common sculpting treatment, which involves the injection of fat-melting drugs into fatty tissues like the buttocks, love handles, back, arms and abdomen.

Bariatric Surgery: There are three kinds of bariatric surgery.

- ▲ Restrictive bariatric surgery decreases food intake and makes the patient feel full after meals.
- ▲ Malabsorptive bariatric surgery reduces absorption of calories, nutrients, and proteins.
- ▲ A combination of both restrictive and malabsorptive is also available.

Bariatric surgeries can be performed open or laparoscopic. After the surgery, the patient must learn not to eat certain foods, such as those high in fat and cholesterol, and to raise their metabolism. The daily routine of changing portion sizes will be a shock, but the patient must adapt to the smaller portions and not revert to old habits.

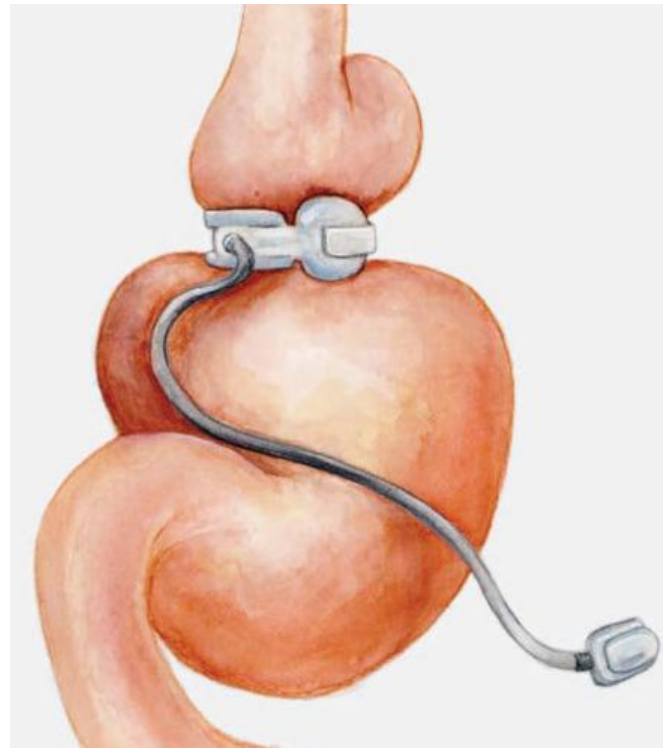
VERTICAL BANDED GASTROPLASTY (STOMACH STAPLING)

The size of the stomach is surgically reduced. Both a band and staples are used to create a small stomach pouch. In the bottom of the pouch is a 1 cm hole, approximately, through which the pouch contents can flow into the remainder of the stomach and then into the remainder of the gastrointestinal tract. Stomach stapling is more effective when combined with a malabsorptive technique, in which part of the digestive tract is bypassed, reducing the absorption of calories and nutrients.

This type of procedure results in less weight loss compared to other surgeries. It is also less commonly used today because of poor long-term prognosis. After stapling, the stomach is still able to stretch past the staples and the person can regain the weight. It was developed in the 1970s as a safer alternative to the Roux-en-Y gastric bypass, which introduced a mechanical stapler to the surgical site.

GASTRIC BANDING

Laparoscopic adjustable gastric banding (LAGB) is a restrictive procedure that uses a gastric band made of silicone and an inflatable balloon. Because it is done laparoscopically,



Restrictive: Adjustable band gastroplasty



ROUX-EN-Y GASTRIC BYPASS

This is the most popular weight loss procedure today.¹ It is simply known as gastric bypass. Similar to the gastric band, the procedure limits food intake, but unlike the band, the surgeon will divide the small bowel about 18 inches below the lower stomach outlet and rearrange it into a y-configuration. This enables the flow of food from the small upper stomach pouch.

The distal version of this procedure moves the y-connection further down the gastrointestinal tract, closer to the distal end of the small bowel, which also reduces the absorption of food, fats, starches, various minerals and fat-soluble vitamins. The unabsorbed starches and fats pass instead through the large intestine, causing some bacterial actions allowing them to produce irritants and malodorous gases, increasing the weight loss. To be fully successful, these procedures must be accompanied by diet and exercise. Lean muscle must be built up to make up for the loss of fat.

The gastric bypass procedure, while one of the most effective and common procedures, comes with a drastic change in lifestyle. Portion control makes the patient eat less than normal, and imposes restrictions on smoking and alcohol consumption. About 140,000 gastric bypass procedures were performed in 2005 in the United States alone.¹

Restrictive operations lead to weight loss in almost all patients, but they are less successful than malabsorptive operations, which achieve substantial long-term weight loss. About 30 percent of those who undergo vertical banded gastroplasty achieve normal weight, and about 80 percent achieve some degree of weight loss. Studies reveal that 10 years after surgery, only 10 percent maintained the weight

While obesity rates have increased nationwide, it has increased more dramatically in specific areas of the country.

REGION OF THE US	1991 %	2000 %
New England	9.9	16.95
Middle Atlantic	12.7	18.41
East North Central	14.1	21.00
West North Central	12.2	19.82
South Atlantic	11.1	19.52
East South Central	13.1	23.05
West South Central	13.1	22.20
Mountain	9.6	17.10
Pacific	10.0	19.10

Source: CDC Behavioral Risk Factor Surveillance System 1991-2000

there is minimal to no scarring. The balloon connects to a small reservoir placed under the skin of the abdomen. The diameter of the band can also be adjusted. When the balloon is inflated, it increases weight loss and when deflated, it reduces weight loss. This procedure has a lower risk of complications and discomfort compared to an open procedure. The advantage of the LAGB is that the procedure is adjustable, allowing the doctor to make changes during each follow-up examination, depending on the results of the diet. After banding, the stomach can only hold approximately one ounce of food. In some cases, the band may erode into the stomach, or there may be some esophageal dilation, resulting in failure to lose weight. On average, LAGB leads to approximately a 40 percent loss of excess weight.²

Considered the least invasive and safest weight loss surgery, the procedure can be reversed if necessary. It has a low complication rate. The most common problem after surgery includes nausea and vomiting. The risk of death is 1 in 2000. It does not interfere with food absorption. For this reason, vitamin deficiencies are rare after gastric banding.

BILIOPANCREATIC DIVERSION

Initially in this procedure, a reduced stomach is created, and then the digestive juices are diverted into the small intestine. The first part of the duodenum is bypassed, because that is where most of the calories are absorbed. The section with the bile and pancreatic juices is anastomosed to the small intestine further down.

FACT VS. FICTION

MYTH #1 People only become obese and overweight because they do not engage in physical activity and have unhealthy eating habits.

FACT #1 It is important to remember that obesity is not always a behavioral issue. Physical activity and eating habits are major contributors, but there needs to be a balanced combination of behavior and medical evaluation and intervention.

MYTH #2 Once committed to a weight-loss regimen, obese individuals should attempt to lose a large amount of weight as quickly as possible.

FACT #2 Rapid weight loss (3 or more lbs per week) will increase risk of developing gallstones. 2 lbs per week over time is more sustainable.

MYTH #3 Weight gain in women over time is healthy and part of a natural aging process.

FACT #3 Although metabolism may change over time, weight gain of more than 20 pounds is not a normal part of the aging process. In fact gaining more than 20 pounds between age 18 and midlife increase risk of disease.

MYTH #4 Osteoarthritis only develops when an individual gains a large amount of weight over a short time period.

FACT #4 Timing is not a major factor in the development of osteoarthritis. For every two-pound increase in weight, the risk of developing arthritis is increased by 9-13 percent.

loss of at least 50 percent of their total excess weight at the time of the surgery.²

Some common bariatric surgery complications include pneumonia, infections, incision hernias, and leaks at the surgical site, bloating and diarrhea after eating, and mortality.

Obesity surgery is not a miracle cure and the pounds do not come off by themselves. A weight loss of two to three pounds a week after the surgery is possible, but one pound a week is more likely. Losing weight too quickly creates a health risk and can lead to other problems. The main goal is to have a weight loss that prevents, improves or resolves health problems connected with morbid obesity.

OBESITY'S IMPACT NATIONWIDE

America is home to the greatest number of obese people in the world. According to the CDC, obesity in adults has increased by 60 percent in the last 20 years, and obesity in children has tripled in the past 30 years. Native Hawaiians have alarmingly high rates of obesity, diabetes and heart disease. The number of Hawaiian children suffering from obesity is double that of children throughout the nation. In 2001, the University of Hawaii Kinesiology and Leisure Science Department, along with the Brigham Young University

Exercise and Sport Science Department, conducted a local study and found that more than 20 percent of Hawaiian children were overweight.¹⁵ According to Kelly Brownwell, phd, an expert on American diet and health, a study was conducted with the Pima Indians in Mexico and Arizona. It found that the Pima Indians who live in Arizona experienced a much higher rate of obesity than their counterparts living in Mexico, even though both groups shared the same genetic and ethnic backgrounds. This is also true for many migrants to the United States, who demonstrate a much higher obesity rate than their relatives back home.¹⁵

In Alabama, the US State of Alabama Employees Insurance Board approved a controversial plan to charge obese workers a monthly \$25 fee, if they do not make the effort to reduce their weight and improve their health. These measures are set to take effect in January 2010, and apply to those with a BMI of 35 or more, who failed to make improvements in their health after one year.

CONCLUSION

Although the history of American obesity is relatively brief, the outlook for the future seems like a much longer struggle. It appears that the obesity problem in adults will continue to grow. In addition, it has been observed that obese parents

greatly increase the chances of obese children,¹¹ so it is likely that obesity will be a blemish in American society for more generations to come. However, this does not mean that measures are not being taken to free America from this burden.

As one of the richest, most progressive countries in the world, America should also be one of the healthiest. The sad truth is that Americans are some of the most unhealthy people in the world. The good news is that obesity can be reversed. Whether through exercise, diet or surgery, the solution is available. All that is required is sound advice, guidance, a strong will, discipline and most important, support.

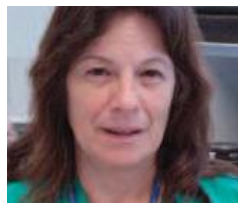
Media, health care, government and the food industry should join forces to promote health and fitness through responsible education. Parents should make greater efforts to get their children away from the TV and video games and engage themselves in active play. Parents should take active roles in putting their children on strict diets and overseeing a sound exercise regimen. The proper food intake, quality and quantity, plus the right amount of good physical activity will soon show positive results.

The US Government has spent billions trying to find a cure for heart disease, cancer, and other diseases. Their conclusions: disease is easier to prevent than it is to cure! Our government tells us to eat seven to 13 servings of fresh, raw fruits and vegetables everyday; increase your physical activity with wholesome exercise. This is the way obesity will be conquered.

We all must learn to help ourselves in this fight against obesity!

ABOUT THE AUTHOR

Karen L Chambers, CST, has been an AST member since 1998 and is the recipient of its 2005 Educator of the Year Award. She currently chairs the surgical technologist and sterile processing technician programs at Dover Business College in New Jersey.



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Wound Management

by Alison Shepherd, R Nutr, MSc, BSc, RCN

Most surgical wounds are the result of a planned procedure and involve precise incisions that cause minimal tissue damage and minimize the risk of infectious complications.¹ However, skin wounds may also result from a wide variety of physical insults, trauma and idiopathic causes.²

Rapid and effective wound healing is of paramount importance to the surgeon and to the patient. Failure of wound healing generally leads to potentially life-threatening complications, additional surgical procedures, increased length of hospital stay, increased cost, and long-term disability.³

This article provides an overview of the wound healing process and seeks to educate the surgical technologist on how to assess, classify and care for patients with surgical wounds, using evidence-based practice.

THE NORMAL HEALING PROCESS

The healing process begins following a breach in skin integrity and is described as an orchestrated, systematic interdependent, but overlapping process that leads to eventual repair.⁴ Wounds heal by either primary or secondary intention.⁵ A full thickness surgical incision will be repaired by primary intention.⁶

In primary intention, the wound edges are brought together and held in place by sutures, skin glue or adhesive strips. Within 24–48 hours, the epidermis will have covered the surface of

LEARNING OBJECTIVES

- ▲ Summarize the physiology of the wound healing process
- ▲ Identify the factors that affect wound healing
- ▲ Analyze the principles of moist wound healing and its influences on modern day management
- ▲ Accurately assess and classify surgical wounds
- ▲ Identify and implement appropriate wound-dressing methods/strategies

the wound, but the healing process will still be continuing underneath.

Healing by secondary intention occurs where there has been an extensive loss of tissue, which means that the wound edges may not be brought together and so the wound has to heal through the process of granulation and epithelialisation.⁵ This is a more “chronic” healing process and takes much longer. An example of a wound healing by this method would be the regeneration and repair of a pressure ulcer.

Surgical technologists will mainly be associated with surgical wounds, so this article will concentrate on the acute healing process.

The sequence of events involved in wound healing, whether it is by primary or secondary intention, can be divided into four main stages: hemostasis, inflammation, proliferation and maturation.

Table 1 shows the major phases of wound healing and the interrelated concomitant events, also including information of the cells used to orchestrate these processes.

Phase of Healing	Days Post Injury	Cells involved in the Phase
Hemostasis	Immediate	Platelets
Inflammation	Days 1-7	Neutrophils
Proliferation	Day 3-20	Macrophages
Granulation		Lymphocytes Angiocytes Neurocytes
Contraction		Fibroblasts Keratinocytes
Maturation (Remodelling)	Day 21-2 years	Fibrocytes

HEMOSTASIS

Any skin trauma, surgical or otherwise, that results in the penetration of the dermal layers within the skin, will result in bleeding.

Hemostasis is defined as “the cessation of bleeding following injury,” with the amount of bleeding being dependent on the site of wound, size of the blood vessels involved, state of the individual’s health and anticoagulation status.⁷ Under normal circumstances, this process occurs within 10 minutes of wound formation.⁸

When injured, blood vessel surfaces attract platelets to the site of injury. Platelets adhere, aggregate and form a procoagulant surface, promoting both the generation of thrombin and fibrin.⁹ This promotes clot formation and subsequent platelet degranulation, which releases platelet-derived growth factor (PDGF), a substance that triggers the clotting cascade, which results in vasoconstriction of the affected blood vessels, reducing the blood flow.¹⁰ Hemostasis is also classified as the early inflammatory stage of wound healing.¹¹

INFLAMMATION AND WOUND HEALING (1-7 DAYS)

Inflammation is a highly complex cellular surveillance system that is essential for both wound healing and antimicrobial defence.¹² It has long been considered that the inflammatory response during wound healing is instrumental to supplying growth factor and cytokine signals that orchestrate the cell and tissue movements necessary for repair.¹³ There are two essential elements to the inflammatory events, namely the vascular and cellular cascades. These occur in parallel and are significantly interlinked.¹⁴ (See figure 1.)

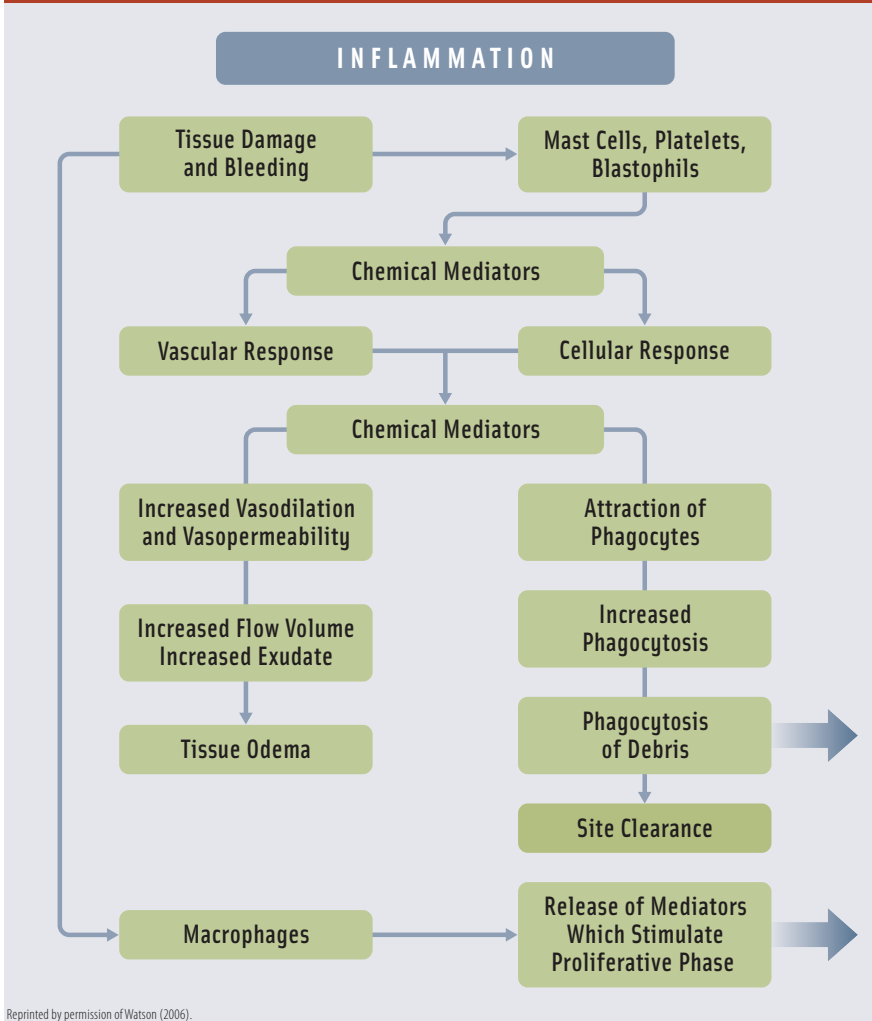
VASCULAR EVENTS:

This stage signifies some marked changes in the caliber of the blood vessels, through morphological changes of the vessel wall and also in the flow of the blood through the vessels, which becomes turbulent.¹⁴ This gives rise to the classic signs of inflammation as seen at the wound, which are described in Table 2.

It is important to note that these signs and symptoms of inflammation after wounding are the same as the inflammatory process associated with tissue infection. This needs to be ruled out for the purposes of patient safety.⁸

Signs/Symptoms	Physiological Changes
Rubor	Results from vasodilatation, mediated by prostacyclin and prostaglandins
Calor around the wound bed	Results from increased vasodilatation and increased metabolic activity
Tumor (swelling) in an around the wound bed.	Vascular endothelial gaps enlarge allowing the progression of plasma protein and fluids into the interstitial spaces
Dolor (Pain)	Increased pressure from oedema in the tissues, prostaglandins which irritate the nerve endings and damage to nerve endings.

FIGURE 1: RELATIONSHIP BETWEEN VASCULAR AND CELLULAR CASCADES DURING INFLAMMATION



Reprinted by permission of Watson (2006).

CELLULAR EVENTS:

The cellular components of the inflammatory response include the early emigration of the Polymorphonucleocytes (PNMs) to the wound site. The process of chemotaxis also attracts several other white blood cells to the wound bed. These include monocytes, leucocytes, eosinophils and basophils.¹⁵ Neutrophil leucocytes may be regarded as the first line of defense against infection at the wound site as they are described as actively phagocytic.⁴ This phagocytic activity involves clearing the wound site of dead and devitalized tissue, and also to neutralize and destroy any toxic agents at the site of injury, restoring tissue homeostasis.¹⁶ The process of phagocytosis also releases lactic acid, which is one of the stimulants for proliferation in the next sequence of wound-healing events.¹⁴ A recent study has also highlighted that lymphocytes secrete a selection

of lymphokines, which may assist in enhancing the rate of wound closure.¹⁶

Towards the end of the inflammatory phase, the eicosanoids, which are chemical mediators generated from the inflammatory process, stimulate the synthesis of collagen from fibroblasts and the “ground substance.” This ground substance contains water, electrolytes, glycoproteins and a specific class of compounds known as proteoglycans, which are vital for cell-to-cell and tissue adhesions.¹⁷ In addition, macrophage-derived growth factors are now at optimal levels, which is required for the influx of fibroblasts, keratinocytes, and endothelial cells into the wound.

The inflammatory stage of wound healing is complex and metabolically demanding. Thus it is of importance to note that any patient who may also present with diabetes or anaemia may experience a delay in the healing process.⁴

PROLIFERATION (3–20 DAYS)

Proliferation refers to the development of granulation tissue, which takes place over a 28-day period. It involves the migration of fibroblasts,

which begin to produce glycosaminoglycans, proteoglycans and the ground substance for granulation tissue and collagen. This is known as the formation of the extra cellular matrix (ECM).⁸ Newly-formed capillaries infiltrate the wound site to nourish and support the development of this connective tissue, a process known as angiogenesis.⁴ Angiogenesis takes place in distinct steps involving growth factors, cells and the ECM. Unregulated or insufficient vessel growth will result in delayed healing.¹⁸

Some of the fibroblasts differentiate into specialist myofibroblasts, which are responsible for the process of contraction. Contraction is defined as the pulling of wound edges together as the myofibrils start to contract around the wound edge. The purpose of this process is to reduce the amount of tissue required to fill the wound bed.⁷

MATURATION/REMODELLING (21 DAYS-2 YEARS)

This is the final stage of healing and can range from 21 days to two years. During this phase, the wound undergoes re-epithelialization, whereby macrophages release epidermal growth factor (EGF), which is responsible for stimulating the growth proliferation and migration of epithelial cells across the wound, covering the granulation tissue.⁸

As the epithelial cells meet in the middle of the wound, the migration stops and the initial cells reconstruct to form a basement membrane. This basement membrane is of great physiological importance as epithelial cells can be easily sheared off the surface during wound dressing changes or vigorous wound cleaning.⁵ Although, the production of collagen enhances the tensile strength of the new tissue, it should be noted that this new tissue is not as strong as the original.⁴

The wound at this stage is covered in scar tissue, which, along with the granulation tissue, is remodelled and strengthened over the course of the following one to two years.⁷

MOIST WOUND HEALING

The concept of a moist wound healing environment has been promoted since the early 1960s.¹⁹ The process was first demonstrated in both humans and animals, which observed that by keeping wounds moist, the rates of healing were much quicker than those left to dry out under tensile-based dressings.²⁰ Moisture in a wound acts as a transport medium for essential growth factors during epithelialisation and

also promotes autolytic debridement.⁴ Therefore, dry or dead tissue would inhibit wound healing. Moist wound healing has many other clinical benefits as shown in sidebar at right.

The Clinical Benefits of Moist Wound Healing

- ▲ Prevention of wound infection²⁰
- ▲ Improved rates of healing
- ▲ Reducing pain²¹
- ▲ Reduced scarring
- ▲ Reduction in nursing hours spent with dressing changes²²
- ▲ Reduced costs to the NHS

CLASSIFICATION OF SURGICAL WOUNDS

According to Devaney & Rowell, surgical wound classification is an important predictor of the risk of postoperative surgical site infections and their associated risks. A standardized wound classification system has been in place since 1964, whereby all surgical wounds are classified according to their levels of risk of contamination. Table 3 identifies these classifications and gives some general descriptions of wounds within each category, including examples of the procedures from which these wounds have evolved.

Recent research has found that the management of wounds resulting from excision and drainage of the condition pilonidal sinus, caused by in-growth of hair in between the buttocks is controversial. These wounds are classified as dirty/infected and are therefore at risk for post operative wound infection. A recent systematic review has proposed that no clear benefit is apparent from either closure or healing by primary intention as compared to open healing by secondary intention.²⁴

TABLE 3: SURGICAL WOUND CLASSIFICATION²³

Classification	Wound Description	Surgical Procedure Associated with Wound Type	Infection Rate
Clean	<ul style="list-style-type: none">• Surgical incision wounds/nonpenetrating• Surgical wounds that do NOT involve the respiratory, alimentary or genital tract	<ul style="list-style-type: none">• Exploratory laparotomy• Prosthetic joint replacement• Vascular surgery	1-5%
Clean/ Contaminated	<ul style="list-style-type: none">• Surgical wound that involves surgery within the urinary, alimentary, respiratory tract.• No breaks in sterile technique throughout the procedure	<ul style="list-style-type: none">• Trans urethral resection of prostate• Bowel resection with formation of colostomy• Bronchoscopy with biopsy	8-11%
Contaminated	<ul style="list-style-type: none">• Procedures that have major breaks in sterile procedures including contents from the gastrointestinal tract	<ul style="list-style-type: none">• Bile spillage during cholecystectomy• Surgery for diverticular disease	15-20%
Dirty/Infected	<ul style="list-style-type: none">• Infected viscera prior to surgery, secondary to the presence of abscess.	<ul style="list-style-type: none">• Surgery for perforated appendix/bowel and formation of colostomy• Peritonitis• Insertion of grommets for Otitis media.	27-40%

FACTORS AFFECTING WOUND HEALING

The majority of wounds will heal normally without delay or complications. However, the capacity of the wound to heal swiftly is determined by intrinsic and extrinsic factors that will vary considerably between individual patients.^{25,26} Table 4 identifies factors that the surgical technologist will need to consider when assessing surgical wounds.

TABLE 4: INTRINSIC AND EXTRINSIC FACTORS WHICH AFFECT WOUND HEALING

Intrinsic Factors	Extrinsic Factors.
Age	Nutrition
Disease process including • Diabetes • Peripheral Vascular Disease • Jaundice • Renal disease	Smoking
Wound perfusion	Radiotherapy
Oxygen tension	Wound Infection
Abnormal scarring	Medication Anti Inflammatory Drugs Immunosuppressant therapy

Whilst all these factors are of considerable importance, the role of nutrition is deemed to be a critical component in the wound healing process.³ It is widely recognized that when patients are in a poor nutritional state, wound healing is impaired and more likely to be complicated by infection.²⁷ To this end, this section of the review will highlight the nutrients involved in the wound healing process.

An individual's nutritional intake consists of both macronutrients, which include carbohydrates, fats and proteins, and micronutrients, which include minerals and vitamins. All of these substances have been shown to play a vital role in the wound healing process.²⁸ In addition, it is important to note that fluid status is an essential part of nutrition, as this maintains adequate perfusion to the wound site, which is critical for transportation of both oxygen and nutrients.²⁹

It is important to identify any patient who may be at risk of malnutrition by performing a nutritional assessment. Should the patient be found to be at risk for, or be suffering from malnutrition, it is important to devise a suitable nutrition care plan, which will optimize their nutritional intake, thus promoting wound healing.³⁰

Early postoperative feeding has been shown to improve wound healing, and commencement within 24 hours of surgery is associated with optimal clinical outcome.³¹ Indeed, early food intake, or enteral feeding, which utilises the gut, as opposed to parenteral feeding, which delivers feed intravenously, is also recommended to promote enhanced recovery of patients after surgery.³² Regular food should contain sufficient energy and nutrients for the vast majority of patients and should be tried prior to any thoughts of possible nutritional support.³³

Any patient who has failed to achieve their optimal nutritional status through oral feeding, and those who cannot or will not eat may be candidates for enteral tube feeding.³⁵

It is also important to note that individuals with infected wounds have an increased requirement for energy, protein and other nutrients, which is secondary to losses of wound exudate and tissue granulation and may therefore benefit from nutritional support.³⁰

To this end, it is imperative that both the patient's wounds and nutritional status are assessed on a weekly basis in the hope that this may prevent the development of both wound infection and malnutrition.³⁶

WOUND ASSESSMENT AND DRESSINGS

There are currently many sophisticated dressings available, made from a variety of materials, which can be used alone or in conjunction with other forms of dressings.

There are also several attributes of an ideal surgical wound dressing that surgical technologists should take into consideration prior to using any dressing. These are described in sidebar below.

Attributes of a Surgical Wound Dressing^{37,38}

- ▲ The ability of the dressing to maintain a moist environment
- ▲ Ability of the dressing to absorb and retain exudate without leakage
- ▲ Enable gaseous exchange
- ▲ Allow ongoing wound assessment
- ▲ Absorb wound odor
- ▲ Avoidance of wound trauma on removal
- ▲ Cost effective and covered by health insurance systems
- ▲ Lack of particulate contaminants from the wound dressing
- ▲ Promote effective scar formation
- ▲ Easy to use
- ▲ Require infrequent changing

The dressings used should be easy to apply, painless on removal, allow earlier discharge from the hospital and require fewer dressing changes.³⁹ The care of wounds and dressings used in wounds healing by primary intention, for example surgical wounds, are generally straight forward. The contact layer of the dressing placed directly over the wound is the most important, as it is required to provide protection from external contamination and absorb exudate. Straight forward surgical wounds that are likely to heal quickly, without complications, require simple, low-cost adhesive film dressings that are transparent, stay in situ for several days, and allow observation.³⁹ The contact dressing must be able to maintain moisture, permit respiration and allow epithelialisation.¹⁷

Some acute surgical wounds may be much deeper, caus-

ing trauma to underlying tissues, which may result in prolonged bleeding. These types of wounds may benefit from an additional layer of gauze or absorbent pads that provide compression and are classed as secondary dressings. These secondary dressings must not be too absorbent, as they may cause the primary dressing to dry out too quickly and delay the healing process.⁴⁰

It is important to recognize that every patient is an individual and the surgical technologist should take into account the patient's underlying condition, for example whether the patient has diabetes, or any other factors that might delay the wound healing process, prior to making the choice of dressing.⁴¹

Table 5 identifies the factors that should be taken into account when deciding which dressing to use.

THE NUTRITIONAL EVIDENCE

Nutrient	Role in Wound Healing	Nutrient	Role in Wound Healing
Protein <i>(Requirements should be calculated on an individual basis and monitored closely)</i>	<ul style="list-style-type: none"> • Synthesis of new tissue • Optimization of tensile strength • Collagen Synthesis 	Vitamin A	<ul style="list-style-type: none"> • Stimulates collagen synthesis via the inflammatory response • Improves cell mediated immunity • Promotes granulation of tissue • Avoid supplementation as this could cause toxicity
L Arginine	<ul style="list-style-type: none"> • Optimizes tensile strength of the wound • Enhances immunity • Improves secretion of growth hormone 	Vitamin E	<ul style="list-style-type: none"> • Antioxidant effect, which can prevent cellular membrane damage
Carbohydrate	<ul style="list-style-type: none"> • Source of energy • Required to prevent protein being used as a source of energy 	Vitamin B	<ul style="list-style-type: none"> • Required for release of energy from carbohydrate metabolism
Fats	<ul style="list-style-type: none"> • Major source of energy supplying 9 kcal/g • If an individual is overweight, low fat foods may be better choices. • Aim for weight maintenance not weight loss as this will compromise wound healing • Evidence equivocal surrounding the use of omega 3 supplementation and wound healing 	Vitamin K	<ul style="list-style-type: none"> • Coagulation
Vitamin C	<ul style="list-style-type: none"> • Vital for collagen synthesis and subsequent cross-linking • Required for angiogenesis • Optimizes tensile strength • Increases the absorption of iron • Boosts immunity • Natural sources from fruit and vegetables are best. 	Zinc	<ul style="list-style-type: none"> • Key role in protein and collagen synthesis • May have antibacterial action • Component of many enzymes
		Iron	<ul style="list-style-type: none"> • Involved in collagen synthesis • Optimises tensile strength of the wound • Optimises tissue perfusion by supplying oxygen • Iron deficiency anaemia can delay the wound healing process
		Hydration	<ul style="list-style-type: none"> • Dehydrated skin is less elastic, more fragile and susceptible to breakdown • Dehydration causes a reduced circulating volume and leads to poor perfusion
		Copper, Selenium, Manganese & Chromium	<ul style="list-style-type: none"> • The physiological role in wound healing is apparent but unclear. More research is required to identify and quantify these roles.

TABLE 5: FACTORS TO CONSIDER WHEN DECIDING WHICH DRESSING TO USE^{40, 42}

Factors related to the patient	Type of wound Level of exudate Location of wound Size of wound Likelihood of wound contamination? Depth of wound Dressing cost
Wound assessment	Suitable Dressing
Closed wound healing by primary intention	Simple dressing/adhesive film (<i>These are semi permeable and allow gaseous exchange/impervious to bacteria</i>)
Superficial partial thickness	Adhesive film/foam (<i>Foam dressings are in the form of sheets/liquid and expand to fill a wound cavity</i>)
Mild to moderate exudate	Hydrocolloid dressing (<i>Hydrocolloid dressings promote a moist wound healing environment</i>)
Contaminated wound	Alginate (<i>Alginate derived from seaweed and in the form of a loose fibrous pad/rope</i>)
Heavy exudate	Hydrogel/hydrocolloid

CONCLUSION

Wound healing is a highly complex physiological phenomenon, with many factors. Age, nutritional status and general health all play a role in the healing process. By understanding the physiology of wound healing, surgical technologists will gain greater insight into the importance of how their skills can impact the body's healing response.

ABOUT THE AUTHOR

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Maintaining *Patient Confidentiality* HIPAA Compliance

by Teri Junge, CST, CFA, FAST, BS

A HIPAA compliance program is necessary in a medical setting to protect the patient's personal, medical and financial information. It will be necessary to share patient information with other entities, and that must be done legally. This article addresses planning, implementation and evaluation of a HIPAA compliance program.

The acronym HIPAA represents the term Health Insurance Portability and Accountability Act, which became federal law in 1996. Implementation and enforcement of HIPAA is the responsibility of the Office for Civil Rights, which is part of the US Department of Health and Human Services.¹ A HIPAA compliance program is necessary to ensure delivery of quality health care to the general public and to protect the patient's personal, medical and financial information. The two main goals of the HIPAA program are portability and accountability.²

The portability portion of HIPAA was set up to broaden the health care options available to an individual by increasing his or her ability to obtain and maintain health coverage, even when changing jobs, or by allowing individuals to purchase health insurance if group coverage is not an option. HIPAA also limits exclusions from health insurance coverage due to preexisting and current conditions.³ The portability portion of HIPAA pertains primarily to health plans, and the focus of this article is on the accountability portion of HIPAA as it pertains to health care providers and health care clearinghouses. Therefore, additional information concerning portability will not be provided.

LEARNING OBJECTIVES

- ▲ Evaluate your workplace for potential HIPAA trouble spots
- ▲ Assess your own personal practices as they relate to HIPAA requirements
- ▲ Examine the potential consequences for noncompliance
- ▲ Compare and contrast the different methods of notifying patients of the privacy policy
- ▲ Examine the intricacies of business associate agreements

The accountability portion of HIPAA was set up to protect patient privacy in relation to health care. This type of information is called protected health information, and there are three types of health organizations that are required to follow the HIPAA privacy rules. These organizations are called covered entities and include health plans, health care providers, and health care clearing houses.⁴



PROTECTED HEALTH INFORMATION

Protected health information (PHI) is defined as any health information that is created or maintained by a covered entity in any form. Forms of information include handwritten or printed documents, electronic documents, and the spoken word. Protected health information consists of anything that is individually identifiable including the patient's physical or mental status (past, present or future), care that he or she has received, is receiving, or will receive, and the method of payment for that care.²

Protected health information may be released in limited situations. The HIPAA Privacy Rule allows protected health information to be released as permitted by the rule or at the written request of the patient or the patient's legal representative. Additionally, information must be released to the US Department of Health and Human Services if requested during an investigation of an alleged HIPAA violation or as required by state or federal law.⁵

PERMITTED USES OF PROTECTED HEALTH INFORMATION

Under the HIPAA privacy rule, the two main reasons for release of protected health information without written authorization or notification are to the individual and to business associates who are directly or indirectly involved with treatment, maintenance of treatment records or payment for treatment. Additionally, protected health information may be released in facility directories and to family and friends involved with the patient's care. Incidental release of information is also allowed, as is release of information for the sake of public interest. Limited information may be released for research purposes.⁶

POLICIES AND PROCEDURES

Each covered entity must appoint an individual as the privacy officer. This person is responsible for creation and maintenance of a HIPAA policy manual that describes all policies and procedures relating to a patient's protected health information. The policy manual must contain information concerning the covered entity's business associates and the

The accountability portion of HIPAA was set up to protect patient privacy in relation to health care. This type of information is called protected health information...

working agreements that are in place to protect patient information handled by those associates. The manual also includes information notifying the patient about how his or her confidential information is used by the covered entity. This is done via a document called a notice of privacy practices. The patient signs an acknowledgment that he or she has received the notice, and that acknowledgment is kept on file. Should the patient choose to have his or her protected health information released, an authorization form must be available for the patient, or his or her representative, to sign prior to that information being released. The privacy officer is also responsible for updating the policy manual as needed, ensuring that all staff receives HIPAA training and that the training is documented in the employee's file. Additionally, the privacy officer is to handle all patient questions or complaints concerning the covered entity's privacy practices.²

TABLE 1^{7,8}

Component	Rationale
Name, address and telephone number of covered entity	Identifiable information.
Name, address and telephone number of business associate	Identifiable information.
Brief explanation of HIPAA	Raise awareness of the business associate.
Definition of related terms	To eliminate misunderstanding of contractual contents (examples include covered entity, business associate, individual, protected health information, etc.).
List of responsibilities of the business associate	List the exact terms of the contract including specifics concerning how the privacy rule is to be followed, timelines for completion of work.
List of permitted activities of the business associate	Description of exactly how the protected health information is to be used. Also contains a provision to extend the agreement to any subcontractors hired by the business associate. Lists reporting requirements and limitations.
Procedures to follow should a breach of security occur	Covered entity must be notified.
List of consequences for noncompliance	Includes civil monetary penalties and federal criminal (monetary and incarceration) penalties.
Disclosure	Covers any possible errors or omissions in the contract and states that HIPAA regulations will prevail.
Liability insurance requirement	May be optional (according to state law).
Signatures and date of signing	Validation of the contract.
Notarization	If desired or required by state law.

BUSINESS ASSOCIATES

A business associate is typically not a covered entity, but is an individual or a business that provides services to a covered entity and has access to a patient's protected health information. Examples of business associates include (but are not limited to) transcription services, billing services, insurance claims processing services, answering service personnel, accountants, consultants (such as quality assurance or utilization review teams), members of a legal team, etc.⁷

BUSINESS ASSOCIATE AGREEMENT

All business associates of a covered entity who have access to a patient's protected health information must have a signed business associate agreement in place.⁷ According to Hinkley, *et al*, the required contractual provisions include:

- ▲ Ensuring that PHI will not be used or disclosed except in accordance with the business associate contract;
- ▲ Ensuring that appropriate safeguards are in place to protect the confidentiality of PHI;
- ▲ Requiring business associates to report breaches to the covered entity;
- ▲ Requiring agents and subcontractors to comply with the same requirements that apply to business associates;
- ▲ Making PHI available to satisfy patients' rights;
- ▲ Making PHI available to satisfy HHS's right to investigate and enforce HIPAA; and
- ▲ Returning or destroying all PHI upon termination of the agreement, if feasible.⁷

An overview listing the main components of a business associate agreement and the rationale for each entry is provided in Table 1.

NOTICE OF PRIVACY PRACTICES

The notice of privacy practices must be given to the patient and a signed acknowledgment of receipt must be obtained prior to the first interaction unless an emergency situation exists. In the case of treatment necessitated by an emergency, the notice must be provided as soon as is feasible following the emergency and a signed receipt is not necessary. As the notice of privacy practices is updated, the information

need only be available to the patient. This may take place by making written brochures available, by posting the information in the reception area, or by posting the updated information on the covered entity's Web site. As the notice of privacy practices is updated, it is not necessary to obtain an updated, signed acknowledgment of receipt from each patient as long as the necessary updates are available upon request. The document must not use legal or medical terminology, but must be written in terms that most patients can easily understand.⁹

An overview listing the main components of a notice of privacy practices and the rationale for each entry is provided in Table 2.

TABLE 2^{9, 10}

Component	Rationale
Name, address, and telephone number of covered entity.	Identifiable information.
Brief explanation of HIPAA and definitions for any terms that the patient may not understand.	Patient education.
Disclose how private health information is used, stored, and protected.	Raise awareness of the patient.
Explain how changes in the notice of privacy practices are handled.	General patient information.
Patient's rights and responsibilities are explained.	Inform patient of his or her rights and responsibilities.
Describe the mechanism by which a patient may make a complaint regarding HIPAA.	General patient information.
Explain the legal duties of the covered entity.	General patient information.
List the name and contact information of the privacy officer.	Raise level of patient confidence.

PATIENT AUTHORIZATION

A covered entity must secure that patient's permission in writing prior to releasing any protected health information that does not fall under permitted usage or is not covered by a business associate agreement. The patient (or the patient's legal proxy) must sign and date an authorization form that states exactly what information is to be released, to whom

and for what purpose. The date or date range for which the authorization is effective is noted, and the method for revocation of the authorization is also included.⁹ A log should be kept in each patient's chart documenting any release of information.¹¹

OPERATING PROCEDURES

When developing the policies and procedures for protecting the patient's health information, the two main concerns for consideration are privacy and security of information that is to be exchanged between the covered entity and other covered entities, the patient, and business associates, as it applies to written or printed information, electronic information, and spoken information.¹²

Written or printed information is anything that is on paper, including faxes.¹³ Some methods of protecting written or printed information include using patient sign-in sheets that contain minimal protected information, placing treatment sheets and staff assignments away from areas where they may be viewed by non-employees, ensuring that patient charts are secure, such as in a locked cabinet or storage room, or by restricting access to the storage location, and placing fax machines where they are not visible to non-employees.¹⁴

Electronic information is anything that is stored in a computer or that is transmitted electronically (excluding faxes). Some methods of protecting electronic information include restricting physical access to computers, including placing computer monitors in locations where they cannot be viewed by non-employees, restricting access to computer files and e-mail accounts, use of firewalls to protect computer files, use of passwords to access computer files and e-mail accounts, and remembering to log off when the computer is not in use. Also, maintenance of computer software and routine backup of computer files is necessary. Laptop computers and personal digital assistant (PDA) devices must be stored in a secure location. Any type of file sharing between covered entities and their business associates, as well as file sharing with patients (for example, access to laboratory results), must be secure.¹⁴



Spoken or verbal information is anything that is said about the patient. Some methods of protecting spoken information include conducting telephone and face-to-face conversations with patients or about patients in private areas so that the conversation is not overheard by non-employees. Employees must also use caution when communicating with the patient by telephone that information is not inadvertently given to someone other than the patient. For example, messages concerning appointments and lab results should not be left on an answering machine without the consent of the patient because someone else could intercept the message or overhear the message being played back.¹⁴

STAFF TRAINING

One of the responsibilities of the privacy officer is to ensure that the staff has been trained according to the HIPAA policy and procedure manual of the covered entity as part of his or her initial orientation and annually thereafter. Documentation of the training must be maintained in the employee's file. Training should include an overview of the policies and procedures and a review of the patient's rights. The consequences for violation of the policies and procedures as set forth in the manual are also made known to the employee, who may be legally held personally responsible for any violation that may occur.¹¹

CONSEQUENCES OF NONCOMPLIANCE

Employees of covered entities who do not comply with the HIPAA Privacy Rule by disclosing or improperly using a patient's protected health information could face civil and federal charges. "Improper use or disclosure of PHI could result in civil monetary penalties of \$100 per incident, or as much as \$25,000 per person, per year, per standard. Because certain criminal violations qualify as a felony, criminal penalties can range from \$50,000 to \$250,000 and up to 10 years in prison."² All employees of a covered entity should be aware of the severity of the criminal penalties and take compliance with all HIPAA regulations in all aspects of the organization seriously.

EVALUATION OF THE HIPAA COMPLIANCE PROGRAM

Most instances of failure to comply with the HIPAA compliance program are inadvertent and, unfortunately, some are purposeful. In order to maintain compliance and reduce the risk of suffering the penalties of noncompliance with the HIPAA regulations, ongoing audits or self-evaluations should occur on a regular basis. Typically, the responsibility for evaluation of the HIPAA compliance

In order to maintain compliance and reduce the risk of suffering the penalties of noncompliance with the HIPAA regulations, ongoing audits or self-evaluations should occur on a regular basis.

program falls to the privacy officer. The evaluations may also be conducted by the risk manager or by an outside consultant. First, the contents of all documents that relate to HIPAA should be compared to the actual regulation to ensure accuracy and thoroughness. Then, actual compliance with the prescribed policies and procedures should be assessed and any corrective action taken. Physical inspections of the facility may also turn up unexpected policy violations. A task as simple as sitting in a reception area while watching the activities and listening to any

verbal interactions that involve protected patient information may prove useful in identifying any problem areas. If a violation is suspected, immediate corrective action (that may actually be very easy to implement) must be taken to avoid a possible patient complaint. A potential government-initiated investigation will be time consuming and will take personnel away from his or her normal duties and may result in punitive action.¹⁵

Numerous tool kits for self-evaluation of HIPAA compliance programs are available online or for purchase.

CONCLUSION

Each facility must maintain a HIPAA policy manual that describes all policies and procedures relating to a patient's protected health information. Business associate agreements are needed between the covered entity and any organizations that are contracted to provide service to the covered entity that involve protected health information. Additionally, a notice of privacy practices informing the patient of his or her rights concerning protected health information and how his or her protected health information will be used by the covered entity must be developed and provided to each patient. The notice must be provided to the patient and a signed acknowledgment of receipt must be obtained and retained by the covered entity. The patient must authorize in writing any release of protected health information that does not fall under permitted usage or is not covered by a business associate agreement. All staff members must receive and have documentation of HIPAA compliance training upon hire and annually thereafter. The consequences for violation of HIPAA regulations are harsh and may involve fines of up to \$250,000 and 10 years in prison for the most severe offenses.



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SURVEY RESULTS

Prior to researching information for this article, the author conducted a qualitative survey of 10 covered entities. Ten survey questions were asked of the individual or group of individuals responsible for setting up the HIPAA compliance program at their facility (Please refer to Appendix 1).

Of the 10 facilities surveyed, a single person was responsible for the program at half of the facilities. There were also teams of two at three facilities, one team of three, and one team of four.

Of the 10 facilities surveyed, five facilities put the HIPAA compliance program together from scratch, two facilities hired consultants, and three facilities purchased planning kits. Of the two facilities that hired consultants, both were very satisfied with the consultant's work. Of the three facili-

ties that purchased planning kits, only one was satisfied with the contents of the kit. The most challenging part of program implementation was reported as time constraints by six of the respondents, one reported that choosing a consultant was the most challenging, one reported problems with the print shop, and two reported no challenges.

Eight out of 10 facilities reported compliance problems with the physical layout of the facility and nine out of 10 facilities reported problems with personnel not following the regulations. None of the facilities reported performing regular comprehensive evaluations of the HIPAA program and three are not doing any type of evaluation at all. Of the 10 facilities surveyed, only one reported a relevant patient question about HIPAA. Ninety percent of the facilities reported that they had no HIPAA violations that resulted in citations.

APPENDIX 1 – SURVEY QUESTIONS AND RESPONSES

Please explain who was responsible for setting up the HIPAA compliance program at your facility.	<ol style="list-style-type: none">1. I did it myself.2. I was the only one responsible for setting up the HIPAA compliance program.3. Two of us were assigned to the task.4. The owner and I worked together on the program.5. Just me.6. It started out as a committee of four, but I ended up doing all of the work without any input from the other three.7. I was.8. Me, by myself.9. Me and one other person.10. Three of us worked on the assignment together.
Would you please describe the planning and implementation process for the HIPAA compliance program at your facility?	<ol style="list-style-type: none">1. I did the research online and set up the program.2. I hired a consultant.3. We did quite a bit of research and then decided to purchase a prepackaged program.4. Neither one of us had much time, so we decided to buy a program from the internet.5. I did everything.6. When the committee fell apart, I got permission from the boss to hire a consultant.7. I started out thinking that I would do everything myself, but it was too much so I bought a kit and worked from there.8. I researched the options and because of cost constraints I put the program together on my own.9. We did it all.10. We divided up the work at the start of the project and then put the finishing touches on together.
If a proprietary service (such as a consultant or document center) was used to provide assistance with planning and implementing the program, please describe the amount of the work that was accomplished by the service?	<ol style="list-style-type: none">1. N/A.2. The consultant did about 95% of the work.3. About half. Even with the purchase of a program, we still did quite a bit of work on the project.4. The program was good, but we had to tailor it to our facility, so I would say about 75%.5. Does not apply.6. The consultant did most of the work, I'd say about 90%. I just had to approve the final documents and train the staff.7. The kit provided about half of what I actually needed. It was a bare bones kit. I should have done more research before deciding.8. Did not use.9. We did not use a service.10. N/A.

APPENDIX 1 – SURVEY QUESTIONS AND RESPONSES

<p>If you relied solely on a proprietary service to provide everything necessary for implementation of the program, what did you like or dislike about their work?</p>	<ul style="list-style-type: none"> . N/A. . I was very pleased with the consultant's work – she took care of everything. . We were not pleased. The program was basically an outline and we had to fill in all of the information. . The program that we bought met our expectations and was satisfactory. . Does not apply. . Yes, I really liked the consultant. He did absolutely everything! . I really disliked the fact that after spending all that money I still had to do a lot of the work myself. . Does not apply. . We did not use a service. <p>10. N/A.</p>
<p>Please describe what was the most challenging part of planning and implementing the program.</p>	<ol style="list-style-type: none"> 1. Finding the time to do it. 2. Interviewing the three consultants and deciding who would be the best fit. 3. Realizing how much work that the owner and I still had to do after purchasing a prepackaged program. 4. Working with the people at the print shop to make sure that all of the documents were ready by the time we needed them. 5. I wasn't able to train the staff all at the same time, so I had to repeat the class four times. 6. The consultant pretty much took care of everything. If there were challenges, I was not aware of them. 7. Thinking that I could do everything myself and then caving in a buying a kit. 8. I wish there had been money to hire a consultant because it took me almost a month of working full time (+) to get the HIPAA program together. 9. We didn't really have any problems. 10. Finding time for the three of us to meet to review and finalize the program.
<p>What concerns do you have about maintenance of the program that relate to the physical layout of your facility?</p>	<ol style="list-style-type: none"> 1. The FAX machine had to be moved because it was too visible. 2. We should have planned for a private consultation room. 3. Now that we have redirected traffic to the restroom, we can put the patient's charts outside of the exam rooms again. 4. I am concerned about security of the patient's charts because they are not locked up. 5. The walls between the exam rooms are not soundproof. 6. So far, no concerns have arisen. 7. The scale is in a busy hallway. 8. People in the waiting room may be able to overhear telephone conversations. 9. The sign in sheet at the front desk was visible to all and asked for lots of private information, so we simply stopped using it. 10. None yet.
<p>What concerns do you have about maintenance of the program that relate to the personnel at your facility?</p>	<ol style="list-style-type: none"> 1. One employee shared her computer password to another employee. 2. There is no place to hold a private conversation, so we have to really concentrate on keeping our voices low and watching to make sure that nobody hears who shouldn't. 3. No personnel problems so far (that I know of). 4. The patients are a bigger problem than the personnel because this is a small community and they all know each other. 5. We have a large staff and ensuring that the training is up to date is huge. I try to do all of the training annually, but every time we get a new employee they are off the schedule. Then to get them on track with everyone else, sometimes they take the training twice on one year, so that they are in sync with everyone else. 6. The hardest thing is getting the employees to tell me when we start running low on the printed material so that I can order more before we run out. 7. One employee is constantly leaving charts, lab reports, etc. scattered around the office where they could be seen by other patients and their family members. 8. We had an employee tell her mother that another family member came in for treatment and provided details of the visit. This was reported to HIPAA as a violation and is currently under investigation. This is the only personnel problem that we have had. 9. One employee was using the phone in the reception area to call in prescriptions to the pharmacy. People in the waiting room could hear the conversation. This actually came to our attention because someone in the waiting room reported it to the office manager. 10. We need to set up a formal training program for the employees. So far, we have been doing it from the top of our heads without a checklist. Three of us share the responsibility for training and I think that we each focus on different aspects

APPENDIX 1 – SURVEY QUESTIONS AND RESPONSES

<p>What types of evaluations are carried out to ensure effectiveness of the program?</p>	<ol style="list-style-type: none"> 1. Requests for information are tracked to be sure that written releases are obtained before the requested information is sent out. 2. All employees are trained and the training is documented in his or her personnel file. 3. We conducted one patient satisfaction survey, but very few patients responded and I don't think that many of the ones that did actually understood what we were asking. 4. None yet. We just opened about a month ago. 5. I guess the fact that the patients are complaining about having to sign a release to get information released to a family member is a good indicator that we are doing something right! 6. We have a HIPAA binder with all of the regulations and documents in it, but I don't think that anyone is making sure that we follow the instructions. 7. Are we supposed to be doing evaluations? Like what? 8. We don't have time to do evaluations. 9. When I have time, I randomly audit patient charts to see if the front office staff is getting them to sign the receipt for the Notice of Privacy Practices. 10. About twice a year I make sure that the Business Associate Agreements are up to date.
<p>What types of questions, if any, do the patients ask about the program?</p>	<ol style="list-style-type: none"> 1. None, most are familiar with the privacy policies from dealing with other facilities. 2. None. 3. I can't recall anyone asking, but I could check with the receptionist if you need more information. 4. They just sign the receipt without asking. 5. Some people ask why they have to sign the HIPAA document at every facility, but that's it. 6. None. 7. They don't ask. 8. We had one patient ask if the privacy policies would prevent her ex-husband from getting information about her health because she was still on his insurance. 9. We stopped using a sign-in sheet at the front desk and the patients quite often ask about that. 10. I can't remember anyone asking questions about HIPAA. They are more concerned about how long they might have to wait.
<p>Please list any citations that your facility has received for HIPAA violations and the describe consequences.</p>	<ol style="list-style-type: none"> 1. None. 2. No citations. 3. One patient threatened to report us for a violation, but once we explained to her that we were allowed to release information to her insurance company in order to receive payment, she understood and did not file a complaint. 4. N/A. 5. None, so far. 6. None. 7. N/A. 8. One complaint has been filed, but it doesn't look like the facility will be cited. The (former) employee who violated the policy will be held responsible and will most likely pay a significant fine however the investigation is ongoing. 9. N/A. 10. None.

An Exercise in Personal Exploration:

Maslow's Hierarchy of Needs

by Bob Poston, CST

Maslow's Hierarchy of Needs is a valuable assessment tool that is used in many different professions, particularly those in the fields of education and health care. The ideas of needs are addressed in order, as the body resolves the most basic needs for survival before moving on to more complex needs.

Many educational programs in the health care field teach Maslow's hierarchy in order to address the needs of patients and where they are in their life from a psychological perspective, simply because it helps identify and address the needs of those particular patients.

The idea of using a hierarchy pyramid helps us to lay out the stages of need, starting with the base of the pyramid, which looks at physiological needs. As we work our way up the pyramid, the needs start to become more complex, and include safety needs, social needs, esteem needs, and finally, at the very top, we have self-actualization. This article explores the theories of Abraham Maslow in detail, as well as addresses the controversies that have been questioned in his theory. This article will also evaluate the impact of these theories on human behavior and assess each of the components comprised within Maslow's Hierarchy Pyramid.

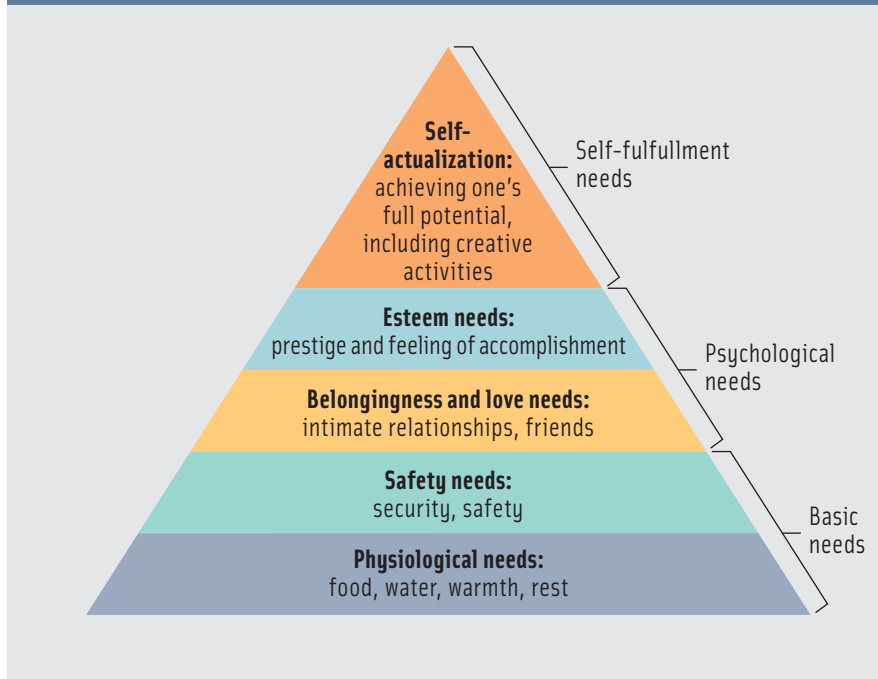
BIOGRAPHICAL OUTLINE

Born on April 1, 1908, in Brooklyn, New York, Abraham Maslow was the first of seven children.¹ The son of under-educated Jewish immigrants, Maslow didn't have many friends as a young

LEARNING OBJECTIVES

- ▲ Identify the different levels of Maslow's Hierarchy of Needs
- ▲ Compare and contrast the differences between being needs and deficit needs
- ▲ Explain the process of self-actualization
- ▲ Examine how Maslow's Hierarchy of Needs impacts patient care
- ▲ Consider the challenges to Maslow's theories and formulate a response

FIGURE 1: MASLOW'S HIERARCHY PYRAMID



food and play, they would in more cases choose the food. The same was true when it came to the monkeys' choice between water and food. The water would always be chosen as the priority over food.

As the observations continued, a pattern emerged. Maslow could see, on a physiological level, that if the monkeys didn't have food, but had water, the group was less aggressive than those that had the water taken away from them.¹ The same held true with safety needs. If all of the physiological needs were met, then the monkeys' behavior became more profound when it came to establishing social roles and dominance.

Maslow later transitioned this idea over to human behavior and was able to establish physiological needs over

child, but found his sense of self by reading books. He began his college journey by attending City College of New York, and later transferred to Cornell University, before going back to City College of New York. After realizing a keen interest in psychology, he moved to Wisconsin, where he studied at the University of Wisconsin. Throughout the 1930s, Maslow earned his BA, MA and PhD.¹ Later, he returned to New York, where he not only taught full time at Brooklyn College, but he also became interested in human sexuality.

Maslow served as chair of the Department of Psychology at Brandeis from 1951-61.¹ While there, he met a well-established researcher named Kurt Goldstein, who developed the idea of "self-actualization." This concept fascinated Maslow, and it was through this notion that he pursued the idea of humanistic psychology, which he ultimately valued more than his own research. Maslow died on June 8, 1970.¹

CREATING THE HIERARCHY OF NEEDS

Abraham Maslow is well known for the creation of the hierarchy of needs. The way he came up with this idea was by studying and observing monkeys. During observation, he noticed that they displayed a very unusual pattern of behavior that addressed priorities based on individual needs. If, for example, the monkeys had a choice between

safety needs, safety needs over belongingness needs, belongingness needs over esteem needs, and esteem needs. The needs, in turn, form the first four components of the pyramid, and are addressed as deficit needs. Self-actualization, the fifth component, addresses the need of being, which defines one's own place in the universe.

When an individual does not have enough of something, he or she has a deficit, ultimately creating what Maslow has termed "deficit needs."¹ When individuals eat and drink, for example, the need for water and food is met, so there is no longer a motivating factor to obtain water or food, and the deficit need has temporarily been satisfied. Deficit needs comprise or make up the four lower components of Maslow's hierarchy pyramid.

On the other hand, Maslow also mentions the idea of "being needs." Being needs have nothing to do with deficit needs. Being needs are internal, and are at the very top of Maslow's hierarchy pyramid, which ties into self-actualization.² An example here might be drawing one's own conclusions of where and who he or she is spiritually. This internal concept is addressed as self-actualization.

The following sections of this article will address each level of Maslow's Hierarchy of Needs in more detail in an effort to see how they apply to individuals, and how they can define who and where an individual is in his or her life.

PHYSIOLOGICAL NEEDS

With so many different capabilities, from the regulation of temperature and hormones to the processing of water, food and the elimination of waste, the living body is the most unique machine in the universe. Despite its relative fragility, the human body can live for many years. Every single detail is so integral, from how the body processes oxygen through millions and millions of tissue cells, to the thousands of miles of arteries that carry blood and nutrients to those tissues. With this being said, there is still the need to meet the very basic essentials of life: the body must take on oxygen, water and food. Before any further growth can take place, this very basic need has to be met. This is what Maslow addresses as a physiological need—the need for the body to work in unison to accomplish the task of basic survival.

Physiological needs are influenced generally through the cravings that we have. If a person is thirsty, he or she finds a drinking fountain. Similarly, if the individual is hungry, he or she will find food. If the body is being deprived of

oxygen, it will surely react. If there is a vitamin deficiency, the body has subtle ways of fulfilling that need.

One example of how the body regulates itself on a physiological level is by homeostasis. Homeostasis simply means to regulate. A part of the human brain, called the hypothalamus, plays an important role in keeping the body regulated by controlling the body's thermostat, which is controlled by the release of several hormones called gonadotropins.

If a female produces too much estrogen, the hypothalamus releases a hormone called luteinizing hormone that triggers ovulation, therefore acting like a shut-off switch for the amount of estrogen present. If the thyroid gland produces too much thyroxin, the hypothalamus produces a hormone to switch off the flow of the thyroxin. These are

Throughout life, the idea of physiological needs remains consistent. The need to maintain adequate physiological balance will always be essential...



The basic principles of Maslow's hierarchy have been observed in primates.

just a few examples of homeostasis at work, however, there are many circulatory hormones that are needed to maintain normal bodily functions.

Another prime example is the release of the “fight or flight” hormones that are secreted by the adrenal medulla of the adrenal glands. If there is a need for the body to defend itself, these hormones will surge into action to prepare the body for fight or flight. These hormones, although they play an important role, are kept in compliance by regulatory mechanisms within the brain.³

Throughout life, the idea of physiological needs remains consistent. The need to maintain adequate physiological balance will always be essential, and may kick into action in very different ways at various different times, whether the individuals experiencing it are aware of it or not. For example, how would anyone ever get a good night's sleep if they had to literally think about their breathing pattern, heart rate or blood pressure on a conscious level? Sure some people may have to get up during the night to use the restroom or grab a glass of water, but remember that this is all part of how the body regulates itself.

The notion that physiological needs tie into other, more complex needs of the hierarchy is very relevant. Maslow

believed that once the physiological needs are met in sufficient detail, people move on to address these more complex needs. Safety and security make up the next platform of the pyramid.

SAFETY NEEDS

Much like physiological needs require maintenance throughout life, so does the need to feel secure. This need is more psychological. With that being said, safety needs may be different for each individual, depending on where he or she is in life. For a child, this need may manifest as the need

Safety needs may be different for each individual, depending on where he or she is in life. For a child, this need may manifest as the need for a safe family environment. There has to be security in the home, with warmth and love.

for a safe family environment.⁴ There has to be security in the home, with warmth and love. When a family is dysfunctional, it makes it difficult for that child to move up to the next level of social needs because fear is often present.

For adults, this need may be economic in nature. If a person loses his or her job, for example, fear and anxiety will have an impact on that person's social life, and may cause him or her to regress.⁵ Additionally, adults are not immune to the need of safety. In some parts of the world, where there is chaos, people are stuck at this level of needing to feel safe. The goal of consistently meeting the need for safety is to have stability in one's life. It is the idea of being able to walk around the block at night without the worry of being mugged. It is the idea of feeling secure in the workplace. It is conclusive that fear hinders one's ability to move on to the more advanced platforms of Maslow's pyramid.

BELONGING NEEDS

Advancing up the hierarchy pyramid, the next level represents the need to belong on a social level. The social level generally becomes the priority only after the physiological and safety needs have been sufficiently met and maintained. A sense of belonging can be felt when an individual becomes more focused on the desire to build relationships with others. This includes the desire for a romantic partner, to have close friends, and maybe to get married and have children.¹

Again, this need will change depending on where an individual is in his or her life. For a young child, approval-seeking behaviors may become more commonplace. The child may engage in activities to get his or her parents' attention by exploring or asking lots of questions. In a sense, the child needs to feel an emotional or social connection with his or her parents. As the child evolves into a teenager, he or she will more than likely become more socially active in peer groups. Generally, whatever gets reinforced, supported, or accepted by these peer groups will often determine which type of group the adolescent will affiliate him or herself

with. This idea can be noticed at any point throughout an individual's life. As youths mature into adulthood, they tend to affiliate with those individuals or groups who accept them.

A sense or a need to belong, at any stage, is influenced by several factors. Some of these influences, for example, are socio-economic influences: the education level of parents and family,

the neighborhood in which the child grows up and the type of schools where they are educated, as well as the children who attend those schools. Whatever type of behavior is learned and accepted, based on these variables, is likely the behavior that will form a particular individual's character and self-esteem.

The level of belonging must be established because of its effect on one's self-esteem. If the level of belonging in the hierarchy model is low, or an individual is viewed negatively by peers in that group, he or she may develop social anxiety and may withdraw toward a level of people in which he or she fits in socially. If a child grows up in a neighborhood where there are street gangs, and attends schools in that neighborhood with the families of those street gangs, then the likelihood of the child to adapt and take on that form of character becomes more likely. According to Maslow, the reason for this behavioral pattern is likely due to the peer groups that the child grew up with.

This is not meant to imply that all children who grow up in this type of neighborhood will join a gang, simply that there is a higher likelihood of that outcome. On the other hand, if a child is brought up in a more affluent neighborhood, it is likely that the parents will also be more educated. In this scenario, it is more likely that the child will develop and adapt to the peer groups in which education is more of a priority. The influence in a child's upbringing starts

with a home and family that secures the previous levels of Maslow's hierarchy by meeting and maintaining the foundation levels of needs. Relieving any anxiety or fear will help put more emphasis on social development, and with this will come a healthier self-esteem.

ESTEEM NEEDS

Once the needs of physiology, safety and belonging have been met, the individual will now move on to the needs of their self-esteem. Self-esteem, like all the prior needs, must also be maintained. This is the highest platform in the category of deficit needs.¹ The process of growth, when addressing one's self-esteem, builds the bridge to one's awareness. Self-esteem begins to establish itself in life as early as age two. Maslow's hierarchy addresses two levels of self-esteem. One of those is a lower level and the other is a higher level.

The higher form of self-esteem that Maslow addresses is that of self-respect. This higher form of self-esteem requires less maintenance because through accomplishment, it becomes a permanent part of who the individual is. We can say that once a person has gained respect for himself or herself, it is much harder to lose that respect or to have it taken away. People on the higher end of self-esteem generally like who they are. The idea of confidence in ability, the mastery of something, or the competence that is established in what these people do, supports this higher form of self-esteem.

These *forms* of self-esteem should not be confused with an individual *having* high or low self-esteem. Individuals with low self-esteem often have a low opinion of themselves and their self-image. As a result, inferiority complexes are present in the individual. With this idea in mind, Maslow

contends that the majority of people's psychological problems are due to low self-esteem. The realism here is that if a person don't like himself or herself, or who he or she is or what he or she has accomplished, then that person will be more critical of himself or herself. Through that process, negative self talk is born, and can create a barrier to achieving personal success.

How does low self-esteem impact these lower and higher forms of self-esteem in general? If an individual has low self-esteem, the lower form of self-esteem affects the individual on a social level. The individual may, for example, constantly attempt to seek or validate feedback and acceptance on a social level from his or her peers. With regard to the higher form of self-esteem, in the individual with low self-

esteem may display a lack of respect for himself or herself and the expectations that they place upon themselves would be unrealistic, or perhaps in some cases these expectations would be placed by others rather than being placed by the individuals themselves.

It is amazing that all of the prior needs within Maslow's hierarchy, including physiological, safety, and even belongingness needs are frequently met, especially in modern society and developed countries. Imagine if more people just had a little respect for themselves in the grand scheme of things.



Maslow's hierarchy is a two-way street. A person can spend a lifetime traveling between the two extremes.

The lower form of self-esteem is directly related to an individual's ego, meaning that there is a strong need to be respected by others.⁴ Within this lower form, the individual still remains focused on acceptance by others. This lower form of self-esteem is met when an individual has established a level of status, recognition, fame, reputation and appreciation, just to name a few. These areas in a person's life take work to maintain. They may also require some reinforcement or validation of some kind in order for this lower form of self-esteem to be maintained.

SELF-ACTUALIZATION

Self-actualization is defined by Maslow as the single component of being within the hierarchy model. Being, in this sense, means not being a part of the deficit needs as they appear within the lower chain of the hierarchy.¹ This need is independent—there must be some accomplishment of all the other deficit needs, which are best defined as what we appear to be, according to the standards of society. Self-actualization is the internal dialogue that everyone establishes at some point in their lives. In order to do that, there must be some establishment or satisfaction of the prior needs. Once all of the previous needs have been met, an individual can direct his or her focus toward a true calling. Usually when a person is hungry, or they don't feel safe, or they feel unloved, the focal point leans towards resolving those issues, therefore disrupting the focus on self-actualizing. With self-actualization, being able to pinpoint how one truly feels about something is often a little more challenging

Self-actualizers are focused on what matters most in defining who they are. Once self-respect is gained, the individual can take a more proactive approach to bettering themselves, as well as being able to remain focused on resolving any dilemmas ...

to figure out, or it can be the determining factor of how well he or she is connected with his or her self and abilities.

People who are self-actualizers are focused on what matters most in defining who they are. Once self-respect is gained, the individual can take a more proactive approach to bettering themselves, as well as being able to remain focused on resolving any dilemmas that may arise regarding the deficit stages. Self-actualizers may be more generative in the sense that the focus is no longer as much about pleasing others as it is giving back or sharing this part of who they are.⁶ In other aspects, it can also appear to be spiritual. Looking at one's life as to who he or she is in the universe is a good example. Once a person is able to come to terms with who they are, and they are ultimately satisfied with that, then they have truly reached the point of being able to self-actualize.

With this level of intuition comes a sense of peace, which in turn serves as a motivator to focus on more advanced tasks in life, such as supporting the moral and ethical stan-

dards in life. There is a more in-depth focus on bettering oneself and expanding one's knowledge and talents. The real definition to self-actualizing is getting to know oneself, while being okay and unconditionally accepting of whatever it is that he or she discovers. The question every individual must face is, do you like and accept who you are? Once that question is answered, then self-respect is gained. Once an individual establishes that respect for his or herself, no one can take that away. In this context, Abraham Maslow is justified in establishing self-actualization in a category by itself that quantifies the need of *being* separately from the need of *deficit*.

THE CONTROVERSY

As we take a look at Abraham Maslow's hierarchy pyramid, there is some controversy as to how it relates directly to humanistic psychology. Is there enough evidence to support this hierarchy when it comes right down to how people develop emotionally? Maslow set forth with the notion that these stages along the course of development match up with how people experience psychological growth.

The primary contention is that anyone in society can regress back to, or value an alternative aspect of the hierarchy pyramid in a way that is not parallel with Maslow's model. For

example, some cultures may be more fixated on belonging over safety, or esteem over belonging.⁵ To answer these challenges, many experts believe that Abraham Maslow's hierarchy doesn't always follow in sequence with how it was intended. If the notion of self-esteem, for example, is thought to develop in children as early as two years of age, then why does Maslow address esteem needs so high up in the hierarchy pyramid? Humanistic psychology does challenge some of these notions, even though Maslow was a believer in humanistic psychology.

Another oft-challenged aspect of his work is that Maslow himself defined self-actualizers as people of great accomplishment, such as former presidents, dignitaries and great discoverers. With that being said, it is very difficult to place an emphasis on the concept of self-actualization. How significant is the concept of the self-actualizer? The only way that to answer that question is to say that all people are at different stages of development, and all of them are self-actualizers in some form.

OVERVIEW

When looking at Maslow's hierarchy pyramid, an important concept to remember is that anyone at anytime can regress back to any point within the hierarchy structure that Maslow addresses. How does this impact human behavior? Looking back at the very basics of physiological needs for example, people need to feel good. It does not matter if a person is employed as a janitor or a top-notch cardiac surgeon, if he or she is diagnosed with a disease that impacts them physically, he or she is likely to regress back towards satisfying any physiological needs that may come about. The affected individual's attitude towards the prognosis of this disease will likely contribute towards a shift in his or her priorities. Emotionally, the feelings of love and belonging may be impacted in the sense that they may want to ensure that their loved ones are safe when they pass.

With regard to esteem, for some, there may be a great sense of loss, while others may come to terms with the fact. With that being said, there are circumstances that affect each individual with regard to where he or she stands in the hierarchy pyramid.

Is everyone a self-actualizer? Yes. For each individual, this experience is different. It is experienced at different depths depending on individual life experiences. The more in touch one is with one's inner self, the better he or she can control, and often master, one's self-talk. It is also important to remember that all individuals are constantly impacted by the forces of life, some of which are far beyond personal control. When the opportunity arises to experience this hierarchy, and the needs of deficit are fully met, it allows the individual to make a closer connection with the concept of self-actualization. Also, when these deficit needs are met, self-actualization, in a sense, is likely to become even more enhanced.

The bottom line is that everyone is effected emotionally at every level of Maslow's Hierarchy of Needs. If early life experiences as a child are positive, and needs are being met, that individual will excel in the area of self-confidence and self-esteem at much faster rate. It helps to establish a strong foundation for life. Later, the individual is able to establish a much stronger set of coping mechanisms when one of the deficit needs isn't being met. Additionally, when adverse circumstances confront the individual, he or she is often better-equipped with the ability to problem solve and confront the challenge confidently.

Conversely, if early life experiences as a child are negative, and needs are not met, that individual's foundation

isn't as secure, and he or she is not as likely to excel in self-confidence and self-esteem, rather, he or she is likely to get trapped a state of constantly seeking approval from peers. He or she may develop a fear of making mistakes.

The majority falls somewhere in between what is positive in life and what is negative. Ultimately, individuals who develop a strong, well-established foundation are likely to be emotionally strong and can exercise a stronger sense of self control. Those whose foundation is shaky and not very stable will focus more on protecting it, therefore having less confidence in that foundation.



ABOUT THE AUTHOR

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A SURGICAL CURE FOR

Chronic Blushing:

Endoscopic Thoracic Sympathectomy

by Kara Showalter, CST

The sympathectomy procedure was developed in the mid-nineteenth century. It was well known at the time that the sympathetic nervous system affected many body systems, and it was surmised that the autonomic nervous system played a role in how the body regulates many body functions, including response to changes in environment, exercise and emotion.

HISTORY

William Alexander first performed the sympathectomy in 1889, while attempting to treat many conditions, including goiter, epilepsy, glaucoma and severe chest pain. Surgeons were unsuccessful in treating most of these conditions, although they did find a few situations where sympathectomy actually helped. For example, it helped stop intractable chest pain in those suffering from inoperable heart disease. It also put an end to uncontrollable sweating and blushing.⁷

A posterior approach to the procedure was developed in 1908, to provide better access to the nerve tissue in the chest cavity, but it required resection of the ribs, which was very painful. A supraclavicular approach was developed in 1935, to lessen the pain involved with the surgery, but this approach was more prone to damaging important nerves and blood vessels. Because of the risky nature of sympathectomy, the open approach was never a very popular procedure. It fell even further out of favor with the popularization of lobotomy.⁷

Sympathectomy did not become popular again until the 1980s, when an endoscopic version was pioneered by Goren

LEARNING OBJECTIVES

- ▲ Examine the historical development of ETS
- ▲ Explore the physiology of the sympathetic nervous system
- ▲ Evaluate the indications for a potential ETS candidate
- ▲ Compare and contrast symptoms of Reynaud's Syndrome and erythromelalgia
- ▲ Analyze the ETS procedure, along with the reversal process

Claes and Christer Drott in Sweden. This endoscopic approach decreased recovery time and risks of nerve and vessel damage due to its minimally-invasive nature. Today, the procedure is commonly used to treat hyperhidrosis, facial blushing and some pain disorders affecting the sympathetic nerves.⁷



PHYSIOLOGY

The autonomic nervous system can be subdivided into two branches that are responsible for controlling involuntary functions of the body, including heart rate, digestion, respiration rate, perspiration and many other basic functions of life. The two branches are the sympathetic nervous system and the parasympathetic nervous system.

These two systems work in opposition to each other to achieve a homeostatic effect. The sympathetic system works to speed up or strengthen a function, while the parasympathetic system works to slow down or weaken a function. The sympathetic nervous system is responsible for increasing heart rate, stimulating sweating, decreasing urine production, dilating the pupils, and reducing intestinal motility. Its main purpose is regulating functions necessary for the “fight or flight” response. The actions of the parasympathetic nervous system can be best summarized as “rest and digest.” It is responsible for decreasing the heart rate, constricting the pupils, increasing intestinal motility and digestion, increasing urine production, and aiding in providing balance and restoring energy.⁸

The sympathetic trunks are a paired bundle of nerve fibers that run from the base of the skull to the coccyx in a downward direction just lateral to the vertebral bodies. The sympathetic trunk is a vital part of the sympathetic division of the autonomic nervous system, as it allows nerve fibers to travel to spinal nerves that are superior and inferior to the one in which they originated. These nerve fibers are called sympathetic chain ganglia, and they are responsible for delivering information to the rest of the body regarding stress situations and the fight or flight response. These sympathetic ganglia are the structures that are destroyed during a sympathectomy.²

INDICATIONS

Endoscopic thoracic sympathectomy (ETS) is performed for a variety of reasons: it is a treatment for idiopathic craniofacial erythema (chronic blushing), hyperhidrosis, and some pain disorders resulting from an overactive sympathetic nervous system.⁷

Idiopathic craniofacial erythema is a medical condition characterized by severe, frequent and uncontrollable reddening of the face, which is often unprovoked. It is unknown why people are afflicted with this condition, but it is definitely the result of an overactive sympathetic nervous system. Chronic blushing is primarily diagnosed by reviewing the patient’s history and by ruling out other conditions that would cause reddening of the skin. Options for conservative treatment for chronic blushing include oral medications and behavioral therapy. Several types of medications are used as treatment for idiopathic craniofacial erythema. Anxiolytics, such as Valium®, are used for anxiety; beta-blockers, which blunt the body’s reaction to stress; or anticholinergic drugs, such as robinol, ditropan, or propanthelin.³

Cognitive behavioral therapy has proved to be the most effective noninvasive treatment for chronic blushing. Cognitive behavioral therapy is a type of psychotherapeutic approach based on the idea that our thoughts, not external stimuli, dictate our behaviors. The benefit of this method is that it teaches patients how to deal with dysfunctional emotions in a systematic, goal-oriented process.

Another indication for ETS surgery is hyperhidrosis, or excessive sweating of the palms, face, or axilla. This condition is characterized by abnormally increased perspiration in excess of that required for regulation of body tempera-

concentrations as an antiperspirant and injections of botulinum toxin type A can be used to disable the sweat glands.⁴

Raynaud's Syndrome and complex regional pain syndrome are pain disorders that can be treated with ETS surgery. Raynaud's Syndrome is a painful vascular disorder that affects blood flow to the extremities when exposed to cold temperatures. Raynaud's is caused by a hypersensitivity of the sympathetic nervous system causing vasoconstriction of the peripheral blood vessels, leading to tissue hypoxia. Chronic, recurrent cases can lead to atrophy of the skin, ulcerations of the skin, and ischemic gangrene. Raynaud's diagnosis is made by patient history and physical examination as well as by ruling out other conditions that could cause the vascular symptoms. Warming devices and vasodilators are the main forms of conservative treatment for Raynaud's Syndrome.

Sympathetic chain ganglia are responsible for delivering information to the rest of the body regarding stress situations and the fight or flight response. These sympathetic ganglia are the structures that are destroyed during a sympathectomy.²

ture. Hyperhidrosis is a condition that is inherited as an autosomal dominant genetic trait. Since it is a congenital condition, diagnosis usually results from a family and patient history. Conservative treatments include anticholinergic medications, such as iontophoresis, oxybutynin and robinol. Aluminum chloride can be used topically in high

ALTERNATIVE TO ETS?

What is Cognitive-Behavioral Therapy?

The term cognitive-behavioral therapy (CBT) does not represent a distinct therapeutic technique, rather, it serves as a general classification for a variety of therapies in the same family. According to the National Association of Cognitive-Behavioral Therapists, there are several approaches to cognitive-behavioral therapy, including: rational emotive behavior therapy, rational behavior therapy, rational living therapy, cognitive therapy and dialectic behavior therapy.¹

The foundation of CBT is based on the idea that an individual's *thoughts* cause feelings, behaviors and reactions, not external stimuli, such as other people, situations or events.¹ If this is in fact the case, then theoretically, people are capable of making themselves feel or act better, even if the situation has not changed,

simply by changing the way he or she thinks about the given circumstance.

While other forms of therapy, such as psychoanalysis, can take years, CBT is a much faster process. This has to do, in part, with the differences in the therapist-patient relationship. A cognitive-behavioral therapist's role is to uncover the client's life goals and then figure out how to help the client reach these goals.¹ As stated by the National Association of Cognitive-Behavioral Therapists, "the therapist's role is to listen, teach and encourage, while the [patient]'s role is to express concerns, learn and implement that learning."¹ Put another way, cognitive-behavioral therapists do not tell their patients what their goals *should* be, or what they *should* tolerate. Instead, they *direct* their patients in ways to think and behave in order to obtain what they want.

The ultimate goal of cognitive-behavioral therapy in regard to chronic blushing

is to help stop the reaction by teaching the patient to adjust his or her expectations of social norms. According to researchers, people who blush excessively tend to have unrealistic expectations of how they should behave in social situations. They fear that even a small mistake will be mocked by others, so they become unnecessarily anxious and start to blush. In comparison, babies and small children, who have yet to develop these feelings about social interactions, do not blush at all.² By working with a cognitive-behavioral therapist, patients are able to work on changing the way they approach certain circumstances, reducing the likelihood of a flare up.

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Complex regional pain syndrome (CRPS) is a chronic progressive disease characterized by severe pain and swelling of a limb, accompanied by changes in the skin. Pain associated with CRPS is continuous and may be heightened by emotional stress. Moving or touching the affected limb is often intolerable and eventually the joints become stiff from disuse and the bones and muscles atrophy as well. The cause of CRPS is unknown, but is associated with an overactive sympathetic nervous system and diagnosis can be made by performing a series of tests. These tests include thermography, which is a technique used for measuring

The foundation of CBT is the idea that an individual's *thoughts* cause feelings, behaviors and reactions, not external stimuli, such as other people or events. When theoretically, people can make themselves feel or act better, even if the situation has not changed.

blood flow; radiography, which can detect osteoporosis up to two weeks after the onset of CRPS; and electrodiagnostic testing, which can differentiate between type I and type II CRPS. Conservative treatments for CRPS include physical and occupational therapy combined with pain and anti-inflammatory medications. The physical and occupational therapies are important components to managing CRPS primarily because they desensitize the affected body part and restore range of motion to improve the functionality of the limb.

Surgery is only recommended for severe and disabling cases of these conditions, and the procedure varies for treatment of each disorder. The sympathetic ganglia are identified by the level of the vertebra to which they correspond. For idiopathic craniofacial erythema and facial sweating, the nerve tissue is interrupted at the T2 level. In cases of hyperhidrosis of the palms, nerve tissue is interrupted at the T3 level. For hyperhidrosis of the axilla, the T3, T4, and T5 levels of nerve tissues are all interrupted. In treatment of both Raynaud's syndrome and complex regional pain syndrome, the T2 through T4 nerve ganglia are destroyed. Other variations in the procedure depend on the method used for interrupting the nerve tissues. Most surgeons prefer to clamp the nerves instead of completely resecting them primarily because the clamping method leaves the possibility of easier reversal of the procedure.⁶

PROCEDURE

Several types of equipment and instrumentation are essential to successfully perform ETS. Necessary endoscopic equipment includes video towers, a fiber-optic light source and endoscopic instrumentation. A 5mm telescopic endoscope and a camera cord and light cord are also very important for performing this procedure. Endoscopic graspers, endoscopic scissors and clip applicators are also required. Soft tissue instrumentation that must be available during ETS surgery includes a hemostat, Adson pick-ups with teeth, a needle holder and suture scissors. Anesthesia will require a double lumen endotracheal tube to deflate the lungs and allow exposure of the surgical site.⁶

In order to prepare for the initial incision, the patient must be positioned, prepped, draped and anesthetized, and some practical considerations about room set-up must be made. The patient will be in the supine position with both arms extended on

padded arm-boards and a safety strap will be applied two inches proximal to the knees. General anesthesia will be utilized for this procedure, with the use of a double lumen endotracheal tube. The prep will begin at mid-chest level and extend from the shoulder, including the axilla, to the iliac crest and down to the table on the affected side. Four folded towels will then be placed around the incision site and a fenestrated drape will be placed on top of the towels. An important consideration regarding room set-up is that ETS is a bilateral procedure. To allow the surgeon an unobstructed view from either side, a video tower should be placed on each side of the patient. An extra set of both prepping and draping supplies should also be opened to allow the transition from one side to the other.¹

To begin the procedure, the surgeon will direct the anesthesia provider to deflate the patient's lung on the affected side to facilitate exposure of the thoracic cavity. A #11 blade will then be used to make a 5mm incision between the patient's second and third ribs in the axillary plane. A disposable thoracic port is inserted through the incision and a 5mm telescopic endoscope is inserted through the port. The sympathetic chain is identified at the level that will be interrupted (between T2 and T5), and an endoscopic scissor is used to open the pleura. At this point, the nerve will be separated depending on the surgeon's preference of method, either by resecting it with

endoscopic scissors or by clamping it with an endoscopic clip applicator. The port is then removed, and a small thoracic catheter is inserted through the incision, which is then closed. Once the incision is closed, the lung is re-expanded, eliminating all residual pneumothorax through the small thoracic catheter. The catheter is then removed and wound closure is completed. Steri-strips™ and Mastisol® are applied to the closed incision, and the patient's other side is prepped and draped. The same procedure is then repeated on the opposite side. Re-intubation is not required during the transition since a double lumen endotracheal tube is used. A double lumen endotracheal tube allows the anesthetist to deflate and re-inflate either lung to facilitate exposure of the operative site. At the conclusion of the procedure, the patient will be transported to PACU, where a postoperative chest X-ray film will be taken to rule out residual air left in the thoracic cavity.⁶

Patients usually stay in the hospital overnight after ETS surgery, and patients may resume normal activities in about one week. Most patients who undergo ETS have suffered for many years from socially-disabling conditions, so instant relief from these conditions dramatically increases their quality of life, providing a 90-95 percent satisfaction rate. Prognosis for patients suffering from Raynaud's Syn-

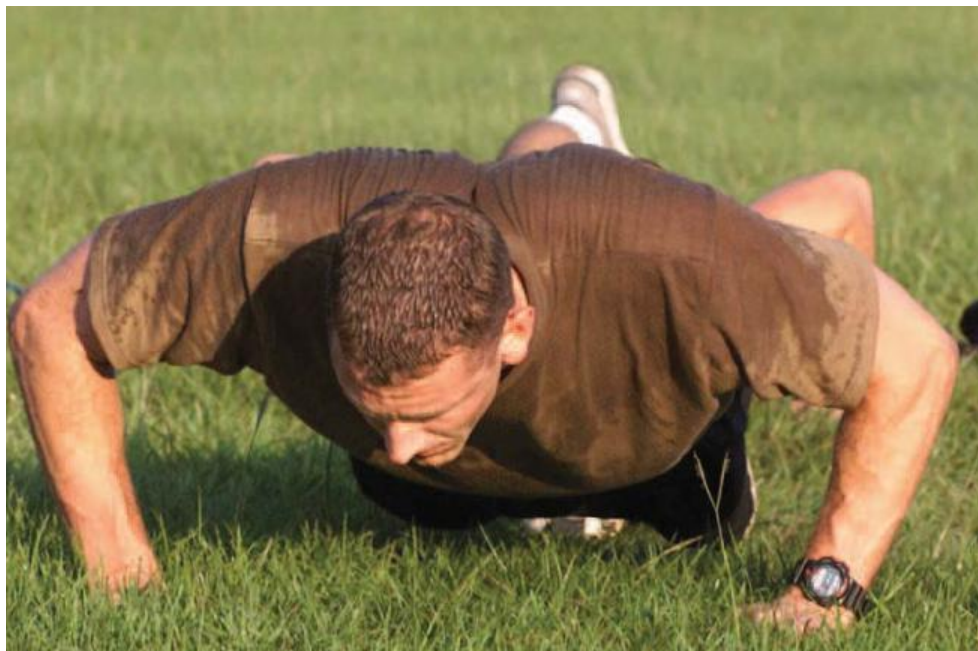
drome, or complex regional pain syndrome, depend on how far the disease has progressed, making the satisfaction rate unpredictable.⁵

Complications associated with ETS include infection, bleeding, respiratory problems, damage to nerves or arteries, compensatory sweating and Horner's Syndrome (Ocu-

Must patients who undergo ETS have suffered for many years from socially-disabling conditions, so instant relief from these conditions dramatically increases their quality of life, providing a 90-95 percent satisfaction rate.

losympthetic Palsy). Compensatory sweating is the most common side effect of ETS surgery, occurring in approximately 50 percent of patients. It is a condition called compensatory hyperhidrosis, in which sweating is shifted from the hands, armpits, face or scalp to the upper and lower back, lower chest, abdomen, buttocks, groin, and backs of the thighs. Compensatory hyperhidrosis is usually mild, and most patients are able to tolerate it without any problems. Rarely, compensatory hyperhidrosis can be very severe, even more so than their original hyperhidrosis. This can cause patients to express regret regarding their sympathectomy and wish to have a reversal.⁵

Horner's Syndrome is the most serious complication of ETS. It results in a slightly smaller pupil and a disfiguring asymmetry of the face due to a slightly drooping upper eye-lid. This complication is caused by damage to the uppermost thoracic nerve node, also called the ganglion stellatum, and can only be reversed by plastic surgery to resect the affected eyelid (blepharoplasty). The risk of this complication depends mainly on the surgeon's familiarity with the procedure. Pneumothorax can also be a significant risk of this procedure. If any air is left in the thoracic cavity, respiratory problems may occur.⁵



REVERSAL

Occasionally, patients wish to have thoracic sympathectomy reversed. Various reasons for dissatisfaction with the procedure include compensatory hyperhidrosis, obesity and the inability to perform exercise, and a lack of temperature control for the upper body. Resumption of nerve conduction and return to normal sympathetic regulation after a reversal of a thoracic sympathectomy can be a very lengthy process. Initial symptoms of recovery of sympathetic regulation may take six to nine months to show after a reversal. The reversal technique depends on the method used to interrupt the nerve tissues during the original operation.

Various reasons for dissatisfaction with thoracic sympathectomy include compensatory hyperhidrosis, obesity and the inability to perform exercise, and a lack of temperature control for the upper body.

If the surgeon who performed the original operation cut the nerve tissue in order to interrupt it, a nerve graft must be performed to restore the nerve. In this method, the location where the operation was previously performed is prepared by refreshing the edges where the nerve was previously cut. Then a nerve graft is harvested from the ankle region, usually the sural nerve is used, and is connected to the divided edges of the sympathetic chain with a biological gluing agent.

The cutting method is the hardest to reverse. The clamping technique is a much easier version of sympathectomy to reverse, which is why it has become the method of choice for ETS surgeons. In reversal of the clamping method, the clip is simply removed from the nerve and the nerve is allowed to regenerate on its own. This method has shown much quicker improvement in compensatory sweating, and the healing process can be reduced to about three to four months. Both reversal methods are performed endoscopically.⁶

CONCLUSION

Although it should only be used as a last resort method of treatment due to the possibility of complications, endoscopic thoracic sympathectomy has proven to be an effective treatment for various conditions, including chronic blushing, hyperhidrosis, and pain syndromes associated with an overactive sympathetic nervous system.

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Man-on-Fire Syndrome

by Tom Borak

Imagine waking up one morning and feeling like your entire body, from head to toe, was on fire. You can't move from your bed, the skin on your toes is cracked and bleeding from the swelling in your feet. There is nothing you can do to dull the sensation of being engulfed in flames.

For a handful of people around the world, this nightmare is a daily reality. They suffer from a rare disease called erythromelalgia (EM), also known as Man-on-Fire Syndrome.

According to the U.S. National Library of Medicine's medical subject headings, a "rare" disease is classified as, "a large group of diseases, which are characterized by a low prevalence in the population. They frequently are associated with problems in diagnosis and treatment."¹ According to a story by ESPN's Steve Cyphers, which follows the journey of Kate Conklin, an EM patient who is training for a triathlon, the disease afflicts fewer than 400 people in the United States.²

The name, erythromelalgia, is derived from three Greek words: *erythros* (red), *melos* (extremities) and *algos* (pain).³ First described in the 1870s, there is still relatively little that is known about this disease, which, due to its rarity, is often misdiagnosed or attributed to a psychological disorder. The symptoms are most common and most severe in the feet and hands. Flare-ups usually occur due to exposure to warmth, and physical activity is often a catalyst. A flare-up will often begin with an itching sensation, which builds into the severe pain and burning symptoms. The pain can be so intense that patients cannot walk.³ Erythromelalgia is not related to complex regional pain syndrome (CRPS), although it can mimic some of the symptoms.⁴

One troubling aspect of the disease is that most cases are idiopathic, and can manifest at any point in life. Conklin, for example, did not experience symptoms until she was 28-years old.² Conversely, remissions are possible, but infrequent.⁴ Since there is no known cause, there is no known cure. EM can also be a secondary development to additional medical conditions, including autoimmune, neurologic or blood disorders. Infrequently, EM can develop following an injury or surgical procedure.⁴ Some people have the inherited or primary form of EM, and usually have other family members with the disease. Recently, an EM gene was identified, as were several mutations to this gene. Apparently, each affected family carries a different mutation, further complicating the process of finding a cure.⁴

There is evidence that suggests that erythromelalgia shares a common pathophysiology with Raynaud's Syndrome. In some instances, a patient has exhibited both conditions – sometimes simultaneously. Despite this possible relation, there is no evidence to suggest that the ETS procedure can have a positive impact on EM patients.⁵



An erythromelalgia flare-up is indicated on both shins.

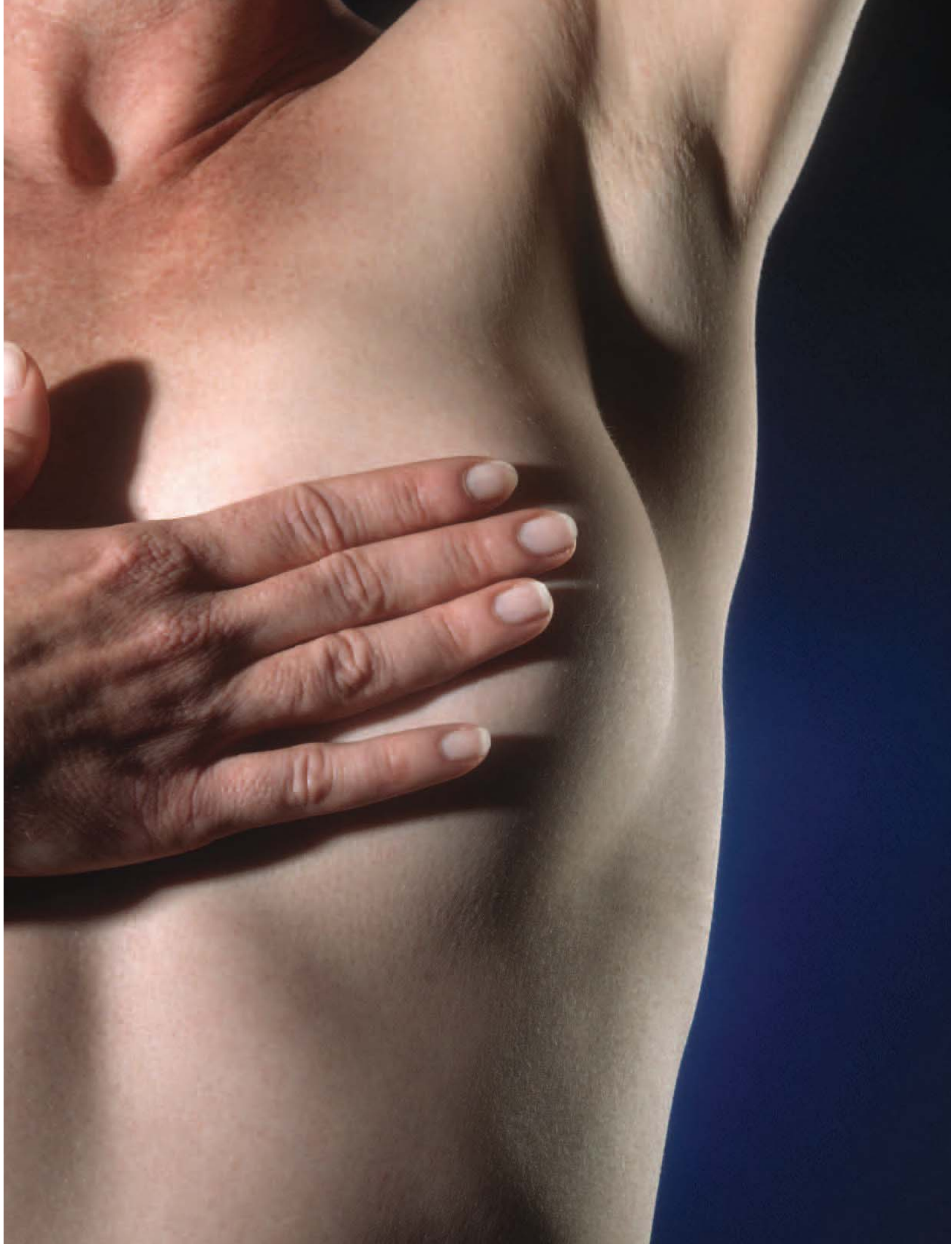
It is extremely difficult for those who have not experienced the symptoms to fully comprehend the severity of the pain that these people are in. Conklin once burned herself on the exhaust pipe of a motorcycle, ultimately peeling herself off the bike with a second-degree burn. When asked by her doctor why she did not pull away, she responded, "that's the burning pain that I'm in, so I didn't notice anything different."²

Due to the nature of the illness, EM patients cannot wear close-toed shoes or socks. This can be particularly challenging during the winter months, when frostbite is a legitimate concern. Because many patients cannot feel pain unless it is more acute than the constant pain of EM, they are unaware of the damage that is occurring in other parts of their bodies. Many patients instinctively soak the affected parts of their body in cold water as a means to reduce the swelling and the burning sensation. However, according to the The Erythromelalgia Association, it has been demonstrated that icing or soaking can actually result in increased flaring, thus making the symptoms worse. Other problems may include skin tissue and nerve damage, infections, even severe ulcers that can take months to heal. Contrary to outdated medical information, this method of treatment is not advisable.⁴ In one extreme case, a patient suffered near-fatal hypothermia related to the constant cooling to control the symptoms.³

Research is ongoing to learn more about the causes of erythromelalgia, and to search for a cure. For more information on Kate Conklin, go to ESPN.com and type "Outside the Lines: Burning Desire" into the search bar.

Resources:

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BILATERAL TOTAL MODIFIED

Radical Mastectomy and Reconstruction

by Brittany Stapp-Caudell

As thousands of women every year are being diagnosed with breast cancer, bilateral mastectomies are becoming both the prophylactic as well as the therapeutic procedure of choice for women young and old to prevent as well as to combat the aggressive, potentially deadly breast cancers. This article will investigate the indications for mastectomy surgery, as well as a case study of a bilateral modified radical mastectomy in the clinical setting.

INTRODUCTION

In today's society, the term "mastectomy" is commonplace in medical terminology, as well as in the postings of an operating room's surgery schedule and insurance billing requests. As thousands of women every year are being diagnosed with breast cancer, bilateral mastectomies are becoming both the prophylactic, as well as therapeutic procedure of choice for women, young and old, to prevent and combat aggressive, potentially deadly, breast cancers.

BREAST ANATOMY

The female breasts are paired anatomical structures on the anterior portion of the thoracic region of a human being. Both males and females have breasts, although the normal anatomy and physiology of the structures varies vastly between the two sexes.

The base of the breast is the attached surface of the breast. It attaches to the deep fascia of the pectoralis major muscle, which overlies the chest cavity. The base of the breast extends vertically over the ribs numbered two through six, and transversally from the sternum to the midaxillary line.¹ The upper region of the

LEARNING OBJECTIVES

- ▲ Examine the evolution of the mastectomy procedure
- ▲ Explore the affected anatomy
- ▲ Compare and contrast different surgical options for breast cancer
- ▲ Evaluate the breast cancer staging process
- ▲ Analyze the step-by-step procedure for a bilateral mastectomy

breast can extend as far as the lateral margin of the pectoralis major muscle and into the axilla.

In general, the breasts consist of secretory glands, superficial fascia and overlying skin, and subcuticular fat. Anatomically, in the pectoral region on each side of the anterior thoracic wall, the mammary glands are modified sweat glands in the superficial fascia anterior to the pectoral muscles and the anterior thoracic wall.¹ In each breast, the mammary glands and their associated duct systems are arranged in an array of lobules situated in a circumferential pattern around a central nipple, or papilla. In culmination, the ducts and the lobules converge to form approximately 20 lactiferous ducts that exit separate of one another onto the nipple.¹ Additionally, in relation to breast anatomy, the circular area of pigmented skin immediately surrounding the nipple is referred to as the areola.

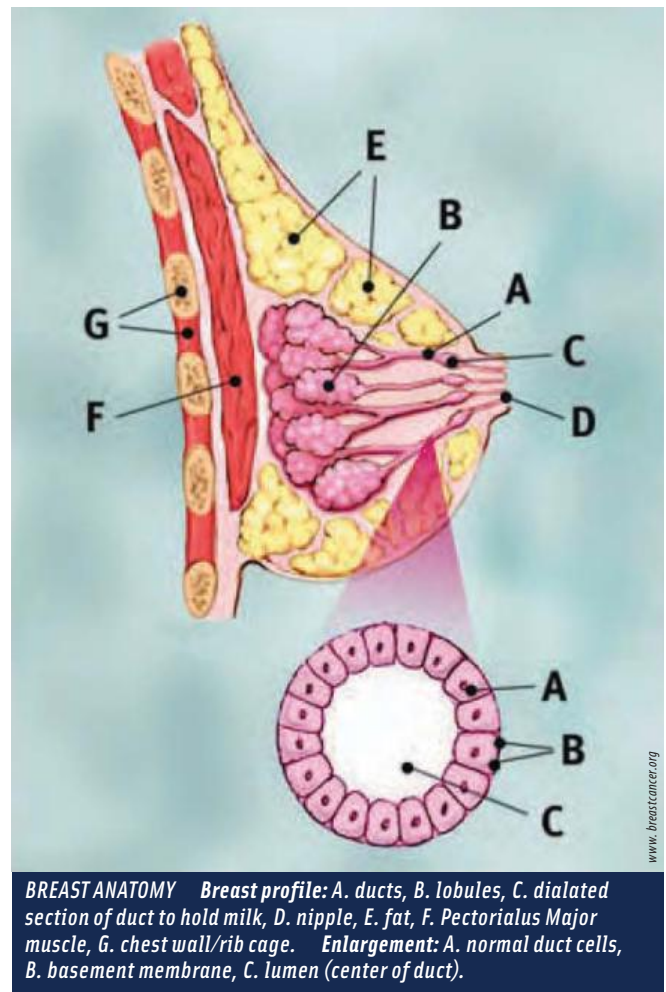
In each breast, a developed connective tissue stroma surrounds the individual ductal and lobule systems of the mammary glands. In certain regions, this connective tissue stroma condenses into ligaments. These are the suspensory ligaments of the breast, and are continuous with the dermal and epidermal tissue of the breast. In general, the suspensory ligaments are responsible for supporting the independent structures of the breasts.¹

The lateral arterial blood supply to the breast provided by the vessels from the superior thoracic axillary artery, the thoracoacromial artery, the lateral thoracic artery and the subscapular arteries.¹ Additionally, the medial breast receives arterial blood flow through the branches from the internal thoracic artery, as well as through the second

Breast cancers account for about 30 percent of all cancer cases found in women and 16 percent of cancer deaths. The highest rates of breast cancer are in North America and Europe.³

through the fourth intercostal arteries via arterial branches that perforate the thoracic wall, and the overlying pectoralis musculature.¹ Venous drainage from the breast occurs through veins that parallel the arteries and drain into the axillary, internal thoracic and intercostal veins.¹

The normal breast is innervated by a number of nervous branches. Innervation of the breast is via the anterior and later-



al cutaneous branches of the second to sixth intercostal nerves. The nipple is innervated by the fourth intercostal nerve.¹

Nearly 75 percent of the lymphatic drainage of the breast drains laterally and superiorly to the axillary lymph nodes. The remaining lymphatic drainage occurs into the parasternal nodes, as well as through lymphatic vessels that follow the lateral branches of the posterior intercostal arteries.¹ The axillary lymph nodes, therefore, are the primary region to sample for cancer metastasis into the lymphatic system.

In males, the breast anatomy differs greatly. The male breast is a rudimentary system composed of small ducts and strings of breast cells that do not typically extend beyond the areolar region of the male breast.

BREAST PHYSIOLOGY

The female breast is physiologically responsible for the production of milk for the purpose of nursing an infant. Specifically, the mammary glands are responsible for the production of milk. These glands are present at birth in the female,

yet do not begin developing until puberty. The glands do not become completely functional, however, until the end of pregnancy. Placental lactogen (hPL), a hormone given off by the placenta, prepares the breasts for lactation.² Additionally, prolactin, a hormone excreted by the anterior pituitary, stimulates the secretory cells of the breast for lactation. In the male, the breast serves no physiological function.

The initial products of the secretory glands of the breast is termed colostrum and is a thin, white liquid that is “let down” immediately following the birth of a neonate. Milk secretion typically begins within a few days of the birth of a neonate and can extend as long as a few years as long as an infant or toddler is suckling on the breast. The process of an infant suckling the breast acts to remove the created milk and further stimulates additional milk production through the release of Oxytocin, an additional hormone, from the posterior pituitary.² In non-lactating women, the predominant component of the breasts is fat, while glandular tissue is more abundant in lactating women.²

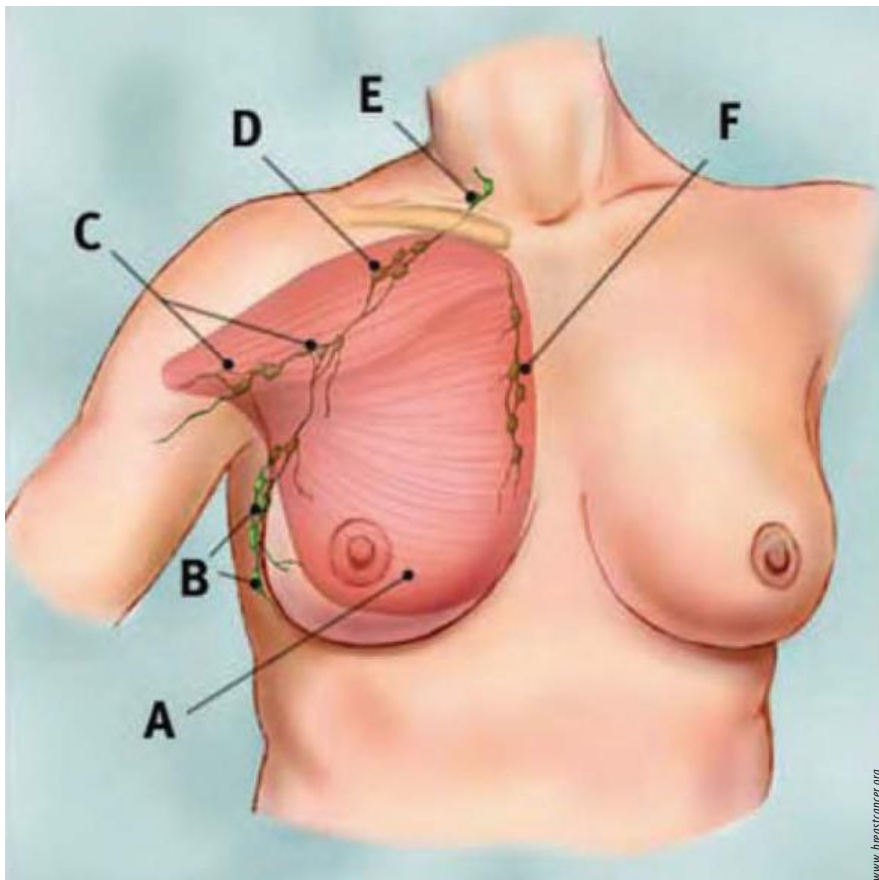
BREAST CANCER

Breast cancer is the most common cancer that affects American women today. Additionally, it is the leading cause of death in women ages 40-44 years of age, and is the second most common killer of all ages after lung cancer.³ The incidence of invasive breast cancer in the female is on the rise, and has increased in incidence since the 1990s. The increase in the incidence rate of invasive breast cancers in today’s society may be a direct result of early detection by means of mammography. Breast cancers account for about 30 percent of all cancer cases found in women and 16 percent of cancer deaths. The highest rates of breast cancer are in North America and Europe.³

Breast cancer should be treated as soon as possible, once a firm diagnosis has been made. Early detection and treatment of breast cancer improves the chances of a successful outcome and full recovery. The risk factors of breast cancer can be classified as reproductive, hormonal, environmental and familial, however, the majority of breast cancers occur in women whose only known risk factors are gender and age.³

The risk for developing breast cancer in women is affected by her age when her first child is born. The younger a female is when she gives birth to her first child, the lower that particular female’s risk is for developing aggressive and invasive breast cancer.³

Additionally, familial factors have an implication in the prevalence of breast cancer development among women. In terms of genetics, breast cancer can be divided into three main groups. The first genetic group is termed sporadic. These women, approximately 40 percent of those diagnosed with breast cancer, have no familial history in the development of the disease.³ The second group of women has an inherited autosomal-dominant set of cancer-causing genes. The final group is a classification of women who *do* have a family history, yet do not possess genes that are passed on in a dominant gene fashion.



BREAST NODES A. Pectoralis Major muscle, B. axillary lymph nodes: levels I, C. axillary lymph nodes: levels II, D. axillary lymph nodes: levels III, E. Supraclavicular lymph nodes, F. internal mammary lymph nodes.

“A history of breast cancer in first-degree relatives (mother or sister) increases a woman’s risk of breast cancer two to three times.³ The risk of breast cancer in these particular women increases exponentially if there is a history of a second first-degree relative who is suffering or suffered from breast cancer, especially if the disease occurred before menopause, and if the disease was bilateral in fashion.³ The most common and important of the breast cancer susceptibility genes are the BRAC1 and BRAC2 genes. BRAC1 is located on chromosome 17 and BRAC2 is located on chromosome 13.³ The BRAC1 and BRAC2 genes are two tumor-suppressing genes that, when mutated, allow a woman to have a higher chance of developing breast cancer.

SYMPTOMS OF BREAST CANCER

The widespread use of screening mammograms, as well as the overall increase in societal information in relation to breast cancer, has increased the number of breast cancers identified before any symptoms are noticed. There are still, however, some cases in which breast cancers are not diagnosed until certain symptoms become noticed by the patient themselves.

The most common sign of breast cancer is a new lump or mass.⁴ A lump felt by either a patient or a health care practitioner that is painless to the touch, hard, and/or has uneven edges is more likely to be cancer when compared to a smoother breast mass.⁴ Additional signs of breast cancer include, but are not limited to, swelling of all or a portion of the affected breast, skin dimpling accompanied by breast pain, nipple pain or an inversion of the nipple, redness in the breast region, thickening of the nipple or breast skin, nipple discharge and/or a lump in the axillary regions.⁵

BREAST CANCER STAGING

Every cancer in the human body is assigned a particular stage. This stage number influences the type of treatment that a patient will receive to treat the cancer. The stage of a given cancer attempts to describe the overall presence and extent of that cancer in the body. The assigned staging number is dependent on a number of factors, including whether or not the cancer is invasive in nature, the size of the cancerous tumor, how many, if any, lymph nodes are involved, as well as whether or not the cancer has metastasized to other regions of the body.⁴ In short, staging is the process of determining how widespread a cancer is upon initial diagnosis.

The staging system for cancers acts as a standardized way for the physician team to generalize information about how far a given cancer has spread within the body once diagnosed.⁴ In society today, the most common staging system

Table 1: Stages of Breast Cancer⁴

PRIMARY TUMOR (T)	
TX:	Primary tumor cannot be assessed.
T0:	No evidence of primary tumor.
Tis:	Carcinoma in situ
T1:	Tumor is 2 cm (3/4 of an inch) or less across.
T2:	Tumor is more than 2 cm but not more than 5 cm (two inches) across.
T3:	Tumor is more than 5 cm across.
T4:	Tumor of any size growing into the chest wall or skin. This includes inflammatory breast cancer.
NEARBY LYMPH NODES (N) (based on looking at them under a microscope)	
NX:	Nearby lymph nodes cannot be assessed (for example, removed previously).
N0:	Cancer has not spread to nearby lymph nodes.
N1:	Cancer has spread to one to three axillary (underarm) lymph node(s), and/or tiny amounts of cancer are found in internal mammary lymph nodes (those near the breast bone) on sentinel lymph node biopsy.
N2:	Cancer has spread to four to nine axillary lymph nodes under the arm, or cancer has enlarged the internal mammary lymph nodes.
N3:	One of the following applies: <ol style="list-style-type: none"> 1. Cancer has spread to 10 or more axillary lymph nodes. 2. Cancer has spread to the lymph nodes under the clavicle (collar bone). 3. Cancer has spread to the lymph nodes above the clavicle. 4. Cancer involves axillary lymph nodes and has enlarged the internal mammary lymph nodes. 5. Cancer involves four or more axillary lymph nodes, and tiny amounts of cancer are found in internal mammary lymph nodes on sentinel lymph node biopsy.
METASTASIS (M)	
MX:	Presence of distant spread (metastasis) cannot be assessed.
M0:	No distant spread.
M1:	Spread to distant organs is present. (The most common sites are bone, lung, brain, and liver.)

is the American Joint Committee on Cancer (AJCC) Tumor Nodal Metastasis (TNM) system.⁴

The stage of a breast cancer can be based either on the results of a physical exam, biopsy, and imaging tests (called

The stage of a breast cancer can be based either on the results of physical exam, biopsy, and imaging tests (called the clinical stage), or on the results of these tests plus the results of surgery (called the pathologic stage).⁴

the clinical stage), or on the results of these tests plus the results of surgery (called the pathologic stage).⁴ The most common type of cancer staging done in the medical community today is the pathological staging. Pathological staging includes the results of a lumpectomy, where a pathologist has studied samples of the removed breast tissue. The process of pathologic staging proves to be more accurate due to the fact that it provides the physician with the knowledge of the extent of spread of a given cancer.

The TNM staging system classifies the various types of cancers based on the stages of T, the size of the tumor, as well as how far the tumor has spread to nearby anatomical structures; N, the spread of the cancer to the nearby lymph nodes; and M, the level of cancer metastasis to distant organs and structures.

Additional letters and numbers are often seen following the TNM classification. These numbers and letters lend further information regarding the cancer's spread, size and lymphatic association of the cancer. The letter T is typically followed by a number ranging anywhere from zero to four. These numbers describe the size of the tumor, as well as the level of spread to the skin or the chest wall. The higher T numbers describe a larger tumor or a wider spread to tissues surrounding the breast tissue.⁴ In addition, the letter N is typically trailed by a number ranging from zero to three. These numbers indicate the degree of cancer spread, if any, to the surrounding lymph nodes and if so, how many lymph nodes are affected. Finally, the letter M is followed by either number zero or one. These numbers indicate whether or not the cancer has metastasized to distant organs or anatomical structures.

Table 1. is taken directly from the American Cancer Society's Web site, and further illustrates the complexity of breast cancer staging that is used in the medical society of today.

BREAST CANCER STAGE GROUPING

Once the breast cancer has been staged by a physician with the TNM system, the results are further compiled and combined in a process referred to as stage grouping. Cancers with similar stages tend to have a similar outlook and thus are often treated in a similar way.⁴ The stage of the diagnosed breast cancer is typically expressed through the use of Roman numerals and varies from stage I, or the least advanced stage of breast cancer, to stage IV, the most advanced stage of breast cancer. A stage of zero refers to a non-invasive cancer.

Table 2. (below), derived directly from the American Cancer Society's Web site (www.cancer.org), refers to the overall survival rates of treated breast cancers and their respective stages.

Stage	5-year Relative Survival Rate
0	100%
I	100%
II	86%
III	57%
IV	20%

DIAGNOSTIC STUDY OF BREAST CANCER

Breast cancers can be diagnosed through a number of means. Typically, breast masses are felt by palpation, or touch, by either the patient or the health care provider during a routine breast examination. If a breast mass is found, a patient will typically undergo a mammogram study that includes both breasts. The mammogram enables the visualization of dense areas of breast tissues that can diagnose either a malignant or a benign breast mass. Additionally, the mass is usually biopsied to determine whether or not the mass is benign or malignant.

If a malignant mass or masses are found within the breast, a physician may further suggest certain imaging tests such as X-rays, bone scans, CT scans, PET scans or MRI scans in an attempt to help aid in the staging of the cancer, as well as the level, if any, of cancer metastasis. Finally, blood tests and white blood cell counts may be performed on the patient in an attempt to evaluate the overall health of the patient as well as to rule out the complexity of cancer spread.

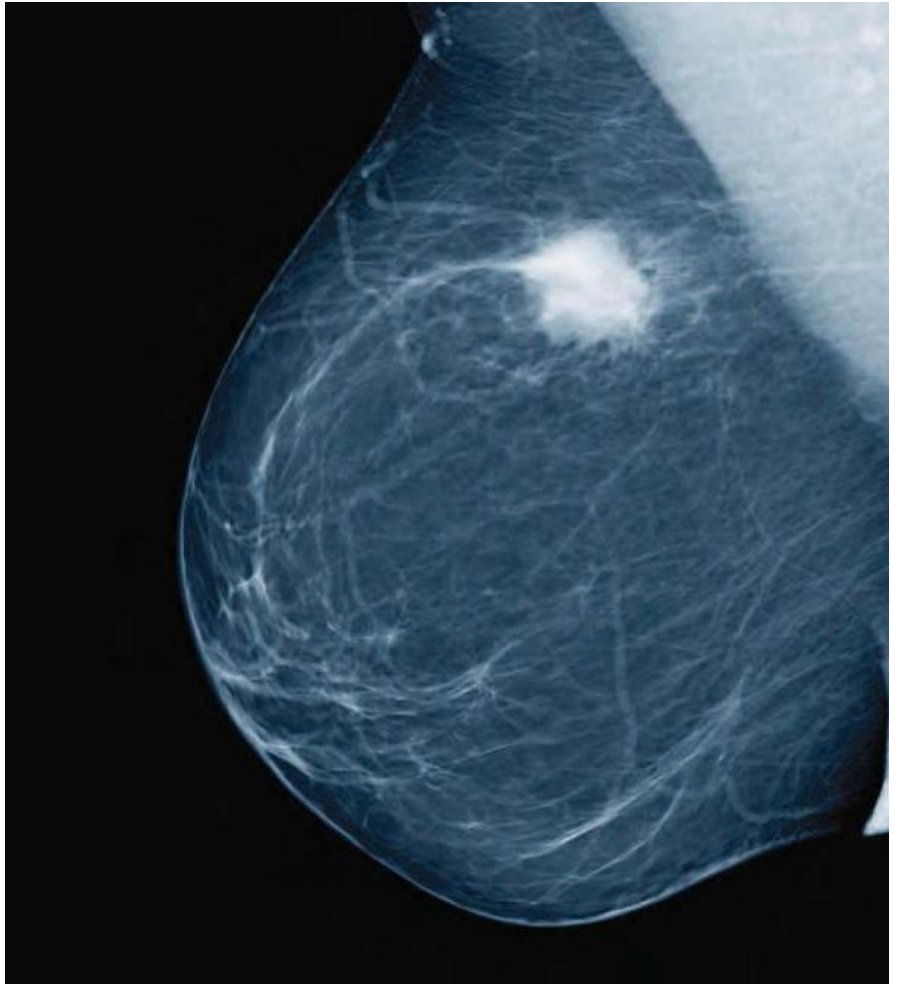
TREATMENT OF BREAST CANCERS

Although there has been a noticeable increase in the number of women being affected by breast cancer, there has additionally been an increase in the number of treatment options available to combat the potentially lethal pathology. Today, rather than only one or two options of treatment, a patient diagnosed with breast cancer can opt for a complex mix of treatment options that fight the complex nature of each individual's breast cancer. A patient can choose from an assortment of surgical treatments, radiation therapy, hormonal therapy and even chemotherapy, or can choose, with the guidance of her health care provider, to attempt a combination of treatment methods to overcome the debilitating cancer.

Surgical treatment of breast cancer is typically the first line of treatment for a patient suffering from breast cancer. Treatments can range anywhere from a lumpectomy to a total bilateral mastectomy. Lumpectomy, also known as breast-conserving surgery, refers to the removal of only the tumor and a small amount of surrounding tissue.⁵ In contrast, a mastectomy is the removal of all of the breast tissue.⁵ Today, mastectomy surgery is more refined and less intrusive than what the procedure entailed in the past. A typical mastectomy spares the muscles located below the breast unless there has been known cancer metastasis to the area. With both surgical treatments, the patient can additionally choose to have the axillary lymph nodes removed in an attempt to determine whether the aggressive breast cancers have spread into the nearby lymphatic system.

In a less invasive lumpectomy procedure, also known as needle localization and wide excision, a radiologist uses a live mammogram to localize a cancerous area in the breast and then inserts a needle into the cancerous tissue. Following the needle localization, the patient is taken to the operating room, with the needle still in place. During the wide excision portion of the procedure, the needle acts as a locator guide for a surgeon to excise all of the cancerous

mass from the breast tissue.⁶ In contrast to a mastectomy, a lumpectomy, or needle localization with wide excision, only removes a small volume of breast tissue and thus conserves the relevant anatomy of the breast.⁶



MASTECTOMY

Mastectomy is the medical term for the surgical removal of one or both of the breasts of either a male or a female patient. One or both of the breasts can be partially or completely removed with a mastectomy surgical procedure. Due to the invasive nature of the surgical intervention and the selected means of tissue removal, a mastectomy is considered to be a local therapy when compared to systemic therapies such as chemotherapy, immunotherapy and hormone therapy.⁵ Currently, mastectomies are the surgery of choice for both the prophylactic and the therapeutic treatment of all known breast cancers.⁷ A mastectomy is not always the most suitable treatment, but in many cases it has proved to be very effective in treating breast cancer.

Although breast cancers are more prevalent in female patients, males can also suffer from the debilitating cancer and thus are also candidates for this procedure.

In the past, it was commonplace in the case of breast cancer to perform a radical mastectomy and remove all of the breast tissues, as well as the underlying musculature and lymphatic drainage system.⁷ There are current changes, however, in today's medical arena in which the election to perform a mastectomy versus a lumpectomy is now based on a number of patient-related factors, such as the size of the patient's breast, the number of cancerous lesions located within the breast tissue, the overall aggressiveness of the diagnosed breast cancer, as well as patient preference. Outcome studies comparing mastectomy to lumpectomy with radiation have suggested that routine radical mastectomy surgeries will not always prevent later distant secondary tumors arising from micro-metastases prior to discovery, diagnosis, and operation.⁵

TYPES OF MASTECTOMY

There are a variety of types of mastectomy procedures being performed in today's medical community. The type that a patient decides to undergo depends on factors such as size, location, and behavior of the tumor, whether or not the surgery is prophylactic, and whether or not the patient intends to undergo reconstructive surgery following the mastectomy.⁷

A simple mastectomy, also referred to as a total mastectomy, involves the complete surgical removal of the entire breast tissue. The axillary components, however, are left in place. Additionally, this surgery is sometimes done bilaterally as a prophylactic measure on patients who wish to undergo mastectomy as a cancer-preventative measure.⁷

A modified radical mastectomy is an alternative type of mastectomy procedure. When a modified radical mastectomy is performed, the entire affected breast is removed along with the axillary lymph nodes and axillary fat.⁷ When compared to a modified radical mastectomy, the pectoralis muscles are left in their proper anatomical location during the modified procedure.

Conversely, a radical mastectomy, sometimes referred to as a "Halstead Mastectomy," involves the surgical removal of all of the breast tissue, the axillary components as well as the pectoralis major and the pectoralis minor muscles

of the chest wall.⁷ This procedure is the most invasive and disfiguring mastectomy procedure due to the fact that the patient is left with a large portion of his or her chest removed for the treatment of cancer. Although this type of mastectomy was performed very often in the past, it has since been replaced with the more modified version of the radical mastectomy. The complete radical mastectomy is typically only performed in today's medical community in extreme cases of breast cancer metastasis that involves the pectoralis muscles.⁷

Mastectomy procedures of today are being further modified to be as minimally-invasive as possible, as well as to provide the patient with some degree of normalcy following the disfiguring surgical procedure. One such modification being performed today is a skin-sparing mastectomy. In this surgery, a conservative areolar incision is made to accommodate the separation of the breast tissue from the overlying skin.⁷ This type of mastectomy provides a large pocket of skin that facilitates a breast reconstructive procedure following the mastectomy. As long as the breast tissue is completely separated from the dermis of the skin, the skin can be left without any incurrence of cancer metastasis. Patients with cancers that involve the skin, however, are not considered to be candidates for skin-sparing mastectomy.⁷

Today, rather than only one or two options of treatment, a patient diagnosed with breast cancer can opt for a complex mix of treatment options that fight the complex nature of each individual's breast cancer.

Similar to a skin-sparing modification of the mastectomy procedure, a subcutaneous mastectomy can be performed in an attempt to preserve the nipple and areola of the patient.

These skin-sparing mastectomies and subcutaneous mastectomies are ideal for patients undergoing prophylactic mastectomies, as well as for patients who wish to undergo an immediate breast reconstructive procedure following the removal of the breast tissue.⁷ The benefit of these procedures is that more of the breast skin envelope is preserved to make it easier to recreate the normal anatomical shape of the breast and aids in the psychology of the disfiguring aspect of the mastectomy procedure.

MASTECTOMY INDICATIONS

A patient is recommended to undergo a mastectomy in a number of instances. Some of these specific groups of patients include a patient who has had radiation therapy to the affected breast, a patient suffering from a cancer that is in two or more isolated locations within a single breast, or a patient in whom a lumpectomy failed to completely remove all of the cancerous cells and a cancer reoccurrence has occurred.⁸ A mastectomy is additionally recommend-

The election to perform a mastectomy versus a lumpectomy is now based on a number of patient-related factors, such as the size of the breast, the number of cancerous lesions in the breast tissue, the aggressiveness of the cancer, as well as patient preference.

ed to a pregnant patient who cannot undergo radiation or chemotherapy due to the potential of harming the fetus, patients who have cancerous breast masses larger than two inches in size or, as a prophylactic measure, for patients who have proved to be genetically positive for the BRCA 1 or BRCA 2 gene mutations.⁸ Finally, mastectomies are normally indicated for male patients who are diagnosed with breast cancer.

CASE STUDY

The following will investigate a case study of a female patient who had been diagnosed with stage II cancer of the right breast. The patient was a 45-year old Hispanic female. This female patient had a family history of breast cancer and thus had been undergoing mammography visualization of the breast for five years prior to her diagnosis of breast cancer.

In February 2009, a medium-sized mass was felt by the patient during a breast self-exam, and a mammogram was ordered. The mammogram revealed a medium-sized mass confined to the right breast. Additionally, blood samples and an MRI were taken to attempt to determine if the mass was cancerous. Both the MRI and the blood sampling were inconclusive as to whether or not the mass was cancerous and thus, the patient was scheduled for a lumpectomy with sentinel node biopsy. Following the procedure, the mass was removed *en bloc*, and the sentinel node biopsied. Both specimens were sent to pathology. The breast mass was found

to be level II cancer, however, the sentinel lymph node was void of cancer and thus it was determined that the cancer was confined specifically to the breast and had not metastasized to surrounding tissue types.

This patient chose a total, bilateral mastectomy as a means to stop the spread of the aggressive cancer in the right breast, as well as to totally remove the breast tissue of the left breast as a prophylactic measure. After extensive genetic testing due to the patient's family history of breast cancer, it was found that the patient was positive for the breast cancer BRAC1 and BRAC2 gene mutations following a complete genetic analysis.

PREOPERATIVE PROCEDURE

The patient is placed in the supine position with both arms extended on arm boards. All of the patient's bony prominences are padded and the feet are placed in padded anti-embolitic compression booties. The anti-embolitic booties both protect the calcaneus, as well as help to aid in venous return to the legs and the prevention of blood clot formation.

A large minor surgical instrumentation set is used for the procedure. Equipment that is needed for a bilateral modified total radical mastectomy includes the following: an electro-surgical pencil with a plume evacuator, attached to the electro-surgical pencil and the suction apparatus. The plume evacuator allows for the removal of the smoke plume that is created through the use of the electro-surgical pencil. Additionally, a Bair Hugger™ warming unit is applied to the patient and a fluid warmer is utilized throughout the procedure to maintain proper body temperature.

In this particular case, the patient had been receiving chemotherapy and radiation therapy prior to the mastectomy surgery, so extra care was taken by the operating room personnel to keep the patient warm. Additionally, care was taken to prevent bruising on areas of the body where bruising could have occurred (padding across the legs where the safety strap was applied, padding around the anti-embolitic hose, etc). Warm blankets were placed over the patient's arms and legs to aid in temperature regulation following the induction of general anesthesia, and a plastic bag was placed over the patient's head after the introduction of the endotracheal tube.

The patient's skin is cleansed with a betadine soap solution and sponges. The soap solution is then allowed to sit on

the skin for five minutes before being wiped off. The umbilicus is cleaned first. The prep starts at each nipple and then the solution is applied in a circular motion, extending outward to the boundaries of the prep area. Once the soap prep is wiped off of the patient's skin, the surgical region is prepped with DuraPrep™ solution. The skin is prepped from the patient's chin to the iliac crest and as far laterally as possible.

In order to drape the surgical area, both of the patient's breasts are outlined with four sterile towels (eight towels

total). Following the placement of the sterile towels to outline the incisional areas, a sterile, adhesive laparotomy drape is applied over the breast region of the patient. The drape sheet is extended caudally and handed to the anesthesiologist. It is then extended toward the feet of the patient, creating a sterile field. Following the application of the sterile drapes and the creation of a sterile field, the suction tubing, light handles and ESU surgical pencil are positioned on the sterile field by the surgical technologist in the scrub role.

Prior to the skin incision, a time-out is performed, when the patient's name, procedure, position, allergies and approach are all stated and agreed upon by participating members of the surgical team. The surgeon is then passed a sterile 10 cc syringe and an 18-gauge needle. The circulating nurse provides an ampule of methylene blue, from which the surgeon draws up 10 cc of the dye. The surgeon is then passed a sterile, 25-gauge needle. The surgeon uses the syringe and hypodermic needle to inject methylene blue dye into the areolar space and nipple of the patient's affected breast. The dye is taken up by the lymphatic duct system of the breast and outlines the sentinel node.

Once the methylene blue has been injected into the areolar area, 10 ml on a 25 gauge needle of 0.5 percent bupivacaine is passed to the surgeon by the surgical technologist. The drug is in a 10 cc syringe, capped with a 25-gauge hypodermic needle. It is administered for local pain control to the skin and musculature surrounding the intended areolar incision locations.

After the injection of the drugs, a #15 blade, loaded onto a #3 knife handle, is passed to the surgeon. The surgeon creates an areolar incision, which is carried circumferentially around the entire areola. The knife is then passed back to the surgical technologist, who places it on the sterile Mayo stand. The electro-surgical pencil, with suc-



Results of a prophylactic mastectomy and TRAM flap reconstruction. The surgeon replaced the missing breasts with stomach fat, resulting in the abdominal incision. An abdominal muscle is re-routed to supply blood to the reconstructed site.

tion attached, is passed to the surgeon. The surgeon uses the electro-surgical pencil to dissect the breast tissue away from the overlying skin extending from the areola down to the fascia of the pectoralis minor muscle. As the dissection is carried deeper into the patient, the surgical technologist anticipates the need of X-ray-detectable sponges, clamps, retractors and pick-ups.

Once the pectoralis muscle is reached, the dissection is then carried laterally to dissect out the sentinel node of the lymphatic system. All breast tissue, with the sentinel lobe attached, is separated from the skin, lymphatic system and underlying musculature. After the complete dissection is complete, the electro-surgical pencil is handed safely back to the surgical technologist, who cleans the tip and places it back into the holster to prevent burns to the patient.

Breast cancer is the most common cancer that affects American women today. Additionally, it is the leading cause of death in women ages 40–44 years of age, and is the second most common killer of all ages after lung cancer.³

Once the breast tissue has been dissected, the tissue is removed through the areolar area and handed to the surgical technologist. The surgical technologist labels the specimen on a piece of sterile towel and hands it off to the circulating nurse. The nurse then labels the specimen and immediately takes it to pathology. As the surgery continues, the pathology department personnel examine the sentinel node under the microscope to see if the cancer has metastasized to the lateral margins of the breast. Once the specimen has been carefully examined under the microscope, the pathology department calls the operating room to let the surgeon know if the lateral margins of the breast, as well as the lymphatic system, are indeed clear of the aggressive breast cancer.

In this particular case, the lateral margins of the breast and the lymphatic system showed no signs of the aggressive cancer.

Once the breast specimen is removed, a new #15 blade, loaded onto a #3 knife handle, is handed to the surgeon, who uses it to make a three-inch incision into the fascia between the pectoralis minor and the pectoralis major muscles. Once the incision is made, the patient's original

saline implant is removed by the surgeon and handed to the surgical technologist. The surgical technologist hands the specimen off of the field to the circulator, who places it in a bucket and correctly identifies and labels it. The surgeon then uses the electro-surgical pencil to further open the capsule that has been created by the saline implant. Additional remaining breast tissue is removed and hemostasis is achieved. At the completion of the mastectomy, the wound is irrigated with sterile water to prevent cancer seeding.

All instruments from this point on are considered contaminated as a result of the cancer. A clean set-up is already prepared prior to this portion of the procedure and is utilized for the remaining portions of the procedure on the right, once-cancerous breast. AlloDerm®, a collagen matrix that preserves all the elements necessary for revascular-

ization and cellular repopulation, is placed into the pocket created by the implant/dissection, located within the muscle layers. The material is first soaked in sterile saline for five minutes before it is transferred to another kidney basin full of saline for another five minutes prior to passing to the plastic surgeon. It is then cut to size and placed into the pocket. Non-

absorbable sutures are used to keep the graft in place.

Following the insertion of the AlloDerm® into the pocket to create a posterior border to the breast pocket, a sterile tissue expander is passed to the plastic surgeon and placed into the newly-created pocket. A butterfly needle is passed to the surgeon and attached to a sterile, infusible IV tube, attached to a pressurized IV infuser filled with warm saline. The surgeon inserts the butterfly needle into the port on the tissue expander, inflating the tissue expander with 540 cc of warm, sterile saline.

For closure, two Jackson-Pratt drains are placed from the muscle pocket to the outside of the body. A 3-0 silk suture is utilized to keep the drains secured in place to the skin. Additionally, absorbable 3-0 polyglactin sutures are passed to the surgeon on a Mayo-Hegar needle holder along with toothed forceps. The sutures are used to close the muscle pocket. Finally, a skin stapler and two Adson, toothed forceps are used to close the areolar incision in a longitudinal fashion.

Following the closure of the right breast, a different, clean set-up is used to carry out the same procedure on the left breast. The sentinel lobe is not removed from the left

side because there is no evidence of cancer present. Only one drain is placed on the left side, which is considered “clean,” due to the fact that it is cancer free. Once the left breast incision is closed with staples, 3-0 undyed polyglecaprone 25 suture is passed on a Crile-Wood needle holder to close the skin. The staples are removed as individual mattress sutures are placed, and then a continuous running suture is placed to close the skin incisions on both sides. Straight Mayo scissors are used to cut the suture edges.

After complete closure on both sides, one-inch wound-closure strips are applied over the incisional area. A wet towel is used to clean the breast and abdominal areas, followed by a dry towel to dry the breast and abdominal area. Two sterile, abdominal pads are placed over the skin incision site, the drapes are removed and the ABD pads are secured with a bandeau-style wrap. Finally, the patient is taken off of anesthesia and extubated. Following extubation, the patient is transported to the post-anesthesia care unit.

Complications of the total bilateral modified radical mastectomy include bleeding, infection, reactions to anesthesia, adhesion formations, thrombi or emboli formation, cancer metastasis, psychological disfigurement problems and death. Additionally, the patient undergoing a radical mastectomy may additionally suffer from phantom breast pain, swelling of the breast area and the possibility of seroma formation. Complications to the tissue expanders include, but are not limited to, infection, bleeding, rupture of implants, dimpling of the skin as well as visualization impedance during follow-up return mammograms.

The advantage to immediate breast reconstruction, as this particular patient opted for, include not waking up to the trauma of losing the anatomical look of the breasts and eliminating the need for additional reconstructive surgery.

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Additional Resources

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In-Office Facial Plastic Surgery:

AUTOLOGOUS FAT GRAFTING

by Nydia Morales, CST

Plastic surgery for pure cosmetic enhancement is becoming more commonplace. As the practice spreads, procedures have become more affordable, and opened the door for middle-income individuals to receive treatments that were previously reserved for the wealthy. In the process, these procedures have also become more refined.

What is it that compels people to pursue an elective surgery, such as plastic surgery? In order to answer this, one can reference Maslow's Hierarchy of Needs. Maslow's pyramid breaks down into five distinct categories: physiological needs, which are basic biological needs, including food, water and warmth; safety needs, which are environmental needs, including safe and secure surroundings; love and belonging needs, including the basic social requirements of friends and intimate relationships; prestige and esteem needs, including respect, which give people a sense of accomplishment and self-worth; and self-actualization, which is the point at which one finally recognizes and accepts his or her ultimate potential. **Please see Editor's Note.*

Self-dissatisfaction is a confrontation with one's self. It can also influence the way a person perceives that he or she is viewed by others. When a person is insecure about physical aspects of his or her body, prestige and esteem needs are negatively affected. These perceived short-comings can have a negative effect on a person's evaluation of self-worth. In some instances, surgery offers a legitimate remedy. The ultimate goal of a cosmetic surgi-

LEARNING OBJECTIVES

- ▲ Evaluate the success of autologous fat grafting
- ▲ Compare and contrast the methods of facial augmentation
- ▲ Review the preparation and procedure for autologous fat grafting
- ▲ Examine the history of plastic surgery
- ▲ Gauge the wide-spread use of plastic surgery in the United States

cal procedure is to help the patient achieve a positive evaluation of himself or herself.

The challenges vary from patient to patient. In some cases, it may take years before the patient is fully satisfied and is able to accept himself or herself. Personal appearance is affected by aging, trauma, disease and heredity. One of the most common phrases in a plastic surgeon's office is, "I don't like my...." Walking through the doors of a cosmetic surgery facility can be a hard step, but it is the first step in resolving the unhappiness that has manifested.

When a person is insecure about physical aspects of his or her body, prestige and esteem needs are negatively affected. These perceived short-comings can have a negative effect on a person's evaluation of self-worth.

There are many options with plastic surgery. Procedures can range from buttocks and breast augmentation to rhinoplasty or a facelift. The central focus of this article is autologous fat grafting, a technique that can be utilized in a variety of procedures. The method is minimally traumatic, and the fat is harvested from the patient's own abdomen or thigh. It is then injected into the area that is in need of enhancement or remodeling. For facial procedures, the most common areas include cheeks, nasolabial folds, the tip of the nose, chin and lips. The ultimate goal of the procedure is to create a natural appearance.²

While autologous fat grafting has proven to be highly successful, it is not the only option for facial augmentation. Other methods include injectable fillers, such as hyaluronic acid, collagen-based structural fillers and calcium-based microspheres, suspended in a water-based gel. These artificial fillers are used to conceal deep wrinkles, nasolabial folds, the nasojugal groove and provide enhancement for the lips. Chemical peels, including trichloroacetic acid, salicylic acid, alpha hydroxyl acid and phenol are used to resurface the skin. Finally, intradermal injections of botulinum toxin type A may be used to improve deep wrinkles, crow's feet and frown lines between the forehead and eye brows. It can also be used as a treatment to improve oily skin. All patients are strongly advised to consult their plastic surgeon regarding specific goals and needs.

Fat is a natural choice for grafting material. An early pioneer in the use of autologous fat grafting for facial remodeling in the 1970s, Tolbert Wilkinson, MD, found that the health and safety benefits of using the patient's own fat for the injection are significant. Since the donor is the patient, the immune system accepts the transplanted fat. The transplanted fat can also be removed, making the procedure reversible. The cells are fragile in the first month following the transfer, so the physician can crush and remove the graft if necessary.⁶ This option is utilized if the result of the procedure is too bulky. The lips are an example of where this result may occur.

In addition, Wilkinson was impressed by the durability of the grafts, noting that some of his patients' grafts were still working after 15 to 20 years.⁶

Fat, or adipose tissue, is a naturally-occurring substance in the human body. Fat storage results from the con-

version of nutrients from dietary fats, proteins and carbohydrates acting together to create a stockpile of reserve energy. Fatty acids and glycerol are broken down in the stomach and small intestine before the lymphatic system transforms them into triglycerides, which are then stored as adipose tissue.³ Sugars from carbohydrates, such as glucose, are also converted into fatty acids and stored.⁴

Fat is typically stored on the abdomen, hips and thighs. Since it lays dormant on the body, it is an accessible entry point for easy collection. This fat is used for grafting.⁵

Some of the most common facial locations that are treated with fat grafting include the nasolabial folds, marionette grooves, lips, chin, jaw line, neck and cheeks. Patients receiving procedures in these areas are often seeking a rejuvenating effect. There are many factors that can cause the dermis and epidermis to atrophy, creating indentations in the skin. One of the more common causes is the after-effects of cortisone injections that were used to treat cystic acne lesions.¹⁰ Other causes include aging, sun exposure and smoking. Fat grafting provides the augmentation needed to fill these areas.

Proportionate distribution of the grafted fat is the key to maintaining the balance of the face. The surgeon will begin by filling in the cheeks and lower eyelids before moving on to other parts of the face. The purpose is to give the fat a chance to settle and take its placement on the face. In the neck area, subcutaneous fat is injected to fill in the creases,

or the cartilage to provide a smooth appearance. If there is a depression from the eyebrow to the supratarsal fold, the surgeon injects the fat superficial to the orbicularis oculi muscle. In this way, autologous fat grafting can be used as an alternative option to an overall face-lift procedure, or as a supplement to the face lift.⁷

How successful is the autologous fat grafting procedure? A first-of-its-kind study was recently documented on the longevity of the procedure's results. In the 2009 survey, titled, "Autologous Fat Grafting: Long-term Evidence of Its Efficacy on Midfacial Rejuvenation," 33 patients were injected with 10 ml of autologous fat to the midface region. Pre-

and postoperative three-dimensional colorimetric analysis (photographs) was used to assess volume change. Magnetic resonance imaging (MRI) was also used to record volume retention. Of the 33 participants, only eight patients needed 3 ml of touch-ups (secondary procedures).

An additional aspect of the study used ultrasonography to record the results of the fat transfer. The patients were scheduled for quarterly follow-up visits for one year following the procedure. The results of the study revealed a high rate of successful fat retention: 51 percent at three months, and 45 percent at six, nine, and 12 months. The eight patients with touch-ups had a lower percentage (29.6) of volume retention.⁸

Patients who have undergone abdominal surgery are not good candidates for autologous fat grafting due to the possibility of developing a ventral hernia.

PREOPERATIVE PROCEDURE

The surgeon reviews the procedure preoperatively, and also obtains and reviews the patient's consent form and medical history. He or she then takes preoperative photographs of the patient, which will be used to illustrate the postoperative difference. The surgical technologist remains in the O.R. at all times, and the patient's vital signs are constantly monitored. For this type of outpatient procedure, there is no circulating nurse or anesthesiologist present. Before the procedure begins, the surgical technologist confirms that the consent form has been signed and countersigns it, reviews the medical entry and takes and records vitals, including blood pressure and pulse oximeter readings. Close attention is given to any irregularities, such as cardiac dysrhythmia, or anything that could indicate a potential medical risk.

ANESTHESIA

The choice of anesthetic varies depending on numerous factors, including the patient's overall health, current medications, consideration of the surgeon and patient preference, and the number and length of time of the procedures that are being performed. Based on these variables, a facial procedure can be performed under general anesthesia, an IV with sedation, or local anesthesia. Most cases are treated with a local anesthetic.



This patient did not like how her nasolabial folds (cheek wrinkles) made her look older and tired. She was also concerned that her skin wasn't "smooth" and had lots of oil. Autologous fat injections were performed to help improve the deep wrinkles and a salicylic acid peel was done to effectively smoothen her skin and reduce the oil. Fillers would not have been as effective given her anatomy.

Kamran S. Jafri, MD

The local anesthetic of choice is a tumescent solution, consisting of 400 ml of normal saline, 90 ml of one percent lidocaine without epinephrine, 10 ml of 8.4 percent sodium bicarbonate and 1 ml of epinephrine (1:1000).

If the patient is nervous prior to the procedure, the surgeon may choose to administer 5-10 mg of diazepam, sublingual, to treat the anxiety. Post-operatively, acetaminophen is often sufficient to manage the pain. In some instances, however, a narcotic pain reliever is prescribed.

In addition, the patient will be prescribed a postoperative antibiotic to prevent bacterial infection. Three of the primary medications are azithromycin; cephalexin, which is used for patients who have certain heart problems in order to prevent coronary infection, such as bacterial endocarditis; and clindamycin, which is used for patients who have an allergic reaction to penicillin.

INSTRUMENTATION AND SUPPLIES

Supplies for Fat Grafting Procedure

Small, medium and large blunt cannulas (3 mm)

10-15 syringes (10 ml)

30-gauge needles

4 x 4

Sterile gloves

Bouffant / cap

Wash basin

Long, cotton-tipped applicator

Drapes: suitable for operative sites

Suture and dressing – surgeon's preference

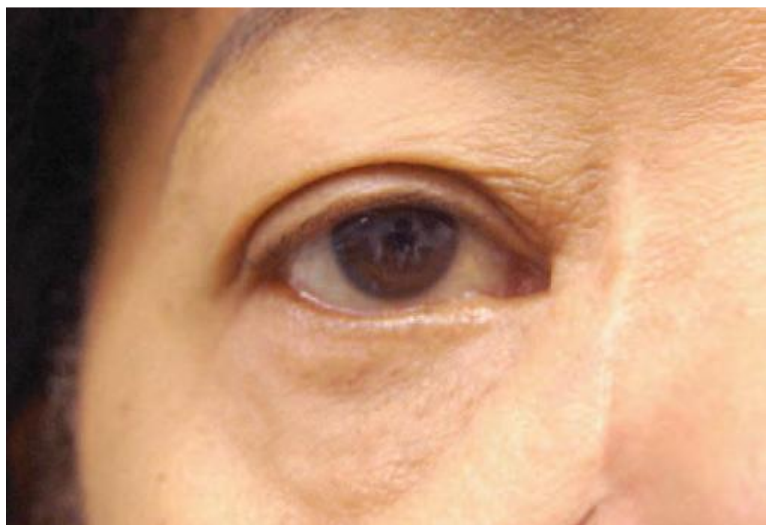
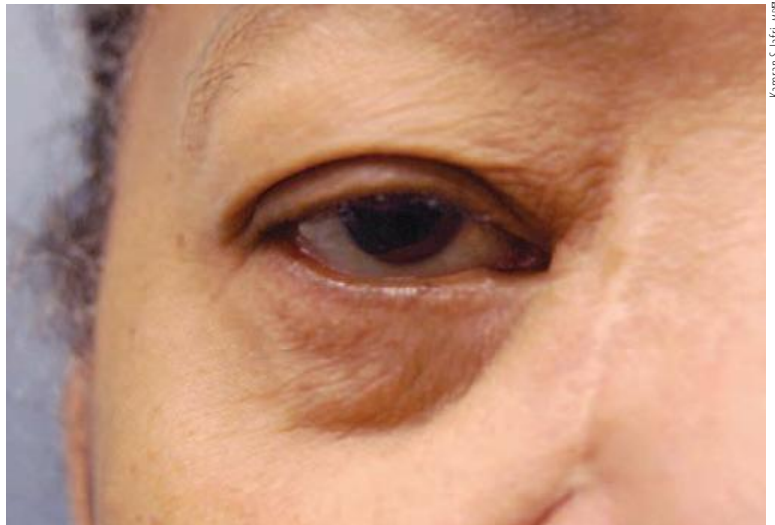
Marking Pen

Electrosurgical pencil with needle-tip electrode (kept on the side, should it be needed)

FAT GRAFT DONOR SITES

The lower umbilical region is an easy-access donor site, and is widely used. Other donor sites include:

- ▲ Inner thigh: In the frog-leg position with the knee flexed and externally rotated (flat on table). The puncture is made on the skin fold along the inguinal line.
- ▲ Anterior thigh: With the patient in the supine position and both legs straight, a puncture is made along the inguinal line.



This patient had undergone extensive surgery for removal of a cranio-facial tumor. Once she had successfully been treated for her tumor, autologous fat injections were used to fill in the deep groove under her eye that was due to tissue and bone removal during her cranio-facial surgery. The fat injections provided her with a natural and long lasting improvement in the cosmetic appearance and functional support of her lower eyelid. This same technique can be easily used for aesthetic purposes in patients with deep grooves under their eyes.

- ▲ Outer thigh and buttock: The patient is placed in the lateral decubitus position, and a puncture is made on the fold of the buttock.
- ▲ Waist roll: Also using the lateral decubitus position, a puncture is made on the inferiolateral extend of the fat pad.
- ▲ Hip: Similar to the waist, the patient is placed in the lateral decubitus position, but the puncture is made in the posterior of the fat pad.
- ▲ Triceps: The patient is placed in the lateral decubitus position, and a puncture is made at the postlateral extend of the axillary fold.⁹

Some of the most common facial locations that are treated with fat grafting include the nasolabial folds, marionette grooves, lips, chin, jaw line, neck and cheeks.

OPERATIVE PROCEDURE

The patient is seated in the reverse Trendelenburg position. The patient's face, as well as the puncture area of the donor site, are cleansed with alcohol wipes. The face is also cleansed with surgi-scrub. Sterile drapes are placed on the thoracic and epigastrium region, as well as on the lower portion of the hypogastrum region.

Once the area has been prepped, the surgeon outlines the planned surgical paths with a sterile marking pen (on both the abdomen and face). He or she then administers the local anesthetic. When the anesthetic has taken effect, the first step in the procedure is to harvest the fat that will be transplanted in the graft. A 30-gauge needle is used to make the entry point for the blunt cannula that is attached to a syringe. In a thrusting, lateral-to-lateral movement, the fat is aspirated from the donor site, while the surgical technologist applies fingertip pressure to the site.

Once the physical harvesting of the fat is complete, the syringes are placed in a centrifuge (to be operated by the surgeon) to remove excess water and impurities. The process takes a few minutes, and at its completion, approximately $\frac{3}{4}$ of the contents of each syringe is useable fat. The fat ranges in color from hues of orange to yellow. The closer the color is to orange, the greater the actual fat content. The surgeon applies a 5-0 nylon suture to the donor site, while the surgical technologist applies an antibiotic ointment to a long, cotton-tipped applicator. The surgical technologist then applies the antibiotic ointment to the wound, which is covered with a 4x4 dressing, followed by a cold compress.

The surgeon then injects the fat graft in the specified areas that have been clearly marked. He or she makes approximately three subcutaneous tunnels in each graft site, injecting the fat as the needle is slowly withdrawn. The surgical technologist then cleanses the area and applies 4x4

dressings. A cold compress is applied in 20-second intervals, alternating sides on the affected region of the face, if the procedure is symmetrical. The chair is then raised to a seated position, and vitals are taken again and recorded. Prescriptions for antibiotics (mandatory) and prescription pain relievers (if needed), or over-the-counter extra strength acetaminophen are noted by the surgeon. Written postoperative instructions are given to the patient, and a follow-up appointment is scheduled for one week.



This patient did not like how her deep smile lines (nasolabial folds) made her face look older and tired. She wanted long lasting results and was not keen on using any artificial materials in her face. Therefore, autologous fat injections were easily done to provide her with a natural and refreshing look to her face. In addition, a slight and subtle elevation was accomplished to her cheek area resulting in a more youthful contour to her face.

Kaman S. Jafri, MD

POSTOPERATIVE CARE

The patient is instructed to maintain ice packs on the recipient area for 48-72 hours post surgery. For a facial procedure, the head must be elevated while sleeping to minimize edema. Sleeping with two pillows is generally sufficient. Strenuous exercise is not allowed, although short walks are acceptable. The patient is also placed on a diet that restricts salt intake in order to reduce facial swelling. In some cases, swelling in the recipient area can last up to six months.

POSTOPERATIVE COMPLICATIONS AND FOLLOW-UP

Postoperative complications for plastic surgery, including autologous fat grafting procedures, include infection, bleeding and hematoma. Bruising, swelling, and mild discomfort are also common, although not normally considered serious.

After the procedure, follow-up visits are scheduled for one week, two weeks, and one month. At that time, postoperative photos are taken. The surgeon retains extra vials of the patient's fat, and refrigerates them should touch-ups be needed in the future.

**Editor's Note: An in-depth look at Maslow's Hierarchy of Needs is available in the August 2009 issue of The Surgical Technologist.*

ABOUT THE AUTHOR

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From the Author

The patients I have encountered are very representative of Maslow's definition of prestige and self-esteem needs. What I have come to understand is that a personal dissatisfaction with a particular element of one's body does not necessarily indicate a sense of vanity. Being unhappy affects the total body and mind, which can be concealed to a certain degree. The serious-minded patient usually takes a year before finally confronting themselves to actually start to change that personal perception. Once the process gets started, and especially after seeing the finished result, the happiness sets in. I

have heard numerous patients acknowledge, "I should have done this a year ago!"

One of the best parts of my job occurs when the surgeon hands the mirror to the patient after a procedure. The expression of relief is evident, and the dissatisfaction that entered the office dissolves as the patient walks out the door. Being a part of helping a person boost his or her self-esteem is both fulfilling and gratifying.

This article is dedicated to my mom, Maria C Morales. Through life's difficulties she gave me the strength to focus and finalize this writing. May she rest in peace. June 14, 2009.

Plastic Surgery: A Timeline

by Tom Borak

The practice of plastic surgery is much older than one might expect. It is believed that nose reconstructions were performed in ancient India as early as 2,000 BCE, when amputation of the nose was an accepted form of punishment.¹ Surgical procedures are noted in Sanskrit texts, including *Sushruta-samhita*, which was written in approximately 600 BCE. It describes the reconstruction of the mutilated nose, using tissue from the cheek.⁴ However, most of the modern procedures that are used today date back to the 1880s and 1890s.²

Aesthetic, or cosmetic surgery became very popular in the 16th century, during the Renaissance. This resurgence in interest paralleled the syphilis epidemic of the time. Syphilis is a sexually-transmitted disease caused by the bacterium *Treponema pallidum*.³ Advanced cases of syphilis can cause disfigurement and even death. The primary role of aesthetic surgery at the time was to rebuild the noses of syphilitics, so they could become less visible in society.²

It was during this time that Italian surgeon Gasparo Tagliacozzi and French surgeon Ambroise Paré

began experimenting with the early Indian ideas, sparking a renewed interest in the use of local and distant tissue to reconstruct complex wounds, giving rise to the modern concept of plastic surgery.⁴

Pierre Joseph Desault, a French anatomist and surgeon, coined the



JOHANN FRIEDRICH DIEFFENBACH

term “plastic surgery” in 1798.² Derived from the Greek word *plastikos*, which means “fit for molding,” plastic surgery eventually became the dominant label for all featural and reconstructive surgery in the early 19th century.² The catalyst that sparked the widespread use of the term was the 1818 publication of *Rhinoplastik*, a monograph on the recon-

struction of the nose by Karl Ferdinand von Gräefe. A superintendent of German military hospitals during the Napoleonic Wars (1800–15), and professor of surgery and director of the surgical clinic at the University of Berlin (1810–40),⁵ Gräefe’s work revived Tagliacozzi’s “Italian Method,” which used a graft from the upper arm, rather than the forehead.

Prior to this publication, and in the immediate aftermath, plastic surgery was generally understood to be surgery on the nose. However, after publication, there was a surge in the number of “plasties,” as new procedures were all tagged with the suffix. In an attempt to curtail the number of uniquely-named procedures, Eduard Zeis, who is credited with authoring the first textbook on plastic surgery, disavowed the continuous labeling of specific procedures after the model of “rhinoplasty” He adopted Desault’s term, plastic surgery, to encompass *all* reconstructive procedures to the face and body.²

Despite the surgical innovations and writings of these pioneers in plastic surgery, Johann Friedrich Dieffenbach (1792–1847) is widely

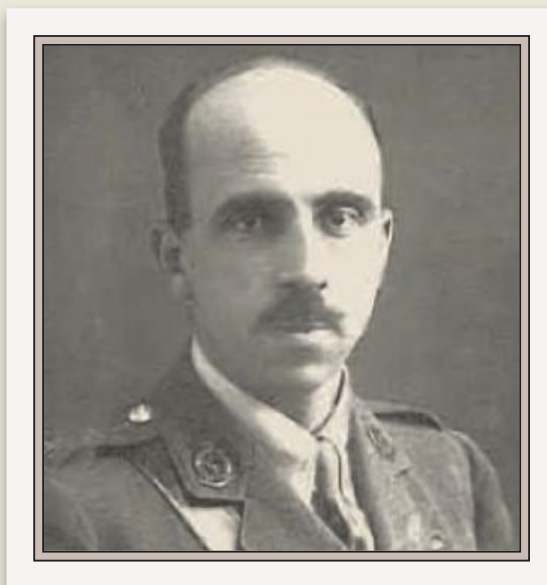
Significant growth and innovation in the field took place during and following the first World War, as the need for reconstructions ballooned.

cited as the “father of plastic surgery.”² It was Dieffenbach who used the term “beauty surgery” (today referred to as cosmetic surgery) to differentiate purely aesthetic procedures from “real” reconstructive surgery, which led the movement toward a definitive distinction between the two.²

Significant growth and innovation in the field took place during and following the first World War, as the need for reconstructions ballooned. Burn and blast victims, along with those who suffered other disfiguring injuries in the line of battle, presented new challenges to surgeons in the emerging field of reconstructive surgery.

One of the premier surgeons during this time was Sir Harold Delf Gillies, a New Zealander who is famous for his innovative work in the practice of skin grafting and facial reconstructions from gunshot, blast and burn wounds during World War I.⁶ Nearly 100 years after Dieffenbach’s contributions revolutionized the field, Gillies is credited as being the “father of modern plastic surgery” for his innovative methods. In a groundbreaking procedure, Gillies reconstructed the

face of Walter Yeo, a British sailor, who sustained massive facial burns, as well as the loss of his upper and lower eye lids during the Battle of Jutland in 1916. The relative success of this surgery, and the growing need for similar operations prompted the opening of a new hospital devoted exclusively



SIR HAROLD DELF GILLIES

to facial repairs. (Gillies is also credited with pioneering sex reassignment surgery in the mid-1940s.)⁶

As the practice expanded, a rift grew between reconstructive surgeons, who saw aesthetic surgery as an incidental part of their practice,² and cosmetic surgeons, who were accused by the establishment, including Gillies himself, of being, “poorly

qualified and very-well advertised surgeons, who adopted the term, plastic surgery, without any true training in surgery and without any other surgical ability than to remove a few folds of skin or a small hump of the nose.”² Because of this, “beauty” surgeons were often deemed quacks by their peers.

While the term quack may not be as prevalent today as it once was, the practice of plastic surgery continues to exist in shades of gray. For example, any physician, whether acknowledged as a specialist by his peers or not, can undertake aesthetic surgery.² More and more non-board certified physicians perform aesthetic procedures every day, including dentists performing hair transplants.²

As physicians’ ability to eliminate pain and reduce the risk of infection grew, the practice of plastic surgery blossomed. The oldest association for aesthetic surgery in the United States is the American Association of Oral Surgeons, which was founded in 1921. It became the American Association of Plastic Surgeons in 1942, and today is known as the American Society of Plastic and Reconstructive

*As physicians' ability to eliminate pain
and reduce the risk of infection grew, the practice
of plastic surgery blossomed.*



WALTER YEO

Surgeons, comprising 97 percent of all plastic surgeons certified by the American Board of Plastic Surgery. The board itself was organized in 1937, and admitted to the American Board of Surgery in 1938.

Plastic surgery is a rapidly-growing practice in the United States. In 1981, there were 296,000 reported procedures performed. By 1984, that number had grown to 477,700.² In 1996, the American Academy of Facial Plastic and Reconstructive Surgery developed a survey, which revealed that 825,000 plastic and reconstructive procedures had been performed on the face alone in 1995, a nine percent increase from 1993. According to the survey, 65 percent of the procedures performed in 1994 were done on people with a family income of less

than \$50,000 per year, indicating that financial factors are not a significant deterrent in the decision to aesthetically change one's body.

In 1997, the total number of all surgical and nonsurgical cosmetic procedures performed in the United States totaled 2,099,173. By 2007, that number had morphed to 11,701,031. These numbers represent a 162 percent increase in the total number of cosmetic procedures. Surgical procedures increased by nearly 80 percent, while nonsurgical procedures increased by more than 233 percent. Nearly 92 percent of all procedures were performed on women. In total, Americans spent nearly \$12 billion dollars on cosmetic procedures in 2008.⁷

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Management and Prevention of Infection in Orthopedic Surgical Procedures

by Amy Broussard, CST, CFA

In orthopedic operating rooms, even one surgical-site infection is too many. In today's operating rooms, a surgical-site infection stands out as a very serious complication. Health-care-associated infections constitute a great challenge in today's hospitals and surgical departments. According to the Institute of Medicine, hospital-acquired infections cost hospitals between \$3.5-5.7 billion dollars per year.¹

This article examines current practices in place at one facility, and through a literature review, attempts to seek out ways to improve the policies and procedures that are currently being practiced to prevent orthopedic surgical-site infections.

The key issues that will be addressed in this discussion are: the types of bacteria commonly seen in orthopedic infections; the chain of infection for these bacteria; current policies and procedures in place at many facilities; the types of orthopedic procedures performed and their associated infection-risk factors; the different types of precautions taken with orthopedic surgical patients; prophylactic antibiotic therapy preoperatively; and new recommendations and standards of care in relation to infection control in the surgical setting. By discussing these key issues and researching current recommendations, it is the author's hope to improve current practices, thereby decreasing surgical-site infection rates in the future. The ultimate goal is to increase the quality of care that is given to patients, making their surgical experience a safer one.

Commonly-performed orthopedic procedures include: total hip and knee arthroplasty; open reduction and internal fixation

LEARNING OBJECTIVES

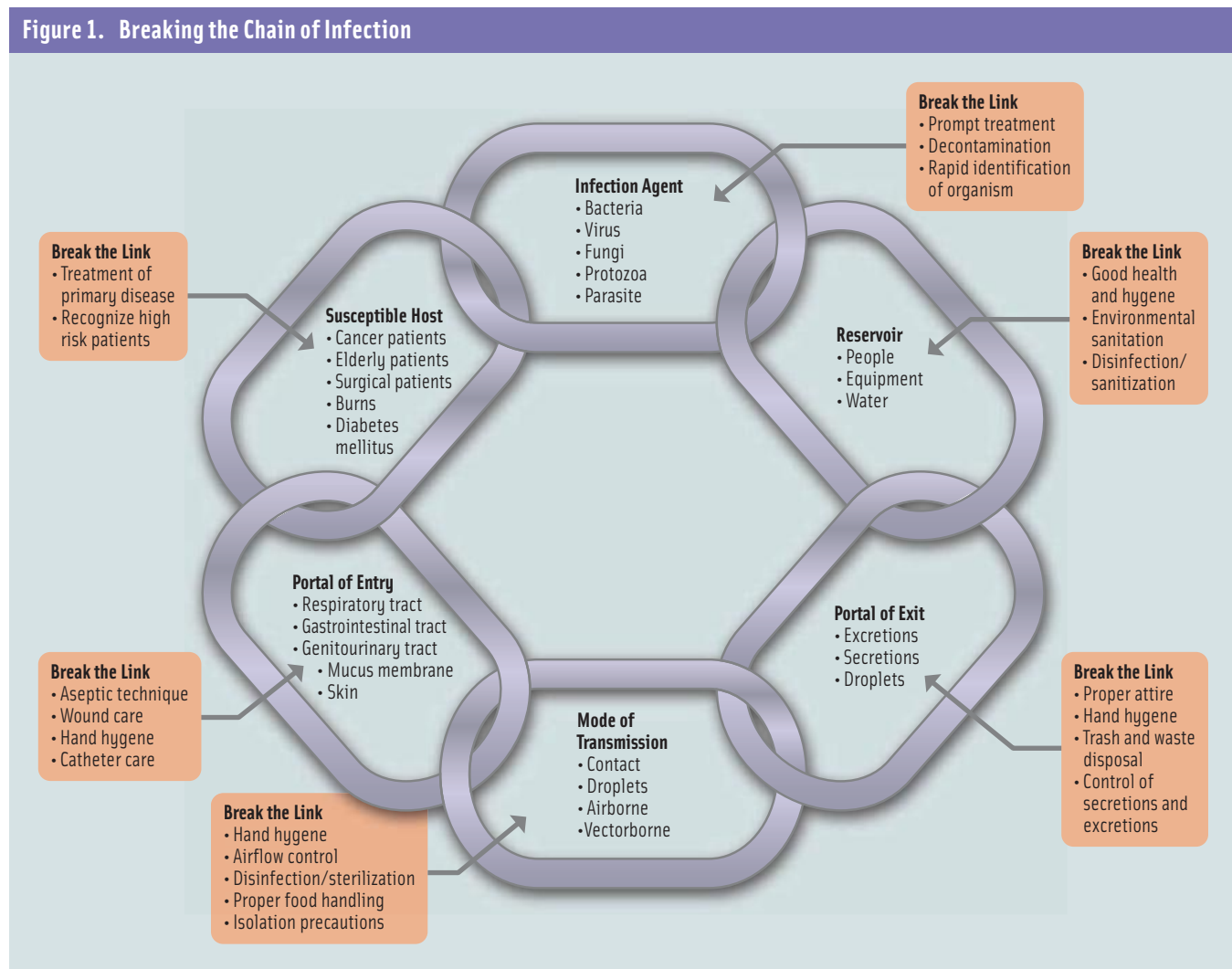
- ▲ Examine the causes of modern surgical-site infections
- ▲ Explore methods of decontamination for the modern O.R.
- ▲ Compare and contrast the different types of *Staphylococcus* bacteria
- ▲ Evaluate the decontamination practices in your own workplace
- ▲ Analyze the chain of infection for ways to improve your personal practice

of fractures; external fixation of fractures using Steinmann pins or an external fixation unit; and spinal laminectomy and discectomy. All of these procedures carry a chance of infection because a portal of entry is made either by surgical incision or from traumatic laceration. In addition, all of these procedures have very unique infection risk factors, although the chain of infection for all orthopedic procedures has a thread of commonality. Contamination of the surgical site by either direct or indirect means is a common cause of surgical-site infections.

The most common microorganism responsible for orthopedic surgical site infections (SSI) is *Staphylococcus*.² The three prevalent strains of these bacteria seen in surgical-site infections are *Staphylococcus aureus*, *Staphylococcus epidermidis*, and methicillin-resistant *Staphylococcus aureus* (MRSA). Of the three, *S. aureus* is the cause of the majority of SSI.³ The normal habitat for these microbes is on the

human skin, and is most commonly spread by direct contact and airborne routes. However, *S. aureus* thrives in the nares of 25 percent of the population.³ According to Bamberger & Boyd, *Staph aureus* is the most commonly isolated microorganism in osteomyelitis.⁴

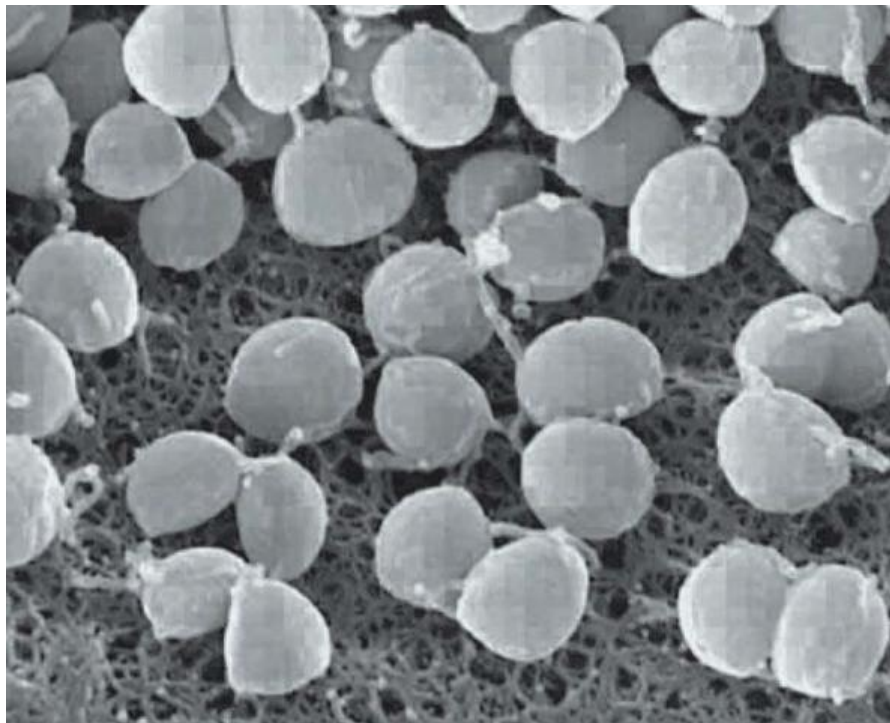
The second strain, *S. epidermidis*, is a normal resident of human skin, mouth and nose. This bacterium has a distinct affinity for plastic,⁵ making it a common contaminant of orthopedic prostheses. The last strain, MRSA, is a strain of *S. aureus* that is resistant to methicillin-containing medications, such as penicillin, oxacillin and amoxicillin. The most common cause of osteomyelitis cases are MRSA.⁶ Although many different microorganisms have been found to cause orthopedic surgical infections, for the purpose of this analysis, the main infectious agent that the article will focus on is *Staphylococcus* and the different strains of this bacteria.



To understand methods of preventing the spread of *Staphylococcus* in surgical-site infections, one must first look at the chain of infection. (see Figure 1)⁷

RESERVOIR

The reservoir for *Staphylococcus* is humans; specifically the nose, skin and peritoneal areas of the body. This means that health care workers in the operating room could potentially contaminate surgical wounds by exposing the sterile fields to bacteria if they touch surgical instruments with bare skin; break sterility by touching a nonsterile area with their sterile gowns or gloves; fail to recognize a perforation or tear in the gloves during a procedure; fail to recognize strike-through of the surgical gown during long procedures; not properly wearing the surgical mask covering the nose since *S aureus* can populate the nose; or poorly perform the patient skin prep to remove bacteria and other contaminants. Surgical employees must know the principles of asepsis and possess a strong surgical conscience. To help with this, a strong employee continuing-education program should be in place in every facility to keep surgical personnel up-to-date on proper sterile technique. Surgical technologists



MRSA: The most common cause of osteomyelitis cases.

PORTAL OF EXIT

The portal of exit for *Staphylococcus* is the human skin and nares, through contact or sloughing of bacterial cells. Standard Precautions should be used in every practice, with all patients, regardless of infection risk. Standard Precautions protect the patient from any microbes that the staff member may be hosting that could be transmitted to the patient via an open wound, and protect staff members from potential infection from patients. These precautions include the use of personal protective equipment (PPE) and hand washing. The purpose of PPE is two-fold, as it protects the patients and the staff. PPE includes gloves, gowns, masks, and eye protection that must be worn when contact with blood, bodily fluids or other potentially-infectious material (OPIM) is expected.

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complete a one- or two-year comprehensive accredited surgical technology program in which the principles of asepsis and sterile technique are learned in detail and emphasized on a daily basis. Due to this expertise in sterile technique, the surgical technologist is in an optimal position to be the advocate for maintaining current knowledge in aseptic principles and current trends in infection control.

Another important Standard Precaution is hand washing. There is great importance placed on the practice of hand disinfection among health care workers, especially in the operating room environment. Proper hand washing has been proven as the most effective form of infection control in the hospital setting to prevent hospital-acquired infections, or nosocomial infection, and is a recommended

practice before and after contact with a patient. All operating room personnel working within the sterile field use either a waterless hand antiseptic or a traditional antimicrobial scrub solution and engage in a vigorous three-to-five minute hand scrub prior to and after surgical procedures. With proper practice of Standard Precautions, the portal of exit link of the chain of infection can be broken. For more specific guidelines regarding hand washing, please reference the *AST Recommended Standards of Practice for Hand Hygiene and Fingernails*.⁸

MODE OF TRANSMISSION

The mode of transmission for orthopedic SSIs can be either direct or indirect contact or airborne transmission.² Recently, the authors became curious about the cleanliness of the laptop computers used for patient charting in the operating room and the possibility of their direct relationship to the



Autoclavable keyboards are easier to disinfect than standard keyboards.

cause of SSIs. The laptop computers are only used within the operating rooms and are never removed except for maintenance purposes. It is the policy of this particular health care facility to disinfect the computers after every procedure with a mild disinfectant solution. The authors conducted an experiment in a single facility by preparing aerobic and anaerobic microbial cultures from the laptop computers. The cultures revealed *S. epidermidis* on all four computers, and MRSA on two of the four computers. These findings are extremely important considering that the computer charting system was implemented within the last three years and an increase in SSIs at this facility has been documented within that time.

Further studies are currently underway in the health care facility to provide definitive evidence that the laptop

computers could be a source of microbial contamination. Recommendations for autoclavable keyboards and plastic covers have been made by the infection control nurse in light of the initial findings. If these precautions are approved by the health care facility administration, this may be a huge step forward in breaking the chain of infection for *S. epidermidis* and MRSA at this particular facility.

Another mode of transmission is the O.R. environment. Environmental controls are established to reduce the ability of microbes to colonize and reproduce. These include the temperature, humidity and air flow in the operating room, and keeping traffic through the operating room to a minimum. According to the AORN Perioperative Standards and Recommended Practices, the temperature in the operating room should be maintained between 65-72 degrees Fahrenheit, and the humidity is maintained at 30-60 percent. This is controlled because most microbes do not survive well in

colder temperatures and low humidity.⁹ Laminar air flow, which is a form of positive pressure ventilation, is used in many health care facilities to decrease the rate of air exchange from the semi-restricted area of the outside hallway to the operating room. Additionally, traffic in the operating room should be kept to a minimum while a procedure is in progress to prevent contaminants from becoming airborne, thus reducing the contact patients have to airborne microbes and fomites, as discussed and described in AST's Recommended Standards of Practice for creating the sterile field.¹⁰ Disinfectants used in the

operating room setting must be tuberculocidal, antiviral, antimicrobial and antifungal. The surfaces in the operating room, including the operating room table, Mayo stands, back table, prep table, sitting stools, operating room lights and floors are disinfected with an antimicrobial solution at the beginning of each day and between each procedure. In addition, terminal cleaning of every surface including the walls, lights, floors, and working surfaces should be performed at the end of each working day to decrease overnight microbial colonization. These practices help to reduce the amount of cross contamination between patients and operating room personnel and provide a clean environment for the patient. If a procedure is performed on a patient with an existing infection, it is recommended that this pro-

cedure be performed in an operating room where orthopedic procedures, especially joint replacement procedures, are not performed to decrease the risk of cross contamination. Preferably, a patient with a pre-existing infection should be scheduled as the last procedure of the day in an operating room. The mode of transmission on the chain of infection is a factor that can be affected with strict vigilance of proper procedure and following recommended practices.

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PORTAL OF ENTRY

The portal of entry is either a surgical incision made by a surgeon's scalpel, a traumatic wound or a pin site, as in the case of an external fixation of a fractured bone. *Staphylococcus* can spread very rapidly when introduced to the mucous membranes and underlying tissues in a surgical incision. A traumatic open wound usually becomes a portal of entry at that time of the injury and is usually exposed to debris and contaminants before entering the operating room. Pin sites allow for a continued portal of entry, even after the surgery is over, because they remain in place for six to eight weeks.

Surgical implants can become a fomite, which can contaminate the surgical portal of entry if contaminated either before or during a joint-replacement procedure. This author's facility's implant policy states that orthopedic implants that are to be placed in a patient's body are to come to the hospital sterile from the manufacturer. It is the policy of the facility not to flash or sterilize any implant devices. The health care facility policy is supported by the standard stated in ANSI/AAMI ST79 2006, "Comprehensive Guide to Steam Sterilization and Sterility Assurance in Health Care Facilities," which recommends implantables not be flash-sterilized.¹¹ The only implants that may be reprocessed are plates and screws that are part of fixation sets. In addition, any outside instrument sets from either another health care facility or an instrument company are packaged in the facility's sterile wrapping and sterilized in accordance with the manufacturer's recommendations.

Sterilization by steam, irradiation, gas, filtration or chemical sterilization is required for all instrumentation. Steam autoclaves and chemical sterilization are utilized in this author's hospital's surgical department. Steam sterilization is the most commonly used sterilization process for facilities worldwide.¹² For items that are unable to withstand steam sterilization, microbial eradication is achieved by chemical methods. Glutaraldehyde is an example of one type of liquid chemical disinfectant and sterilant used for heat-sensitive items. Disinfection can be achieved by placing the instruments in glutaraldehyde for 20 minutes at room temperature. To render the item sterile, it must be immersed for 10 hours.¹³

SUSCEPTIBLE HOST

The surgical patient is a susceptible host who, by simply having a surgical procedure, is exposed to acquiring a SSI. The body's primary defense against infection is an intact integumentary system. When a procedure is performed, the integrity of the skin is compromised and a route for bacteria to enter the body has been created. One way to help decrease this susceptibility is the use of preoperative antibiotics. A vast body of evidence supports the theory that preoperative antibiotic therapy can significantly lower the risk of, or even prevent SSIs. Two national organizations, including the Centers for Disease Control and Prevention (CDC) and the American Society for Health System Pharmacists (ASHP) support this premise.

Antimicrobial prophylaxis refers to antibiotics administered in a brief course approximately 30-60 minutes before a surgical procedure is to be performed. This action will give the highest probability that the serum concentration of the agent used will be at a therapeutic level. It is optimal that this serum level is maintained at most a few hours after the surgical procedure is performed. This course of antibiotics is to reduce the possibility of a SSI occurring while not overwhelming the surgical patient's defenses. Many studies have shown a marked decrease in SSIs, including orthopedic surgical sites, with the use of preoperative antibiotic therapy.^{14, 15}

This author's hospital's surgical department has used this evidence as a model for a preoperative antibiotic policy and it is considered a standing order for all patients. The antibiotic of choice for preoperative prophylaxis is acephalosporin. It has been shown to have great effectiveness on both gram-positive and gram-negative microorganisms.¹⁶ If a patient is aller-

gic to penicillin, the drugs of choice are either vancomycin or clindamycin. Although vancomycin and clindamycin are not recommended as first choice antibiotics for any operative procedure, an exception to this is the presence of MRSA in the patient who must undergo the procedure and time does not allow for the eradication of the infection before the procedure.

CONTRIBUTING FACTORS OF SUSCEPTIBILITY

Intraoperative core hypothermia, another factor that increases susceptibility, can result in impaired immune function and vasoconstriction. The body temperature of an operative patient may fall between one- and one-and-a-half degrees Celsius during the first hour of general anesthesia. In addition, regional anesthesia also poses a risk for core hypothermia. This increases the risk for SSIs by decreasing the oxygen saturation of the body's tissues.¹⁷ Measures

There are also a number of pre-existing health conditions that greatly increase a patient's risk for a SSI. Smoking and diabetes are two of the most recognized conditions. Smoking causes vasoconstriction in a patient's entire body. In the surgical patient's case, the importance of this is the vasoconstriction that occurs around the surgical site, cutting off oxygen and nutrients to the healing tissue. This risk can be decreased if the patient stops smoking at least seven to 14 days before the surgical procedure. Vasoconstriction is also the cause for the increased infection risk in the diabetic patient in addition to delayed wound healing. This risk factor can be decreased by maintaining a normal serum glucose level during the perioperative period. It is the policy of this author's hospital's surgical department to monitor a patient's serum glucose level preoperatively upon arrival in the patient holding area, intra-operatively by anesthesia personnel and postoperatively by the post-anesthesia recovery room nurse. If any fluctuation of the patient's glucose level is detected, the primary care physician for that patient is notified.

Class I – Clean	Uninfected, uninflamed operative wound in which the respiratory, alimentary, genital, or uninfected urinary tracts are not entered.
Class II – Clean-Contaminated	Uninfected operative wound; respiratory, alimentary, genital or uninfected urinary tract is entered under controlled conditions without unusual contamination
Class III – Contaminated	Acute, nonpurulent, inflamed operative or open, fresh wound, or any surgical operation with an obvious break in the sterile technique or gross spillage from the GI tract.
Class IV – Dirty-Infected	Old traumatic wounds with retained devitalized tissue or clinically infected operative wound or perforated viscera. This category suggests that microorganisms that are capable of causing a postoperative infection were present in the operative field before the operation.

DIAGNOSIS AND TREATMENT

Symptoms of a SSI are important keys that must be recognized in order to prevent treatment delays, which can increase patient morbidity and mortality. Orthopedic SSIs can manifest as superficial incisional infections, infections of the deep incision space, infections of the bone or infections involving a newly-implanted prosthetic device. Management of these infec-

should be taken to maintain core body normothermia in the surgical patient. This may include warmed intravenous fluids, forced air warming blankets, other types of warming blankets using warmed fluid, increased ambient temperature in the operating room during the time of the procedure, decreased surgical time, exposure of the patient kept at a minimum, and continuous monitoring of the patients core body temperature during the surgical procedure, as cited in AST's Guideline Statement for the Maintenance of Normothermia in the Perioperative Patient.¹⁸

The susceptibility of a host is also related to surgical wound classification of the wound that is present or that will be made by surgical incision. There are four different categories.¹³ (See Table 1.)

tions depends on the extent of the involvement. Infections that involve a localized area may only require antibiotic therapy with the appropriate agents and may involve irrigation and drainage of the wound. Because of the increasing concern of community-acquired MRSA, purulent lesions that require systemic therapy should be cultured so that antimicrobial susceptibility testing can be performed and initial empiric treatment should consider the local prevalence of community-acquired MRSA.⁴ Bone and joint infections are treated in much the same way that superficial infections are treated—with antibiotics and drainage of the wounds. Usually, a four-week antibiotic therapy is ordered. Prosthetic joint infections, like those seen in total knee and total hip arthroplasty, are difficult to eradicate with the for-

eign prosthesis still in place. Removal of the prosthesis is usually indicated with a follow-up of antibiotic therapy of four to six weeks.

TRACKING

There are two national studies currently underway in the United States that are monitoring SSIs: the National Nosocomial Infection's Surveillance System Report (NNIS) and the Surgical Care Improvement Project (SCIP). The NNIS system was established in 1970, when selected hospitals in the United States routinely started reporting their nosocomial infection surveillance on a national database. All of the data collected for the NNIS system are collected using standard protocols set by the CDC. SCIP describes itself as a national quality partnership of organizations committed to improving the safety of surgical care through the reduction of post-operative complications, including SSIs. The ultimate goal of the partnership is to save lives by reducing the incidence of surgical complications by 25 percent by the year 2010. The partners participating in the SCIP project feel that a meaningful reduction in complications requires that surgeons, anesthesiologists, surgical technologists, pharmacists, infection control managers and hospital executives work together to make surgical care and a decrease in infection and other surgical complications a priority.

CONCLUSION

It has been shown through a literature review that some precautions currently being practiced at this author's health care facility are adequate, such as the implementation of Standard Precautions and prophylactic antibiotics, but other measures can be taken to decrease the occurrence of SSIs. These include an increase in employee continuing education and new and improved ways of disinfecting the laptop computers in the operating rooms. If all of these additional measures are taken, the infection rate in the surgical department may decrease.

ABOUT THE AUTHOR

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Drug Discovery, Development and Approval Process

- The drug sildenafil citrate (Viagra®) was originally developed to treat ____.**
 - Angina
 - Erectile dysfunction
 - Hypertension
 - Glaucoma
- A drug containing active molecules that have never been included in another new drug application is called ____.**
 - A new molecular entity
 - An original compound
 - A unique chemical compound
 - A prototype
- Which is not a principal concept affecting drug interaction?**
 - Onset
 - Peak effect
 - Duration of action
 - Frequency of future doses
- ____ studies encompass the entire process of the drug within the body.**
 - Toxicology
 - Pharmacokinetic
 - Post-clinical
 - Biotransformation
- ____ studies determine the dosage and safety of the drug for human use.**
 - Toxicology
 - Pharmacokinetic
 - Post-clinical
 - Biotransformation
- Toxicology studies are used to determine:**
 - Toxic, side and adverse effects
 - Reversal agents
 - Addictive properties
 - All of the above
- ____ denotes a study when subjects and administrators are unaware of grouping status.**
 - Single blind
 - Double blind
 - Placebo
 - None of the above
- A written plan of action that follows the scientific process is a ____.**
 - Theory
 - Hypothesis
 - Protocol
 - Trial
- Examples of clinical safeguard trials include:**
 - Informed consent
 - Audits
 - Institutional review boards
 - All of the above
- Human trials have ____ phases.**
 - 2
 - 3
 - 4
 - 5

Drug Discovery, Development and Approval Process- questions cont.

11. The ___ contains all information know about a new drug.
- New drug application (NDA)
 - Food and drug administration (FDA)
 - Center for drug evaluation and research (CDER)
 - Center for disease control (CDC)
12. A patent is valid for ___ years from the original date of application
- 10
 - 15
 - 20
 - 25
13. A ___ distinguishes the source of goods of one party from those of another.
- Phrase
 - Symbol
 - Design
 - Trademark
14. A new drug application is filed with the FDA at the end of ___.
- Phase 1
 - Phase 2
 - Phase 3
 - Phase 4
15. ___ is conducted on a small group of people (20-80).
- Phase 1
 - Phase 2
 - Phase 3
 - Phase 4
16. Determining effectiveness and identifying long-term risks are purposes of ___.
- Phase 1
 - Phase 2
 - Phase 3
 - Phase 4
17. The study design for ___ trials is usually a double blind, randomized control trial.
- Phase 1
 - Phase 2
 - Phase 3
 - Phase 4
18. Approximately how many clinical trials are currently underway worldwide?
- 50 – 55, 000
 - 55 – 60,000
 - 60 – 65,000
 - 65 – 70,000
19. One of the biggest legal challenges in clinical trials is ___.
- Luring qualified volunteers
 - Misrepresentation/fraud
 - Clarity of informed consent
 - FDA regulations and safeguards
20. Increasing legal threats may lead to a decline in ___.
- Quality of medical research
 - Willing volunteers
 - Clinical trials
 - Marketable drugs

Tonsillectomy and Adenoidectomy 101

- 1. Recurrent ear infections can be treated with the removal of the ____.**
 - a. Tonsillar fossa
 - b. Tonsillar capsule
 - c. Adenoids
 - d. All of the above
- 2. ____ decreases postoperative pain, quickens recovery and aids in fewer readmissions for complications.**
 - a. Intracapsular tonsillectomy
 - b. Extracapsular tonsillectomy
 - c. Supercapsular tonsillectomy
 - d. Electrocautery
- 3. The use of a laser affords the patient ____.**
 - a. Less postoperative pain
 - b. More rapid healing
 - c. Less blood loss
 - d. All of the above
- 4. ____ is a powered rotary shaving device with continuous suction.**
 - a. Plasma knife
 - b. Harmonic scalpel
 - c. Coblator
 - d. Microdebrider
- 5. ____ is a bipolar radiofrequency low-level energy device that transfers to sodium ions, creating a thin layer of plasma.**
 - a. Plasma knife
 - b. Harmonic scalpel
 - c. Coblator
 - d. Microdebrider
- 6. A ----- uses the high-frequency ultrasound vibration of a titanium blade to cut and coagulate tissue with minimal thermal tissue damage.**
 - a. Plasma knife
 - b. Harmonic scalpel
 - c. Coblator
 - d. Microdebrider
- 7. After adenoid removal, tonsil sponges should be soaked in saline prior to application to ____.**
 - a. Avoid the risk of airway fire
 - b. Avoid wound contamination
 - c. Promote hemostasis
 - d. Promote adhesion
- 8. Required elements for the surgeon during a tonsillectomy include ____.**
 - a. A rolling chair
 - b. A headlight
 - c. An electrosurgical unit
 - d. All of the above
- 9. ____ is required throughout the procedure to keep the surgical field visible.**
 - a. A headlight
 - b. A mouth gag
 - c. Suction
 - d. A tonsil sponge
- 10. Timing the length of suspension of the mouth gag prevents ____.**
 - a. Swelling of the tongue
 - b. Decreased blood flow to the tongue
 - c. Excessive postoperative jaw pain
 - d. All of the above

Advance Directives

- 1. The ____ requires that health care entities provide information concerning advance directives.**
 - a. Patient Self-Determination Act of 1990
 - b. Patient's Bill of Rights
 - c. Limited power of attorney for health care
 - d. Durable power of attorney for health care
- 2. A/an ____ indicates that a proxy has been named to make health care decisions if the patient is unable to do so.**
 - a. Limited power of attorney for health care
 - b. Durable power of attorney for health care
 - c. Advance directive
 - d. Living will
- 3. A/an ____ dictates medical care if the patient is unable to make his/her wishes known.**
 - a. Limited power of attorney for health care
 - b. Durable power of attorney for health care
 - c. Advance directive
 - d. Living will
- 4. The patient Self-Determination Act of 1990 has ____ basic components.**
 - a. 1
 - b. 2
 - c. 3
 - d. 4
- 5. A/an ____ specifies the type of care that should be given or withheld if a patient is unable to communicate his/her wishes.**
 - a. Limited power of attorney for health care
 - b. Durable power of attorney for health care
 - c. Advance directive
 - d. Living will
- 6. The durable power of attorney for health care is sometimes also called a/an ____.**
 - a. Health care proxy
 - b. Medical power of attorney
 - c. a & b
 - d. None of the above
- 7. If the power of attorney has an expiration date, it is referred to as ____.**
 - a. Limited
 - b. Durable
 - c. Temporary
 - d. None of the above
- 8. A/an ____ is special advance directive that only applies to withholding CPR and ACLS in the event of cardiac or respiratory arrest.**
 - a. Living will
 - b. Medical power of attorney
 - c. Do not resuscitate
 - d. Health care proxy
- 9. If an original legal document is unavailable, a ____ can stand in its place.**
 - a. Notarized physician's note
 - b. Copy of the original document
 - c. Notarized attorney's note
 - d. Original must be obtained
- 10. A living will may contain provisions for:**
 - a. Pain management
 - b. Experimental treatment
 - c. Mechanical ventilation
 - d. All of the above

Ulnar Collateral Ligament Reconstruction

1. **Ulnar collateral ligament (UCL) reconstruction surgery was pioneered by ____.**
 - a. Tommy John
 - b. Frank Jobe
 - c. David Altchek
 - d. James Andrews
2. **The UCL is made up of ____ bands.**
 - a. 1
 - b. 2
 - c. 3
 - d. 4
3. **Resection of both the UCL and the radial head can result in ____ of the elbow.**
 - a. Gross instability
 - b. Subluxation
 - c. Dislocation
 - d. All of the above
4. **____ stress on the elbow during a pitch can overcome the tensile strength of the UCL, causing it to tear.**
 - a. Valgus
 - b. Flexion
 - c. Extension
 - d. Acceleration
5. **According to James Andrews, MD, the odds of partial UCL tears healing with non-surgical treatment is ____.**
 - a. 20%
 - b. 50%
 - c. 70%
 - d. 90%
6. **____ is an example of acceptable autograft tendon.**
 - a. Palmaris longus
 - b. Gracilis
 - c. Plantaris
 - d. All of the above
7. **One advantage of allograft tendon is ____.**
 - a. Less likely to be rejected by the body
 - b. Takes less time to heal
 - c. More tissue is available to work with
 - d. All of the above
8. **The modified docking procedure was developed by ____.**
 - a. Frank Jobe
 - b. David Altchek
 - c. James Andrews
 - d. E Lyle Cain
9. **The docking technique features a higher rate of ____ than the traditional method.**
 - a. Postoperative nerve damage
 - b. Postoperative bone fracture
 - c. Postoperative return to competition
 - d. a & b
10. **Holes for the bone tunnel are drilled above and below the tubercle using a ____.**
 - a. Small bur
 - b. 2.0 drill bit
 - c. 4.5mm drill bit
 - d. Curette

Ulnar Collateral Ligament Reconstruction – questions cont.

11. To approximate the tendon's normal location, it is checked in ____.
- Flexion
 - Extension
 - mild varus
 - a & b
12. The surgically-repaired arm is immobilized for ____ days postoperatively.
- 3-5
 - 5-10
 - 10-14
 - 14-21
13. External rotation of the shoulder is prohibited for ____.
- 10 – 14 days
 - Four weeks
 - Six weeks
 - Three months
14. The patient can resume a normal throwing routine at ____.
- 20 weeks
 - Six months
 - Nine months
 - One year
15. It is estimated that ____ percent of patients who undergo a second Tommy John procedure return to their pre-surgery level of play.
- 10
 - 20
 - 30
 - 40
16. In 2005, __ of the surgical patients in E Lyle Cain's study were high school athletes.
- 10 percent
 - 25 percent
 - 33 percent
 - 40 percent
17. The increased number of UCL reconstructions in minors can be attributed to ____.
- Overanxious parents
 - Player wanting to throw harder
 - Players seeking second opinions
 - The overuse of young arms
18. Correcting and improving mechanics, as well as strengthening shoulders and rotator cuff muscles can ____.
- Increase pitch velocity
 - Increase injury potential
 - Increase recovery time
 - Decrease recovery time
19. Tommy John surgery provides ____ increased ability over a healthy, natural ligament.
- No
 - Slightly
 - Moderately
 - Significantly
20. ____ is/are a contributing factor to overuse of young arms.
- Year-round baseball leagues
 - Throwing a greater number of pitches
 - Throwing more difficult pitches
 - All of the above

Obesity

- 1. A person's ideal weight is established by his or her ____.**
 - a. Height
 - b. Sex
 - c. Build
 - d. All of the above
- 2. ____ occurs when excess body fat accumulates to such levels that it affects a person's health.**
 - a. Obesity
 - b. Hypertension
 - c. Heart disease
 - d. None of the above
- 3. According to the CDC, ____ is the number one health threat in America.**
 - a. Obesity
 - b. Smoking
 - c. Heart Disease
 - d. Cancer
- 4. ____ is not a cause of obesity.**
 - a. Poor eating habits
 - b. Lack of exercise
 - c. High leptin levels
 - d. A sedentary lifestyle
- 5. According to Cynthia Ogden's study, __ percent of American adults are obese.**
 - a. 65
 - b. 59
 - c. 31
 - d. 15
- 6. Medical conditions facing obese people include:**
 - a. Hypertension
 - b. Diabetes
 - c. Cardiac failure
 - d. All of the above
- 7. More than 80 percent of overweight people have ____.**
 - a. Heart disease
 - b. Type 2 diabetes
 - c. High levels of HDL cholesterol
 - d. All of the above
- 8. The state of ____ successfully banned junk food from being sold in its public school system.**
 - a. Texas
 - b. Colorado
 - c. Virginia
 - d. New York
- 9. The diet with the highest success rate is ____.**
 - a. Low in carbohydrates
 - b. Low in calories
 - c. Low in protein
 - d. Low in fat
- 10. Surgery is recommended for patients with ____.**
 - a. A BMI of 40
 - b. A BMI of 25-39.9 with serious obesity related conditions
 - c. Aversion to exercise
 - d. a&b

Obesity – questions cont.

11. ___ involves the injection of fat-melting drugs.
- Liposuction
 - Mesotherapy
 - Restrictive bariatric surgery
 - Vertical banded gastroplasty
12. ___ removes fat deposits from under the skin by using a cannula attached to a vacuum.
- Liposuction
 - Mesotherapy
 - Restrictive bariatric surgery
 - Vertical banded gastroplasty
13. ___ was developed in the 1970s as a safer alternative to Roux-en-Y gastric bypass.
- Liposuction
 - Mesotherapy
 - Restrictive bariatric surgery
 - Vertical banded gastroplasty
14. ___ is the most common weight loss procedure today.
- Roux-en-Y gastric bypass
 - Biliopancreatic diversion
 - Gastric banding
 - None of the above
15. On average, ___ leads to a loss of 40 percent of excess weight.
- Roux-en- Y gastric bypass
 - Biliopancreatic division
 - Gastric banding
 - None of the above
16. ___ is considered the safest and least invasive weight loss surgery.
- Roux-en-Y gastric bypass
 - Biliopancreatic division
 - Gastric banding
 - Vertical banded gastroplasty
17. In ___, a reduced stomach is created and digestive juices are diverted to the small intestine.
- Roux-en-Y gastric bypass
 - Biliopancreatic diversion
 - Gastric banding
 - None of the above
18. About ___ percent of those who undergo vertical banded gastroplasty achieve normal weight, and about ___ percent achieve some degree of weight loss.
- 30, 80
 - 30, 50
 - 50, 30
 - 50, 80
19. ___ percentage of Americans are overweight or obese.
- 53
 - 47
 - 64
 - 35
20. Diabetes is projected to increase by ___ percent in the next 50 years.
- 100
 - 125
 - 145
 - 165

Wound Management

- 1. Failure of a wound to heal can result in ____.**
 - a. Additional surgical procedures
 - b. Longer hospital stays
 - c. Long-term disability
 - d. All of the above
- 2. A full thickness surgical incision will be repaired by ____.**
 - a. Primary intention
 - b. Secondary intention
 - c. Polyglactin suture
 - d. Adhesive strips
- 3. Regeneration and repair of a pressure ulcer is an example of ____.**
 - a. Primary intention
 - b. Secondary intention
 - c. Granulation
 - d. Epithelialization
- 4. The proliferation phase of healing includes ____.**
 - a. Inflammation
 - b. Granulation
 - c. Contraction
 - d. b & c
- 5. The cessation of bleeding following an injury is ____.**
 - a. Contraction
 - b. Proliferation
 - c. Hemostasis
 - d. Maturation
- 6. ____ is classified as the early inflammatory stage of wound healing.**
 - a. Contraction
 - b. Proliferation
 - c. Hemostasis
 - d. Maturation
- 7. ____ may be regarded as the first line of defense against infection at the wound site.**
 - a. Neutrophil leucocytes
 - b. Basophils
 - c. Eosinophils
 - d. Monocytes
- 8. The class of compounds known as ____ are vital for cell-to-cell and tissue adhesion.**
 - a. Fibroblasts
 - b. Proteoglycans
 - c. Electrolytes
 - d. Glycoproteins
- 9. By keeping a wound moist, ____.**
 - a. Infection is more likely
 - b. Healing time is prolonged
 - c. Healing rates increase
 - d. Scarring is increased
- 10. Spillage of bile during a cholecystectomy is classified as a ____ wound.**
 - a. Clean
 - b. Clean/Contaminated
 - c. Contaminated
 - d. Dirty/Infected

Wound Management – questions cont.

11. One intrinsic factor affecting wound healing is

_____.

- a. Wound perfusion
- b. Radiotherapy
- c. Medication
- d. Wound infection

12. One extrinsic factor affecting wound healing is ___.

- a. Disease
- b. Age
- c. Oxygen tension
- d. Radiotherapy

13. Surgical patients should eat within ___ of surgery for optimal clinical outcome.

- a. 6
- b. 12
- c. 24
- d. 48

14. ___ is a critical nutrient in optimizing the tensile strength of new tissue.

- a. Carbohydrate
- b. Protein
- c. Fat
- d. Vitamin A

15. ___ is a critical nutrient for collagen synthesis.

- a. Vitamin A
- b. Vitamin E
- c. Vitamin B
- d. Vitamin K

16. ___ is another critical nutrient for collagen synthesis.

- a. Iron
- b. Zinc
- c. Vitamin C
- d. All of the above

17. Attributes of a surgical dressing include the ability to ___.

- a. Enable gaseous exchange
- b. Maintain a dry environment
- c. Compress the wound
- d. Adhere to the skin

18. Low-cost, transparent adhesive film dressings are ideal for ___.

- a. Infected wounds
- b. Straight forward surgical wounds
- c. Acute surgical wounds
- d. Nonsurgical wounds

19. Factors to consider when selecting a wound dressing include ___.

- a. Level of exudates
- b. Depth of the wound
- c. Cost
- d. All of the above

20. A mild to moderate amount of exudate requires a ___ dressing.

- a. Alginate
- b. Simple adhesive film
- c. Hydrocolloid dressing
- d. Adhesive film/foam

HIPAA Compliance

1. The two main goals of the HIPAA program are __ and ____.
 - a. Privacy/accessibility
 - b. Portability/confidentiality
 - c. Portability/accountability
 - d. Privacy/accountability

2. Which is an example of a health organization that is required to follow HIPAA privacy rules?
 - a. Health plans
 - b. Health care providers
 - c. Health care clearing houses
 - d. All of the above

3. Information that is created or maintained by a HIPAA-covered entity in any form is ____.
 - a. Medical records
 - b. Protected health information
 - c. Public domain
 - d. Available only to immediate family

4. Prior to interaction with a patient, the ____ must be given to the patient and a signed receipt must be verified.
 - a. Notice of privacy practices
 - b. Liability waiver
 - c. A & B
 - d. None of the above

5. The notice of privacy practices can be supplied via ____.
 - a. Written brochures
 - b. Posted information in the reception area
 - c. The entity's web site
 - d. All of the above

6. Written or printed information does not include ____.
 - a. Charts
 - b. Faxes
 - c. Emails
 - d. None of the above

7. Messages concerning appointments and lab results should only be left on an answering machine if ____.
 - a. The patient is not home
 - b. The patient has given consent
 - c. The information is time sensitive
 - d. Information should never be left on an answering machine

8. The most severe consequences for a HIPAA violation include ____.
 - a. A fine of \$100 per incident
 - b. \$25,000
 - c. 10 years in prison
 - d. All of the above

9. A notice of privacy should ____.
 - a. Explain the legal duties of the covered entity
 - b. Explain patient's rights and responsibilities
 - c. Disclose how information is used, stored and protected
 - d. All of the above

10. A business associate agreement includes ____.
 - a. A list of consequences for noncompliance
 - b. An advance directive
 - c. An appointed trustee
 - d. All of the above

Maslow's Hierarchy of Needs

- 1. Maslow developed the concept for the hierarchy of needs by observing ____.**
 - a. Kurt Goldstein
 - b. His students
 - c. Monkeys
 - d. Infants
- 2. Based on observed reactions, the most important need in monkeys is ____.**
 - a. Water
 - b. Food
 - c. Play
 - d. None of the above
- 3. The ____ level of the pyramid addresses the need of being.**
 - a. Safety needs
 - b. Self-actualization
 - c. Esteem needs
 - d. Physiological needs
- 4. ____ needs make up the four lower components of Maslow's pyramid.**
 - a. Deficit
 - b. Being
 - c. Safety
 - d. Esteem
- 5. Drawing conclusions about spirituality is an example of ____ needs.**
 - a. Deficit
 - b. Being
 - c. Safety
 - d. Esteem
- 6. Needs that must occur for the body to survive are ____ needs.**
 - a. Safety
 - b. Esteem
 - c. Belongingness
 - d. Physiological
- 7. The body regulates itself by ____.**
 - a. Controlling its temperature
 - b. Counterbalancing hormones
 - c. Homeostasis
 - d. All of the above
- 8. Fear can prevent an individual from fulfilling ____ needs.**
 - a. Esteem
 - b. Belongingness
 - c. Safety
 - d. Physiological
- 9. Belongingness needs can be influenced by ____.**
 - a. Socially-accepted behaviors
 - b. Education levels
 - c. Economic status
 - d. All of the above
- 10. According to Maslow, a child who grows up in an affluent neighborhood is ____ likely to join a gang.**
 - a. More
 - b. Less
 - c. Just as
 - d. Cannot determine

Maslow's Hierarchy of Needs – questions cont.

11. The highest platform in the category of deficit needs is ____.
- Physiological
 - Belongingness
 - Esteem
 - Safety
12. Self-esteem begins to manifest at ____.
- Age 2
 - Age 5
 - Age 12
 - Birth
13. The lower form of self-esteem is characterized by ____.
- A need to be respected by others
 - A low opinion of oneself
 - Confidence in one's abilities
 - Inferiority complexes
14. The higher form of self-esteem is characterized by ____.
- A need to be respected by others
 - A low opinion of oneself
 - Confidence in one's abilities
 - None of the above
15. Low self-esteem is characterized by ____.
- Constantly seeking validation/acceptance
 - Lack of self-respect
 - Unrealistic expectations for oneself
 - All of the above
16. "The single component of being" describes ____.
- High self-esteem
 - Self-actualization
 - Social acceptance
 - Maslow's Hierarchy of Needs
17. Fluctuation within Maslow's hierarchy is ____.
- Common
 - Probable
 - Constant
 - All of the above
18. The process of self-actualization can include ____.
- Defining oneself spiritually
 - Focusing on resolving deficits
 - Rejecting unfavorable aspects of one's life
 - a & b
19. Self-actualization is limited to ____.
- Dignitaries
 - Everyone
 - Scientists
 - Explorers
20. Maslow's Hierarchy of Needs is especially relevant in the ____ field.
- Medical
 - Educational
 - Self-help
 - All of the above

Endoscopic Thoracic Sympathectomy

- ETS was initially developed to treat ____.
 - Goiter
 - Glaucoma
 - Epilepsy
 - All of the above
- The ____ is responsible for controlling involuntary bodily functions.
 - Autonomic nervous system
 - Central nervous system
 - Regulatory system
 - Homeostatic effect
- The ____ system slows down a function.
 - Homeostatic
 - Sympathetic
 - Parasympathetic
 - Autonomic
- The “fight or flight” response is triggered by the ____ system.
 - Homeostatic
 - Sympathetic
 - Parasympathetic
 - Autonomic
- The ____ are destroyed during the ETS procedure.
 - Sympathetic trunk
 - Sympathetic ganglia
 - Spinal nerves
 - None of the above
- ETS is a treatment for ____.
 - Hyperhidrosis
 - Epilepsy
 - Irregular heartbeat
 - All of the above
- Treatment options for idiopathic craniofacial erythema include ____.
 - Endoscopic thoracic sympathectomy
 - Valium
 - Cognitive behavioral therapy
 - All of the above
- ____ is a vascular disorder that affects blood flow to extremities in cold conditions.
 - Erythromelalgia
 - Raynaud’s Syndrome
 - Complex regional pain syndrome
 - Hypoxia
- Raynaud’s Syndrome can result in ____.
 - Gangrene
 - Skin ulcers
 - Skin atrophy
 - All of the above
- Thermography and radiography are two methods of detecting ____.
 - Erythromelalgia
 - Raynaud’s Syndrome
 - Complex regional pain syndrome
 - hypoxia

Endoscopic Thoracic Sympathectomy – questions cont.

11. **Clamping the nerves allows for ____.**
- Irreversible procedure
 - Temporary relief
 - Improved functionality
 - Easier reversal process
12. **A ____ is not used in the ETS procedure.**
- Harmonic scalpel
 - Hemostat
 - Video tower
 - Fiber-optic light source
13. **Complications associated with ETS sometimes include ____.**
- Respiratory problems
 - Compensatory sweating
 - Horner's Syndrome
 - All of the above
14. **Disfiguring asymmetry of the face can indicate ____.**
- Raynaud's Syndrome
 - Horner's Syndrome
 - Erythromelalgia
 - Complex regional pain syndrome
15. **A reversal of the ETS procedure is possible by ____.**
- Performing a nerve graft
 - Removing the clip from the nerve
 - A or B, depending on the surgeon's method
 - The ETS procedure is not reversible
16. **Erythromelalgia cannot be described as ____.**
- Idiopathic
 - A rare disease
 - A curable disease
 - A & B
17. **____ can trigger an EM flare-up**
- Heat
 - Physical activity
 - Anger
 - A & B
18. **EM can develop due to ____.**
- Psychological disorders
 - Neurologic or blood disorders
 - Physical contact with a carrier
 - A & B
19. **____ do not blush in social situations.**
- Babies
 - Cognitive-behavioral therapy patients
 - ETS recipients
 - Everyone blushes
20. **Cognitive-behavioral therapy can include ____.**
- Rational emotive behavior therapy
 - Dialectic behavior therapy
 - Cognitive therapy
 - All of the above

Radical Mastectomy and Reconstruction

- Breasts consist generally of ____.**
 - Secretory glands
 - Subcuticular fat
 - Overlying skin
 - All of the above
- ____ are modified sweat glands.**
 - Breasts
 - Mammary glands
 - Nipples
 - Superficial fascia
- ____ compose the suspensory ligaments of the breasts.**
 - Connective tissue stroma
 - Individual ductal and lobule systems
 - Dermal tissues of the breast
 - None of the above
- The lateral arterial blood supply to the breast does not include the ____.**
 - Fourth intercostal artery
 - Thoracoacromial artery
 - Lateral thoracic artery
 - Superior thoracic axillary artery
- Nearly ____ percent of lymphatic drainage of the breast drains laterally and superiorly to the axillary lymph nodes.**
 - 65
 - 70
 - 75
 - 80
- The ____ are the primary region to sample for cancer metastasis into the lymphatic system.**
 - Parasternal lymph nodes
 - Axillary lymph nodes
 - Lymphatic vessels
 - Intercostal veins
- The mammary glands are completely functional at ____.**
 - Puberty
 - The end of pregnancy
 - Birth
 - Conception
- hP1 is a hormone given off by the ____.**
 - Placenta
 - Pituitary gland
 - Secretory glands
 - None of the above
- ____ is the leading cause of death in women age 40-44.**
 - Heart disease
 - Lung cancer
 - Breast cancer
 - None of the above
- The risk of developing breast cancer is related to ____.**
 - Age when first child is born
 - Genetic factors
 - Family history
 - All of the above

Radical Mastectomy and Reconstruction – questions cont.

11. ___ stimulates the secretory cells for lactation.
- Placental lactogen
 - Prolactin
 - Oxytocin
 - B & C
12. Breast cancers account for __ percent of all cancers in women and __ percent of cancer deaths.
- 30, 16
 - 43, 30
 - 16, 30
 - 43, 16
13. ___ provides a standardized way for physicians to determine information about a cancer's metastasis.
- Staging
 - Mammogram
 - Lumpectomy
 - None of the above
14. The most common staging system is the ___.
- Mammogram
 - Lumpectomy
 - Tumor Nodal Metastasis
 - None of the above
15. Pathological staging includes the results of a ___.
- Mammogram
 - Lumpectomy
 - Tumor Nodal Metastasis
 - All of the above
16. Patients have many treatment options, including ___.
- Radiation therapy
 - Chemotherapy
 - Hormonal therapy
 - All of the above
17. In TNM classification, the number following a T indicates ___.
- Size of the tumor
 - If the cancer has metastasized
 - If the cancer has spread to the lymph nodes
 - All of the above
18. ___ is considered a "breast conserving surgery".
- Mastectomy
 - Breast reconstruction
 - Needle localization and wide excision
 - B & C
19. In a ___, the surgeon removes a small volume of breast tissue.
- Mastectomy
 - Breast reconstruction
 - Lumpectomy
 - B & C
20. Removal of one or both breasts in a male or female patient is a ___.
- Mastectomy
 - Breast reconstruction
 - Lumpectomy
 - Needle localization and wide excision

Radical Mastectomy and Reconstruction – questions cont.

21. An example of a minimally – invasive procedure is a ____.
- Simple mastectomy
 - Skin-sparing mastectomy
 - Halstead mastectomy
 - A & B
22. Methylene blue is used during a mastectomy to ____.
- Sterilize the surgical site
 - Provide local anesthetic
 - Outline the sentinel node
 - None of the above
23. The complete removal of the entire breast tissue is a ____.
- Simple mastectomy
 - Radical mastectomy
 - Modified radical mastectomy
 - Halstead mastectomy
24. A/an ____ is used to separate the breast tissue from the skin.
- Electrosurgical pencil
 - #15 blade
 - Harmonic scalpel
 - None of these above
25. In a TRAM flap reconstruction, the surgeon reconstructs the breasts with ____.
- Warm saline
 - Autologous fat
 - AlloDerm®
 - Artificial fillers
26. Axillary components and the pectoralis muscles are removed in a ____.
- Simple mastectomy
 - Radical mastectomy
 - Modified radical mastectomy
 - Bilateral mastectomy
27. To prevent cancer seeding, the wound is ____.
- Cauterized
 - Closed with absorbable suture
 - Irrigated with sterile water
 - All of the above
28. Complications of a mastectomy include ____.
- Infection
 - Disfigurement
 - Cancer metastasis
 - All of the above
29. In a modified radical mastectomy, ____ are removed.
- Only axillary components
 - Axillary components & pectoralis muscles
 - Both breasts, in their entirety
 - Only suspicious lumps
30. Specimens from mastectomy patients are examined ____ by the pathology department.
- Prior to scheduling surgery
 - Intraoperatively
 - Postoperatively
 - At follow-up appointments

In-Office Autologous Fat Grafting

- 1. Plastic Surgery most often addresses which of Maslow's needs?**
 - a. Physiological
 - b. Safety
 - c. Love and belonging
 - d. Prestige and esteem
- 2. The most common facial locations for autologous fat grafting include ____.**
 - a. Nasolabial folds
 - b. Chin
 - c. Marionette grooves
 - d. All of the above
- 3. Which of the following does not describe an autologous fat graft?**
 - a. Safe
 - b. Permanent
 - c. Temporary
 - d. Reversible
- 4. The ultimate goal of cosmetic surgery is ____.**
 - a. Help the patient achieve a positive self-evaluation
 - b. Fix the patient's physical short-comings
 - c. Create a new image for the patient
 - d. Reverse the affects of aging
- 5. Patients who have undergone ____ are not good candidates for autologous fat grafting.**
 - a. Oral surgery
 - b. Organ transplant surgery
 - c. Abdominal surgery
 - d. All of the above
- 6. The choice of anesthetic for cosmetic procedures depends on ____.**
 - a. The patient's health
 - b. The number of procedures being performed
 - c. The patient's current medications
 - d. All of above
- 7. In a fat grafting procedure, the ____ are filled first.**
 - a. Nasolabial folds
 - b. Cheeks
 - c. Jaw line
 - d. None of the above
- 8. Nose reconstructions are believed to have been performed as early as ____.**
 - a. 2,000 BCE
 - b. 600 BCE
 - c. 1880
 - d. The Middle Ages
- 9. Who is the considered the father of plastic surgery?**
 - a. Pierre Joseph Desault
 - b. Karl Ferdinand von Gräefe
 - c. Johann Friedrich Dieffenbach
 - d. Sir Harold Gillies
- 10. Most cosmetic surgery cases are performed under ____.**
 - a. Local anesthetic
 - b. IV with sedation
 - c. General anesthesia
 - d. Acetaminophen

In-office Autologous Fat Grafting – questions cont.

11. Alternative option for facial augmentation include ____.
- Botox
 - Chemical peels
 - Injectable fillers
 - All of the above
12. The term “plastic” is derived from a/an ____ word.
- Indian
 - Greek
 - Latin
 - Sanskrit
13. For facial procedures, the patient is put in the ____ position.
- Trendelenburg
 - Supine
 - Reverse Trendelenburg
 - Fowler’s
14. Who was a leading pioneer in skin grafts and sex-reassignment surgery?
- Gasparo Tagliacozzi
 - Karl Ferdinand von Gräefe
 - Johann Friedrich Dieffenbach
 - Sir Harold Gillies
15. After the fat is harvested, the next step is to ____.
- Inject the donor fat into the specified areas
 - Place the syringes in a centrifuge
 - Apply a cold compress to the surgical site
 - Cleanse the injection site
16. Cosmetic surgery became popular during the Renaissance due to ____.
- Syphilis
 - Nose amputation as punishment
 - Social pressures
 - All of the above
17. The oldest association for aesthetic surgery in the United States is the ____.
- American Academy of Facial Plastic and Reconstructive Surgery
 - American Association of Plastic Surgeons
 - American Association of Oral Surgeons
 - American Board of Plastic Surgery
18. The term “plastic surgery” was coined by ____.
- Pierre Joseph Desault
 - Karl Ferdinand von Gräefe
 - Johann Friedrich Dieffenbach
 - Sir Harold Gillies
19. From 1997 to 2007, the number of cosmetic procedures in the United States increased ____.
- 162 percent
 - 233 percent
 - 92 percent
 - 80 percent
20. The father of modern plastic surgery is ____.
- Pierre Joseph Desault
 - Karl Ferdinand von Gräefe
 - Johann Friedrich Dieffenbach
 - Sir Harold Gillies

Infection in Orthopedic Surgical Procedures

- The most common microorganism causing orthopedic surgical-site infections is ____.**
 - Staphylococcus*
 - Acinetobacter*
 - Klebsiella*
 - Aspergillus*
- ____ thrives on plastic, including orthopedic prostheses.**
 - Staphylococcus epidermidis*
 - Staphylococcus aureus*
 - MRSA
 - All of the above
- The reservoir for *Staphylococcus* is the ____.**
 - Peritoneal areas of the body
 - Nose
 - Skin
 - All of the above
- Standard Precautions should be used with ____ patients.**
 - High-risk
 - All
 - Symptomatic
 - Open-wound bearing
- Hospital-acquired infections cost hospitals between ____ annually.**
 - \$150-200 million
 - \$1.5 – 2 billion
 - \$3.5 – 5.7 billion
 - \$6.7 – 9.5 billion
- Vasoconstriction in surgical patients can be caused by ____.**
 - Smoking
 - Diabetes
 - Intraoperative core hypothermia
 - All of the above
- ____ is the cause of the majority of SSI.**
 - Staphylococcus epidermidis*
 - Staphylococcus aureus*
 - MRSA
 - B & C
- ____ represents a break in the sterile field.**
 - Touching a nonsterile area with sterile gown or gloves
 - Touching surgical instruments with bare skin
 - Not properly wearing a surgical mask over the nose
 - All of the above
- OPIM stands for ____.**
 - Other Potentially Influential Material
 - Often Problematic Infectious Material
 - Other Potentially Infectious Material
 - Open Portal Infection Method
- ____ are options to improve decontamination of O.R. keyboards.**
 - Autoclavable keyboards
 - Plastic keyboard covers
 - Disinfectant solution
 - A & B

Infection in Orthopedic Surgical Procedures - questions cont.

11. Environmental controls in the O.R. include ____.
 - a. Temperature
 - b. Humidity
 - c. Air flow
 - d. All of the above

12. A patient with a/an ____ should be scheduled at the end of the day.
 - a. Joint-replacement procedure
 - b. Pre-existing infection
 - c. Open wound
 - d. A & B

13. ____ is the most effective form of infection control in the hospital setting.
 - a. Hand washing
 - b. Sterile PPE
 - c. Proper sterile attire
 - d. None of the above

14. The ANSI/AAMI Guide to Steam Sterilization and Sterility states that implants should ____.
 - a. Come to the hospital sterile from the manufacturer
 - b. Be reprocessed on a case-by-case basis
 - c. Not be flash sterilized
 - d. All of the above

15. The temperature in the O.R. should be maintained between ____.
 - a. 68° - 75° F
 - b. 65° - 72° F
 - c. 60° - 68° F
 - d. Depends on the procedure

16. Disinfectants used in the O.R. must be ____.
 - a. Antiviral
 - b. Antifungal
 - c. Tuberculocidal
 - d. All of the above

17. Surgical incisions, traumatic wounds and pin sites are considered ____.
 - a. Reservoirs
 - b. Portals of Exit
 - c. Portals of Entry
 - d. Contributing factors of Susceptibility

18. An instrument can be sterilized in glutaraldehyde if immersed for ____.
 - a. 10 hours
 - b. 20 minutes
 - c. 6 hours
 - d. Items cannot be sterilized with glutaraldehyde

19. The humidity level in the O.R. should be maintained at ____.
 - a. 30 – 60 percent
 - b. 25-50 percent
 - c. 10-25 percent
 - d. Depends on the procedure

20. Antimicrobial prophylaxis refers to ____.
 - a. Hand washing
 - b. Sterile technique
 - c. Preoperative antibiotics
 - d. All of the above

Answers CE CREDIT PKG 11: 22 CONTINUING EDUCATION CREDITS

Certified Member

AST Member No: _____

Name: _____

Certification No: _____

Address: _____ City: _____ State: _____ Zip: _____

Telephone: _____ Email: _____

CE Credit PKG 11: 22 CONTINUING EDUCATION CREDITS

The fee is \$37. This package is only available to AST & ASA members.

Check Enclosed Yes, I want to pay by Credit Card: Visa MasterCard AmEx

Card# _____ Expiration Date _____ Signature _____

Drug Discovery, Development and Approval Process

a	b	c	d	a	b	c	d	a	b	c	d	a	b	c	d				
1.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	13.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	19.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	14.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	20.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	15.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
4.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	16.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
5.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	11.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	17.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
6.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	12.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	18.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					

Mark one box next to each number. Only one correct or best answer will be selected for each question.

Tonsillectomy and Adenoidectomy 101

a	b	c	d	a	b	c	d	
1.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
6.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				

Mark one box next to each number. Only one correct or best answer will be selected for each question.

Advanced Directives

a	b	c	d	a	b	c	d	
1.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
6.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				

Mark one box next to each number. Only one correct or best answer will be selected for each question.

Ulnar Collateral Ligament Reconstruction

a	b	c	d	a	b	c	d	a	b	c	d	a	b	c	d				
1.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	13.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
2.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	14.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
3.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	15.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
4.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	16.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
5.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	11.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	17.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
6.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	12.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	18.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
															19.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
															20.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Mark one box next to each number. Only one correct or best answer will be selected for each question.

Obesity

a	b	c	d	a	b	c	d	a	b	c	d	a	b	c	d				
1.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	13.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
2.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	14.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
3.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	15.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
4.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	16.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
5.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	11.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	17.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
6.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	12.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	18.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
															19.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
															20.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Mark one box next to each number. Only one correct or best answer will be selected for each question.

Wound Management

a	b	c	d	a	b	c	d	a	b	c	d	a	b	c	d				
1.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	13.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
2.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	14.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
3.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	15.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
4.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	16.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
5.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	11.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	17.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
6.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	12.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	18.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
															19.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
															20.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Mark one box next to each number. Only one correct or best answer will be selected for each question.

HIPAA Compliance

a	b	c	d	a	b	c	d		
1.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
6.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					

Mark one box next to each number. Only one correct or best answer will be selected for each question.

Maslow's Hierarchy of Needs

a	b	c	d	a	b	c	d	a	b	c	d	a	b	c	d				
1.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	13.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
2.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	14.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
3.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	15.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
4.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	16.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
5.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	11.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	17.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
6.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	12.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	18.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
															19.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
															20.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Mark one box next to each number. Only one correct or best answer will be selected for each question.

Endoscopic Thoracic Sympathectomy

a	b	c	d	a	b	c	d	a	b	c	d	a	b	c	d				
1.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	6.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	13.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	19.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	14.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	20.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	15.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
4.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	16.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
5.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	11.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	17.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
6.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	12.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	18.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					

Mark one box next to each number. Only one correct or best answer will be selected for each question.

Radical Mastectomy and Reconstruction

a	b	c	d	a	b	c	d	a	b	c	d	a	b	c	d	a	b	c	d					
1.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	13.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	19.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	25.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	14.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	20.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	26.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	15.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	21.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	27.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	16.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	22.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	28.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	11.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	17.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	23.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	29.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	12.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	18.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	24.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	30.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Mark one box next to each number. Only one correct or best answer will be selected for each question.

In-office Autologous Fat Grafting

a	b	c	d	a	b	c	d	a	b	c	d	a	b	c	d				
1.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	13.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	19.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	14.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	20.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	15.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
4.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	16.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
5.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	11.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	17.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
6.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	12.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	18.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					

Mark one box next to each number. Only one correct or best answer will be selected for each question.

Infection in Orthopedic Surgical Procedures

a	b	c	d	a	b	c	d	a	b	c	d	a	b	c	d				
1.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	13.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	19.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	14.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	20.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	15.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
4.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	16.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
5.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	11.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	17.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
6.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	12.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	18.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					

Mark one box next to each number. Only one correct or best answer will be selected for each question.