

CASE STUDY:

Treating Colon Cancer Surgically

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Introduction

Colon cancer is a form of cancer that affects the colon or rectum. With the exception of skin cancers, it is the third most common cancer diagnosed in the United States. The majority of colon cancers are **adenocarcinomas**, which is cancer of the glandular cells that line the inner wall of the colon. These cancerous cells spread outward into the layers of the intestinal wall. The degree of infiltration to outer tissues of the colon indicates the stage of the cancer.⁷

It is common for colon cancer to return after successful treatment. Once a patient develops colon cancer, even if it is completely removed, he is more likely to develop cancer in new areas of the colon, especially if the patient is younger than 60 when the cancer first appeared. As a result, follow-up visits and diagnostic tests, such as colonoscopies, are very important to prevent and treat recurrences.⁷

General biographical information

The patient is a 73-year-old Caucasian female, who is 5 feet ½ inches, and weighs 211 pounds. She is a former smoker and drinks alcohol occasionally. During a routine colonoscopy, a mass was found

in the patient's colon. A biopsy was performed, and the specimen tested positive for cancer.

Patient's physical condition

The patient arrived at the hospital on the morning of her scheduled surgery. She was calm, cooperative and did not complain of pain.

Vital Signs

Pulse:	84 beats per minute
Respirations:	16
Blood Pressure:	160/80

Medical and surgical history

The patient is allergic to nizatidine, oxycodone and acetaminophen, cefazolin, and furosemide, and experiences a rash when taking these medications.

Her past medical history includes colon cancer in 1990 and 1999, and gastroesophageal reflux disease (GERD). Previous surgeries include a right colon resection in 1990 and a sigmoid colon resection in 1999; a hysterectomy in the 1970s, and bilateral hip replacements. Details of the hysterectomy and the hip replacement surgeries were not included in the chart.

Preoperative lab work

Preoperative tests included a complete blood count with differential and platelet count, blood chemistry, routine urinalysis, chest X-ray and ECG. The blood work and X-ray were performed

five days prior to surgery. (See Table 1)

The patient's blood type was O positive.⁵ Results indicated a normal size heart and clear lungs with no evidence of pulmonary disease. However, some degeneration of the dor-

Table 1 Preoperative and Postoperative Lab Values

	Accepted Range	Preoperative Patient Values	Postoperative Patient Values				
			Day 1	Day 2	Day 3	Day 4	Day 5
Blood Count							
WBC	3.9-11.0 k/ul	7.4 k/ul	22.4 k/ul	9.2 k/ul	12.2 k/ul	11.6 k/ul	9.8 k/ul
HGB	11.6-16.3 g/dl	14.6 g/dl	13.3 g/dl	11.6 g/dl	12.2 g/dl	13.2 g/dl	12.0 g/dl
HCT	36-48%	42.7%	38.8%	33.8%	35.7%	38.4%	35.3%
RBC	4.2-5.4 M/ul	4.6 M/ul	4.2 M/ul	3.7 M/ul	3.9 M/ul	4.2 M/ul	3.8 M/ul
MCV	80-99 fl	92 fl	93 fl	93 fl	92 fl	92 fl	92 fl
MCH	27-31 g/dl	32 g/dl	32 g/dl	32 g/dl	32 g/dl	32 g/dl	31 g/dl
MCHC	32-36 g/dl	34 g/dl	34 g/dl	34 g/dl	34 g/dl	34 g/dl	34 g/dl
RDW	11.0-15.2%	12.4%	12.3%	12.8%	12.1%	12.5%	12.2%
PLT	160-392 k/ul	230 k/ul	243 k/ul	175 k/ul	185 k/ul	244 k/ul	250 k/ul
Hematology Differential							
Neutrophils (Poly)	42-75%	65%	84%		73%		
Stab Cells (Stab)	0-5%	Not available			1%		
Lymphocytes (Lymph)	21-51%	23%	10%		8%		
Monocytes (Mono)	0-10%	8%	6%		16%		
Eosinophil (Eos)	0-5%	3%			0%		
Basophils (Baso)	0-2%	1%			0%		
Blood Chemistry							
Sodium (NA)	138-145 mEQ/L	142 mEQ/L	141 mEQ/L	142 mEQ/L	140 mEQ/L	143 mEQ/L	
Potassium (K)	3.7-5.2 mEQ/L	5.0 mEQ/L	3.5 mEQ/L	3.9 mEQ/L	3.8 mEQ/L	3.5 mEQ/L	
Chloride (CL)	103-112 mEQ/L	104 mEQ/L	103 mEQ/L	108 mEQ/L	101 mEQ/L	102 mEQ/L	
Carbon Dioxide (CO ₂)	23-33 mEQ/L	27 mEQ/L	27 mEQ/L	32 mEQ/L	26 mEQ/L	29 mEQ/L	
Blood Urea Nitrogen (BUN)	8-21 MG/DL	10 MG/DL	7 MG/DL	4 MG/DL	5 MG/DL		
Creatinine (CREAT)	0.4-1.0 MG/DL	1.0 MG/DL	0.8 MG/DL	0.7 MG/DL	0.7 MG/DL		
Glucose (GLU)	73-107 MG/DL	Not available	188	109			
Calcium (CA)	8.6-10.0 MG/DL	9.6 MG/DL	8.2 MG/DL	8.6 MG/DL	8.6 MG/DL		
Phosphorus (PHOS)	2.7-4.7 MG/DL	Not available		2.7 MG/DL	2.5 MG/DL		
Magnesium (MG)	1.7-2.2 MG/DL	Not available		1.6 MG/DL	1.6 MG/DL		

Note: When estimating blood loss, the amount of irrigation that is in the suction container is taken into consideration. When suctioning occurs during a procedure, blood collects in the suction container (output). Irrigation is poured into the abdomen prior to closing the cavity (input), and suctioned out (output), and flows into the same suction container. The amount of irrigation that is poured into the cavity must be tracked by the first scrub surgical technologist so it can be subtracted from the overall amount of fluids in the suction container and that difference equals the blood loss.

sal spine was found, which was probably due to the patient's age. Results from the ECG indicated a normal sinus rhythm, and a heart rate of 84 beats per minute. A nonspecific T-wave abnormality was noted.

Ventricle Rate:	84 beats per minute
PR interval:	174 milliseconds
QRS duration:	72 milliseconds
QT/QTc:	342/404 milliseconds
P-R-T axes:	62-28 57

Anesthesia

Prior to the administration of anesthesia, the patient received intrathecal infusion after insertion of a needle and catheter into the sheath of the spinal canal. She was placed in a sitting position, with her legs over the side of the bed and asked to slump forward and arch her back. A betadine skin prep was done, and a fenestrated sterile sheet was placed over the area of insertion. The anesthesia provider inserted a 25-gauge needle in the middle of the back between L₃ and L₄. He injected 0.3 mg of morphine initially and subsequently gave 0.7 mg at the end of the procedure for postoperative pain relief.

Intrathecal agents

Morphine, a narcotic analgesic was given for postoperative pain relief.¹⁰ After administration of intrathecal medication, intravenous agents were given to anesthetize the patient.

Intravenous agents

1. Benzodiazepine.¹
2. Narcotic analgesic³
3. Sedative hypnotic¹
4. Depolarizing muscle relaxant¹
5. Nondepolarizing muscle relaxant¹
6. Antibiotic¹⁰
7. Antiemetic³
8. Antibacterial and antiprotozoal³

Inhalation agents

1. Oxygen
2. Inhalation anesthetic¹⁰

Positioning

The patient was placed in the supine position with both arms anatomically positioned and extended on arm boards. Pressure points and bony areas were padded with towels to prevent nerve damage. A donut was used to support her head. A blood pressure cuff was placed on the left arm; a pulse oximeter was placed on the right index finger; and a 20-gauge angiocath was located intravenously in the right hand. ECG leads were placed on her anterior chest wall. An electrosurgical grounding pad was placed on her upper back, because the patient had prior bilateral hip surgery with implants. Sequential compression stockings were placed on the patient's calves to maintain circulation in legs and reduce the risk of blood clots. The safety strap was placed two inches above the knees.

Surgical considerations

After the patient was placed under anesthesia, the anesthesiologist inserted a nasogastric tube to decompress the digestive tract intraoperatively and remove bilious drainage from the patient postoperatively. The tube would be removed when the patient was able to move her bowels on her own, as evidenced by bowel sounds and flatulence.

The circulator inserted a 16 Fr Foley catheter into the patient's bladder to deflate the bladder during surgery and to drain urine postoperatively.¹

A time-out was initiated prior to incision to verify the correct patient, correct site and correct procedure.

Surgical skin preparation

The circulator visually inspected the skin, donned new sterile gloves, and placed sterile towels around the area to create a sterile boundary, thereby preventing pooling of fluids. After cleaning the umbilicus with cotton swabs, she was ready to begin scrubbing with an iodine solution. The area to be prepped extended from the patient's midchest to midhigh, the standard abdominal skin prep margins. The surgeon completed the skin prep by painting the area with iodine.

Surgical draping

The surgeon used a three-quarter sheet to cover the patient's lower extremities and then utilized four blue incisional towels to outline the surgical site. A chest breastsheet was then placed over the four towels. The surgeon preferred the chest breastsheet, because the larger opening afforded him improved visibility of the surgical site.

Operative procedure

Overview

A transverse colon resection was performed to remove a cancerous portion of colon. First, an exploratory laparotomy was performed by opening the abdomen and exploring the peritoneal cavity for visible signs of cancer metastasis.

Due to prior colon surgery, adhesions had developed and needed to be removed. A lysis of adhesions was carried out by cross clamping the adhesions, cutting them and ligating. This freed the peritoneum of existing scar tissue, which allowed for better visualization and less abdominal pain postoperatively. Intestinal clamps were placed on the colon and stapling equipment was

used to cut the colon, while simultaneously closing the open ends.

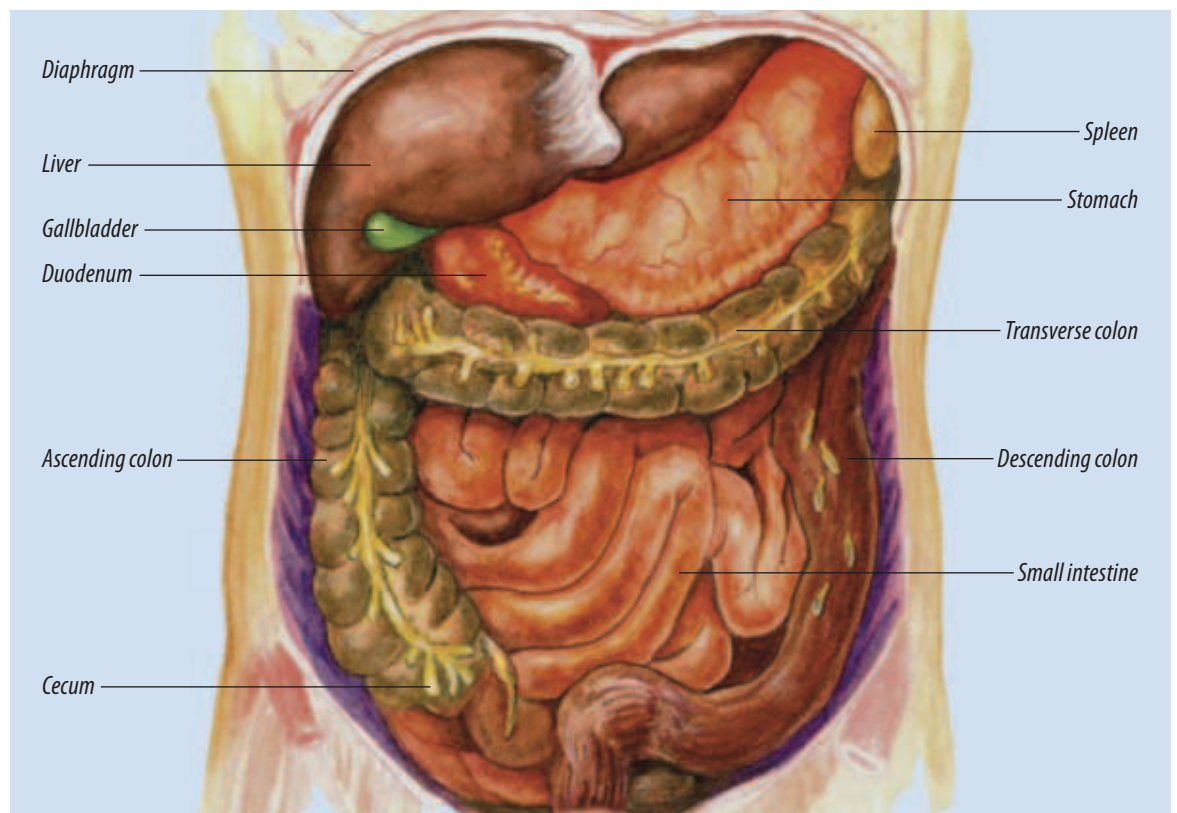
A small bowel resection was also performed to establish clean margins of healthy tissue, since the right colon was missing due to a prior surgical resection. The surgeon removed a portion of the small bowel by clamping, cutting and simultaneously stapling it to create clean margins of noncancerous tissue.

An ileotransverse anastomosis was then carried out to restore gastrointestinal continuity. This was accomplished by attaching the side of the remaining small bowel to the side of the patient's left colon with a stapler. The wound was then closed and dressed.

Risks and complications

As with any surgery, risks of the procedure include infection and bleeding. More specific to colon surgery are incisional hernias, strictures of the colon lumen, intestinal blockage and stenosis due to scar tissue formation, and leakage at the anastomosis site.¹⁵

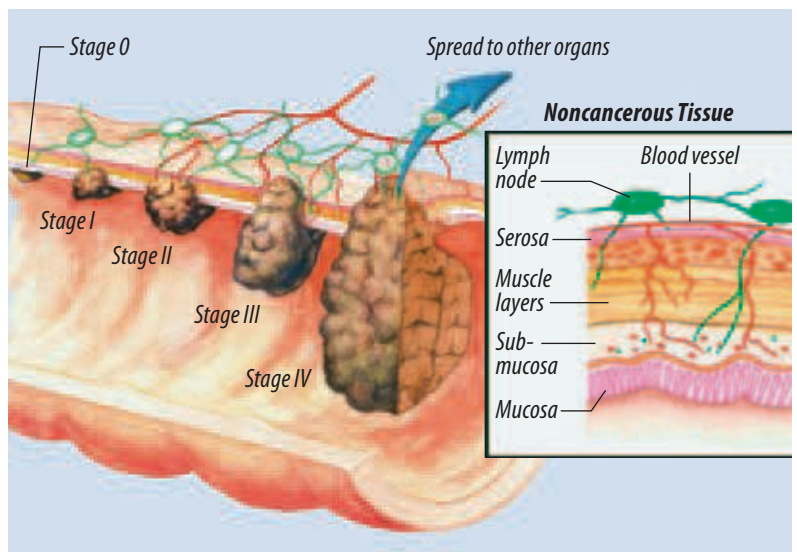
FIGURE 1:
Abdominal
viscera



Detailed description of procedure

An upper midline incision was made into the skin with a #10 blade on a #3 knife handle. Bleeding was controlled with dry lap pads. The incision was then continued downward through the subcutaneous tissue with the electrosurgical unit (ESU). Bleeding was controlled with Crile clamps and ESU coagulation. The peritoneum was opened with the ESU. Small Kelly retractors were used to retract the wound edges.

At this point, multiple adhesions were observed due to prior colon surgery. The adhesions were lysed by clamping the adhesion with two Kelly clamps, (Criles were also used for smaller, superficial adhesions) and cutting between the clamps with Metzenbaum scissors. The freed ends were tied off with 2-0 pre-cut ties. DeBakey forceps were used to manipulate the tissue around the adhesion and to aid in dissection. Dissection was done with the tip of a Crile clamp. Medium Kelly retractors were used to expose additional adhesion sites. This process was repeated multiple times until all adhesions were free. The surgeon then noticed more adhesions by the right side of the transverse colon caused by a prior right colon resection. He also lysed adhesions, with clamps and scissors. The surgeon, at one point, attempted to use a clip applier, but returned to his former method of clamping. The surgeon used medium and large Kelly retractors based on the location of the adhesion. At one point, a large Harrington retractor was used to visualize adhesions that were hard to detach, but was later replaced by the large Kelly retractor. After all adhesions were completely lysed, the surgeon placed a Balfour retractor in the abdomen to expose the operative site by retracting surrounding structures. Moist lap pads were used with the Balfour to protect wound edges. He mobilized the transverse colon by incising the lateral peritoneum with the ESU, and also mobilized the ileum of the small intestine approximately six to seven inches from the proposed anastomosis site. He detached the ileum from the mesentery by cross clamping with two Kellys, cutting with a Metzenbaum scissors and tying with 2-0 silk ties. Additional adhesions were present between the small intestine and the pelvic cavity and were lysed following the same procedures.



Once all adhesions were freed and enough colon was mobilized, the small intestine was clamped approximately six to seven inches from the tumor site with Kelly clamps. (Normally, the small intestine is not affected during colon surgery. However, either due to the location of the tumor and/or previous colon resection surgery, the small intestine was resected to allow for margins.) A stapler was employed to excise the intestine, while simultaneously stapling on either side of the excision. The transverse colon was then clamped with Kelly clamps and cut with the stapler approximately seven inches from the tumor site. The transverse mesocolon was transected by cross clamping with two Kelly clamps, cutting with Metzenbaum scissors and ligating with 2-0 silk ligatures. After the mesocolon was completely divided and ligated, the specimen was removed. A side-to-side ileotransverse anastomosis was performed by inserting the stapler into the colon and firing it. Bowel technique was instituted at this point. Allis clamps were then used to elevate the stumps of colon, and a second stapler was used to staple the two segments together. A curved Mayo scissors was used to cut off the excess tissue past the staple line. The anastomosis was reinforced with interrupted stitches of 3-0 silk pop-offs on a V-20 needle in order to prevent leakage at the anastomosis site.

At this point, all sterile team members' gloves were changed. The abdomen was irrigated with

FIGURE 2:
Stages of colon
cancer

warm saline (0.9% NaCl), and excess fluid was suctioned out. The mesocolon and lateral peritoneum were then closed with interrupted stitches of 3-0 silk pop-offs on a V-20 needle. The peritoneum and fascia were then closed in one layer in a running stitch of #1 double-stranded suture on a GS-26 needle. The subcutaneous tissue was then closed with interrupted 0 stitches on a GS-21 needle and 2-0 suture on a GS-21 needle. The skin edges were approximated with a skin stapler. The site was washed, and the wound was dressed with 4x4 gauze and paper tape.

Estimated blood loss:	200 cc
Input:	Lactated Ringers 2600 ml
Output:	Urine 200 ml
Specimen:	Portion of the transverse colon and portion of the small bowel—sent to pathology
Operative Findings:	Transverse colon cancer, multiple adhesions from extensive prior colon surgeries.

Postanesthesia care unit (PACU)

In the operating room, the patient had been extubated. She was awake and talking to the anesthesia provider, but then closed her eyes and became cyanotic. The anesthesia provider inserted a nasopharyngeal airway tube and used an Ambu bag

and mask to deliver oxygen. The patient rapidly stabilized and was transferred to PACU, with oxygen being administered through a nasal cannula.

Upon arrival to PACU, the patient's vitals were taken.

Pulse:	106 beats per minute
Respirations:	18 breaths per minute
Pulse Oximeter:	98%
Blood Pressure:	190/80

Oxygen was being delivered through nasal cannula. She was drowsy, but awake, and said she was not in any pain.

She was evaluated by PACU personnel on a score sheet. (See Table 2.)

Postoperative care Medications

The following medications were prescribed by the anesthesiologist for immediate PACU care after surgery.

- 25 micrograms of narcotic analgesic
- 4 mg of an antiemetic¹⁰

The following medications were prescribed by the surgical resident for the days following surgery.

- 5000 units of an anticoagulant to be given subcutaneously in the abdomen every 12 hours¹⁰
- 400 mg of an antibiotic, to be given intravenously every day¹⁰
- 500 mg of an antibacterial/antiprotozoal, to be given intravenously every eight hours¹⁰
- 4 mg of an antiemetic, to be given intravenously every six hours as needed¹⁰
- 2 mg of a narcotic analgesic, to be given intramuscularly (IM) every three hours as needed⁶
- 40 mg of a proton pump inhibitor, to be given intravenously every day to treat GERD.⁶
- 7 Gm sucralfate to protect against pepsin and bile acid, to be placed down the patient's nasogastric tube on the second postoperative day.⁶

Intravenous fluids

125 cc/hour lactated ringers solution given intravenously to prevent dehydration.

Table 2

	Arrival	15 minutes	30 minutes	1 hour
Activity	2	2	2	2
Respiration	1	1	1	1
Circulation	1	2	2	2
Conscious	1	1	1	1
Color	2	2	2	2
Total	7	8	8	8

Key

<p>Activity:</p> <p>2 can move all extremities</p> <p>1 can move 2 extremities</p> <p>0 moves no extremities</p> <p>Respiration:</p> <p>2 can cough and breathe deeply</p> <p>1 limited respiratory effort</p> <p>0 no spontaneous effort</p>	<p>Circulation:</p> <p>2 +/- 20 from preop blood pressure value</p> <p>1 +/- 50 from preop blood pressure value</p> <p>0 more than +/- 50 from preop value</p>	<p>Consciousness:</p> <p>2 fully awake and alert</p> <p>1 may be aroused upon calling name</p> <p>0 not responding</p> <p>Color:</p> <p>2 normal skin color</p> <p>1 alteration in color; pale, dusky, jaundice</p> <p>0 cyanotic</p>
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Postoperative lab testing

Complete blood count and blood chemistry tests were ordered and administered. The patient's values are shown in Table 1.

Postoperative care

On the morning after the procedure, the Foley catheter and nasogastric tube were still in place. The tube remained attached to intermittent suction. No significant drainage was noted. Lactated ringers were administered intravenously. Oxygen was given via nasal cannula. Sequential compression stockings were still in place.

Two days after surgery, the Foley catheter was still in place; clear yellow urine was draining by gravity, indicating that the Foley could be discontinued later in the day. The nasogastric tube was still in place and attached to suction. It was draining a dark colored fluid; the patient's bandages were clean.

The nasogastric tube was discontinued on the fourth postoperative day, since there was evidence of bowel sounds and flatulence. On the fifth postoperative day, the patient started a clear liquid diet. Since she responded well, her diet was slowly increased to a low-residue diet. At this point, she was feeling stronger and was moving independently. Her IV was discontinued on the sixth postoperative day. She was given discharge instructions and a copy of a diet to follow. She was advised not to bathe but to shower daily and wash the incision site with soap and water. Until permitted, no heavy lifting was allowed. She was prescribed a narcotic analgesic, to be taken every four to six hours as needed for pain and released.

Prognosis

The final pathology report revealed a recurrent, poorly differentiated adenocarcinoma. The tumor had infiltrated into mucosa, submucosa, muscle and serosa of the colon. The distal margins of the specimen were negative for cancer.

The patient's discharge diagnosis was recurrent poorly differentiated adenocarcinoma of the transverse colon. Her tumor was classified as T4, NO, M0, which means the cancer had spread completely through the colon wall and into

nearby tissue. Lymph nodes were found negative for cancer. Evidence of distant spread was inconclusive. The patient's tumor classification places her cancer in Stage IIB, meaning she has a slightly less than an 87% chance for a five-year survival rate.⁷ Chemotherapy was suggested to the patient as a treatment option.

About the Author

Shauna Glubiak, CST, graduated from the surgical technology program at Nassau Community College in May 2005. Currently, she is working at Winthrop University Hospital in Mineola, New York, and enrolled in science classes at a local university. Her plans include attending the physician assistant program at Tour, Bayshore, Long Island.

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