Treatment of War Casualties

A COMPARISON BETWEEN VIETNAM AND THE PRESENT

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Author's Note: The purpose of this brief article is to compare treatment of war casualties in Vietnam, circa 1971, with the treatment being administered today in Iraq and Afghanistan. I will present some statistics, describe changes in care units, evacuation of the wounded, equipment and training of personnel. I will also describe differences in injuries based on weaponry.

LEARNING OBJECTIVES

- Compare the treatment provided in Vietnam and Iraq.
- Evaluate how the Forward Surgical Team has contributed to survival rates.
- Compare the wounds experienced in Vietnam and Iraq.
- Explain the mechanisms of injury of a landmine vs roadside bomb.
- Assess the effectiveness of tourniquets.

I am a board-certified general surgeon and have been in practice since 1973. I had the privilege of serving in the US Army in Vietnam in 1971 after completing a five-year surgical residency at Hartford Hospital in Hartford, Connecticut, in 1970. During my residency, I saw a moderate amount of blunt trauma, low-velocity gunshot wounds, stab wounds and burns. However, my excellent training did not prepare me for high-velocity gunshot wounds and mine injuries. And I would say that probably pertained to all of the younger general surgeons, including those who were trained at inner-city hospitals, where the number of trauma cases was higher. We learned our lessons largely from those who were there before us—on-the-job training, so to speak.

We cared for GIs, Vietnamese civilians, Korean and Thai allies, North Vietnamese and even a Polish sailor who was injured on a ship off the coast. My first patient was Viet Cong. Our patients arrived by ambulance, truck and out of the field by helicopter. The injured GI was usually seen first by a medic at a battalion aid station. Heroic "DUSTOFF"* helicopter crews flew to the aid stations and sometimes to crude landing zones in the middle of fire fights to deliver the wounded to the 24th Evacuation Hospital in Long Binh, where we had the expertise and equipment to perform every surgery but cardiac. Those patients, if they survived long enough, were brought to the 3rd Field Hospital in Saigon.

Whole blood is administered to an airborne casualty, enclosed in a metal capsule attached to the side of an Air Rescue helicopter about to land at an advanced air station in Korea. A medical technician holds a life-giving bottle over the wounded man during the 45-minute flight from the front lines. 12/31/1952

I began my tour of duty in Vietnam with a two-week orientation phase, where I worked alongside general surgeons who had been in-country for a longer period of time and with orthopedic surgeons who taught me the critical lessons of adequate debridement of extremity wounds, including frequent returns to the operating room for additional debridement and irrigation, and keeping wounds open until it was safe to close them.

The general surgeons also acted as the Surgical Officer of the Day (SOD) and were in charge of triage, ordering laboratory studies and X-rays (we had no ultrasound, CT scan or MRI), calling of appropriate teams and determining the order of cases for surgery, but not performing surgery themselves, while acting as SOD. Triage is the determination among the injured of those requiring immediate surgery, those whose surgery can be delayed, those requiring minimal surgical care and those in expectant status, who are not likely to live even with surgery.

Survival rate statistics from war to war and generation to generation are illuminating. In World War II, the survival rate of GIs reaching hospitals was 69.7 percent. In Korea, that number improved to 75.4 percent. Vietnam saw another small increase with a 76.4 percent survival rate. Today, 90.5 percent of GIs reaching a field hospital survive the ordeal.[1]

During the Vietnam War, the average length of time from initial treatment to transfer to the continental United States (CONUS) was 45 days. This would involve initial surgery at a surgical or evacuation hospital, followed by a transfer to Yakota Air Force Base in Japan, or Clark Air Force Base in the Philippines, for possible additional surgery and transfer back to the United States. In Iraq, a wounded soldier is quickly stabilized, including damage-control surgery when necessary. The time from initial treatment in the field until the time of arrival in Landstuhl, Germany, a Level II trauma facility, might be 12 hours. More surgery could be completed in Germany before the patient is flown to CONUS, all within three days of the time of initial treatment.

Combat units in the field in Vietnam were manned by medics who basically delivered first aid. In today's combat units in Iraq and Afghanistan, Marine and Army infantrymen are all trained in advanced first aid and are taught the ABCs of resuscitation. Every soldier carries two single-handed tourniquet devices they can use on a buddy or on themselves. Since 60-70 percent of wounds are musculoskeletal, and the major cause of death is still exsanguination, surgeons say the tourniquets are the single greatest life-saving advancement to emerge from the Iraq conflict. They are now being used in ambulances in the United States.[2]

Special forces combat medics have more than one year of training and are certified EMTs. In addition, they undergo an extra six months of training, when they learn to resuscitate, place chest tubes, stabilize fractures and perform some amputations and basic surgery. At battalion aid stations, there are physician assistants (PAs) who are also trained in resuscitation and stabilization and are qualified in Advanced Trauma Life

* DUSTOFF stands for Devoted Unswerving Service To Our Fighting Forces.

Support (ATLS). Along with partially-trained surgeons, they start IVs, place chest tubes, stabilize fractures and prepare patients for transfer for additional treatment.[3]

Generally, the distance traveled for care after initial treatment at an aid station was not far in Vietnam. Surgical and evacuation hospitals were well-established, permanent facilities with relatively large numbers of surgical and medical specialists, nurses, beds and ancillary personnel, such as lab and X-ray technicians. We had a radiologist and a pathologist as well. In Iraq, because of the long distances traveled for care in a large country, the concept of the Forward Surgical Team was developed after the first Gulf War. This is a mobile unit usually comprised of one surgeon, a nurse anesthetist and a medic. Intravenous treatment begins with procoagulants and whole blood, type O, followed by fresh whole blood with thawed plasma instead of crystalloids. High doses of Factor VII are also used to stop bleeding. Surgeons are using temporary intravascular shunts rather than attempting vascular repair at this point. These have not been found to adversely affect subsequent definitive repair.

Patients are then transported to one of two combat surgical hospitals (CSH), where there are two operating rooms, an ICU, and various surgical specialists and a larger staff of nurses and enlisted, noncommissioned officers (NCOs). After reevaluation and possible surgery, the patient is prepared for transfer to Landstuhl by Critical Care Aeromedical Transport Teams (CCATT) developed by the Air Force. Continuous intensive care can be given enroute without a 24-hour delay to assure stability. In Vietnam, I accompanied soldiers to Japan and Thailand in C-141s that contained ICUs, but all patients were stable at the time of transfer and no intense active care was given.

At Landstuhl, the surgical teams are primarily military. They are also comprised of visiting senior surgeons from the United States, who are invited via a senior visiting surgeon program sponsored by the military. The visiting surgeons add their expertise to surgical care and take back the knowledge they have absorbed in order to enrich the teaching programs at their institutions.[2]

In Vietnam, telecommunication technology was relatively primitive. It usually took weeks for families to learn the whereabouts of their loved ones in a war zone. Now, contact is made from Landstuhl to hospitals like Walter Reed, Brooke and Bethesda Naval, which will be receiving the injured for further definitive and reconstructive surgery, and reuniting them with their families within 24-36 hours. Communications can also take place between Landstuhl and forward surgical teams on the ground in Iraq, which allows the hospital an extra window of time to prepare for the arrival of incoming casualties.

Daniel Love/US Army

A special forces team medic assigned to the Combined Joint Special Operations Task Force-Afghanistan treats another US Army soldier for shrapnel wounds from a rocket-propelled grenade explosion while battling Taliban fighters in the Sangin District area of Helmand Province, Afghanistan, April 10, 2007.

Most combat casualties in Vietnam were caused by the high-velocity AK-47 assault rifle, artillery or land mines. The AK-47 is still the small-arms weapon of choice for the adversary in Iraq and Afghanistan, but .50 caliber rifles and mortars are also used. Fighting in Iraq has seen changes in style and the degree of devastation, compared to Vietnam. The primary cause of injury in Iraq is the 155mm howitzer shell, which can be hidden under asphalt and detonated from a distance, often with a cell phone. Added shrapnel in the form of nails, screws and nuts covered with feces adds to the lethality of this terrible weapon. Other improvised explosive devices (IEDs) are vehicle-borne and may be accompanied by tanks of propane or other inflammable material adding to the burn effect.

Rocket-propelled grenades (RPGs) and the 122mm rockets are also used.[1]

Since injuries to the head and chest are often fatal, improved helmets and body armor have helped reduce deaths from these injuries. With the preponderance of wounds to the extremities, as in Vietnam, aggressive and repeated debridement and irrigation are of paramount importance to prevent death from overwhelming infection and to preserve limbs.

Medical evacuation patients on the deck of the amphibious assault ship USS Tripoli (LPH-10) await transfer to the 22nd Casualty Station in Danang, from which they will be sent to CONUS. July 1967

Since the primary cause of injury to coalition forces in Iraq is the roadside bomb, it is worthwhile to describe its mechanisms of injury. The injuries are significantly different from those administered by land mines in Vietnam.

The explosion is caused by rapid chemical conversion of a solid or liquid to a gas, accompanied by an enormous release of energy. High-order explosives detonate quickly, generating heat, noise and high-pressure gasses in 1/1,000th of a second, forming a supersonic overpressure shock wave. This blast wave moves in all directions and can exert up to 700 tons of pressure. It creates high-velocity fragmentation of its contents and its container, a blast wind that can reach hurricane strength, structural collapse, burns and toxic inhalants. Secondary-blast pressure effects are caused by reflection off other surfaces, which magnifies the effect—particularly in enclosed spaces, where structural collapse increases mortality.

Primary blast injuries are the result of overpressurization, which causes damage mainly to gas-filled structures, such as eardrums, lungs and intestines. Secondary blast injuries result from fragmentation, producing both penetrating and blunt-force injuries. Tertiary blast effects result from bodies being thrown by a blast wind, flying through the air or tumbling and striking other objects with additional penetrating or blunt-force injuries. Quaternary blast injuries might include burns or inhalation injury due to temperatures from the explosion reaching as high as 3,000 degrees centigrade. Sutphen has given an excellent description of types of injuries and their evaluation and treatment and gives credit to the Israelis and others for what we have learned.[4]

In summary, this article has been written to describe changes that have improved the surgical care of those injured in war since Vietnam. The basic principles remain the same, but changes in training, hospital logistics, equipment and evacuation have resulted in significantly better survival rates. What has not changed since Vietnam is the intensity, courage and dedication of doctors, nurses and surgical technologists who have served in active war zones, sometimes under fire themselves, as they perform their duties. It was an honor for me to have worked alongside them in Vietnam and it provided experiences and memories that I will never forget.

ABOUT THE AUTHOR

Charles J Middleton received his BA from Trinity College and his MD from Downstate Medical Center at the State University of New York in Brooklyn, NY. He previously served as chief of surgery at Berrien County Hospital in Nashville, Georgia, from September 2002-September 2004. He is currently a general surgeon at the Tarboro Clinic in Tarboro, North Carolina.

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Military technology with civilian application: Most effective tourniquets available today

Uncontrollable hemorrhage accounts for almost 50 percent of combat fatalities and up to 80 percent of civilian trauma fatalities in the United States.[1] One of the best methods of combating exsanguination in critical circumstances is the use of a tourniquet. According to some studies, it has been estimated that seven out of 100 battlefield deaths could have been prevented with a properly-applied tourniquet.[2,3]

In 2005, the US Army Institute of Surgical Research (USAISR) commissioned a study to improve tourniquet use doctrine and training to maximize the potential life-saving benefits of tourniquet use, especially during active combat; and identify an effective, commercially available, simple-to-use, field-compatible tourniquet for issue to all soldiers.[4]

Based on an informal internet search for trauma tourniquets, as well as reports from military medical personnel involved in the Iraq conflict regarding functional parameters, USAISR selected seven models for its evaluation.

The evaluation process consisted of two experiments. In Experiment I, each model was tested for efficacy (elimination of distal Doppler sound) in volunteer human subjects' legs. Those found to be effective in 80 percent or more subjects were then subjected to Experiment II, which tested effectiveness in the subjects' arms. In both experiments, the subjects were required to apply the device to themselves without any external assistance.[5]

The results of the study yielded positive options for both military and civilian application. Of the seven models tested, only three were 100 percent effective in occluding distal arterial Doppler sound in both the arm and leg when self-applied by the volunteer human subjects: the Emergency & Military Tourniquet (EMT), Combat Application Tourniquet (CAT) and Special Operations Force Tactical Tourniquet (SOFTT). Reasons for failure among the other models included mechanical limitations (design or construction), circumferential pain and/or skin-pinching pain.[5]

The mechanical augmentation of both the CAT and SOFTT is the windlass, essentially a tension strap that is twisted to compress the wound. The EMT employs a pneumatic system, similar to that of a blood-pressure cuff.

For military purposes, the CAT and the SOFTT are advantageous for their lighter weight and affordability, an edge that offers a practical application in the field. In the civilian quarter, however, the EMT is the clear winner. According to the Army's tests, the EMT resulted in "significantly less circumferential pain than the other effective tourniquets."[5]

An additional advantage to the EMT is its design. While heavier (215g to the CAT's 59g), it boasts a strap width that is nearly twice that of either the CAT or the SOFTT. Studies have shown that a wider tourniquet allows for occlusion of blood flow at lower pressure, thus helping to minimize the potential for damage to the underlying tissues.[5]

These distinct advantages present the EMT as an excellent option for application in the civilian trauma field in the United States.

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Special Operations Force Tactical Tourniquet (SOFTT).

Emergency & Military Tourniquet (EMT)

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1. Hypovolemia is low:
- **a.** Blood pressure
- **b.** Body temperature
- **c.** Blood volume
- **d.** Oxygen volume

2. Dextran is used parenterally to:
- **a.** Expand blood plasma volume
- **b.** Nourish vital tissue
- **c.** Carry oxygen in circulation
- **d.** Increase blood viscosity

3. Dark blood in the operative field is a sign of possible:
- **a.** Rigid chest
- **b.** Hypoxia
- **c.** Hypertension
- **d.** Hypothermia

4. The universal recipient blood type is:
- **a.** AB+
- **b.** AB-
- **c.** O
- **d.** B+

5. What can be utilized for wounds, in particular for abdominal surgical wounds, that will require frequent dressing changes and prevent damage to the skin?
- **a.** Liquid collodion
- **b.** Three-layer dressing
- **c.** Montgomery straps
- **d.** Stent dressing

6. Which of the following dressings is ideal for neck procedures?
- **a.** Stent
- **b.** Single-layer
- **c.** Collodion
- **d.** Three-layer

7. The rupture of a wound with spilling of contents is known as:
- **a.** Dehiscence
- **b.** Evisceration
- **c.** Disruption
- **d.** Incisional hernia

8. The healing process in which a wound is purposely left open and allowed to heal from the bottom up is called:
- **a.** Primary intention
- **b.** Secondary intention
- **c.** Delayed intention
- **d.** Third intention

9. Which of the following sutures generally would not be used in the presence of infection?
- **a.** Silk
- **b.** Chromic
- **c.** Steel
- **d.** Polypropylene

10. Tissue trauma is best minimized using a:
- **a.** Threaded suture
- **b.** Braided suture
- **c.** Swaged on suture
- **d.** Free tie

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2	❑	❑	❑	❑	7	❑	❑	❑	❑
3	❑	❑	❑	❑	8	❑	❑	❑	❑
4	❑	❑	❑	❑	9	❑	❑	❑	❑
5	❑	❑	❑	❑	10	❑	❑	❑	❑

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