

Prolonged Field Care of a Casualty With Penetrating Chest Trauma

Case Report

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ABSTRACT

As Special Operations mission sets shift to regions with less coalition medical infrastructure, the need for quality long-term field care has increased. More and more, Special Operations Medics will be expected to maintain casualties in the field well past the “golden hour” with limited resources and other tactical limitations. This case report describes an extended-care scenario (>12 hours) of a casualty with a chest wound, from point of injury to eventual casualty evacuation and hand off at a Role II facility. This case demonstrates the importance of long-term tactical medical considerations and the effectiveness of minimal fluid resuscitation in treating penetrating thoracic trauma.

KEYWORDS: *prolonged field care; chest trauma, penetrating; resuscitation, fluid*

Introduction

With the drawdown of combat troops and medical assets in Afghanistan, smaller deployed forces operate in areas of low-intensity conflict globally, with minimally developed US medical facilities. The Special Operations Forces (SOF) Medic must be prepared to care for surgical casualties for an extended time until arrival at a facility with definitive surgical care, and may need to rely on host-nation medical capabilities within many theaters of operation. Terrain, weather, and operational considerations also may impact evacuation times in areas where prolonged field care would not otherwise be expected. Movement of casualties may cross national borders, using multiple evacuation platforms, many of which may not be outfitted for casualty care.

Application of Tactical Combat Casualty Care (TCCC) principles at the point of injury has helped reduce the number of troops dying of potentially survivable wounds among US casualties—from 24% to 3% in Operation Iraqi Freedom and Operation Enduring Freedom, respectively.^{1,2} Nevertheless, the majority of combat deaths occur before the casualty ever reaches

a medical treatment facility.³ Implications of prolonged evacuation times are profound in today’s conflicts, because TCCC does not address prolonged prehospital care of the trauma casualty. As part of an analysis of current and future SOF missions, the Special Operations Medical Association (SOMA), in conjunction with US Special Operations Command (SOCOM), initiated the Prolonged Field Care Working Group in December of 2013, with the intent of creating guidelines and position papers to support training and education for medics to conduct extended casualty care in the field.

Case Presentation

A partner-enabled helicopter assault operation was planned and conducted by a US Army Special Forces (SF) Operational Detachment Alpha (ODA) and the Afghan counter narcotics interdiction unit (NIU) targeting a series of narcotics manufacturing facilities. The target objective was well within the golden hour of medical evacuation (MEDEVAC) flight, so prolonged field care was not expected to be a necessity during mission planning. Additionally, because the mission called for a helicopter assault, supplies were limited to what could be easily carried and dispersed among the partner force. Threat assessment led the 18Ds to bring a North American Rescue WALK Kit Bag (<http://www.narescue.com>) stocked with additional supplies in anticipation of prolonged field care. This included North American Rescue hypothermia kits, Chinook chest-tube kits, and field blood-transfusion kits (Tactical Medical Module FBTK). However, it was assumed that use of the field blood-transfusion kits would be reserved for American casualties (US to US) as the blood types of the Afghan NIU members were unknown—dried plasma was unavailable. Each 18D carried an identical supply of tranexamic acid (TXA), narcotics, and antibiotics sufficient to provide prolonged care to several casualties.

During the assault, a male Afghan officer, approximately 32 years old, was injured when the enemy initiated a coordinated small arms attack at around 1300. An 18D

collocated with the casualty conducted an initial assessment under fire, identifying what appeared to be a gunshot wound to the left upper chest approximately 3 inches below the clavicle and 1 inch medial to the midclavicular line. Further assessment also revealed a 4-inch contusion with significant ecchymosis along the casualty's left lower posterior rib cage. The casualty was conscious, ambulatory, and able to move under his own power with direction from the 18D to a covered position south of the main element, which remained engaged from the north.

After placing a nonvented occlusive chest seal (HALO Chest Seal; Curaplex, <http://www.curaplex.com/>), the 18D conducted a thorough secondary assessment, noting crepitus and a significant pain response across the entire left torso with no apparent exit wound. The casualty was warm and diaphoretic with a weak carotid pulse of 120 bpm, absent radial pulses, and 32 shallow respirations per minute with bilateral chest expansion. He complained of extreme pain on his left side and difficulty breathing. These findings suggested that the round, having struck the upper chest, was redirected down through the torso, fracturing ribs and lodging somewhere in the vicinity of the identified contusion. The casualty was diagnosed with uncontrolled internal hemorrhage along with likely traumatic hemo/pneumothorax. Air MEDEVAC was requested. The casualty then received 800µg of oral transmucosal fentanyl citrate and a needle thoracocentesis on the left side, which provided minimal relief. Intravenous (IV) access was acquired in the right antecubital fossa.

The casualty was transferred to a litter and covered with a hypothermia-prevention management kit (outer shell; HPMK, North American Rescue Products), but further treatments were deferred in order to move the casualty to an emergency helicopter landing zone (HLZ) approximately 400m away. On reaching the proposed HLZ, heavy enemy fire coming from the south and west on the exposed position resulted in the Afghan litter team abandoning the casualty and 18Ds for distant cover. MEDEVAC was denied because of heavy enemy machine gun and rocket-propelled grenade fire, forcing the 18Ds to drag the casualty into a nearby sewer for defilade. The casualty's level of consciousness gradually decreased, shifting between verbal and pain responses as his carotid pulse increased to 136 bpm. The 18Ds continued to monitor the casualty and return effective fire, but were unable to provide further treatment until the main element breached and occupied a nearby walled compound approximately 45 minutes later, providing a safe working area with cover from direct fire.

Inside the compound, the casualty was given 500mL Hex-tend (BioTime, <http://www.biotimeinc.com/>), 1g TXA,

and 1g ertapenem IV through the previously established access. Within 20 minutes, the casualty's level of consciousness improved enough to maintain conversation. Over the next hour, radial pulses returned, decreasing to 120 bpm. Blood pressure averaged 90mmHg. Respirations remained approximately 30/min. The casualty complained of pain on his left side and upon deep inhalations but otherwise no difficulty breathing. Breath sounds were diminished but present on the affected side, and strong and regular on the unaffected side. The compound was under direct enemy fire from the north, west, and south for the remaining daylight hours. During this time the 18Ds rotated between casualty care, sniper overwatch/breach security, and assessing minor fragmentation wounds among partner force and inhalation injuries of fellow teammates from a drug laboratory destroyed several hours earlier.

Based on the casualty's apparent stability, a chest-tube kit was prepped, but administration was delayed barring any worsening of the casualty's condition and security priorities of work. The 18Ds considered a course of IV ketamine but opted for a second dose of 800µg fentanyl to maintain the casualty's responsiveness and preserve the limited supply of medical resources in anticipation of an increasingly prolonged time on target. The casualty was positioned on an incline with feet slightly elevated, and allowed to sleep. Water intake was reduced to a minimum because it was expected he would enter surgery immediately following exfiltration. The 18Ds continued to closely monitor the casualty's vital signs (initially recorded on a casualty evacuation card and later on their smartphones) and twice performed finger thoracostomy for decompression relief. Hours of darkness allowed the main element to transport the casualty 1600m across two ridgelines to an HLZ for exfiltration.

Despite extremely inhospitable terrain navigated by litter teams without night-vision goggles, the casualty remained stable and arrived at the HLZ alert and conscious with a heart rate of 110 bpm, respirations of 24/min, and systolic blood pressure averaging 110mmHg. On arrival at the final exfiltration point, an approaching storm deterred the team's departure indefinitely. Tentative plans were made to find defensible real estate for the next 24 hours. Effort was necessary to keep the casualty warm and dry during a brief rain shower and to monitor him over the next several hours while awaiting a delayed departure time. No further treatments were administered until the casualty was delivered to a Role II emergency department around 0200, 13 hours after injury.

Upon arrival at the American Role II surgical facility, a focused assessment by sonogram for trauma (FAST examination) revealed fluid in the pelvis. A chest tube was

placed that drained 600mL of blood. Four fractured ribs and subcutaneous emphysema were identified in initial radiographs, but no bullet was located. The casualty was then taken to the operating room for a laparotomy. No injuries to the abdomen were identified. After surgery, the casualty remained intubated and stable for 2 days, during which further imaging revealed the bullet lodged in soft tissue in the vicinity of the L3 vertebral body. The casualty remained in hospital care for the next 2 weeks with few complications. He developed a climbing white blood cell count, fever, and worsening pleural effusion adjacent to the left lower lobe. A broad spectrum of antibiotic treatment with meropenem, vancomycin, and levofloxacin was initiated and his symptoms resolved. A number of pulmonary embolisms were also identified. Three weeks after injury, he was discharged with a prescription for rivaroxaban for his pulmonary embolisms and continued his recovery at home. Checkups at 1 and 3 weeks after discharge revealed an unremarkable postoperative course. The casualty complained of mild discomfort on the affected side and some difficulty breathing when lying prone, but both of these symptoms diminished over time.

Discussion

Supportive care in casualty transport and management for prevention of hypothermia proved crucial during this scenario of limited advanced treatment options. The ability of the partner force to provide these supportive measures in addition to standard TCCC care allowed the 18Ds to effect , safe casualty transport and increase the overall capabilities of the ODA by freeing up manpower. Prolonged field care situations many times tax the sole medical provider(s), and cross-training team members allows the medic to view the overall casualty assessment and develop and modify treatment plans rather than participating in work that can be delegated to people with less medical training.

A tube thoracostomy was indicated by mechanism of injury and physical findings, the casualty's difficulty breathing, and evidence of uncontrolled, internal hemorrhage. However, the application of less invasive treatments first and close monitoring eventually suggested a field tube thoracostomy was unnecessary. Although a chest tube would have enabled the 18Ds to reclaim lost blood and transfuse it to the casualty, using the field blood-transfusion kit, the casualty's stable presentation led the medics to suspend further treatments pending continued assessment and vital signs trending.

Despite the casualty's initial presentation as urgent surgical, a MEDEVAC request could have been delayed. This decision may have prevented developments in the tactical situation that led to the casualty and caregivers

being isolated from the main element and to delayed application of treatments, specifically Hextend and TXA, which subsequently stabilized the casualty. Our recommendation is that while engaged in a developing and unstable tactical situation in which the HLZ is not secured, consider delaying MEDEVAC requests and develop a casualty collection point pending all other attempts to stabilize the casualty or significant change in the tactical environment.

Prolonged field care should be central to a medic's provision considerations, and mission parameters will dictate the load out between team members and "speed-ball" air resupply feasibility in the field. The 18Ds possessed the supplies and ability to perform higher interventions on this casualty prior to exfiltration. However, it is important to weigh improving an individual casualty's vital signs against the prospect of uncertain extraction or air resupply, further casualties in the immediate future, and tapping into finite supplies. When exfiltration was accomplished 4 hours later, the casualty's vital signs were stable. The 18Ds did not transfuse (US) blood to the casualty, but having identified universal or type-specific donors among the partner force prior to the mission would have been an effective method for prolonged casualty hemostasis in lieu of MEDEVAC or air resupply of blood products. There is a need in this setting to identify indicators for further resuscitation, such as serum lactate, pulse oximetry, end tidal carbon dioxide, or physiologic parameters to help medics preserve limited resources such as blood products.

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