

Foley Catheter Balloon Tamponade for Penetrating Neck Injury Management in Military Medicine: A Case Report

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Abstract

Background

The use of Foley catheter balloon tamponade (FCBT) to address bleeding in the neck and maxillofacial area associated with penetrating trauma is widely accepted in South African Emergency Departments (Scriba et al., 2017). Its efficacy has previously been documented in combat theaters such as Iraq with significant improvement in mortality rate (Weppner, 2013). Despite such evidence, training for Special Operations Forces (SOF) medics in this technique is limited.

Case

We present the case of a partner forces (PF) soldier who received shrapnel injuries during combat operations which resulted in a life-threatening hemorrhage from the neck. This was treated in an austere Casualty Collection Point (CCP) with the use of the FCBT.

Conclusion

The Special Operations Forces medics who treated this patient decided to apply FCBT to prevent re-bleeding during unsupervised ground vehicle movement to host nation (HN) definitive care. None of the SOF medics involved had received formal training in the technique prior to the case. Their only knowledge was based on anecdotal evidence and self-study of the relevant literature. Due to the lack of accountability by

admitting a patient into the HN chain of care, there is no information on the outcome other than the patient survived transport to definitive care. FCBT was performed after the wound was packed ineffectively with hemostatic gauze which resulted in an unstable clot that became dislodged with patient movement. This subsequently resulted in what was clinically assessed as a carotid artery zone II neck bleed. FCBT has the potential to be a quick and effective adjunct to control bleeding in complicated narrow track wound patterns in the neck and maxillofacial area that are not amendable to manual pressure or hemostatic agents in combat trauma medicine.

Keywords

Foley; Foley catheter balloon tamponade; Special Operations Forces Medics; Bleeding; Hemorrhage; Hemorrhage Control.

Introduction

The use of Foley catheter balloon tamponade (FCBT) to control bleeding in the neck and maxillofacial area is widely endorsed in South African Emergency Departments (Scriba et al., 2017). Tactical Combat Casualty Care (TCCC), the most widespread military prehospital protocol, does not discuss FCBT use to treat junctional bleeding (Butler et al., 2018). Evidence of its efficacy in combat settings exists with previous studies demonstrating an improved mortality rate when compared with direct

pressure techniques, especially when it comes to temporizing lethal hemorrhage (Weppner, 2013). The high rate of success documented in civilian medicine (Navsaria et al., 2006) suggests the technique would be a useful addition to SOF medical training.

Case report

We report the case of a partner forces (PF) soldier in his twenties who sustained multiple shrapnel injuries. These injuries resulted in massive external bleeding and suspected vascular bleeding in the right side of his neck.

The patient was involved in a mass casualty incident caused by the detonation of an improvised explosive device (IED) during combat operations. Initial care of the patient was delivered by a non-governmental organization (NGO) Trauma Stabilization Point (TSP) close to the point of injury (POI). Due to the severity of the injuries and difficulty in controlling the bleeding from the neck, the NGO personnel decided to transport the patient to a military coalition CCP. At that time the CCP was staffed with four enlisted SOF medics and a four-person element consisting of a Forward Surgical Team (FST). Located in an abandoned house, the CCP was tasked with providing Damage Control Resuscitation (DCR), Damage Control Surgery (DCS) and Prolonged Field Care (PFC) to the troops in combat. The day of this case report, a total of seventeen patients were received, treated and evacuated by the CCP personnel.

The patient was transported to the CCP on a ground ambulance under the supervision of an NGO emergency medical technician. Despite the application of a dressing the bleeding from the neck wound was still active at the time of the handover to the SOF medics. Immediate application of hemostatic

gauze and direct pressure on the wound track, situated along the carotid artery, provided temporary control of the blood loss. A developing hematoma was noticed as well as

untreated shrapnel wounds which were present on the left chest. The airway was patent, but the patient presented with an altered level of consciousness (LOC) and weak radial pulse.

Upon transfer of the patient inside the CCP trauma bay, the SOF medic that was holding pressure on the neck noticed how difficult it was to apply pressure on the move due to the depth of the wound track.

As part of the initial assessment, a full set of vital signs were obtained. Low systolic blood pressure and an altered LOC indicated the need for resuscitation with blood products. A unit of type O negative blood, previously collected from a PF soldier in anticipation of incoming casualties, was rewarmed as bilateral 18-gauge IV access was obtained. The patient received: 1 gram of Tranexamic Acid (TXA), 8 milligrams of Ondansetron, 1 gram of Ertapenem, and 10 milligrams of Ketamine Hydrochloride.

The shrapnel wounds on the left side of his chest, multiple small penetrating injuries, were covered with occlusive dressings (chest seals). An Extended Focused Assessment with Sonography in Trauma (E-FAST) in conjunction with auscultation of the lungs revealed positive lung slide on both sides as well as clear breath sounds.

The shrapnel wound in zone II on the neck penetrated the platysma and the hematoma, likely stemming from damage to the carotid artery, was growing in size. There was concern the hematoma was causing midline shift in the neck. This presented a potential

compromise to airway security, necessitating the need for a definitive airway to be placed. Because of the difficulty of performing a Rapid Sequence Induction and managing an endotracheal intubation during an unsupervised transport to the HN hospital, the SOF medic trauma team leader opted for an elective surgical cricothyroidotomy. Prior to the procedure, an additional 10 milligrams of Ketamine Hydrochloride were administered to the patient and Lidocaine with Epinephrine was administered subcutaneously across the cricothyroid membrane to provide local anesthesia. One of the SOF medics performed the intervention and the tube was successfully inserted with the aid of a bougie.

Blood was ready for administration and the transfusion started immediately. The patient responded positively to the blood transfusion with increased systolic blood pressure and improved LOC. The more stable hemodynamics allowed for the administration of 5 milligrams intravenous Midazolam to reduce patient distress and mitigate possible Ketamine side effects.

As a member of the partner forces, the patient had to be routed through his own national chain of care. The closest definitive care facility was situated an hour away by air however the weather conditions prevented flight operations at that particular time. An ambulance was available, with an estimated ground transport time of three to four hours. This included travel along an unpaved dirt road which could be unreliable at best due to ongoing combat operations. This method of transport presented the additional challenge of not having a provider to supervise the patient during the movement.

Since the patient was admitted into the CCP, a hematoma had developed under the platysma to the point where the bleeding was beginning to tamponade itself. However, due to the particular logistics of this patient evacuation and the concern that the hematoma would shift or the clot break free, there was a need to find a hands free solution that would prevent the wound beginning to hemorrhage again in the back of an empty ambulance.

As the patient was being prepared for transport and the SOF medics were attempting to pack the small complicated wound track, the fragile clot was disturbed resulting in life-threatening carotid artery hemorrhage.

At this point, the SOF medics quickly decided to attempt the application of a Foley catheter through the wound track, with the intention of providing internal pressure on the carotid artery. None of them had received training in FCBT and their knowledge was based on anecdotal evidence and previous literature consultation. The flexible nature of the Foley catheter required the aid of a bougie in order to effectively push it all the way through to the bottom of the twisted wound track. Once completely inserted, the balloon was inflated using 10 milliliters of NaCl. This resulted in immediate control of the hemorrhage. A simple knot on the loose end of the Foley prevented drainage through the actual catheter lumen (figure 1).



Author's Picture (Figure 1)

The patient was monitored for the next twenty minutes in order to assess the efficacy of the treatment. No external bleeding nor expansion of the hematoma was noted. The patient's vital signs remained stable. The catheter was sutured and stapled in place to reduce the chance of dislodgement during transport (figure 2).



Author's Picture (Figure 2)

Once satisfied with the result of the intervention, the SOF medics packaged the patient for transport and transferred him to the ground ambulance, which proceeded to the HN definitive care facility.

Owing to lack of reliable points of contact within the HN medical chain, coupled with no formal transfer record system, tracking of patients proved difficult. In this instance

however, due to the unique nature of this patient's treatment, it was possible to identify him and receive a follow-up report. It was ascertained that he survived transport and subsequently underwent vascular surgery to repair five transections of his carotid artery. Further reports received from the soldier's parent unit indicated that he went on to make a full recovery.

Discussion

The evolution of military medicine in the past twenty years has been significant however hemorrhage still remains the leading cause of death on the battlefield (Puryear and Knight, 2018). Hemorrhage that is not tourniquet amenable is especially challenging due to its time-sensitive nature and anatomical limitations (Tjardes and Luecking, 2018).

In civilian medicine, FCBT has shown significant improvement in neck and maxillofacial bleeding. SOF medics are consistently trained in the application of manual direct pressure and hemostatic gauze packing, but such techniques are not always successful, particularly in small complex wound tracks and those in the junctional area (Weppner, 2017). FCBT provides a potentially powerful tool to control life-threatening hemorrhage in locations that are not otherwise amenable to tourniquet, direct pressure, and wound packing techniques.

Conclusion

The statistical data for FCBT in military medicine is not yet powerful enough to draw evidence-based conclusions, however the increasing body of anecdotal evidence and case reports suggest there is potential for it to become an alternative to manual direct pressure and hemostatic agent use. This is

especially the case in small narrow tracking wounds that are not easily packable. Existing civilian studies correlate the efficacy of the technique to specific wounding patterns and it is assessed that SOF medics already possess the majority of the core skills to safely apply FCBT in such cases. Further studies are required to assess the training requirements to potentially incorporate FCBT into SOF medic protocols.

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