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### **Another Civilian Life Saved by Law Enforcement–Applied Tourniquets**

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**Abstract:**

Increasing data and anecdotal operational reports are supporting the early, aggressive, prehospital application of tourniquets in potentially life-threatening extremity trauma. Especially in the civilian urban setting where transport times are short, the benefit in terms of lives saved far outweighs the potential risk to the extremity. The popular press has reported frequently on law enforcement– applied tourniquets, but to date, no group has published a scientific review of any of these cases. This case report suggests that law enforcement personnel can be trained to safely identify indications for tourniquet application, properly apply them with limited training, and function as effective first care providers.

**Introduction**

Prehospital application of tourniquets to control lifethreatening extremity hemorrhage saves lives. In combat, isolated extremity hemorrhage remains the number one potentially preventable cause of death, declining from 9% in Vietnam to approximately 2% in Operation Iraqi and Operation Enduring Freedom. In the civilian setting, hemorrhage is the second leading cause of death behind head injury. Recent experience from the Aurora Century Theater shooting and the Boston bombing further validates the critical importance of robust, early hemorrhage control strategies, including tourniquets in the civilian setting. Civilian trauma scenarios are distinct from combat scenarios, but extremity hemorrhage remains an easily preventable cause of potential mortality. Combat data indicate that successful reductions in mortality required a comprehensive trauma management system with traditionally nonmedical personnel playing a critical role in creating access, providing security, initiating hemorrhage control with tourniquets, and assisting with evacuation. The US Army Rangers demonstrated the value of training all unit members in Tactical Combat Casualty Care (TCCC), resulting in a 0% prehospital preventable death rate. While tourniquets are gaining wider acceptance in the traditional medical prehospital environment, expansion of hemorrhage control strategies to include nonmedical first responders (e.g., law enforcement officers [LEOs]) is critical to achieving the levels of success seen by the Rangers. This report details the case of a patrol officer who applied a tourniquet with life-saving results to a civilian suffering massive, life-threatening extremity trauma in a nontactical environment.

**Case Report:****Prehospital Course**

An on-duty patrol officer operating in a marked patrol vehicle received an off-duty call for assistance at 1537 hours. The off-duty officer described a male subject who had stepped in front of a moving train, resulting in high amputation of his right upper extremity. The off-duty officer used a leather belt to create an improvised tourniquet on the right upper extremity stump. A second off-duty officer applied pressure over the distal aspect of the wound. The patrol officer arrived at 1539. On arrival, no obvious threats were visualized. The victim was lying on a concrete surface, naked and covered in blood. Per officer report: *I could see the victim was missing his right arm several inches above the elbow and decided that a tourniquet would be helpful in this type of traumatic injury. The belt was placed up near the arm pit and since it was slowing some of the blood loss I decided to leave it in place while the tourniquet was applied. I applied my C-A-T tourniquet below the belt and as high up on the arm as possible. That TQ was in place in less than 30 seconds. After the application of that first tourniquet, I removed the belt and decided to place another tourniquet as high up on what was left of his limb just to be safe. The first tourniquet was in place and secured in less than a minute on my arrival on scene.*

Because the subject was naked, the officer quickly checked for other major injuries and did not find any other injury than road rash. Charlotte Fire Department (CFD), the county basic life support (BLS) service, arrived on scene at 1542. CFD prepped the patient for transfer, including implementing basic hypothermia prevention. Charlotte-Mecklenburg emergency medical services (EMS) (MEDIC) arrived on scene at 1545. On arrival of EMS personnel, the patient was expeditiously loaded into ambulance, the arm was located in the woods, and patient was transported to the hospital for definitive care. Prehospital vital signs reported a highest heart rate of 138 beats/min, lowest blood pressure of 200/110mmHg, and best Glasgow Coma Scale (GCS) score of 15.

**Emergency Department and Hospital Course:**

On arrival in the emergency department (ED) at 1559 hours, patient was noted to have a traumatic amputation of the right arm at the proximal humerus as well as multiple abrasions to the upper and lower extremities bilaterally.

The Combat Application Tourniquet (C-A-T®; North American Rescue, <http://www.narescue.com/>) was in place with no active hemorrhage (Figure 1). Initial ED vital signs were notable for heart rate of 126 beats/min, blood pressure of 97/55mmHg, and GCS score of 15 (1600 hours). The patient had a negative focused assessment with sonography for trauma exam, and no other obvious injuries were identified. Initial labs were notable for an initial hemoglobin level of 12.6 g/dL and lactate level of 14.4 mmol/ L. Based on the patient's tachycardia, relative hypotension, and elevated lactate level, the trauma team initiated component blood therapy treatment with the administration of 2 units of packed red blood cells in the trauma bay as well as antibiotic prophylaxis with 2g of cephazolin (Ancef®). The trauma surgery and orthopedic surgery teams took the patient emergently to the operating theater at 1635 hours (Figure 2). In the operating room, the axillary artery was identified and a vascular clamp was applied. Given the limited size of the upper extremity stump, the orthopedic team left the C-A-T in place until proximal arterial vascular control was achieved. Further dissection was undertaken to suture ligate the axillary artery more proximally. Additional dissection was performed to identify additional neurovascular structures in the exposed axilla, specifically terminal branches of the radial, ulnar, and median nerves for possible myoelectric above-elbow prosthesis. The wound was irrigated and underwent sharp debridement of grossly contaminated and nonviable tissue, and muscle was loosely approximated over exposed bone. The patient remained in the hospital for 24 days, undergoing additional treatment and therapy. He was discharged with daily dressing changes to an inpatient psychiatric facility to undergo additional management of his psychiatric conditions, as well as followup with orthopedics in the outpatient clinic.

### ***Discussion:***

This case reports highlights three critical findings. First, LEOs are frequently the first on scene for major trauma incidents; this is true even in the nontactical environment. In this case, off-duty law enforcement was immediately on scene and the patrol officer arrived within 3 minutes of the incident. The commercial tourniquet was secured and hemorrhage controlled 3 minutes before BLS personnel arrival and 6 minutes before advanced life support (ALS) personnel arrival. Second, properly trained LEOs can identify appropriate indications for tourniquets and effectively execute critical life-saving interventions. Again, in this case, the off-duty officers recognized the requirement for hemorrhage control and implemented a combination of improvised tourniquet and direct pressure. Finally, LEOs can effectively perform basic lifesaving interventions without jeopardizing their primary mission of community security and policing; this creates a major force multiplier effect for trauma care. This most recent case report supports a larger case series in the Charlotte-Mecklenburg area of four additional cases of LEO-applied tourniquets. Three of the four patients in the prior series had significant vascular injury with life-threatening hemorrhage. In all cases, an LEO-applied tourniquet resulted in hemorrhage control before BLS/ALS arrival on scene. The three patients with vascular injury arrived at the ED in class III or IV shock, received immediate blood products, and were taken emergently to the operating theater. All have made full recovery without significant sequelae. Law Enforcement First on Scene Modern combat data clearly demonstrate that early tourniquet application reduces mortality. Extensive military, and now expanding civilian, data demonstrate that early application of tourniquets is the essential first step in effective damage control resuscitation strategies, with survival benefit being greatest when tourniquets are applied prior to the patient entering a shock state. Kragh et al. demonstrated that TQ application prior to onset of clinical shock reduced mortality from 96% to 4%.<sup>1</sup> Further analysis of one of two data sets used in this study also suggests a greater than twofold reduction in mortality if the tourniquet is applied in the prehospital arena versus first application in the ED. In the civilian setting, LEOs are first on scene in a majority of medical and trauma calls. In the nontactical environment, LEOs can play an important role beyond securing the scene and preserving evidence; LEOs can function as the first link in the medical and trauma "Chain of Survival." A meta-analysis by Husain and Eisenberg from March 2013 looked at the response times and survival data of police-and-EMS combined automated external defibrillator (AED) programs versus EMS-alone programs. If an LEO was first on scene, the mean time to defibrillation was 3.4 minutes shorter and survival improved by 10.8%. If examining the most recent data in isolation, reflecting the current system of response in each subject community, a more dramatic benefit was observed, with defibrillation initiated 3.8 minutes sooner and survival being 14.3% higher in the LEO cases. Other data have also shown that LEOs often present more quickly to the patient's side after arriving on scene secondary to the ease and speed of LEO movement in the field (e.g., less equipment, fewer personnel, more robust threat mitigation tactics, etc.) compared with other traditional medical prehospital providers.

Finally, a recent retrospective study from Band et al. in Philadelphia demonstrated that law enforcement transportation of trauma patients resulted in similar adjusted mortality rates for patients with penetrating trauma. In high-threat scenarios such as the active shooter incident at the Century Theater in Aurora or the Boston bombing, LEOs were not only first on scene but also had earlier access to casualties than any other first responders. In Aurora, preliminary after-action reports revealed that LEOs transported to hospitals 75% of the casualties within the first 30 minutes post event (Aurora Shoo, personal communication). Taken in totality, this suggests that LEOs can play a significant role in both routine response and dynamic high-threat incidents. The key factors are robust training, solid quality assurance, and interagency collaboration. Law Enforcement Can Learn and Execute Life-Saving Interventions Various studies have demonstrated the ability of LEOs to evaluate patients with complex medical complaints and to perform life-saving medical/trauma tasks. The work conducted by Husain and Eisenberg described earlier showed that patrol LEOs can undergo training, retain knowledge, and effectively deploy AEDs in the field, with a dramatic impact on mortality. With tactical law enforcement teams, Sztajnkrzyer observed that after a 90-minute didactic and practical application session, nonmedical LEOs were able to learn to identify and treat tension pneumothoraces with needle thoracocentesis. Importantly, LEOs retained this knowledge at 6 months There are multiple reports in the popular press of law enforcement–applied tourniquets to fellow officers and even the occasional civilian. However, very little data exist regarding law enforcement tourniquet use on community civilians. This case report reaffirms what prior data have suggested: LEOs can deploy tourniquets in the field with life-saving benefit. The authors have observed four additional cases of LEO-applied prehospital tourniquets following violent trauma that resulted in life- and, in those cases, limb-saving results for the victims. Furthermore, this case report highlights the importance of appreciating that LEO tourniquet use expands outside of violent trauma. Modern combat tourniquets have altered the treatment paradigm of extremity hemorrhage, and the authors postulate that expeditious and extensive use of tourniquets, specifically by nonmedical LEOs, has immense potential benefit to our communities.

### ***Law Enforcement as Force Multipliers***

The quantity of marked, unmarked, and off-duty patrol officers in a given metropolitan area that can potentially respond to a 911 dispatch far outnumber the available EMS units. In Charlotte, NC, there are approximately 25 to 50 units divided into three shifts, deployed daily to cover an area of 300 square miles and 1 million people. There are an additional approximately 100 patrol officers per shift per day (approximately 300 in total) divided into 13 districts. Similar to the military model, highlighted by the Rangers, expanded training to nonmedical personnel is a force multiplier in initial casualty management and mass casualty incidents. In most communities, LEOs are an untapped resource for expanding initial trauma care and reducing mortality.

### ***Conclusion:***

Law enforcement tourniquet programs are important components of multiagency, tiered trauma response systems. In the civilian arena, the Committee for Tactical Emergency Casualty Care (C-TECC), a nonprofit, best practice development group for prehospital care in highthreat environments, also supports expanded tourniquet use. Combat data indicate that successful reductions in mortality require a comprehensive trauma management system, with traditionally nonmedical personnel playing a critical role in initiating hemorrhage control and assisting with evacuation.<sup>20</sup> The C-TECC strongly endorses LEO-based tourniquet programs as a critical component of this “Chain of Survival” in traumatic mass casualty incidents and active violent incidents (Figure 3). In addition, the American College of Surgeons also recently released evidence-based guidelines for hemorrhage control in the prehospital setting call for early tourniquet use and seem to support LEO-based tourniquet programs. Finally, the 2013 Hartford Consensus statement supports the position that medical training for external hemorrhage control techniques is essential for all law enforcement officers. This case report further demonstrates the survival benefit of LEO tourniquet application with expansion beyond active violent incidents and violent trauma to injury sustained in nondynamic environments (e.g., no active threat to first responders). With extensive experience from training LEOs in both tourniquet use and advanced prehospital care such as TECC, it is the authors’ belief that patrol LEOs can be efficiently trained to use tourniquets in the appropriate setting with effective results.

***Study Limitations***

The primary limitation of this report is that it is a case report. Additional research is needed to further compare LEO- and EMS-applied tourniquets to evaluate efficacy following training and mortality benefit. Some studies have pointed out a hesitation of police officers to participate in medical training. It is important to note, however, that other studies have shown an increased willingness of LEOs to participate in trauma and tourniquet training compared with other forms of medical training. The authors also appreciate that undertaking a training regimen for entire community police departments is a large commitment.



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