

## Sri Lankan perspective of combat extremity vascular trauma: lessons learned and implications for future directives

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**Keywords:** Combat vascular trauma; limb fasciotomy; temporary intraluminal shunting; field tourniquets

There were more than 5000 casualties admitted to Anuradhapura Military Base Hospital (MBH) during the last phase of Sri Lanka civil war (November 2008 –June 2009). Out of these casualties, there were 129 vascular injuries. The circumstances of each injury were meticulously recorded and later examined for patterns of injury and outcomes.

The key findings were published in journals and textbooks [1, 2]. This communication is to share the salient points that the authors consider invaluable for future surgeons who will take up the challenging field of combat surgery.

Of the 129 vascular injured limbs analysed, gunshots and explosive devices were responsible for 50% and 42% vascular injuries respectively. In this study group, 58 (44%) had combined arterial and venous injuries, 53 (42%) had isolated arterial injuries and 12 (9%) had only venous injuries. Four non axial injuries were managed by ligation and two popliteal branch injuries with popliteal artery spasm were managed expectantly. Most commonly injured vessels were femoral (35%), popliteal (34%) and brachial (18%) while the most frequent procedure performed was an interposition vein graft at 62%. The adverse outcomes for the 129 vascular injuries included 17 primary amputations, 5 secondary amputations, 10 post-operative thrombosis, and 5 arterial anastomotic disruptions. Out of 87 procedures for arterial injury, in 80 both life and limb could be saved upon discharge from MBH with an average 17 days institutional follow-up. Vascular reconstruction directly contributed to 2 deaths due to ischemic rhabdomyolysis in one case and severe shock in the other. Both of those could have been prevented with primary amputation. Amputation rate following arterial reconstruction only was 5% (4/87).

This high intensity war was fought in harsh terrains under unpredictable weather conditions which affected casualty retrieval and transport to definitive care often exceeding 5

hours. Casualties were transported either by ground or air evacuation from role 2 to role 3 care at MBH.

At role 2 (Main Dressing Station), they lack consistency in equipment and surgeons trained to perform limb fasciotomies and vascular shunting of damaged vessels. Although these are not frequently used skills outside combat situations, these are core damage control components of contemporary combat vascular trauma management[3]. Arterial shunts at role 2 may have prevented 17 amputations in the study population.

There is no local data on deaths due to exsanguination from extremity injuries that may have benefitted from a tourniquet. Nevertheless, a notable difference in front line extremity trauma management strategy was the lack of liberal implementation of the emergency application of tourniquets, which was proven to be a life saving measure in the conflicts in the Middle East [4].

Sri Lanka lacked the facilities for dedicated data collection, analysis hence protocol-based management of casualties could not be established during the war. The U.S. military established the Joint Theatre Trauma Registry (JTTR) which was modelled after the U.S. National Trauma Data Bank, during Operation Iraqi Freedom and Operation Enduring Freedom. This is the data by which the U.S. military creates and disseminates clinical practice guidelines and informs future required training of military providers [5].

Based on the author's experience, training military surgeons in limb fasciotomies and vascular shunting to practice at role 1 and 2 would lead to more limbs salvaged. Perhaps the early and more liberal use of tourniquets could lead to more patients reaching role 1 and role 2 alive. Establishing a trauma registry is imperative to gather data on timing and causes of deaths in theatres of war and to establish procedural improvement and quality of care.

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional or national ethics committee and the Helsinki Declaration of 1975, as revised in 2000.

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Received: 25-05-2019 Accepted: 19-08-2019

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DOI: <http://doi.org/10.4038/sljs.v37i2.8626>



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