



# Mangled Extremity Severity Score in Combat Casualty Care: Time to Revise

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## Editorial

Throughout the 20<sup>th</sup> and 21<sup>st</sup> century war theaters, extremity injuries were predominating in the range of 50 to 70% [1]. Rate of vascular trauma in current war fields is on the rise, ranging from 9 to 12% [2]. Out of those, three quarter involves major extremity vessels and close to half of these documented with concomitant venous injury.

Amputation rate of war time vascular injured limbs considerably improved from 36% in WW1 through 13% in Korea and Vietnam to 4-6% in Operation Iraqi Freedom & Operation Endurance Freedom (OIF& OEF) due to improvement in combat casualty care structure with rapid transport and far forward surgical capability allowing surgeons to perform more vascular reconstructions [3]. About one third of the combat vascular injured limbs are in association with skeletal trauma and saving these limbs will test the acumen of the military surgeon [4]. Understanding of pathophysiology of vascular injured patient, liberal application of field tourniquets, temporary intraluminal shunts and damage control resuscitation allows combat surgeons to save limbs at a commendable percentage. However, wartime amputees are still a considerable cost to society with 1715 major limb amputation in OIF and OEF by December 2012, according to congressional research service [5]. Throughout the history of war, combined vascular and skeletal trauma have fare worse outcome in comparison to isolated arterial injury [6]. Prioritizing and protocol management of these mangled limbs is order of the day. Temporary shunting of both artery and vein with four quadrant fasciotomy at second echelon of care with expedited evacuation to third echelon for definitive vascular reconstruction with skeletal stabilization then planning advanced soft tissue reconstruction and rehabilitation at continental fifth echelon of care proven effective in current combat theaters [7]. Out of these devastating injuries, there are a percentage of limbs with excess ischemic burden upon revascularization, which will result in acute multi organ dysfunction or later septic consequences leading to loss of life, if not limb. In this challenging scenario, it is pivotal to select early which limbs to reconstruct vs. which to amputate. For the above task, Mangled Extremity Severity Score (MESS) is the only prioritization selection tool used upon its simplicity and assumed reliability [8]. However, prudence of its application in combat theaters questioned by several authors in the background of its failed accuracy in civilian studies [9].

In scrutinizing MESS in the battlefield, following facts are highlighted:

- Age, in particular, is not a criterion that bears much effect on combat composite scoring system, as most of the military are young fit individuals in the age range of 20 to 40 years. In addition, skeletal/soft tissue score is often either 3 or 4, considering the high velocity automatic rifles and blast munitions in combat setting. In combat extremity composite scoring system, we could safely omit age and soft tissue criterion, as these two are more or less static in combat, making them less valued. The presence of a vascular injury in a physiologically sick patient is the main factor indicating amputation [9]. Considering vascular injury, our experience in Sri Lankan war theaters indicated popliteal anatomy and associated venous injury in the background of compound fracture challenge even the most experienced surgeons to salvage the extremity. We should include local anatomical criterion to the composite score, giving weight to each. As such, we experienced 17 primary amputations, 4 secondary amputations and 3 deaths in 39 popliteal combat vascular injuries [10].
- Combined venous and arterial injuries bled more at the field and definitive care resulting in statistically significant more amputations in comparison to arterial injury alone [10].
- Considering limb ischemia, we could refine more with inclusion of Doppler assessment in addition to manually detected peripheral pulse. Fixed ankle often predicts worse outcome, in that

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**Table 1:** Ballistic Mangled Extremity Severity Score (proposal).

<b>Factor 1- Involved structures</b>	Score
Vein	0
Artery	1
Artery +Vein	2
Artery+Vein+ Bone+Nerve	4
<b>Factor 2 -Region of injury</b>	
Brachial	1
Femoral	2
Popliteal	4
<b>Factor 3- Blood flow presence (Score double if ischemic time &gt; 6 hours)</b>	
Pulse reduced, Doppler audible	1
Pulse absent, Doppler absent	2
Pulse absent, Doppler absent, Fixed ankle	4
<b>Factor 4-Shock</b>	
Systolic pressure above 90mmHg	0
Transient hypotension	2
Persistent hypotension	4

one should not proceed with limb [11].

Following is our proposed criteria for a Ballistic Mangled Extremity Severity Score (BMESS) (Table 1). These factors should be weighted in a statistical analysis of sufficient number of data to make the score accurately predict which limb to amputate and which to proceed with salvage protocol.

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