

## Utility of mangled extremity severity score in severely injured lower limbs

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### Abstract

**Introduction:** Massive lower extremity trauma, in particular open tibial fractures with associated vascular injuries, present an immediate and complex decision-making challenge between a limb salvage attempt and primary amputation. Medical and surgical advances of the past two decades have improved the ability to reconstruct severely injured limb. Limbs that once would have been amputated are now routinely managed with complex reconstruction protocol. Mangled extremity severity score is one of the scoring systems to predict the fate of limbs after severe limb injuries.

**Methods:** Patients fulfilling the inclusion criteria were evaluated with MESS, at the same time treatment protocol for management of injuries of lower limb were followed independently by attending orthopedic surgeon. Mean MESS for salvaged and amputated limbs were calculated and its reliability for prediction of fate of injured limb was assessed using software SPSS v16.

**Result:** The age of patient ranges from 10 to 65 yrs with mean age 35.83. The most common mechanism of injury was Road Traffic Accident followed by fall from height. The mean MESS score for salvaged limbs was 4.18 and for amputated limbs was 8.12 suggesting significant difference in mean scores. The sensitivity (the probability that limbs requiring amputation will have MESS at or above 7) was found to be 75%. The specificity of MESS (the probability that salvage limbs will have MESS < 7) was 95.45%.

**Conclusion:** MESS is a reliable indicator in decision making process whether a limb can be salvaged or needs amputation. The mangled lower extremity with the score of less than 7 may be salvaged and 7 or more may need amputation.

**Keywords:** Amputation; MESS; Salvage

### Introduction

Massive lower extremity trauma, in particular open tibial fractures with associated vascular injuries, present an immediate and complex decision-making challenge between limb salvage attempt and primary amputation.<sup>1</sup> Medical and surgical advances of the past two decades have improved the ability to reconstruct severely injured leg. Limbs that once would have been amputated are now routinely managed with complex reconstruction protocol. The ideal situation is one which allows identification of those patient who will benefit from early and aggressive attempts

at limb salvage and those for whom primary amputation is the correct choice.<sup>2</sup> An attempt to quantify the severity of the trauma and to establish numerical guidelines for the decision to amputate or salvage the limb has been proposed by many others. These include the Mangled extremity severity score (MESS), the Predictive Salvage Index, the Limb Salvage Index, the nerve, ischemia, soft tissue injury, skeletal injury and age of patient (NISSA) score and the Hanover fracture scale-97 (HFS-97).<sup>3</sup> Mangled extremity severity score is one of the scoring systems to predict the fate of limbs after severe limb injuries and was found to be the most useful.<sup>4,5</sup>

The number of patients coming to major 3 institutions of Kathmandu i.e., Patan hospital, Bir hospital and Shree Birendra Army hospital with lower limb extremity injury is large in number. MESS is simple to use and it has high sensitivity in predicting limb salvage vs amputation of severely injured extremities.

The objective of the study was to evaluate the utility of MESS score to predict the fate of severely injured lower limbs.

### Methods

The ethical approval was taken from Institutional Review Board NAMS. This was a prospective observational study undertaken at Patan hospital, Bir hospital and Shree Birendra Army hospital, Kathmandu from July 2011 to January 2013 (Shrawan 2068 to Magh 2069). This study was done as thesis for fulfillment of the requirement for the degree of master of surgery (MS) in orthopedics and trauma surgery. Patients with mangled lower extremity presenting in the emergency department who fulfilled the inclusion criteria and gave consent for inclusion in the study were included. The inclusion criteria were mangled lower extremity, open fracture of lower limbs, vascular injuries of lower limb except the foot, including the dislocation of knee, ankle, closed tibial or femoral fracture and penetrating wounds with vascular injury noted on color doppler or at the time of surgery. Patient with auto-amputated lower limb, with isolated foot or digit injuries, who died in less than a week and with failure to provide written consent were excluded from the study. On admission to emergency ward all resuscitative measures according to Advanced Trauma Life Support protocol were followed. Once the general condition of the patient was stabilized, a detailed history was recorded regarding mode of injury, treatment taken, associated medical and surgical illness. Radiograph of the mangled extremity and other injured parts were taken. Color Doppler of the mangled extremity was carried out whenever peripheral pulses absent and perfusion was in doubt. Patient was taken to operation room and management was done with thorough irrigation with saline, meticulous debridement, external fixator, pressure bandage and antibiotics as per necessity. MESS was calculated at the time of admission or on operation table. Vascular repair if indicated was done by vascular team. Serial debridement was carried out as per necessity in successive days. Serial wound culture were done and antibiotics given as per sensitivity. The decision of salvage or amputation of lower limb was taken by surgeon based on clinical judgment after discussion with patient or patient relatives. The viability of the lower limb was checked with regard to capillary refill

time and neurological status of limb and recorded the time of discharge, at 6 weeks follow up and 3 months follow up. The limb which was viable at three months follow up was considered as salvaged.

### Results

Initially, thirty five patients of the lower extremity injury who fulfilled the inclusion criteria were included in our study but as only thirty patient completed 3 month follow up, 5 were excluded from study. The viability of the limb was checked at discharge, 6 weeks follow up and three month follow up. The limb viability was assessed with vascular status (capillary refill time and status of dorsalis pedis and posterior tibial artery pulse), neurological status (sensory and motor function of the limb) and condition of soft tissue of the limb. The age of patient ranges from 10 to 65 yrs with mean age 35.83. The most common mechanism of injury was road traffic accident followed by fall from height. Out of 23 limbs with MESS score less than seven, 21 were salvaged and two were amputated. All the children though only 3 in number, with MESS less than 7 were salvaged. Out of seven limbs with MESS score more than seven, six were amputated and one is salvaged. The mean MESS score for salvaged limbs was 4.18 and for amputated limbs was 8.12 suggesting significant difference in mean score. Out of the 30 cases eight underwent amputation and 22 were salvaged. The sensitivity of MESS was 75% and the specificity was 95.45%.

#### Limbs salvaged and amputated

**Table1: Number of amputated and salvaged limbs as per MESS scores**

MESS	Outcome		Total
	Amputated	Salvaged	
>7	6	1	7
<7	2	21	23
	8	22	30

### Discussion

In our study, mean MESS for salvaged limb was 4.18 and that for amputated limbs was 8.12 suggesting significant difference in mean MESS score (p value 0.005). This was similar to study reported from India with 56 mangled extremities of 50 patient in which mean MESS for salvaged limbs was 4.7 and that for amputated limbs was 8.12.<sup>6</sup> Similarly a study evaluating 26 lower extremity open

fracture with vascular injury over 12 month of period at two centers showed significant difference in mean MESS score; 4 for 14 salvaged limbs and 8.83 for 12 amputated limbs.<sup>7</sup> Similar results were found in a study from India in which 25 patient retrospectively and 36 lower limbs in 58 patient with high injuries prospectively evaluated for MESS.<sup>8</sup> In our study two cases with Mean MESS less than 7 were amputated. However all the limbs of children with MESS less than 7 were salvaged which showed good correlation between MESS and limb salvage or amputation. This may be explained by the fact that patient younger than 30 years of age did not receive any points on MESS score and more repair capability children's body. This was similar to most of studies done.<sup>9</sup>

In our study, Sensitivity of MESS was 75% and specificity of MESS was 95.45%. This finding showed that chances of limb with MESS less than 7 being salvaged is more than limbs with MESS more than 7 being amputated. This might be due to advance in development of orthopedic, vascular and plastic reconstruction, availability of these services in one centre and more team approach in patient care. This was comparable to most studies in which specificity of MESS was high.<sup>10</sup> In our study there is low sensitivity compared to other studies as we had included both ischemic and non ischemic limbs. Sensitivity of the MESS in most studies increased when they had included only ischemic limbs.<sup>10</sup>

The limitation of our study was small number of patient and duration of follow up.

## Conclusion

MESS is a reliable predictor in decision-making of salvage or amputation of lower extremity mangled injuries.

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