

Surgical Management of Musculoskeletal Trauma



Daniel J. Stinner, MD^{a,b,*}, Dafydd Edwards, FRCS (Tr&Orth)^{a,c}

KEYWORDS

- Extremity trauma • Limb salvage • Limb reconstruction
- Damage control orthopedics • Early total care • Early appropriate care

KEY POINTS

- Extremity injuries account for more than 50% of the total costs to society for nonfatal injuries.
- Communication between the orthopedic surgeon, trauma team leader, and other surgical services is paramount to optimize outcomes.
- Damage control orthopedics (DCO) is reserved for the physiologically unstable or borderline patient.
- Early total care (ETC) is often ideal for the management of stable trauma patients with isolated extremity injuries.
- Early appropriate care refers to the decision to apply either DCO or ETC depending on the patient's physiologic status and response to resuscitation.

SOCIETAL BURDEN OF EXTREMITY TRAUMA

Injuries remain a leading cause of death in people younger than the age of 65 years. When considering years of potential life lost, it ranks higher than malignant neoplasms, heart disease, and cerebrovascular disease. However, deaths are truly just the tip of the iceberg. For every trauma-related death there are 13 hospital discharges and 140 emergency department visits related to injury or trauma.¹ With advances in automobile safety and improvements in acute resuscitation strategies, lives are being saved, but that comes at a cost for both the patient and society. When evaluating societal costs due to injury, 20% can be attributed to medical and related costs, another 35% are due to productivity losses due to death, and 45% are due to productivity losses

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^a Royal School of Mines, Centre for Blast Injury Studies, Imperial College London, Prince Consort Road, Kensington, London SW7 2BP, UK; ^b US Army Institute of Surgical Research, San Antonio, TX, USA; ^c Royal Centre for Defence Medicine, Birmingham, UK

* Corresponding author. Royal School of Mines, Centre for Blast Injury Studies, Imperial College London, Prince Consort Road, Kensington, London SW7 2BP, UK.

E-mail address: Daniel.stinner@gmail.com

Surg Clin N Am 97 (2017) 1119–1131

<http://dx.doi.org/10.1016/j.suc.2017.06.005>

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due to disability. When looking specifically at the comprehensive costs on society of nonfatal injuries, upper limb injuries account for 16% and lower limb injuries account for 38%, attributing well more than 50% of the total costs on society for nonfatal injuries to the extremities.² Furthermore, of those working before an injury from a moderate to high-energy force with an orthopedic injury with an Abbreviated Injury Scale (AIS) of 3 or more, only 58% have returned to work at 1 year.³ This gives orthopedic surgeons the opportunity to have a significant impact on minimizing this burden by doing their part to optimize outcomes of those with extremity injuries.

NEED FOR A COORDINATED NATIONAL TRAUMA SYSTEM TO OPTIMIZE OUTCOMES

Having an established and optimized trauma system is essential to improve the outcomes of those who sustain high-energy extremity trauma. Research clearly demonstrates that those sustaining severe lower-limb injuries benefit from treatment at a trauma center.^{4,5} Interestingly enough, although the total number of trauma centers is increasing throughout the United States, the number of severe orthopedic injuries seen at these centers seems to be decreasing, which ultimately results in less trauma volume per orthopedic surgeon.⁶ The American College of Surgeons Committee on Trauma has recognized this dilemma and has published a position statement outlining several guidelines for the optimization of a regional trauma system, which seeks to best serve the needs of the injured patient.⁷ In addition, through the establishment of a coordinated National Trauma System, which may be on the horizon in the United States, outcomes of extremity trauma patients are likely to improve.⁸

TRAUMA-RELATED MORTALITY

In the developed world, trauma is the most common cause of death in those younger than the age of 44 years and is most commonly due to road traffic accidents. Donald Trunkey⁹ described a predictable trimodal distribution of death in 1983.

Acute or Primary Mortality

The casualties that belong in this group are ones that have sustained injuries that are incompatible with life. Typical injuries include severe head injuries, major hemorrhage, high cervical vertebra (C3 and above) and spinal cord injuries, airway obstruction, or mediastinal and cardiac disruption. Casualties often succumb to these injuries within seconds because they are not amenable to medical intervention regardless of the timeline.

Secondary Mortality

Death in the second peak usually occurs within minutes to hours and is potentially preventable by early and appropriate medical intervention. Examples of early or acute injuries in this group are intracranial hemorrhage, pneumothorax, cardiac tamponade, hemothorax, intra-abdominal hemorrhage, pelvic fracture, or long bone fracture, in particular femoral fractures. All of these are characterized by the need for early invasive medical intervention to stabilize the casualty before physiologic disruption and organ failure occurs. For the orthopedic surgeon, interventions include pelvis and long bone stabilization; however, it is important for them to be aware that patients with these injuries often require significant resuscitation.

Tertiary Mortality

Thirty percent of all trauma-related deaths occur within days or weeks following the injury.¹⁰ The triggering of multiorgan failure and subsequent death is usually on a

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