

# Damage Control Orthopedic Surgery

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## Abstract

The concept of damage control surgery was first described for the purpose of treating medically unstable patients with abdominal trauma. The purpose of such surgery is rapid control of hemorrhage and contamination, not definitive repair of injuries. The goal is to improve survival of patients with the potentially lethal triad of hypothermia, acidosis and coagulopathy. Definitive repair of injuries and abdominal closure are not performed at the time of initial laparotomy. Rather, the abdominal wound is left open, a dressing is placed, and the patient is transported to the intensive care unit for continued resuscitation. This includes optimization of hemodynamic condition, respiratory support, warming, and correction of coagulopathy. Following successful resuscitation, when the patient is medically stable, a return to the operating room is scheduled for repair of injuries and abdominal closure.

**Keywords:** *Damage control surgery, hemorrhage, acidosis, coagulopathy, resuscitation*

## Introduction

Damage control orthopaedics (DCO) represents the application of this methodology for treating musculoskeletal injuries in patients with multiple trauma.<sup>1</sup> The goal is to provide rapid stabilization of orthopaedic injuries while avoiding prolonged surgical procedures, giving the surgical team the best opportunity at minimizing hypothermia, acidosis, and coagulopathy. Open wounds and mangled extremities are washed out and debrided as necessary and fractures are reduced and stabilized provisionally. For long bone fractures, external fixation frames are applied to provide temporary fixation. Definitive treatment is postponed until the patient is successfully resuscitated and medically stable. In this way, prolonged surgical interventions and excessive blood loss are avoided, and the patient can be transferred to the intensive care unit as quickly as possible. Damage control orthopedic surgery should minimize the systemic inflammatory response by reducing the effect of the second hit associated with prolonged orthopaedic procedures.

## Discussion

The consensus statement of the Eastern Association for Surgery of Trauma relating to the timing of long bone fracture fixation in patients with multiple trauma is instructive.<sup>1</sup> This group performed a systematic review of the literature regarding the timing of fracture fixation in different subsets of patients with multiple trauma. Specifically, the group concluded that there is no compelling evidence that early long bone stabilization either enhances or worsens outcome for patients with severe head injury or for patients with associated pulmonary trauma. Although it is suggested that early fracture fixation may reduce associated morbidity for certain patients with multiple trauma, the study stops short of recommending early fixation for all patients. Instead, the authors recommend that the timing of fracture fixation be individualized according to the patient's clinical condition. If a patient has severe pulmonary dysfunction, remains hemodynamically unstable, or has severely elevated intracranial pressures, then prolonged surgery for extremity fractures

should be delayed.<sup>1</sup>

The application of temporary external fixation for femur fractures, with planned conversion to intramedullary nailing, has been advocated for patients with multiple trauma.<sup>2,3</sup>

It is believed that external fixation allows for some of the benefits of early fracture fixation while avoiding the pitfalls associated with prolonged orthopedic procedures. Surgical time and blood loss are minimized, and the potential pulmonary morbidity associated with intramedullary nailing is postponed until the patient has had a chance to recover from the initial traumatic insult. Compared with patients undergoing early femoral nailing, patients treated with external fixation demonstrate a blunt inflammatory response as measured by serologic inflammatory markers.<sup>4</sup> Furthermore, when patients undergo staged intramedullary nailing after temporary external fixation; they demonstrate a decreased inflammatory response following the nailing procedure. For this reason, it has been suggested that a protocol including damage control orthopedic surgery may improve the outcomes for the most severely injured patients.

However, it must be recognized that the clinical significance of a decreased inflammatory response remains uncertain. There are few prospective data that show that damage control orthopedics can actually reduce the rate of ARDS, multiple organ failure, or mortality. Critics argue that damage control protocols contradict decades of experience and the accumulation of data supporting the superiority of early fracture fixation in patients with multiple trauma.<sup>5</sup> Proponents infer the success of damage control orthopedics based on studies showing that patients treated with damage control orthopedics seem to have results that are better than might have been expected based on their ISS scores.<sup>3,6,7</sup>

## Conclusions

Temporary external fixation makes sense for those patients too sick to undergo early definitive fixation of their orthopedic injuries. Although damage control protocols do make theoretic sense, prospective data are lacking. Additional

study may be required before damage control protocols are universally accepted.

## References

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