Damage Control in Orthopedic Surgery: Fad or Fact?

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The term “damage control” was originally coined by the United States Navy to describe tactical approaches to permit a damaged sea vessel in naval battle to continue functioning. Subsequent use in the medical field appears to have begun with the experience of military surgeons in Korea. General trauma surgeons extended the damage control concept to the multiply injured patient in extremis who required life-saving interventional procedures, such as laparotomy and thoracotomy, but in whom any further procedures were believed to jeopardize the potential for survival.

This surgical strategy was named “damage control surgery” by Rotondo et al1 in 1993. Practices evolved to rapidly control bleeding and shock, and to relieve brain injury with procedures that were nondefinitive and less stressful to the patients’ physiology, trying to avoid the lethal triad of acidosis, hypothermia, and coagulopathy. During the 1980s and 1990s, research in multiply injured patients showed that early stabilization of long bone fractures decreased the incidence of systemic complications such as adult respiratory distress syndrome and multisystem organ failure, and decreased mortality. Early and aggressive stabilization of open fractures was found to decrease sepsis. The concept of “early total care” evolved from these findings and has become a hallmark of trauma and orthopedic care around the world.

EARLY TOTAL CARE

As early total care became a regular practice at trauma centers, the concepts of damage control surgery and early total care collided. General surgeons and neurosurgeons committed to the benefits of damage control insisted that some patients were “too sick” for definitive orthopedic operations whereas orthopedists convinced of the benefits to the patient of early total care argued for immediate fracture fixation. Each group has examined the issue from their perspective and found subsets of patients in whom both are correct. This has led to the evolution of damage control orthopedic surgery predicated on early fracture stabilization with quick, minimally invasive and often nondefinitive means.

A controversial example is the treatment of femoral shaft fractures in the multiply injured patient with refractory shock. Damage control orthopedic surgery advocates rapid external fixation of the femur during the resuscitation period, permitting early stabilization and mobilization without the potential risks of blood loss, increased fat embolism rate, and prolonged time in the operating room, which can occur with reamed or unreamed nailing. Early total care practitioners urge aggressive resuscitation of the patient and subsequent intramedullary nailing within 24 hours to achieve the same benefits.

Few studies exist exploring the relative benefits of these contrasting philosophies. Pape et al2 showed an increased mortality in polytraumatized femur fracture patients with chest trauma who received an intramedullary nail in the first 24 hours. Nowotarski et al3 demonstrated that conversion of an acute external fixation to a reamed nail in these patients was safe and effective if performed within 2 weeks. Townsend et al4 reported that if significant precautions were taken to insure maintenance of central perfusion, intramedullary nailing of neurotrauma patients was safe and effective. Unfortunately, for each study in the literature advocating one method, a contrary view can be cited from an equally reputable group.

MAKING THE RIGHT DECISION

What is the answer for the orthopedist in the middle of the night? The first point is to understand the underlying physiology responsible for these divergent philosophies and experiences. Trauma patients are prone to systemic inflammation in the hours following their traumatic episode. Injured cells throughout the body release cytokines and other inflammatory mediators that can lead to systemic inflammatory response syndrome (SIRS), multiple organ dysfunction syndrome (MODS), and disseminated intravascular coagulation (DIC). These complications can be prevented or delayed by early intervention and aggressive resuscitation with goal-directed therapies such as fluid resuscitation, transfusion of packed red blood cells, and early administration of vasopressors. Early total care practitioners believe that by aggressively resuscitating the patient and performing early fracture fixation, they can reduce the risk of secondary complications. Damage control orthopedic surgeons argue that by avoiding the potential risks associated with definitive surgery, they can improve patient survival.

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Correction

In the article “Functional Assessment Using the Step-Up-and-Over Test and Forward Lunge Following ACL Reconstruction” in the June 2004 issue of *Orthopedics*, the name of the second author was spelled incorrectly on the table of contents and on page 602. It should have read:

Functional Assessment Using the Step-Up-and-Over Test and Forward Lunge Following ACL Reconstruction

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REFERENCES


