

Acute Management of the Traumatically Injured Pelvis



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KEYWORDS

• Pelvis • Trauma • Hemorrhage control • Open fracture • REBOA

KEY POINTS

- Severe pelvic injury has a high mortality even in modern series.
- Exsanguination from blunt pelvic trauma is a common cause of preventable death.
- Initial treatment generally involves damage control resuscitation and external pelvic wrapping.
- Definitive hemorrhage control may require multiple modalities and multiple disciplines.
- Recognition of associated injuries, particularly the presence of compound fractures, is essential.

Managing patients with severe pelvic fractures is one of the most challenging aspects of trauma care. Pelvic fractures frequently result from high-energy mechanisms, often with associated multisystem injuries, and can lead to catastrophic hemorrhage. There is a high risk for serious morbidity and mortality with these injuries. Trauma registry studies from multiple countries report that unstable pelvic fractures are associated with mortalities ranging from 8% to 32%.^{1–6} However, there has been a trend toward decreased mortality among patients with severe pelvic fractures as trauma care has evolved.⁷ Despite advances in trauma care, mortality remains high for the subset of patients presenting with pelvic fractures complicated by hemorrhagic shock. Contemporary studies, using modern best management practices, report mortalities of 32% for these patients.⁵

Conflicts of Interest: All of the authors report no financial or professional conflict of interest.

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Emerg Med Clin N Am 36 (2018) 161–179

<https://doi.org/10.1016/j.emc.2017.08.011>

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This article focuses on the current approach to severe pelvic injury, including diagnosis and classification, pelvic binding, angiography and embolization, operative stabilization, and treatment of associated injuries, as well as exploring emerging therapies, including resuscitative endovascular balloon occlusion of the aorta (REBOA) and hybrid operative and angiography suites.

ANATOMY AND CLASSIFICATION FOR EMERGENCY MEDICINE TRAUMA PRACTITIONERS

The bony anatomy of the pelvis can be conceptualized as a ring formed by the sacrum and right and left innominate bones, specifically the ischium, ilium, and pubis.⁸ Viscera of the gastrointestinal and genitourinary system are housed within the bony pelvis. Paired internal iliac arteries and their related tributaries are the predominant arterial supply of the pelvis. The venous system follows a similar path but is arranged in a plexus adherent to the posterior pelvic wall. Pelvic fracture bleeding predominantly arises from the venous plexus or cancellous bone; however, arterial bleeding occurs in a significant number of cases and is associated with life-threatening hemorrhage.⁹ Knowledge of pelvic fracture classification is useful in predicting likelihood of severe injury and to aid communication with consultants.

A variety of classification systems have been proposed; the 2 most commonly described in the emergency medicine (EM) literature are the Young-Burgess (YB) and Tile fracture classification systems. The YB system is mechanistically based with fractures classified as lateral compression, anteroposterior compression, vertical shear, or combination injuries with levels of gradation depending on the degree of disruption of the ligamentous and bony stabilizers of the pelvis.¹⁰ The Tile classification system is based on the integrity of the posterior sacroiliac ligaments of the pelvis and associated mechanical instability (Tile A, stable; Tile B, rotationally unstable; Tile C, rotationally and vertically unstable).¹¹ Further details regarding these classification systems are available in EM and trauma textbooks⁸ and review articles.¹² Several studies support the utility of both the YB and Tile systems to predict need for blood transfusion and associated injuries.^{10,13–16} However, these results have not been consistently replicated across all studies and fracture classification cannot reliably predict mortality.^{9,17–19} In the subset of patients with persistent shock after initial resuscitation (for the authors, this means an appropriately placed pelvic binder and administration of 2 units packed red blood cells and tranexamic acid), the presence of a severe pelvic fracture does predict an increased probability of a pelvic source of hemorrhage and need for arterial embolization.²⁰ Fracture pattern should be considered as one component of determining the likelihood of an associated vascular or visceral injury but must be interpreted in the context of the patient's hemodynamic status and associated injuries.

APPROACH TO INITIAL ASSESSMENT AND MANAGEMENT OF PELVIC FRACTURES

The authors' approach to the assessment and management of the severely injured pelvis is outlined in [Fig. 1](#). Further details and description are provided later, including exploration of areas of nonconsensus among trauma practitioners.

Initial Resuscitation

Resuscitation of severely injured patients with trauma is covered in depth elsewhere (see Tim Harris and colleagues article, "[The Evolving Science of Trauma Resuscitation](#)," in this issue). Specific to patients with severe pelvic fractures is the need to obtain meaningful supradiaphragmatic intravenous (IV) access. The potential

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