Pelvic emergency management: the first 24 hours

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Abstract

Pelvic ring injuries are a major cause of morbidity and mortality in the polytrauma patient. Mortality rates from pelvic ring injuries have declined, unrelated to injury severity. This is due to an improved understanding of trauma as a disease, initial and subsequent management options. There are a number of guidelines pertaining to these injuries. These have been brought together to provide an overview of the current guidance on the emergent management of these complex injuries. The foundations of treatment for these injuries includes the following: recognition of the high energy involved, rapid assessment, resuscitation and temporary stabilization of bony and soft tissue injuries. It is important to involve a multidisciplinary team prior to definitive management. By following the guidance set out by this article, the orthopaedic trauma team in the receiving hospital can optimize the patient and prepare them for transfer to the regional major trauma centre. This will improve patient morbidity and mortality and ensure standardization of pelvic trauma management in the first 24 hours.

Keywords acetabular; guidelines; haemorrhage; initial management; pelvic; trauma

Introduction

The British Orthopaedic Association published national guidelines for trauma management in 2008 (BOAST) to aid clinicians in their practice but also improve and standardize care across the UK. BOAST 3 (revised and republished January 2018) guides the management of pelvic and acetabular fractures and discusses the need for referral. BOAST stated that ‘a mismanaged pelvic injury can lead to early death from haemorrhage or major disability while delayed or poor management of an acetabular fracture can lead to accelerated osteoarthritis and avoidable permanent hip dysfunction’. Recommendations include awareness of major haemorrhage and resuscitation techniques, early application of a pelvic binder, unstable haemorrhage recommendations and conversion to pelvic packing and embolization. Once stabilization has occurred there is a need for early CT scanning and classification of the injury. Points are raised with regard to the possible genito-urinary injuries, need for further imaging and urgent urology input according to a separate BOAST on urological injuries associated with pelvic fractures. There is also some new guidance on stoma formation in the case of open fractures. Following haemodynamic and temporary skeletal stabilization, a definitive plan for pelvic reconstruction needs to be formulated and acted upon within 5 days of the injury by a specialist pelvic surgeon. BOAST advises radiological image transfer to the pelvic unit within 24 hours. Patient follow-up should occur in the specialist pelvic units to ensure full advice is available and chemical thromboprophylaxis should start within 48 hours of injury providing there are no contraindications.

Recent NICE guidance (2016) on major trauma incorporates BOAST advice but expands on the aspects of haemorrhage and resuscitation as well as the use of pelvic binders. Suspected pelvic fracture patients should be transported to the nearest hospital or if they fulfil major trauma triage to an MTC (major trauma centre). Secondary transfer to an MTC is advised within 24 hours once the patient has been stabilized. If a patient is haemodynamically unstable at the scene the patient should be taken to the MTC directly. They advise the use of a pelvic binder if active bleeding is suspected from a pelvic fracture following ‘blunt high energy’ trauma. Any binder, purpose made or improvized will be acceptable as long as it is placed correctly. Removing the binder should be done ‘as soon as possible’ or within 24 hours of application if there is no pelvic fracture, the fracture is mechanically stable, the binder is not affecting stability or haemodynamic stability has been achieved. Before removal, it is advised to discuss the mechanical stability with the pelvic specialist.

NICE recommends use of CT scanning as first-line imaging in patients over 16 or children with high-energy pelvic fractures who are responding to resuscitation. Patients with suspected haemorrhage should have limited diagnostic imaging, that is, chest and pelvic X-rays or focused assessment with sonography for trauma (FAST) scanning. FAST scanning should not be used before CT and negative FAST scans do not exclude intraperitoneal or retroperitoneal haemorrhage. CT scanograms should be used to detect limb trauma.

Interventional radiology should be considered in solid organ arterial haemorrhage and surgically inaccessible sites. Regarding pelvic haemorrhage first-line treatment of arterial bleeding is use of intervention radiology and pelvic packing if emergency laparotomy is performed. Haemostatic agents such as tranexamic acid (IV) should be given within 3 hours if suspected haemorrhage occurring. Prothrombin complex can be used to reverse vitamin K antagonists and consultation with a haematologist is recommended.

Physiological criteria should be used to assess the patients haemodynamic status and the response to immediate volume resuscitation. Concern should cause one to activate the major haemorrhage protocol. ‘Damage control surgery’ should be used

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for patients who are non-responders to fluid resuscitation. Definitive surgery can be considered in patients who have stabilized following resuscitation but who were unstable at first presentation and those who have always maintained their haemodynamic status.

Understanding the injury

Injuries can be intentional or non-intentional. Intentional injuries account for 50% of the trauma we are exposed to in the UK including the suicide attempts and interpersonal violence. Contributing factors to this include alcohol, drugs and street violence. Unintentional injury incorporates road traffic collisions, falls, domestic violence and occupational injury. High-energy pelvic fractures are rare with 37 cases per 100,000 person-years. The causes of significant pelvic fractures in adults are; motor vehicle crash (50–60%), motorcycle crash (10–20%), pedestrian versus car (10–20%), falling (8–10%), crush (3–6%). In children the causes are commonly pedestrian versus car (60–80%) or motor vehicle crash (20–30%). The key to treating trauma is understanding the mechanism of injury and the role of energy transfer in injury pathophysiology. By understanding the kinematics of matter movement and how it interacts during a collision one will be able to predict the severity of injury and the need for specialist intervention early.

Pelvic ring fractures are classified as low-energy or high-energy injuries. Low-energy injuries are common and seen more commonly in the elderly. The incidence increases with age peaking in patients above 90. High body mass index (BMI) and male sex are protective of pelvic fractures. Mortality in patients who sustain low-energy fractures was reported to be approximately 10% at 1 year, 20% at 2 years, and 50% at 5 years.[1] Prognosis worsens with the presence of dementia and age. Hill et al in 2001 reviewed the epidemiology of high-energy pelvic ring injuries and found them to be classified as stable in 55% of cases, rotationally unstable in 25% and unstable in translation in 21%; concomitant acetabular fractures were present in 16% of cases.[1]

Pelvic injury and mortality

The anatomy of the pelvis is straightforward and comprised of the sacrum, ischium, wing and body of the ilium and pubic bones (a fusion of three bones) to create a bony ring that is attached at the front by two strong ligaments, the symphysis pubis and the pubic ligament. The iliac wings attach to the sacrum via very strong sacroiliac ligaments. The ring protects visceral contents and traversing neurovascular structures. Distortion of the ring occurs primarily after high-energy injuries causing pelvic instability, organ damage and extensive haemorrhage. Fractures of the pelvis are now becoming more commonly seen in lower energy injuries such as in the elderly who have osteoporotic bones and poor bone health. In the adult population pelvic fractures represent 6% of all fractures however occur in 20% of all polytrauma cases.[2] In 2010 Evans et al found that 74% of patients dying following polytrauma was due to musculoskeletal injury of which 23% of death was directly related to haemorrhage from a pelvic fracture.[3]

Evidence suggests that pelvic fracture mortality has been decreasing over the years and studies from the German Trauma Registry illustrate significant drops in mortality despite there being no overall change in the injury severity score (ISS). It has been proposed that mortality is more likely to be associated with other significant injuries and not from isolated pelvic fractures.[4] Gansslen et al found that the overall mortality rate for any classification of pelvic fracture was 13.4% but this did depend significantly on the associated extra-pelvic trauma. In complex pelvic injury the mortality rate increased to 31.1% however when there was no associated soft tissue injury the rate dropped to 10.8%. Causes for this improved mortality rate could also be related to medical advances, algorithms and protocols associated with major trauma and physiology from military casualty. The introduction of MTCs in the UK and the application of pelvic compression devices at the scene of the accident to improve the patients chances of physiologically stabilizing pre-admission to a trauma centre may have also contributed to decreased mortality. Trauma is a cause for unpreventable death in 90% of the civilian population. Of the 10% which can be prevented up to 85% are potentially reversible haemorrhagic situations which occur within the first 6 hours of injury.[5]

Initial assessment

Advanced trauma life support (ATLS) looks predominantly at the concept of the 'golden hour' which is the time from accident to successful treatment implementation so as to have a positive impact on morbidity and mortality. Initial assessment of any pelvic fracture should include predicting the injury pattern, assessment of the patient pre- and post-hospital admission, temporary stabilization, making plans for shock and open pelvic fractures, extra-peritoneal packing and planning for the outcomes. Assessment of the whole pelvic region is imperative to rule out urogenital injuries. In patients with altered Glasgow Coma Scale scores of less than 13, haemodynamic compromise or distracting injuries have been shown to affect the examination of a pelvis and thus produce inaccurate assessment thus routine radiological assessment is recommended.[6]

Uncontrolled haemorrhage in trauma is the most common cause of preventable death.[7] ATLS principles aim to stem major haemorrhage before any other system is intervened as uncontrolled blood loss will result in a low circulating blood volume which leads to circulatory collapse. Therefore simple observations will aid in the direction of primary management, that is, heart rate, blood pressure, respiratory rate and oxygen saturations.[8] During resuscitation of patients following the <C> ABCDE set out by ATLS, priority is given to preventing the lethal triad. This consists of hypothermia, acidosis and progressive coagulopathy. The most efficient way to prevent this is to reduce massive blood loss (<C> catastrophic haemorrhage) before assessing airway (A). Bleeding can be obvious but when it is not, one must act to reduce possibilities such as loss from pelvic fractures. Feeling the pubic symphysis (under a pelvic compression device (PCD)) will give you an idea of whether the uncontrolled haemorrhage is coming from an open book pelvic injury or elsewhere. Application of an external PCD at the scene or in the resuscitation department will reduce further haemorrhage and aids transportation of the patient.

CT scanning is the best imaging study for evaluation of pelvic anatomy and degree of pelvic, retroperitoneal, and

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