Review Article

Evaluation of Trauma-Related Pelvic İnjuries and Their Complications, Review Article

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Abstract

Pelvic trauma, a complex clinical scenario, encompasses a spectrum of challenges in both diagnosis and management. The intricate nature of pelvic fractures and their potential complications, extending beyond the immediate injury, underscores the need for a nuanced and comprehensive approach to patient care. This brief overview delves into the multifaceted aspects of pelvic trauma, exploring the classification systems guiding treatment decisions and highlighting the delicate balance between life-saving interventions and potential adverse outcomes. Studies involving individuals with non-alcoholic fatty liver disease were sought for using the following databases; Medline, Pubmed, Embase, NCBI, and Cochrane. Analysis was done on the incidence, etiology, and available treatments. Pelvic trauma presents an intricate and multifaceted clinical challenge, demanding careful consideration in both its diagnosis and management. Complications arising from interventions in pelvic trauma, encompassing the application of pelvic binders, angioembolization, and REBOA, underscore the intricate balance between life-saving measures and their potential adverse outcomes.

Keywords: Pelvic injuries, Complication, Trauma, Traumatic injuries.

Introduction

Traumatic injuries encompass a spectrum from minor wounds to severe, intricate injuries leading to shock and dysfunction of multiple organ systems. Notably, trauma stands as the primary cause of death among individuals aged 15 to 24, constituting approximately 30% of all annual ICU admissions. Because such injuries usually take a great amount of force to occur, pelvic trauma in particular raises serious concerns. It typically coexists with other injuries, transfusion requirements, and protracted rehabilitation [1].

The pelvis is ring-like and composed of bones such as the sacrum and the coccyx, as well as innominate bones (the ilium, ischium, and pubis). These innominate bones come together to produce the pubic symphysis and the acetabulum, respectively. Because it contains blood arteries, nerves, the rectum, and the urogenital organs, the pelvis is a complex structure [1].

Many vascular structures are anatomically connected to the pelvis. The aorta splits into the common iliac arteries at the L4 level, and at the sacroiliac joint, it further separates into internal and external branches. When there is pelvic trauma, the superior gluteal artery—which emerges from the internal iliac artery and leaves the pelvis at the sciatic notch—is more prone to damage. Other intrapelvic arteries prone to injury include the vesical artery, obturator artery, rectal arteries, and the inferior gluteal artery. Veins and accompanying arteries, are also injury-prone, contributing to a high incidence of multiple trauma [2]. Hematoma and hemorrhagic shock are real potential associated with the severity of pelvic fractures. Hence, morbidity and mortality are often the result of hemorrhage from pelvic fractures.

lumbosacral plexus injuries are predominant pelvic trauma, while nerve injuries are often less frequent than vascular

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damage. Situated near the sacroiliac joint and acetabulum—frequent sites of pelvic injuries—the plexus is susceptible to injury. Severe pelvic trauma may lead to root avulsion, although it is relatively uncommon. Injuries to the lumbar plexus are less frequent, often occurring due to traction or compression resulting from retroperitoneal bleeding [3].

Epidemiology

Pelvic fractures constitute a significant portion, approximately 10%, of fractures observed in patients who have experienced blunt trauma. More than 16% of people in this cohort who have pelvic fractures also have at least one other injury. Among the various structures affected, intraabdominal organs bear the brunt of the trauma, with the kidneys, liver, and spleen being the most commonly impacted. The significant effects of pelvic fractures are highlighted by urogenital lesions, which make up more than 40% of related injuries [4].

In the context of pelvic trauma, urethral injuries are noteworthy, occurring in up to 24% of patients, and approximately 20% of these cases involve an associated bladder laceration. Among males, the majority of urethral injuries are localized to the bulbomembranous junction. In 1% to 2% of cases, traumatic rectal injuries associated with pelvic fractures are less common. Among cases where pelvic fractures are documented, 2% to 4% involve vaginal lacerations [5].

The AAST (American Association for the Surgery of Trauma) provides a classification for vaginal injuries, categorizing them into three degrees, ranging from I to III. First-degree injuries involve hematoma, contusion, and superficial lacerations confined to the mucosa. Lacerations of the second degree include deep muscle or fat layers, while third-degree lacerations affect structures such as the cervix, peritoneum, or nearby organs [5].

It is fairly common to observe pelvic nerve and vascular lesions in the context of pelvic fractures. The internal iliac artery's anterior branches, comprising the lateral sacral artery, the superior gluteal artery, and the pedestal and obturator arteries, are also frequently affected. Similarly, veins, including the prevesical veins and the presacral plexus, are commonly involved. Importantly, fractured bones can be responsible for blood loss emanating directly from them, adding another layer of complexity to the management of pelvic trauma. The intricate interplay of injuries to various structures necessitates a comprehensive approach to diagnosis, classification, and treatment in the context of pelvic fractures [6].

Classifications

• Tile Classification

Type A: fracture that is rotationally and vertically stable;
Type B: fracture that is vertically stable but rotationally unstable;
Type C: fracture that is both vertically and rotationally unstable.

• Young-Burgess Classification

1. Anteroposterior Compression (APC): Often unstable, associated with "open book" pelvic fractures, causing pelvic and retroperitoneal hemorrhage, Usually, as a result of a motor vehicle collision (MVC).
2. Lateral Compression (LC): Common and often stable, but oftentimes seen together with bladder rupture. Seen often as a result of a T-bone MVC or a pedestrian hit from the side.
3. Vertical Shear (VS): Usually unstable, requires a powerful force on one or both hemipelves (fall or jump from a high vantage point, getting caught underneath a falling tree). The result is a complete ligamentous injury.
4. Combined Mechanism (CM): Varied patterns with combined mechanisms [7].

• WSES (World Society of Emergency Surgery) Classification

1. Mild (WSES Grade I): Stable fracture, patient is hemodynamically stable. APC I and LC I fractures.
2. Moderate (WSES Grade II and Grade III): Unstable fracture, but the patient is hemodynamically stable
   Grade II: APC II, APC III, LC II, LC III fractures.
   Grade III: VS and CM fractures [7].
3. Severe (WSES Grade IV): Any fracture pattern in a hemodynamically unstable patient [8]. The fracture in this instance is either stable or unstable.

• For Treatment

1- Minor Injuries: Typically managed non-operatively.
2- Moderate Injuries: Pelvic binder in the field, but if a blush is caught on the CT scan then angioembolization should be considered.
3- Severe Injuries: Pelvic binder in the field, treatment options include angioembolization, preperitoneal packing, or resuscitative endovascular balloon occlusion of the aorta (REBOA) [8].

Treatments

Pelvic fractures, irrespective of their severity, pose a potential threat to life. Initiating treatment for pelvic fractures is a critical aspect of the primary survey, concentrating on the airway, breathing, and circulation, (ABCs). Proper resuscitation is essential for every patient suffering from trauma, involving the placement of two large-bore IVs upon arrival at the trauma bay. In cases of hypotension, aggressive fluid resuscitation is the initial step, and if the patient remains hypotensive, blood products may be administered [9].

Pelvic binders play a crucial role when there are indications of pelvic ring disruption, regardless of the patient's stability. These binders serve a dual purpose in reducing bleeding: they compress bone hemorrhage and decrease pelvic volume,

promoting a tamponade effect. It's crucial to remember that pelvic binders are only meant to be used temporarily before a more permanent procedure can be carried out. Their proper application is crucial to their efficacy; to precisely adduct the legs and decrease pelvic volume, the binder must be positioned around the pubic symphysis and greater trochanter. However, it's crucial to avoid placing a pelvic binder in cases of lateral fractures, as this can potentially exacerbate bleeding [10].

Complication

Prognostic assessments in cases of pelvic fractures are challenging due to the array of associated injuries. A study revealed that more than half of individuals with traumatic pelvic fractures endure chronic pelvic pain, often linked to depression and anxiety. External fixation, while addressing pelvic fractures, introduces complications such as pin site infections. These infections can be managed with antibiotics either oral or intravenous, possibly accompanied by site debridement. External fixation may also lead to lateral femoral cutaneous nerve injuries [11].

Urogenital injuries associated with pelvic fractures can result in sexual dysfunction, encompassing issues like restricted motion, erectile dysfunction, and dyspareunia. Further consequences include fecal and urinary incontinence, about 31% to 69% of whole urethral transections were found to have urethral strictures. Conservative treatment options for urethral strictures involve dilation, but posterior urethroplasty (bulbomembranous anastomosis) may be necessary if dilation proves ineffective, with success rates exceeding 90% [12].

The initial approach to treating urinary incontinence is conservative, involving pelvic floor strengthening, biofeedback, and, in some cases, the use of duloxetine in combination with physiotherapy. Treatment for incontinence using an implanted sacral nerve stimulator in the upper buttock has demonstrated promise. For cases where conservative measures fail, artificial urinary sphincter implantation becomes a viable option.

Fecal incontinence starts with nonoperative approaches like dietary modifications, fiber supplements, and medications to regulate bowel movements. Physical therapy and biofeedback are effective in strengthening the pelvic floor, while sphincteroplasty may be performed if conservative methods fall short. Surgical interventions, including the implantation of artificial or magnetic anal sphincters, remain additional options, along with sacral nerve stimulators [13].

It's crucial to acknowledge potential complications arising directly from the use of a pelvic binder. Skin necrosis can occur if the placement has lasted longer than 24 hours, and pressure ulcers are likely after 2-3 hours. Considering the heightened risk of deep venous thrombosis in trauma patients, especially those with decreased mobility and bone fractures, preventive measures such as mechanical serial compression devices and chemoprophylaxis are essential until ambulation is possible [13].

Angioembolization presents risks for at least 5% of cases though it has been proven effective. These complications include hematoma, dissection, thrombus, or pseudoaneurysm around the Access site. Pelvic tissue necrosis is a severe complication requiring exploration and repair. Contrast-related reactions or contrast nephropathy leading to acute kidney injury are also potential complications.

Regarding REBOA (resuscitative endovascular balloon occlusion of the aorta), There are several problems, with vascular damage being the most common [13]. These may include dissection, perforation caused by the balloon to lower extremity ischemia, rupture of an artery, reperfusion injury, and compartment syndrome induced by the catheter. Prolonged occlusion may result in irreversible organ ischemia, while reperfusion can lead to the dysfunction or failure of multiple organs, fatalities, spinal cord infarction, intestinal ischemia, liver failure, and acute renal damage [14]. Resolving issues related to the access site may involve bypasses, patch repairs, or artery reconstructions. Amputation of the leg may be required in severe circumstances. REBOA-related aortic injuries are usually limb- or life-threatening, and multiorgan dysfunction is mostly treated medically [14].

Conclusion

Pelvic trauma presents an intricate and multifaceted clinical challenge, demanding careful consideration in both its diagnosis and management. The potential complications stemming from pelvic fractures reach beyond the immediate injury, impacting diverse physiological systems. From persistent pelvic pain to complications involving the urogenital and gastrointestinal systems, the consequences can significantly impair a patient's overall well-being. Anatomical classification systems like Tile, Young-Burgess, and WSES play a pivotal role in characterizing fractures and gauging hemodynamic stability, thereby guiding the selection of appropriate treatment modalities.

Complications arising from interventions in pelvic trauma, encompassing the application of pelvic binders, angioembolization, and REBOA, underscore the intricate balance between life-saving measures and potential risks. Healthcare professionals must remain vigilant regarding complications such as skin necrosis, infections, and vascular injuries. This necessitates adopting a comprehensive, patient-centric approach to ensure optimal outcomes and minimize untoward effects.

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