



## Current Best Practice in Pelvic and Hip Fracture Management in the Older Adult Population

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### PELVIC FRACTURES IN OLDER ADULTS

Pelvic ring fractures (PRFs) are a leading cause of preventable deaths in trauma patients. A 2007 Australian study<sup>1</sup> found that the incidence of PRFs over a 12-month period was approximately 23/100,000 population with 10/100,000 population incidence of high-energy (HE) PRFs (mostly young males) and 10/100,000 population incidence of low-energy (LE) PRFs (mostly older females). The incidence of major bleeding was 1.3/100,000 population.

60% of the 32 deaths due to PRFs occurred in the pre-hospital environment and, of those who made it to the hospital, the mortality rates were 7% in the HE group and 2% in the LE group. Hemorrhage was a major contributor to mortality in the pre-hospital deaths and the HE group and less so in the LE group.

Pelvic fractures in the younger population (< 65 years) are due to traffic crashes or high falls and in the older population (> 65 years) are due to falls from a standing height and these fractures are often associated with osteoporosis. Older patients have an increased length of stay in the hospital and are less likely to return to independent living. According to a recent Finnish study, the mortality risk at 90 days after a pelvic ring fracture, treated non-operatively and compared to the general population, increased by 8.5-fold for females and 11-fold for males.<sup>2</sup>

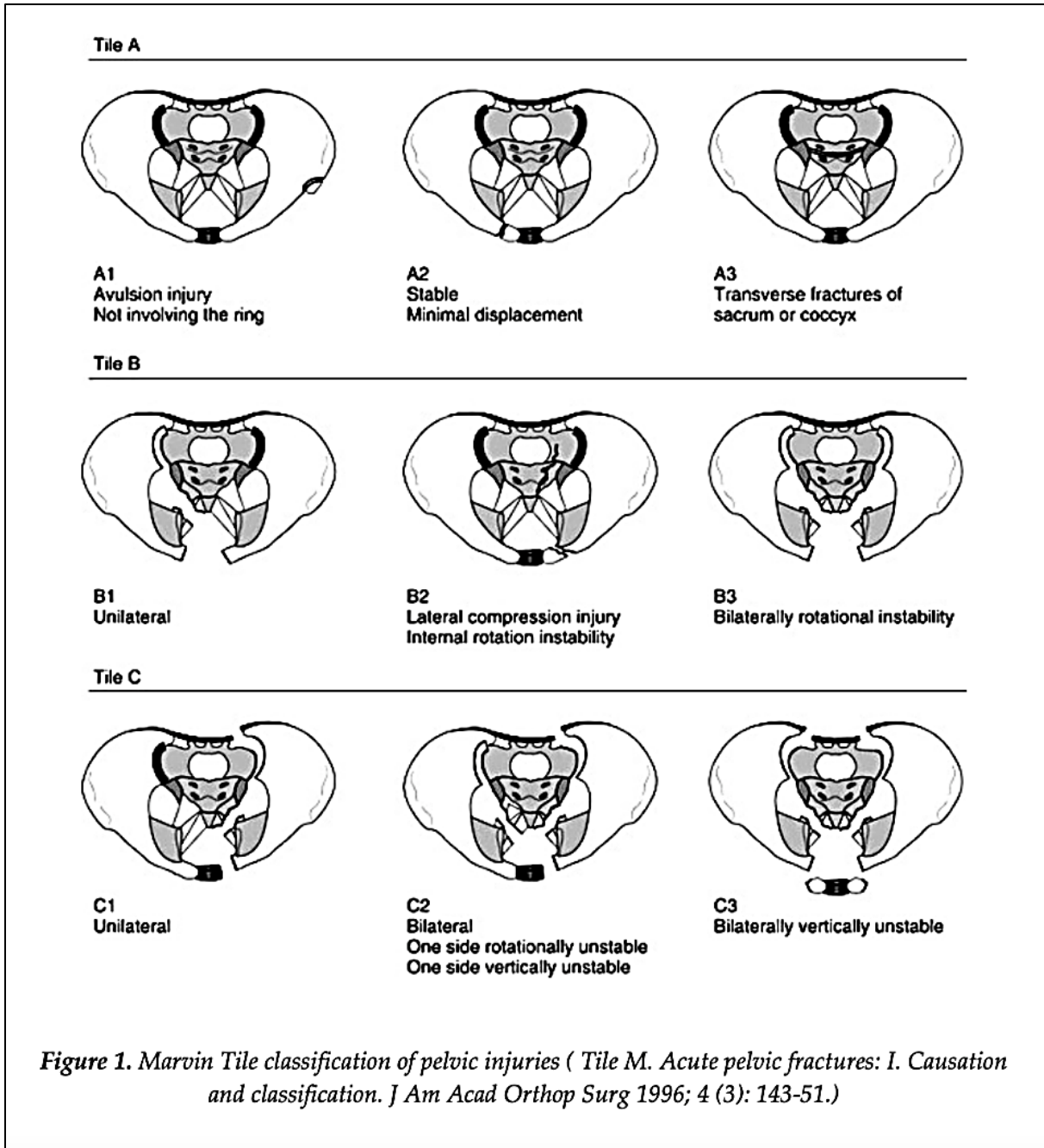
There are several classifications of pelvic fractures which include the Tile Classification,<sup>3</sup> the Young and Burgess classification,<sup>4</sup> and the Comprehensive Classification of Pelvic Fractures.<sup>5</sup>

#### *Tile Classification of Pelvic Fractures*

(Figure 1) based on stability by clinical and radiological assessment.

- Intact ring- stable posterior arch
- Posterior sacroiliac complex is intact- incomplete disruption of post arch (Open book fracture)
- Posterior sacroiliac complex injured- unstable/complete disruption of post arch (sacroiliac fracture-dislocation)

Figure 1. Tile Classification of Pelvic Fractures



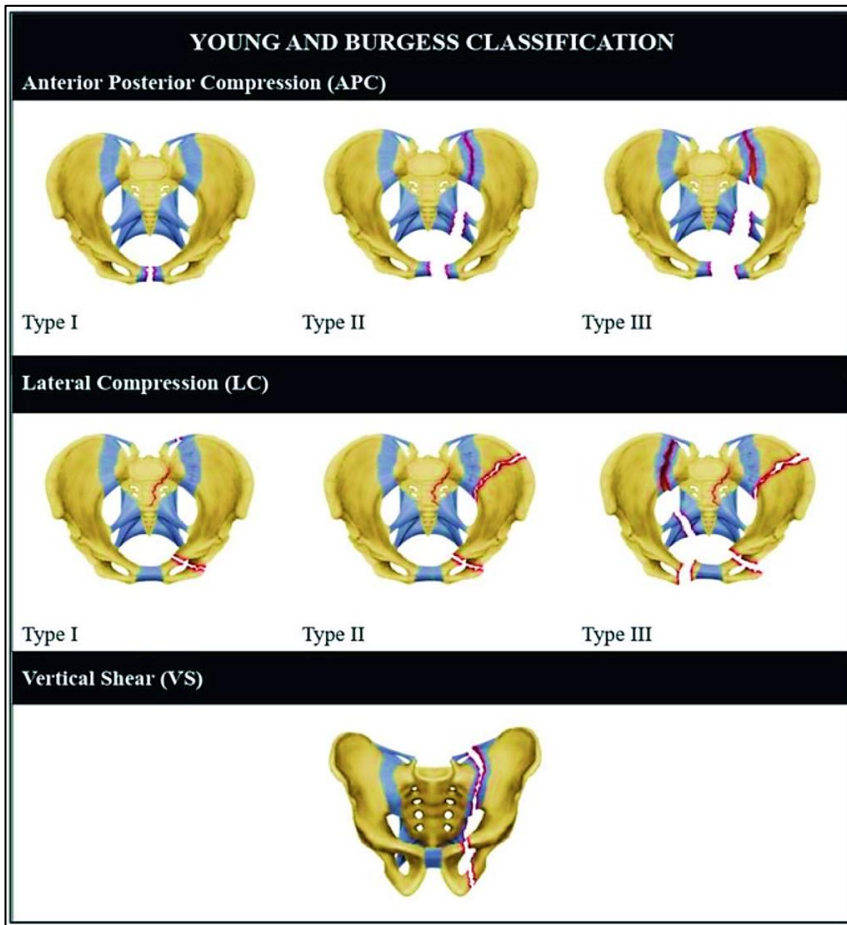
### Young and Burgess Classification of Pelvic Fractures

(Figure 2) according to the vector of the force applied to the pelvis.

- Antero-Posterior Compression fracture
  - 25 %
  - Pubic symphysis diastasis
  - Vertical fracture of pubic rami
- Lateral Compression fracture
  - Most common 60%
  - Transverse fracture of pubic rami
- Vertical shear fracture

- Least common 5%
- Vertical fracture of the anterior and posterior pelvis
- Highest risk of bleeding (70%)

**Figure 2. Young and Burgess Classification of Pelvic Ring Injuries**



There is also a trend towards classification of pelvic fractures as either spontaneous or due to low impact as “Fragility Fractures.”<sup>4</sup> This classification is complicated and depends on morphological criteria which correspond to the degree of instability. This is used as a management guide for both the type and extent of surgery if unstable.

### **Comprehensive Classification of Pelvic Fractures**

A simpler classification of pelvic fractures is the “AO/ CCF” (Comprehensive Classification of Fractures).<sup>6</sup> **Figure 3** below classifies the fractures into 3 groups:

- **Type A** involves the anterior ring or the iliac crest or the sacral bone below the Sacro-iliac (SI) joints. These fractures are stable and usually do not require surgical stabilization.
- **Type B** fractures involve the anterior ring and a partial fracture of the posterior ring.
- **Type C** fracture has complete disruption of the posterior ring with or without fractures to the anterior ring.

**Figure 3. Comprehensive Classification of Pelvic Fractures**

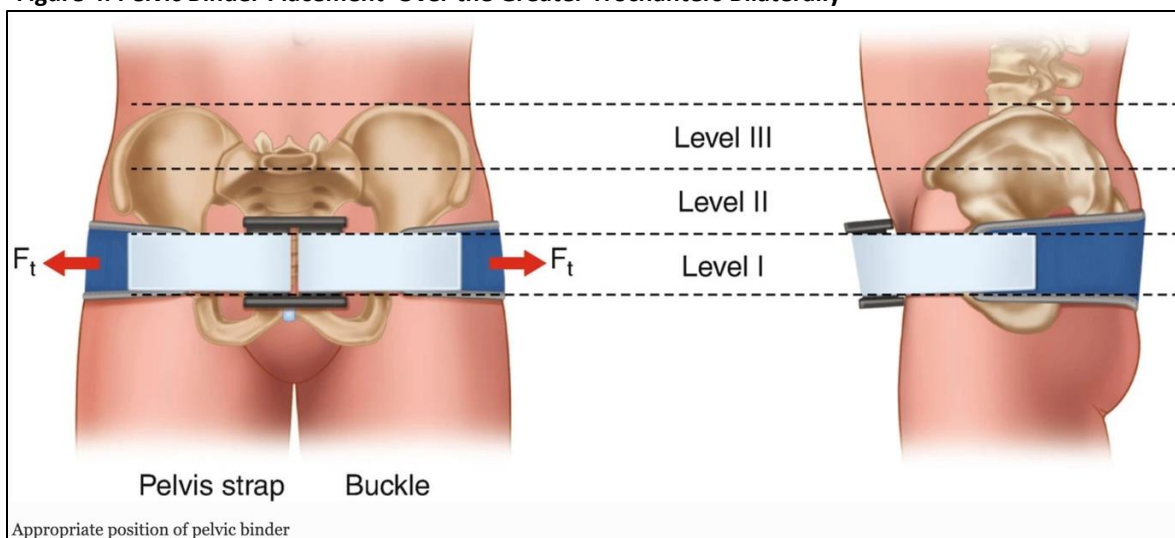
Comprehensive Classification
<b>Type A: Stable pelvic ring injury</b>
<b>A1: Avulsion of the innominate bone</b>
<b>A2: Stable iliac wing fracture or stable minimally displaced ring fracture</b>
<b>A3: Transverse fractures of the sacrum and coccyx</b>
<b>Type B: Partially stable</b>
<b>B1: Open-book injury</b>
<b>B2: The lateral compression injury</b>
<b>B3: Bilateral B injuries</b>
<b>Type C: Complete unstable</b>
<b>C1: Unilateral</b>
<b>C2: Bilateral, one side B, one side C</b>
<b>C3: Bilateral C lesions</b>

Type B and C are considered unstable and will require surgical stabilization if the patient is to regain mobility.

### Acute Management of Pelvic Fractures

- Initial attention to the ABCDE and analgesia in the form of small doses of narcotics
- There is no benefit in the initial assessment of pelvic stability by “rocking” the iliac wings and the possibility of causing further hemorrhage if already present.
- Circulation and hemorrhage control are obviously important if exsanguination and death are to be avoided.
- A pelvic binder should be applied to stabilize the fracture and reduce the volume of the pelvis if an X-Ray confirms an open-book fracture.<sup>7</sup>
- The presence of shock requires vascular access and a low threshold for blood product administration.
- Hemorrhage control requires early and correct pelvic binder application. **(Figure 4)**
  - Most bleeding is venous in origin but 10-15% is arterial and best seen as a “blush” on CT Angiography.

**Figure 4. Pelvic Binder Placement Over the Greater Trochanters Bilaterally**



- Once an arterial “blush” is seen, early Interventional Radiology arteriography and embolization are required.
- Urgent orthopedic assessment is required regarding the need for operative stabilization of the fractures either by external fixation or open reduction and internal fixation (ORIF).
- Adherence to an agreed guideline for the management of patients with hemodynamically unstable pelvic fractures leads to improved outcomes and less team conflict in the decision-making process.<sup>2</sup>
- The pelvic binder be removed when the patient is hemodynamically stable or when the pelvic fracture is judged to be stable usually on CT.<sup>7</sup>
  - The only caveat is the rare occurrence of a fracture through pubic symphysis which will show an obvious pubic symphysis diastasis on an X-ray of the pelvis after binder removal.

The complications associated with complex pelvic fractures include the following:<sup>8</sup>

- Bleeding and hemodynamic instability as seen on CT Angiography.

- Lumbo-sacral plexus injury with neurological deficit including bowel or bladder dysfunction or lower limb neurological deficit.
- Urogenital injury (including urethral or bladder rupture) associated with anterior pelvic fractures.
- Rectal injury associated with sacrum or coccygeal fractures.
- Open pelvic fractures have high mortality between 20-50%.

### ***Pelvic Fractures in Older Adults: Conservative versus Operative Fixation***

Isolated anterior pelvic ring (iAPR) fractures are usually treated conservatively with multi-modal analgesia (e.g., paracetamol, non-steroidal analgesics, opioids (both long and short-acting), early weight-bearing, and physiotherapy).

Gabapentin is reserved for neuropathic pain and would not be used for the acute pain associated with pelvic fractures as the dose should be increased slowly over 1-2 weeks and it takes up to 1-2 weeks before analgesia takes effect.

As many anterior pelvic ring fractures are associated with posterior fractures, orthopedic surgeons often recommend early transcuteaneous fixation of both anterior and posterior fractures which results in less pain, early mobilization, and improved overall morbidity and mortality.<sup>9</sup>

If patients with clinically unstable pelvic fractures are unable to mobilize within three days, then operative fixation should be considered for this subset of patients. These fractures most often involved the posterior pelvis as seen on fine-cut CT with 3-D reconstruction. Spinal anaesthesia/local analgesia in conjunction with monitored anaesthesia care is the preferred method of anaesthesia.

The authors in the above study<sup>9</sup> observed that a patient with a clinically stable pelvic fragility fracture should be able to mobilize within three days when a satisfactory analgesic protocol is utilized. Patients with clinically unstable pelvic fragility fractures were found to be unable to mobilize within three days even with adequate analgesia. A failure of early mobilization resulted in prolonged bed rest, increased narcotic use, and rapid deconditioning. The authors believed that this group of patients would most benefit from percutaneous minimally invasive pelvic fixation and early weight bearing after surgery. Early mobilization is encouraged and a failure to mobilize is associated with an increased risk of chest or urine infection as well as DVT/ Pulmonary embolism.

Postoperative care should include the following:

- Careful pin and wound care
- Deep vein thrombosis prophylaxis
- Adequate nutrition
- Early sitting out of bed
- Partial/Touch weight bear at least one side (P/TWB)
- Hydrotherapy may be helpful.

Complex pelvic fractures in older patients require early orthogeriatric consultation to avoid complications such as respiratory and urinary tract infections, delirium, and pressure ulcers as well as the recognition of acute coronary ischemia precipitated by acute blood loss. Elderly patients are also more susceptible to the effects of narcotic medication. This may include oversedation, particularly in cognitively impaired patients, as well as undertreatment resulting in impaired mobility, agitation, and more time in bed resulting in pressure areas or DVTs. Either of the above may translate to an increase in hospital length of stay, discharge to a rehabilitation facility instead of home, and an increased cost of care.

## ***Outcomes After Pelvic Fractures in the Older Population***

A Dutch study<sup>10</sup> retrospectively analyzed the outcomes of older patients with both anterior and posterior pelvic fractures at 6 and 12 months after admission. Unsurprisingly, complication rates were greatest in those patients with posterior pelvic ring fractures. They also found that mortality rates in Fragility Fractures of the Pelvis (FFP) at 6 and 12 months were 14% and 23% respectively which were like those of hip fracture patients at 15.8% and 24.5% for the same time intervals.

The authors also found that, in admitted patients, the strongest predictor of mortality at 12 months was the development of medical complications during the admission (OR 5.2) and this was closely followed by pre-existing dependent ambulatory status (OR 4.7.)<sup>11</sup>

### ***Summary***

Pelvic fractures in the older adult population are common. They are mostly due to low falls in a population with fragile bones. They usually involve the anterior and/or posterior ring. Posterior ring fractures always require a CT scan for diagnosis. Skeletal stabilization should be considered in anterior fractures with increasing pain or an inability to mobilize.

Posterior fractures will usually require surgical stabilization. The timing of surgery is important and should be done as early as possible to minimize complications associated with prolonged bed rest. Orthogeriatric services should be involved as early as possible in order to minimize the development of complications. Outcomes depend on complications in the hospital and pre-injury mobility status. Interventional Radiology (IVR)/arterial embolization may be appropriate if the patient is hemodynamically unstable.

## **HIP FRACTURES IN OLDER ADULTS**

The incidence and management of hip fractures in the elderly population have major consequences both for the individuals affected and for the impact on the healthcare system.<sup>11</sup> In 2010, there were an estimated 258,000 hip fractures in the US, and the annual cost to the US economy was estimated to be \$17-20 billion per annum. In Europe, there were an estimated 500,000 hip fractures in 2012 and the mortality in the first 12 months after hip fracture was estimated to range between 14-36%.<sup>12</sup> As the population ages the number of older patients admitted with hip fractures is likely to increase annually.

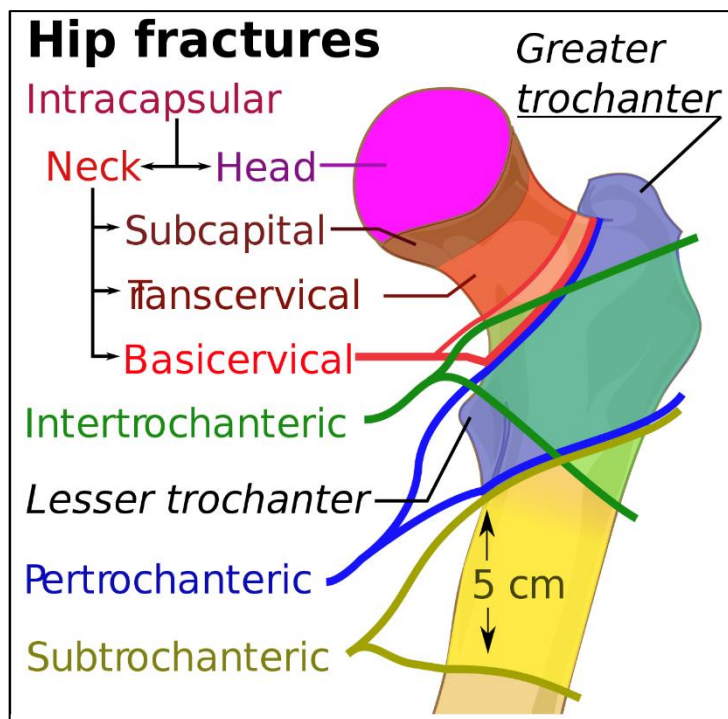
Early surgery within 24-48 hours of admission has been recommended by the NICE Clinical Guidelines<sup>13</sup> as this is associated with a shorter length of stay and a lower complication rate but there is no clear relationship between time of surgery and mortality.<sup>14</sup>

In addition to the economic costs of managing these fractures, there are significant costs to the individual and society including increased mortality, an inability to return to previous living conditions, and a requirement for an increased level of care and supervision. These fractures are also associated with decreased quality of life, decreased mobility, and secondary osteoporotic fractures.

Marks et al<sup>15</sup> reviewed the literature regarding the causation of hip fractures from 1966-2002 and found that the increasing incidence of hip fractures is likely due to an increasing tendency of the older population to fall which is associated with muscle weakness and low physical activity levels. Other factors may include poor nutrition, some medications, and neurological disorders such as Parkinson's Disease. They recommended several interventions to counter the co-morbid conditions which may lead to hip fractures.

Forni et al,<sup>12</sup> in a large retrospective observational study, found the implementation of multidisciplinary geriatric and orthopaedic interventions in elderly hip fracture patients resulted in a reduction in 30-day mortality. But they also concluded that further studies were required to determine if the co-managed model of care would lead to improved outcomes for patients with co-morbidities and reduce complications and functional decline after a definitive hip surgery.

Figure 5. Hip Fracture Classification



Hip fractures are classified according to their location and surgery is modified depending on the fracture site for the Femoral neck, Intertrochanteric, and Subtrochanteric regions. (Figure 5).

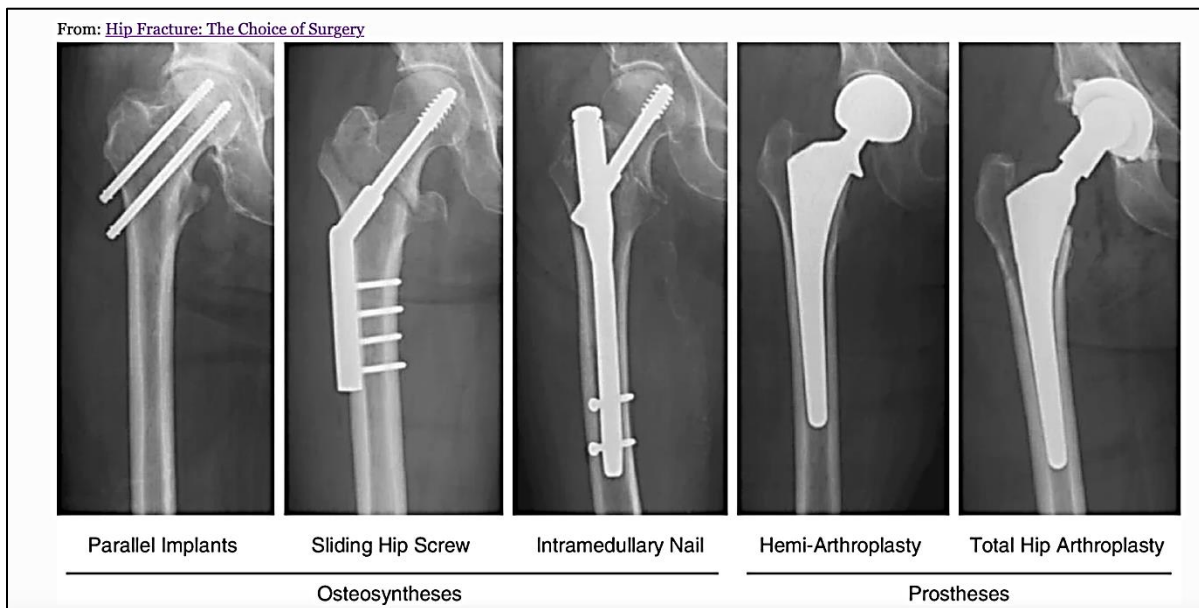
In the Emergency Department, the initial assessment and management of the older patient with a hip fracture include a rapid screen for other injuries, such as a head injury, as well as past medical history and current medication list.

Early intravenous access should be achieved, and a fluid bolus can be given as well as small boluses of narcotic analgesia titrated to pain. An early Fascia Iliaca Block (FIB) or femoral nerve block should be achieved under ultrasound guidance and a urinary catheter should be placed. The Orthopaedic team should be called as early as possible to plan for surgery.

Surgical treatment will depend on the region affected (Figure 6) and will involve:

- a compression screw or hemiarthroplasty for femoral neck fractures or
- a metal nail that may be inserted across the fracture in an intertrochanteric or subtrochanteric fracture.

Figure 6. Surgical Treatment of Hip Fractures



In 2015, the American Academy of Orthopaedic Surgeons made several recommendations for “best practice in (surgical) hip fracture management” based on the current evidence-based guidelines.<sup>11</sup>

Strong recommendations include the following:	Moderate recommendations include the following:
<ul style="list-style-type: none"> <li>• Preop regional anaesthesia</li> <li>• General/spinal anaesthesia</li> <li>• Arthroplasty for displaced femoral neck #</li> <li>• Blood transfusion only if Hb &lt; 8</li> <li>• Post-op nutrition supplementation</li> <li>• Interdisciplinary care in mild-moderate dementia</li> <li>• Post-op multimodal pain management</li> </ul>	<ul style="list-style-type: none"> <li>• MRI if the hip fracture is not seen on X-ray</li> <li>• No pre-operative traction</li> <li>• Surgery within 48 hours</li> <li>• No delay of surgery for aspirin/ clopidogrel</li> <li>• Surgery for stable neck of femur fractures</li> <li>• Total Hip Replacement in displaced neck of femur fractures</li> <li>• Sliding hip screw in Intertrochanteric fractures</li> </ul>

## CONCLUSION

A multi-disciplinary approach in pelvic and hip fractures in the elderly is desirable and can lead to better outcomes by optimizing the management of co-morbidities. Arterial bleeding in pelvic fractures seen on CT should be managed by interventional radiology where possible. Early parenteral opioid analgesia should be administered. There should be a low threshold for the surgical fixation of pelvic fractures as early definitive surgery leads to better outcomes and earlier mobilization. Complications such as chest or urinary infections and venous thromboembolism should be actively looked for and treated appropriately.

## KEYWORDS

Pelvic fracture, hip fracture, classification, complications, operative, non-operative management

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## CONFLICTS OF INTEREST

Author has no conflicts to report.

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