Proceedings of the International Conference of Community Health and Medical Sciences, Vol. ,1 Issue. 1, 2023, pp. 190-198

ISSN 3021-677X online
DOI: https://doi.org/10.17501/3021677X.2023.1123

EARLY OPEN REDUCTION INTERNAL FIXATION OF IPSILATERAL "DISPLACED" SACRO-ILIAC FRACTURE PREVENT SHORTENING OF THE LIMB: RADIOLOGICAL EVALUATION

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Abstract: The Sacro-Iliaca is part of the pelvis. The prevalence of pelvic fractures due to high-energy injuries is 93.6%. 46.8% of all cases of pelvic fractures required surgery. Displaced sacro-iliac fractures can cause the pelvis to be vertically or rotationally unstable, including Tile's classification of type B or type C. Fractures of the ipsilateral “displaced” sacro-iliac often result in shortening of the involved limb or “Leg Length Discrepancy”. Inadequate and late treatment can cause shortening of the limbs that is difficult or cannot be corrected so that the patient is lame. Open Reduction Internal Fixation of the initial fracture is helpful for correction of “LLD”. Radiological evaluation through antero-posterior projection of the pelvic x-Ray is easy to do with a comparison of "reference points" on the right and left sides, namely: "Greater Sciatic Notch", "Articular Cartilage", "Greater Trochanter Femur", "Superior Lesser Trochanter Femur", “pubic arch”, before and after surgery. In the case of a male, bus attendant, colliding with a truck, was thrown off bus, unable to move his right leg. General condition, and vital sign are stable. Right gluteal edema, bruised, right leg exorotation and shortens (LLD). X-Ray Pelvis Antero-Posterior, showing the pelvis and proximal femur on the right side with "5 reference points" rotation and cranial shift. Comminuted fracture of the iliac bone with displacement of the sacro-iliac. Diagnosed with comminuted iliac fracture and sacro-iliac displacement. Open Reduction Internal Fixation with the plate screw was done within less than 48 hours. X-Ray Pelvis was conducted after the surgery, it was appeared that 5 reference points on the right and left sides were almost 100% identical.

Introduction

Pelvic fractures or hip bone fractures are often caused by strong impacts, such as falls from a height, sports, or traffic accidents. The prevalence of pelvic fractures due to high-strength injuries is 93.6%2. Most patients with pelvic fractures are predominantly male2–4. Fractures from high-strength injuries are often experienced by men, young patients, and patients with high Injury Severity Scores (ISS)4. Based on Tile's classification, 46.8% of patients had stable fractures (type A), 40.5% were rotationally unstable (type B), and 12.7% had unstable rotational and vertical fractures (type C). 46.8% of all pelvic fractures require surgery2. Sacroiliac fractures are part of the pelvic fracture, according to

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Tile's classification, including type B or type C which can cause the pelvis to be unstable rotationally or vertically and can cause shortening or lengthening of the limb.

There are three classifications commonly used in pelvic trauma cases, namely the Young-Burgess classification, the Tile classification, and the classification according to The World Society of Emergency Surgery (WSES)5. Tile classifies pelvic fractures based on the mechanism of trauma and stability of the pelvic ring, namely rotationally stable and vertical fractures (type A), rotationally unstable but vertically stable fractures (type B), and rotationally unstable and vertical (type C) fractures1.

Type A fractures are also called stable fractures because they do not cause instability in the pelvic ring either rotationally or vertically. In this case, the anterior and posterior sacroiliac ligaments are still intact. Type A fractures are divided into three subtypes, namely type A1 which is the result of avulsion injury, type A2 which occurs due to direct injury to the iliac wing or anterior arch, and type A3 which is a transverse fracture of the sacroiliac joint6-7.

Type B fractures are also called partially stable fractures. This type of fracture involves fractures at two or more points, causing the pelvis to be rotationally unstable but still vertically stable. In fractures of this type, there is an incomplete disruption of the posterior sacroiliac ligament6. Subtype B1 fractures are also called "open-book injury" fractures in which there is an external rotation of the pelvis. Subtype B2 fractures are also called "lateral compression injury" in which there is an internal rotation of the pelvis. Meanwhile, in subtype B3 there is bilateral rotational instability in the pelvis6-7.

In the case of type C fractures, the anterior and posterior sacroiliac ligaments are completely separated, resulting in pelvic instability either rotationally or vertically (unstable fracture)6.

This condition can occur unilaterally (subtype C1), bilaterally with one side unstable rotationally and the other side unstable vertically (subtype C2), and bilaterally unstable vertically (subtype C3)6-7.

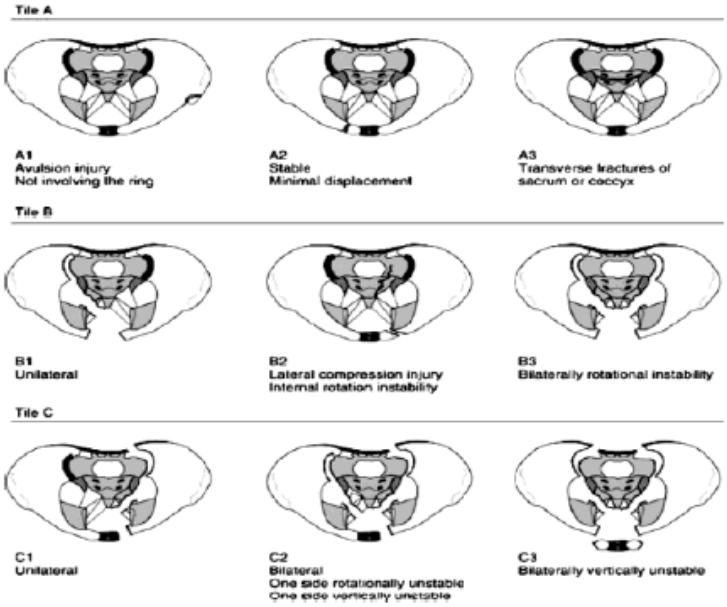

Figure 1.Tile Classification of Pelvis Fractures6

Meanwhile, Young-Burgess classifies pelvic fractures into four types based on the mechanism and strength of the trauma, namely anteroposterior compression (APC), lateral compression (LC), vertical shear (VS), and combined mechanism (CM)8 fractures. The mechanism of trauma in APC fractures occurs due to external rotation of the hemipelvis with separation of the pubic symphysis and tearing of the posterior ligamentous complex. This trauma mechanism usually occurs in the case of a motorcycle collision or a collision between two vehicles originating in two opposite directions ("head-on collision")8. Patients who experience this type of trauma are often unstable and associated with pelvic and retroperitoneal hemorrhages5. The bleeding that occurs as a result of this trauma is severe and can be life-threatening8.

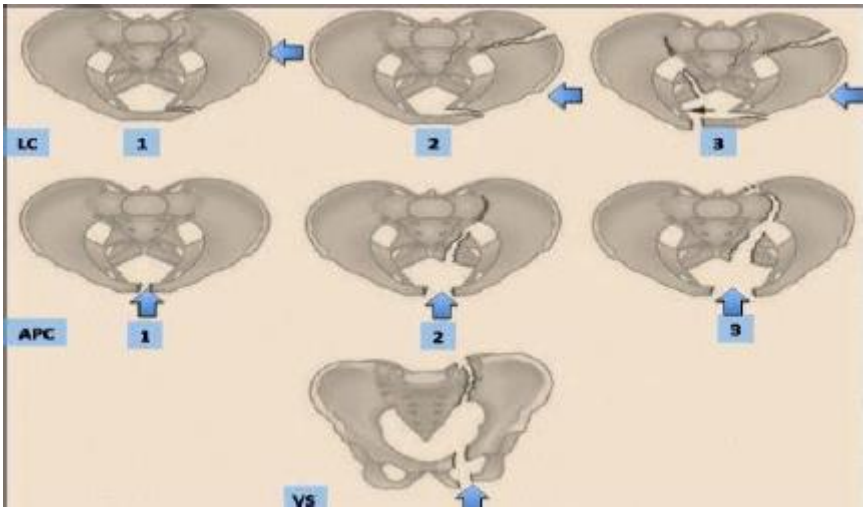

Figure 2.Young-Burgees Classification of Pelvic Fractures1

The problem of leg length discrepancy (LLD) in orthopedics is not only a cosmetic problem but also a functional problem. The gait of shortened limbs causes irregularities and increases energy

requirements due to excessive vertical movement of the pelvic up and down and can cause back pain due to the mismatch of the length of both extremities when standing for a long time.

In a study of 23 young adults with uncorrected LLD 1.2 – 5.2 cm in fracture cases, compensatory scoliosis and decreased spinal mobility were obtained, with no back pain (Papaioannou, 1982). Giles, Taylor, and Friberg studied larger numbers of patients and concluded that significant LLD caused lower back pain, and pain was reduced by equalizing limb length (Giles, 1981). Action is needed to prevent leg length discrepancy by taking action as soon as possible and adequately. Evaluation of leg length discrepancy other than physical examination, can be easily done with radiology (pelvic x-ray AP/PA).

CASE

The patient was a bus conductor, involved in traffic accident wherein the bus collided with a truck in front of it. The patient was thrown out of the bus and felt that his right leg could not be moved. The patient is weak, but there is no feeling of nausea, vomiting, or dizziness.

Physical examination showed that the patient was in good general condition and consciousness. Blood pressure was 110/72 mmHg, pulse was 64x/min, respiratory rate was 20x/min, temperature was 36.10 oC, and SpO2 was 100%. Localis Status indicated swelling of the right buttocks along with bruising (+), deformity (+), shortening, and external rotation (LLD) of the right leg. Tenderness (+) and pulsation a. Dorsalis pedis (+).

Laboratory tests are often helpful in cases of pelvic trauma. Examination of AP pelvic rongent photo helps to see where the fracture is located. A visible fracture of the os illiaca and right sacroiliac joint was identified. Through a comparison of five anatomical points on the pelvic (5 reference points) on the right and left sides, there were differences or shifts (not symmetrical) of os illiaca-sacroiliaca-femur right to cranial/superior was causing right limb shortening/LLD (figure 3).

Figure 3. Pelvic X-Ray before surgery

The patient was diagnosed with a comminuted fracture of the os illiaca and sacroiliac with a shift to the right cranial and LLD. In consideration of the hemodynamic status, location of anatomical injuries

to the pelvis, and other associated injuries, open reduction by traction and internal fixation with the plate screw via posterior approach was carried out before 48 hours. The purpose of this was to prevent leg length discrepancy from becoming persistent.

Postoperative radiology performed pelvic x-ray AP/PA , showing five reference points of the fractured side with the normal side almost parallel or symmetrical (figure 4)

Figure 4. Pelvic X-Ray after surgery

Discussion

Displaced sacroiliac fractures according to Tile's classification include type B or type C, often giving rise to leg length discrepancy. Immediate treatment with regard to hemodynamic status is carried out through open reduction with traction and internal fixation because the fracture cannot be reduced sufficiently by closed reduction10. Inadequate and late handling can lead to difficult or uncorrectable fractures that can lead to leg length discrepancy10.

Evaluation of leg length discrepancy other than physical examination can be done simply with radiology (pelvic x-ray AP/PA) without moving the limbs that can hurt the patient, by comparing five anatomical points on the pelvic and proximal femur (5 reference points) of the disease/fracture side with the normal side (figure 5).

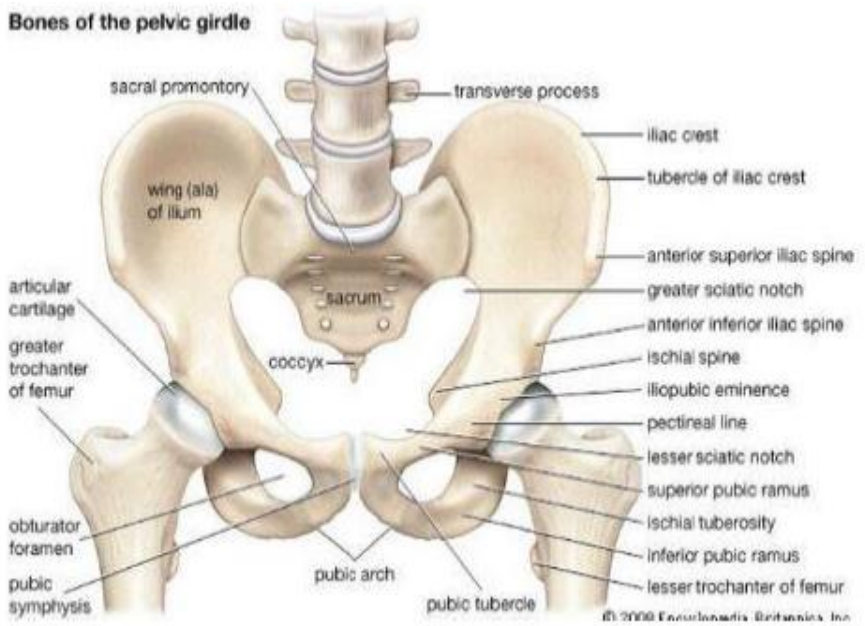

Figure 5. Anatomical points on the pelvic and proximal femur

In this case, there is shortening of the right leg after a traffic accident. Radiological evaluation (pelvic x-ray AP) shows a fracture and shift towards the cranial (figure 6).

Figure 6. Pelvic X-Ray before surgery

After an open repositioning operation with traction and internal fixation with plate screws on the sacroiliac before 48 hours, a corrected shift was seen at five reference points on the fractures side, and almost symmetrical or one level (figure 7).

Figure 7. Pelvic X-Ray after Surgery

The first point at the greater sciatic notch point:

In the radiology results, the greater sciatic notch point appears to have shifted on the right is higher than the left point before surgery. After ORIF is done, it returns almost to normal.

The second point on the Articular Cartilage point:

In the radiology results, the Articular Cartilage point appears to have shifted on the right is higher than the left point before surgery. After ORIF is done, it returns back to normal.

The third point at the greater trochanter of femur point:

In the radiology results, the greater trochanter of femur point appears to have shifted on the right is higher than the the left point before surgery. After ORIF, it returns back to normal.

The fourth point at the superior lesser trochanter of femur point:

In the radiological results, the superior lesser trochanter of femur point appears to have shifted on the right is higher than the the left point before surgery. After ORIF is done, it returns back to normal.

The fifth point at the pubic arch point:

In the radiological results, the pubic arch point appears to have shifted on the right is higher than the the left point before surgery. After ORIF is done, it returns almost to normal.

A comparative evaluation with clinical examination of patients is necessary, such as :

1. True leg length: measured from trocantor major to malleolus medialis

2. Clinical leg length: measured from spina illiaca anterior superior to malleolus medialis

3. Apperent leg length: measured from umbilical to malleolus medialis

Conclusion

Pelvic fractures or hip bone fractures due to high-strength injuries is 93.6%, mostly occurring in men. Surgery is required in 46.8% of all pelvic fracture cases. The type of pelvic fracture that causes limb shortening (LLD) is type B and type C with a percentage of 59.5%. Sacroiliac fracture is a type B or type C pelvic fracture. An ipsilateral "displaced" sacroiliac fracture causes leg length discrepancy, which is reduced by traction and internal fixation with plate screw immediately less than 48 hours with radiological Evaluation (Pelvic x-ray AP / PA) obtained results from "5 Reference points" on the right side (the fracture) return to normal, indicating that the initial reduction and internal fixation are necessary to prevent Leg Length Discrepancy in ipsilateral "displaced" sacroiliac fractures.

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