Percutaneous Lumbopelvic Fixation as a Stabilization Strategy in a Pediatric Trauma Patient

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Introduction

- High-energy sacral and pelvic fractures can produce complete lumbopelvic dissociation, often presenting as U- or H-type fracture patterns which can involve zone I, zone II, or zone III of the sacrum[1]. The Denis Classification is a tool for categorizing these fractures. **(Fig. 2)**
- The biomechanically strongest construct for stabilizing these injuries is a triangular osteosynthesis construct via lumbopelvic fixation (LPF), which provides multiplanar stability and enables early mobilization[2,3].
- Historically performed through open posterior approaches associated with wound complications, LPF has evolved into percutaneous techniques with excellent union and low complication rates[4].
- Pediatric LPFs have been reported primarily in congenital conditions such as scoliosis;[5] however, lumbopelvic fixations are under-reported and underutilized in pediatric trauma patients.

Case Presentation

- This case presents a 13-year-old female who was a pedestrian struck by a motor vehicle. She sustained lumbosacral dissociation from the pelvis with bilateral zone II sacral alar fractures and sacroiliac joint injuries **(Fig. 1).**
- The posterior pelvic ring was stabilized with trans-sacral trans-iliac screws, followed by staged percutaneous lumbopelvic fixation for enhanced stability and early mobilization. Bilateral L5 pedicle and iliac screws were connected with contoured rods to form a triangular osteosynthesis construct, with final imaging confirming satisfactory alignment and no complications **(Fig. 3).**
- Weight bearing was advanced to ambulation with crutches as tolerated within 8 weeks, with full weight bearing achieved by 6 months postoperatively. Hardware was ultimately removed upon full weight bearing

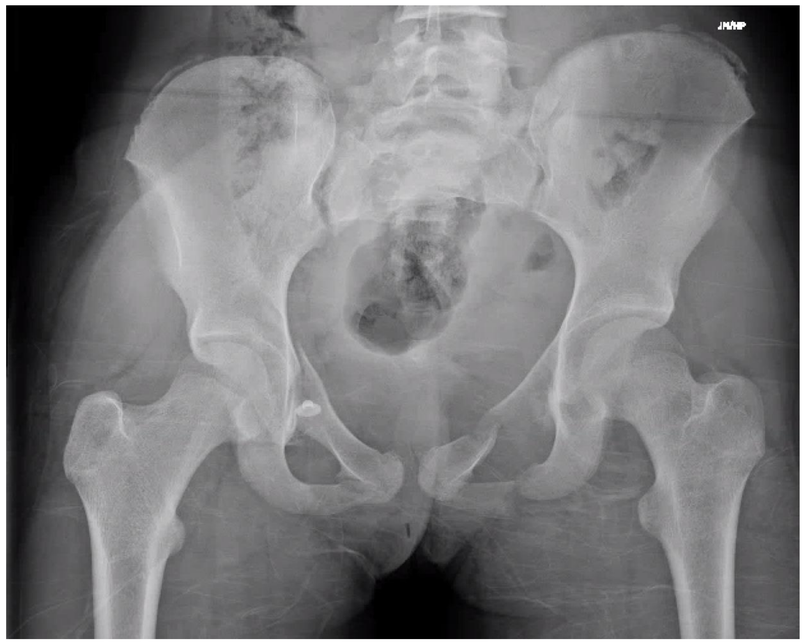

Fig. 1 Preoperative anteroposterior (AP) pelvic radiograph showing bilateral pelvic ring disruption with left posterior column acetabular and sacral ala fractures, and right lateral compression–type injury with anterior column fracture, sacroiliac joint widening, and right sacral ala involvement.

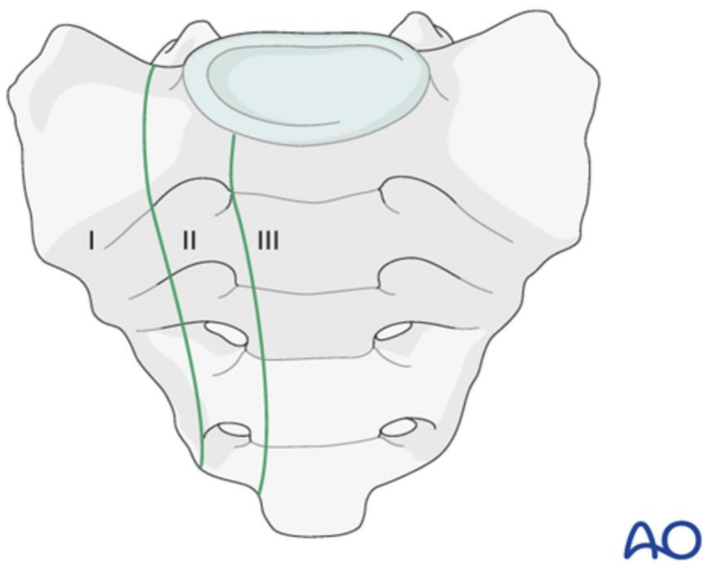

Fig 2. Illustration of the Denis classification of sacral fractures, which divides injuries into three zones based on transverse location: Zone I , Zone II, and Zone III. Our patient's fracture corresponds to a Denis Zone II pattern. (Source: AO)

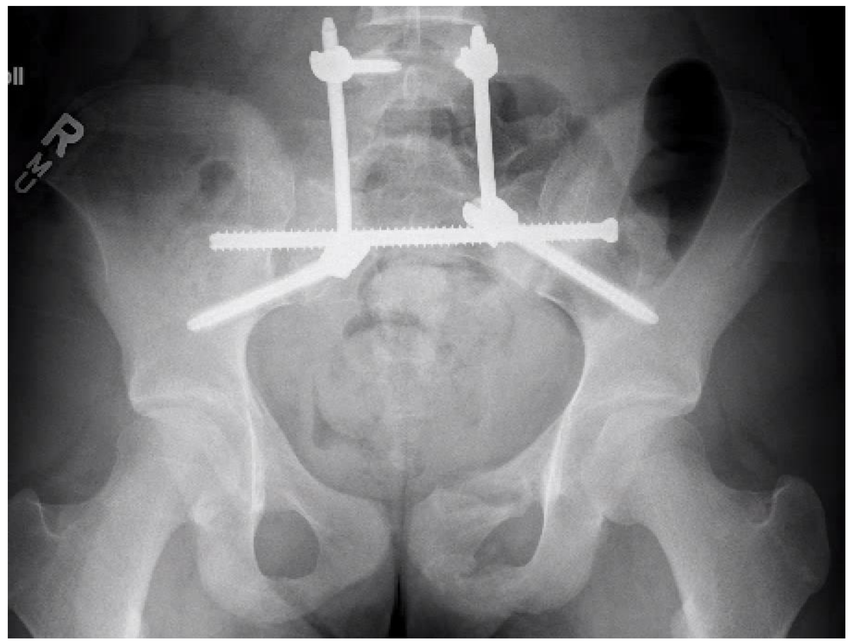

Fig. 3 AP pelvis radiograph at four months post-operation demonstrating healing fractures with screws still fixed and in place. No further X-rays were warranted beyond this point, and hardware was removed at the 6-month post-operation mark.

Discussion & Conclusion

- Study demonstrates the safety and effectiveness of LPF in pediatric trauma patients and success with weight bearing advancement with earlier operative measures.
- We hypothesize that the greater remodeling and healing capacity of pediatric bone[6] may allow for faster recovery following lumbopelvic fixation compared with adults.
- This case highlights the successful staged application of trans-sacral and lumbopelvic fixation in a 13-year-old, demonstrating the safety and effectiveness of triangular osteosynthesis in select pediatric pelvic injuries.
- Future Directions: This case, together with growing adult data, suggests that percutaneous lumbopelvic fixation may have broader applications in pediatric trauma. Further investigation into optimal timing, fixation configuration, and postoperative rehabilitation could help establish evidence-based guidelines for this rare but challenging injury pattern.

References

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