



Case Report

Modified triangular osteosynthesis in the treatment of bilateral sacroiliac joint dislocation

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ARTICLE INFO

Keywords:

Bilateral sacroiliac joint dislocation
 Triangular osteosynthesis
 Pelvic ring instability
 Reduction technique

ABSTRACT

Bilateral sacroiliac joint dislocation is a rare injury associated with rotational and vertical instability of the pelvic ring. The ideal strategy for the reduction and fixation of this injury is poorly described in the current literature. Triangular osteosynthesis provides multiplanar stability to the posterior pelvic ring allowing early weight bearing. We present the case of a young female with a bilateral sacroiliac joint dislocation who underwent a modified bilateral triangular osteosynthesis, using S1 pedicle screws to improve the reduction of the sacroiliac joint.

Introduction

The stability of the pelvic ring depends on the integrity of the posterior sacroiliac complex, which complete disruption leads to rotational and vertical instability of the pelvis [1]. Bilateral sacroiliac joint dislocation is a rare subtype of posterior pelvic ring injury resulting from high-energy trauma with only a few cases reported [2–5]. The ideal strategy for the reduction and fixation of this injury is poorly described in the current literature. Triangular osteosynthesis is a well-established technique in the treatment of vertically unstable posterior pelvic ring injuries, allowing early weight bearing. However, triangular osteosynthesis has been used only once in the treatment of a bilateral sacroiliac joint dislocation [5]. Therefore, we present the case of a patient with a bilateral sacroiliac joint dislocation and describe a modified bilateral triangular osteosynthesis with S1 pedicle screws to improve the reduction of the sacroiliac joint.

Case report

A 23-year-old female restrained back seat passenger was involved in a rear-end collision by a truck at high speed. On the arrival at the emergency room, the patient was conscious and oriented, hypotensive, and complained of neck and pelvic pain. Physical examination revealed lower back and pelvic pain from pelvis compression. No gross deformities nor neurologic deficits were found. Radiographic trauma assessment showed a flexion teardrop fracture at C3 and a bilateral sacroiliac joint dislocation (Fig. 1A). Adequate fluid and blood resuscitation were initiated and a computed tomography scan study was performed, which revealed a bilateral sacroiliac joint dislocation with anterior displacement of the sacrum, non-displaced left pubic rami fractures and bilateral L5 transverse process fracture (Fig. 1B and C). The patient was taken to the operating room for spine surgery and bilateral distal femoral skeletal traction was applied for temporary stabilization of the pelvic ring. Admitted to the intensive care unit for monitoring, the

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Fig. 1. Imaging study on admission. A - Anteroposterior radiograph view showing bilateral sacroiliac joint dislocation. B and C - Anteroposterior and inlet computed tomography views revealing bilateral sacroiliac joint dislocation with anterior displacement of the sacrum, non-displaced left pubic rami fractures and bilateral L5 transverse process fracture.



Fig. 2. Intraoperative fluoroscopic radiographs. A – Initial anterior displacement of the sacrum. B – Sacroiliac joint reduction with 20 pounds of traction on each femur. C – Sacroiliac joint reduction with the iliac rod and the pedicle screw towers.

patient returned to the operating room five days later and underwent a modified bilateral triangular osteosynthesis.

Surgical technique

Stage 1

The patient was positioned supine with 30-degree of hip flexion on a radiolucent table. Under fluoroscopic guidance, bilateral distal femoral skeletal traction was increasingly applied, with progressive reduction of the sacroiliac joint dislocation until 20 pounds of traction on each femur (Fig. 2A and B). Due to a persistent anterior displacement of the sacrum, closed reduction technique was terminated and an iliosacral Kirschner wire was inserted percutaneously on each side for provisional fixation.

Stage 2

With the patient in prone position, a midline incision from L3 to S2 was made. After dissection, bilateral L4, L5 and S1 pedicle screws were placed, followed by iliac screws. A connecting rod was inserted and tightened over the iliac screws, iliosacral Kirschner wires were removed and anatomical reduction of the sacroiliac joint was achieved with rod-pedicle screw towers used as gradual persuaders (Fig. 2C). After reduction of the sacroiliac joint, bilateral iliosacral screws were placed percutaneously in the first sacral segment. The connecting rod of the iliac screws was then removed, a rod was contoured and placed bilaterally connecting the pedicle screws and iliac screws were connected to the rods by modular connectors.

Post-operative computed tomography confirmed proper reduction of the bilateral sacroiliac joint dislocation and position of the screws (Fig. 3). Immediate post-operative partial weight bearing was permitted. The patient advanced to full weight bearing at 6 weeks post-operation and was able to walk unaided after 4 months. The fixation construct was removed at 12 months post-operation. At 3-year follow-up, the patient has occasionally pain. The radiograph shows good posterior pelvic ring alignment and early post-traumatic sacroiliac arthritis changes (Fig. 4).

Discussion

There are several options for surgical treatment of vertically unstable posterior pelvic injuries. Biomechanical studies have demonstrated greater stability of triangular osteosynthesis compared to other fixation techniques isolated [6,7]. Introduced by Schildhauer et al. for vertically unstable sacrum fractures, triangular osteosynthesis combines a vertical lumbopelvic fixation and a transverse sacroiliac fixation to provide multiplanar stability to the posterior pelvic ring, allowing early weight bearing. Traditional fixation construct consists of L4 and L5 pedicle screws combined with iliac screws and iliosacral or transsacral screws [8].



Fig. 3. Post-operative computed tomography showing the modified bilateral triangular osteosynthesis construct.



Fig. 4. Anteroposterior radiograph view at 3-year follow-up.

Based on the principles of triangular osteosynthesis, we used a modified triangular osteosynthesis to reduce and stabilize a bilateral sacroiliac joint dislocation with anterior displacement of the sacrum. As a predictor of a better outcome, anatomical reduction of the sacroiliac joint is the main goal [9]. Reduction can be achieved from either closed techniques or open approaches and there is currently no consensus on the ideal method [10].

In the present case, we performed a closed reduction technique in supine position, applying longitudinal traction through both lower extremities with distal femoral traction. Gross reduction was obtained and maintained with bilateral iliosacral Kirschner wires. Anatomical reduction was achieved by a modified lumbopelvic fixation technique including S1 pedicle screws, which allowed direct manipulation of the sacrum with iliac rod-pedicle screw towers used as gradual persuaders. Sar and Kilicoglu were the first who described a S1 pedicle-iliac screw fixation construct in the treatment of sacroiliac joint dislocations and vertical transalar fractures of the sacrum. In their technique, iliac and S1 pedicle screws connected by a rod and a modular connector allow compression and distraction between the fragments in all directions, being used to obtain and maintain anatomical reduction [11]. Due to the highly unstable lesion pattern present in this case, a more rigid construct was chosen, with L4, L5 and S1 pedicle screws and iliac screws combined with S1 iliosacral screws to increase the stability of the sacroiliac joint.

The main disadvantage of triangular osteosynthesis is the loss of mobility of the lower lumbar segments [12]. Given the young age of the patient, no fusion was performed to preserve motion across the lumbosacral junction and the implants were removed 1 year postoperatively.

Conclusion

Bilateral sacroiliac joint dislocation is a rare injury associated with rotational and vertical instability of the pelvic ring. We describe a modified triangular osteosynthesis for bilateral sacroiliac joint dislocation with good clinical and radiologic outcomes. Closed reduction with femoral skeletal traction and sacroiliac provisional fixation allows S1 pedicle screws to be used to improve reduction of the sacroiliac joint in a modified bilateral triangular osteosynthesis construct. Large case series and long-term studies are needed to validate this surgical technique in treating bilateral sacroiliac joint dislocations.

Funding sources

None.

Conflicts of interest

None.

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