Malgaigne Fracture in Childhood
A Case Report and Review of Literature

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Abstract: Sacrum fractures are rare pathologies seen after spinal traumas. The incidence of a sacral fracture after trauma is 0.6% in childhood. A Malgaigne fracture is composed of fractures and dislocations of the anterior and posterior regions of the pelvis. This is the first reported case of Malgaigne fracture during childhood.

A 12-year-old girl was admitted to our emergency room after having suffered a fall. Radiological tests revealed a zone 3 sacral fracture according to the Denis scoring, a subtype 2 sacral fracture according to the Roy-Camille classification, and a detachment in the symphysis pubis. Appropriate load distribution through a bilateral L5–S1–S2 transpedicular screw and a bilateral iliac wing screw, as well as neural decompression were performed together with an S1–S2 total laminectomy.

It is very difficult to make a generalization for treatment of sacral fractures and Malgaigne fractures in childhood due to the small number of patients. Each patient should be individualized and lumbosacroiliac instability should be treated.

Abbreviations: CT = computed tomography.

INTRODUCTION

Sacral fractures are rare injuries in children with an incidence of 0.6%. Even rarer is a transverse sacral fracture associated with an unstable pelvic ring injury (a Malgaigne pelvic fracture).

The Malgaigne fracture was defined by a famous French anatomist and orthopedic surgeon in the 1800s. The Malgaigne fracture is a fracture of both pubic rami and the posterior region of the sacroiliac complex. Namely, it is a fracture of both the anterior and posterior regions of the pelvis.

The usually associated sacral fracture of the Malgaigne fracture is unilateral and vertical through the sacral ala or transforaminal region (Denis Type 1 or 2). This case report introduces to the literature the unusual upper sacral (S1/S2) transverse fracture with a kyphotic displacement and potential nerve root compression in a pediatric patient. This is believed to be first report of such a case.

CASE

A 12-year-old girl was admitted to the emergency room after having suffered from a fall. She fell from a height of approximately 12 m on her left leg then hit her hip on the ground vertically. So an ethical statement is not required. She had severe thigh and left leg pain. She did not have any neurological deficits or incontinence and her abdominal examination revealed normal findings. Her thigh and left leg pain were increased with movement. X-rays revealed a detachment in the right sacroiliac joint and the symphysis pubis (Figure 1).

Lumbar computed tomography (CT) revealed a zone 3 sacral fracture according to the Denis classification, a subtype 2 fracture according to the Roy-Camille classification, an S1–S2 listhesis, and a right sacroiliac joint dislocation. The left ankle CT showed a talus fracture (Figure 2A and B).

The patient was placed on the operating table in the prone position under general anesthesia after the preoperative procedures had been completed. A midline skin incision was performed in the lumbosacral region. The paravertebral muscles between L4 and S3 were stripped subperiosteally. An S1 and S2 total laminectomy was performed and cord nerve decompression was provided. Transpedicular screws were placed at the L5, S1, and S2 vertebrae bilaterally. The pedicle screws were connected with a rod system (Titani-Istanbul). Bilateral iliac wing screws were placed and both iliac wings were attached to the system through a connector (Figure 3).

No postoperative problems were observed. The patient, who could not be mobilized early due to the left talus fracture, was mobilized with crutches so that the left leg could be in a plaster cast for 1 week postoperatively. She did not have any complaints on the control examination 3 months later and she was able to do her daily activities. An ethical statement is not required.

DISCUSSION

As in adults, sacral fractures during childhood develop as a result of high energy traumas. Pelvic fractures accompany these in approximately 50% of cases. The rate of sacral fractures that accompanies spinal trauma has been reported as 30% in a study conducted in adults. The rate of sacral fractures is 0.6%, and that of pelvic fractures is 4.76% in all spinal axis traumas in childhood. However, these studies all had a small number of patients.
Many classification systems have been proposed for sacral fractures; however, there is no universally accepted classification system. The classification recommended by Denis et al is a very useful system and is commonly used today. According to Denis, the sacral ala is affected in zone 1, sacral foramina are affected in zone 2, and the sacral canal is affected in zone 3. Vertical or transverse fractures are seen in zone 3. It has been reported that fractures exceeding this limitation or classification are known to be defined as zone fractures. According to this classification, Gibbons et al reported the rate of zone 1 fractures as 6%, zone 2 fractures as 28%, and zone 3 fractures, including vertical fractures, as 58%. They reported neurological deficits occur at a rate of 57% in zone 3 fractures that accompany transverse fractures. Roy-Camille et al made a subclassification for Denis type 3 fractures. Type 1 was defined as a simple flexion deformity of the sacrum, type 2 as a partial translation and hyperkyphotic, and type 3 is a complete translation with no fracture overlap. Our case was a zone 3 fracture according to Denis, a type 2 fracture according to the Roy-Camille classification, and there was no neurological deficit.

There are significant differences between transverse and vertical sacral fractures. Transverse fractures occur less frequently and all sacral fractures in adults are reported in varying rates between 5% and 16%. It has been reported that sacral fractures may coexist with spinal vertebral fractures in different localizations, usually with pelvic fractures and large extremity fractures. A sacroiliac joint dislocation accompanied the vertical type sacral fracture in our case. There was root compression from the anterior side due to the S2 fracture. We considered that the absence of neurological deficits was due to the elastic structure of the bone in the developmental period.

The importance of the mechanical stability role provided by the sacrum and pelvis bone ring require that meticulous care be provided to patients with pelvic trauma. Vertical shear fractures, known as Malgaigne fractures, develop as a result of high energy traumas. Sacroiliac joint dislocations are pathologies that develop as a result of vertical loading; almost all of these develop as the result of falls in the standing position.

In Malgaigne fractures, the sacrospinous and sacrotuberous ligaments are also torn in addition to the posterior sacroiliac complex. Anterior and posterior lesions develop in this fracture. Additionally, an impairment of the symphysis pubis or superior–inferior rami, fracture in the ilium, dislocation or fracture in the sacroiliac joint, and fractures in the lumbar vertebral 4 and 5 are also observed. Thoracic or lumbar fractures and internal organ injuries may also be observed. There was a detachment in the symphysis pubis, a sacroiliac dislocation, and a sacral fracture in our case. However, there were no internal organ injuries.

Etiologic studies are insufficient in sacral fractures. A diagnosis may be made with radiological methods only. However, these fractures may be overlooked in X-rays due to the complexity of the region. Computed tomography is able to yield a higher proportion of the diagnoses.

Comparative studies have shown that all current sacroiliac fixation methods have close stability with regard to biomechanical properties. Another result of these studies is that no

![FIGURE 1. Preoperative X-ray AP image. Right sacroiliac displacement (white arrow), displacement of symphysis pubis (black arrow).](image)

![FIGURE 2. Preoperative spine CT. (A) S1–S2 listhesis image in the sagittal plane. (B) S1–S2 listhesis image in the axial plane with a right sacroiliac joint dislocation.](image)
methods can reach the stability of the intact pelvis. S1 sacroiliac fixation with an iliac screw and transpedicular screw, anatomical reduction of the sacroiliac complex, and stabilization are the most commonly preferred techniques. In our case, an appropriate load distribution was provided with lumbosacroiliac fixation through bilateral L5–S1–S2 transpedicular screws and bilateral iliac wing screws. Neural decompression was performed with an S1–S2 total laminectomy, and the compression on the neural tissue in the sacral region was eliminated.

CONCLUSION
It is very difficult to make treatment generalizations due to the limited number of cases of sacral fractures in childhood and Malgaigne fractures. Each patient should be individualized and the lumbosacroiliac instability should be treated. Sacral fractures should be suspected in the presence of ecchymosis and pain in the sacral region, pelvic unstability, radiculopathy, and urinary/anal incontinence. Further radiological techniques should be performed in these cases.

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