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Case Report

Complex pelvic injury in a morbidly obese patient – A case report

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ABSTRACT

Unstable pelvic ring injuries continue to be challenging to manage. Obese patients have a higher risk of complications and such management entails additional difficulties for emergency services and the medical-surgical team. A 41-year-old male with a body mass index of 44 fell from a water slide and suffered an anteroposterior pelvic compression impact injury. He presented with a Tile C1.3 pelvic fracture, Denis III sacral fracture, and Roy-Camille Type 4 spinopelvic dissociation. We performed a posterior triangular fixation and anterior double plating, and the patient gained full recovery and was able to return to work. This case report focuses on some key tools and techniques to consider when managing complex pelvic fractures in obese patients, requiring specialized equipment or adjustments to conventional treatments to obtain a good outcome. We used accessory portals through the fat pad to adequately place the plate screws. In addition, we used polypropylene mesh for post-operative incisional hernia prophylaxis, longer instruments for iliosacral screw placement, and a multidisciplinary approach with rehabilitation and nutrition control.

Keywords: Fracture fixation, Morbid obesity, Orthopedic surgery, Pelvic fracture, Sacrum

INTRODUCTION

Despite their low frequency, pelvic ring injuries account for 3% of all fractures. They have high morbidity and mortality, with a reported mortality of 19–31% in unstable pelvic injuries.[1,2]

Traumatic spinopelvic dissociations are rare injuries characterized by multiplanar instability between the spine and the pelvis, usually associated with complex sacrum fractures.[3] In 1976, Roy-Camille *et al.* described this type of injury, coining the name suicide jumper fracture.[4] Later, Strange-Vongsen and Lebech added a fourth type to their classification, describing a comminuted fracture of the upper sacrum.[5] At present, the most widely used classification for sacral fractures is Denis, categorizing the fractures into three types according to the relationship with the sacral foramina. Sacral fractures in Denis Zone 3 are the least common and least studied. They are frequently associated with neurological injuries.[6]

Because of their multiplanar instability, spinopelvic dissociations continue to be a challenge in management. Historically, conservative treatment has been the gold standard due to the lack of implants and techniques that could stabilize these injuries. However, there have been complications associated with the conservative treatment, such as increased kyphosis,

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neurological symptoms, and residual pain.[7,8] Several methods have now been developed to restore the posterior sacral-lumbar complex, each with its own advantages and disadvantages.

In morbidly obese patients, with body mass index (BMI), with fractures of the pelvis and acetabulum, there have been reported higher rates of surgical complications, such as; wound infection, wound dehiscence, loss of reduction, and development of pneumonia and pressure ulcers. As well as intraoperative complications such as longer operating time, bleeding, and iatrogenic neurological injury.[9-11]

Spinopelvic fixation and triangular fixation have been proposed as alternative treatments for complex sacral injuries and spinopelvic dissociations isolated or associated with anterior pelvic fixation. There are several configurations described for this treatment. A posterior thoracolumbar spine fixation system with polyaxial screws is preferred in our institution.[12]

This particular case presented us with a challenge in management; since it involved an unusual and seldom studied fracture pattern, added to a morbidly obese patient. We present here the case with emphasis on some key points that allowed a satisfactory result for a morbidly obese patient with a complex pelvic injury.

CASE REPORT

A 41-year-old male patient with a history of morbid obesity, and a BMI of 44.2, reported sliding from a straight 30 m high water slide and landing on a shallow pool. The fall caused a direct impact on the sacral area, resulting in a mechanism of anteroposterior compression over the pelvis, with axial load over the sacrum platform. He presented with intense pain in the pelvic region and an inability to stand. Neurologic symptoms were denied [Figure 1].

He was transferred by paramedics to the nearest area hospital, obtaining simple radiographs of the pelvis and spine. Unfortunately, due to his complexion and weight, a tomographic study could not be performed in that unit and he was referred to our hospital with a diagnosis of a pelvic fracture.

Figure 1: Photogram that illustrates the injury mechanism; axial compression at the impact moment plus anteroposterior compression caused by the forced abduction and external rotation of the lower extremities.

On arrival, the patient was stable; he presented with a hematoma over the pubic area, painfully palpable diastasis of the pubis, and bilateral scrotal edema and ecchymosis. He had intact upper extremities, a painful hip area on mobilization, with preserved strength and sensitivity in the lower extremities, and adequate sphincter control and sensitivity in the genital area.

ATLS protocols were followed and we requested simple radiographs [Figure 2] and computed tomography (CT) with 3D reconstruction. Images revealed complete disruption of the posterior arch with sacral impaction and a comminuted fracture of the upper platform of S1 that extended in the sagittal plane to the lower edge of the sacrum between both foramina, a Denis Type 3 injury. In addition, the sagittal section confirmed a fracture line in the coronal plane of S1 with anterior displacement of the anterior portion of the body of S1 and comminution of the upper platform; Roy-Camille Type 4 [Figure 3]. On the anterior arch, a pubic symphysis diastasis of 45 mm was observed. We classified it as a Tile C1.3 pelvic fracture.

Since the patient was hemodynamically stable, we decided not to place external fixators and approached definitive surgical management after receiving interdisciplinary attention from urology, nutrition, and internal medicine. As a result, we performed open reduction and internal anterior and posterior fixation 3 days after arrival.

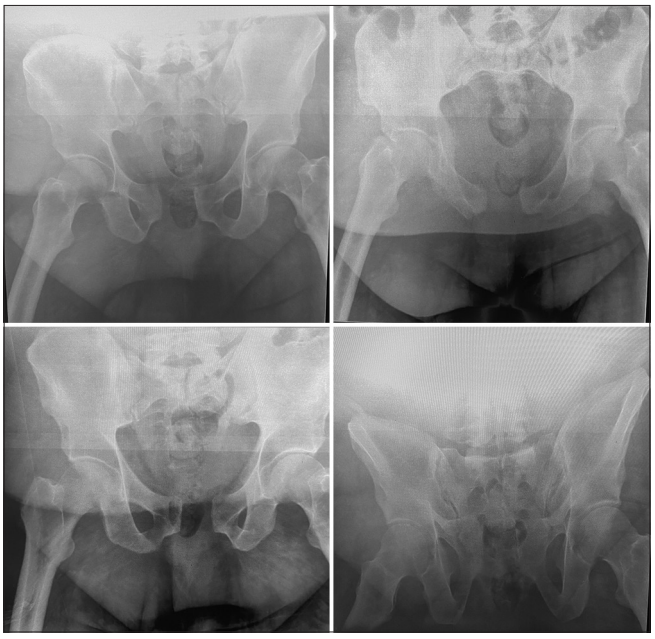

Figure 2: Radiographic images that show a 55 mm pubic symphysis diastasis, and compression fracture of the upper S1 platform with a combined fracture line that runs in between the sacral foramina.

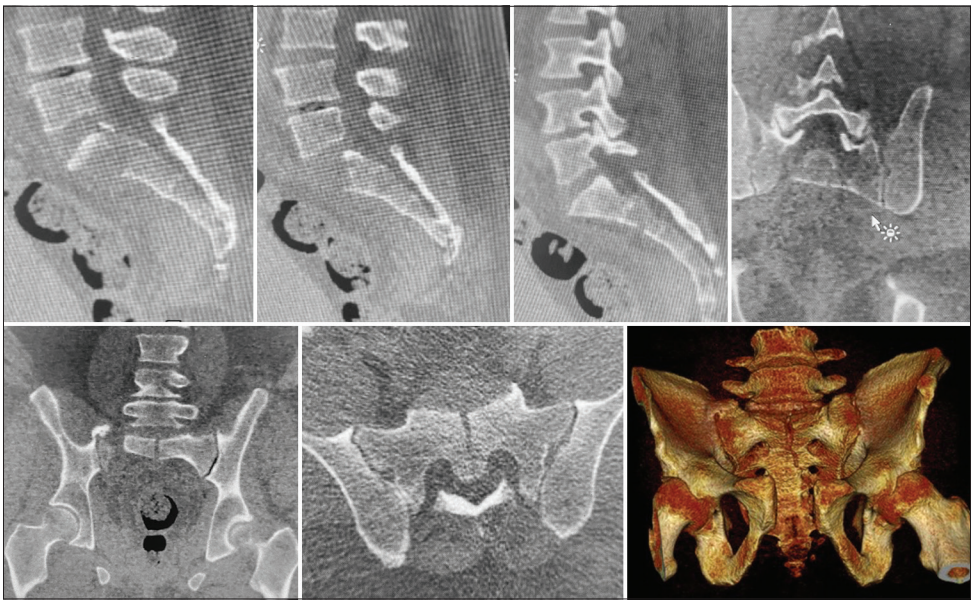

Figure 3: CT scan shows a complex sacral fracture with compression and fragmentation of the anterior section of the upper platform of S1. 3D reconstruction illustrates the whole pelvic injury.

The patient was placed supine over a wooden table, which facilitated the visualization 360 degree with the fluoroscope. In addition, we added support of both legs at the level of the ankles in internal rotation to facilitate pelvic reduction [Figure 4].

We used a standard Pfannenstiel approach; an automatic Charnley frame-type retractor was placed due to the large fat pad. The reduction was achieved with pelvic reduction forceps by placing two 3.5 mm screws as anchorage [Figure 5] and proceeding to fixation with two 3.5 mm reconstruction plates, one anterior and the other superior; since screw loosening and plate breakage often appear when a single reconstruction plate is used in obese patients.[13,14] While fixing the upper plate, we encountered difficulty with the placement and direction of the drill; thus, we incised two separate ports through the abdominal fat pad proximal to the incision, through which the screws were placed [Figure 6]. For incisional hernia prophylaxis, we placed a polypropylene mesh over the aponeurosis [Figure 7].

During the same surgical event, we placed the patient in the prone position, taking care to avoid high-pressure points, and limiting the abdomen from pressing against the OR table with chest rolls and foam cushions. We performed a posterior approach to the spine, placing two 6.0 × 45 mm transpedicular screws at L5 and one 7.0 × 55 mm transpedicular screw in each iliac wing, fixed with two posterior bars. We also placed percutaneously one left iliosacral screw 6.5 × 110 mm threaded 32 mm with a washer [Figure 8].

The patient was stable and did not require a blood transfusion. Rehabilitation started the next day with passive and active mobilization of feet, knees, and hips and sitting on the 2nd day. The patient was discharged the 2nd day after surgery.

Figure 4: (a) Photograph of patient positioning in the operating room; supine position, over a wooden table for 360° fluoroscopy visualization. (b) Image showing bandage of the lower limbs to facilitate symphysis reduction.

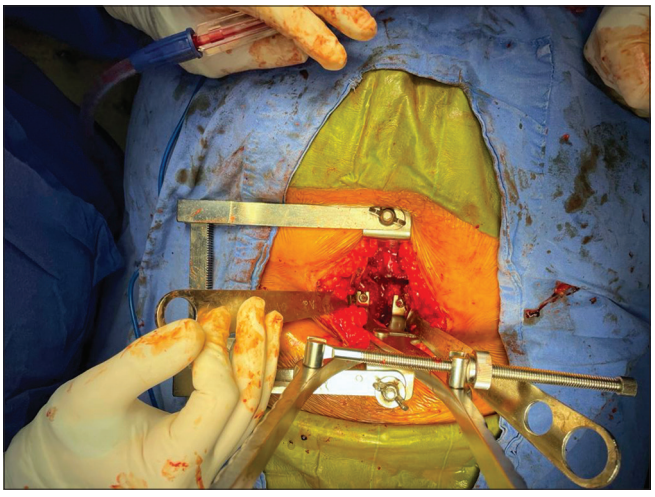

Figure 5: Surgical field photography shows an automatic spreader for exposure and the pelvic clamp holding the reduction through one 3.5 mm cortical screw on each side of the symphysis.

During the first follow-up, the patient presented with a superficial seroma in the pubic area that healed 15 days later without complications after prescribing oral antibiotics.

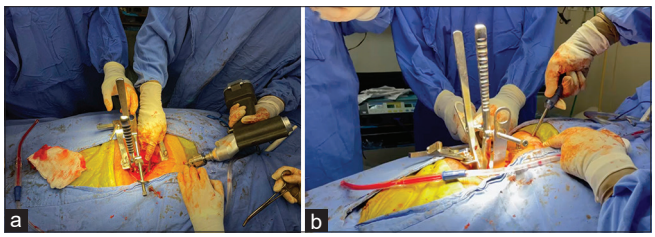

Figure 6: (a) Transoperative photograph while drilling through a percutaneous suprapubic portal. (b) Placement of a 3.5 mm screw through the suprapubic portals.

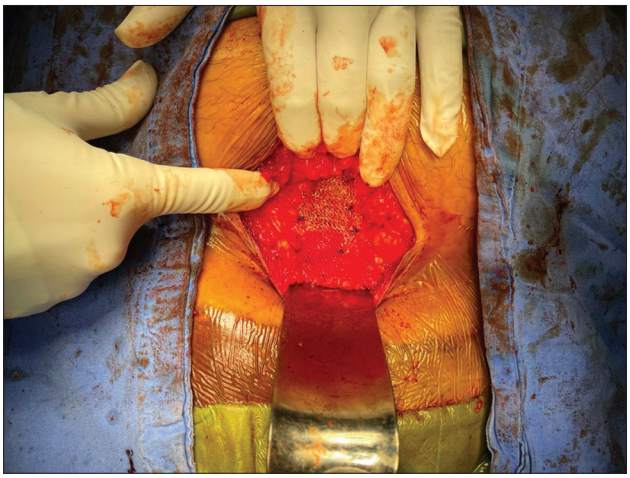

Figure 7: On-lay technique for polypropylene meshes prophylactic placement.

Assisted ambulation started in the 6th week and evolved from a walking frame to a hand cane through the 12th week. Independent walking was achieved at 16 post-operative weeks [Figure 9]. The patient was able to return to work 6 months after injury and was discharged after radiographic bone consolidation [Figure 10] that was observed at 7 months of follow-up. The patient started treatment by endocrinology and bariatric surgery for proper body weight control.

DISCUSSION

In the operating room, it is vital to have a table that supports the patient's weight and allows for the positioning of the C-arm. Some authors recommend the use of two tables or special extensions.[15] In our institution, we recommend using a wooden table, which allows 360° visualization of the fluoroscope, and proper and safe positioning of the patient.

In the supine position for anterior approaches, measures must be taken to retract the adipose tissue from the surgical area without compromising diaphragmatic function and causing pulmonary restriction. This can be achieved through bands, sutures, or adhesive tape that retracts the patient's fat pad and excess skin. Although there is no literature reported to our knowledge on the use of additional incisions or ports through the fat pad, we find their use extremely helpful when fixing the pubic ramus. They allow for correct angulation and direction of the drill and placement of the screws. This permits good anchorage of the pubic ramus in a zone with greater bone stock and placement of longer screws: Lowering the risk of pullout and plate loosening. Double plating to the symphysis is performed since screw loosening and plate breakage often appear when a single reconstruction plate is used in obese patients.[13,14]

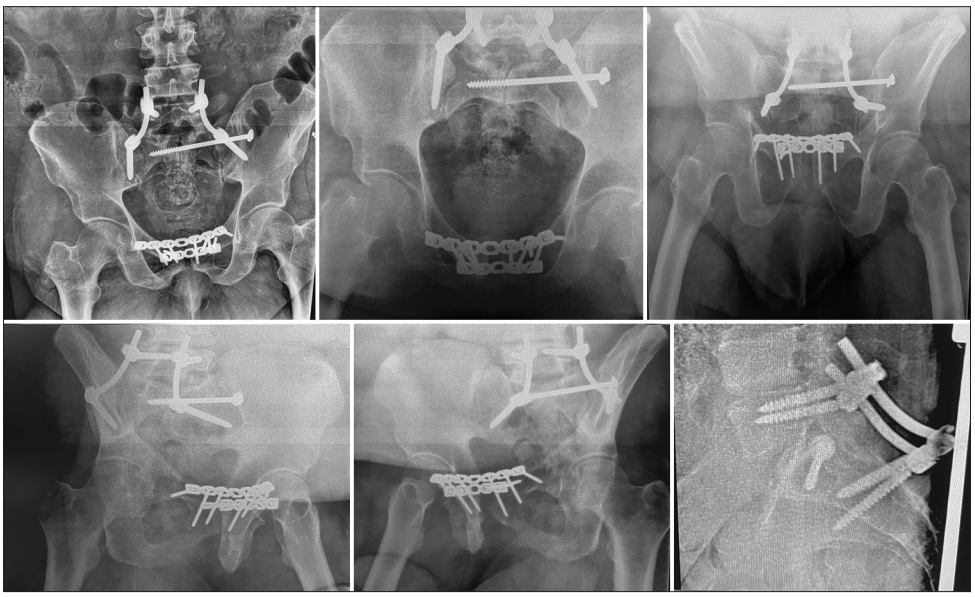

Figure 8: Radiographic post-operative control series.

Figure 9: Six-month post-operative follow-up. (a) Squat, (b) walking without aids, (c) healed abdominal incisions, (d) healed posterior approach, and (e) healed lateral sacroiliac screw wound.

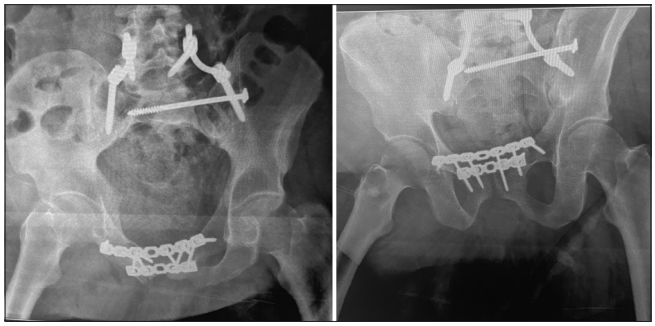

Figure 10: Radiographic series at 6-month follow-up showing fracture consolidation.

In a prone position, the increase in intrathoracic and intra-abdominal pressure must be avoided at all costs, so we recommend the use of soft rolls of sufficient size placed between the thorax and superior iliac spines to avoid pressing the abdomen against the surgical table. Pressure areas such as the elbows and knees should always be padded.[15]

It is recommended to ensure the quality of intraoperative images before starting the procedure and adjust the fluoroscope to the intensity necessary for the obese patient. When planning to perform a percutaneous procedure such as placing a sacroiliac screw, it will be necessary to have longer instruments and a wider approach than usual.[16]

We used a prophylactic polypropylene mesh for wound closure in the Pfannenstiel approach. However, their use in trauma surgery has not been well studied. The use of a polypropylene mesh as reinforcement in the closure of abdominal wall incisions has been recommended by several studies and some general surgery guidelines to prevent post-operative incisional hernias in obese patients (BMI ≥27).[17-19] Closure of the fascia with continuous stitches and non-absorbable sutures is also recommended.[17] It has been shown that the on-lay technique reduces the possibility of post-incision herniation to a greater extent than the inlay technique; however, the former has reported a greater risk of developing seromas in the wound. Both are safe and effective, and no further evidence recommends absorbable or synthetic meshes.[18,19]

Regarding the posterior arch fixation method, it has been shown in unstable fractures of the pelvis, Tile C, as well as complex fractures of the sacrum (Vaccaro U, H, λ, T, Y and, Roy-Camille 1-4), that bilateral spinopelvic fixation is recommended, since it achieves pelvic and iliolumbar stability, which allows the patient to bear weight again and sit upright early.[18-26]

Our experience highlights that the treatment of the morbidly obese patient with a complex fracture carries some additional factors to consider to avoid complications. Therefore, the treatment plan has to be made by a multidisciplinary approach.

CONCLUSION

Spinopelvic dissociation injuries continue to be a challenge in managing traumatized patients. Added to the sheer difficulty of the injury, management of morbidly obese patients entails additional difficulties for both emergency services and the medical-surgical team. CT assessment is essential for diagnosis and pre-operative planning. Patient preparation must be optimized when planning for a complex surgery such as an anterior and posterior fixation of the pelvic ring with triangular fixation done in a prone position, requiring specialized equipment or adjustments to conventional treatments. The nutritional status of the patient, patient positioning, surgical instruments, limited surgical exposure, and other impediments must be taken into account. This multidisciplinary approach can only be made if the hospital conditions and patient neurological status permit it. Thus, we recommend treating such patients in a Level 1 trauma centers.

AUTHORS' CONTRIBUTION

BL and MA conceived and designed the study, conducted research, provided research materials, and collected and organized data, wrote the initial and final draft of the article, and provided logistic support. All authors have critically reviewed and approved the final draft and are responsible for the manuscript's content and similarity index.

ETHICAL APPROVAL

The case was revised and authorized by the bioethical committee of our hospital.

DECLARATION OF PATIENT CONSENT

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

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CONFLICTS OF INTEREST

There are no conflicting relationships or activities.

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