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Minimally Displaced Acetabular Fracture in a Young Adult: A Conservative Treatment Strategy

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A B S T R A C T
Acetabular fractures, often caused by high-energy trauma, can be treated conservatively or surgically depending on the degree of displacement. For fractures with minimal displacement, non-surgical treatment may be effective. This report explores the outcomes of conservative management in a young adult with a minimally displaced acetabular fracture. In this case report, a 21-year-old female presented with severe pain in her left hip following a fall. Radiography and CT scans revealed a minimally displaced anterior column acetabular fracture, with no significant joint incongruence or associated injuries. Conservative treatment was chosen, including skin traction for one week followed by a non-weight-bearing protocol for six weeks, with gradual progression to partial weight-bearing. Physical therapy focused on restoring mobility and strength. After 12 weeks, the patient achieved full function without complications. Conservative management of minimally displaced acetabular fractures in young adults can be highly effective, providing full functional recovery without the need for surgery.

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INTRODUCTION

Acetabular fractures are a significant cause of morbidity, particularly in young adults, often resulting from high-energy trauma such as motor vehicle accidents or falls from height. These fractures are classified based on the degree of displacement, which can range from non-displaced fractures to those with significant displacement and comminution. Accurate classification is essential for determining the most appropriate treatment approach. Fractures with significant displacement typically require surgical intervention involving anatomical reduction and stable fixation to restore hip function and prevent long-term complications such as post-traumatic osteoarthritis.

However, for minimally displaced acetabular fractures, particularly in young adults, conservative management can be a viable and effective alternative to surgery. Conservative management focuses on non-operative treatments such as restricted weight-bearing, bed rest, and physical therapy. Studies suggest that when displacement is minimal, the potential for natural healing without the need for invasive procedures is high, which can reduce the risks and complications associated with surgery. Conservative strategies are particularly beneficial in young, healthy individuals where early mobilization can be facilitated without compromising the healing process.

For young adults, conservative management is often preferred due to the reduced risks of complications compared to surgical options. This approach helps in avoiding the risks associated with surgery, such as infection, blood loss, and long recovery times, which are especially important for active individuals. Furthermore, conservative treatment may allow the preservation of joint mobility, thereby reducing the risk of post-traumatic osteoarthritis or stiffness that can occur with more invasive surgical methods.

This case report aims to demonstrate the effectiveness of nonoperative treatment in a young adult with a minimally displaced acetabular fracture. The report focuses on the clinical management, outcome, and recovery of the patient treated conservatively, emphasizing how such an approach can be beneficial in specific circumstances. By documenting this case, we hope to contribute to the body of knowledge regarding the management of minimally displaced acetabular fractures and provide insights into the decision-making process for conservative treatment.

LITERATURE REVIEW

Acetabular fractures are complex injuries that commonly result from high-energy trauma such as vehicular accidents or falls from significant heights. The classification and management of these fractures are critical to ensuring optimal functional outcomes. According to the AO Foundation and Letournel-Judet classification system, treatment decisions are primarily guided by fracture type, displacement degree, and joint stability. Displaced fractures generally necessitate surgical intervention to restore anatomic alignment and joint congruency, thus minimizing the risk of post-traumatic arthritis. However, for fractures with minimal displacement and preserved joint congruity, conservative (non-surgical) management may offer comparable results with fewer risks.

Recent studies support the viability of nonoperative approaches, particularly in young and otherwise healthy individuals. Rajagopal et al. (2020) found that conservative management of minimally displaced acetabular fractures could yield functional outcomes similar to surgical intervention when strict non-weight-bearing protocols are followed. Similarly, Swartman et al. (2020) demonstrated that minimally invasive surgery offered no significant advantage in terms of pain reduction or mobility when compared to conservative treatment in select patient populations. These findings highlight the importance of patient selection, where fracture stability and compliance with rehabilitation protocols are essential factors in successful outcomes.

Physical rehabilitation plays a central role in the recovery process. Giorgi et al. (2025) emphasized the importance of early mobilization and targeted strengthening exercises to prevent complications such as joint stiffness and muscle atrophy. Conservative strategies are increasingly recommended for younger patients with high healing potential, as they tend to respond favorably to structured nonoperative regimens. Conversely, Boudissa et al. (2020) observed that in elderly patients, surgical management might be more appropriate due to the higher risk of fracture non-union and comorbid conditions that compromise healing.

Despite the positive results in selected cases, some literature urges caution. Esmaeili et al. (2024) highlighted various risk factors for treatment failure in acetabular fractures, including poor bone quality and inadequate immobilization. Therefore, close radiologic and clinical monitoring is essential throughout the conservative treatment period to detect any signs of secondary displacement or healing complications.

In conclusion, literature supports that conservative management is a valid treatment strategy for minimally displaced acetabular fractures in carefully selected patients, especially young adults. Successful outcomes hinge on accurate fracture classification, strict adherence to rehabilitation protocols, and consistent monitoring to ensure stable healing.

METHODOLOGY

In this case report, a 21-year-old woman presented to the emergency department after falling from a stone staircase. She was brought to the hospital by her family with complaints of severe pain in her left hip after landing with her left leg extended, bearing her body weight. Immediately after the fall, the patient experienced intense pain in her left hip and difficulty bearing weight on her left leg. Any movement of the hip joint exacerbated the pain. On physical examination, tenderness was noted in the left hip, specifically over the anterior acetabulum. The range of motion in the left hip was limited, with significant pain during attempts at flexion, extension, or rotation. The patient was unable to stand or walk without assistance due to the severe pain. Neurological and vascular examinations showed no signs of nerve compression or vascular injury in the affected extremity.

Initial radiographic images of the left hip revealed a minimally displaced acetabular fracture, particularly in the anterior column. No joint incongruence or significant displacement was noted, indicating that the fracture was not majorly

displaced, with only a small gap between the fractured bone fragments. A CT scan was performed to provide a more detailed view of the fracture pattern. The CT confirmed the minimally displaced acetabular fracture in the anterior column. No deformity or major displacement requiring surgical intervention was found. The fracture line was limited to the anterior column, without involvement of the weight-bearing portion of the acetabulum, preserving joint stability.

Figure I. X-ray of the pelvis in the anteroposterior view taken on the day of the trauma reveals a linear fracture of the acetabular floor, extending into the ilium.

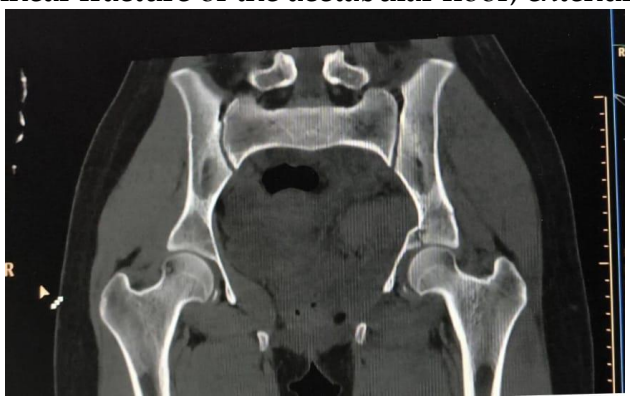

Figure 2. CT Scan of the pelvis in the coronal view A complete fracture is observed in the anterior column

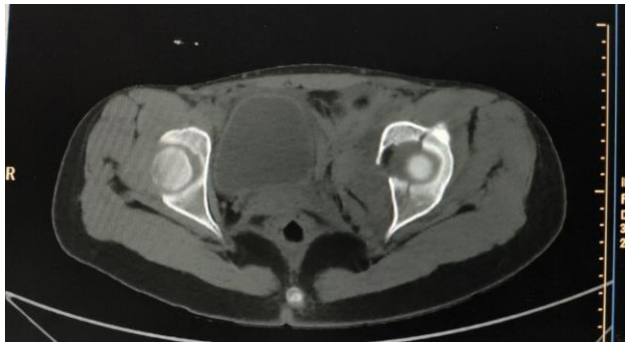

Figure 3. CT Scan of the pelvis in the horizontal view A complete fracture is observed in the anterior column and an incomplete fracture in the posterior column

Skin traction was applied for one week to reduce pain and prevent further movement of the bone fragments. A weight of 6 kg was used to provide light traction, stabilizing the area and reducing discomfort. After skin traction, the patient was placed on a non-weight-bearing protocol for six weeks, using crutches or a walker for mobility. This was intended to prevent additional

pressure on the joint that could worsen the fracture. After six weeks, the patient began gradual progression to partial weight-bearing, with the goal of full weight-bearing within 8-12 weeks. This gradual approach allowed the bone to heal slowly while monitoring the patient's tolerance to weight. Physical therapy was initiated to focus on restoring hip mobility and strengthening the muscles around the injured hip joint. Therapy began with light mobilization, followed by strengthening exercises in line with the healing process. Follow-up examinations were conducted regularly to monitor healing progress, including radiographic imaging every 2-4 weeks to assess bone healing. This ensured that the fracture remained stable and no further displacement occurred.

Figure 4. X-ray of the pelvis in the anteroposterior view at 6 weeks, the acetabular fracture shows signs of union

After 6 weeks of non-weight-bearing and gradual progression to weight-bearing over 8-12 weeks, the patient showed significant improvement in pain and functional mobility. Follow-up radiographs demonstrated good healing of the acetabular fracture without signs of displacement or deformity. After 12 weeks, the patient was able to return to normal activities with full weight-bearing, and physical therapy continued to strengthen the muscles around the hip joint and ensure optimal functional recovery.

At 6-month follow-up, the patient exhibited excellent hip function and pain-free mobility. She was able to walk independently without the use of assistive devices and had resumed all daily activities without any limitations. Clinical evaluation revealed a full range of motion in the left hip joint without pain or discomfort. The patient reported no residual pain or functional impairment, indicating a successful recovery and a return to her pre-injury condition.

RESEARCH RESULT AND DISCUSSION

Recent studies highlight that nonoperative management for acetabular fractures, particularly those with minimal displacement, is often a viable option. A key factor in this approach is ensuring that the fracture remains stable, as excessive displacement or instability may necessitate surgical intervention. Conservative management, typically involving non-weight bearing, is shown to

provide favorable long-term outcomes if the reduction remains congruent and if rehabilitation is promptly initiated. However, close monitoring is crucial to prevent complications such as non-union or malunion.

The comparison of surgical versus nonoperative treatments for acetabular fractures reveals mixed results. Some studies indicate no significant differences in functional outcomes between the two approaches, especially when fractures exhibit minimal displacement and the joint remains stable. Nonoperative management typically results in fewer complications, such as infection and prolonged recovery time, compared to surgery. However, surgical approaches tend to provide quicker functional recovery in cases with more complex fracture patterns or significant displacement.

One of the critical aspects of conservative treatment is proper patient selection, which aligns with the AO Foundation guidelines that introduce the Letournel-Judet classification system. This system helps differentiate acetabular fractures based on their location and stability, making it useful in determining whether a conservative approach can be applied or if surgical intervention is more necessary. Patients with minimal displacement, good bone quality, and no signs of instability are ideal candidates for conservative treatment. Additionally, younger patients, such as those in their 20s or 30s, typically benefit from nonoperative strategies because of their higher healing potential and fewer comorbidities. In the case of stable acetabular fractures with minimal displacement, the AO Foundation emphasizes the importance of close monitoring to ensure that there are no changes in fracture stability that could affect the healing process. Through careful monitoring and appropriate non-operative rehabilitation, optimal long-term outcomes can be achieved, providing patients with good recovery without the need for more invasive surgical interventions. On the other hand, elderly patients or those with poor compliance to rehabilitation may be less suited for conservative treatment, as their fractures may not heal effectively without surgical intervention.

Rehabilitation is a key component of conservative acetabular fracture management. After the non-weight-bearing period and skin traction, the focus of care shifts to restoring joint mobility and strengthening the muscles around the affected area. As demonstrated in the case report, physical therapy plays an essential role in achieving successful recovery by enhancing hip mobility and building muscle strength around the hip joint. Early mobilization, guided by physical therapy, helps to prevent complications such as muscle atrophy, joint stiffness, and post-traumatic osteoarthritis. Gradual progression to weight-bearing activities is critical to ensuring optimal healing and restoring normal function, allowing patients to return to normal activities with minimal functional disruption. Proper rehabilitation not only helps prevent muscle atrophy and restore joint function but also minimizes long-term complications such as osteoarthritis and joint stiffness.

CONCLUSIONS AND RECOMMENDATIONS

Conservative management of undisplaced or minimally displaced acetabular fractures in young adults has proven effective, offering good outcomes without the need for surgery. Key factors include careful patient

selection, adherence to non-weight-bearing protocols, and a structured rehabilitation plan. These approaches promote proper healing and minimize complications, though long-term follow-up is essential to monitor for issues like post-traumatic arthritis.

ADVANCED RESEARCH

Recent studies suggest that conservative treatment can yield results comparable to surgery, while reducing surgical risks. However, this case report's single-patient design limits generalizability, and further large-scale studies with longer follow-up are needed to compare the long-term effectiveness of conservative versus surgical management.

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