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Incidence and Outcomes of Sciatic Nerve Palsy in Acetabular Fractures: Findings from A Prospective Cohort

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Abstract

Introduction: Acetabular fractures are severe orthopedic injuries often associated with high-energy trauma. One of the major complications is sciatic nerve palsy, which can lead to significant functional impairments. This study aims to assess the incidence, risk factors, and outcomes of sciatic nerve palsy in patients with acetabular fractures treated at a tertiary care center in South India.

Methods: This prospective study analyzed 160 patients with acetabular fractures over two years. After exclusions, 152 patients were evaluated using radiographic imaging and clinical assessments, including electromyography (EMG) and nerve conduction studies (NCS). Fracture types were classified using the Letournel and Judet system, and sciatic nerve injuries were categorized as neuropraxia or neurotmesis. Follow-ups were conducted at one month, six months, and one year.

Results: The overall incidence of sciatic nerve palsy was 7.89%, with the highest rate (66.67%) observed in fractures involving the transverse and posterior wall. Posterior column fractures and posterior dislocations were identified as major risk factors. Among the 12 cases of nerve palsy, 50% showed partial recovery, and full recovery was observed in 2 patients with neuropraxia. Neurotmesis cases demonstrated poor recovery outcomes despite surgical intervention.

Discussion: Sciatic nerve palsy in acetabular fractures is predominantly seen in complex fracture patterns involving the posterior wall and transverse fractures. While neuropraxia has a favorable prognosis, neurotmesis results in long-term functional impairment. Comprehensive rehabilitation and early identification of nerve injuries are crucial for improving outcomes.

Conclusion: Sciatic nerve palsy remains a significant complication in acetabular fractures, with complex posterior fracture patterns posing the highest risk. Early diagnosis, careful surgical technique, and structured rehabilitation are essential for optimizing patient outcomes.

Keywords: Acetabular fractures, Sciatic nerve palsy, Neuropraxia, Neurotmesis, Posterior wall fractures, Transverse fractures, Nerve injury, Rehabilitation.

Introduction

Acetabular fractures represent a complex orthopedic challenge, frequently resulting from high-energy trauma such as motor vehicle accidents or falls from height. These fractures often necessitate surgical intervention due to their intricate anatomy and the potential for complications, one of the most severe being sciatic nerve palsy. The sciatic nerve, owing to its proximity to the posterior aspect of the acetabulum, is vulnerable, particularly in posterior wall and column fractures. Sciatic nerve injuries may range from neuropraxia, which typically recovers, to neurotmesis, which often results in significant long-term disability. The incidence of sciatic nerve palsy in acetabular fractures varies based on fracture type and surgical approach. This study aims to investigate the incidence and clinical outcomes of sciatic nerve palsy in a cohort of patients with acetabular fractures over a two-year period at a tertiary care center in South India.

Literature Review

Numerous studies have explored the incidence of sciatic nerve palsy in patients with acetabular fractures, reporting rates ranging from 2% to 18%, depending on the fracture type and surgical intervention method . The higher incidence is linked with complex posterior wall fractures, which elevate the risk to the sciatic nerve . In a meta-analysis by Giannoudis et al., an incidence rate of approximately 4.7% was reported, with the posterior surgical approach carrying the highest risk . (1) Fracture-dislocation patterns, particularly those involving the transverse and posterior wall, pose a greater risk of sciatic nerve injury. Letournel's studies have documented an 18.4% incidence of sciatic nerve palsy, further emphasizing the significance of fracture patterns in relation to nerve injury. (2)

Risk Factors for Sciatic Nerve Injury

Risk factors contributing to sciatic nerve injury in acetabular fractures include posterior surgical approaches and fracture types involving the posterior wall or column. Factors such as prolonged retraction, poor nerve visualization, and improper positioning during surgery can exacerbate the risk of sciatic nerve damage. Fractures with posterior hip dislocation also increase the likelihood of sciatic nerve injury due to the added tension on the nerve. (3)

Outcomes and Prognosis

The prognosis of sciatic nerve palsy is dependent on the severity of the injury. Neuropraxia has a good prognosis, with recovery observed in 50–70% of cases, while neurotmesis often requires surgical intervention and is associated with poorer outcomes. Recovery can be protracted, often taking up to two years. Early identification and management are critical to improving outcomes, but neurotmesis, even with surgery, often leads to incomplete recovery. (4)

Rehabilitation and Long-Term Management

Rehabilitation plays an integral role in managing sciatic nerve palsy, focusing on early mobilization, physical therapy, and regular nerve monitoring. (5) Managing secondary complications, such as heterotopic

ossification, post-traumatic arthritis, and muscle atrophy, is crucial for optimizing functional recovery.

Materials and Methods

Study Design and Setting

This prospective cohort study was conducted from October 2022 to October 2024 at Government Medical College, Thiruvananthapuram, Kerala, India. A total of 160 patients with acetabular fractures confirmed via radiographic imaging were initially enrolled, with a final sample size of 152 after exclusions.

Patient Population and Inclusion Criteria

Participants were aged 18 years and older and presented with radiographically confirmed acetabular fractures. The exclusion criteria included death due to polytrauma or refusal to participate in follow-up. Fractures were classified using the Letournel and Judet system, and sciatic nerve palsy was assessed through clinical examination, EMG, and NCS.

Outcome Measures

The primary outcome was the incidence of sciatic nerve palsy among patients, with secondary outcomes focusing on recovery and functional outcomes over a one-year follow-up period.

Table 1: Fracture Types and Sciatic Nerve Palsy Incidence

Fracture Type	Total Fractures	Sciatic Nerve Palsy Cases	Palsy Incidence (%)
Total Cases	152	12	7.89
Transverse + Posterior Wall	12	8	66.67
Posterior Wall + Posterior Column	14	4	28.57

Table 2: Recovery Outcomes for Transverse + Posterior Wall Fractures

Recovery Status	Count
Full Recovery	2
Partial Recovery	4
No Recovery	1

Table 3: Recovery Outcomes for Posterior Wall + Posterior Column Fractures

Recovery Status	Count
Partial Recovery	4

Results

Incidence of Sciatic Nerve Palsy

- Total cases analyzed: 152
- Sciatic nerve palsy cases: 12 (7.89%)

Fracture type breakdown:

- **Transverse + Posterior Wall Fractures:**
  - 66.67% (8/12) presented with sciatic nerve palsy.
  - Incidence: 5.26% of the cohort.
- **Posterior Wall + Posterior Column Fractures:**
  - 28.57% (4/14) presented with sciatic nerve palsy.
  - Incidence: 2.63% of the cohort.

Recovery Outcomes

- **Transverse + Posterior Wall Fractures**:
  - Full recovery: 2 cases
  - Partial recovery: 4 cases
  - No recovery (Neurotmesis): 1 case
- **Posterior Wall + Posterior Column Fractures**:
  - Partial recovery: 4 cases

Discussion

The findings of this study reveal that sciatic nerve palsy remains a notable complication in patients with acetabular fractures, with an incidence of 7.89%. This incidence is in line with prior literature that reports a

wide range of 2% to 18% depending on fracture type and treatment approach. Specifically, fractures involving the transverse and posterior wall present a substantially higher risk, with 66.67% of such fractures resulting in sciatic nerve palsy. This aligns with studies like Giannoudis et al., which demonstrate that the posterior wall and column fractures, due to their anatomical proximity to the sciatic nerve, pose the greatest risk for injury. (6)

The association between the posterior surgical approach and a higher incidence of nerve injury observed in this study corroborates earlier research. The posterior approach, while commonly used due to its ability to provide better access to certain fracture patterns, increases the vulnerability of the sciatic nerve. This is consistent with the findings of Letournel, who emphasized that posterior wall fractures are the most prone to sciatic nerve damage, particularly when the surgical approach involves extensive retraction and tension on the nerve. (2) Additionally, posterior hip dislocations, which often accompany acetabular fractures, further elevate the risk of nerve injury due to the increased strain on the sciatic nerve during both the injury and surgical reduction.

In terms of outcomes, the prognosis of sciatic nerve palsy varies based on the nature of the injury. Neuropraxia, a common presentation in this study, has a relatively favorable prognosis, with a significant portion of patients recovering either fully or partially over time. This mirrors the findings of other studies where recovery rates for neuropraxia range between 50% and 70%. However, recovery timelines can extend up to two years or more, highlighting the chronic nature of this complication. On the other hand, cases of neurotmesis, where the nerve is completely severed, demonstrate poorer outcomes despite surgical intervention. Only partial recovery was noted in these cases, consistent with previous studies indicating that neurotmesis often results in long-term functional deficits.

Rehabilitation plays a pivotal role in optimizing recovery for patients with sciatic nerve palsy. Early mobilization, physical therapy, and regular monitoring through EMG and NCS are critical components of a comprehensive rehabilitation program. Despite advances in surgical techniques aimed at protecting the nerve, the high incidence of nerve palsy in posterior approaches suggests that further refinements are needed. Techniques such as intraoperative nerve monitoring may help mitigate the risk of nerve damage during surgery, although this was not a focus in this study. Additionally, the management of secondary complications, including heterotopic ossification, muscle atrophy, and post-traumatic arthritis, is essential to improving functional outcomes.

Comparison with Existing Literature

The incidence and recovery patterns observed in this study largely corroborate existing data, but the incidence in transverse and posterior wall fractures (66.67%) is on the higher end of the spectrum compared to global studies reporting a broader range. Variations in incidence could be attributed to differences in surgical expertise, fracture complexity, and resource availability, particularly in a resource-constrained setting like that of this study. For example, Gupta et al. reported similar challenges in managing complex acetabular fractures in settings with limited access to advanced imaging or surgical equipment, which may contribute to higher nerve injury rates and prolonged recovery times. (7)

Strengths and Limitations

A key strength of this study is its prospective design and the use of standardized tools such as EMG and NCS to accurately assess the presence and recovery of sciatic nerve palsy. The inclusion of a large cohort from a single center allows for consistency in the evaluation and management of acetabular fractures, but it also introduces limitations in terms of generalizability. The study's relatively short follow-up period of one year may not capture the full extent of recovery, particularly for patients with more severe nerve injuries such as neurotmesis, where recovery can take several years.

In summary, this study adds to the growing body of evidence highlighting the significant risk of sciatic nerve palsy in acetabular fractures, particularly those involving the posterior column and wall. The study also underscores the need for meticulous surgical planning, nerve protection techniques, and robust postoperative rehabilitation to optimize patient outcomes. Further research should explore the role of advanced intraoperative monitoring and postoperative care protocols to minimize the risk of nerve damage and improve long-term recovery outcomes.

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