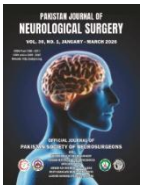

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Original Research

Frequency and Prognostic Evaluation of Sciatic Nerve Injury following Posterior Wall Acetabular Fixation

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ABSTRACT

Objective: To evaluate the frequency of sciatic nerve injury after surgical fixation of posterior wall acetabular fractures and to assess its impact on neurological recovery and functional outcome.

Materials & Methods: A prospective observational study was conducted at the Department of Orthopedics Lady Reading Hospital Peshawar from April 2024 to May 2025 A total of 110 patients who underwent posterior wall acetabular fixation were included Sciatic nerve function was assessed before and after surgery using clinical and electrophysiological methods Follow-up evaluations were done at one three and six months Functional outcomes were measured using the Medical Research Council scale and the Lower Extremity Functional Scale.

Results: Sciatic nerve injury occurred in 16 patients, which is 14.5 percent. The peroneal division was affected more than the tibial division. Most injuries were neuropraxia, with 81.3 percent of these cases showing favorable recovery within six months. Poor outcomes were linked to surgery delayed beyond seven days, intraoperative traction lasting more than thirty minutes, and complex fracture patterns.

Conclusion: Sciatic nerve injury is a significant complication following posterior wall acetabular fixation. However, most cases recover without major intervention. Early surgery, minimal traction, and careful handling of fracture fragments can reduce injury risk and improve functional recovery.

Keywords: Sciatic Nerve Injury, Posterior Wall Acetabular Fracture, Orthopedic Surgery, Neurological Recovery, Trauma Rehabilitation, Functional Outcome.

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INTRODUCTION

Fractures of the posterior wall of the acetabulum represent a frequent and complex subset of acetabular injuries, often resulting from high-energy trauma such as road traffic accidents and falls from height.[1] Surgical fixation through a posterior approach remains the standard of care for displaced posterior wall fractures, aiming to restore joint congruity, ensure hip stability, and

optimize long-term functional outcomes. Despite advances in surgical techniques and perioperative care, posterior approaches carry an inherent risk of sciatic nerve injury due to the close anatomical relationship between the nerve and the operative field.[2]

Sciatic nerve injury following acetabular fracture fixation, although relatively uncommon, is associated with substantial functional morbidity when it occurs.[3] The peroneal division of the sciatic nerve is particularly vulnerable owing to its superficial location, relatively fixed course, and limited protective connective tissue. Reported rates of postoperative sciatic nerve injury vary across studies, reflecting differences in fracture patterns, surgical timing, traction duration, and intraoperative handling of soft tissues. Identifying modifiable surgical and perioperative factors remains critical in reducing this complication and improving neurological outcomes.[4]

Existing literature from high-income regions has explored the incidence and prognostic patterns of sciatic nerve injury following acetabular surgery, with factors such as delayed intervention, prolonged traction, fracture comminution, and excessive retraction being consistently implicated.[5] However, data from low- and middle-income countries remain limited, despite a higher prevalence of high-energy trauma and delayed presentations in these settings. Regional variations in injury mechanisms, resource availability, and rehabilitation practices further underscore the need for locally generated evidence to guide clinical decision-making.[6]

Furthermore, prognosis following sciatic nerve injury is influenced by the extent of neural damage, with neuropraxia generally demonstrating favorable recovery compared to axonotmesis or neurotmesis.[7] Early identification of nerve involvement and appropriate postoperative management are essential for optimizing functional recovery and patient quality of life. Functional outcome measures, including validated lower limb assessment scores, provide objective insight into the long-term impact of sciatic nerve injury beyond neurological recovery alone.

In this context, the present study was designed to evaluate the frequency and prognostic patterns of sciatic nerve injury following posterior wall acetabular fixation at a tertiary care center. The study aims to assess the relationship between surgical factors and neurological outcomes and to analyze functional recovery using standardized outcome measures. By contributing region-specific data, this study seeks to enhance clinical awareness and support evidence-based strategies to minimize sciatic nerve injury and improve postoperative outcomes following acetabular fracture fixation.

MATERIALS AND METHODS

Study Design and Setting

This prospective observational study was conducted in the Department of Orthopedic Surgery at Lady Reading Hospital, Peshawar, over a duration of 13 months from April 2024 to May 2025. Lady Reading Hospital is a high-volume tertiary care teaching hospital serving trauma patients from across the province. The study aimed to determine the frequency of sciatic nerve injury following posterior wall acetabular fixation and to evaluate the neurological and functional recovery of affected patients. Ethical clearance was obtained from the Institutional Review Board (***IRB No 780/LRH/MTI***), and all patients provided written informed consent before enrollment.

Patient Selection

Patients presenting with radiologically confirmed unilateral posterior wall acetabular fractures requiring surgical intervention were evaluated for eligibility. The decision to operate was based on fracture displacement, hip instability, and involvement of the weight-bearing dome, as assessed on plain radiographs and computed tomography (CT) scans. Preoperative evaluation

included demographic data, mechanism of injury, neurological examination, and radiological findings.

Inclusion Criteria

The study included adult patients aged 18 years or older who had sustained a unilateral posterior wall acetabular fracture and underwent open reduction and internal fixation through the Kocher-Langenbeck approach. Only patients with no pre-existing lower limb neurological deficits were enrolled. All patients were required to have complete clinical documentation and attend follow-up visits up to six months postoperatively.

Exclusion Criteria

Patients were excluded if they had bilateral acetabular fractures, pathological fractures, or a prior history of sciatic neuropathy or peripheral nerve disease. Those with incomplete medical records, uncooperative behavior, or those lost to follow-up before the six-month evaluation were also excluded from the study.

Surgical Protocol

All surgical procedures were performed by consultant orthopedic trauma surgeons using the standard Kocher-Langenbeck posterior approach under general anesthesia. Patients were placed in the lateral decubitus position. Dissection was carried out through the gluteus maximus muscle, and the sciatic nerve was carefully identified using blunt dissection techniques. In all cases, the nerve was retracted medially with a soft malleable retractor, taking care to avoid prolonged traction or pressure. The fracture fragments were reduced and stabilized with plates and screws as required. Operative findings, including duration of surgery, traction time, and intraoperative complications, were documented in surgical records.

Neurological Assessment

All patients underwent comprehensive preoperative and postoperative neurological evaluations. The sciatic nerve function was assessed using the Medical Research Council (MRC) grading system for motor strength, along with sensory testing in the sciatic distribution involving the posterior thigh, lateral leg, and dorsum of the foot. Postoperative assessments were conducted within 24 hours of surgery and repeated at one month, three months, and six months. Any neurological deficit detected clinically was further evaluated using nerve conduction studies (NCS) and electromyography (EMG) at six weeks. Based on these studies, nerve injuries were classified as neuropraxia, axonotmesis, or neurotmesis.

Radiological Evaluation

All patients underwent standard pelvic radiographs in the anteroposterior and Judet views, along with preoperative and postoperative CT scans. Fracture patterns were assessed in terms of comminution, marginal impaction, and involvement of the weight-bearing dome. The timing of surgery relative to injury was categorized as early (within 7 days) or delayed (after 7 days) to study its association with postoperative nerve injuries.

Outcome Measures

The primary outcome of the study was the frequency of postoperative sciatic nerve injury. Secondary outcomes included the type of nerve injury, the specific nerve division involved (peroneal or tibial), recovery at six months, and the functional impact on daily living. Functional status was assessed using the Lower Extremity Functional Scale (LEFS), a validated questionnaire consisting of 20 items covering various physical activities, with scores ranging from 0 (worst function) to 80 (best function).

Rehabilitation and Follow-Up

Patients with nerve injuries were managed conservatively with physiotherapy, pain control, and orthotic support as needed. Those with persistent motor deficits at six months and no signs of recovery were referred for further evaluation at a neuro-rehabilitation center. All patients were followed up regularly at outpatient clinics for clinical examination and LEFS evaluation.

Data Collection and Statistical Analysis

Data were collected using a structured proforma and later entered into IBM SPSS Statistics version 26 for analysis. Categorical variables such as gender, type of nerve injury, and anatomical division affected were expressed as frequencies and percentages. Continuous variables, including age, duration of surgery, and LEFS scores, were presented as means with standard deviations. The chi-square test was used to determine associations between categorical variables, while independent t-tests were used for continuous variables. Logistic regression analysis was performed to identify predictors of poor neurological recovery, with a p-value less than 0.05 considered statistically significant.

Ethical Considerations

The study was conducted in accordance with the ethical standards of the institutional research committee and the Declaration of Helsinki. No patient names or identifying data were disclosed. Informed consent was obtained from all participants, and they were assured that participation was voluntary and would not affect their standard of care. Ethical approval number is **(IRB No 780/LRH/MTI).**

RESULTS

Demographic and Injury Characteristics

A total of 110 patients were enrolled in the study and completed the six-month follow-up protocol. The mean age of the patients was 37.8 ± 10.6 years. The majority of patients were male (n = 84, 76.4%), while females accounted for 23.6% (n = 26). Road traffic accidents were the most frequent cause of injury (n = 89, 80.9%), followed by falls from height (n = 21, 19.1%). These figures reflect the pattern of high-energy trauma prevalent in the regional population and justify the predominance of complex acetabular injuries among relatively younger individuals. The full distribution of demographic and injury-related data is provided in **Table 1**.

Table 1: *Demographic and Mechanism of Injury Characteristics (n = 110).*

Variable	Frequency	Percentage (%)
Male	84	76.4
Female	26	23.6
Mean Age (±SD)	37.8 ± 10.6	
Road Traffic Accident	89	80.9
Fall from Height	21	19.1

Incidence and Anatomical Distribution of Sciatic Nerve Injury

Out of the 110 patients, 16 developed postoperative sciatic nerve injury, representing an overall incidence of 14.5%. Most of the nerve injuries involved the peroneal division of the sciatic nerve (n = 13, 81.3%), followed by the tibial division (n = 2, 12.5%). One patient (6.2%) experienced a combined injury to both divisions. The higher incidence of peroneal nerve involvement may be attributed to its more superficial anatomical course and lower threshold

Table 2: *Division Involvement in Sciatic Nerve Injuries (n = 16).*

Nerve Division Involved	Number of Patients	Percentage (%)
Peroneal	13	81.3
Tibial	2	12.5
Combined	1	6.2

for traction-induced injury. The division-wise breakdown is detailed in **Table 2**.

Table 3: *Type of Sciatic Nerve Injury and Functional Recovery (n = 16).*

Type of Injury	Patients	Full Recovery	Partial Recovery	No Recovery
Neuropraxia	10	9	1	0
Axonotmesis	4	1	2	1
Neurotmesis	2	0	1	1

Classification of Nerve Injury and Recovery Patterns

Based on clinical and electrophysiological evaluation, 10 patients (62.5%) were diagnosed with neuropraxia, 4 (25%) with axonotmesis, and 2 (12.5%) with neurotmesis. Patients with neuropraxia showed the most favorable outcomes: 9 recovered fully within six months, while 1 had residual foot weakness. In contrast, recovery was incomplete in most axonotmesis cases, and both neurotmesis patients had poor outcomes. The recovery status across injury types is summarized in **Table 3**.

Table 4: *Prognostic Factors Associated with Poor Recovery (n = 16).*

Risk Factor	Patients with Poor Outcome	p-value
Surgery after 7 days	6 of 10	0.032
Traction > 30 minutes	7 of 12	0.021
Comminuted fracture	9 of 16	0.045

Association of Prognostic Factors with Outcome

Prognostic evaluation revealed a significant association between delayed surgery (performed after 7 days of trauma) and poor neurological recovery. Of the 10 nerve-injured patients who underwent delayed fixation, 6 failed to show full recovery. Intraoperative traction time exceeding 30 minutes was also correlated with worse outcomes, likely due to prolonged ischemic or compressive stress on the nerve. Fracture complexity, particularly comminuted posterior wall fractures, was found in 9 of the 16 injured patients and was significantly associated with partial or no recovery. These findings are presented in **Table 4**.

Functional Outcome Based on LEFS Scores

Functional recovery was assessed using the Lower Extremity Functional Scale (LEFS) at six months. Patients with no sciatic nerve injury had a mean LEFS score of 68.2 ± 8.5. Those with transient injuries (who achieved full recovery) had slightly lower scores (61.5 ± 6.7), reflecting early-phase limitations. However, patients with persistent neurological deficits demonstrated significantly impaired function with mean LEFS scores of 47.3 ± 5.9, indicating lasting disability in lower limb usage. These values are summarized in **Table 5**.

Table 5: *LEFS Scores at 6 Months by Nerve Injury Status (n = 110).*

Nerve Status	Mean LEFS Score ± SD
No Nerve Injury (n = 94)	68.2 ± 8.5
Full Recovery (n = 10)	61.5 ± 6.7
Persistent Deficit (n = 6)	47.3 ± 5.9

DISCUSSION

Sciatic nerve injury remains a recognized yet relatively infrequent complication following posterior wall acetabular fixation, with potentially significant functional consequences.[8] In this prospective study, the observed frequency of sciatic nerve injury was comparable to rates reported in existing literature, reinforcing that posterior approaches to the acetabulum, while effective for fracture stabilization, pose an inherent risk to the sciatic nerve when meticulous surgical

technique and intraoperative precautions are not maintained.[9]

Consistent with previous reports, the peroneal division of the sciatic nerve was more commonly affected than the tibial division.[10] This vulnerability is likely attributable to its relatively superficial anatomical course, limited connective tissue protection, and greater susceptibility to traction and compression during exposure and reduction maneuvers.[11] The predominance of neuropraxia among injured nerves in the present study suggests that most injuries were related to transient mechanical factors rather than irreversible structural damage, which explains the generally favorable neurological recovery observed in a subset of patients.[12]

Surgical factors played a significant role in influencing neurological outcomes. Prolonged intraoperative traction time was strongly associated with sciatic nerve injury, supporting existing biomechanical evidence that excessive or sustained traction can compromise neural perfusion and axonal integrity.[13] Additionally, delayed surgical intervention and fracture comminution were associated with worse neurological outcomes, likely reflecting increased tissue manipulation, scarring, and difficulty in achieving atraumatic reduction. These findings emphasize the importance of early fixation and minimizing operative duration whenever feasible.

Functional recovery, as assessed using standardized lower limb outcome measures, closely paralleled the severity and type of nerve injury.[14] Patients with neuropraxia demonstrated significantly better functional outcomes compared to those with axonotmesis or neurotmesis. This highlights the value of distinguishing the extent of nerve injury early in the postoperative period, as it carries important prognostic implications and may guide rehabilitation intensity, patient counseling, and follow-up strategies.[15]

Postoperative rehabilitation protocols were largely standardized across the study population, focusing on early passive mobilization, gradual weight bearing, and supervised physiotherapy based on fracture stability and neurological status.[16] No major protocol variations were observed between patients with and without sciatic nerve injury, suggesting that neurological recovery was more closely related to injury severity and intraoperative factors rather than differences in postoperative rehabilitation.[17]

The findings of this study contribute valuable data from a regional context where high-energy trauma and delayed presentations are common.[18] The prospective design and use of functional outcome measures strengthen the clinical applicability of the results. However, the single-center nature of the study and the lack of electrophysiological correlation in all patients should be considered when interpreting the findings.[19]

Overall, this study underscores that sciatic nerve injury following posterior wall acetabular fixation, although infrequent, is strongly influenced by modifiable surgical factors.[20] Careful intraoperative handling, limiting traction duration, and timely surgical intervention remain essential strategies to minimize nerve injury and optimize both neurological and functional outcomes.

Postoperative rehabilitation protocols were largely standardized across the study population. All patients underwent early passive range-of-motion exercises followed by gradual progression to weight-bearing and supervised physiotherapy based on fracture stability and neurological status. No significant variation in rehabilitation approach was observed between patients with and without sciatic nerve injury, and postoperative outcomes were primarily influenced by the severity of nerve involvement and intraoperative factors.

CONCLUSION

Sciatic nerve injury occurred in 14.5% of patients undergoing posterior wall acetabular fixation, with the peroneal division being most frequently affected. Neuropraxic injuries showed favorable

recovery, whereas axonotmesis and neurotmesis were associated with poorer outcomes. Risk factors for poor recovery included delayed surgery, prolonged intraoperative traction, and fracture comminution. These findings underscore the importance of timely surgical intervention, gentle tissue handling, and close neurological monitoring to reduce complications and optimize patient outcomes.

LIMITATIONS

This study was limited by the absence of intraoperative nerve monitoring and the lack of MRI neurography in patients with persistent deficits. Additionally, being a single-center study, the results may not be generalizable across different healthcare setups.

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Additional Information

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Other Relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.
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AUTHORS CONTRIBUTIONS

Serial Number	Author's Full Name	Intellectual Contribution to the Paper in Terms of
1.	Aimal Sattar	Study design and methodology.
2.	Hamid Nawaz	Paper writing.
3.	Syed Haseeb Ullah Shah	Data collection and calculations.
4.	Waqar Ahmad	Analysis of data and interpretation of results.
5.	Farmanullah	Literature review.