



3-2023

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Recommended Citation

Khadim, Maryum Khadim; Bano, Safia; and Numan, Ahsan (2023) "Clinical Spectrum, Risk Factors & Electrophysiological Evaluation of Sciatic Nerve Injury in Patients Presenting to A Tertiary Care Hospital," *Pakistan Journal of Neurological Sciences (PJNS)*: Vol. 18: Iss. 1, Article 5.
Available at: <https://ecommons.aku.edu/pjns/vol18/iss1/5>

CLINICAL SPECTRUM, RISK FACTORS & ELECTROPHYSIOLOGICAL EVALUATION OF SCIATIC NERVE INJURY IN PATIENTS PRESENTING TO A TERTIARY CARE HOSPITAL

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Date of submission: January 15, 2023 **Date of revision:** March 19, 2023 **Date of acceptance:** March 25, 2023

ABSTRACT

Background and objective:

Sciatic nerve injury (SNI) is the second most common neuropathy of the lower extremities. The objective of this study was to find out the clinical spectrum and risk factors of SNI and to evaluate correlation between electrophysiological and clinical severity.

Methods:

In this cross-sectional study, 85 consecutive patients clinically diagnosed with sciatic neuropathy in the months of July 2022 to Dec 2022 who presented in department of Neurology, King Edward Medical University were examined electrophysiologically. Patients with polyneuropathy, plexopathy, radiculopathy were excluded from the study. NCS & EMG were performed by conventional methods. Findings were noted in the predesigned pro forma along with history & demographic variables.

Results:

Out of total of 85 patients, 80% were males and 20% were females. Forty-three patients presented with traumatic injuries (49.4%), 34 patients had injection-induced nerve injury in gluteal region (40%), and remaining eight presented with history of hip surgeries (9.4%). Electrodiagnostic studies (EDX) revealed axonal damage in all the injuries. Peroneal division was predominantly involved in 55% of patients, and 26.6% had equal involvement of both the components. Common clinical presentations were sensory loss and foot drop. There was a moderate positive correlation between EDX and clinical severity ($R = 0.65$).

Conclusion:

SNI is not uncommon in our setup and often remains under-reported. Common etiology of SNI was improper intramuscular injection in our study and pattern of injury was axonal in nature.

Key Words: Sciatic nerve injury (SNI), Electro-diagnostics (EDX), Intramuscular Injection, Nerve conduction studies (NCS), Electromyography (EMG)

INTRODUCTION

Sciatic nerve injury (SNI) is known to be the second most common neuropathy of the lower extremities.¹ Sciatic nerve is derived from L4-S3 nerve roots, and leaves the pelvis through greater sciatic foramen covered by gluteal muscles. In the popliteal fossa, it divides into common peroneal and tibial components

that eventually innervate muscles in the leg and foot.² Its long anatomic course and postero-lateral position predispose it to several types of injuries.³ Most common mechanisms of injury include intramuscular injections in the buttock, trauma & surgical procedures of the pelvic region. Other causes include stretch injury, post radiation injury etc.² Clinically patients with sciatic

nerve injury show weakness in the peroneal and tibial innervated muscles with sensory disturbance over lateral calf, dorsum & sole of the foot.^{4,5}

The most common clinical presentation is foot drop and most common pathophysiology is axonal damage.^{4,6} SNI is diagnosed clinically and is supported by nerve conduction study/ electromyography, CT, MRI and neuromuscular ultrasound. Electrodiagnostic studies (EDX) evaluation plays a vital role in diagnosing SNI and ruling out its possible mimics.²

In the past hip arthroplasty was known to be the most common cause of SNI, but recent studies have reported IM injections as the leading cause in poor economic countries.^{7,8} Therefore, we aimed to identify the most common cause of SNI and its electrophysiological features in our setup, and to check the correlation between clinical and electrophysiological severity.

METHODS

Study type: Cross-sectional study.

Place and duration of study: Department of Neurology, King Edward Medical University from July 2022 to Dec 2022.

Sample size: Eighty-five patients enrolled in the study.

Sampling technique: Non-probability consecutive sampling.

Inclusion criteria: Patients aged 13 to 70 year with clinical and electrophysiological evidence of sciatic nerve injury were included.

Exclusion criteria: Patients with signs and symptoms of Polyneuropathy, plexopathy and radiculopathy were excluded from the study. Patients with pacemakers and significant edema were also excluded for the procedure.

Data collection: Eighty-five consecutive patients clinically diagnosed with sciatic nerve injury in the months of July 2022 to Dec 2022, who were referred to the EMG laboratory were examined clinically and electrophysiologically. The leads assessment scale of neuropathic signs and symptoms was used to evaluate severity.⁹ Clinical severity was labelled by a consultant neurologist. Written informed consent was taken from all the patients.

Nerve conduction studies and electromyography were performed by conventional methods. Electrodiagnostic findings along with clinical history and demographic variables were noted on a predesigned pro forma.

In electrophysiological examination, EDX procedure was done according to the protocol for SNI.² Sensory nerve conduction studies were performed antidromically. Peroneal and tibial nerve CMAPs were recorded from extensor digitorum brevis & abductor hallucis muscles respectively by using surface electrodes. Reference values were obtained from normal asymptomatic limb. In the analysis, CMAP or SNAP amplitudes were considered abnormal if they were less than 75% of the reference values. The muscles sampled during needle EMG were as follows; Tibialis anterior, gastrocnemius-soleus complex, short and long heads of biceps femoris, rectus femoris and vastus lateralis muscles of the symptomatic limb, and paraspinal muscles.

In needle electromyography, MUAPs were analyzed in terms of recruitment, amplitude, duration and polyphasia. MUAP was labelled neurogenic when reduction in recruitment pattern was present. Denervation was labelled when Spontaneous activity (fibrillation potentials and positive sharp waves) was present. Re-innervation was labelled when MUAP amplitude was >3mV, polyphasic units were seen or its duration was >15 ms. Electrophysiological severity was labelled on the basis of reduction in recruitment pattern; (mild – mild reduction), (moderate – moderate reduction), (severe – marked reduction) in two or more muscles.

Data analysis: The data was analysed using SPSS 25.0.

Ethical considerations: This study was approved by the Ethical Review Committee of King Edward Medical University, Lahore.

RESULTS

In this study, 85 patients were evaluated electrophysiologically with a mean age of 34.2 ± 16.2 . Out of which 68 patients (80%) were males and only 17 patients (20%) were females. Clinical characteristics are shown in the Table 1.

Table 1: Clinical features of 85 patients with sciatic neuropathy

Clinical features		Frequency (n) (Total patients n=85)	Percentage (%)
Gender	Males	68	80 %
	Females	17	20 %
Age	Mean Age = 34.2 ± 16.2		
Walking difficulty	Yes	83	97.6 %
	No	2	2.4 %
Foot drop	Present	76	89.4 %
	Absent	9	10.6 %
Steppage gait	Yes	82	96.5 %
	No	3	3.5 %
Sensory loss	Present	85	100 %
	Absent	0	0.0 %
Weakness of Inversion/Eversion	Yes	84	98.8 %
	No	1	1.2 %
Abnormality of ankle reflex	Yes	80	94.1 %
	No	5	5.9 %
Decreased power of intrinsic & extrinsic foot muscles	Yes	85	100 %
	No	0	0.0 %
Atrophy	Present	44	51.8 %
	Absent	41	48.2 %
Pain	Present	76	89.4 %
	Absent	9	10.6 %
Difficulty in standing from sitting position	Yes	21	24.7 %
	No	64	75.3 %
Weakness of	Left limb	41	48.2 %
	Right limb	43	50.6 %
Temporal course	Acute	1	1.2 %
	Sub-acute	28	32.9 %
	Subacute- chronic	40	47.1 %
	chronic	16	18.8 %

In 44 patients, right lower extremity was affected while 41 patients had weakness of the left lower extremity. Table 2 shows percentage of different injury mechanisms resulting in SNI. 49.4% of individuals presented with traumatic injuries (Road traffic accidents & gunshot wounds were the most common incidents among traumatic injuries). The second most

common mechanism of injury was improperly administered IM injections in the buttock, found in 40% of patients. Nineteen patients received injections on the left side and 15 received injections on the right side. In all the patients dorsogluteal area was selected for injection administration. Only eight patients (9.4%) had post-operative weakness.

Table 2: Etiologies of sciatic neuropathy

Etiologies	Frequency (n) (Total patients n=85)	Percentage (%)
Trauma	42	49.4 %
IM Injection	34	40.0 %
Post-operative	8	9.4 %
Other	1	1.2 %

In EDX laboratory, one patient was encountered in acute stage of injury, while 28 patients were evaluated in subacute stage. Most of the patients were evaluated in subacute-chronic stage, only 16 patients had chronic injuries. In chronic cases, re-innervation changes were present in 50% individuals. Electrodiagnostic features of all individuals are shown in Table 3. In all 85 patients damage was axonal in nature, 59 injuries were localized above the level of thigh muscles (e.g short & long heads of biceps-femoris muscles) while 26 patients had injuries below the level of biceps femoris. In at least three patients with proximal injuries in the buttock, thigh muscles (short head of biceps) were exceptionally spared maybe due to fascicular sparing. Peroneal fibers were preferentially affected in 55.3% of cases. Tibial nerve fibers were predominantly involved in 13 patients (15.3%). Twenty-five individuals had equal involvement of both the components. In two patients tibial nerve conductions were entirely normal.

Table 3: Electro-diagnostic features of sciatic neuropathy

Electro-diagnostic Features		Frequency (n) (Total patients n=85)	Percentage (%)
Pathophysiology	Axonal	85	100 %
	Demyelinating	0	0.0 %
Localization of lesion	Above Biceps Femoris	59	69.4 %
	Below Biceps femoris	26	30.6 %
Predominantly involved fibers	Peroneal fibers	47	55.3 %
	Tibial fibers	13	15.3 %
	Equal involvement	25	29.4 %
Evidence of Denervation/re-innervation	Denervation changes	25	29.4 %
	Reinnervation changes	19	22.4 %
	Both	25	29.4 %
	None	16	18.8 %
EDX-severity	Mild	5	5.9 %
	Modertae	32	37.6 %
	Severe	48	56.6 %

Severity on the basis of clinical and electrophysiology findings is shown in Table 4. Severe & moderate sciatic nerve injuries represented 85.8% on clinical severity scale and 94% on

electrophysiology severity scale. There was a moderate positive correlation between clinical and electrophysiological severity ($R = 0.65$).

Table 4: Correlation between clinical & electrophysiological severity

Clinical severity	Electrophysiological severity			Total	Pearson Correlation coefficient
	Mild	Moderate	Severe		
Mild	4	7	1	12	-----
Moderate	0	20	8	28	-----
Severe	1	5	39	45	-----
Total	5	32	48	85	R = 0.65 Moderately Positive

DISCUSSION

Sciatic nerve injury is a major health problem as it affects both economically rich & poor countries alike. In this study we investigated sciatic nerve injuries due to different causes in our tertiary care hospital. In our study 80% of the affected individuals were males whereas several studies from different countries have shown that females were mostly affected.^{4,10} In a retrospective study conducted by Cherian et al. 48% of patients were males while 52% were females.⁴ Maybe the difference exists because in our study major causes of injury are traumas (RTA & gunshot) & intramuscular injections, and in our population females are mostly housewives and most of the females refuse injections due to needle phobia. However, some studies have shown that men are at higher risk than women because of thinner fat pad.^{11,12}

In our study, the most common etiology of SNI was traumatic injuries (RTA & gunshot wounds). In major cities traffic rules violation and climate changes (smog) are the contributing factors. The second most common cause is IM Injections which is consistent with another study.¹³ Hip surgeries which were the most common cause in west, is the least common cause in our setup.^{4,14} In a research conducted by Kadioglu et al. in 2017 (Turkey), injection injuries were more common in thin lean patients.¹⁰ Our study also supports this finding as most of patients were slim. More than 50 % of our patients had been given injections in the left buttock

and this finding is also consistent with the same study. In economically poor countries, negligence of health care workers seems to be an important factor.^{7,14} The other factor is a misbelief that injections work more efficiently than oral medications.

Clinical features due to SNI can range from mild sensory abnormality to severe motor disability. In a study, most common clinical presentation was sensory symptoms & motor weakness e.g foot drop (77.1%).⁴ Our findings were consistent with this study as 89.4% of our patients had foot drop.

Several studies concluded that demyelinating neuropathies are extremely rare.^{4,6,8} Previously studies reported a small percentage of demyelinating sciatic nerve injuries but in our series all the patients had axonal pathophysiology that supports the hypothesis that demyelinating sciatic nerve injuries are very rare.^{4,6}

Studies have shown that common peroneal nerve is predominantly affected because of its position within the nerve and several other factors.^{3,6,8,15} Our findings support the hypothesis as peroneal fibers were preferentially affected in 55% of our patients. A study reported the same findings in 2011. They also reported that most of their patients presented with moderate or severe injuries and our findings are consistent with them as 85% to 94% of our patients were either moderate or severe.¹⁵

Limitations:

1. As follow up NCS/EMG was not done, so we cannot comment about prognosis.
2. Only patients referred to the Neuro-electrophysiology laboratory were evaluated.
3. Unfortunately, most of our patients did not know about the name of drug injected so there is less information regarding nature of drugs.

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CONCLUSION:

In the past, hip surgeries were thought to be the most common mechanism of injury in sciatic neuropathy but traumatic injuries & improperly administered IM Injections are becoming the leading causes in economically poor countries as shown in our study. EDX data shows most of the injuries had preferential involvement of peroneal division of sciatic nerve and axonal damage remains the significant pathophysiology.

Conflict of interest: Author declares no conflict of interest.

Funding disclosure: Nil

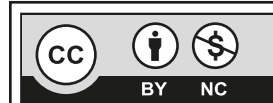
Authors' contribution:

Maryum Khadim; Concept, data collection and analysis, manuscript writing

Safia Bano; Concept, data analysis and interpretation, manuscript writing,

Ahsan Numan; Concept and design, manuscript revision

All the authors have approved the final version of the article, and agree to be accountable for all aspects of the work.



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