ORIGINAL ARTICLE

FREQUENCY OF DIFFERENT PATTERNS OF SCIATIC NERVE INJURY WITH OPEN COMMINUTED FRACTURE OF FEMUR DUE TO FIRE ARM

Umar Hayat[1], Abdus Samad Khan[1], Waqas Raza[2], Syed Dilbagh[1]

[1]Department of Orthopaedic, Khyber Teaching Hospital, Peshawar - Pakistan

[2]Department of Orthopaedic, Mercy Teaching Hospital, Peshawar - Pakistan

ABSTRACT

Objective: To determine frequency of different patterns of sciatic nerve injury with open comminuted fracture of femur due to fire-arm.

Material and Methods: This study was conducted at Department of Orthopedics, Khyber Teaching Hospital, Peshawar, Pakistan from January 2016 to June 2016. Study design was cross sectional study and the duration of the study was 6 months in which according to W.H.O sample size software sample size was 171 using 20% prevalence of tibial component with 95% confidence interval and absolute precision/margin of error to be 6%. Moreover Consecutive (Non-Probability) sampling technique was used for sample collection. Written informed consent was taken from the patients with firearm injuries having femur fracture included in the study. All patients were treated according to the standard protocol.

Results: In this study 30% patients were in age range 21-30 years, 38% patients were in age range 31-40 years, 27% patients were in age range 41-50 years and 5% patients were in age range 51-60 years. Seventy two percent patients were male and 28% patients were female. Moreover 62% patients had completer sciatic nerve injury, 28% patients had peroneal component injury and 10% patients had tibial component injury.

Conclusion: Majority of patients with firm injury to their femur suffer from sciatic nerve injury concomitantly.

Key Words: Sciatic nerve injury, comminuted fracture of femur, fire-arm.

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INTRODUCTION

Sciatic nerve is largest peripheral nerve of human body. It is composed of peroneal and tibial components which later on separatein in lower third of thigh proximal to popliteal fossa at a variable distance from knee.[1] Sciatic nerve is the largest peripheral nerve of human body. The prevalence of nerve palsy associated with gunshot fractures of the femur is 9% with an average of about 5%.Injuries may be complete or partial and mostly involve peroneal or sciatic nerve.

In thigh the nerve usually is damage by penetrating wounds, fractures of femoral shaft or gunshot injuries.[4] Because of its special anatomic situation, entrapment of nerve whether distally or proximally may render its axons more prone to mechanical damage.[5] Nerve injury results in sensory loss from whole of lower leg and foot. It also causes weakness of ankle dorsiflexors, toe extensors and ankle evertors resulting in plantar flexed, equino-varus foot deformity commonly known as foot drop.[6]

The common peroneal component of sciatic nerve is more prone to damage because of its small contribution to the main nerve trunk, more lateral and superficial position.[7] Campbell in a study in 2008 reveals that surgical repair of peripheral nerve is done at varying time intervals after the injury and there are a number of considerations in deciding whether and when to operate. The optimal timing for an electrodiagnostic study depends upon clinical examination although conventional teachings usually hold that an electrodiagnostic study should not be done until about

Dr. Umar Hayat (Corresponding Author)
Senior Registrar
Mercy Teaching Hospital, Peshawar - Pakistan
Cell: +92-333-9125754
Email: uhayat2@gmail.com
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3 weeks after the injury. This reflects the importance of clinical examination done at time of initial presentation and then at regular intervals to evaluate the progress.[8]

The common peroneal and tibial components have variations in functional neurologic recovery whether operated or not as described by Murovic in a study in 2009. The tibial component has better prognosis than common peroneal nerve.[9] Beidas in a study in 2011 showed that in civilian gunshot injuries presence of fracture is clearly an additional risk factor for neurologic injury.[10] Hamdan in a study in 2008 showed various patterns of sciatic nerve injury. He states that 95% suffered common peroneal nerve palsy. The rest of the patients had either solitary tibial division palsy or complete tibial and peroneal deficits.[11]

Due to intense pain and disability at fracture site sciatic nerve and its components injury is missed by orthopedic surgeon.[12] Later on patient develops foot drop due to motor loss and ulcer over the sole of foot due to insensate foot. We conducted this study by overcoming pain with application of skeletal traction first. This immobilize the fracture site and pain was minimized. Then detailed clinical neurological examination of sciatic nerve and its components performed by using British Medical Research Council grading system for Motor and Sensory assessment after nerve injury. This study shows the magnitude of sciatic nerve and its components injury with open comminuted fracture due to fire-arm. The study will also show the importance of clinical examination done at the time of presentation after immobilizing fracture site with skeletal traction to minimize pain so the treating orthopedic surgeon will have less chances of missing sciatic nerve injury with open comminuted fracture femur due to fire arm.

MATERIAL AND METHODS

This cross sectional study was designed at the department of Orthopedics khyber Teaching Hosital, Peshawar from January 2016 to June 2016. The aim of the study was to determine frequency of different patterns of sciatic nerve injury with open comminuted fracture of femur due to fire-arm.

A total of 171 patients visiting to Orthopedics department of khyber teaching Hospital, Peshawar were included this study. The study was conducted after approval from hospital ethical and research committee. All patients meeting the inclusion criteria with open comminuted fracture of femur due to firearm injury and exclusion criteria were included in the study . The purpose and benefits of the study were explained to all the patients and a written informed consent was taken. All patients were subjeced to detailed history with clinical examination after immobilizing the fracture site with skeletal traction. A through neurological examination of the patient was carried out to document sensory loss and motor loss using British Medical Research Council (MRC) grade score for the assessment of motor and sensory loss after peripheral nerve injury.

All the above-mentioned information including name, age, and gender was recorded on a predesigned Proforma. Strictly exclusion criteria was followed to control confounders and bias in the study results.

RESULTS

A total of 171 patients were observed to determine the frequency of different patterns of sciatic nerve injury with open comminuted fracture of femur due to fire-arm. The results were analyzed as: 106(62%) patients had completer sciatic nerve injury, 48(28%) patients had peroneal component injury and 17(10%) patients had tibial component injury. 123(72%) patients were male while 48(28%) patients were female.

Age distribution is shown in Table 1. In 17 patients who had tibial component injury, 51 patients were in age range 21-30 years,65 patients were in age range 31-40 years and 46 patients were in age range 41-50 years. Chi Square test was applied in which P value was 0.046

Stratification of patterns of sciatic nerve injury with gender distribution was analyzed as in 106 patients with completer sciatic nerve injury, 78 patients were male and 28 patients were female. In 48 patients had peroneal component injury 32 patients were male and 16 patients were female. In 17 patients had tibial component injury, 13 patients were male and 4 patients were female. Chi Square test was applied in which P value was 0.031.

DISCUSSION

Sciatic nerve is the largest peripheral nerve of human body. It is composed of peroneal and tibial components which later on separate in the lower third of thigh proximal to popliteal fossa at a variable distance from knee. In thigh the nerve usually is damage by penetrating wounds, fractures of femoral shaft or gunshot injuries. Beidas in a study in 2011 showed that in civilian gunshot injuries presence of fracture is

Table 1: Distribution of different age groups (n=171)

Age in years	Frequency & Percentage
21-30	51(30%)
31-40	65(38%)
41-50	46(27%)
51-60	9(5%)
Total	171(100%)

clearly an additional risk factor for neurologic injury.10 Hamdan in a study in 2008 showed various patterns of sciatic nerve injury. He states that 95% suffered common peroneal nerve palsy. The rest of the patients had either solitary tibial division palsy or complete tibial and peroneal deficits.[11]

In our study 30% patients were in age range 21-30 years, 38% patients were in age range 31-40 years, 27% patients were in age range 41-50 years and 5% patients were in age range 51-60 years. 72% patients were male and 28% patients were female. Moreover 62% patients had completer sciatic nerve injury, 28% patients had peroneal component injury while 10% patients had tibial component injury.

Similar results were observed in study done by Warwick D et al[12] in which the prevalence of nerve palsy associated with gunshot fractures of the femur was 9% with an average of about 5% injuries may be complete or partial and mostly involve peroneal or sciatic nerve. The frequency of sciatic nerve involvement associated with long bone fractures in lower limb is 50%. With femur fracture, complete sciatic nerve injury 15%, tibial component 20% and peroneal component 35% respectively but this is war injury data. No comparable figures for civilian fire-arm injury is yet available.

Similar results were also observed in another study done by Behr JT et al[13] in which the frequency of specific nerve involvement associated with long bone fractures on 300 cases in lower limb is 50%.

Nerve injuries accompany approximately 25% or more of gunshot wounds to the extremities[14] and are the major determinant in long-term disability. Hassan et al noted that nerve injuries often occur concomitantly with vascular injuries, resulting in worse outcomes (39% poor results) than with a vascular injury alone (7% poor results)[15]. In two landmark studies of nerve injuries in military conflicts, Sunderland S et al[16] and Canale[17] both noted spontaneous recovery of neurologic deficits in 68% to 69% of patients. Ninety percent of patients with recovery had improved within the first 3 to 9 months. Studies describing nerve injuries inflicted by civilian firearms have reported similar results[13] because many nerve injuries spontaneously recovered, most investigators recommend initial observation. In patients with neurologic deficits and large open wounds, nerves can be explored to determine whether they are in continuity or are severed. The ends of severed nerves are tagged and usually are repaired secondarily when the extent of the nerve injury can be more clearly determined. Patients are followed with clinical examination and may also be evaluated with electromyography and nerve conduction velocity tests to evaluate neurologic recovery. If no recovery is noted within the first 3 to 4 months after injury, nerve exploration should be considered, particularly in proximal injuries. Neurolysis, neuroma resection, end-to-end repair, or nerve grafting can be done as the situation dictates. Canale[17] described significant recovery in only 25% of repaired nerves that had been severed by gunshots.

The prevalence of nerve palsy associated with gunshot fractures of the femur ranges from 0% to 9%, with an average of about 5%. Injuries may be complete or partial, and most commonly involve the common peroneal nerve. Approximately 50% to 60% of nerve palsies demonstrate complete or significant partial recovery, whereas 40% to 50% exhibit minimal or no recovery. Neurologic recovery can be assessed clinically or by electromyography and nerve conduction studies. If no appreciable recovery is detected after 4 to 6 months, delayed nerve exploration may be considered.

CONCLUSION

Fire arm injuries to thigh are significantly related to the sciatic nerve injuries.

RECOMMENDATIONS

Thorough assessment of firearm injury victims help early detection of sciatic nerve injury.

REFERENCES

1. Gustafson KJ, Grinberg Y, Joseph S, Triolo RJ. Human distal sciatic nerve fascicular anatomy: Implications for ankle control using nerve-cuff electrodes. J Rehabil Res Dev.2012;49(2):309–22.
2. Parez EA. Penerating trauma. In: Bucholaz RW, Heckman JD, Court-Brown CM, editors. Rockwood and Green's fractures in adults. 6th ed. USA: Lippincot Williams and Wilkins; 2006.p.466.
3. Jobe MT, Martinez SF. Peripheral nerve injuries. In: Canale ST, Beaty JH, editors. Campbell's operative orthopaedics. 11th ed. Pennsylvania: Mosby Elsevier;2008.p.36-46.
4. Agrawal M,Suri T,Sural S, DhalA. Use of external fixator in the post operative management of sciatic nerve injuries. Eur J Orth Surg Trauma.2011;21:135-37.
5. Bartkiw MJ, Sethi A, ConiglioneF, Holland D, Hoard D, Colen R, et al. Civilian gunshot wounds of the hip and pelvis. J Orth Trauma.2010;24(10):645-52.
6. Secer H,Daneymez M,Tehli O,Gonul E, Izci Y. The clinical, electrophysiologic, and surgical characteristics of peripheral nerve injuries caused by gunshot wounds in adults: a 40-year experience. Surg Neurol.2008;69(2):143-52.
7. Weil YA,Pearle AD,Palladas L,Liebergall M, Mosheiff R. Long term functional outcome of peneterating sciatic nerve injury. J Trauma.2008;64(3):790-95.

8. Campbell WW. Evaluation and management of peripheral nerve injury. Clin Neurol Physiol. 2008;119(9):1951-65.

9. Murovic JA. A Louosiana state university health sciences center literature review with comparison of the Operative Outcomes of 806 louisiana state university health sciences center Sciatic, common peroneal, and Tibial nerve lesions. Neurosurg.2009;65(4):18-23.

10. Beidas OE,Rehman S. Civilian gun-shot extremity fractures with neurologic injury. Orthop Surg.2011;3(2):102-05

11. Hamdan FB, Jaffar AA, Ossi RG. The propensity of common peroneal nerve in thigh level injuries. J Trauma.2008;64(2):300-03.

12. Warwick D, Srinivasan H, Solomon L. Peripheral nerve disorders. In:Solomon L, Warwick D, Nayagam S, editors. Apley's system of orthopaedics and fractures. 9th ed. London: Hodder Arnold; 2010.p.272.

13. Behr JT, Apel DM, Pinzur MS, Dobozi WR, Behr MJ: Flexible intramedullary nails for ipsilateral femoral and tibial fractures. J Trauma 2002:27:1354-57.

14. Platzer W: Color Atlas of Human Anatomy. Vol. I. Locomotor System. 5th ed. Thieme Verlag, Stuttgart New York 2003.

15. Hassan Hamdy Noaman. Surgical Treatment of Peripheral Nerve Injury, Basic Principles of Peripheral Nerve Disorders, Dr. Seyed Mansoor Rayegani (Ed.),2012 ISBN: 978-953-51-0407-08.

16. Sunderland S: Nerve Injuries and Their Repair: A Critical Appraisal. New York: Churchill Livingstone, 1991.

17. Canale & Beaty: Early management of nerve injuries. Campbell's Operative Orthopaedics, 11th ed.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

Hayat U: Data collection
Khan AS: Idea and Data analysis
Raza W: Statistics /Bibliography
Dilbagh S: Data collection & manuscript writing

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.