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Demography and incidence of peripheral nerve injury in extremity trauma

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ABSTRACT

INTRODUCTION: Peripheral Nerve Injury can have significant long term morbidity. They are common injury in the extremity trauma but demographic data and incidence vary. This study aimed to analyze the demographic data and incidence of Peripheral Nerve Injury in the upper and lower limb trauma.

METHODS: This was a retrospective cross section study of the medical records of all the extremity injury admitted in the orthopaedic inpatient with or without peripheral nerve injury in the period of one year from January 1, 2019 to December 31, 2019 in the tertiary care teaching hospital. Details of the demographic data such as age, sex, and injury details (mode of injury, complete diagnosis, nerve involved, closed or open injury, associated injury) were entered in the data sheet and results were analyzed along with possible associations.

RESULT: There were total of 4.04% (n=31) cases of peripheral nerve injury out of total 766 upper and lower limb traumatic inpatients. Mean age of the patients with Peripheral Nerve Injury was 24.58 years (range 5-50) with male predominace. Radial nerve injury was most common followed by median and ulnar nerve. Peripheral Nerve Injury was more common in upper limb trauma, open injury, Road Traffic Accident and associated vascular injury.

CONCLUSION: Incidence of Peripheral Nerve Injury was 4.04% of all the extremity injured inpatients in the orthopaedics. There was predilection of male sex, younger age group and upper limb injury. Radial nerve was the most commonly injured nerve and there was significant association of Peripheral Nerve Injury with open injury and vascular injury.

KEYWORDS: Demography; extremity trauma; incidence; peripheral nerve injury

INTRODUCTION

Trauma to the extremity can not only cause bone or joint injury but also soft tissue injury. Injury to the peripheral nerve is an important adjunct to extremity trauma and results in significant impact on treatment protocol and morbidity on long run.[1] Types, frequency and severity of nerve injury are dependent upon nature of trauma, mode of injury, anatomical site and nature of bone and joint injury. Nerve may be contused, lacerated, traction injured or transected. Reported incidence of peripheral nerve injury among patients with extremity trauma varies from 2-5% in different studies.[2,3] Incidence is on the lower side of this figure when excluding the brachial plexus injury. There is variation in the limb involved and nerve involved depending upon the site and nature of injury. Most of the studies have shown increased risk of peripheral nerve injury in the younger age, upper limb and incidence increases with Road Traffic Accident (RTA) and penetrating nature of injury.[4,5]

There are few studies regarding demography and incidence of peripheral nerve injury in the extremity trauma in the developed countries but such data are lacking from our country. Data

from the other countries may not be directly transferrable to our context. So, this study was planned with aim of describing incidence of peripheral nerve injury in the patients with extremity trauma and analyze the different clinical and demographics data associated with the injury.

METHODS

This is a retrospective cross section study of the data obtained from the medical record section for all the inpatient of the department of Orthopedics for complete one year period from Jan 1, 2019 to Dec 31, 2019 in tertiary care teaching hospital located in the central Nepal. Approval for the study was obtained from the institutional review board.

All the demographic data such as age, sex, mode of injury, diagnosis, nerve, vessels, bone, joint and soft tissue injury, open or closed injury and associated injury of the cases admitted in the department of orthopedics were entered in the master chart of Excel. Inclusion criteria were all the traumatic extremity injury with peripheral major nerve injury inpatient of all age admitted and managed in one year period in the department of Orthopedics. Exclusion criteria were patient with spinal cord or traumatic brain injury, iatrogenic nerve injury, postoperative or post plaster nerve injury and operatively treated nerve injury elsewhere.

Data was analyzed with the SPSS software. Frequency data and categorical variables were analyzed with descriptive statistics and mean was calculated and compared for numerical variables. Comparision and contrasting of nerve injury was done with clinical and demographics parameters such as age, sex, mode of injury, upper limb, lower limb, open and closed injury. Associated vascular injury and association with the nerve injury was analyzed with Pearson's correlation. P value of <0.05 was considered as statistical significance level.

RESULT

There were total of 766 (61.37%) of extremity trauma patients out of total 1248 orthopedic inpatients during one year period. Out of them, there were total of 31 cases of peripheral nerve injury which constituted 4.04% of all the extremity injury. Mean age of the cases with nerve injury was 24.58 years (range 5-50). There were male predominance with 87.1% (n=27) vs female 12.9% (n=4) though it was not statistically significant (p>0.05). Upper extremity was the most common site of PNI followed by lower extremity.

Summary of the demographic data of 31 cases of peripheral nerve injury (PNI) has been presented in the table 1.

Male: Female (Total=31)	87.1%: 12.9% (n=27:4)
Upper limb	80.64% (n=25)
Lower Limb	19.35% (n=6)
Closed injury	38.7%(n=12)
Open injury (Laceration/cut injury)	61.29% (19)
Associated vascular injury	32.3% (n=10)
Mean Length of hospital stay	15.6 days (range 1-77)

Table 1: Showing summary of demographic and clinical data distribution for peripheral nerve injury

Most common mode of injury was Road Traffic Accident (RTA) followed by object related injury as presented in the pie chart. It was statistically significant (p=0.002).

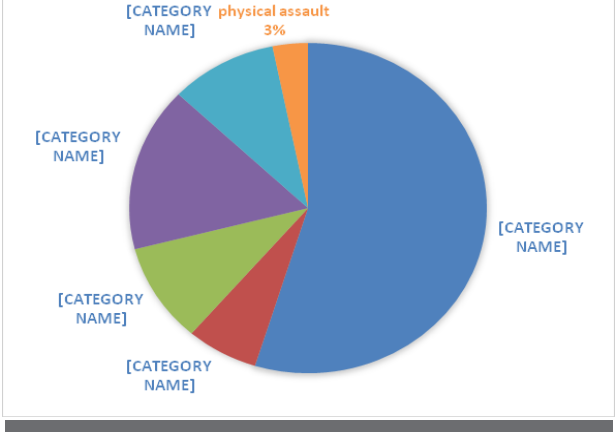

Fig 1: Pie chart showing distribution of mode of injury (n=31)

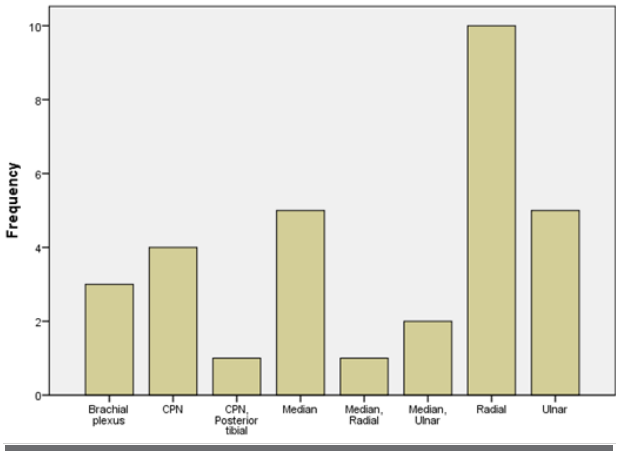

Fig 2: Bar chart showing distribution of PNI in the extremity

The most common PNI was radial (32.3%) followed by ulnar and median nerve (16.1% each). There were 4 patients with two concomitant PNI and rest 27 cases had single PNI. The details of the distribution of PNI has been given in the bar diagram above. The most common anatomical site of injury in the upper limb was elbow and forearm (20% each). Similarly, the most common anatomical site of injury was knee and leg in the lower limb.

The most common age group for PNI was 11-20 years (41.9%) followed by 21-30 years (29 %). These two groups together constituted 70.9% of the total cases of PNI. Second decade was found to be the most common age group with statistical significance level (p value=0.026).

Open injury (open fracture, laceration or sharp cut injury) had more incidence of PNI 61.29% (n=19) followed by closed injury (n= 12). Open injury had statistically significant level for incidence of PNI. There was only one case of dislocation (radial head) with PNI (radial nerve palsy) out of total 48 cases of dislocations of the extremity joints. Associated major arterial injury was found to be in 32.25% of cases of PNI which is statistically significant (p=0.000). There was no significant difference between mean hospital stay between PNI and no nerve injury group; 13.48 vs 9.63 days (p=0.07)

DISCUSSION

The current study showed incidence of PNI among extremity injured patients as 4.04%. The incidence of PNI varies as seen the different studies and range from 2-5% of extremity injury if brachial plexus injury is included.[2,3,6] Saadat S et al and Taylor CA et al have shown incidence of PNI as 1.3% and 1.4% respectively in their study of extremity injury.[7,8]

Incidence of PNI in this study was relatively on higher side and this could be so due to referral of severe injury in the tertiary care hospital.

Incidence of PNI is more in young patient, male and upper limb in most of the studies and same holds true in this study also. The most common age group was up to 20 years which constituted 2/3rd of PNI in this study which is consistent with the findings of Noble J et al and Saadat et al.2,7 This could be so because male and younger age people are at increased risk of injury due to outside job nature and sports activities.

Findings of this study showed 80.64% of PNI from upper limb trauma, either open or closed. This is in par with the findings of Saadat S et al (83.9%), Munro et al (60.5%) and Babbar et al (80.9%) study.[2,5,7] The most common anatomical site of extremity trauma was elbow and forearm in upper limb and knee and leg in lower limb. Similar findings were present in the study of Saadat S et al.[7] The most common type of nerve injury was radial nerve followed by median and ulnar nerve in upper limb trauma and common peroneal nerve in lower limb. Types of peripheral nerve injury, single or multiple, in extremity trauma have been found to be varied in the different studies. Saadat et al has shown ulnar nerve as the most common nerve injury followed by median nerve in his series whereas Nobel J et al and Selecki et al have shown radial nerve as the most common PNI in upper limb.[2,3,7] Huckhagel et al has shown common peroneal nerve as the most common PNI in lower limb.[6]

Mode of injury varies and different studies have shown variable cause of PNI in extremity trauma.

RTA, fall injury and penetrating trauma are the most common mode of injury with variable frequency in the different studies.5,9-11 Our study showed RTA as the most common mode of injury followed by objected related injury (sharp cut and machinery injury) and fall injury. These findings are in accordance with the results of Asplund et al, Banarjee et al and Mansuri et al.9-11 Extremity is more prone to injury during RTA and so are the peripheral nerves. Open injury is more likely to be associated with PNI in our study than closed injury. This is in par with the findings of Saadat et al and Babar et al.5,7

Vascular injury present in the extremity are more likely to be associated with PNI and association is significant in the current study. Similar findings were shown in the study of Huckhagel et al.6 He found that 10.9% of the cases with PNI had major arterial injury. This could be due to nature of open injury or high velocity injury which is more likely to injure nerves also along with vessels because of their close anatomical proximity.

There are many limitations of the current study. Firstly, study is of retrospective nature and hence exact and details of data may be absent in some cases. Secondly, there is lack of differentiation of grade of nerve injury. So, prospective study involving longer duration and large volume of cases or multicentric study may be advised to validate the result of this study further.

CONCLUSION

The current study showed incidence of PNI as 4.04% in the extremity trauma. The mean age was 24.58 years and most common nerve injury was radial nerve followed by median and ulnar. The demographic data showed male patient, younger age and upper limbs were more likely to have PNI. Incidence was more in cases with RTA, open injury and vascular injury with significant level of association.

Conflict of Interest: There is no conflict of interest to declare

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