ORIGINAL ARTICLE

Brachial Plexus and Peripheral Nerves Injuries Based on Etiology and Site

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ABSTRACT

Objective; *To determine the brachial plexus and peripheral nerves injuries based on etiology and site.*

Materials and Methods: *This prospective observational study was conducted at neurosurgery department of lady Reading hospital Peshawar from 1st January 2011 to 30th June 2012 with total 1½ year duration. After taking consent from ethical research committee operative records of all those patients were started to document who were admitted in the mentioned duration with brachial plexus and peripheral nerves injuries and documentation was done according to the preformed proforma including age, sex, etiology, type of nerve, site of injury according to operative findings while excluding neuropathies due to compression, metabolic, immunologic causes. Data was analyzed from different angles by SPSS software.*

Results: *Total 36 patients were included in this study in which 28 were males and 8 were females having age distribution of 10 in first 2 decades, 14 in 3rd decade and remaining 12 patients in 4th – 7th decades. Among 36 cases of peripheral nerves injuries 22 were in upper limbs, 12 in lower limbs and right and left side distribution was equal while the most common cause was fire arm injuries followed by injuries due to the sharp objects .Based on location and nerve involvement the ulnar nerve injury at the wrist joint was most common followed by common peroneal nerve injury at popliteal fossa then sciatic nerve at gluteal region.*

Conclusion: *Brachial plexus and peripheral nerves injuries occurs mostly due to FAI and sharp objects. in upper limbs Ulnar nerve at wrist joint while in lower limbs common peroneal nerve at popliteal fossa are most commonly injured.*

Key words: *Brachial plexus and peripheral nerves injuries, ulnar nerve, common peroneal nerve.*

Abbreviations: *TPNI = Traumatic peripheral nerve injury. CBC = Complete blood count.*

INTRODUCTION

Multiple mechanisms leads to the brachial plexus and traumatic peripheral nerve injury (TPNI) which include penetration, crushing, traction, ischemia, thermal etc. and based on these mechanisms these injuries has been classified into 3 basic types in which stretch related injuries are most common examples of which are brachial plexus avulsion, Erbs palsy etc. and 2nd type is lacerations having frequency of 30% and the least common type is compressional neuropathies just like Saturday night palsy etc. The most common cause is vehicle accidents followed by gunshot injuries, sharp objects, injuries due to the fall etc. Incidence of injuries according to age, sex, limb involvement, type of nerve and nerves plexus is more in young to middle age males than females while brachial plexus and ulnar nerve are effected in greater proportion than lumber plexus and sciatic nerve in lower limbs.[1-5]

Several classification systems are present for brachial plexus and peripheral nerves injuries based on internal disruption of neuron and prognosis like Seddon, Sunderland, Lori and Hershman etc… Seddon has divided brachial plexus and peripheral nerve injuries into neuropraxia in which there is failure of signals transmission due minor injury with no anatomical disruption of neuron which is reversible and having

good prognosis, axonotmesis having complete disruption of axon while neurotmesis has worst prognosis in all 3 types in which axon and all supporting layers are destroyed. Sunderland classified the brachial plexus and peripheral nerve injuries in first, second, third, fourth and fifth degrees in order of severity.[6] Wellerian degeneration is a process which occurs after laceration and crush types of injuries in which axon distal to the injury starts to degenerate within 24 – 36 h of injury the debris of which is cleared by macrophages and other cells followed by regeneration at the rate of 3 – 4 mm/day after crush injury and 2 – 3 mm/day after lacertion.[7]

A multimodality diagnostic approach including physical examination, electrophysiology, and US and MR imaging allows an accurate evaluation of most peripheral nerves. Electrodiagnostic studies which include NCS and EMG provides information about the site of injury, level, type of nerve involvement, severity, prognosis and used for follow up while Imaging assessment in the form high frequency ultrasound and MRI for brachial plexus and peripheral nerves injuries are useful for the diagnosis, follow-up, and postoperative evaluation.[8,9] Prognosis of brachial plexus and peripheral nerve injuries depends upon time between the injury and intervention because after 1y the target muscles are fibrosed with extremely poor prognosis, age, sex, related vascular injuries, pre ganglionic or post ganglonic and the main objectivity of management is pain control and maintenance of some degree of functionality which provided in the form of conservative and surgical in which we have different options like neurolysis, nerve grafting, nerve transfer, neurotization, arthrodesis, tendon transfer, or functioning free muscle transplantation performed according to its indications but inspite of all these techniques the functionality of lumbrical muscles is still a big problem.[10]

Based on severity 1^{st} – 3^{rd} degree injuries with closed injury are managed expectedly without surgery and 4^{th} – 5^{th} degree injuries requires different types of surgical interventions according to their indications while 6^{th} degree in which there is neuroma in continuity may or may not require surgery depending upon the conditions.[11]

MATERIALS AND METHODS

This prospective observational study was conducted on 36 patients of traumatic brachial plexus and peripheral nerves injuries in Neurosurgery Department of PGMI, Lady Reading hospital Peshawar from 1st January 2011 to 30th June 2012 with total 1½ y duration. Patients of all ages with traumatic brachial plexus and peripheral neuropathy were included in this study while all neuropathies due to compression, immunological and metabolic diseases were excluded. All the data was collected and analyzed by descriptive statistics using software SPSS version 16 expressed in percentages while presented in charts and graphs.

All admitted patients for surgery were evaluated thorough history, detailed clinical examination and relevant investigations including NCS & according to the situation U/S of injured nerve, MRI with Myelogram. All patients for surgical intervention were subjected to pre-operative preparation, like complete blood count (CBC) and viral serology (HbsAg and Anti-HCV Ab) was done. Blood and surgical equipment's were arranged accordingly. An informed consent was taken, explaining the prognosis. The ethical approval was taken from the hospital ethical committee, "Postgraduate Medical Institute, Institutional Research and Ethics board". Etiology and site of traumatic BBP and peripheral nerve injuries were after surgery.

RESULTS

Out of 36 patients of traumatic brachial plexus and peripheral nerves injuries who were subjected to different surgical interventions males were 28 (77.8%) and females were 8 (22.2%) Figure 1 while according to the age 10 (27.8%) patients were in first 2 decades, 14 (38.9%) were in 3rd Dec, while remaining 12 (33.3%) patients were from 4^{th} – 7^{th} Dec. (Fig. 2). Regarding side and limb involvement upper limbs were involved in 22 (61.1%) of cases, lower limbs in 14 (38.9%) of cases while left and right side limbs involvement ratio

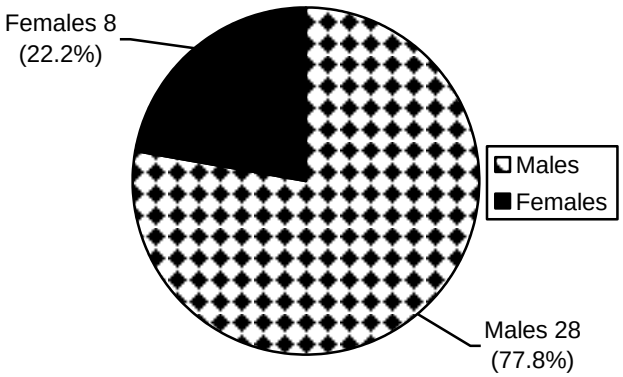

Figure 1: *Gender (N = 30).*

was equal.

The most common cause of injury was due to FAI having 16 (44.4%) followed by sharp objects injury having 14 (38.9%) cases, while 4 (11.1%) cases were due to the BBI and 2 (5.6%) cases were from blunt trauma (Fig. 3). Based on location the commonest sites of nerves injury were wrist joint and arm both had frequency 6 (16.7%) for each, followed by popliteal fossa 5 (13.9%) then buttock, shoulder girdle and fore-arm 4 (11.1%) for each and remaining 7 (19.44%) were thigh, leg and elbow joint etc. (Table 3).

Regarding nerve involvement ulnar nerve was injured in 8 (22.2%) of cases, common peroneal nerve 5 (13.9%), radial and sciatic nerves in 4 (11.1%) and remaining 19 (41.7%) cases were of median, tibial nerve and combination of nerves injuries (Figure 4).

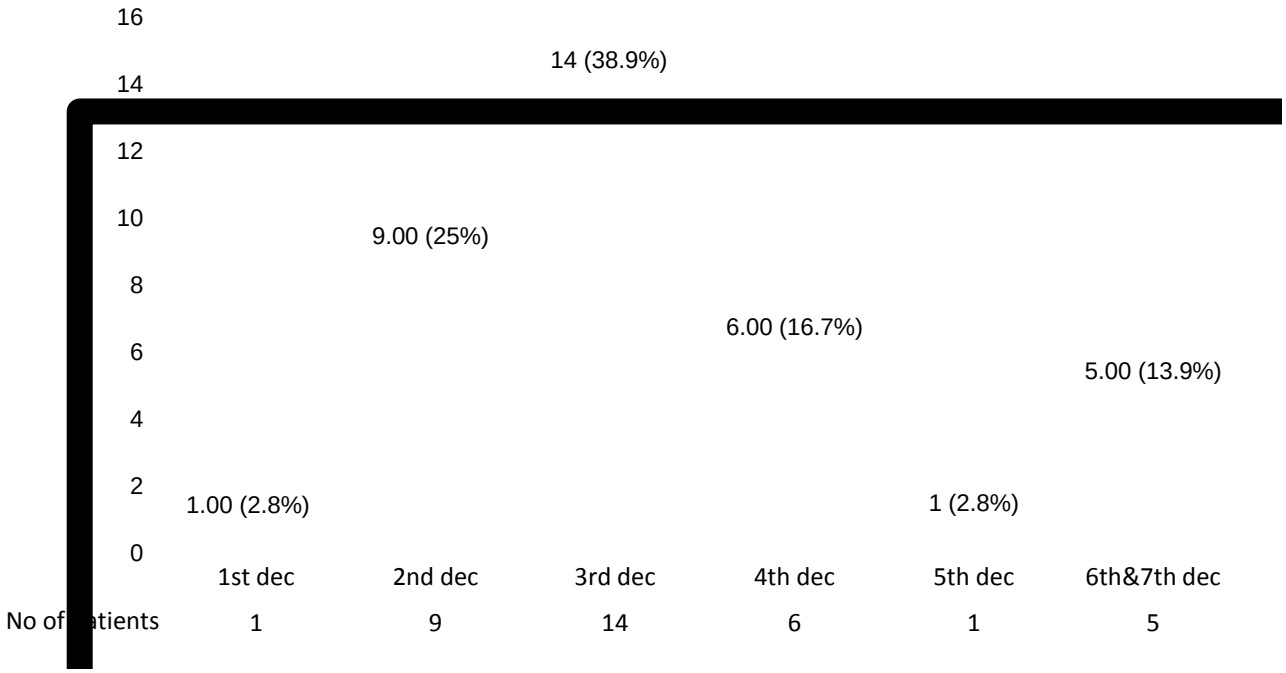

Figure 2: *Age Distribution (N = 30).*

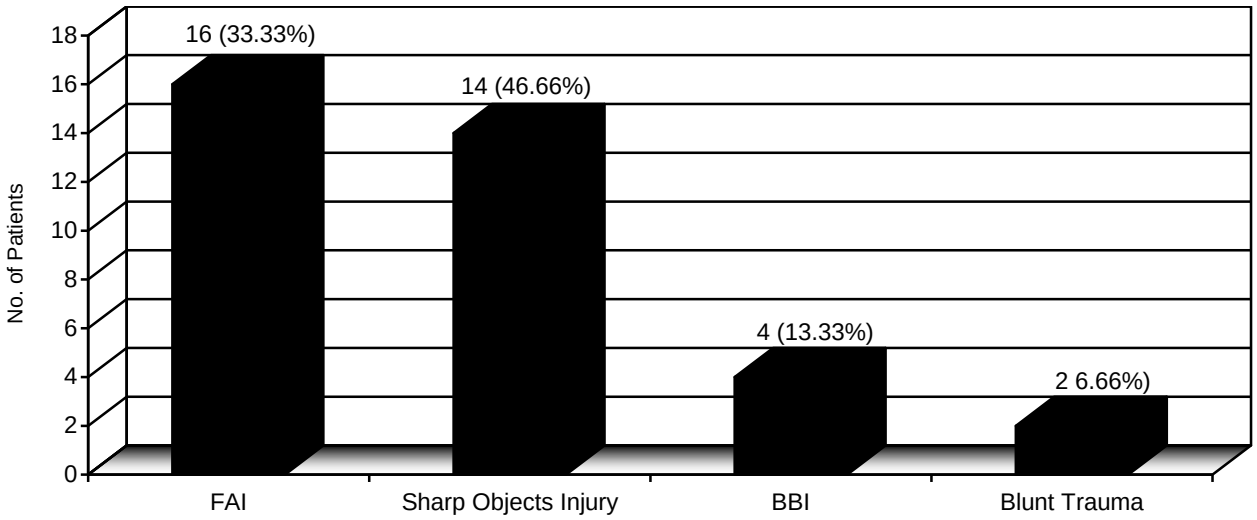

Figure 3: *Etiology (N = 30).*

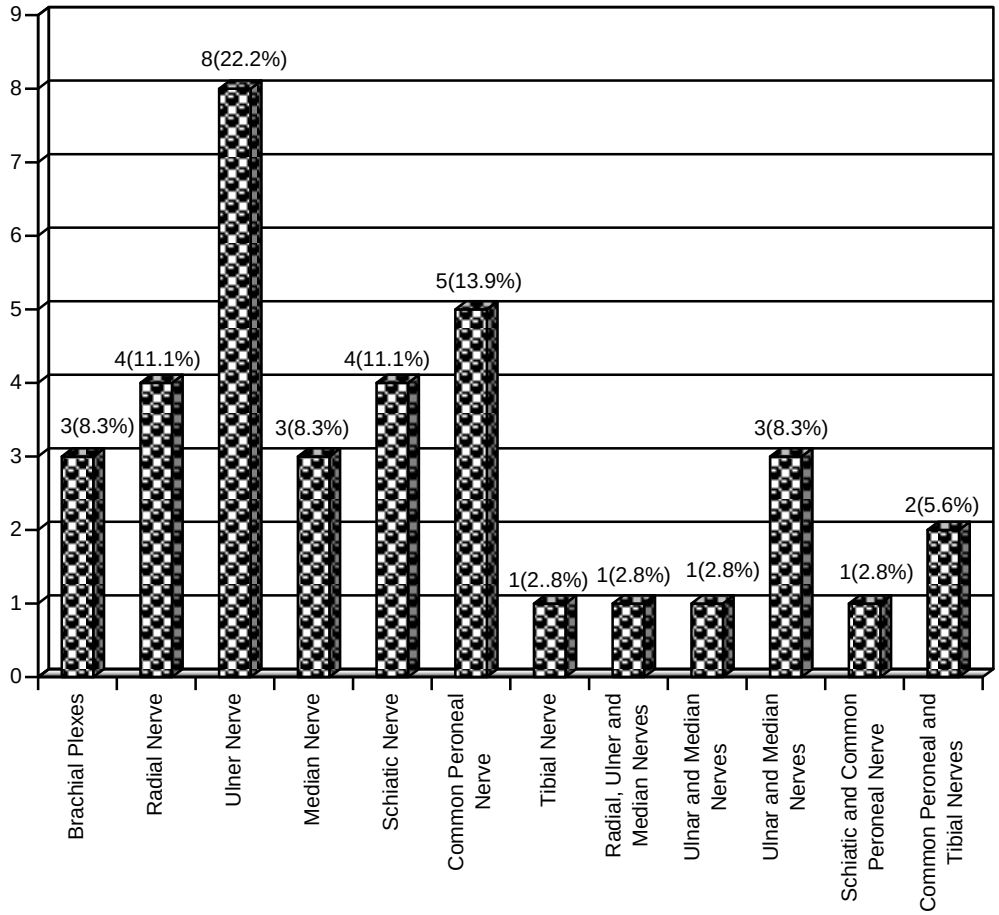

Figure 4: *Nerves Involvement (N = 30).*

Table 3: *Location of Nerve Injury (N = 30).*

Location	No. of Cases	Percentage
buttock	4	11.1%
thigh	3	8.3%
Popliteal fossa	5	13.9%
leg	1	2.8%
foot	0	0 %
Shoulder girdle	4	11.1%
Arm	6	16.7%
Elbow	2	5.6%
forearm	4	11.1%
wrist joint	6	16.7%
Shoulder girdle, Arm, wrist joint	1	2.8%
Total	36	100%

DISCUSSION

Traumatic injury to brachial plexus and peripheral nerves is a global problem resulting in significant disabilities. The etiological and epidemiological factors of it depend upon era of peace, wars and development level of populations. Historically, mostly the knowledge of PNIs was developed during wartimes. Traumatic nerve injuries results in significant neurological deficits. In periods of peace brachial plexus and PNIs results from MVAs, sharp objects, penetrating trauma, stretching or crushing trauma etc. The reported incidence of PNIs among the trauma population is 2 – 2.8% and 5% if plexus and root lesions are included.[13]

In our study males (77.8%) were effected more than females (22.2%), upper limbs and lower limbs involvement was equal 50% for each and the most common nerves which were injured due to the trauma were Ulnar (22.2.%), common peroneal nerves (13.9%), radial nerves 11.1% and brachial plexus 8.3%. Krivickas et al has documented ulnar nerve

(18%) as a most common which was injured. While in a study of Birch et al[12] conducted on Iraq and Afghan war effectives sustaining peripheral nerves injuries upper limbs were (51.3%) and lower (48.7%) limbs, most common nerves injured were common peroneal nerves followed by tibial then ulnar nerves, while based on gender males (98%) were predominantly effected then females (2%). The variation in results from Birch et al based on nerves involvement and gender is due to that in our study sharp objects were 2nd most common cause of injuries in which majority were ulnar nerve injuries while Birch et al conducted the study on effectives of war in which BBI and Fai effected mostly lower limbs nerves while females and children's in the war affected areas were in homes as compared to males to remain protected this is why our study gender percentages are less.

In Eser et a[l3] males were 71% and females 29% which are comparable to our study, The most common nerves were ulnar, median and radial nerves having frequency of 27%, 21.9%, 21% due to MVA, sharp and penetrating objects, glass wounds and iatrogenic injuries with frequency of 26.9%, 16.1%, 15.1% and 10.6% predominantly effecting upper limbs 77% and lower limbs 23%. In another study of Kouyoumdjian JA.[1] Males were 74% and females were 26% to which our results are comparable, upper limbs involvement was 73.3% and lower limbs were 26.7% effecting mainly brachial plexus, ulnar, median and sciatic nerves due to MVA while in other international studies[16-18] MVA was also the most common cause was. Study conducted by Uzun and colleagues[13] the most common cause was blunt trauma followed by prolonged compression of limbs under the debris with the frequency of 37% and this was also the most common cause in other international studies[14,15] conducted on earth quick effectives. In present study FAI 44.4% was the leading cause followed by sharp objects injury 38.9% then BBI 11.1%. This variation of data in terms of limbs, nerves involvement, etiology and percentages from our study is due to that we have low level of education, living in the area effected by terrorism and personal violation due to enmity.

In the present study the most common site of injury were wrist joint and arm having frequency of 16.7% for each while Asplund and colleagues[20] has documented wrist 19% and hand 18% as a most sites for injury.

CONCLUSION

From this study we concluded that:

Majority of our patients were young males and the most common presenting age range was 2nd – 4th Dec (80.6%). If we look at the nature FAI (44.4%) was the most common cause followed by injury due to the sharp objects (38.9%). Based on location and nerves involvement the most common sites were wrist joint (16.7%) and arm (16.7%) in upper limbs and popliteal fossa (13.9%) while ulnar nerve (22.2%) was most commonly injured followed by common peroneal nerve (13.9%).

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