

Peripheral Nerve Surgery: A Retrospective Analysis of Our Experience

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Received, 18 November, 2018

Accepted, 5 December, 2018

Peripheral Nerve Surgery (PNS) is one of the vital neurosurgical sub-specialties. It occupies about one fifth of total neurosurgical procedures and is included in functional neurosurgery. Its scope is much higher, however it is much limited in Nepal due to lack of awareness and technology.

This is a retrospective analysis of our experience of PNS at BB hospital and other centers in last more than 10 years. Our experience shows that PNS occupies about than 15% of total neurosurgical procedures in our setup. The main PNSs in our experience are Carpal Tunnel Syndrome, Cubital Tunnel Syndrome (CTS), Tarsal Tunnel Syndrome, Nerve Injury and Repair, Selective Peripheral Neurotomy, Peripheral Nerve Schwannoma, Brachial Plexus exploration and decompression, Peripheral Nerve biopsy, Nerve Grafting etc.

CTS is the most common PNS procedures in our experiences comprising more than 200 cases in last more than 10 years. The outcome is excellent.

Cubital tunnel syndrome surgery is the next common procedure followed by nerve injury and its repair, selective peripheral neurotomy, peripheral nerve tumors and so on. Similarly, less common procedures are suprascapular nerve decompression, tarsal tunnel syndrome surgery, peripheral nerve grafting, brachial plexus repair etc.

The overall outcome of PNS in our experience is satisfactory.

Keywords: CTS, outcome, PNS, surgical procedures.

Peripheral Nerve Surgery (PNS) is one of the neurosurgical subspecialties. Even though it may be related to other medical specialties also such as orthopedic surgery, plastic surgery etc neurosurgery is its parent specialty. It occupies about 15-20% of total neurosurgical procedures and it is also included in functional neurosurgery. Despite the fact that its scope is much higher in highly developed countries, it is significantly limited in Nepal.

Here we present a retrospective descriptive analysis of different types of peripheral nerve surgical procedures according to our own experience.

Materials and Methods

This is a retrospective case series descriptive analytical study of the cases of peripheral nerve surgery operated from 2008 till 2017. The cases were operated in Norvic International Hospital, Kathmandu and B & B Hospital, Lalitpur. Retrospective analysis was done on number of cases, variety of cases, surgical procedure, outcome and its implication in Nepal.

Different cases operated were Carpal Tunnel Syndrome and Median Nerve Decompression, Cubital Tunnel Syndrome, Tarsal Tunnel Syndrome, Nerve Injury and Repair, Selective Peripheral Neurotomy, Brachial Plexus exploration and decompression, Peripheral Nerve biopsy and Nerve Grafting.

Results

Carpal Tunnel Syndrome (CTS)

About 200 cases of CTS were operated in 10 years of time. This is the commonest peripheral nerve problem more common in females. Pregnancy and hard manual work were two factors consistently found as etiological factors in addition to others. No analytical study on CTS has been done so far in Nepalese context.

In our experience majority of patients were female comprising 91% and male were only 9%. In females reproductive age group was the most common age in which CTS was found suggesting there is some hormonal influence in the causation of CTS.

CTS was found more commonly in Right side in more than 4/5th of cases suggesting manual work is one of the main causes of CTS. Bilateral CTS was found in 1/4th of total surgical candidates of which only very few were operated bilaterally.

In addition to clinical symptoms, nerve conduction test (NCT) was done to make a final diagnosis of CTS. Even though X-ray cervical spine was often done as an initial investigation, MRI was performed routinely in almost all the cases before surgery.

Analgesics, oral steroid and sometime local steroid injections were used as an initial treatment before surgery. In our experience the surgical rate is about 12-14%. Surgery is done under local anesthesia, without rubber tourniquet, median nerve is completely decompressed and wound closed with prolene in single layer mattress fashion (**Figure 1**).



Figure 1: Carpal tunnel syndrome surgery decompressing the median nerve

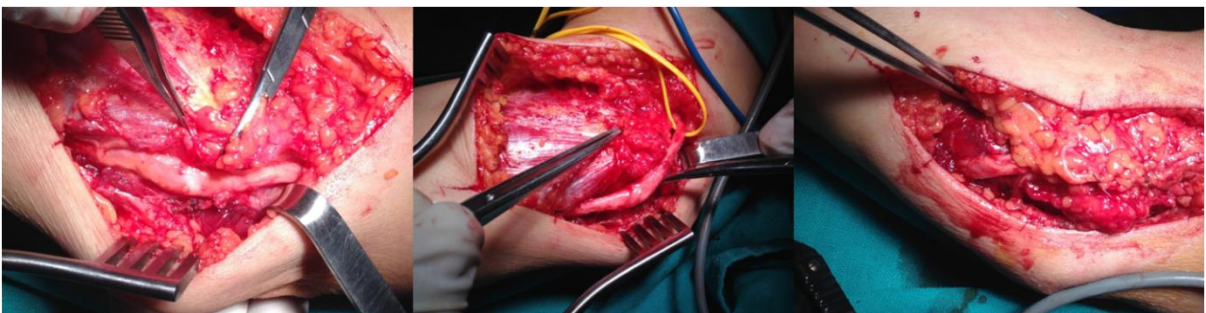


Figure 2: Ulnar nerve decompression and anterior transposition

Cubital Tunnel Syndrome

About 50 cases were operated in last 10 years with almost equal prevalence in male and female and middle age was the commonest age group. Ulnar nerve compression was diagnosed on the basis of NCT and MRI of cervical spine before surgery. Surgery was performed under general anesthesia as well as local anesthesia with lazy omega incision over the medial epicondyle. Long segment decompression and anterior transposition was the procedure of choice in all the cases (**Figure 2**). Significant improvement was found in all the cases.

In one case of young man, both CTS and Guyon's canal syndrome was found due to blunt trauma and was operated in single sitting.

Suprascapular nerve compression is a rare peripheral nerve compression syndrome, only few cases operated so far. It is diagnosed by NCT and MRI of shoulder. Both technician and radiologist need to be expert enough to diagnose this condition by MRI. Surgery was done only in 2 cases with good outcome.

Traumatic nerve injury was commonly found in ulner, radial and medical nerves. Immediate repair was done in few cases only as the patient couldn't come early. In most of the cases there was post traumatic nerve compression rather than complete or incomplete nerve transection. Nerve conduction test was performed in almost all the cases of traumatic nerve injury and MRI of the concerned part or spine was done before surgical intervention. Therefore in



Figure 3: Traumatic ulnar nerve injury and secondary repair

majority of cases delayed surgical decompression of nerve was done which was found effective (**Figure 3**).

Selective Peripheral Neurotomy

Selective peripheral neurotomy is another important PNS that we have been doing whenever we are getting appropriate cases. Spastic hand deformity is the commonest condition in which we did selective median nerve neurotomy. This is a relatively new

field in neurosurgery and we have initial experience of about 2 dozens of cases so far. Out of that 9 cases are Median nerve neurotomy, 8 cases were Tibial nerve neurotomy, 2 cases were sciatic nerve neurotomy, 4 case was obturator nerve and 1 case of ulnar nerve neurotomy. All the cases improved to a great extent after selective neurotomy.

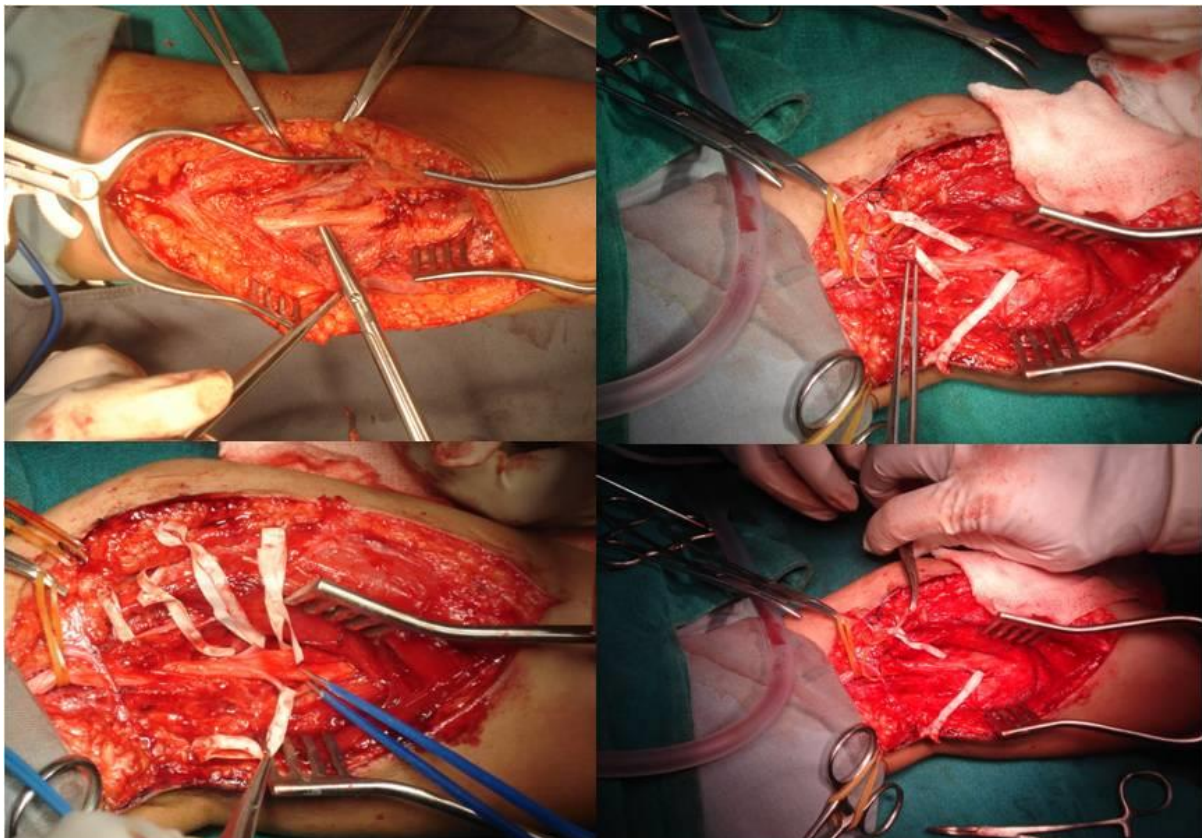


Figure 4: Median nerve selective neurotomy

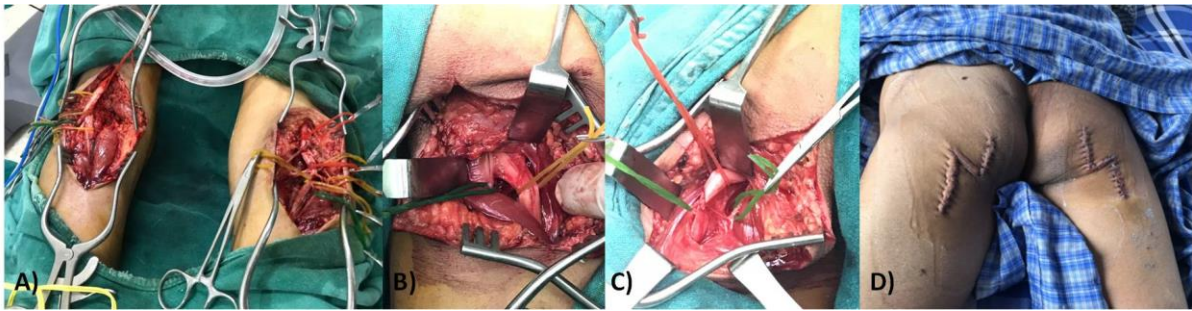


Figure 5: A) bilateral tibial nerve neurotomy, B)-D) bilateral sciatic nerve neurotomy

Median and ulnar nerve neurotomy was done for spastic hand deformity, tibial neurotomy was done for spastic planter flexion deformity of foot, sciatic nerve neurotomy was done for spastic flexion deformity of hip joint and obturator nerve neurotomy was done for spastic adduction deformity of thigh (**Figure 5**). This is our preliminary experience which shows good and encouraging results. Due to practical and financial reason, all the procedures were done in a single stage. Moreover, all the cases were done without intraoperative monitoring due to its unavailability. Our results showed improvement was better in lower limbs as compared to upper limbs.

Preoperative counseling was properly done about the possible outcome after surgery.

Peripheral Nerve Schwannoma

These are another important aspects of peripheral nerve surgery that we have experienced. In addition to schwannoma arising from peripheral smaller nerves, we have experience of several cases of brachial plexus schwannoma which is relatively rare. Brachial plexus schwannoma typically presents with a lump in antero-lateral aspect of neck, depending on the size of mass and neurological symptoms radiation to upper past of arm all the way upto the tip of fingers. By the time patient is symptomatic the mass grows big enough to cause

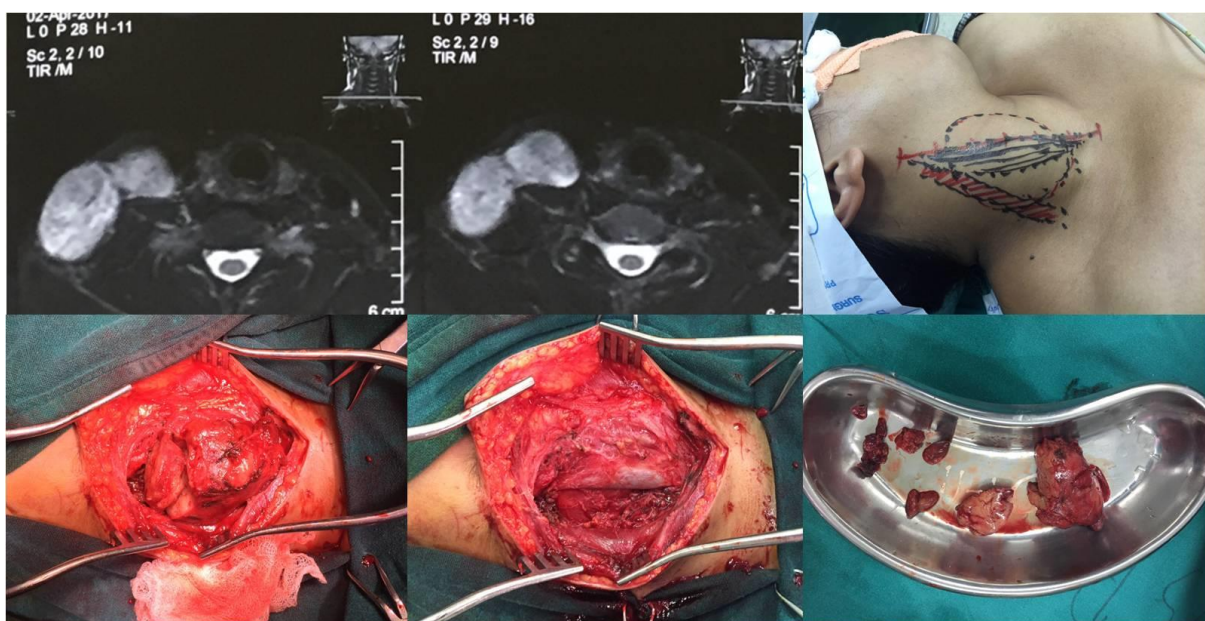


Figure 6: Total en-block resection of brachial plexus schwannoma

neurological deficit.

We have experienced about half a dozen cases of peripheral nerve schwannoma in which we have removed the whole mass en-block (**Figure 6**). That often gives complete cure without any surgical complications.

Similarly, lumbar plexus schwannoma is even rarer form of nerve plexus schwannoma. We have experienced few cases of lumbar plexus schwannoma which we operated through retroperitoneal approach and removed en-block without any surgical complications.

Others

Other peripheral nerve surgeries are Peripheral nerve biopsy, Nerve graft, Brachial plexus exploration/Decompression, Tarsal Tunnel Syn etc.

Discussion

Peripheral nerve surgery is a huge part of surgical field. Though it is also at times dealt by general surgeons and orthopedic surgeons, it is dealt thoroughly by neurosurgeons.¹ It is also sometimes called functional neurosurgery as in this procedure the function of nerve has to be preserved while completely curing the problem.

In Nepalese context, though some of above mentioned procedures are commonly performed by neurosurgeons, some are still rarely performed. Some procedures are even not well established in Nepal.

Trauma is a major field where PNS has a big role.² In Nepalese context though overall management of trauma has improved a lot, more minute and specific management is still lagging far behind.

Nepal is still lacking the technology which aims at improving the function of limbs and enhancing the quality of life. Subspecialty in this field within neurosurgery has to be developed.

Orthopedic field has wide scope of getting varieties of traumatic and not traumatic cases of limbs where PNS can have great role.³

Functional PNS has wide scope in different conditions for example dystonia, severe spasticity etc.⁴ As suggested by Ravindran et al, peripheral denervation by doing selective neurotomy has equally good result as that of deep brain stimulation in cervical dystonia. This procedure is not yet established in Nepal. We also don't have experience of doing PNS for cervical dystonia.

Similarly use of sensory denervation after injuries of peripheral nerves is also at times very useful for alleviating the causalgia, phantom pain etc following trauma of limbs.^{5,6} Sensory Denervation is also a new PNS technology in Nepalese context. We are also not yet well oriented to this particular type of PNS.

Selective sensory (posterior) spinal nerve root block is another very useful PNS technique.⁷ Though we sometimes perform this procedure in case of poorly localized lumbar radicular pain, this is also not a regular procedure in our context and also in Nepal. According to symptoms, spinal sensory nerve root at several levels are blocked with local anesthetic agent under CT guidance. This not only helps to alleviate pain but also localizes the level of pain in the spine so that surgical

decompression can be done if needed in future.

Chemotherapy-induced peripheral neuropathy and radiation-induced brachial plexopathy are extremely debilitating conditions which can occur after treatment of malignancy. Unfortunately, the diagnosis can be elusive, and this dilemma is further compounded by the lack of efficacious therapeutics to prevent the onset of neurotoxicity before initiating chemotherapy or radiation or to treat these sequelae after treatment. However, microsurgical nerve decompression can provide these patients with a viable option to treat this complication.⁸ Role of PNS in such conditions is limited in Nepalese context due to lack of proper referral of cases. Since the procedure is not that technically demanding, such cases can be cured if properly referred to the neurosurgeons.

Pediatric group of population can benefit a lot from timely repair of peripheral nerve injuries. By this future neurological deficits can be prevented to a great extent. However, due to poor referral system in Nepal huge population of this group is still suffering. Children have been reported to experience much better functional results after nerve repair than adults. Moreover, recovery generally is faster in children. The superior capacity of children's central nervous system to adapt to external or internal environmental changes (neural plasticity) and the shorter recovery distance from the axon repair site to the target muscle are claimed to be crucial determinants of their favorable outcomes.

Moreover, even in the pediatric population, it has been demonstrated that functional results are better the younger the patient is, including better clinical results in those injured in early childhood (< 6 years old) than in those injured in adolescence. Other favorable prognostic factors include the type of nerve injury (with complete transections doing less well than crush injuries) and the timing of surgery, result being better after early repairs.^{9,10}

Brachial plexus tumor, though uncommon, is not a rare problem that a neurosurgeon encounters in his/her daily practice.¹¹ We do have good experience in this field though not a big one.

In addition to the problem of proper and timely referring of the cases of peripheral nerves, radiological evaluation of peripheral nerves is also a lacking in our country. As Hochman et al have explained in many cases of peripheral nerve compression syndromes, exact location of nerve pinch cant be identified radiologically.¹² Though median nerve and ulner nerve compression are quite common and are promptly managed by neurosurgeons, other rarer nerve compression syndromes are not being commonly detected and managed in our context.¹³

Conclusion

PNS has a wide scope in not only neurosurgery but also in traumatic and orthopedic surgery. Development of its technology and techniques is highly demanding at present context of medical practice in Nepal.

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