

Original Article**Nerve Anastomosis-our Experience of Thirteen Cases**Haroon K¹, Taher T², Alam S³, Alamgir A³, Reza MA⁴, Hossain SS⁵

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Abstract:

Background: Peripheral nerve injury is a common condition. Though it is not life threatening, it may cause disability to a person. In this study we have analysed our experience of anastomosis of injured nerves.

Materials and methods: This is an observational study that was done within a period from January 2014 to December 2018. 13 patients with injury to the nerves were operated upon. There were 11 male and 2 female patients. All patients were followed up in OPD upto one and half years. 5 patients were lost from follow up, of these, two were female.

Results: After surgery, touch returned in 5 patients. Of motor function, there was no improvement in 1 patient, grade 1 in 1 patient, grade 2 in 4 patients and grade 3 in 3 patients. Those who came earlier had better outcome, so had those with small injury and distal to the limb.

Conclusion: peripheral nerve injury has to be repaired as soon as possible. The sooner it can be done the better will be the outcome.

Key Words: Nerve injury, anastomosis, nerve grafting, facial reanimation, end to end anastomosis.

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Introduction:

Peripheral nerve injuries are very challenging for a surgeon. The outcome is much variable and unpredictable. But microsurgical techniques can improve the outcome.

Injuries to peripheral nerves are extremely common in many types of upper limb trauma. Injury to peripheral nerves can cause extreme dysfunction in the hand for the patient disrupting their professional and leisure activities. It is therefore vital that adequate treatment is available to repair peripheral nerves to prevent permanent financial loss for the patient as well as the healthcare economy. Galen was the first to describe the concept of the nerve but it was Paulus Aegineta in the 7th century who documented the first nerve repair and wound closure as a military surgeon¹. The first alleged nerve coaptation was performed by a Persian physician named Avicenna.

Before that, the field of peripheral nerves (PN) was “noli me tangere” in Latin, that is, “touch me not,” considering that touching the injured nerves produced seizures².

Approximately 100,000 patients undergo peripheral nerve surgery in the United States and Europe annually³. A retrospective study of 722 traumatic nerve lesions across multiple disciplines found that 17.4% were iatrogenic in nature. In the upper extremity, the median nerve is most commonly injured, followed by the spinal accessory, superficial radial, common peroneal, and ulnar nerves⁴.

Seddon's classification, which is used more frequently in a clinical setting ranging from least to most severe these are: neuropraxia, axonotemesis and neurotmesis⁵. Neuropraxia is a mild form of injury then there is axonotemesis and when there is complete

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disruption it is called neurotmesis. Sunderland's classification differs from Seddon's in that five different classes are used. First degree injuries are equivalent to neuropraxia. 2nd, 3rd and 4th degree injuries are equivalent to axonotmesis, the difference being the degree of mesenchymal damage to the nerve. Fifth degree injuries are equivalent to neurotmesis⁶.

Nerve autografts are considered the reference standard for bridging nerve gaps in the PNS. Autologous tissue grafts possess several advantages such as low immunogenicity and a structural support that promotes cell adhesion and migration. However, there are several disadvantages to this technique. Obtaining a natural graft could lead to loss of function and potential neuroma formation at the donor site, multiple small grafts may be needed in case of a long nerve gap, and there could be a size mismatch between the donor nerve graft and the injured nerve. More important, complete functional recovery is seldom obtained with autografts⁷.

When primary repair cannot be performed without undue tension, nerve grafting is required. Autografts remain the standard for nerve grafting material. The three major types of autograft are cable, trunk, and vascularized nerve grafts⁸. A common source of nerve grafts is the Sural nerve, the anterior branch of the medial antebrachial cutaneous nerve, the lateral femoral cutaneous nerve, and the superficial radial sensory nerve⁷. When a direct tensionless repair is not possible, conduits from vein may be used. Bio-absorbable conduits of collagen, PGA, and caprolactone have been approved by the US FDA⁹.

In our series we had anastomosed peripheral nerves. These included the radial nerve, ulnar nerve and median nerve in the upper limb and sciatic and common peroneal nerve in the lower limb. The spinal accessory nerve and the facial nerve were also repaired after traumatic injury and surgery, respectively.

Material and Methods:

- 13 patients with injury to the nerves were operated upon within a period from Jan 2014 to Dec 2018 in the Department of Neurosurgery in the National Institute of Neurosciences and Hospital. There were 11 male and 2 female patients. Patients with traumatic or surgical injury of the nerve were

included. Neuropraxia following fixation, implant removal, fracture or trauma were excluded from the study. All patients were evaluated clinically and by electrophysiological studies. All patients had undergone surgery under GA.

- Surgical steps: The affected nerves were explored. Both proximal and distal portions were exposed. If there were any neuroma, they were excised. End to end anastomosis was first choice for anastomosis. If there was shortening of nerve, then Sural nerve graft was used as a cable graft.
- Wounds were closed in layers. The limb was immobilized with plaster cast for a period of three weeks. All sutures were removed by 8-10 POD. Physiotherapy was encouraged. All patients were followed up for one and half years.
- Follow up: 8 patients followed up regularly upto one year. Five patients were lost from follow up. All female patients (02) were lost from follow-up. 3 male patients were lost from follow up.
- All patients Sensory and Motor examinations were carried out those patients who had nerve anastomosis. If muscle power of the muscle supplied by the affected nerve was >3 it was graded as excellent recovery. If muscle power was less than three but more than 1 it was good improvement. If the power was 0 to 1 than it was graded no recovery.

Results:

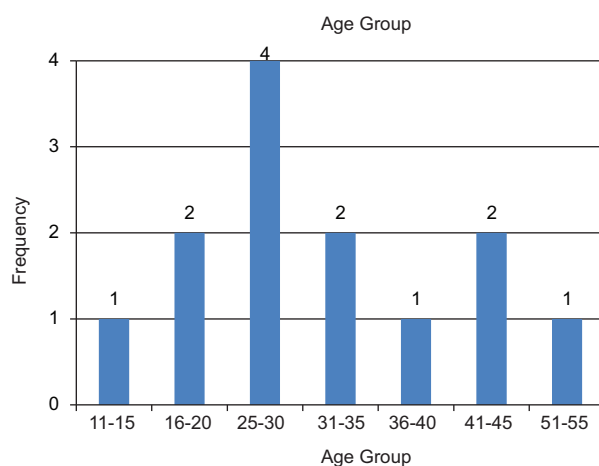


Fig.-1: Distribution according to Age group:

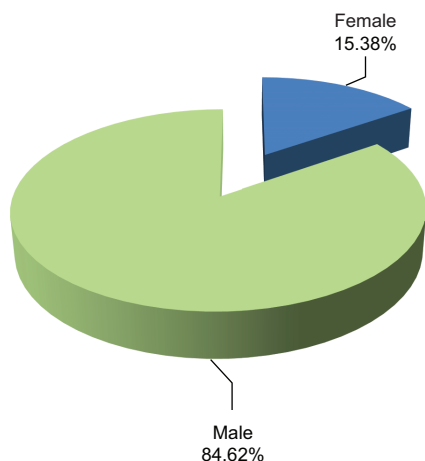


Fig.-2: distribution according to sex: Males were predominantly affected

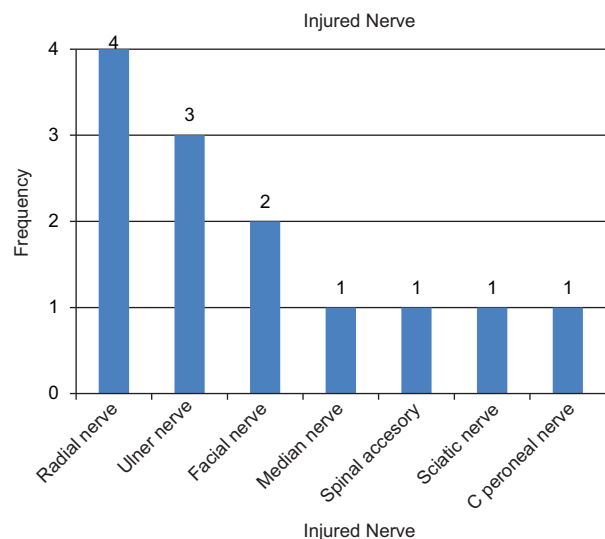


Fig.-3: Distribution according to the Injured Nerves: Radial nerve was the predominant nerve injured.

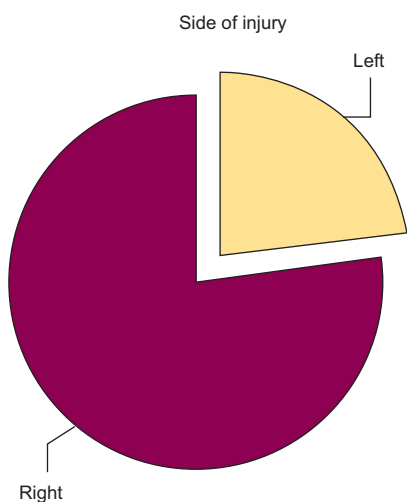


Fig.-4: Side of Injury: around 80% patients had injury to the right side of the body.

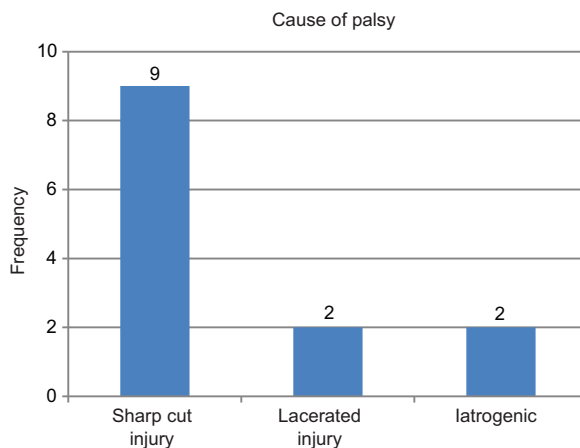


Fig.-5: Cause of palsy: Most common cause of injury was sharp cut injury followed by lacerated injury and cases.

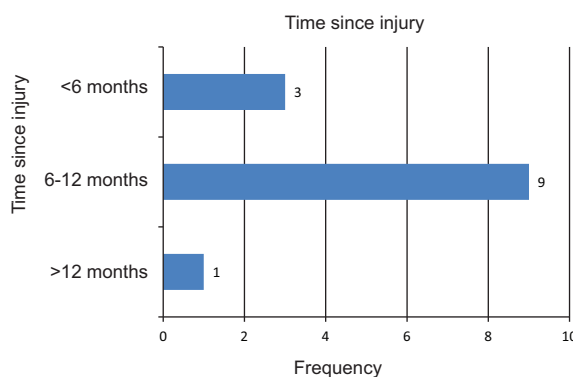


Fig.-6 : Time since Injury most patients presented to us after nine months.

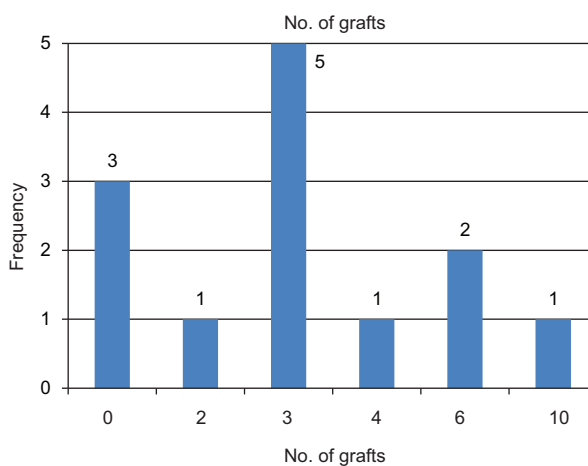


Fig.-7: No. of Grafts used:

Table-II
Outcome of surgery

- Sensory : Touch returned in 5 patients
- Motor Function:
- No improvement : 1 patient
- Grade 1 : 1 patient
- Grade 2: 4 Patients
- Grade 3: 3 patient

Table-III
Outcome according to nerve

Nerve	Outcome
Radial	Good improvement
Ulnar	Good improvement
Median	Good improvement
Sciatic	No improvement
Common peroneal nerve	Some improvement
Spinal accessory	Excellent improvement
Facial	Good improvement

Table-IV
outcome according to time since surgery

Time since injury	Outcome
< 6 months	Excellent improvement
6-12 months	Good improvement
>12 months	No improvement

Table-V
Outcome of length of graft

Length of grafts	Outcome
End to end anastomosis	Excellent improvement
<4 cm	Good improvement
>4 cm	No improvement

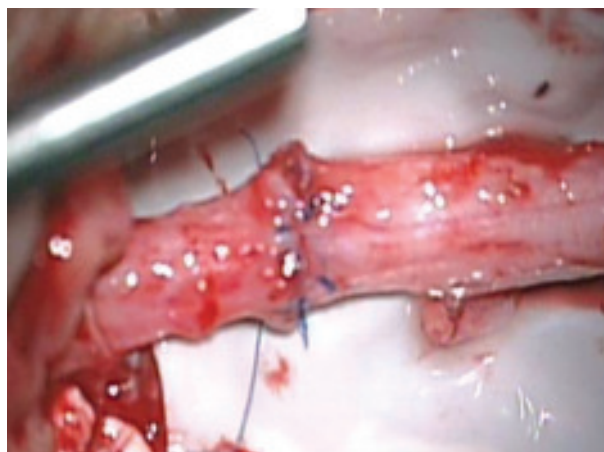


Fig.-8: Ulnar nerve : End to end Anastomosis

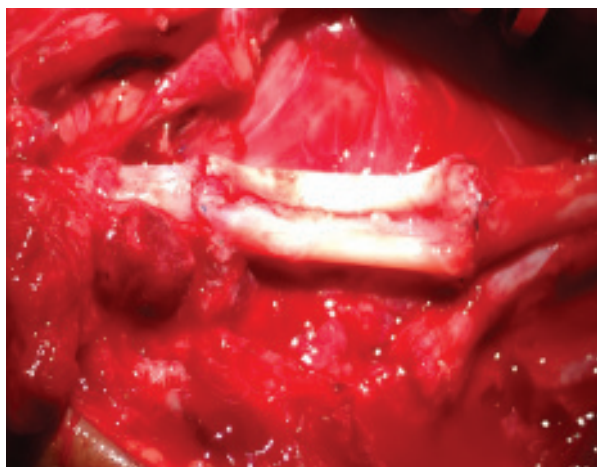


Fig.-9: Rt. Ulnar nerve : 3 grafts

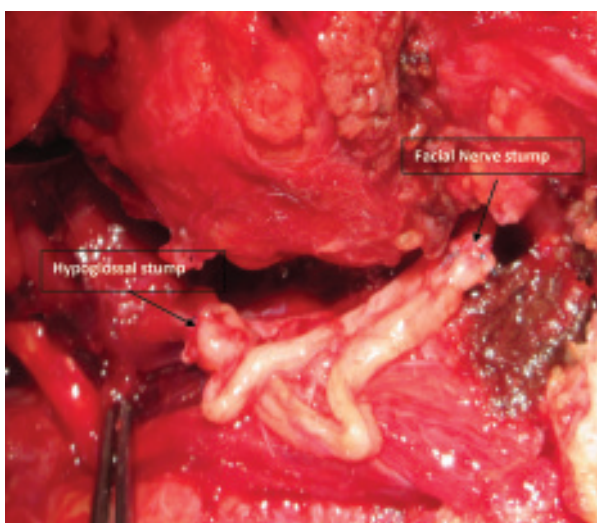


Fig.-10: Facial hypoglossal anastomosis with interposition graft



Fig.-11: Combined Rt. MN And UN Injury at elbow after 12 months



Fig.-12: Outcome of Facial Hypoglossal anastomosis -After 1 year (reproduced with permission of patient)

Discussion:

Results were poor in four situations: (1) the patient was more than 54 years old; (2) the level of injury was proximal to the elbow; (3) the graft length was greater than 7 cm; or (4) the surgery was delayed more than 23 months⁸. In our series also the patients more than 50 years and presenting after a year had unfavourable outcome. In our series also, when the grafting was after longer period and more proximal, repairs resulted in bad outcome.

On the basis of 40 years experience with nerve repairs, Sunderland made a number of generalizations regarding nerve reconstruction results. He found that (1) young patients generally do better than old patients; (2) early repairs do better than late repairs; (3) repairs of single function nerves do better than mixed nerve repairs; (4) distal repairs do better than proximal repairs; and (5) short nerve grafts do better than long nerve grafts⁸. In our series also, patients younger in age and with early presence and short length injury had better result.

Despite good microsurgical techniques for repair of peripheral nerve lesions and the use of nerve grafts and nerve conduits for bridging the defects, functional nerve recovery is generally partial and unsatisfactory. Even excellent coaptation of the matching proximal and distal fascicles/axons and proper guiding axon regeneration toward the original target tissues does not guarantee full recovery of nerve function¹⁰. Therefore, our patients also had variable outcome with repair of the nerves.

In our series also there was a predominantly upper limb injury. Peripheral nerve injuries in the upper extremity are extremely common. The typical patient is usually young, sustaining a laceration from metal, sharp objects or machinery¹.

According to Poage et al, the etiologies for Peroneal nerve palsy are numerous. Although compressive etiology remains the most common cause, many other factors contribute to injury. Traumatic causes include knee dislocation, severe ankle inversion injuries, lacerations, and direct blunt trauma. These traumatic injuries are typically associated with poorer outcomes¹¹. In our patient the outcome was less satisfactory as some dorsiflexion of the foot returned.

Surgically we have tried to perform primary repair when possible. But if there was tension during anastomosis, then Sural nerve was taken from the healthy side and cable grafting was done. This is also advocated by authors¹².

We had one patient with left spinal accessory nerve injury due to penetrating injury. We had explored and repaired the nerve. The result was excellent functional outcome by six months. This is also being reported by Kim et al¹³.

Two cases of facial hypoglossal anastomosis were done in our series. In one patient direct hypoglossal to facial anastomosis was done and in the other on interposition Sural nerve graft was used as the hypoglossal nerve had short limb. This is also a standard procedure¹⁴. As a side effect to this, there was deviation of the tongue to one side¹⁴. This was also pronounced in our both cases.

We have followed up the patients for upto one year. On an average, a follow-up period of 6 months is considered before an unequivocal functional successful outcome may be established².

Conclusion:

Repair of peripheral nerves are very challenging task for a surgeon. Outcome of surgery is variable. This is mainly due to the delay of presentation of the patient to the surgeon. Lost from follow up is a common problem in female patients of our country. Loss of nerve more than 4 cm leads to poor result.

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