NERVE INJURIES AT WRIST: RESULTS OF DELAYED PRIMARY REPAIR

ABSTRACT:

Introduction: Peripheral nerves are injured commonly by mechanical trauma, the terms applied to the timing of the nerve repair include primary repair (immediately after injury, or within 6 to 12 hours), delayed primary repair (usually within the first 2 to 2.5 weeks), and secondary repair (after 2.5 to 3 weeks). This study was conducted to analyze the clinical outcome of median and ulnar nerve repair at wrist.

Material and Method: This Prospective observational study was conducted at Liaquat University of Medical & Health Sciences, Jamshoro. Twenty five patients, (37 nerves), with age range between 25 to 50 years, were included in the study and followed on average 24 months. Common cause of injury was sharp laceration as result of knife injury or sharp glass injury. Delayed primary repair (epineurial neurorrhaphy) was performed in all patients. The associated injuries to tendons were dealt at the same time. Informed consent was taken from all patients before their inclusion in study.

Results: The results of ulnar nerve repair: motor function recovery was fair in 8/19, (42.10%) nerves and good in 4/19 (21.05%), and unsuccessful in 7/19 (36.8%) nerves. The sensory recovery was fair in 5/19 (26.31%) nerves and good in 7/19 (36.84%) nerves and unsuccessful in 7/19 (36.8%) repaired nerves.

The results of Median Nerve repair: Motor function recovery was fair in 6/18 (33.33%) and good in 4/18 (22.22%), and unsuccessful in 8/18 (44.44%) repaired median nerves. The sensory recovery was fair in 4/18 (22.22%) and good in 6/18 (33.33%), and unsuccessful in 8/18 (44.44%) repaired median nerves. Post operative wound infection was seen in 7/25 patients (28%). The infection was treated with drainage debridement and appropriate antibiotics.

Conclusion: The results of median and ulnar nerve delayed primary repair may be adversely affected by infection, use of thick thread, and operating without magnification.

KEY WORDS: Nerve, Repair, Median, Ulnar.

INTRODUCTION:

Peripheral nerves are injured by mechanical trauma, laceration, stretching, entrapment, thermal or chemical trauma, malignancies, toxins, and collagen diseases. A mechanical trauma is most commonly seen in orthopedic practice.

The nerve injuries were classified by Seddon in 1943, in three groups, neuropraxia, (minor contusion or compression), axonotmesis (breakdown of axon and distal wallerian degeneration) and neurotmesis, (complete anatomical severance of the nerve). This classification was generally accepted but rarely used. Sunderland in 1951, presented a more useful classification, in which the nerve injuries are arranged in ascending order of severity from first to fifth degree. This classification is easily applicable clinically. When the ulnar nerve is incompletely transected at wrist, the intrinsic muscles supplied by...
the nerve are paralyzed. Only opponenspollicis, lateral or superficial head of flexor pollicis brevis and the lateral two lumbricals remain functional. Practically only three muscles, flexor carpi ulnaris, abductor digiti quinti and first dorsal interosseous can be tested in hand accurately in case of ulnar nerve injury. The action of other ulnar nerve innervated muscles in hand can be substituted by other muscles by an occasional patient. Regarding sensory loss, the middle and distal phalanges of the little finger consists of autonomous zone of the ulnar nerve. Complete anesthesia to pinpricks in this area suggests complete division of ulnar nerve. While testing the median nerve, the opposition of the thumb is difficult to confirm. The abductor pollicis function can be confirmed if the thumb can be actively maintained in palm abduction and the contracting muscle can be palpated. Regarding sensory supply of median nerve the autonomous zone covers the dorsal and volar surfaces of distal phalanges of the index and middle finger. Most of the times after repair of the sensory nerve, as the regeneration progresses, the area of anesthesia decreases in size. The area may become paresthetic in 2 to 3 months time. Later on the area becomes hyperesthetic to light touch and cold. This hyperesthesia resolves after some time.

As the regeneration process continues, the sensation improves significantly within 18 the 24 months time. In adults full normal sensation with two point discrimination is rarely expected in all. When the peripheral nerve is completely transected, motor functions distal to that level is lost, as all the muscles supplied by the never distal to that level are paralyzed.

To measure and document motor return after peripheral nerve injury, several methods are used. In these methods, the muscle strength against gravity and against graded resistance is checked. The MRC scale used the check the muscle strength is as follows.

- M0, no active contraction.
- M1, A flicker of muscle contraction can be seen or found by palpation over the muscle, but the activity is insufficient to cause any joint movement.
- M2, contraction is very weak, but can just produce movement as long as the weight of the part can be countered by careful positioning of the limb.
- M3, contraction is still very weak, but can produce movement against, gravitational resistance. M4, strength is not full, but can produce movement against gravity and added resistance.
- M5, normal power is present.

The British Medical Research Council established the following six-level grading scale for sensory return: S0, absence of sensibility in the autonomous area; S1, recovery of deep cutaneous pain within the autonomous area; S2, return of superficial cutaneous pain and tactile sensibility within the autonomous area of the nerve; S3, return of superficial cutaneous pain and tactile sensibility throughout the autonomous area with disappearance of overreaction; S4, some recovery of 2-point discrimination within the autonomous area; S5, complete recovery.

Most of the timeneurorrhaphy is not followed by full return of motor and sensory function. Anadequate recovery often occurs when the factors that influence recovery are favorable. The degree of recovery varies from nerve to nerve and with the relative extent of damage to the motor and sensory components within each nerve.

The terms applied to the timing of the nerve repair include primary repair (immediately after injury, or within 6 to 12 hours), delayed primary repair (usually within the first 2 to 2.5 weeks), and secondary repair (after 2.5 to 3 weeks).

This study was conducted to analyze the clinical outcome of median and ulnar nerve repair at wrist.

**MATERIAL AND METHODS**

The prospective observational study was conducted at LUMHS and a private practice setup. Twenty five patients, 18 male and 7 female, with age range between 25 to 50 years, presenting between June 2008 and December 2011 were included in the study and followed on average 24 months. Patients reporting with wrist injury were initially assessed for vital functions. Wherever indicated measures were taken to prevent cardiopulmonary failure and shock. Systemic antibiotics and tetanus prophylaxis was given. The injury to the peripheral nerve was evaluated and careful assessment was made.

Open wounds in which never was injured was cleaned and debridement done. The nerve ends were identified and marked with sutures. Only those cases were included in this study in which end to end repair was possible.

These patients had no co morbidity. Cause of injury was sharp laceration as result of knife injury or sharp glass injury in 14 patients, iatrogenic in 2 patients, road traffic accident resulting in fracture of distal radius or ulna or both in 4 cases, and hand caught in machine in 5 patients. Twelve patients had injury to both median and ulnar nerve; six had injury to median and seven only to ulnar nerve. All the patients had associated injuries to tendons as well. Delayed primary repair of nerve was performed in all patients. The associated injuries to tendons were dealt at the same time.

The epineural Neurorrhaphy was done in all patients. The nerve ends were exposed and dissected. End to end repair was done without tension.

Appropriate rotational alignment was determined by observing the orientation of surface vessels and location of fascicule within the nerve. The suture used for repair was 6-0 proline. Total of four sutures were used one for each quadrant of nerve, to ensure appropriate rotational alignment. Additional interrupted sutures were placed to make a satisfactory neurorrhaphy. After neurorrhaphy, the extremity was immobilized in a plaster splint or cast. A posterior molded plaster splint was used for the arm; sutures were removed after fifteen days. Plaster splint was retained for 4 to 6 weeks; Physical therapy was advised to regain full function of the extremity.

After removal of splint the patients were called every 3 months for follow up visit and on each visit muscle strength and sensation were checked and recorded.

To document the outcome of nerve repair, the muscle strength and sensory return was recorded according the British medical research council grading. For return of muscle strength M3 was taken as fair and M4 as good and M5 as excellent. For sensory recovery S3 was taken as fair and S3+ and good and S 4 as excellent recovery.

To record the motor recovery after ulnar nerve repair, first dorsal interosseous and abductor digitiminimi were checked for strength. For sensory recovery the autonomous area on meddle and distal phalanges of little finger were checked.

To record the motor recovery after median nerve repair, abductorpollicisbrevis was checked for strength and for sensory...
RESULTS:
A total of 37 nerves (18 median and 19 ulnar) were repaired in twenty-five patients. At the end two years follow up the results were as under.

The results of ulnar nerve repair: motor function recovery was fair in 8/19, (42.10%) nerves and good in 4/19 (21.05%), and unsuccessful in 7/19 (36.8%) nerves. A total of 12/19 (63.15%) had fair or good motor ulnar nerve recovery. The sensory recovery was fair in 5/19 (26.31%) nerves and good in 7/19 (36.84%) nerves and unsuccessful in 7/19 (36.8%) repaired nerves. A total of 12/19 (63.15%) had fair or good sensory ulnar nerve recovery.

The results of Median Nerve repair: Motor function recovery was fair in 6/18 (33.33%) and good in 4/18 (22.22%), and unsuccessful in 8/18 (44.44%) repaired median nerves. A total of 10/18 (55.55%) repaired median nerves had fair or good motor recovery. The sensory recovery was fair in 4/18 (22.22%) and good in 6/18 (33.33%), and unsuccessful in 8/18 (44.44%) repaired median nerves. A total of 10/18 (55.55%) repaired median nerves had fair or good sensory recovery.

Post-operative wound infection was seen in 7/25 patients (28%). The infection was treated with drainage debridement and appropriate antibiotics.

DISCUSSION:
Majority of our patients were male (72%), the reason may be that most of working population is male in this part of world. The age range is between 25 to 50 years. The age range was reported 18 to 60 years by Najeb Y and 14 to 62 years by Galanakos SP et al and 26 to 42 years by Gurbuz H et al. The age group in our study is comparable to that presented in other studies. Epineural repair is a conventional technique for suturing lacerated nerves. The technique has some advantages e.g., the operating time is short, it is easy to perform, not much magnification is required, intraneural contents are not invaded. The disadvantages may be the malalignment of fascicles, and the need for many sutures. Mohseni MA et al reported 7 (28%) unsuccessful repairs out of 25 nerves which underwent delayed repair. Number of unsuccessful repair in our study was 7/19 (36.8%) in ulnar nerve repair and 8/18 (44.44%) in median nerve repair, which is significantly higher. This poor result was due to high rate (28%) of postoperative infection in our series.

Kilinic A et al has shown 71% good results in isolated median or ulnar nerve repair. In their series 12 patients with combine median and ulnar nerve injury has to undergo revision surgery. They concluded that combined median and ulnar lesions have bad prognosis, and sensory recovery after isolated ulnar nerve repair at wrist was better than median nerve repair results. The motor recovery was had no deference in isolated nerve repair. Murovic JA has shown good results in 91% of median and radial nerve repair and 73% good results in ulnar nerve repair. Seddon reported 90% combined good and fair motor return in ulnar neurotrophies at the wrist.

In our study 63.15% had fair or good motor and sensory ulnar nerve recovery, and 55.55% repaired median nerves had fair or good motor and sensory recovery. These results are far inferior to those reported in literature mentioned above. The reasons for this result may be the use of thick thread (proline 6/0) used for nerve repair, high postoperative infection rate and failure to use magnification due to no availability of operating microscope.

CONCLUSION:
The results of median and ulnar nerve delayed primary repair may be adversely affected by infection, use of thick thread, and operating without magnification.

REFERENCES: