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Original Research Article

Surgical outcome of prognostic factors for final outcome of hand function following primary median nerve repair

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ABSTRACT

Background: A major problem in surgery of median nerve injuries is the unpredictable final outcome, so identifying the prognostic factors for final outcome is needed in primary median nerve repair following injury. Assessing the functional recovery of hand function following median nerve repair.
Methods: Total no. of patients with median nerve injury repaired in our institution was 70. All the patients assessed preoperatively by clinical examination, surgery performed immediately or within 12 hours of injury, performed under axillary block and tourniquet control, Multiple surgeons involved (about 6 surgeons). All are primarily repaired nerves, repair by 70 prolene epineural sutures, postoperative immobilization of 3 weeks.
Results: Median nerve injury associated with other flexors involved patients show good functional recovery, the functional recovery deteriorate once involvement of finger flexors, particularly if all the tendons were injured. The arterial injury and repair don't seem to influence the outcome of the hand function, but both artery involvement usually associated with all tendon injury, it shows poor outcome.
Conclusions: The more distal the injury the outcome will be quicker as compared to middle 1/3 and proximal 1/3 injuries. Pure median nerve injuries sensory recovery in S4 grade about 5%, S3+ recovery of sensation is about 36%. Pure median nerve injury patients M4 motor recovery about 54%. Only median nerve injury the final outcome is good but combined median and ulnar nerve injury and associated tendon injury the outcome is poor.

Keywords: Diabetes mellitus, Smoking, Median nerve injury, Ulnar nerve injury

INTRODUCTION

Peripheral nerve injuries must be appropriately managed to optimize motor and sensory recovery and to minimize pain, Loss of motor and sensory function following median nerve injuries to the upper extremities may result in a less functional hand.[1] and it affects the patient's activities of daily living. Traumatized peripheral nerves are characterized by specific changes both proximal and distal to the site of injury.[2] Proximally axons retract a variable distance and after a brief period of quiescence elongate as a hydra-like regenerating unit in which a single parent axon gives rise to multiple daughter axons.[3] In myelinated nerves, axons aprout at sheathed gaps known as the nodes of Ranvier, and progress to their sensory or motor targets. Once a functional synapse is made, the remaining daughter axons degenerate or are pruned back.[4] In the distal nerve segment, Schwann cells, fibroblasts, myocytes, and injured axons express a host of neurotrophic factors, including glial and brain-derivedneurotrophic factors at discrete concentrations and time points as the degrading neural elements are

phagocytosed in a process termed Wallerian degeneration.[5] Schwann cells assume a pro-regenerative phenotype instrumental in remyelinating and guiding regenerating axons to their appropriate targets along residual endoneurial tubes known as the bands of the burner.[6] Regenerating fibers can demonstrate both tissue and end-organ specificity. This process is called neurotrophins. The preference of the nerve fiber to grow toward a nerve versus other tissue depends on a critical gap across which the fiber responds to the influences of the distal nerve.[7]

METHODS

Total no. of patients with median nerve injury repaired in our institution was 70. Patients assessed those who got an injury and treated at our institution from January 2016 to December 2017. Median nerve alone -42, Median + Ulnar nerve: 28. Male: 68, Female: 2.

A total number of patients assessed: 40. Median nerve injury alone: 22, Median nerve + ulnar nerve: 8. All the patients assessed preoperatively by clinical examination, surgery performed immediately or within 12 hours of injury, performed under axillary block and tourniquet control, Multiple surgeons involved (about 6 surgeons) All are primarily repaired nerves, repair by 7o prolene epineural sutures, postoperative immobilization of 3 weeks.

Inclusion criteria

Patients presented to our emergency service with median nerve injury.

Exclusion criteria

- Children< 6 years,
- Uncooperative patients,
- Mentally unstable patients, bilateral median nerve injury patients,
- Delayed primary and secondary nerve repair patients,
- Thumb, index, middle finger amputation patients associated with median nerve injury.

All the patients assessed preoperatively by clinical examination, surgery performed immediately or within 12 hours of injury, performed under axillary block and tourniquet control, multiple surgeons involved (about 6 surgeons), all are primarily repaired nerves, repair by 7o prolene epineural sutures, postoperative immobilization of 3 weeks.

RESULTS

Nature of injury-sharp injuries are dominating, but sharp injuries doesn't mean will give good outcome, the severity or depth of injury will determine the good functional recovery, 75% of injuries are due to glass piece injury, 15% due to iron plate and 5% due to knife In our study 70% of forearm injuries are due to accidental injury, 30% injuries are due to self-inflicting.

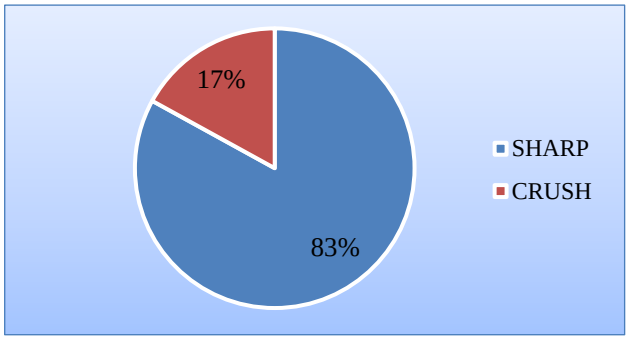

Figure 1: Nature of injury.

While examining the level of injury the more distal the injury the outcome will be more quick as compared to middle1/3 and proximal 1/3 injuries, we are not able to follow the two arm level median nerve injury patients .In pure median nerve injuries sensory and motor recovery about 5% and 54% with sensory grade of 4 and motor grade of 4 respectively, S3+ recovery of sensation in about 36%.

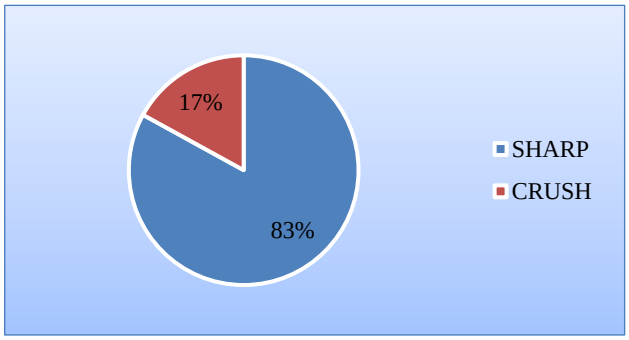

Figure 2: Level of injury.

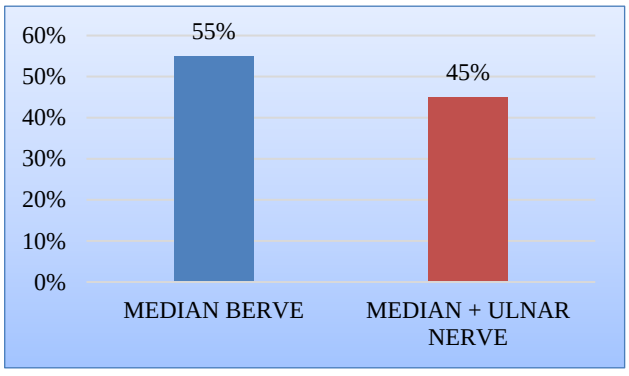

Figure 3: Associated ulnar nerve injury.

In combined median and Ulnar nerve injury, M4 motor recovery is only 16%, sensory recovery S3+ recovery in about 11%, no S4 sensory recovery noted in combined median and Ulnar nerve injured patients.In 22 cases

median nerve injury observed, 18 patients had both combination of median and ulnar nerve injury. Comparing Opponens grading good Opponens that means grade >6 is present in 63% of patients of median nerve injury only and 16% of median and Ulnar nerve injury patients. Only median nerve injury the final outcome is good but combined median and ulnar nerve injury the outcome is poor. Overall M4 recovery that is near normal recovery in distal forearm injury is 37%, S4 recovery is 25%.

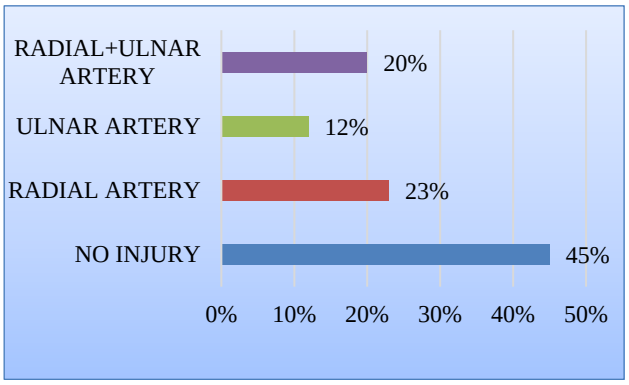

Figure 4: Associated vessel injury.

Out of 40 patients 18 had no vessel injury, of the 18 patients 50% have good functional outcome, 9 patients with the Opponens of more than 6, usually these patients have less no of tendon involvement and also no Ulnar nerve injury, 9 patients have single vessel (either radial or Ulnar) forearm, Ulnar artery injured patients usually associated with Ulnar nerve injury, so the hand function is poor comparing the Ulnar artery repaired vs ligated patients no significant improvement in hand function. There is no significant improvement in hand function following repair of either single or double vessels in both vessel injured patients.

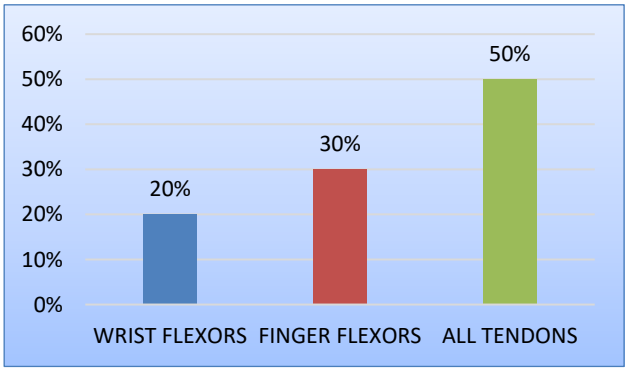

Figure 5: No. tendon injury.

8 cases had wrist flexor injury, flexor compartment 4-9 injury was observed in 12 patients. Total group injury of tendon 9-12 was observed in 20patients. No of tendons injury associated with the final outcome of hand function in median nerve injury patients, 20 patients have 1-9 tendons injury; another 20 patients had 10-12 tendons injury that is all flexor tendons involved in 20 patients, All flexor tendon injured patients, have a M4 motor recovery in 20% of patients whereas less no. of tendons involved patients shows M4 recovery in 60% of patients

DISCUSSION

Total no of patients treated for median nerve injury in our institution is 70 in the period of January 2016 to December 2017, of which 40 patients were followed and assessed, patients called over through phone and letters, of the 40 assessed patients median nerve alone involved in 28, median and ulnar nerve involvement is 12 patients. Sex factor not able to study in this study population because no female patient is examined or come under this study. Nature of injury- sharp injuries are dominating, but sharp injuries doesn't mean will give good outcome, the severity or depth of injury will determine the good functional recovery, 75% of injuries are due to glass piece injury, 15% due to iron plate and 5% due to knife.[8]

In the present study 70% of forearm injuries are due to accidental injury, 30% injuries are due to self-inflicting.While examining the level of injury the more distal the injury the outcome will be quicker as compared to middle1/3 and proximal 1/3 injuries, we are not able to follow the two arm level median nerve injury patients.[9] In pure median nerve injuries sensory and motor recovery about 5% and 54% with a sensory grade of 4 and motor grade of 4 respectively, S3+ recovery of sensation in about 36%.In combined median and Ulnar nerve injury, M4 motor recovery is only 16%, sensory recovery S3+ recovery in about 11%, no S4 sensory recovery noted in combined median and Ulnar nerve-injured patients.[10]

Comparing opponents grading good opponents that means grade > 6 is present in 63% of patients of median nerve injury only and 16% of median and Ulnar nerve injury patients Only median nerve injury the final outcome is good but combined median and ulnar nerve injury the outcome is poor.[11] Overall M4 recovery that is near normal recovery in distal forearm injury is 37%, S4 recovery is 25%, Marcoccio I et al claims M5 and S4 recovery of peripheral nerve injury patients is only 10%. No. of tendons injury associated with the final outcome of hand function in median nerve injury patients, 20 patients have 1-9 tendons injury another 20 patients had 10-12 tendons injury that is all flexor tendons involved in 20 patients, all flexor tendon injured patients, have a M4 motor recovery in 20% of patients whereas less no of tendons involved patients shows M4 recovery in 60% of patients.[12]

Sensory recovery in all flexors involved patients, S3+ recovery in only 5% of patients, whereas less no of tendons involved (1-9) shows S3+ recovery of 40%. Opponents grade also vary as per no of tendon involvement , this may also due to associated Ulnar nerve injury, opponents good grade noted in 70% of patients, 15% good grade in all tendons involved patients.[13] Only

other flexors involved patients shows good functional recovery, the functional recovery deteriorate once involvement of finger flexors, particularly if all the tendons were injured .Out of 40 patients 18 had no vessel injury, of the 18 patients 50% have good functional outcome, 9 patients with the Opponents of more than 6, usually these patients have less no of tendon involvement and also no Ulnar nerve injury, 9 patients have single vessel (either radial or Ulnar) forearm, Ulnar artery injured patients usually associated with Ulnar nerve injury, so the hand function is poor comparing the Ulnar artery repaired vs ligated patients no significant improvement in hand function.[14] There is no significant improvement in hand function following repair of either single or double vessels in both vessels injured patients. Both the vessels ligated in one patient, he was assessed after 8 months of repair, shows poor Opponents and relatively good power grip, tripod, and key pinch.[15] Most of our patients are working young adults, so only 3 patients have diabetes mellitus out of 40 patients. Not able to study because ofa small group of patients.

CONCLUSION

Median nerve injuries in forearm most commonly due to accidental injuries, mainly caused by glass piece injury, it's a workplace injury. Sharp injuries are dominating, but sharp injuries don't mean will give good outcome, the severity or depth of injury will determine the good functional recovery. Only median nerve injury the final outcome is good but combined median and ulnar nerve injury the outcome is poor.All flexor tendon injured patients have an M4 motor recovery in 20% of patients whereas less no of tendons involved patients shows M4 recovery in 60% of patients. Comparing the ulnar artery repaired Vs ligated patients no significant improvement in hand function.There is no significant improvement in hand function following repair of either single or double vessels in both vessel injured patients

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