EXPERIENCES WITH REPAIR OF ULNAR NERVE INJURIES
(A Study of Twelve Cases)

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INTRODUCTION :

The successful repair of an injured peripheral nerve continues to be a challenge. Although major advances in the technique were introduced in the peripheral nerve repair by 1940 (Converse 1977), recovery of function of such a nerve to its pre-operative level is seldom attained following repair of a severed nerve. Search for more refined techniques and their strict evaluation will therefore continue in future.

At the present study attempts have been made to assess the results of repair of injured ulnar nerve which were undertaken by the first author in patients admitted to the Departments of Plastic Surgery and Neurosurgery of Institute of Post Graduate Medical Education and Research, S.S.K.M. Hospital and Bangur Institute of Neurology during last four years (1979 to 1983).

MATERIAL AND METHODS :

30 patients of different types of severed peripheral nerves, single, double and multiple were studied during the period. Out of 30 cases, there were 12 patients with ulnar nerve injury. Observations of these 12 patients of ulnar nerve injury and their repair have been reviewed in this paper. The assessment has been made in respect of the age, the nature and type of injury and the result of repair of the severed nerves with special reference to the surgical technique employed in each case.

Electrophysiological and histopathologic changes in the denervated muscle and motor end plates following repair in some of them have been studied to correlate these changes with the recovery of function.

Out of 12 cases, 11 cases were repaired under magnification with micro surgical technique and 1 case was operated by conventional technique.

OBSERVATIONS :

A. Age and Sex incidence—

All patients in this series were male. The age incidence is shown in the following (table-I),

Table-I

Age incidence	
0 — 10	— 2 Cases
11 — 20	— 4 Cases
21 — 30	— 3 Cases
31 — 40	— 3 Cases

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B. Machanism of Injury—

Eight Patients had glass cut injuries and 4 had stab injury.

C. Level of lesion—

In 8 patients, the injury was at or above the wrist, 2 cases had injuries in the arm, and one each at the elbow and at the upper forearm.

D. Time interval between injury and repair—

2 patients had primary repair of the injured nerve and 9 patients were repaired between three and twelve months, and only one had repair at $2\frac{1}{2}$ years after injury.

E. Pre-operative assessment—

(i) Motor—All patients in this series had weakness of the motor power of the muscles supplied by the nerve following injury. Adductor pollicis muscle power was M_2 in 7 patients, M_3 in 3 patients and M_4 in 2 patients.

(ii) Sensory deficit—Sensory deficit in the hand following ulnar nerve injury mainly involved ulnar half of fourth and whole of the fifth finger with the adjoining hypothenar area. Complete loss of light touch was present in 9 patients while in the remaining 3, the loss was less pronounced.

(iii) Nerve conduction velocity—In 7 out of 12 cases there was no conduction velocity, In 4 patients there was reduction in nerve conduction velocity. In 1 case nerve conduction study was not done.

(iv) Electromyographic study—Electromyographic studies showed gross neuropathic changes along with the fibrillation potentials and a few motor unit potentials in all patients with ulnar nerve injury in this series.

F. Operative findings—

Scarring at the injury site was a prominent feature in most of the patients associated with complete division causing adhesion with the surrounding muscle. In most cases neuroma was present. In one case (Case No. 5) fibrous tissue had completely entrapped the ulnar nerve though its anatomical continuity was not disrupted.

No magnification was used during repair in one case (Case No. 4) while in all others magnifying loupe (2 and 5 magnifications) were used. Technique used was group funicular apposition with epineural reinforcement with 8/0 Nylon in all cases except one who had conventional repair with 5/0 Nylon.

G. Post Operative assessment:

Post operative follow-up studies were made first at 6 weeks, then at 3 months and subsequently at 3 monthly intervals. Earliest follow up was done at 6 weeks and longest follow up was available at 4 years.

Sensory return was always noted earlier than the inprovement in motor function. In some of the patients recovery of sensation was noted within 3-4 weeks of repair. In 4 patients at 2 years follow up, two-point discrimination were evident.

Recovery of motor function was good in 4 at one year follow up. In 4 patients at 6 months follow up recovery was fair to good. In 3 cases onset of recovery just noted at 6 weeks after repair was achieved. Recovery was fair at the end of 2 years in the only

patient of ulnar nerve injury treated by epinural suture in this series.

Nerve conduction velocity was measured in 8 out of 12 patients, at regular intervals. Definite improvement was noted from 6 months onward following repair. Post operative Electromyographic studies were made at intervals. Muscles tested were hypothenar and 1st. dorsal interosseus. With the passage of time, gradual reduction of fibrillation potential, reduced interference pattern and changes from gross neuropathy to mild neuropathy or nearly normal electromyographic pattern were noted. Functional recovery was always better than nerve conduction velocity.

H. Muscle Biopsy :

Histological changes in motor end plates and muscle fibres were observed in a few patients following denervation and after repair of the nerves. Materials from muscle biopsy in these cases were taken from Adductor pollicis muscle. Biopsies which were studied 3 months after injury showed degenerating motor end plates. A few intact motor and plates were also seen. Evidence of regeneration was also evident in the end plates in a few muscle biopsy specimen taken at 6 and 9 months following repair.

DISCUSSION :

The full restoration of motor power and sensory recovery after nerve repair require more than mere reestablishment of axonal continuity with the terminal endings in the muscle. It requires maturation of newly restored pathways into functionally mature and efficient fibres as also the capacity of the reinnervated muscle fibres to respond in sufficient numbers to give precision and power to motor performance. Eleven of the present series of 12 patients, the nerves were repaired under magnification with micro-surgical technique and only one was repaired by the conventional epineural suturing technique.

Majority of these patients (7 out of 12) belonged to the age group of 11-30. 2 patients were below 10 years and another 3 were between 31 and 40 years. It was evident that the quality of recovery after nerve suture in this series was better in younger patients. This view has also been supported by many other workers (Moberg 1968, Omer 1973).

The rate as well as the quality of recovery of motor and sensory function following repair of nerve are said to be inferior in high placed rather than in low placed lesions (Sunderland, 1968 and Omer 1974). Analysis of the cases, in this series, however, does not fully suport the view. Three patients with lesions at the elbow and above in the arm showed good recovery of function.

All the cases in our series except one were operated within 9 months of injury. 40% of our cases in this series had excellent recovery and 28% showed good recovery. This shows that sooner a severed nerve was repaired the better would be the functional result, an observation which agreed well with those of many other workers (Thomson et al, 1946, Kirklin et al. 1949 & Perrit, 1957).

Recovery of motor function in the cases in the present series has been assessed according to the criteria used by Seddon (1972). Onset of recovery of motor function was evident from 3 months onward in 4 cases (Case Nos. 3,5,6 & 9). One of them showed

evidence of recovery in 1st. dorsal interossei at 6 weeks and in three cases, recovery was evident at 6 months.

Light touch, heavy touch and pain sensation were present at 6 months follow up in patient of ulnar nerve repair. In one, they were present during first follow-up at 6 weeks. This patient had complete transection of ulnar nerve at the upper arm. Two point discrimination tests were performed and analysed in cases of ulnar nerve repair and it was found that 4 patients had shown restoration of this sensibility between 9 months and 2 years whereas this was not evident at 6 months. Almquist and Eeg—Olofson (1970) found that return of two point discrimination was never so good when the patient was older than 10 years whereas Sunderland (1978) observed that younger teenagers also enjoyed those advantages. Observations in the present series confirm those of Sunderland, where two point discrimination was found to have returned in patients between 11 and 30 years of age.

Sweating was clinically apparent at 9 months to $1\frac{1}{2}$ years after repair.

Electromyography and Nerve conduction Velocity Study :

Four patients in this series were followed up for 1 year to 2 years (Case No. 1,3,5,6) showed nearly normal E.M.G. picture. Patients who were followed up for 6 months showed mild to moderate degree neuropathy with steady improvement (5,6,8,9). Only one case (Case 7) continued to show gross neuropathic changes during 6 months follow up.

Seddon (1972) reported that motor activity appeared ahead of clinical evidence of recovery. In this series E.M.G. picture in most of cases were proportional to the amount of functional recovery.

It was observed that nerve conduction velocity improved along with functional recovery following repair. Thomas et al (1959) have pointed out that it was not uncommon for maximum conduction velocity in some patients to be only slightly below the accepted normal range.

SUMMARY AND CONCLUSIONS :

The quality of recovery after nerve suture in this series appears to be better in younger patients.

Though the functional recovery after a nerve suture is better in a low placed lesion, the results of repair in this series appears to be quite good in high placed lesions as well.

The functional result following a nerve repair appears to be good if repaired between 3 to 9 months.

Sensory return following repair of ulnar nerve was always noted earlier than improvement in the motor power.

Group funicular repair of severed nerve with the aid of magnification and microsuture gave better functional result than conventional epineural suture with coarser suture material and without the aid of magnification.

Operation under magnification allow better identification of funiculi, of their sizes, position and alignment. It further enables the surgeon to use finer needles, suture materials and thus achieve better apposition of severed nerves.

ACKNOWLEDGEMENT :

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Muscle biopsy studies were undertaken at the University College of Medicine, Calcutta.

The authors are grateful to the Director, I.P.G.M.E. & R. and B.I.N. and the Surgeon-Superintendent, S.S.K.M. Hospital for permission to utilise the Hospital records for this study.

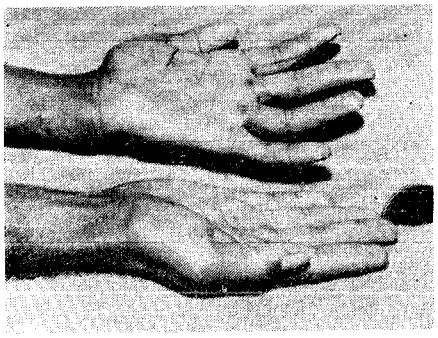

Fig. 1. Showing transverse scar mark just above left wrist and early clawing of ring and little finger of Left hand in a case of ulner nerve injury.

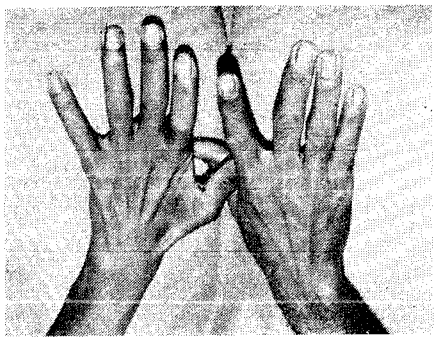

Fig. 2. Showing wasting of 1st. dorsal interossi of left hand-

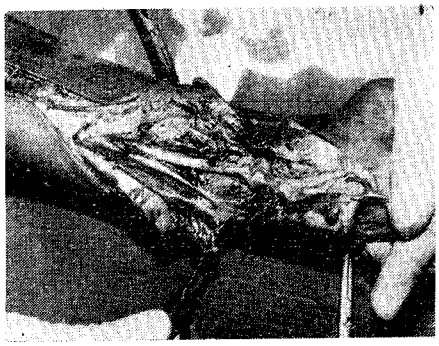

Fig. 3. Showing dissection of the wrist and lower end of the forearm in a patient with ulnar nerve injury. Figure shows lacerated flexor carpi ulnaris muscle (↑) and lacerated ulnar nerve. (↓ ↓)

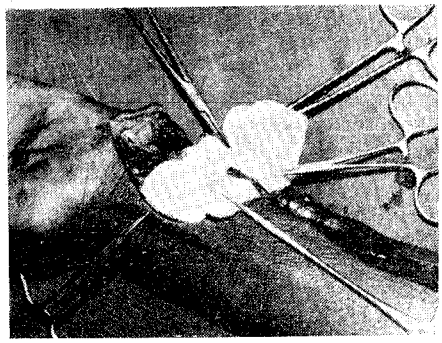

Fig. 4. Following dissection and excision of neuroma the cut ends of the nerve is ready for suture.

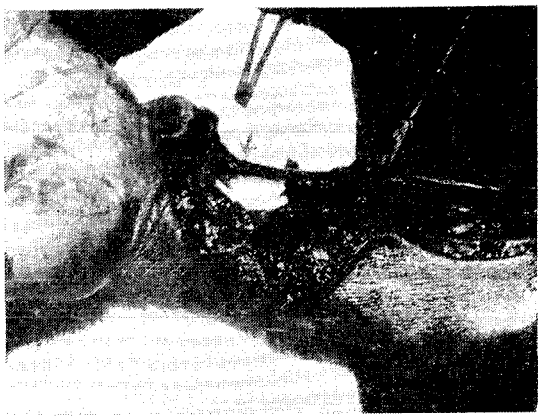

Fig. 5. Shows suture of the ulnar nerve is complete.

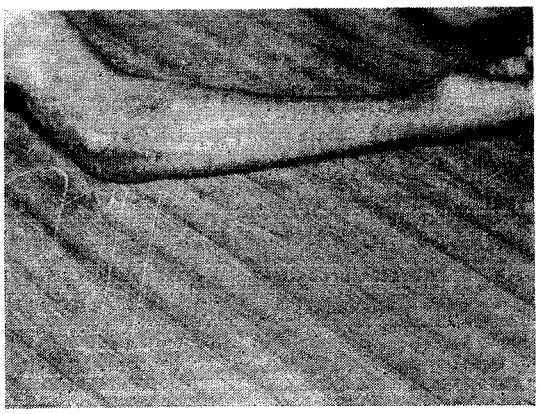

Fig. 6. Picture shows scar on the operation site where ulnar nerve was repaired.

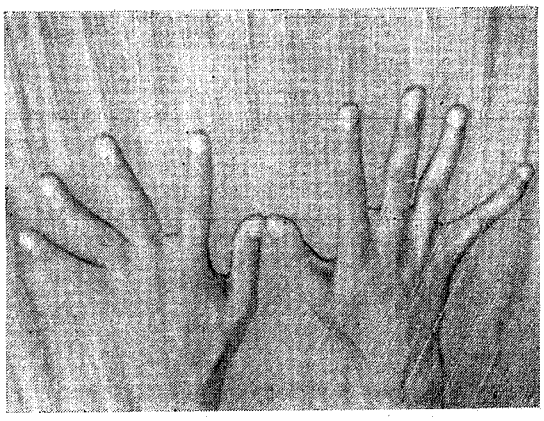

Fig. 7. Photograph showing abduction of all fingers.
A case of ulnar nerve injury repair, followed up at 4 years. Wasting present in first web space.

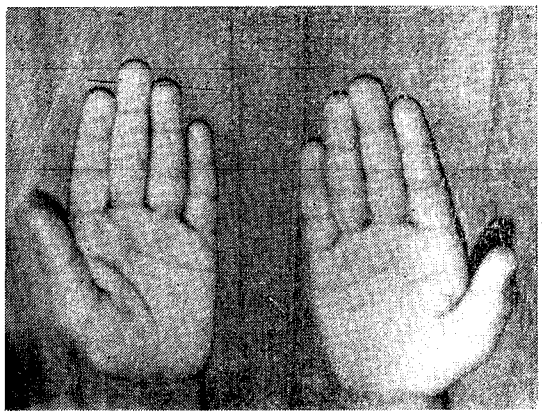

Fig. 8. Picture showing adduction of all fingers of the same patient, followed up at 4 years.

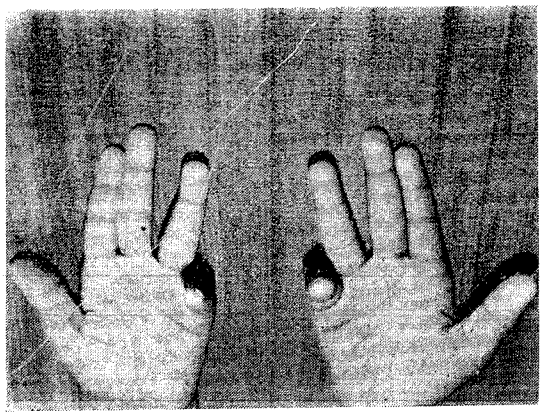

Fig. 9. Picture showing flexor of M.P. Joint of little finger following repair (4 years follow up).

Fig. 10. The photo micrograph shows motor end plate (M.E.P.) of a normal muscle study. 400X Gold Chloride Stain.

Fig. 11. The photomicrograph shows the isolated areas of fragmented motor end plate with degenerating axis cylinder. 400X Gold Chloride Stain.

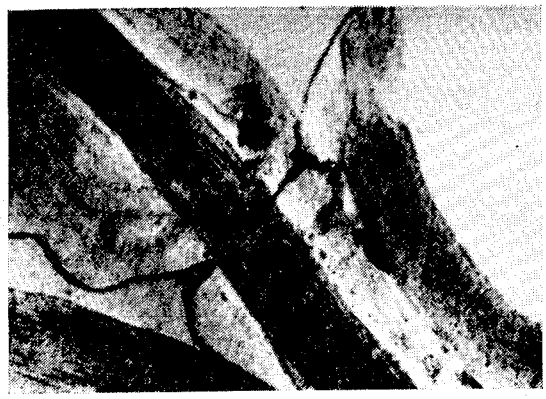

Fig. 12. The photomicrograph shows dual nerve endings, the downward arrow indicate the reganerating motor end plate (↓) whereas the upward arrow indicate the degenerated end plate. Morphology of the motor end plate was lost and changed into a undifferentiated solid mass, indicating degenerative changes. photograph taken 9 months after repair.

Fig. 13. Picture shows the regenerating motor end plates, taken 8 months after operation (marked by an arrow) the other end plate shows degenerating motor end plate with broken axis cylinders.

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