

STUDY OF LONG TERM FUNCTIONAL OUTCOME AFTER REPAIRED VOLAR CUT WRISTLokesh Chowdary R¹, Sushil Rangdal², Srinivas Nagendra³, Vishwanath Yaligod⁴, Girish H. Rudrappa⁵**HOW TO CITE THIS ARTICLE:**

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ABSTRACT: BACKGROUND: Cut wrist repair is commonest procedure done in Hand surgery, inspite of that there is dearth of literature on long term functional outcome & social rehabilitation of such patients, so we decided to study our patients retrospectively with self-devised scale which not only incorporated the combined assessment of nerve & tendon but also the patients self-assessment of his status of recovery. **MATERIAL AND METHODS:** We retrospectively studied a cohort of 32 patients by searching through hospital records from 2010 to 2013. **RESULTS:** Most common age group 21-30 yrs, M:F=9:1, glass cut most common injury, sensation improved with time but return of sensation not seen in period of observation, MN has better recovery than UN, except 2 patients significant 2PD was not observed. Cold intolerance/paraesthesia is a common problem in patients & persists for long, tendon function recovery is good to excellent at wrist level, majority of our patients were satisfied & were able to return to their original vocation within 1 yr.

KEYWORDS: 2 PD, patients scale, evaluator's scale, MN, UN.

INTRODUCTION: Superficial location of tendon and nerves in the volar aspect of wrist put these structures in jeopardy with any penetrating injury, thus producing functional and psychosocial disability. Inability to use hand regardless of the cause of severe functional disability and prolonged incapacity for work.

Despite the fact that primary tendon and nerve repair is one of the most common procedure of hand surgery, yet in one scenario there is a dearth of literature on long term study of functional outcome and social rehabilitation of such patients. Majority of literature written on outcome of wrist repair focuses individually of either nerve or tendon assessment, yet the fact remains that invariably both of them are injured more commonly. Benet JE et al; Puckett Meyer¹ are amongst few who have made an attempt to collectively assess tendon and nerve injury outcome. As far as our Indian scenario goes we could not find any literature on long term functional outcome of these patients.

In the light of above mentioned statement and that we have been regularly repairing volar cut wrist in our Department of Orthopaedics, we planned not only to introspect our results but also to find the long term outcome of these patients with respect to:

- a. Level of return of functional capacity.
- b. Social and vocational rehabilitation
- c. Any shortcoming post repair in patients ADL.

To fulfill the objectives of our study we had to prepare assessment protocol, that not only incorporated the combined assessment of nerve and tendon recovery but also the patients self-assessment of his status of recovery and the percentage of return to the pre injury vocation.

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MATERIALS & METHODS: Our study done from 2010 to 2014 at department of orthopedics, Sapthagiri institute of medical sciences & research centre, Bangalore on, by searching through records of registered patients of our department, we found a cohort of 32 patients who fulfilled our selection criteria and whose complete records were available and who volunteered for follow up.

INCLUSION CRITERIA:

1. Injury at wrist involving both tendon & nerves (Zone 5 of tendon injury of IFSSHS)
2. Clean cut, uncontaminated injury that was repaired within a period of 14 days.
3. Patient with minimum follow up of 11/2 years post repair.

We excluded the following:

1. Any injury at wrist with contamination, massive tissue loss & any fractures in vicinity.
2. Psychologically impaired, non-compliant patient/children less than 8 years.
3. If the structures in injury were partially cut.
4. Tertiary repair and repair of neglected injuries.

By searching records of our registered patients of our department, we found 32 patients who fulfilled our criteria & assessment was done.

65% of our cases were in 21-30 yrs age group and majority were below 40 yrs of age indicating hand injuries are more common in people of young age as they are more commonly involved in job involving use of sharp instruments.

90.6% of our patients were males as explained by the fact that males are more involving in outdoor work and more susceptible to assault/injury, most injuries were sustained in dominant hand. Majority of repairs in our study were done in 0-7 days and were delayed primary repairs. In our study all fingers were involved equally but thumb was least involved because of deeper location of its tendon. Nearly 60% of the patients presented with clawing with average follow up of 1.6 yrs.

In > 90 % of our cases no or minimal flexion lag was observed and in no patient extension lag was observed. We had superficial infection in 6 cases which promptly settled with antibiotics. For 2 cases skin flap necrosis we had to go for local rotation flap. In our study majority were in motor recovery stages of M3 and M4., Majority were in S2 and no patient showed complete recovery. Nearly 60% of our patient presented with Wartenberg phenomenon, >85% of our patients suffered from cold intolerance/paraesthesia and nearly 22% said they are disturbed by it. Majority of our patients returned to work within 1 year of injury. 90% of cases showed good to excellent result, poor result was seen in one patient.

ASSESSMENT:

OBJECTIVE RECOVERY

Sensory motor tendon function
Pinprick BMRC scale LOUISVILLE system²
2 PD

SUBJECTIVE RECOVERY

Patients assessment of outcome
Return to vocation
Effect on ADL

These results were combined and tabulated to produce the evaluator's scale.

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EVALUATOR'S SCALE:

0	1	2	3	4
S ₀	S ₁ /S ₁₊	S ₁₊ /S ₂	S ₃	S ₄
M	M ₁	M ₂ /M ₃	M ₄	M ₅
No finger	Flexion lag	<3cms >1 to 1.5cms	no flexion lag	Excursion >3cms

In our study a patients scale i, e the patient's opinion of outcome which is given half of the weightage to the "total score"

Each patient was asked to estimate the impact of the injury on ADL.

This estimation was made and quantified on a scale ranging from maximal impact to no impact

PATIENT'S SCALE:

MAXIMUM IMPACT		MILD/MODERATE IMPACT		NO IMPACT
0	1	2	3	4
Handicapped Willing for Amputation	severe pain severe cold Intolerance psychiatric illness due Injury jobless	mild to moderate pain/cold intolerance unable to maintain home change of original work change of dominant hand	Does not interfere with ADL return to original work within 6 mon to 1yr no pain / <u>paraesthesia</u> / cold intolerance	complete recovery return to original work within 6 mon continue to work with same hand as dominant hand

For the final result average numerical score from evaluator scale was added to patients scale score.

Us the final score.

RESULTS: In our study of 32 patients with volar cut wrist, maximum age group affected was 21-30 yrs with majority < 40 years and male: female ration was 9:1. Glass cut was most common mode of injury. No conclusion about the timing of repair to the final outcome was seen. Sensation improved with time but return of complete sensation was not seen in period of observation. Amongst the two nerves, MN has better recovery than UN. Leaving aside two patients significant 2PD was not observed. Motor functions improved over time but complete (M₅) recovery was not seen. Motor recovery was better in MN than UN. Cold intolerance / paraesthesia is a common problem in patients with repaired nerves and persist for long. Majority of patients attain good to excellent results with repair of sharply severed tendons at this level (Zone V wrist).²

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Some complications of volar cut wrist repair includes superficial infection and flap necrosis. Majority of our patients were satisfied with the results and were able to return to their original vocation within one year of injury. 90% of cases of our study showed good to excellent results. 6% of fair, 3% of poor results.

DISCUSSION: Sharp cut injuries at wrist though look innocuous but may involve injury to tendon, nerves and other structure leading to complete loss of hand function. Unlike injury at other regions mere restoration of anatomy is not enough. As for most other tissues once some sort of mechanical repair has been affected the body takes care of return of function. At this level this may be partly true for sharply severed tendons but for the peripheral nerves the surgeon may anticipate no such reward for his service, so here restoration of function involves more than restoration of nerve trunk continuity (Sunderland).³

In the literature, long term functional results of tendon & nerve injuries has been compared individually, but the fact remains the outcome of one grossly affects outcome of other. The total outcome of hand function and patients satisfaction and to his return to original vocation depends on composite function of tendon & nerve. No study to find collective outcome of injury to both structures at same time have been done.

We found that majority of cases had both nerves and all tendons involved. On observation it was seen that FPL was least commonly injured tendon. It was seen that when MN was isolatedly cut it was usually associated with cut flexor of IF, MF, Cut FCR & PL whereas injury to UN was associated with injury to flexor of LF, RF & FCU.

NERVE FUNCTION ASSESSMENT: Though axonal regeneration is essential prerequisite for functional recovery of innervated structure, such recovery requires for more than restoration of axonal pathways. It is well established that the recovery continues to improve steadily over many years and the maturation of restored pathways have been completed.

As per Sunderland³ the contribution to this delayed improvement could be due to:

- a. The use hypertrophy of muscle fibres, that have satisfactorily reinnervated and have recovered, to compensate for the loss of those muscle fibres that failed to be reinnervated.
- b. The continued efforts of the well-motivated patients to improve function by adhering to the principle that "practice makes perfect".

SENSORY FUNCTION ASSESSMENT: In our series we found that with increasing duration of follow up, the quality of sensory recovery improved from S₁ to S₃. Despite the fact that we had long follow up of 3 yrs in two patients, still complete (S₄) recovery was not seen. Both patients with average follow up period of 3 yrs had motor recovery of M₄ and the other patient who did not have any sensory recovery had motor recovery of M₄ in median nerve and M₂ in UN which is difficult to explain. These findings are consistent with the comment of Lundborg⁴ and sensory recovery.

Where he showed an ongoing recovery of sensory function over a 5 year period, however the significant improvement was seen in first 2 years. The explanation for this observation is presumably that outgrowth and myelination of fibres occurred primarily over the first 2 years while the CNS adaptation to the new and modified sensory input was an ongoing process.

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2PD test was carried out at final follow up, it was observed that 2PD improves with passage of time. 1 patient with a follow up of 4years, he had 2PD of 10mm in both UN and MN. In rest of the patient the recovery of 2PD in both the nerves was >16mm which is not significant.

In the study of Pucket and Mayor,¹ they commented that the patient with better 2PD had evidence of more normal hand used in sensory function, our findings are consistent with this fact. We found that majority of our patients despite not attaining significant 2PD, were able to perform their ADL near normally, but commonly encountered problems with activities where vision was excluded from touch, like buttoning, operating computer keyboard etc.

According to Kanakappa and Baklin (1976),⁵ in studying sensory recovery of 137 peripheral neurorrhaphies in 96 patients, found that a higher percentage of those under 20years of age at the time of repair had 2PD <6mm than did in those over 20years. Since in our study, significant 2PD was attained in 2 patients, so no such comment on effect of age and recovery of 2PD could be made.⁵

MOTOR FUNCTION RECOVERY: In our series there was better motor recovery in MN than UN. With 65% of patients being able to attain M₄ of motor recovery in MN, whereas only 31% attained M₄ level in UN. Complete recovery that is M₅ was not seen in either. These findings can be explained by 2 anatomical facts. One the muscles supplied by MN in hand are few while UN supplies larger number of muscles. Second, the diameter of median nerve is greater than ulnar, so with large diameter and few motor fibres, scope of error in co potation is big, this is not true for ulnar nerve, as it leaves very little scope of error, with small diameter and large number of motor fibres.

Our results were similar with study of Wynparry (1981) that motor recovery is best in radial nerve, then in median nerve and poorest in ulnar nerves⁶. In our study with average follow up of 1.6 yrs in ulnar nerve injury almost 60% of patients had persistent clawing. On other hand in patients with median nerve injury only 9% patients presented with ape thumb. It was also seen that nearly 60% of patients had persistent Wartenberg's phenomena this only substantiates the above fact that even in long term follow up complete recovery of short muscles of hand is not seen.

In our study we found that about 87% of cases had some sort of cold intolerance / paraesthesia which was disturbing in 22% and occasional in 65% cases. Thus, our findings are consistent with the fact that cold intolerance persists for long.

TENDON FUNCTION ASSESSMENT: Isolated MN involvement and combined MN and UN injury do not pose much problem for excursion of tendons. Isolated UN injury has a hampering effect on excursion. In UN injuries intrinsic negative hand leads to decreased excursion of tendon due to clawing and hyperextension at MCP, joint attempted flexion was wasted at IP joint. With tendency to develop contracture at PIP joint and no flexion at MCP joint decreasing gliding of tendons. LOUISVILLE system LISTER GD, Kleinert HE (1978) was used for tendon function assessment⁷. We found that in > 90% of cases no or minimal flexion lag was observed we had no poor result. Our long term evaluation says in majority of cases at this level of injury the recovery of tendon function is good to excellent.

We had our own set of complication. 6 patients had superficial infection which settled with prompt antibiotic treatment. In 2 cases had significant flap necroses which were treated by local rotation flap.

REFERENCES:

1. Puckett CL, Meyer VH: Results of treatment of extensive volar wrist lacerations; the spaghetti wrist. *Plast Reconstr Surg* 1985; 75:714-721.
2. Saini N, Kundani V, Patni P, Gupta S. Outcome of early active mobilization after flexor tendons repair in zones 2-5. *Indian J Ortop*. 2010; 44(3):314-321.
3. Sunderland S: *Nerve Injuries and Their Repair: A Critical Appraisal*. New York: Churchill Livingstone, 1991
4. Lundborg G, Bjorkman A, Rosen B. Enhanced sensory relearning after nerve repair by Re-education of sensation in the hand after nerve injury and repair.
5. Kankaanpää U, Bakalim G: Peripheral nerve injuries of the upper extremity. Sensory return of 137 neurorrhaphies. *Acta Orthop Scand* 1976; 47:4
6. C.B. Wynn Parry, M.A., D.M., D.Phys.Med.^{1,2} (M.B.E., F.R.C.P., Now Director of Rehabilitation
7. Kleinert HE, Kutz JE, Atasoy E, et al: Primary repair of flexor tendons. *Orthop Clin North Am* 1973; 4:865-876.

**Fig. 1****Fig. 2**

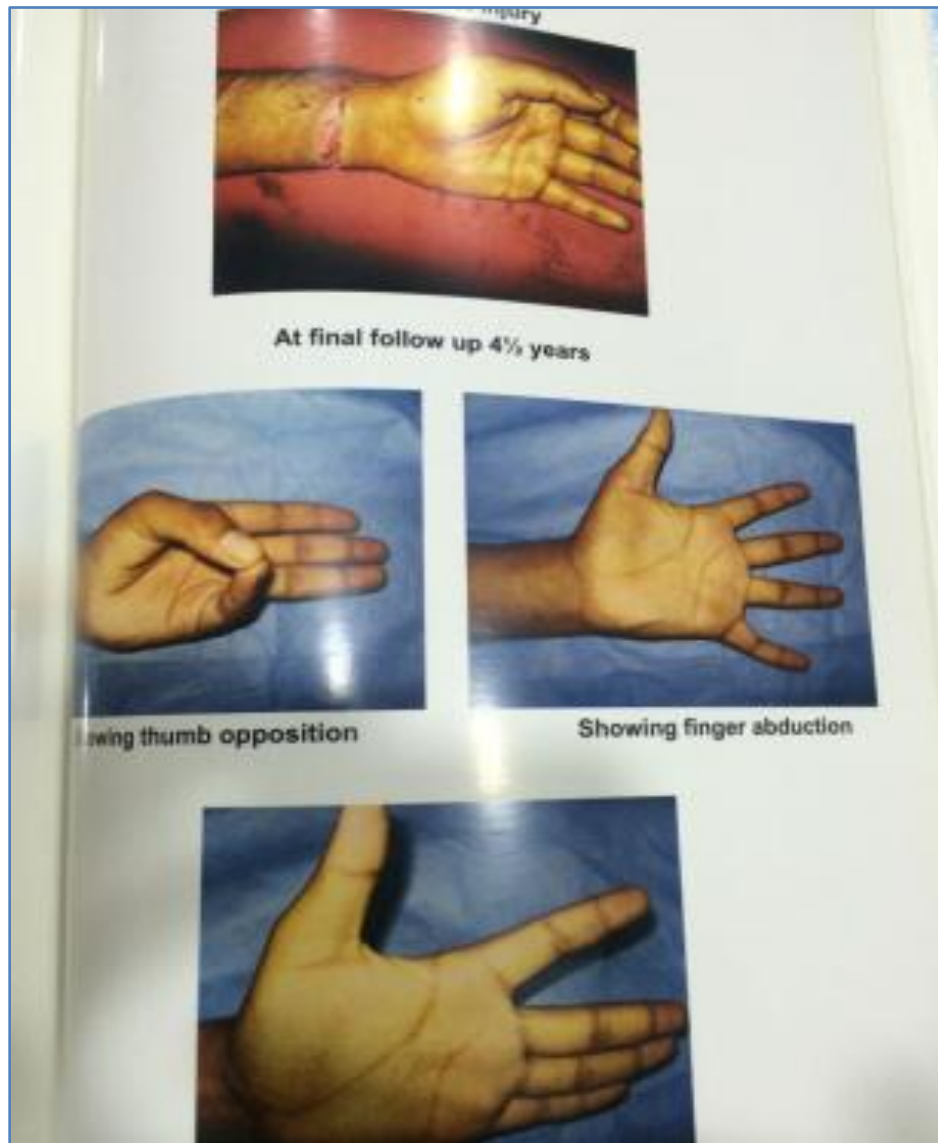


Fig. 3



Fig. 4

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