

Outcome of Carpal Tunnel Release: a prospective study

Pradhan NMS; Khan JA; Acharya BM; Devkota P; Rajbhandari A

¹Patan Hospital, Department of Orthopedics and Trauma

ABSTRACT

BACKGROUND: Carpal tunnel syndrome (CTS) is the most common peripheral entrapment neuropathy and is manifested by characteristic signs and symptoms resulting from median nerve compression at the carpal tunnel¹. The diagnosis is essentially clinical, which is further confirmed by nerve conduction studies. Surgical release of the transverse carpal ligament is advised when conservative treatment fails.

METHODS: This prospective study evaluates the outcome of standard open carpal tunnel release performed at our center* from June 2004 to July 2007. Thirty two patients with idiopathic carpal tunnel syndrome, with failed conservative treatments, either with NSAIDs and/or local infiltration with corticosteroid injections plus night splint, or recurrence after conservative treatment were subjected to open carpal tunnel release after getting approval from the local ethical committee and getting a written and informed consent from the patient. Clinical assessment was done pre-operatively and at 6 weeks, 3 months and 6 months following the procedure and included the two-point discrimination test at the tip of the index finger and Boston questionnaires as an outcome measurement of symptoms severity. All the patients were followed up for a period of six months.

RESULTS: All the patients presented improvement in the postoperative evaluations in all the analyzed parameters.

CONCLUSION: Open carpal tunnel release is a safe and effective method for the treatment of CTS and can be carried out when the conservative means fail to relieve the symptoms.

KEY WORDS: carpal tunnel syndrome, entrapment neuropathy, surgical decompression

INTRODUCTION

Carpal tunnel syndrome (CTS) is the most common peripheral entrapment neuropathy and is manifested by characteristic signs and symptoms resulting from median nerve compression at the carpal tunnel¹. Diagnosis is essentially clinical and is confirmed by the nerve conduction studies. The treatment can be conservative, with NSAIDs, corticosteroid infiltration, and/or wrist splinting, or surgical, with the open or endoscopic release of the transverse carpal ligament².

The surgical treatment is indicated when non-operative management fails, when symptoms are persistent for more than one year and when there is a neurological deficit (motor or sensory), or when there is recurrence of symptoms after a temporary relief with any of the conservative treatments. It has been shown by the clinical trials that there is no significant advantage of the endoscopic procedure over the conventional one⁴. The open surgical release of the carpal tunnel still remains

the gold standard of the treatment of the carpal tunnel syndrome^{3,4}.

MATERIALS AND METHODS

Appropriate informed consent was obtained both verbally and in written form from each patient prior to surgery. The diagnosis of CTS was preliminarily based on symptoms and findings on physical examination. Clinical examination included the presence of typical sensory symptoms, Tinel's sign, Phalen's and Durkan's tests, sensory testing by two-point discrimination at the tip of the index finger, muscle testing and examination of thenar atrophy. The diagnosis was further confirmed by nerve conduction studies.

Inclusion criteria for the study included all patients with idiopathic CTS admitted at the Department of Orthopedics at Patan Hospital from June 2004 to July 2007. Exclusion criteria included inability to complete a self-administered questionnaire; a previous carpal tunnel release; occurrence of medical conditions associated

with increased incidence of CTS like diabetes mellitus and hypothyroidism; wrist trauma or surgery; musculoskeletal, metabolic or autoimmune disorders; presence of space-occupying lesions at the wrist identified before or during surgery and pregnancy.

Conservative treatment was adopted for at least six weeks and included wrist splinting at neutral angle and use of non-steroid anti-inflammatory drugs, oral neurotrophic and local infiltration with corticosteroid infiltration (40mg of Methylprednisolone acetate). The surgical treatment was carried out in patients with failed conservative treatment and with recurrence after the discontinuation of the treatment or return to work.

All the patients included in the study had open carpal tunnel release under regional or general anesthesia with upper-arm tourniquet. All the surgeries were performed by the same surgeon. A standard 3-cm incision was made in the palm along a line projected proximally from the interspace between the middle and ring finger, paralleling the thenar crease without transgressing the wrist flexion crease. After the retinaculum section, the manipulation of the median nerve was limited to the inspection to discard any additional extrinsic compression. The wound was closed with interrupted 3.0 nylon sutures. All patients received the same immediate postoperative care. Each wrist was bandaged with a bulky dressing and light compressive bandage for 72 hours, which was changed to the light compression dressing and the patients were encouraged to move their hands and fingers freely. No splint was used post-operatively⁵. The sutures were removed at 2 weeks post-operatively. No patients were referred to the physiotherapy department for physiotherapy.

The evaluations were performed pre-operatively, at 6 weeks, 3 months and 6 months after the surgery. All of the subjects were examined by the same author. Each patient completed the first section of a validated questionnaire described by Levine et al.⁶, named Boston questionnaire (BQ). Static two-point discrimination was measured using a two-point discriminator applied to palmar surface of the index finger distal phalange. As well as in the evaluation through the described scales, the two-point discrimination was evaluated pre and post-operatively.

Statistical analyses were performed by using SPSS 16 for windows using student paired t-test. The level of significance was set at $p < 0.05$.

RESULTS

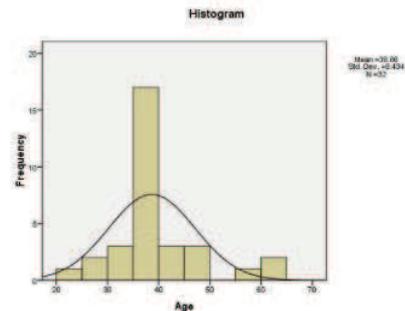


Fig. 1: Age distribution

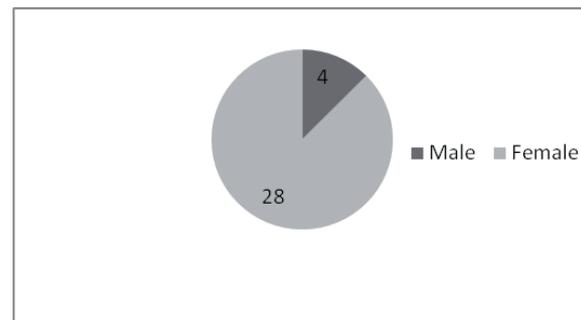


Fig 2: Male to Female Ratio (n=32)

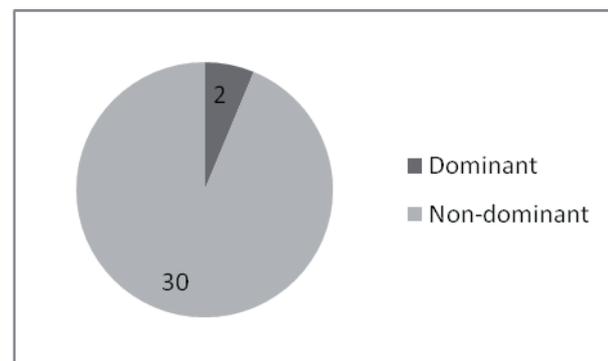


Fig 3: Involvement of the dominant hand

Thirty-two patients fulfilled the inclusion criteria during the study period. We had two exclusions in this study, one

patient with classical symptoms who presented with an old healed Colles' fracture and a patient who was found to have a large ganglion arising from the flexor digitorum sublimis tendon sheath inside the carpal tunnel. There were no post-operative median nerve lesions, wound dehiscence, infection or tendon injuries. There was no recurrence at six months follow up.

The ages of the patients ranged from 22 to 62 years and averaged 39 years. There were twenty-eight female compared to 4 males. The dominant hand was involved in thirty cases. Five patients had bilateral involvement, but were operated only on the dominant side, which happened to be the most severe side.

symptoms, both in terms of severity and intensity after surgery in all the patients.

DISCUSSION

Carpal tunnel syndrome is the most common entrapment neuropathy and often occurs after the age of 30 years, with women been affected three to six times more than men^{8,9}. A large proportion of patients fail to respond to conservative treatment and, in this population, carpal tunnel decompression with division of the transverse carpal ligament has been a highly successful procedure^{2,3,4}. While the patient satisfaction is usually

Table 1: Two Point Discrimination and Boston Questionnaire Results

	Pre-op	6weeks	12weeks	24weeks	Significance
Two Point Discrimination	5.83	5.18	4.24	3.65	<0.001
Functional Severity Score(FSS)	2.76	2.31	1.95	1.54	<0.001
Symptom Severity Score(SSS)	3.8	2.9	2.04	1.59	<0.001
Symptom Intensity Score(SIS)	3.53	2.57	2.09	1.9	<0.001

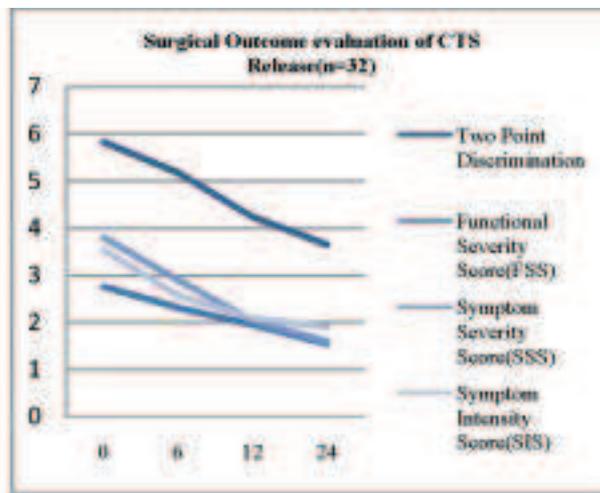


Fig. .Surgical Outcome Evaluation of CTS Release

The average 2-point discrimination score improved from 5.83±2.80 mm before surgery to 3.65±1.19 mm after surgery. The SSS improved from 3.8 to 1.59; the SIS improved from 3.53 to 1.90 and the FSS improved from 2.76 to 1.54 after six months. There was a gradual improvement in the functional outcome as well as the

high with the surgery, potential complications do exist and includes pain and scar discomfort, wound dehiscence, bowstringing of the flexor tendons and inclusion of the median nerve within the postoperative scar¹⁰⁻¹³.

To minimize these complications, most surgeons immobilize patients' wrists for 1 to 4 weeks following open carpal tunnel surgery¹⁴. On the other hand, some authors recommend precocious mobilization of wrist and fingers after the surgery in order to enable the free longitudinal nerve movement in the surgical bed, what should avoid possible adhesences from neighboring structures^{6,16}. However, the literature shows no statistically significant differences in results between the splint or non-splint groups^{5,14}. Finally, Finsen et al. reported no significant differences between post-operative immobilization and non-immobilization after open carpal tunnel release in 82 wrists⁵. In our study we have not immobilized the wrist post-operatively.

The evaluations were performed subjectively with validated questionnaire described by Levine et al.⁶ named Boston questionnaire (BQ). BQ is a self-reported questionnaire

designed to evaluate the outcome specifically in CTS and has been found to be reproducible, internally consistent and responsive to clinical change^{6,7}. In the first section of this scale, the symptom score is determined from 11 questions regarding different attributes of pain, tingling and numbness with each answer scoring between 1 (no symptom) and 5 (very severe symptoms). The intensity of symptoms (tingling, burning pain and numbness) was evaluated by another scale (Symptom Intensity Scale - SIS). This was done by asking the subjects to rate each symptom on an interval scale from 0 to 4, with zero indicating "no symptom" and 4 indicating "intolerable symptom". For both questionnaires the results were expressed as a mean score for the answered questions. The functional status of the patient was evaluated with the second part of the question: FSS (Functional Severity Scale). The objective evaluation was performed using the Two Point Discrimination Test.

It is important to remind that the related studies, including ours, evaluated only patients with idiopathic CTS. The selected patients had undergone numerous conservative measures of treatment before finally having to undergo surgical treatment because of increasing severity of the symptoms as well as the loss of function. In this patient subpopulation, the adverse effects of surgery on the flexor tendon mechanics such as bowstringing of the tendons are known but they are very rare and seldom lead to serious problems^{17,18}. It is not clear if the non-immobilization treatment can affect the recovery after surgery in patients where there is an associated rheumatologic condition like basal joint arthritis¹⁸. Additional studies are necessary to evaluate if similar results are observed in this kind of patient.

In conclusion, if we consider the evaluated parameters, our results suggest that open carpal tunnel release is a safe and reliable procedure in the treatment of idiopathic CTS.

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Dr. Nabees Man Singh Pradhan,
Consultant Orthopedic Surgeon,
Department of Orthopedics and Trauma,
Patan Hospital
E-mail: nabeesman@yahoo.com