

# Pinch and grip strength recovery following ambulatory carpal tunnel release under local anaesthesia

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## Abstract

**Aim:** This study was conducted to compare pinch and grip strength of patients with carpal tunnel syndrome undergoing release to normative values preoperatively and postoperatively.

**Methods:** Clinical data collected on grip and pinch strength of 50 hands with carpal tunnel syndrome was compared to appropriately matched normative data.

**Results:** There were definite improvements in strength after 4 weeks of postsurgical release and some subjects continued to have significant deficits compared to the normative data.

**Keywords:** Carpal Tunnel Release, Grip Strength, Motor Function, Pinch Strength.

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**Conclusion:** Patients with carpal tunnel syndrome have moderate to large weakness in grip and pinch strength in comparison to normative data. Carpal Tunnel Release may reduce this weakness; however, carpal tunnel syndrome patients may often have with residual problems at 4 weeks and may take up to 1 year to resolve completely.

## Introduction

Carpal tunnel syndrome is the most common compression neuropathy of upper limb in practice and is most extensively studied condition (1-3). Carpal tunnel syndrome accounts for approximately 90% of all entrapment neuropathies (2,3). It involves middle aged ladies. In the majority of patients, the exact cause is unknown. Objective assessment of motor function is useful to evaluate outcome after surgical decompression. There appears to be a controversy on which motor function recovery after release (4-7).

Patients with carpal tunnel will have moderate to large weakness in pinch and grip strength in comparison to normative data. Surgery reduces this weakness; however, these patients often will have residual problems at 4 weeks. The aim of our study was to know the motor functional outcome in the form of grip strength and pinch strength changes in idiopathic carpal tunnel syndrome following carpal tunnel release.

## Materials and Methods

This prospective cohort study was conducted in 45 consecutive patients who were undergoing carpal tunnel release, between May 2019 and May 2021 after obtaining the institutional ethics committee approval.

The inclusion criteria were all cases between the age of 21 and 60 years who underwent carpal tunnel release surgery following the diagnosis of Carpal Tunnel syndrome by clinical and nerve conduction studies (4,5).

Those patients with history of cervical, shoulder, elbow disorders or history of diagnosed neuromuscular skeletal disorders or post burn contracture or pregnancy or post trauma or carpal tunnel syndrome due to systemic illness were excluded from the study (6,7).

All patients with clinically suspected carpal tunnel syndrome are confirmed by nerve conduction study. Routine and some special investigations are done to rule out the other causes of carpal tunnel syndrome.

Preoperative functional status of hand is measured with questionnaire for disability and Grip and pinch strength (8). Carpal tunnel release was done under local anaesthesia using about 8 to 10 ml of 2% Lignocaine injection.

Grip strength and pinch strength were measured using a handheld Jamar dynamometer, said to be the most accurate for measurement of grip strength. While standardizing, it was set at the second handle position. After the dynamometer was lightly held around the readout dial, the scores were read on the needle side of the red readout marker. For each of the tests, the patients were seated comfortably with their shoulder adducted and neutrally rotated, elbow flexed at 90°, forearm in neutral position, and wrist between 0° and 30° dorsiflexion and between 0° and 15° ulnar deviation (8-10). Three successive trials were recorded for each test.

To measure pinch strength Jamar dynamometer or Pinch gauge was used.

The recommendations made were:

- Standard position and instruction should be used
- The same test instrument used for preoperative and postoperative testing
- The average of three readings should be used.
- Scores obtained should be compared with age and sex matched formative values
- The dynamometer and pinch gauges should be calibrated and checked regularly

Postoperative functional outcome is measured with questionnaire for disability, grip strength and pinch strength. Patients were followed up after 10 days, 3 months, 6 months and one year.

## Results

A total of 50 hands in 45 patients were operated on for carpal tunnel syndrome. All patients in our study were right-handed dominant. In the present study even though 68% of patients presented with bilateral symptoms, it was noted that the right-side symptoms (70 %) were more severe than left. Most of the cases were in the age group of 30 to 50 years and right-hand dominance was a universal feature for all the cases included in our series. Bilaterality of disease was observed in 68 % cases. 54 Females were affected more than twice as much as male patients.

Most common symptom was pain (32 patients) in the hand followed by tingling (30 patients), which in turn was followed by weakness (16 patients). Many patients in the study had a combination of two or three symptoms (22 patients). Almost 74 % of the study population had diurnal variation in their symptoms and presented with more symptoms in nighttime with disturbed sleep.

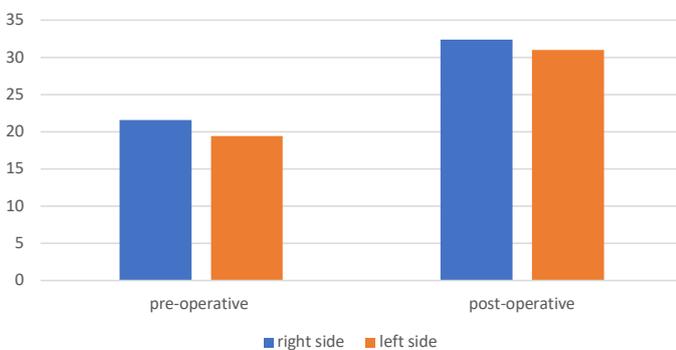
Out of three tests used in our study to diagnose Carpal tunnel syndrome, Phalen's test (n=36) found to be more sensitive compared to other two tests, by Reverse Phalen's (n=30) and lastly by Tinel's sign (n=22).

Most patients in our study were in the severe carpal tunnel syndrome group (56%). In our study, out of 45 patients of carpal tunnel syndrome, 30 patients were operated on right Side 10 patients on left side and 5 patients on both sides. However, 68% of patients had bilateral symptoms and more severely affected hands were operated upon.

Normative value for grip strength was 33.67 and pinch strength was 3.95 measured with elbow at 90° flexion in Indian population (10)

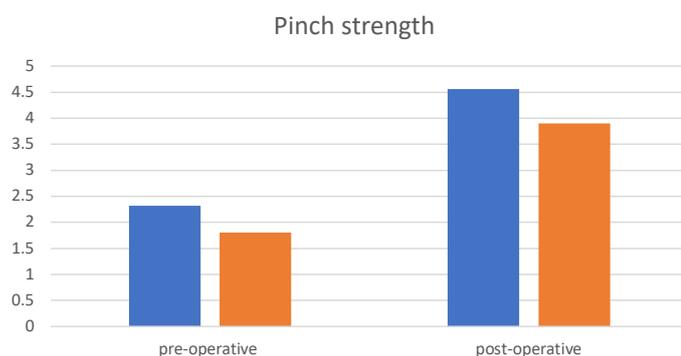
Grip Strength, from an average pre-operative value of 21.55 on the right side & 19.40 on left side, the value increased to 32.37 and 31 respectively [Graph 1]. Progressive trend and hence better outcome in the patients grip strength. The maximum improvement was noted between the 10th postoperative days to 3rd month.

**Graph 1**



Pinch strength from an average pre-operative value of 2.32 on right side & 1.8 on left side, the value increased to 4.56 & 3.9 respectively [Graph 2]. Progressive trend and hence better outcome in the patients Pinch strength. The maximum improvement was noted between the 10th postoperative days to 3rd month.

**Graph 2**



## Discussion

In a study by Baker et al, patients with carpal tunnel syndrome had moderate to large deficits in grip and pinch strength in comparison with normative data (13). Splinting and stretching may reduce these defects.

In our study it has been found that 72% of patients had both motor and sensory conduction abnormalities. 20% had only pure sensory abnormalities and 10 % had pure motor changes. This is in sharp contrast to western literature where pure sensory abnormality is more common (10-13). Normal Grip Strength measured was 43.5 Kg/m<sup>2</sup> on right side and 40.11 Kg/m<sup>2</sup> on left side. Females had lesser grip and pinch strengths when compared to male subjects. Our measurements were found to be lesser compared with other studies (14-16). Improvement in parameters considered in this study, were maximum from 3rd week to 3rd month (17,18). However full recovery took almost one year and was based on severity.

There are newer grip systems to measure each finger's grip strength available and they are being used in some parts of the world instead of traditional dynamometers (19).

Study by Gellman et al evaluates the time required for grip and pinch strength to return to preoperative levels after carpal tunnel release. Grip strength was 28% of preoperative level at 3 weeks; 73% by 6 weeks and returned to the preoperative level by 3 months. At 6 months grip strength was found to increase to 116%. Pinch strength returned sooner, being 74% of preoperative level at 3 weeks and 96% by 6 weeks. By 3 months an increase to 108% was seen and at 6 months an increase to 126% of preoperative levels was found (20).

## Conclusion

Motor function improvement as assessed by grip strength and pinch strength in this study, were maximum from 3rd week to 3rd month. However full recovery took almost one year based on severity. Significant functional improvement in terms of grip and pinch strengths, following surgical release was observed.

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