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## Mini-incision technique in carpal tunnel syndrome: A study on presentation and its outcome

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### Abstract

**Background:** Carpal tunnel syndrome (CTS) is a major occupational health issue, characterized by numbness, tingling, and pain in the hands, which impairs daily activities. While treatment options range from conservative management to surgery, minimally invasive techniques like mini-incision carpal tunnel release have gained popularity for their effectiveness in reducing symptoms and postoperative complications. Thus, the study aimed to evaluate the presentation and outcomes of carpal tunnel decompression using a 1.5 cm mini-incision technique.

**Methodology:** A total of 20 patients with CTS, unresponsive to conservative treatment, underwent mini-incision carpal tunnel release. The procedure involved a 1.5 cm incision, followed by decompression of the median nerve. Outcomes were assessed preoperatively and postoperatively. Functional outcomes were evaluated based on symptom relief and recovery.

**Results:** The study included 80% female and 20% male patients, with a mean age of  $46.15 \pm 8.09$  years. Of the cases, 40% had right CTS, 35% had bilateral, and 25% had left CTS. Postoperatively, no immediate complications were observed. However, 25% of patients reported delayed tingling sensations. The mean pretest BCTQ score was  $14.1 \pm 0.79$ , significantly reducing to  $8.2 \pm 1.28$  postoperatively. Functional outcomes were good in 75% of cases and moderate in 25%.

**Conclusion:** The mini-incision technique for carpal tunnel release proved effective and safe, offering substantial relief from symptoms with no critical complications. This approach provides a favorable alternative for patients, ensuring symptomatic improvement with minimal risk of adverse outcomes.

**Keywords:** Mini incision, carpal tunnel syndrome, surgical outcomes, decompression

### Introduction

The most common form of entrapment neuropathy observed is carpal tunnel syndrome (CTS) [1]. The condition accounts for 90% of all nerve entrapment syndromes and affects approximately 1% to 4% of the general population [2, 3]. CTS is a major occupational upper extremity disorder linked to significant healthcare costs. A primary cause is a repetitive pressure or force on the wrist, making it a significant occupational risk factor [4]. This condition is marked by recurring numbness, tingling, and pain in the fingers and palm, which interferes with daily activities and reduces productivity and quality of life [5].

The available treatment options vary from conservative approaches, like splinting and corticosteroid injections, to more invasive surgical procedures [6]. Physicians have several Carpal Tunnel Release (CTR) techniques to access the transverse carpal ligament. A recent trend favors smaller incisions to reduce surgical trauma, minimize postoperative pain, and be cost-effective [7].

Patients with severe, advanced CTS who did not respond to conservative management were candidates for open surgery using different approaches [8]. Various limited skin incisions and endoscopic techniques have been proposed as minimally invasive and effective methods for preventing excessive scar formation and achieving better cosmetic outcomes [1]. Therefore, this study aimed to evaluate the presentation and outcomes of carpal tunnel decompression using a 1.5 cm longitudinal mini-incision procedure, focusing on the presentation and outcomes of this approach.

## Materials and Methodology

This study was conducted in the OT complex of Karnataka Institute of Medical Sciences (KIMS) Hospital, Hubballi, where patients with Carpal Tunnel Syndrome (CTS) were treated using a mini-incision carpal tunnel release technique. The procedure began with the patient positioned supine, with the affected limb stabilized using a tourniquet. After induction with either general anesthesia or a regional block, anatomical landmarks were identified, and a 1.5 cm to 2 cm incision was made at the intersection of the radial border of the third web space and the Kaplan line.

Following the incision, careful dissection exposed the palmar fascia and the underlying transverse carpal ligament, which was then released to decompress the median nerve. Hemostasis was achieved, and the wound was closed with Ethilon 3-0 sutures. Postoperative care included early mobilization exercises starting on day two, wrist splints for three weeks, and suture removal after 14 days. For patients with bilateral CTS, the contralateral surgery was performed after a three-month interval.

Outcomes were assessed preoperatively and postoperatively using the Boston Carpal Tunnel Questionnaire, ensuring a thorough evaluation of symptom relief and functional recovery.

## Results

**Table 1:** Distribution according to age & gender

Age (Mean±SD)	46.15±8.09	
Gender	No. of cases	% of cases
Male	4	20
Female	16	80

**Table 4:** Distribution according to time since surgery (in months) wise

Time since surgery	No. of cases	% of cases
<=6 months	7	35
7-12 months	9	45
>=13 months	4	20
Mean±SD	14.3± 14.89	

The time since surgery for the cases was distributed as follows: 35% had surgery within 6 months, 45% between 7-12 months, and 20% over 13 months ago. The mean time since surgery was 14.3±14.89 months.

**Table 5:** Comparison of pretest and posttest BCTQ scores

Time	Mean±SD	p-value
Pretest	14.1±0.79	0.0001*
Posttest	8.2±1.28	

The mean pretest score was 14.1±0.79, while the posttest score was 8.2±1.28. The change was statistically significant, with a p-value of 0.0001.

**Table 6:** Distribution according to Functional outcome-wise

Functional outcome	No of cases	% of cases
Good	15	75
Moderate	5	25

In terms of functional outcome, 75% of cases had a good outcome, while 25% had a moderate outcome.

## Discussion

Carpal Tunnel Syndrome (CTS) is the most prevalent compressive neuropathy encountered in clinical practice. It

The mean age of the group was 46.15±8.09 years. Of the cases, 80% were female (16 cases) and 20% were male (4 cases).

**Table 2:** Distribution according to NCS Study

NCS Study	No. of cases	% of cases
L Carpal tunnel syndrome	5	25
R Carpal tunnel syndrome	8	40
BL Carpal tunnel syndrome	7	35

The above table showed that 40% of cases had right carpal tunnel syndrome, 35% had bilateral, and 25% had left carpal tunnel syndrome.

**Table 3:** Distribution according to post-op complications & Delayed complications

Post-op complications	No. of cases	% of cases
No	20	100
Yes	0	0
Delayed complications		
No	15	75
Tingling	5	25

The table shows that none of the patients experienced postoperative complications immediately following the surgery, as all 20 cases reported no complications. Moreover, 75% of patients did not experience any delayed complications. However, 25% of patients reported delayed tingling sensations as a complication.

results from the compression of the median nerve within the carpal tunnel at the wrist. CTS primarily affects middle-aged individuals, with a higher prevalence in females<sup>[3,4]</sup>.

The current study found that the mean age of participants was 46.15±8.09 years, with a predominance of females (80%) compared to males (20%). Another study carried out by Umakanth K *et al.*<sup>[4]</sup> found that 24% were male and 76% were female. The results of this study align with previous research, which has shown that the higher frequency of CTS in women is due to several factors, including the anatomically narrower carpal tunnel that is more prone to higher internal pressures and subsequent median nerve compression<sup>[8,9]</sup>.

Among the cases, 40% had right carpal tunnel syndrome, 35% had bilateral carpal tunnel syndrome, and 25% had left carpal tunnel syndrome. Matsis R *et al.*<sup>[10]</sup> reported that 63.6% of their patients had CTS on the dominant side, 23.37% had non-dominant side involvement, and 12.98% had bilateral CTS. Additionally, Mardanpour K *et al.*<sup>[1]</sup> found that the majority of CTS cases were in the right hand which was parallel to the present study findings.

The current study found no postoperative complications, with 75% of patients experiencing no delayed complications. The mean preoperative BCTQ score was 14.1±0.79, which significantly decreased to 8.2±1.28 postoperatively, indicating a statistically significant improvement in symptoms. This is consistent with findings from a study by Saaq M<sup>[11]</sup> where

preoperative BCTQ scores showed 53.24% of patients with moderate symptoms and 46.75% with severe symptoms, and postoperative results demonstrated 96.10% of patients with only mild symptoms, with no moderate or severe cases.

In comparison, a study by Mardanpour *et al.* [1] also reported significant improvements, with the mean preoperative GSS score of  $7 \pm 2.5$  decreasing to  $1.3 \pm 0.34$  postoperatively, and the mean VAPSS score improving to  $8.3 \pm 1.5$  during the follow-up period. Both studies parallel the results of the current study, as they all demonstrate significant symptom relief and functional improvement following the intervention.

Among the cases, 75% of patients had a good functional outcome, while 25% had a moderate outcome, indicating that the majority experienced favorable results and regained good function post-treatment. Bland JD *et al.*, [12] 79% of patients reported significant improvement in symptoms after carpal tunnel release, which aligns with present study and Matsis R *et al.*, as well where most patients saw relief after decompression surgery. Similarly, a study by Saaq M *et al.* observed that, apart from three patients, all others experienced symptom relief within four months post-surgery, with no critical intraoperative complications observed consistent with the current study, which also did not encounter any significant intraoperative issues. Moreover Bahar-Moni AS *et al.* [13] also demonstrated, seventy-five percent of the patient's satisfactory improvement.

This study was limited by a small sample size, which may reduce the generalizability of the findings. The study also lacked a control group, making it difficult to compare the mini-incision technique with other surgical methods. Further studies with larger sample sizes and extended follow-up are needed for more conclusive results.

### Conclusion

The mini-incision open carpal tunnel technique proved to be highly effective in alleviating symptoms for the majority of patients. This approach not only delivered significant relief from CTS symptoms but also demonstrated a strong safety profile, with no critical complications or recurrences observed. These findings highlight the advantages of the mini-incision method in providing symptomatic improvement while minimizing the risk of adverse outcomes.

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