ORIGINAL ARTICLE

Transverse mini-incision for carpal tunnel release

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ABSTRACT

Background: Carpal tunnel syndrome is a commonly prevalent entrapment neuropathy characterized by median nerve compression within the carpal tunnel. The aim of this study was to compare the outcomes of transverse mini-incision and traditional mini-palm incision for carpal tunnel release.

Methods: A non-randomized interventional study was done at Kurmitola General Hospital, Dhaka and US Bangla Medical College Hospital, Narayangonj between January 2019 and December 2021. Forty-two patients diagnosed with idiopathic carpal tunnel syndrome were allocated to the transverse mini-incision group (n=20) and traditional mini-palm incision group (n=22).

Results: Patients operated with transverse mini-incision returned to their work significantly earlier (mean 10.3 days) than patients operated with traditional mini-palm incision (mean 18.7 days). No significant difference was found between transverse mini-incision group and traditional mini-palm incision group as determined by the McGill pain score improvement (*P*=0.16), the Bangla version of the Boston carpal tunnel questionnaire symptom severity score (*P*=0.61) and functional severity score (*P*=0.43).

Conclusion: Transverse mini-incision is comparable to the traditional mini-palm incision in terms of pain, other symptoms, and functional outcome. However, patients in transverse mini-incision group could return earlier to work.

Keywords: Carpal tunnel syndrome, carpal tunnel release, transverse mini-incision, traditional mini-palm incision, SF-MPQ

INTRODUCTION

Carpal tunnel syndrome (CTS) is a commonly prevalent entrapment neuropathy characterized by median nerve compression within the carpal tunnel, leading to symptoms such as pain, tingling, and numbness in the hand and fingers.[1] Various factors, including malunited fractures, infections, oedema, and tumours, can reduce the total space within the carpal tunnel.[2-4] Systemic disorders such as overweight, diabetes mellitus, hypo or hyperthyroidism, and rheumatoid arthritis are found to be associated with CTS.[5-7] CTS affects both hands, with a more prevalent in women, and dominant hand often affected more.[8-11]

Management of CTS can be conservative or surgical. Conservative treatments include activity modification, nightly wrist immobilization, steroid injections, and oral medications.[12,13] In case of failure to conservative measures, surgical decompression of the carpal tunnel, known as carpal tunnel release (CTR), is considered the gold standard for moderate to severe cases.[14] Advancements in surgical techniques have led to open, minimally invasive, and endoscopic approaches to CTR, with good results and low incidence of complications.[15]

While traditional open carpal tunnel surgery remains an effective option, it may be associated with certain complications.[16] In contrast, the transverse mini-incision, a relatively new approach involving a 1 to 1.5 cm transverse incision at the proximal wrist crease, offers potential advantages such as reduced postoperative pain, faster recovery, and improved cosmesis,[17-21] making it an alternative to the traditional approach.[22]

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HIGHLIGHTS

1. The efficacy of transverse mini-incision is similar to the efficacy of traditional mini-palm incision in terms of postoperative symptoms, pain, and functional outcomes.
2. The patients with transverse mini-incision had returned to their work significantly earlier than patients operated with traditional mini-palm incision.

Several studies have investigated the clinical outcomes and efficacy of these two CTR techniques, but a consensus regarding the superior approach remains elusive.[12] While some studies report comparable outcomes between the two techniques in terms of symptom relief and functional improvement,[12, 23, 24] others suggest potential benefits of the transverse mini-incision technique, including decreased scar tenderness and earlier return to daily activities.[23, 24] However, variations in study designs, sample sizes, patient characteristics, and follow-up periods contribute to conflicting findings, emphasizing the need for a comprehensive investigation to draw definitive conclusions.[25, 26] Thus, the primary objective of this study was to compare the transverse mini-incision and traditional mini-palm incision techniques for CTR.

METHODS

Patients and study design

Initially 50 patients diagnosed with idiopathic CTS were recruited from Kurmitola General Hospital, Dhaka, Bangladesh and US Bangla Medical College Hospital, Narayangonj, Bangladesh from January 2019 to December 2021. Initially, CTS was diagnosed by at least three of the following symptoms: night pain or paresthesia, numbness along the median nerve, and struggling in grasping and using small substances, positive Tinel or Phalen's test, and positive electrophysiologic changes in electromyography.[10]

After that, those who had idiopathic CTS, ineffective conservative treatment for six months, unilateral CTS, and moderate to severe CTS on electrophysiological study were included in the study. Conversely, those who had previous operation, bilateral CTS, secondary CTS, anomaly of hand, and psychiatric or neurological problems, were excluded from the study. A pre-anesthetic check-up was done for those who satisfied the inclusion criteria and had an ASA I or II physical status.[27] The patients were allocated into two groups, 25 patients in each group and named as (a) transverse mini -incision group (intervention group) and (b) traditional mini-palm incision group (control group). Five patients in the transverse mini-incision group and three patients in the traditional mini-palm incision group could not complete the follow-up.

Outcome measurements

Outcome measures were assessed and documented by two investigators. The Short-Form McGill Pain Questionnaire (SF-MPQ)[28] and the Bangla version of the Boston Carpal Tunnel Questionnaire (BCTQ)[29] were used to evaluate patients' conditions before surgery, one month after surgery, three months after surgery, and six months after surgery. Additionally, postoperative complications such as infection, postoperative pain, and ugly scars were also recorded.

Transverse mini-incision group

Patients in this group underwent surgery using a minimally invasive technique involving a 2 cm long transverse incision located 1 cm proximal to the wrist flexion fold. The palmaris longus tendon was identified laterally to the median nerve on the palmar side and the upper border of the transverse ligament. The transverse ligament was then cut to expose the median nerve.[24]

Traditional mini-palm incision group

Patients in this group underwent surgery using the traditional mini-palm incision method. The incision started just below the distal wrist flexion crease and marginally ulnar to the midline of the wrist, extending distally about 2.0 to 3.0 cm along the third web space. The transverse carpal ligament was exposed and carefully divided to open the carpal tunnel.[1]

Statistical analysis

Continuous data were presented as mean (standard deviation), while other data were expressed as number (percent). Within-group improvements were compared using paired sample *t* test, and between-group differences were examined using an independent

sample *t* test. A *P* value of less than 0.05 was considered statistically significant. All statistical analyses were performed using Statistical Package for the Social Sciences, for windows version 26 (IBM Corporation, New York).

RESULTS

Forty-two patients were included in this study as all of them completed a 6 months follow-up. Twenty patients were operated with transverse mini-incision and traditional mini-palm incision were done on 22 patients. The mean (standard deviation) age of the patients was 41 (9.3) years where around 93% (n=39) were women. Three-fifth (60%) had right hand CTS and more than half (52%) had severe CTS according to electrophysiological criteria **(TABLE 1)**.

The transverse mini-incision group (mean and standard deviation: 10.3 and 2.1) needed significantly lower days to return to work than the traditional mini-palm group (mean and standard deviation: 18.7 and 2.3) **(TABLE 2)**. Using paired sample *t* test within both the groups, both McGill short form of pain questionnaire and BCTQ were significantly improved ($P<0.05$) after operation.

TABLE 1 Background characteristics of patients with carpal tunnel syndrome (CTS)

Variables	Overall (n=42)	Transverse mini-incision group (n=20)	Traditional mini-palm incision group (n=22)
Age in years, mean (standard deviation)	41.0 (9.3)	40.4 (9.1)	41.6 (9.7)
Sex			
Men	3 (7.1)	2 (10.0)	1(4.5)
Women	39 (92.9)	18 (90.0)	21(94.5)
CTS involvement site			
Right hand	25 (59.5)	11 (55.0)	14 (63.6)
Left hand	17 (40.5)	9 (45.0)	7 (36.4)
Severity of CTS			
Moderate	20 (47.6)	9 (45.0)	11 (50.0)
Severe	22 (52.4)	11 (55.0)	11 (50.0)

Results are number (%) unless otherwise indicated

For comparison of effectiveness of operation between the two groups, independent sample *t* test was done. No significant difference was found between two groups in McGill pain score improvement ($P=0.16$), symptom severity score ($P=0.61$) and functional severity score of BCTQ ($P=0.43$). There were minor complications in both groups. There were two cases of CTR in the traditional mini-palm incision group that did not improve.

TABLE 2 Comparison of transverse mini-incision and traditional mini-palm incision of patients with carpal tunnel syndrome

Variables	Transverse mini-incision group (n=20)	Traditional mini-palm incision group (n=22)	*P*
Days to return to work	10.3 (2.1)	18.7 (2.3)	0.00
McGill pain score			
Preoperative	21.0 (6.8)	18.5 (5.8)	0.21
Postoperative 1 month	9.3 (4.1)	8.0 (2.7)	0.23
Postoperative 3 months	4.2 (3.4)	4.8 (5.3)	0.66
Postoperative 6 months	3.1 (4.2)	4.1 (6.2)	0.57
Mean (95% CI) difference†	17.9 (14.0 – 21.8)	14.4 (11.2 – 17.7)	0.16*
Symptom Severity Score assessment			
Preoperative	38.5 (8.7)	41.9 (8.5)	0.21
Postoperative 1 month	21.8 (5.8)	21.4 (5.8)	0.83
Postoperative 3 months	14.5 (4.3)	15.8 (7.0)	0.46
Postoperative 6 months	13.9 (5.6)	15.7 (9.9)	0.48
Mean (95% CI) difference†	24.6 (20.5 – 28.7)	26.2 (21.1 – 31.3)	0.61*
Functional Severity Score assessment			
Preoperative	28.2 (6.3)	31.0 (5.6)	0.13
Postoperative 1 month	15.8 (4.6)	15.0 (3.9)	0.83
Postoperative 3 months	11.0 (3.7)	11.6 (6.8)	0.55
Postoperative 6 months	10.3 (4.6)	11.1 (7.7)	0.75
Mean (95% CI) difference†	17.9 (14.8 – 21.1)	19.9 (16.0-23.8)	0.43*

Results are mean (standard deviation)
*Paired *t* test; rest are independent *t* test
†Postoperative 6 months minus preoperative; CI: Confidence interval

DISCUSSION

In this interventional study, we compared transverse mini-incision versus traditional mini-palm incision. Patients with transverse mini-incision had returned significantly early to work. In a recent article, Khoshnevis et al. demonstrated the advantages of minimal incision surgery over conventional open surgery, which is consistent with our observations

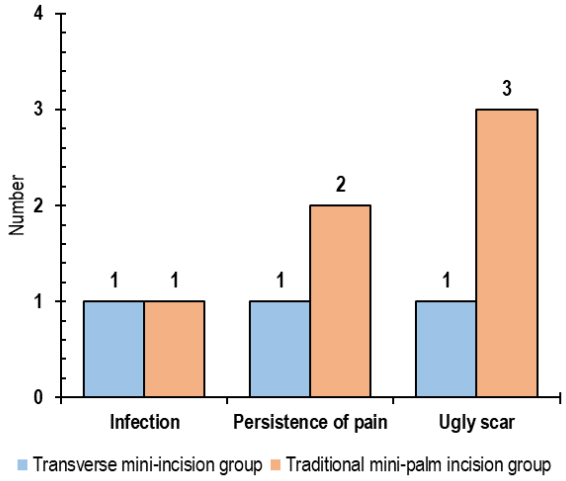

FIGURE 1 Postoperative complications in transverse mini-incision and traditional mini-palm incision group of patients with carpal tunnel

regarding recovery durations.[30] A labour reintegration is described by Khoshnevis as occurring 9.4 days following surgery as opposed to 24.1 days with the conventional technique. In this study, we found the transverse mini-incision group was significantly better for early working capacity.

It was shown that mini transverse incision was superior to open carpal tunnel operation in a study by Keramettin *et al.*[31] The grip force, movement, and cosmetic outcomes were the metrics that revealed disparities.[31] Al-Mofty *et al.* showed that transverse mini-incision reduced scarring.[32] In another trial, there was no statistically significant difference between the conventional method and the transverse mini-incision technique. However, four out of fifty patients in the conventional group complained about their scars.[12] Our study also had no significant difference regarding pain and outcomes. Faraj *et al.* showed that patients in both approaches were symptomatically improved. The scar length in mini-transverse wrist incision technique was shorter than the traditional one. Patients with mini-transverse wrist incisions returned early to work.[33]

As a realistic amount of time for symptom alleviation and functional recovery, we chose six months as the follow-up objectives. Longes follow-up could provide further understanding superiority of the approaches. Three doctors with various surgical skill levels carried out the procedures but the influence of surgeons experience cannot be determined because of the small number of subjects for each surgeon. We did not collect information on the patients' forms of job, and it is plausible that this might have an impact on how soon they may start working again. There might be between hospital difference which we are not sure.

Conclusion

We conclude that both transverse mini-incision and traditional mini-palm incision are safe and effective surgical options for CTS. No significant difference was found regarding pain, symptom and functional outcome. However, in case of return to work after operation, transverse mini-incision. However, the patients in mini-incision group can return to world earlier than the traditional mini-palm incision group.

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Author Contributions

Conception and design: TM, AKS, MIH. Acquisition, analysis, and interpretation of data: TM, AKS, MIH. Manuscript drafting and revising it critically: TM, AKS, MIH, SMA, MZF. Approval of the final version of the manuscript: TM, AKS, MIH, SMA, MZF. Guarantor accuracy and integrity of the work- SMA, MZF, AKS.

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Conflict of Interest

The authors have no conflict of interest to declare.

Ethical Approval

The study received ethical approval from the board at US Bangla Medical College Hospital (Memo No. USBMC/PO-031/22, date: 07 Mar 2022). Written informed consent was obtained from the participants of the study. This study fulfilled the Declaration of Helsinki, and assured that the data would be used for scientific research only.

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