

Effectiveness and safety of endoscopic vs open carpal tunnel release: Single center experience from Maldives

Original Article

Ali Niyaf,¹ Kiran Niraula,² Aishath Sofia Shareef,³ Mohamed Sajuwan Mushrif⁴

1. Senior Consultant Neurosurgery, ADK Hospital, Male, Maldives. 
2. Consultant Neurosurgery, ADK Hospital, Male, Maldives. 
3. Medical Officer, Neurosurgery, ADK Hospital, Male, Maldives. 
4. Medical Student, Lithuanian university of health sciences, Lithuania. 



ABSTRACT

Introduction: Carpal Tunnel Syndrome (CTS) is one of the most frequently encountered entrapment neuropathies. It is prevalent in middle age groups. Conservative management is effective in the majority of population surgery being offered to those who don't respond to medical therapy.

Objectives: To compare the efficacy between endoscopic and open carpal tunnel release procedures for carpal tunnel syndrome patients.

Design and setting: Randomized control study in a single neurosurgery department.

Participants: Thirty patients aged 35-69 years with clinically diagnosed CTS.

Main outcome measures: Primarily – operative duration, bleeding, pain score on day one, the requirement of non-steroidal anti-inflammatory drugs (NSAIDs), time spent in the hospital, and days took to return to work. Other outcomes included infection, wound status/cosmesis, injury to the median nerve, chronic regional pain syndrome, and patient satisfaction.

Results: Fifteen patients were allocated to open surgery, and the other 15 for endoscopic. The average operative duration for open surgery was 9.9 minutes compared to 52 minutes spent on the endoscopic procedure. Cauterization had to be performed 4:1 times in endoscopic compared to open. Pain scores rated 3x higher after open surgery and resulted in increased NSAIDs use. Time spent in the hospital after open surgery was 0.7 hours compared to 2.2 in endoscopic, however, patients were able to return to work an average of 10.6 days earlier after endoscopic surgery.

Conclusion: In carpal tunnel syndrome, endoscopic surgery allowed patients to experience less post-operative pain and return to work several days sooner than in open surgery.

Keywords: Carpal tunnel syndrome, Open carpal tunnel release, endoscopic carpal tunnel release, entrapment neuropathy, median nerve.

INTRODUCTION

Carpal tunnel is a bony passageway present in the

wrist about an inch wide. The roof of the tunnel is a tough band of connective tissue called transverse carpal ligament and through this tunnel traverses nine flexor tendons and the median nerve.[1]

The boundaries of the tunnel are rigid and have little capacity to “stretch”. Carpal Tunnel Syndrome (CTS) is one of the most frequently encountered

entrapment neuropathies.[2] It occurs when the tunnel becomes narrowed or when the synovium surrounding the flexor tendons swell putting pressure on the median nerve. This abnormal pressure on the nerve can result in pain, numbness, tingling, and weakness of the hand. The peak age group for CTS is 45-60 years with female predominance and is more common in caucasians and in developed countries.[3]

Carpal tunnel syndrome can be treated conservatively with splinting or steroid injections. Those who fail conservative management are treated surgically via an open or endoscopic approach. Other newer techniques also include ultrasound-guided steroid injection combined with mini scalpel-needle release, nerve hydro-dissection, z-elongation of the transverse carpal ligament and radial extracorporeal shock waves.[1-3]

MATERIALS AND METHODS

We conducted this randomized control study to compare the efficacy between ‘endoscopic’ and ‘open’ carpal tunnel release surgeries. The study was performed in a single-center, in the department of Neurosurgery in ADK hospital, Maldives. We analyzed a total sample size of



CORRESPONDING AUTHOR
Ali Niyaf
Senior Consultant
Neurosurgery, ADK Hospital,
Male, Maldives.

Author Email:
ali.niyaf@gmail.com



doi: 10.37978/pjsm.vli2.181

Submission: Mar 20, 2020
Acceptance: May 05, 2020
Publication: May 11, 2020.



thirty patients with CTS who underwent surgical decompression of the carpal tunnel.

To make sure our inclusion criteria were specific and purposeful, we paid close attention to their symptoms; we selected the patients, who had classical symptoms of carpal tunnel syndrome, as elaborated by the Katz hand diagram diagnostic criteria.[4] In addition to this, other causes of pain in the forearm, hand, or fingers (abnormalities such as the cervical spine or other hand / upper limb problems) were ruled out. In this way, we established an exclusion criterion, and confirmed CTS as the primary and only causative factor of their symptoms. The patients who had history of trauma to the hands, previous carpal tunnel surgery of either hand or joint diseases were excluded. Informed consent was obtained from every patient. Open surgery was performed in 15 patients, while the other 15 underwent endoscopic surgery. The type of operation for each patient was randomized in accordance with patient preference and availability of the surgeon for a specific time. Both sets of patients were given local anesthesia in the Operation Theater (OT). For the endoscopic surgery, we used a single-portal endoscopic technique at the wrist. The endoscopic incision was a single 2 cm incision at the proximal wrist crease perpendicular to the digits. Comparatively, the incision in the open procedure extended from a point 1.5 cm distal to distal wrist crease in between 3rd and 4th digits up towards the fingers and was 1.5 cm in length. Post-operatively for both procedures, tight dressing was applied to avoid the collection of hematomas. Patients were advised to elevate the hand for 1 day and change the dressing every 3rd day until suture removal in 12 days. Immediate movement of fingers in all ranges was recommended, as well as using the fingers for daily tasks if no pain was felt. No physical therapy was considered; however, paracetamol for 5 days was prescribed.

Both were day surgeries and the outcome was evaluated based on the following indicators: operative duration, bleeding, pain score on day one, the requirement of non-steroidal anti-inflammatory drugs (NSAIDs), infection, wound status/cosmesis, injury to the median nerve, chronic regional pain syndrome, patient satisfaction, time spent in hospital and days taken to return to work.

RESULTS

Out of the 30 patients, 24 were female and 6 were male and the age range of them was between 35-69 years. All of the patients admitted to performing heavy work with the hands for a number of years in one

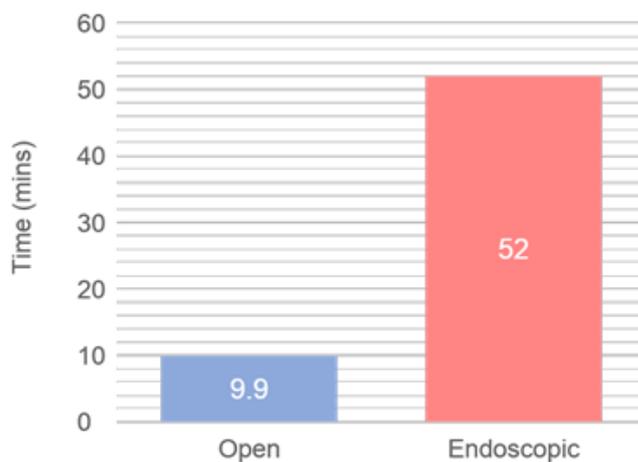


Figure 1: Time comparison of Open & Endoscopic Carpal Tunnel Release

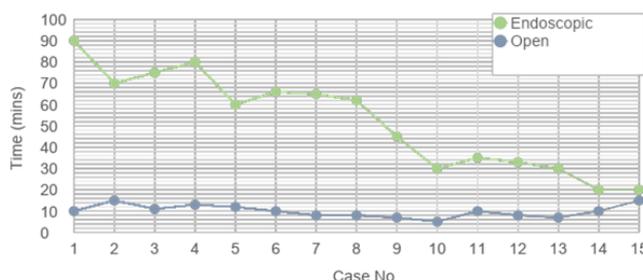


Figure 2: Improvement in Endoscopic Surgery time

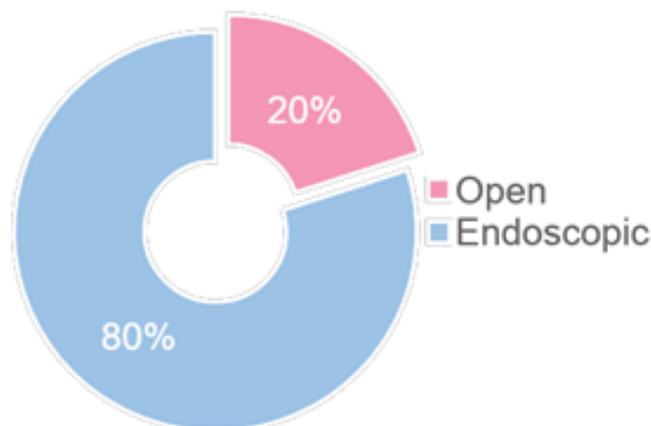


Figure 3: Cautery use in Endoscopic & Open procedures

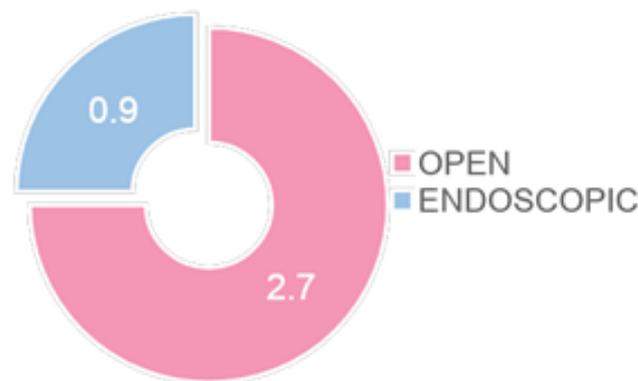


Figure 4: Pain score on first post operative day form or another; as such, most of the females were traditional workers from villages, however, 2 were

urban dwellers doing modern household work. All the males had employment in heavy work such as construction, boat driving, and fishing. All of them had undergone conservative medical treatment prior to decompression; 18 females and 4 males had taken only medication, while the rest also incorporated steroid injections into their treatment regime.

The manpower required for the open procedure was only 2, however, for endoscopic was 5. The average operative duration for open surgery was 9.9 minutes compared to 52 minutes spent on the endoscopic procedure[figure 1]. This was mainly due to the slow learning curve for the endoscopic procedure. The operating time for endoscopic procedures decreased as more cases were operated. Note in figure 2, that the operating time for endoscopic procedures decreased from 90 minutes (mins) to 20 mins and the time taken for open surgery remained within the range of 5-15 mins throughout the period.

In regards to bleeding that occurred during the operation, it was observed more times in endoscopic than in open surgery. Hence, from a total of 10 procedures in which cautery was used, 8 were in endoscopic and only twice in open[figure 3].

To evaluate pain, the visual analog scale (VAS) was used. Pain score on Day one of surgery was a mean of 2.7 for open and 0.9 for endoscopic surgery[figure 4]. This also correlated to the results of pain medication used. The only analgesic prescribed was Tablet Paracetamol 500mg thrice daily for 3 days and NSAIDs were given only on an SOS basis. NSAIDs had to be used in a total of 15/30 cases of which 12 were in open surgery and 3 in endoscopic[figure 5].

The time spent in hospital after the open surgery was under one hour and after endoscopic procedure was on an average approximately 2 hours[figure 6].

A follow up was done 30 days post-op to find out the time it took to return to work after surgery. For open surgery it was a mean of 16.1 days and for endoscopic it was 5.5 days[figure 7].

There was no significant difference with regards to wound infection, cosmetic outcome, chronic regional pain syndrome, median nerve injury and patient satisfaction.

DISCUSSION

Many of the similar studies complement our results in terms of pain evaluation. Zhang et.al performed statistical analysis among the patients and concluded that scar pain was the lowest (1%) in the endoscopic technique and highest in the standard open carpal tunnel release (OCTR) (7%).[5] They also found that

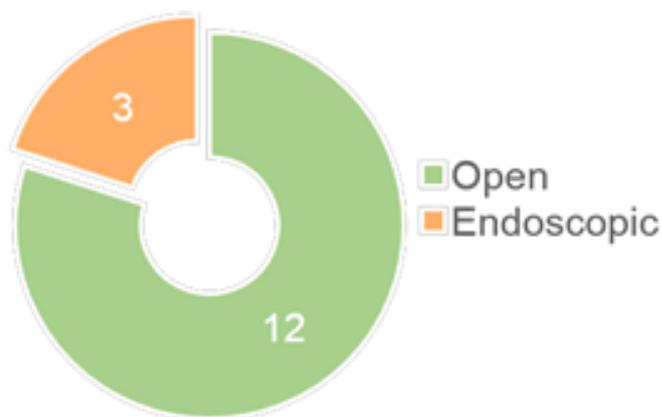


Figure 5: NSAID use

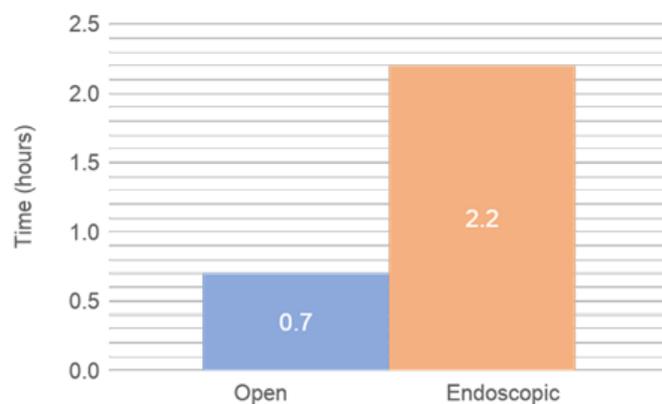


Figure 6: Time spent in hospital post op



Figure 7: Return to work/days

patients after endoscopic carpal tunnel release (ECTR) had better results on the Semmes-Weinstein Monofilament Test (SWMT) in sensation testing when compared to the OCTR. However, conflictingly they found that ECTR patients had a worse Levine-Katz Questionnaire result in both symptoms and function.[5] In 2006, Atroshi et al., stated that endoscopic surgery in carpal tunnel syndrome resulted in less post operative pain in the scar and proximal palm and related limitation of activity than open surgery, but the differences were generally small.[6] Zamborsky et al., also claimed ECTR showed faster recovery in patients undergoing the surgery in the first 2 weeks, with faster relief from pain and faster improvement in functional activities. They also report an alternative mini-OCTR technique with a smaller incision and claim that in this

case, the palmar fascia remains intact, further decreasing the incidence of post-operative pain.[6] Our study describes pain on day 1 of surgery, but it is important to keep in mind that other studies have recorded pain at different periods, for example, Zhang et al. collected the results 2 years post-surgery.[5]

There were minor complications in approximately 7% of the cases evaluated by Vasiliadis et al. (i.e. 183 minor complications from 2442 hands). The meta-analysis revealed that ECTR resulted on average in a lower rate of minor complications when compared with OCTR. The summary effect indicates that ECTR is associated with an average relative decrease in odds of minor complications of 50% compared to OCTR. Contrastingly though, further analysis of minor complications revealed that ECTR was associated with a higher rate of transient nerve problems.[4] Another study by Sayegh et al. exclaims that when comparing the complications of open versus endoscopic techniques, there is an increased risk of nerve injury during endoscopic carpal tunnel release.[7] The possible explanation for this is the limited exposure of the carpal ligament before ligation.[8] It is important to highlight that this is a minor complication causing symptoms such as neurapraxia, numbness, paraesthesia and, the reported incidence of serious complications, such as irreversible major injury to the nerve, has been low in ECTR.[4, 6]

In regards to symptom relief and improvement in health-related quality of life, both OCTR and ECTR seem to be equal amounts effective.[9] However, there is a statistically and clinically significant reduction in time out of work or daily activities with ECTR; patients treated with ECTR returned to work or to daily activities on average 10 days earlier than those in the OCTR group.[4]

In the systemic review done by Vasiliadis et al., only 12 ECTR and 12 OCTR cases experienced a major complication (from 1366 ECTR and 1199 OCTR cases treated), however, interestingly the meta-analysis did not reveal any differences between ECTR and OCTR in regards to major complications.[4] In 2006, a study by Benson et al. showed that the incidence of structural damage to nerves, arteries, or tendons, for OCTR is 0.49%, and for ECTR, it is 0.19%.[9] It is important to note that there are two types of endoscopic techniques – single portal and dual portal, and there is a very real possibility that differences in the techniques may alter the results of studies.[5] A third option was explored by Zhang et. al, where the results showed double small incisions combined with the advantages of the standard

OCTR and ECTR. The advantages included a minimally invasive procedure, good visualization of the operating field, a less technically challenging procedure, a low wound complication rate, and a good appearance.[5]

In our study, we have evaluated additional factors other than what was discussed above, such as manpower, time taken per surgery as well as the occurrence of bleeding during the surgery. We believe the difference in these factors between the two surgeries is due to the novelty of ECTR, as it requires more training and experience concerning learning to work with the equipment and consequently surgeon comfort. We, of course, had some limitations in our study. One of them being our randomization method – we did not employ a systematic method (for example with sealed envelopes) and it was not double-blinded to remove any bias in terms of surgeon skill, the severity of the CTS case. In our study, we did not measure post-op grip or thenar strength, and we did not measure sensations or pain after the patient was released from the hospital and made no follow-ups. Another limitation is a small sample size and so factors such as “return to work period” could be affected by patient status (for example – their wealth and hence not needing to go back to work urgently, or decreased pain tolerance for open surgery and so couldn’t go back to work as soon).

CONCLUSION

In conclusion, our results show that OCTR had lesser operating time with less manpower, less bleeding during surgery, and lesser time spent in the hospital afterward. However, the endoscopic procedures showed that patients had a better pain score, lesser use of NSAIDs, and were able to return to work after the procedure quicker. The results are backed up by multiple other similar studies.[2, 4, 6-7] However, it is important to note that similar comparative studies have also shown that one procedure is not particularly better than the other in terms of safety (i.e. long recovery, major complications, and recurrences).[6, 9]

REFERENCES

1. Presazzi A, Bortolotto C, Zacchino M, Madonia L, Draghi F. Carpal tunnel: Normal anatomy, anatomical variants and ultrasound technique. *J Ultrasound*. 2011;14(1):40-6. Available from: doi: 10.1016/j.jus.2011.01.006.
2. Hobson-Webb LD, Juel VC. Common Entrapment Neuropathies. *Continuum (Minneapolis)*. 2017 ;23(2), Selected Topics in Outpatient Neurology:487-511. Available from: doi: 10.1212/CON.0000000000000452.
3. Atroshi I, Gummesson C, Johnsson R, Ornstein E, Ranstam J, Rosén I. Prevalence of carpal tunnel syndrome in a general population. *JAMA*. 1999;282(2):153-8. Available from: doi: 10.1001/jama.282.2.153.
4. Katz JN, Stirrat CR. A self-administered hand

- diagram for the diagnosis of carpal tunnel syndrome. J Hand Surg Am. 1990;15(2):360-3. Available from: doi: 10.1016/0363-5023(90)90124-a.
5. Zhang X, Huang X, Wang X, Wen S, Sun J, Shao X. A Randomized Comparison of Double Small, Standard, and Endoscopic Approaches for Carpal Tunnel Release. Plast Reconstr Surg. 2016;138(3):641-7. Available from: doi: 10.1097/PRS.0000000000002511.
6. Atroshi I, Larsson GU, Ornstein E, Hofer M, Johnsson R, Ranstam J. Outcomes of endoscopic surgery compared with open surgery for carpal tunnel syndrome among employed patients: randomised controlled trial. BMJ. 2006;332(7556):1473. Available from: doi: 10.1136/bmj.38863.632789.1F.
7. Sayegh ET, Strauch RJ. Open versus endoscopic carpal tunnel release: a meta-analysis of randomized controlled trials. Clin Orthop Relat Res. 2015;473(3):1120-32. Available from: doi: 10.1007/s11999-014-3835-z.
8. Agee JM, Peimer CA, Pyrek JD, Walsh WE. Endoscopic carpal tunnel release: a prospective study of complications and surgical experience. J Hand Surg Am. 1995;20(2):165-71; discussion 172. Available from: doi: 10.1016/S0363-5023(05)80001-2.
9. Benson LS, Bare AA, Nagle DJ, Harder VS, Williams CS, Visotsky JL. Complications of endoscopic and open carpal tunnel release. Arthroscopy. 2006;22(9):919-24, 924.e1-2. Available from: doi: 10.1016/j.arthro.2006.05.008.

AUTHOR CONTRIBUTIONS

AN Concept, Design, Literature Search, Final Approval
KN Concept, Design, Literature Search, Submission
AS Data Collection
MSM Statistical Analysis

INFORMED CONSENT

Informed consent was obtained from all participants.

HOW TO CITE

Niyaf A, Niraula K, Shareef AS, Mushrif MS. Effectiveness and safety of endoscopic vs open carpal tunnel release: Single center experience from Maldives. Pak J Surg Med. 2020;1(2):113-117. doi: 10.37978/pjasm.v1i2.181

CONFLICT OF INTEREST

The author declared no conflict of interest

E-OP

We Value your Opinions. Register your Opinion to this Original Article by Niyaf A et al. by [clicking here](#).

MANUSCRIPT PROCESSING

Submission: PJSM-2020-000181-O-20-Mar-2020

Processing:

PJSM-2020-000181-P-25-Apr-2020

PJSM-2020-000005-C-29-Apr-2020

PJSM-2020-000181-E-30-Apr-2020

PJSM-2020-000181-P-07-May-2020

Acceptance: 05-May-2020

Publication: 11-May-2020

EDITORIAL TEAM

Lead Editor: S Shams

Asst Editor: J Siddiq, AA Sheikh

Proof: K Zahra

Bibliography: Z Sarfraz

PUBLISHER NOTE

The views and opinion expressed in this article are those of the authors and do not necessarily reflect the official policy or position of any other agency, organization, employer or company.