Double mini incision in the treatment of carpal tunnel syndrome

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Purpose
Patients who undergo an open carpal tunnel surgery frequently complain of a postoperative tender scar as a result of the long incision and of excessive scar formation. Instead, in this study, a double mini skin incision, each 1-cm long, was used in the surgical treatment of the carpal tunnel syndrome (CTS) by using classic instruments with no need for an endoscope. The transverse carpal ligament was easily sectioned.
Patients and methods
The study population consisted of 40 patients treated in El-Kasr El-Eini Hospital, with CTS and a mean age of 47 years (range: 28–65 years). The average follow-up duration was 12 months (range: 10–15 months). Inclusion criteria included patients with classic CTS without underlying autoimmune disease or traumatic injury. Recurrent cases were excluded in this study.
Results
Surgical results were evaluated using the Boston Carpal Tunnel questionnaire. Postoperatively, only one patient complained of residual mild pain and one patient complained of residual weak handgrip.
Conclusion
Double mini incision in the treatment of CTS showed satisfactory pain relief, nontender scar with good functional outcome, and satisfactory healing of wounds.

Keywords:
carpal tunnel syndrome, double mini incision, treatment

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Introduction

Carpal tunnel syndrome (CTS) is the most frequently encountered entrapment neuropathy [1]. In 1933, Abbott and Saunders published a large series of patients with chronic median neuropathy following fractures of the distal radius; then, James Learmonth reported on the first surgical release of the transverse carpal ligament (TCL) for post-traumatic median nerve compression [2]. The National Center for Biotechnology Information and highly cited older literature cite typing as the most common cause of CTS [3]. More recent research by Lozano-Calderón *et al.* [4] has cited genetics as a larger factor than use: According to a quantitative analysis of published scientific evidence, the etiology of carpal tunnel syndrome is largely structural, genetic, and biological, with environmental and occupational factors such as repetitive hand use playing a minor and more debatable role [4].

The main symptom of CTS is intermittent numbness of the thumb, index and long fingers, and radial half of the ring finger [5]. The numbness usually occurs at night, as humans tend to sleep with flexed wrists. It can be relieved by wearing a wrist splint that prevents flexion [6].

Improper wound healing, excessive scar formation, and the long classic surgical incision for carpal tunnel release were the main causes of tender scar, influencing the quality of life in patients undergoing open median nerve release. These types of cosmetic problems can affect patient satisfaction, even after successful treatment of the pathology. Various limited skin incisions are regarded as minimally invasive and effective for preventing excessive scar formation and achieving better cosmetic results [7].

Here we described the surgical technique of median nerve release using double mini skin incisions with evaluation of wound healing, cosmetic results, scar formation, and functional outcome.

Patients and methods

The study was conducted between April 2010 to March 2013. The study has been approved by the hospital ethics committee, and informed consent was obtained from all individual participants included in the study. In this study, 40 cases presented with symptoms suggestive of CTS. Twenty-three operations were performed for the right

hand and 17 for the left hand. All patients were right-handed. The average patients' age at the time of operation was 47 years, ranging between 28 and 65 years. The cases included 34 women and six men. Out of the 34 female patients, 17 were housewives, 11 had an office job, and six were teachers. Out of the six men, three were manual workers and the other three had an office job. All patients who had any general medical condition or other etiological factors as a cause of CTS were excluded from the study. Moreover, all pregnant patients were excluded.

Symptoms were suggestive of CTS in all patients. Twelve patients complained of weakness in their hands in the form of weak handgrip in nine patients and in the form of weak opposition in three patients. The duration of symptoms before surgical intervention ranged from few months to 5 years.

All patients were subjected to preoperative radiographs of the wrist both anteroposterior and lateral views, with no bony abnormality detected. Twenty-six patients had abnormal nerve conduction studies in the form of sensory-motor affection, whereas 14 patients had sensory affection only.

All patients were subjected to double mini incision for carpal tunnel release. The average follow-up duration was 12 months (range: 10–15 months).

Surgical technique

The majority of the patients (90%) underwent a regional anesthetic (intravenous regional or a Bier block). The patient was able to stay awake for the procedure with or without sedation. On the other hand, the minority of the patients (10%) underwent a general anesthetic. The patient was able to discuss their preferences with the anesthesiologist before surgery.

A two-portal incision technique was performed. Proximal portal is a 1-cm incision, which is outlined longitudinally from the wrist flexion crease and proceeded proximally just adjacent to the ulnar border of the palmaris longus tendon (or in the midline of the wrist if the palmaris longus tendon is absent). The proximal skin edge is elevated and the palmar carpal fascia is split longitudinally and subcutaneously with blunt-tipped scissors. Distally, the fascia is incised as far as the thickened proximal border of the TCL. A retractor is placed beneath the distal skin edge and pulled upwards, which slightly elevates the TCL allowing the insertion of a blunt elevator beneath the TCL. The flexor sheath and nerve are then freed from the ligament by sweeping the instrument back and forth beneath the internal surface of the TCL. It is possible to mistake the edge of the palmar fascia for the TCL if it is not directly visualized, and this could cause the elevator to enter Guyon's canal. The distal end of the TCL can be palpated by the opposite hand as the elevator exits beneath its edge in the ulnar palm [8].

The distal portal is 1-cm long and is in line with the first incision, and it goes proximal to the Kaplan's line (from the base of the first web space, with thumb abducted in the plane of the palm parallel to the proximal palmar crease toward the hook of hamate). Skin is opened. Proper dissection and inspection of the distal incision is required. The palmar fascia is split longitudinally and distally 1 cm under direct vision. The soft deep tissue is gently dissected with small blunt-tipped scissors, which frees the superficial arch and flexor sheath of the median nerve from any adherence to the adjacent soft tissues. The blunt elevator is passed through the proximal portal beneath the TCL under direct vision. With the wrist slightly extended, an elevator is passed distally through the distal portal. The elevator should pass easily as the distal palmar fascia is split and the soft tissues are released from the distal edge of the TCL [8].

The TCL is cut off through the distal and proximal incisions under direct vision, between the ulnar neurovascular bundle and the lateral aspect of the median nerve. Extension of the wrist can help in the identification of the TCL and the median nerve under the nonincised skin segment. The ligament is cut off as far as the inferior edge of the proximal incision. The proximal part of the ligament is sectioned through the proximal skin incision. The divided ligament is then checked along the carpal tunnel, and the median nerve is inspected. The surgeon can also palpate the distal incision to ensure that the entire ligament has been divided [8]. At this point, the tourniquet is released for proper hemostasis and the wounds are closed (Fig. 1).

Results

Double mini incision for carpal tunnel release was carried out for all patients. Patients were discharged a day after the surgery. The sutures were removed after 2 weeks. Patients were encouraged to move their fingers on the same operative day, and yet it was advised to the keep the use of hands minimal, especially in the first weeks.

The follow-up of patients was initially on scheduled on weekly basis till the removal of the sutures, and then

Figure 1

(a) Double mini incision for the treatment of carpal tunnel syndrome. (b) Released median nerve through double mini incision. (c) McDonald's passing through the two mini-incisions. (d) Closure of the wounds. (e) Healed scars after 6 months. (f) Both hands with no thenar or hypothenar atrophy.

monthly thereafter. Surgical outcomes were evaluated using the Boston Carpal Tunnel (BCT) questionnaire [9]. BCT questionnaire is a patient-oriented, self-administered standardized instrument that has shown reproducibility and validity when translated to the patient into Arabic. BCT questionnaire helps to assess the severity frequency and duration of hand and wrist pain at night and daytime. It also evaluates the numbness, weakness, tingling, and power of grasping of the hand. Grip strength had been assessed both preoperatively and postoperatively.

At the final follow-up after surgical release, one (2.5%) patient complained of residual mild pain and one (2.5%) patient complained of residual weak handgrip. Although one patient had less improvement of pain postoperatively, which was burning pain, the patient was satisfied with the results of the surgery as the pain was tolerable, much less after surgery than before, and responded well to NSAIDs. Out of the nine patients who sustained weak handgrip preoperatively, qualitative improvement was achieved in eight patients. All the three patients who complained of weakness in opposition preoperatively had improvement postoperatively, with ages 28, 30, and 31 years and with the duration of their symptoms as four months. Thus, 38 out of 40 (95%) patients operated upon showed satisfactory pain relief, and good functional and cosmetic outcome with satisfactory healing of wounds.

Discussion

Open carpal tunnel release may result in prolonged pain at the scar and proximal palm. In a randomized study of open surgery versus splinting, 55 out of 87 patients in the surgery group had painful or hypertrophic scar or pillar pain [10]. Benson *et al.* [11], according to their complication selection criteria, suggested that the overall proportion of structural complications to nerves, arteries, or tendons for open carpal tunnel release is greater than the overall proportion of complications for endoscopic carpal tunnel release.

The endoscopic surgery is associated with high direct costs of instrumentation with the possibility of a higher rate of repeat surgery. However, the diminished postoperative endoscopic pain may result in decreased need for therapy and rehabilitation.

Thereby, the cost effectiveness of endoscopic surgery might be uncertain [12].

Moreover, many surgeons find it difficult to learn endoscopic procedures, as it requires an ability to work with longer and smaller instruments at a distance from the structure to be repaired, or released in this case. Isiks and Bostanci [13] reported that the limited uniskin incision is a safe and effective minimal invasive procedure for releasing the carpal tunnel.

Therefore, in this study, we decided to use double mini incisions for releasing the carpal tunnel for two reasons: first, the same incisions were used for endoscopy with all the benefits of minimal approaches and without the need for the instrumentation or experience of endoscopy; and, second, it allows for better visualization and safety than does the uniskin incision. Our technique offers less dissection and interruption of tissue planes than does the open method because it does not divide the subcutaneous tissues or the palmar fascia to the same degree as the open method does. Thus, a more rapid recovery is generally touted with our technique as the normal skin above the TCL is not incised.

Cowan *et al.* [14] reported in their study that after a limited incision open carpal tunnel release, the most important determinant of return to full work is the job type, as well as psychological factors such as patient expectations, catastrophic thinking, and anxiety in response to pain.

Gannon *et al.* [15] reported that in 1227 release there were 69 (5.6%) anomalies in the anatomy. The most common aberrant structure was a transligamentous motor branches of the median nerve, seen in 39 (55.7%) hands. Subligamentous motor branch and persistent median artery and vein running anterior to the TCL can also been seen [15]. Preoperative ultrasound scan examination was missing in this study and we believe that it should be ideally carried out when adopting this technique, as ultrasound scan examination of the carpal tunnel can rule out other possible causes of median nerve compression such as flexor tenosynovitis, lipomas or other masses, presence of anomalous structures into the carpal tunnel, anatomical variations, etc.

Conclusion

We believe that the use of double mini incision in the treatment of CTS is a valuable alternative that is minimally invasive and effective in preventing excessive scar formation, achieving nontender scar with satisfactory healing of wounds, and good patient satisfaction with low need for therapy and rehabilitation costs. However, it requires expertise and more practice. Moreover, the safety of this technique must be assessed if there is a variation in the normal anatomy such an aberrant structure as a transligamentous motor branches of the median nerve, which may be in danger.

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Conflicts of interest

There are no conflicts of interest.

References

1 Yamaguchi DM, Lipscomb PR, Soule EH. Carpal tunnel syndrome. Minn Med 1965; 48:22–23.

2 Lee H, Jackson TA. Carpal tunnel release through a limited skin incision under direct visualization using a new instrument: the carposcope. Plast Reconstr Surg 1996; 98:313–319.

3 Silverstein B, Fine L, Armstrong T. Occupational factors and carpal tunnel syndrome. Am J Ind Med 1987; 11:343–358.

4 Lozano-Calderón S, Anthony S, Ring D. The quality and strength of evidence for etiology: example of carpal tunnel syndrome. J Hand Surg Am 2008; 33:525–538.

5 Scangas G, Lozano-Calderón S, Ring D. Disparity between popular (internet) and scientific illness concepts of carpal tunnel syndrome causation. J Hand Surg Am 2008; 33:1076–1080.

6 Walker JA. Management of patients with carpal tunnel syndrome. Nurs Stand 2010; 24:44–48.

7 Nathan PA. Carpal tunnel release using minimally invasive technique. Plast Reconstr Surg 1997; 99:1195–1196.

8 Cooney WP, Dobyns JH, Linscheid RL. The wrist: Diagnosis and operative treatment. Vol. 2. 1st edn. Philadelphia, PA: Mosby; chap 21. Mosby-year Book, Hardcover, 1998. 1197-2230.

9 Levine DW, Simmons BP, Koris MJ, Daltroy LH, Hohl GG, Fossel AH, Katz JN. A self-administered questionnaire for the assessment of severity of symptoms and functional status in carpal tunnel syndrome. J Bone Joint Surg Am 1993; 75:1585–1592.

10 Gerritsen AA, De Vet HC, Scholten RJ, Bertelsmann FW, de Krom MC, Bouter LM. Splinting vs surgery in the treatment of carpal tunnel syndrome: a randomized controlled trial. JAMA 2002; 288:1245–1251.

11 Benson LS, Bare AA, Nagle DJ, Harder VS, Williams CS, Visotsky JL. Complications of endoscopic and open carpal tunnel release. Arthroscopy 2006; 22:919–924.

12 Atroshi I, Larsson G, 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; 332:1473.

13 Isiks HS, Bostanci U. Experience of carpal tunnel syndrome that operated using a limited uni skin incision. Turk Neurosurg 2011; 21:177–180.

14 Cowan J, Makanji H, Mudgal C, Jupiter J, Ring D. Determinants of return to work after carpal tunnel release. J Hand Surg Am 2012; 37:18–27.

15 Gannon C, Harlan J, Baratz E. Safe limited-open carpal tunnel release in the presence of aberrant anatomy. Hand (NY) 2001; 6:138–141.