

MINI-INCISION CARPAL TUNNEL RELEASE

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Received on April 15, 2020
Presented by D. Damianov, Member of BAS, on May 26, 2020

Abstract

Carpal tunnel syndrome has been reported as the most common neuropathy in humans. The syndrome has a major impact on socio-economic life due to its high incidence and it usually affects the working-age population. The purpose of this study was to evaluate the results and reliability after our own mini-open incision with simple retractors from eye surgery, through a 1.5–2.0 cm long incision. For this reason, we used Disabilities of the Arm, Shoulder, and Hand score, Boston Carpal Tunnel Questionnaire and Pittsburgh Sleep Quality Index.

The study included 24 operated hands in 23 patients (79% females; 21% males). The right hand was affected in 19 patients (83%), the left – in three patients (13%) and in one patient (4%) we performed bilateral decompression. The mean length of the incision scar was 1.5 ± 0.3 cm. Subjectively, most of the patients (20 of 23) had improvement of paresthesia after 3 months postoperative examination. No patients reported recurrence of the symptoms that would require second decompression. Significant differences between the pre- and postoperative evaluation were observed in Disabilities of the Arm, Shoulder, and Hand score, Boston Carpal Tunnel Questionnaire and Pittsburgh Sleep Quality Index.

In conclusion, our study presented that the median nerve decompression with a mini-incision technique was safe and effective operative technique with short learning curve, especially for experienced with opened techniques hand surgeons. The final results revealed that patients with mini-incision approach have satisfactory surgical outcomes, low postoperative complications, good patient satisfaction and appearance.

Key words: mini-open incision technique, carpal tunnel release, patient satisfaction

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DOI:10.7546/CRABS.2023.02.16

Introduction. Carpal tunnel syndrome (CTS) is the most common nerve entrapment syndrome in the upper extremity [1]. In cases of failure of conservative treatment, surgical treatment is usually recommended. The goal of the treatment is to cut the flexor retinaculum (FR) for median nerve (MN) decompression. Nowadays, the open classical operation is under debate. In this technique the incision extends between the distal end of the FR and the proximal end of the palmar crest. This approach presents excellent view, especially revealing different variations in canal anatomy and provides safe release of the FR (Fig. 1a, b). Nevertheless, different complications and disadvantages have been reported. They include local pain and hypersensitivity, extensive formation of scar tissue, wrist contracture, and lesser grip and pinch strength, problems with wound healing and rough cicatrix [2]. According to BENSON et al. [3] scar tenderness was reported between 19% and 61% of cases.

To reduce the complications endoscopic or different mini-incision techniques have been developed [4]. However, the higher learning curve of the endoscopic method, higher rates of intraoperative complications and higher cost have been reported [5].

As an alternative, the mini-incision techniques gained popularity. They have different reported advantages: limited scar, less local and pillar pain and faster recovery. However, different limitations have been reported as well: less visualization and exposure of the canal, difficult haemostasis, no possibility to treat other pathological processes in the canal. Like the endoscopic techniques, due to limited vision, different iatrogenic complications as injury of palmar aponeurosis, MN or its recurrence branch, superficial palmar arch, flexor tendons injury and failed decompression have been established. Commonly, mini-incision release requires various types of tools, systems, nasal instruments, as well as newly created instruments for reduction of complications. On the other hand this reduces the cost of operation [6].

The presented study aimed to evaluate the reliability of the mini-open incision with simple retractors from eye surgery, through a 1.5–2.0 cm long incision, which can completely release MN without complications. To evaluate patients' outcomes, we used Disabilities of the Arm, Shoulder, and Hand (DASH) score, Boston Carpal Tunnel Questionnaire (BCTQ), and Pittsburgh Sleep Quality Index (PSQI).

Materials and methods. A total of 23 patients were operated by a single surgeon with a mini-incision approach. In all patients the operations were performed after failure of conservative treatment and with no other hand pathological conditions. The diagnosis was based on: 1) clinical symptoms (MN sensory abnormalities, dysesthesia, and night pain); 2) physical examination and tests (atrophy thenar muscles, disturbance of thumb opposition, Phalen test, Tinel test; and 3) positive electromyography. The patient had no other hand pathology. All patients completed preoperatively and postoperatively DASH score, BCTQ and PSQI. The findings were recorded and compared before and three months after

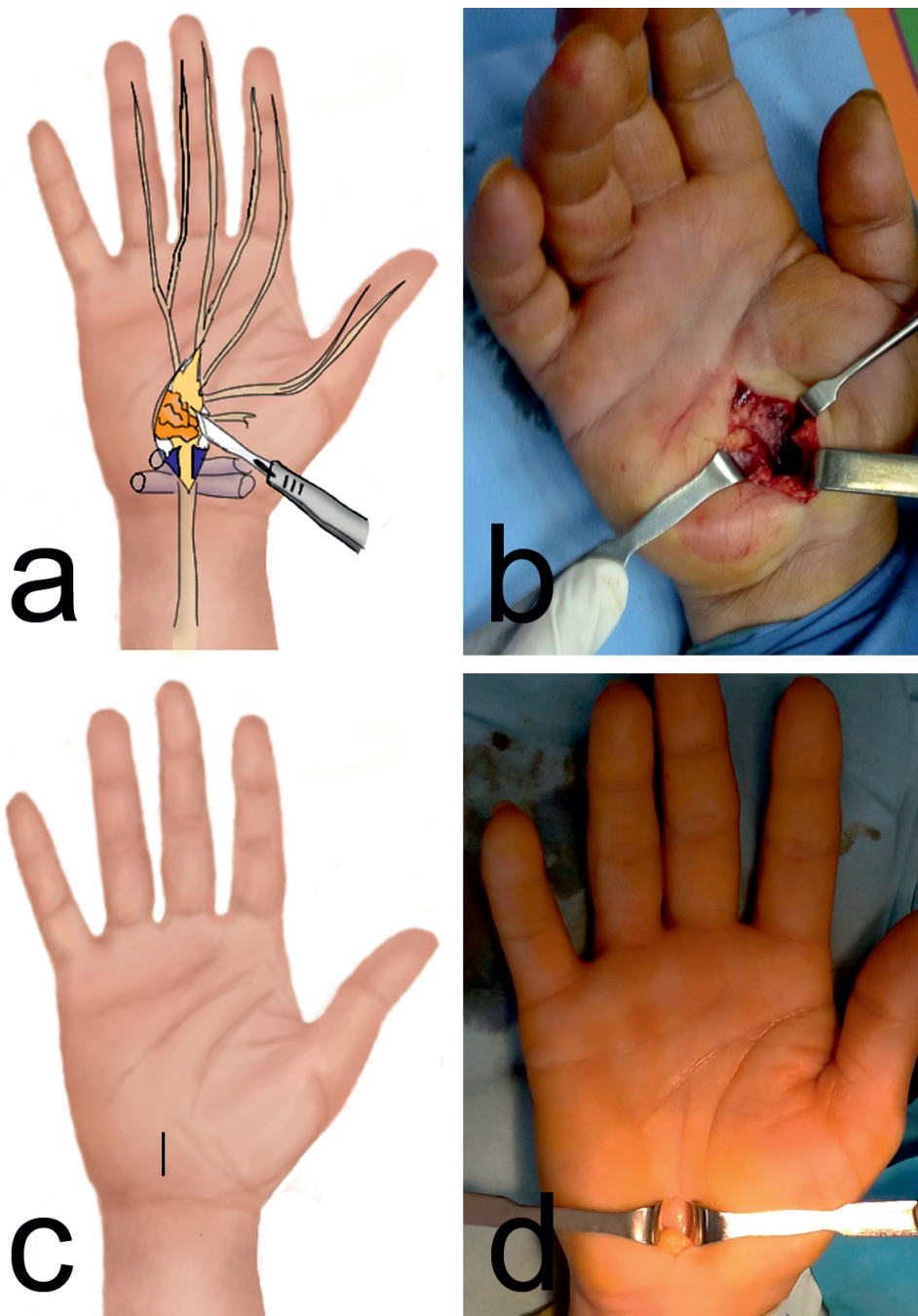


Fig. 1. a) Schematic representation of the classic open carpal tunnel release; b) Approach in classic open surgery, provides an excellent view of anatomical structures; c) Layout scheme of our mini-incision technique; d) Our technique in mini-incision carpal tunnel release: we used a single approach between 1.5–2 cm, in which according to us there is an excellent visualization of the MN and its recurrent branch

surgery to evaluate the effectiveness of the used mini-incision technique. Finally, we evaluated cosmetic results, complications and recurrence rates.

Results. In our retrospective study, females (79%) were more commonly affected than males (21%). The average age at the point of operation was 52.3 years. The right hand was affected in 19 patients (83%), the left – in three patients (13%) and in one patient (4%) we performed bilateral decompression. The hospitalization of all patients was 2 days. The mean length of the incision scar was 1.5 ± 0.3 cm. Subjectively, most of the patients (20 of 23) reported improvement of paresthesia after 3 months postoperative examination. No patients reported recurrence of the symptoms that required second decompression. Of the 24 hands, 23 had a small scar without pain to touch. No pillar pain was detected. One patient developed scar hypersensitivity, which has not limited the normal activity; and one patient had persistent postoperative hand swelling.

Significant differences between the pre- and postoperative evaluation were observed in DASH score, BCTQ and PSQI ($\alpha = 0.001$). The mean DASH scores were 47.8 ± 19.8 (range 13.4–85.8) preoperatively, and 17.2 ± 3.1 (range 8–42) at 3 months postoperatively. The mean BCTQ scores were 3.15 ± 0.76 (range 2–4.64) preoperatively, and 1.73 ± 0.09 (range 1.64–1.82) at 3 months postoperatively for symptom severity scale (BCTQ-SSS). For the functional status scale (BCTQ-FSS) mean scores were 2.95 ± 0.81 (range 1.63–4.38) preoperatively, and 1.75 ± 0.27 (range 1.36–2) at 3 months postoperatively. The mean PSQI were 8.17 ± 3.88 (range 3–15) preoperatively, and 4.5 ± 2.69 (range 2–9) at 3 months postoperatively (Table 1 and Fig. 2).

Surgical technique. The surgical intervention was performed under local anesthesia with a tourniquet. The patient was placed in the supine position with the hand, wrist and fingers stretched in slight extension with a small pillow under the wrist. A 1.5–2 cm longitudinal incision located on the vertical line drawn from the third interdigital space and extending proximally to 0.5 cm from distal wrist crease, was performed. The underlying tissues were passed with a scalpel through the palmar aponeurosis; after reaching the FR, the last was explored for anatomical variant of branches of the MN. Under the cover of the mosquito the FR was cut from distal to proximal end at its ulnar end. The distal edge of the

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Measurement of DASH, BCTQ and PSQI scores

	Preoperatively		Postoperatively	
	Mean	SD	Mean	SD
DASH	47.8	19.8	17.2	3.1
BCTQ-SSS	3.15	0.76	1.73	0.09
BCTQ-FSS	2.95	0.81	1.75	0.27
PSQI	8.17	3.88	4.5	2.69

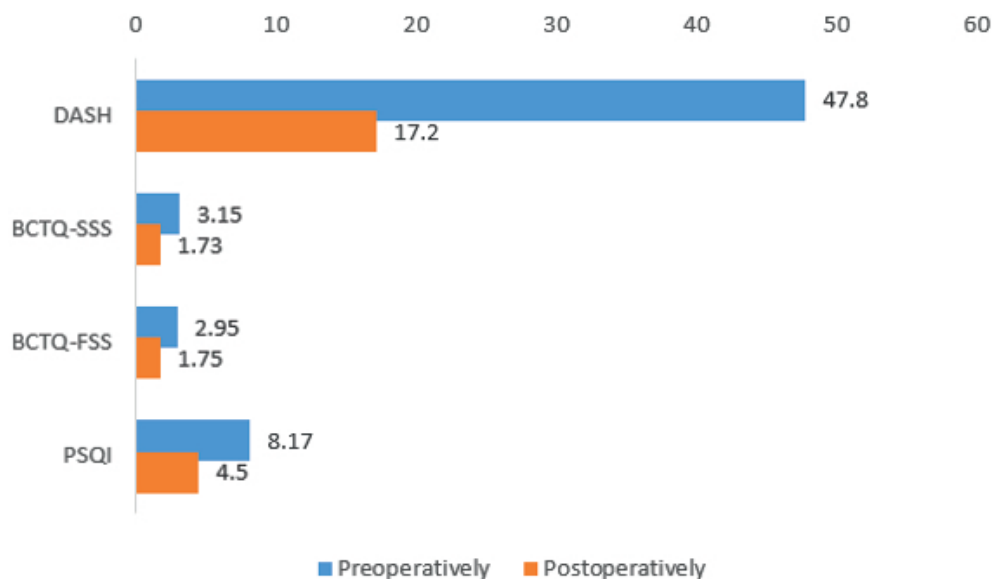


Fig. 2. Results of our battery of self-assessment scales administered preoperatively and 3 months after the intervention. A statistically significant improvement in post-operative assessments is observed in all scales

FR and the branch of the MN were exposed. After lifting the skin at the proximal end of the wound, the distal fibres of the volar carpal ligament were also cut. The canal was digitally and visually explored (Fig. 1c, d). Then the skin incision was closed. The hands were dressed in cotton padding without cast immobilization. Finger exercises were started on the next day. Peroral broad-spectrum antibiotic prophylaxis was administered for 3 days. Active use of the hand was allowed from the tenth postoperative day.

Discussion. The mini-incision technique for CTS has the advantages of leaving a smaller scar, less pain, esthetic cicatrix and early return to daily activities [7]. The use of these methods for CTS surgery started with the mini-open two-incision method described by Biyani and Downes in 1993, and the distal mini-open method described by Bromley in 1994 [8]. Different surgical techniques and instruments have been introduced to reduce complications and improve the functional outcome. CHEN et al. [6] with nasal instruments ensured relatively safe visualization of the carpal tunnel and excellent exposure of the FR. SEVER et al. [9] stated that nasal instruments in CTS surgery have the advantages of being simple, effective, cheap and with less complications. CALLEJA et al. [10] performed two incision approach, using palmar incision and wrist incision. KALEFF et al. [11] reported the MN decompression through small transverse incision at the wrist. AVCI and SAYLI [12] presented a mini-open blind technique through a short longitudinal palmar incision with a new instrument that has blade placed between 2 blunt plastic skids knife. The instrument had a light source and performed easy decompression.

The complications after mini-incision CTS release vary between 2% and 35% [8]. To reduce the incidence of these complications, special surgical instruments as a carpal tunnel knife, a transverse carpal ligament cutter, and a cutter with a lighting source are used. They make the procedures simpler, reduce postoperative pain and ensure early postoperative recovery. However, this increases the cost of the treatment [2]. In the presented mini-invasive surgery, we used single approach between 1.5–2 cm, which according to us presented excellent vision of the MN and its recurrent branch. The surgery was performed without using a specific detractor. As we reported, we do not have iatrogenic injury of the anatomical structures and serious postoperative complications. In our opinion an experienced surgeon with detailed knowledge of carpal tunnel anatomy is capable of successful CTS surgery. It was not necessary to undergo training courses for working with special tools.

The methods of establishing the results of CTS treatment were: 1) an objective evaluation as grip strength, pinch strength and nerve conduction speed; 2) subjective evaluation by the patient. Usually, most surgeons evaluate the postoperative results according to objective function of the patient. KARNEZIS and FRAGKIADAKIS [13] thought that patient's subjective evaluation presents the function of the hand more precisely and better accessed the inducement of symptoms. For these reasons, we believe subjective evaluation is an indispensable part of evaluating the effectiveness of mini-incision surgery for CTS. In our research, we applied preoperatively and postoperatively DASH score, BCTQ and PSQI. Using multiple different questionnaires we aimed to evaluate at the same time the function of the arm and the overall quality of life of the patients. For assessment of the function of the arm, we used two tools – a disease-specific (BCTQ) and regional-specific (DASH). In patients with CTS, we observed poor quality of sleep [14]. We believe that by assessing sleep quality, as an important element of overall quality of life in these patients, we can objectively evaluate the results of CTR. Our results showed a significant improvement in the evaluation of both sensory symptoms and function of the affected limb postoperatively. Postoperatively, we also observed a significant improvement in sleep quality. The average value of the post carpal tunnel release result corresponded to good sleep quality.

Conclusion. In conclusion, the MN decompression with a mini-incision technique is a safe and effective procedure. According to us, the learning curve is short, especially for experienced with open techniques hand surgeons. The final results revealed that patients with mini-incision approach achieve satisfactory surgical outcomes, low postoperative complications, patient satisfaction and good appearance. On the basis of our study, the performed procedure can be recommended to other surgeons for carpal tunnel decompression.

Acknowledgements. The authors thank Dr. Dimitrichka Dzhenkova (Clinic of Neurology, National Cardiology Hospital) for her kind proofreading of the English text.

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