Original Article

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The Effects of Surgical Timing on Treatment Outcomes in Carpal Tunnel Syndrome

Karpal Tünel Sendromunda Cerrahi Zamanlamanın Tedavi Sonuçları Üzerine Etkisi

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ABSTRACT

Objective: The purpose of this study is to assess and compare outcomes of two different timing surgery for moderately carpal tunnel syndrome (CTS).

Methods: Eighty-eight patients who underwent early and late due to CTS were evaluated retrospectively. Patients with early surgery and late surgery were divided into two groups. Preoperative and postoperative visual analog scale (VAS) score and postoperative Boston Carpal Tunnel Questionnaire (BCTQ) scores of both groups were compared.

Results: Preoperative and postoperative VAS scores were compared, there was a significant decrease in both groups. When BCTQ results of both groups were compared, the results of patients who underwent early surgery were statistically better.

Conclusion: In conclusion, we think that early surgery is better clinically in patients with moderately CTS.

Keywords: Carpal tunnel syndrome, surgical timing, median nerve

ÖZ

Amaç: Bu çalışmanın amacı, orta derece karpal tünel sendromunda (KTS) iki farklı cerrahi zamanlamanın sonuçlarını değerlendirmek ve karşılaştırmaktır.

Yöntemler: KTS nedeniyle erken ve geç dönemde ameliyat edilen 88 hasta retrospektif olarak değerlendirildi. Erken cerrahi ve geç cerrahi geçiren hastalar iki gruba ayrıldı. Her iki grubun ameliyat öncesi ve sonrası görsel analog skala (VAS) skoru ve ameliyat sonrası Boston Karpal Tünel Anketi (BCTQ) skorları karşılaştırıldı.

Bulgular: Ameliyat öncesi ve sonrası VAS skorları karşılaştırıldığında, her iki grupta da anlamlı düşüş vardı. Her iki grubun BCTQ sonuçları karşılaştırıldığında, erken cerrahi uygulanan hastaların sonuçları istatistiksel olarak daha iyiydi.

Sonuç: Sonuç olarak orta derece KTS'li hastalarda erken cerrahinin klinik olarak daha iyi olduğunu düşünüyoruz.

Anahtar Sözcükler: Karpal tünel sendrom, cerrahi zamanlama, medyan sinir

Introduction

Carpal tunnel syndrome (CTS) occurs when the median nerve is under pressure within the carpal tunnel in the wrist and is the most common entrapment neuropathy (1). In its early stage, the most common symptoms include tingling, pain, and numbness in the median nerve dermatome. In advanced stages, in addition to numbness and pain, loss of strength and atrophy may develop in the muscles innervated by the median nerve (2-4).

In CTS treatment, conservative treatments are applied in the early stages, while surgery takes priority in the middle and

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advanced stages (5,6). Conservative treatment consists of steroid injections, physical therapy, medication and splinting. Patients who continue to experience symptoms after physical therapy are treated surgically. In surgical treatment, the flexor retinaculum can be released with open, mini-open, or arthroscopic methods (7,8). Delayed surgical treatment of CTS may lead to exacerbation of symptoms, permanent paresthesia, and atrophy in the thenar region. These consequences reduce the chance of success after surgery (9).The literature recommends conservative treatment in mild and moderate CTS, and surgical treatment in moderate to severe CTS (10,11). Here, the confusing part is whether the appropriate treatment of moderate CTS is conservative or conservative treatment.

Our study aims to evaluate the effect of surgical timing on the results by comparing the clinical and functional outcomes of patients with moderate CTS who underwent surgical treatment in the early and late stages.

Methods

This retrospective study was performed in our clinic after it was approved by the local institutional review board from Ethics Committee Department (2021/03). The preoperative and postoperative clinical and functional outcomes of patients, who were diagnosed as having CTS and underwent treatment between 2015-2019, were reviewed from our hospital's database archives.

All patients were diagnosed as having CTS with clinical symptoms and examination. All of them underwent electrodiagnostic studies (EDX) (nerve and motor conduction studies). Patients who had moderate CTS according to a neurophysiological grading scale for CTS on EDX (12) (Table 1) were included in the current study. We recommended conservative treatment in all patients who had moderate CTS. Conservative treatment was performed in patients who accepted surgery, while conservative treatment was applied in patients who did not accept conservative treatment. Night splint, oral and topical NSAIDs, and lifestyle modifications were recommended in conservative treatment. Patients who received conservative treatment were reevaluated at least 6 months later, and among these patients, those who accepted conservative treatment underwent operation. Group 1 consisted of 40 patients who accepted conservative treatment at initial admission, and Group 2 consisted of 33 patients whose complaints did not resolve after conservative treatment and who accepted surgery at least six months later. EDX was not re-administered to these patients. Fifteen patients who were absent from follow up during conservative treatment or who did not accept conservative treatment were excluded from the study. When these patients were contacted, they stated that their complaints continued, but they did not plan to undergo surgery.

Table 1. A neurophysiological grading scale for carpal tunnel syndrome

Grade 0	Normal
Grade 1	Very mild CTS; demonstrable only with the most sensitive tests
Grade 2	Mild CTS; sensory nerve conduction velocity slow on finger or wrist measurement; normal terminal motor latency
Grade 3	Moderate CTS; sensory potential preserved with motor slowing; distal motor latency to APB <6.5 milliseconds
Grade 4	Severe CTS; sensory potentials absent but motor responses preserved; distal motor latency to APB <6.5 milliseconds
Grade 5	Very severe CTS; terminal latency to APB >6.5 milliseconds
Grade 6	Extremely severe CTS; sensory and motor potentials effectively not recordable

CTS: Carpal tunnel syndrome

Patients who underwent revision CTS and patients with peripheral neuropathy, history of trauma, and pregnant women were excluded from the study.

Clinical Evaluation

Clinical outcomes in both groups were assessed by a specialist who did not participate in surgical procedures. In the preoperative period and 6-month after surgery, visual analogue scale (VAS) and postoperative Boston Carpal Tunnel Questionnaire (BCTQ) scores of both groups were collected and compared.

The BCTQ is a scoring system developed by Levine et al. (13) for the standardization of patients with CTS. It consists of a total of 19 questions, including 11 questions for symptom severity and 8 questions for evaluating functional capacity. Questions are scored on a scale ranging from 1 to 5 and overall score is calculated by dividing the sum of scores by the number of questions. Sezgin et al. (14) conducted the Turkish adaptation of the scale, which was used in our study.

Surgical Technique

All operations were performed by the same surgeon. A vertical line was drawn proximally from the radial side of the fourth finger. After the thumb was placed in maximum abduction, a transverse line was drawn from the ulnar side. A longitudinal incision was made from the intersection of the two lines. After subcutaneous infiltration, the palmar aponeurosis was incised. After partial incision of the transverse carpal ligament, the median nerve was accessed. The median nerve was preserved and the carpal ligament was proximally and distally incised. After making sure the transverse ligament was completely incised, the tourniquet was deflated. Skin closure was made after ensuring bleeding control.

Postoperative Care and Rehabilitation

Active range of motion exercises were permitted after the surgery. Load-bearing exercises were permitted as much as the patient could tolerate.

Statistical Analysis

All analyses were performed using SPSS 21 (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk,

NY: IBM Corp.). Continuous variables were expressed as median (minimum-maximum) and mean ± standard deviation values. The results were reported within a 95% confidence interval. Normality distribution of continuous data was assessed with Shapiro-Wilk test, skewness, and kurtosis. Mann-Whitney U test and Independent samples t-test were used for comparisons between two groups. P<0.05 was considered statistically significant.

Results

Age, gender, and affected sides were determined in both groups. Mean age was 51.9±6.6 years in Group 1 and it was 52.3±6.8 years in Group 2. Group 1 consisted of 33 female patients and 7 male patients, and 30 of the operated wrists were right wrists and 10 were left wrists. Group 2 consisted of 27 female patients and 6 male patients; 24 right wrists and 9 left wrists were operated.

Postoperative VAS and BCTQ symptom severity scale and functional status scores are presented in Table 2. Group 1 was found to be statistically superior to Group 2 in terms of BCTQ scores (p<0.05). A significant decrease in postoperative VAS score compared to preoperative VAS score was observed in both groups (p<0.05). Improvement in VAS score was statistically significant in Group 1 compared to Group 2 (p<0.05).

Discussion

CTS is surgically treated by many different surgical branches in clinical practice. These patients are also treated with conservative methods by many non-surgical branches. These multidisciplinary treatment processes lead to differences in clinical applications and uncertainty about the timing of surgery, especially in moderate CTS. It is known that when compressive forces on the median nerve persist, it may lead to irreversible fibrotic changes in the nerve. The pathological changes in the median nerve in CTS cannot be explained by neuropraxia, axonotmesis, and neurotmesis in normal nerve damage. The notion that rapid alleviation of symptoms after surgery in CTS is due to the elimination of local ischemia on the median nerve has gained prominence (15). Studies on the efficacy of conservative treatment and conservative treatment in CTS demonstrated that both treatment methods yielded good outcomes (16-18). Delayed treatment and prolonged compression may lead to end organ atrophy and conservative treatment may not achieve the expected benefit. A previous study found that patients with moderate CTS who underwent surgery in the early term had better functional outcomes than those who underwent surgery in the late period (19). The results of our study also indicate that early conservative treatment provide better clinical outcomes.

Table 2. Clinical outcomes

	Earl surgery Group 1	Delayed surgery Group 2
Preoperative VAS	7.27±1.1	7.24±1.1
Postoperative VAS	2.05±0.9	3.15±1.3
BCTQ SSS	1.97±0.2	2.46±0.3
BCTQ FSS	2.28±0.2	2.61±0.2

VAS:Visual analogue scale, BCTQ: Boston Carpal Tunnel Questionnaire
SSS: Symptom severity score, FSS: Functional status score

Many scoring systems, which vary according conservative treatment to many factors, have been described to evaluate patients with CTS (20,21). However, BCTQ was shown to be a reliable method in the evaluation of patients diagnosed as having CTS, therefore we used BCTQ to evaluate the symptoms and functional status of our patients.

Pourmokhtari et al. (22) compared the 1-year outcomes of patients with moderate CTS who underwent conservative treatment or surgical treatment. They found that the surgical treatment group had significantly less symptoms and that surgical treatment was more successful. As in our study, they demonstrated that surgical treatment was superior to conservative treatment.

Study Limitations

The present study had several limitations, including its small sample size and retrospective design. Postoperative VAS and BCTQ scores were subjectively evaluated. Postoperative EDX studies were not conducted. Patients in Group 2 were not reevaluated with EDX before surgery. None of the delayed patients had a steroid injection which could be a very effective intervention that would avoid surgery in a proportion of patients.

Conclusion

There is no consensus regarding the surgical timing of patients with moderate CTS. The data in our study support that early surgical treatment of moderate CTS provides superior outcomes. We recommend early surgery treatment in patients with moderate CTS, as delayed surgical treatment leads to poor symptomatic and functional outcomes.

Ethics

Ethics Committee Approval: This study was carried out after the approval of Dicle Univercity Medicine Faculty Ethical Committe.

Informed Consent: Written informed consent was obtained from a legally authorized representative(s) for anonymized patient information to be published in this article.

Peer-review: Externally peer reviewed.

Authorship Contributions

Surgical and Medical Practices: F.D., Concept: F.D., E.Ş., M.S.A., A.Ö., Ş.Y., Design: F.D., E.Ş., M.S.A., A.Ö., Ş.Y., Data Collection or Processing: F.D., E.Ş., M.S.A., A.Ö., Ş.Y., Analysis or Interpretation: F.D., E.Ş., M.S.A., A.Ö., Ş.Y., Literature Search: F.D., E.Ş., M.S.A., A.Ö., Ş.Y., Writing: F.D.

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