RESEARCH ARTICLE

Carpal Tunnel Release in Diabetic and Non-Diabetic Patients

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Received: 5 June 2013 *Accepted: 16 September 2013*

Abstract

Background: Carpal tunnel syndrome (CTS) is a compression neuropathy that causes paresthesia, pain or numbness in the territory of median nerve. The aim of this study is to compare the open surgery outcome and patients` satisfaction in carpal tunnel syndrome among diabetic and non-diabetic patients.

Methods: In a retrospective cohort study from April 2011 to June 2012, patients suffered from carpal tunnel syndrome at least 6 months, without response to conservative treatment, who had the inclusion and exclusion criteria, were evaluated by the usage of MHQ and WHOQOL-BREEF tests, one month before surgery and three months after that. Carpal tunnel decompression surgery was performed by two surgeons, experienced in hand surgery, which used the same surgical method. Statistical analysis was performed by SPSS 19.0.

Results: 24 of patient (34.2%) were male and 46 (65.8%) were female and there was no significant difference between two groups (P>0.05). MHQ total score before and after surgery was respectively 50.22±7.13 and 63.49±11.28 and this difference was significant (P<0.05). In WHOQOF-BREEF parameters, physical parameters (36.81±19.8 vs. 55.30±24.36) and psychological parameters (41.64±14.77 vs. 61.24±19.9) improved significantly after surgery.

Conclusion: The outcome of carpal tunnel syndrome open surgery is good in both men and women, but diabetes has a negative impact on surgery outcome in short term.

Keywords: Carpal tunnel syndrome, Michigan hand questionnaire, WHO quality of life –BREEF questionnaire

Introduction

Carpal tunnel syndrome (CTS) is a compression neuropathy that causes paresthesia, pain or numbness in the territory of the median nerve (1). Epidemiology studies have showed an increasing rate in CTS incidence, which is more prevalent in women and its ratio was estimated to be about 3-10:1 (2). One of the major risk factors for CTS is diabetes and it has been estimated that a lifetime risk of symptomatic CTS in type I diabetes might be as high as 80% (3). CTS is less prevalent in young adults and the cutoff age point in which CTS begins is supposed to be after the age of 30 (4).

Generally, factors or conditions, which press or squeeze the median nerve at the wrist, lead to signs of this syndrome. The physiological basis of this syndrome is related to ischemic events of the median nerve due to elevated internal canal pressure, which happens because of transverse carpal ligament (TCL) compression and vein circulatory disorder. Another hypothesis of this condition the development of tenosynovitis in the vicinity of this nerve (5). Although carpal tunnel syndrome usually occurs in the dominant hand, in some cases it happens in both. Some of the identified causes of CTS are collagen vascular diseases, metabolic disorders, pregnancy, and wrist dislocations or fractures, but in a large group of patients the reason remains idiopathic (5).

CTS diagnosis is based on patient history, a physical examination and confirmed by physiological findings. Different treatment modalities have been described for this syndrome, in mild to moderate cases, wrist splints and corticosteroid injections are recommended. Surgery is usually considered in severe cases of carpal tunnel syndrome, chronic numbness or when nonsurgical treatments fail. CTS surgical methods include endoscopic and open surgery. Surgery outcome are usually good, but in some cases complications such as pain and pillar syndrome occur (6).

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It has been proven that the development of patient-oriented outcome measures provides a good chance for surgeons and patients to choose the best treatment procedure (7).

The aim of this study was to compare open surgery outcome and patient satisfaction in carpal tunnel syndrome in diabetic and non-diabetic patients.

Materials and Methods

In a retrospective cohort study from April 2011 to June 2012, we evaluated patients suffering from carpal tunnel syndrome for at least 6 months, who had no response to conservative treatment and who met the inclusion criteria.

Population

After obtaining approval of the ethics committee of the Mashhad University of Medical Sciences, seventy-four patients with CTS were selected by the consensus sampling method and divided into two groups (diabetic and non-diabetic patients). Groups were matched in age and sex

Table 1. compression of mean scores of MHQ subgroups in diabetic and nondiabetic patients

MHQ	Time	group	Mean ±SD	Mean ±SD	
				DM-I	DM-II
Aesthetics	Before surgery	Diabetic	63.03±12.48	56.60±10.42	67.43±11.99
		Nondiabetic	72.57±11.56		
	After surgery	Diabetic	76.06±13.16	69.57±12.79	80.38±11.78
		Nondiabetic	85.60±10.95		
Satisfaction	Before surgery	Diabetic	29.89±6.82	26.14±6.54	32.38±5.92
		Nondiabetic	35.43±6.64		
	After surgery	Diabetic	62.31±14.32	54.36±13.45	67.62±12.53
		Nondiabetic	73.40±13.3		
Function	Before surgery	Diabetic	36±8	31.5±6.01	39±7.86
		Nondiabetic	42.46±8.94		
	After surgery	Diabetic	56.7±12.43	50.07±10.18	61.14±12
		Nondiabetic	67.11±12.4		
Activity	Before surgery	Diabetic	42.63±12.08	36.07±8.52	47±12.28
		Nondiabetic	52.43±12.8		
	After surgery	Diabetic	64.8±15.88	55.86±12.4	70.76±15.35
		Nondiabetic	76.6±14.81		
Work	Before surgery	Diabetic	41.92±11.43	35.57±8.43	46.16±11.34
		Nondiabetic	51±11.73		
	After surgery	Diabetic	62.69±16.39	53.36±13.09	68.90±15.62
		Nondiabetic	75.43±15.13		
Pain	Before surgery	Diabetic	71.97±10.73	77.5±8.24	68.29±10.76
		Nondiabetic	63.26±10.92		
	After surgery	Diabetic	32.37±4.74	34.93±3.79	30.67±4.6
		Nondiabetic	28.57±4.7		
Total	Before surgery	Diabetic	47.58±6.59	43.88±5.19	50.04±6.36
		Nondiabetic	52.86±6.73		
	After surgery	Diabetic	59.25±10.96	53.08±9.36	63.37±10.15
		Nondiabetic	67.73±10.05		

(*P*>0.05). Two patients in each group left the study (one was excluded because of rheumatoid arthritis and three became dissatisfied in taking part in the study). Exclusion criteria were previous surgery for CTS, nerve involvement other than median, cervical radiculopathy , connective tissue disorders, a fracture in the hand and wrist, pregnancy, thyroid disease, and hepatic and renal failure. If both wrists were involved, the more severe one was selected to avoid statistical biases.

FBS and GTT were performed in all patients to rule out diabetes in the non-diabetic group. CTS was suspected in patients with clinical criteria (numbness or pain in the median nerve territory and positive Phalen and Tinel tests) and was confirmed by electro-diagnostic studies.

Surgical Technique

Carpal tunnel decompression surgery was performed by two surgeons experienced in hand surgery and they used the same surgical method. A small incision (3-4 cm) was done at the base of the palm, along with the radial side of the fourth finger distal to the wrest fold. The incision was taken down to the transverse ligament and the roof of the tunnel was incised. After cutting of the fibrotic tissue (carpal retinaculum), complete release of the median nerve to the location of the nerve deviation was achieved. The skin incision was closed and the dressing was applied. Sutures were removed between 10 and 12 days after surgery. The patient was allowed to return to routine tasks by four weeks and laborious ones by eight weeks.

Measurement Tool

The valid Persian version of WHOQOL-BREEF, which has 4 scopes on physical, psychological, social and environmental status with 26 questions was used to evaluate patient satisfaction one month before surgery and three months afterwards (8). The Persian version of MHQ was used to determine the surgery outcome; this questionnaire included 6 subgroups and was filled for each patient one month before and three months after CTS surgical treatment.

Statistical analysis

Statistical analysis was performed by SPSS 19.0 software. An inter-group difference between the diabetic group and non-diabetic group was analyzed using a non-parametric method, the Mann-Whitney U test. Furthermore, an analysis was performed to identify the correlation between age and disease duration using the Spearman's test. A value of *P*<0.05 was considered as the significant level.

Results

Twenty-four of the patients (34.2%) were male and 46 (65.8%) were female. There was no significant difference between the two groups (*P*>0.05). The diabetic group included 14 cases (40%) of type I with the mean age of 36 years and 21 cases (60%) of type II with the mean age of 57 years.

All subgroups of MHQ, other than aesthetics and function after surgery, had a normal contribution, in WHOQOL-BREEF, only after surgery, the psychological subgroup did not have a normal contribution. All MHQ subgroup scores improved significantly after surgery, the MHQ total score before and after surgery was 50.22±7.13 and 63.49±11.28 respectively, and this difference was significant (*P*<0.05). MHQ total score in men was 7.4±52.54 and in women was 6.75±49 (*P*<0.05) and after surgery these scores changed to 11.07±66.87 and 11.10±61.73 (*P*>0.05).

The lowest score in the MHQ subgroups before surgery was related to pain (30.47±5.06) and the highest score after surgery was related to aesthetics (80.83±12.94), the heights improvement in the means` differences before and after surgery happened in the pain (37.14) and satisfaction (35.20) subgroups.

In Table 1 mean scores of the MHQ subgroups were compared between the diabetic and non-diabetic patients. Scores in all subgroups of MHQ were significantly different in the diabetic and non-diabetic patients.

MHQ scores differ significantly between diabetes types I and II patients and all scores were better in DM-II. MHQ scores had no significant differences between DM treatment regimes (oral pills or insulin therapy).

WHOQOF-BREEF scores showed that although physical parameters (36.81±19.8 vs. 55.30±24.36) and psychological parameters (41.64±14.77 vs. 61.24±19.9) improved significantly after surgery, social and environmental parameters did not vary much before and after surgery (*P*>0.05).

In Table 2 WHOQOL-BREEF scores were compared be-

Table 2. comparison of WHOQOL-BREEF scores in groups, diabetes types and two sexes

WHOQOL-BREEF parameters	Time	Mean ± SD		Mean ± SD		Mean ± SD	
		Male	Female	Diabetic	Nondiabetic	DM-I	DM-II
Physical	Before	43.38±20.53	33.39±18.73	29.34±18.57	44.29±18.32	19.17±13.6	35.67±18.92
	After	63.21±24.49	51.17±23.51	46.20±22.91	64.4±22.56	33.57±16.79	54.62±22.86
Psychological	Before	66.67±20.01	58.41±19.45	35.97±14	47.31±13.44	28.36±9.53	41.05±14.37
	After	75.46±16.13	68.22±16.09	53.91±18.96	68.57±18.25	44±11.59	60.52±20.23
Social	Before	54.58±13.05	48.65±9.86	47.74±9.47	54.63±11.87	42.14±5.57	49.81±10.37
	After	54.96±12.88	48.89±9.91	47.06±9.62	54.89±11.63	42.36±5.58	50.19±10.54
Environmental	Before	59.13±12.53	53.28±11.44	50.86±11.03	59.71±11.54	44.86±7.09	54.86±11.5
	After	59.25±12.48	53.3±11.49	50.83±11	59.86±11.55	2،44.49±۷	54.81±11.46

tween the two groups, diabetes types and two sexes.

Social and physical parameters were significantly higher in men before and after surgery (P<0.05). Other parameters had no significant differences between the two sexes (P>0.05). All parameters elevated significantly in the non-diabetic group in comparison with diabetic patients (P<0.05). Scores in all parameters in WHOQOL-BREEF were significantly higher in DM-II (P<0.05). Treatment type (oral drugs or insulin) had no effect on the WHOQOL-BREEF scores (P>0.05).

Discussion

Diabetes mellitus (DM) is a chronic systemic disorder with a wide range of complications. Moreover, DM is a common disease in all parts of the world and in recent years its incidence and significance has increased. Diabetic patients suffer from various rheumatic conditions that influence their quality of life (9). Recent study results show that the prevalence of CTS in Iranian women is about 2.7%. Aslani showed that the size of the incision could affect the patients` early satisfaction rate, and smaller incisions were associated with shorter delay to return to work (10). After thirteen years of follow up it was proven that the majority of patients were satisfied and symptom free after open carpal tunnel surgery (11).

The prevalence of Carpal tunnel syndrome is higher in women, especially around menopause, which means that some sex-related risk factors might play a role in its pathogenesis. In our study the MHQ total score in men was 7.4±52.54 and in women 6.75±49 (P<0.05) and after surgery these scores changed to 11.07±66.87 and 11.10±61.73 (P>0.05), which means that although CTS could be more severe in females, after surgical intervention its outcome did not differ from male patients. Song showed that menopausal rating scale scores as a female related factor had a fundamental effect on the DASH scores (12). Another fact that confirmed the effect of the female-related factor is that the prevalence and severity of CTS increases during pregnancy and the number of asymptomatic cases are reduced (13).

Different studies have proven that obesity, DM and cervical spine disorders could influence surgery outcome in CTS patients (14 , 15). In Becker's study, DM was a weak risk factor for CTS, particularly in women. In Kidwai's study the prevalence of limited joint mobility, CTS, trigger finger and Dupuytren's contracture were higher in diabetic patients (15). In our study, MHQ scores varied significantly between diabetes types I and II patients and all scores were better in DM-II. MHQ scores had no significant differences between DM treatment regimes (oral pills or insulin therapy). One limitation of our study is the short follow up duration, but open carpal tunnel release had a good outcome after 3 months of follow up. The outcome of carpal tunnel syndrome open surgery is favorable in both men and women, but diabetes has a negative impact on surgery outcome in the short term. Moreover, diabetes mellitus type I has more inferior results compare to type II.

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