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Conservative vs Operative Treatment of Tarsal Tunnel Syndrome: A Comparative Study

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Abstract

Background The most common compression neuropathy affecting the foot and ankle is tarsal tunnel syndrome. The tibial nerve is constricted beneath the flexor retinaculum (laciniate ligament).

Objective To analyze the clinical results of conservative versus operative treatment of tarsal tunnel syndrome.

Methods Twenty-seven patients (thirty feet, as three patients manifested with bilateral tarsal tunnel syndrome) were treated at Al-Imamein AL-Kadhimein Medical City in 2016. Fourteen patients (17 feet) underwent surgical intervention after a diagnosis of tarsal tunnel syndrome, while thirteen patients received exclusively conservative treatment for six months.

Results Two months after initiating treatment, a clinical assessment and follow-up were conducted in accordance with Takakura's severity rating scale. The clinical results after conservative treatment showed some improvement at the 4-month and 6-month follow-ups; however, there was no significant difference, and postoperative treatment showed virtually no changes. There was no substantial improvement in the nerve conductive investigations.

Conclusion In the beginning stages, especially if the issue is due to tenosynovitis or a flexible foot deformity, non-surgical treatment can be helpful, and neurophysiologic studies are not very important for early monitoring and evaluating the results.

Keywords Operative treatment, conservative treatment of tarsal tunnel syndrome

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List of abbreviations: TTS = Tarsal tunnel syndrome

Introduction

A compressive neuropathy affecting the tibial nerve located in the tarsal canal is known as tarsal tunnel syndrome (TTS). Lam independently described TTS in 1962. It is similar to carpal tunnel syndrome, but instead of the median nerve being trapped under the transverse carpal ligament, the tibial nerve is squeezed under the flexor retinaculum (laciniate ligament). Release of the flexor retinaculum is not as effective in TTS as release of the transverse carpal ligament is in carpal tunnel syndrome [(1)].

Women are affected more than men, and individuals in all post-pubescent ages can be affected [(2)].

The contents of the tarsal tunnel include the posterior tibial tendon, flexor digitorum longus, posterior tibial vein and artery, tibial nerve, and flexor hallucis longus. The flexor retinaculum (laciniate ligament) bridges the leg fascia proximally and the fascia of the abductor hallucis distally. The posterior tibial nerve has

three terminal branches: the medial plantar, lateral plantar, and medial calcaneal nerves [3].
TTS can be caused by injuries and their effects, pressure from growths or lumps, overall health problems, issues with how the joint is built or shaped, and unknown reasons [4].
TTS can be separated into proximal and distal based on the location of pathology [5].
Symptoms of TTS may be vague and misleading. Include a burning sensation on the plantar surface of the foot and medial ankle and occasional sharp pains or paresthesia. Prolonged standing, walking, or running can exacerbate the symptoms [6].
Electromyography and nerve conductive studies are used for diagnosis of TTS; however, they are positive in only 65% of patients with clinical TTS [7].
Rationale of the study: TTS can significantly affect mobility and daily functioning. Researching, which approach yields better functional recovery, pain relief, and long-term satisfaction supports better quality of care, in addition to avoid unnecessary surgeries with cost-effective results.

Methods

Study design and setting

A cross-sectional study with analytic components conducted at Al-Imamein Al-Kadhimein Medical City during 2016.

Sample and sampling technique

A convenient sample of twenty-seven patients (thirty feet, since three patients had TTS in both feet) who were treated at the orthopedic unit was sorted and then randomly split into two groups: one for surgery and one for non-surgical treatment.
First group: Thirteen patients diagnosed with TTS were treated exclusively with conservative measures for a six-month period. Incorporate rest, non-steroidal anti-inflammatory medications, heel pads and night splints, medial longitudinal arch supports, foot orthoses, soft-soled shoes, and physiotherapy in the form of Achilles tendon and plantar fascia stretching.
In the second group, there are fourteen patients who have been treated surgically. The operational treatment consists of decompressing the posterior tibial nerve and its branches. This procedure was performed on fourteen patients, totaling seventeen feet, with three of them being bilateral.
Regarding the gathering of data, the selection of patients is contingent upon the inclusion and exclusion criteria, as well as whether the patients were treated conservatively or surgically, based on the randomised selection process.

Inclusion criteria

Adult patients diagnosed with TTS who visit the orthopaedic consultation clinic and agree to participate in the study must have a minimum interval of 6 to 18 months between the onset of their symptoms and the initiation of treatment.

Exclusion criteria

Patients with diabetes mellitus have peripheral neuropathy.

Investigations

- All patients underwent electro-diagnostic studies.
- A plain radiograph of the ankle, anterior and lateral views, was performed to rule out fracture or bony cause of TTS.
- Biochemical and blood tests were conducted to exclude systemic diseases, including diabetes mellitus.

Ethical approval

The study was approved by the administration of Al-Imamein Al-Kadhymein Medical City and Al-Karkh Health Directorate. Written consent had been taken from the patients before initiation of the study.

had been taken from the patients before initiation of the study.

The follow up

Clinical and electrophysiological examinations were performed on each of the twenty-seven patients four weeks, eight weeks, and six months after the treatment (which was either conservative or postoperative).

The patients who were receiving conservative treatment were subjected to follow-up to identify whether or not they remained receiving treatment and whether or not their symptoms improved. In addition, the follow-up evaluation of patients who had undergone surgical operations enabled the evaluation of any complaints that were linked with the incision as well as any post-operative improvements. This evaluation was carried out to gain a better understanding of the patient's condition. The clinical evaluation will be carried out with the purpose of assessing the clinical outcomes that have happened as a result of therapy for TTS. This evaluation will be carried out with the use of an easy rating scale, known as the Takakura rating scale, for the severity of TTS (2).

Neuro-physiological evaluation

Nerve conductivity investigations were carried out on each and every one of the patients prior to therapy, as well as at 2, 4, and 6 months after treatment had been completed. Prior to the administration of medication, all of the patients' nerve conduction assays revealed a decrease in the conductive velocity for the tibial nerve. This effect was found in all of the patients.

Statistical analysis

Data were introduced and loaded into statistical package for social sciences (SPSS) version 21. Parametric data are presented as mean and standard deviation. Categorical data are presented as numbers and percentages. The chi-square test was used, and a P value <0.05 was considered significant.

Results

Based on the findings of this study, the patients who presented with TTS ranged in age from 20 to 40 years, with a mean value of 31.19±6.28. Additionally, the duration of the symptoms ranged from 6 to 18 months, with a mean value of 10.3 to 3.41.

There were a total of 23 female patients who participated in the study, which accounts for 85.2% of the total, and there were four male patients, which accounts for 14.8% of the total. The details of cases are shown in table (1).

A clinical assessment was conducted followed by a follow-up two months after starting treatment, employing the severity rating scale for TTS.

For patients' feet treated by conservative methods (13 patients) as follows:

- 0 cases were rated as excellent (0%).
- 2 cases were rated as good (15.38%).
- 3 cases were rated as fair (23.07%).
- 8 cases were rated as poor (61.53%).

For patients' feet treated by operative method (14 patients, 17 feet), the clinical assessment was as follows:

- 9 cases were rated as excellent (52.94%).
- 3 cases were rated as good (17.64%).
- 2 cases were rated as fair (11.76%).
- 3 cases were rated as poor (17.64%).

For patients who were treated by the operative decompression method, the cause of the entrapment (the posterior tibial nerve or its branches) was as follows:

- Tight flexor retinaculum sheath (9) feet.
- Distended veins (8) feet.

The comparison of clinical results with the items of the tarsal tunnel severity score scale is illustrated in table (2).

Table 1. Information's of the 27 patients with tarsal tunnel syndrome

Age (yr)	Sex	Duration of symptoms in months	Tinel's sign	Changes in electro-diagnostic studies
20	Female	6	+ve	+ve
25	Female	12	+ve	+ve
35	Male	10	+ve	+ve
23	Female	8	+ve	+ve
40	Female	14	+ve	+ve
34*	Female	12	+ve	+ve
38	Female	9	+ve	+ve
27	Female	7	+ve	+ve
39	Female	18	+ve	+ve
36	Female	16	+ve	+ve
20	Female	12	+ve	+ve
33	Male	8	+ve	+ve
28*	Female	8	+ve	+ve
32	Female	6	+ve	+ve
37	Female	10	+ve	+ve
40	Female	18	+ve	+ve
24	Female	8	+ve	+ve
30*	Female	12	+ve	+ve
32	Female	9	+ve	+ve
21	Female	6	+ve	+ve
36	Female	10	+ve	+ve
35	Female	12	+ve	+ve
38	Female	12	+ve	+ve
26	Male	6	+ve	+ve
28	Female	9	+ve	+ve
30	Male	8	+ve	+ve
35	Female	12	+ve	+ve

*Patient complained from bilateral tarsal tunnel syndrome

Table 2. The comparison of clinical results with the items of the tarsal tunnel severity score scale was conducted after two months following both conservative and operative treatments

Parameters		Type of treatment				P value
		Conservative		Operative		
		Count	%	Count	%	
Clinical Results	Poor	8	61.53	3	17.64	0.010*
	Fair	3	23.07	2	11.76	
	Good	2	15.38	3	17.64	
	Excellent	0	0.0	9	52.94	
	The score					
Muscle Atrophy	2	13	100	17	100	
Sensory disturbances	0	6	46.2	2	11.8	0.005*
	1	7	53.8	6	35.3	
	2	0	0.0	9	52.9	
Tinel's Sign	0	8	61.5	3	17.6	0.041*
	1	0	0.0	1	5.9	
	2	5	38.5	13	76.5	
Burning pain	1	13	100	6	35.3	<0.001**
	2	0	0.0	11	64.7	
Pain	0	7	53.8	3	17.6	0.023*
	1	4	30.8	3	17.6	
	2	2	15.4	11	64.7	

X2 test, *: Statistically significant (p≤0.05), **: Statistically highly significant (p≤0.001). For the rating scale score: 0 for the presence of the condition, 1 for the presence of some, 2 for the absence of the condition

A follow-up was conducted 4 months after the start of treatment.

Clinical assessment for patients treated by the conservative method (13 patients) after 4 months from starting treatment is as follows in table (3):

0 cases were rated as excellent (0%).
3 cases were rated as good (23.07%).
4 cases were rated as fair (30.76%).
6 cases were rated as poor (46.15%).

The clinical assessment of the feet of 14 patients, who underwent surgery on a total of 17 feet is presented in table (4), detailing the results obtained 4 months after the commencement of treatment.

9 cases were rated as excellent (52.94%).
3 cases were rated as good (17.64%).
2 cases were rated as fair (11.76%).
3 cases were rated as poor (17.64%).

Table 3. The clinical results assessment for patients treated by conservative methods after 4 months from starting treatment

No.	Pain	Burning pain	Tinel's sign	Sensory disturbance	Muscle atrophy	Scale rate	Result
1	1	1	2	0	2	6	Fair
2	0	1	0	1	2	4	Poor
3	1	1	2	0	2	6	Fair
4	1	1	0	1	2	5	Poor
5	2	1	2	1	2	8	Good
6	0	1	0	1	2	4	Poor
7	1	1	2	1	2	7	Fair
8	0	1	0	0	2	3	Poor
9	2	1	2	1	2	8	Good
10	2	1	2	1	2	8	Good
11	0	1	0	0	2	3	Poor
12	1	1	2	0	2	6	Fair
13	0	1	0	0	2	3	Poor

Table 4. The clinical results assessment for patients treated by operative method after 4 months from starting treatment

No.	Pain	Burning pain	Tinel's sign	Sensory disturbance	Muscle atrophy	Scale rate	Result
1	1	1	2	0	2	6	Fair
2	0	1	0	0	2	3	Poor
3	1	2	2	1	2	8	Good
4	2	2	2	2	2	10	Excellent
5	2	2	2	2	2	10	Excellent
6	2	2	2	2	2	10	Excellent
7	2	1	2	1	2	8	Good
8	0	1	0	1	2	4	Poor
9	2	2	2	2	2	10	Excellent
10	2	2	2	2	2	10	Excellent
11	0	1	0	1	2	4	Poor
12	1	2	1	1	2	7	Fair
13	2	2	2	2	2	10	Excellent
14	2	2	2	2	2	10	Excellent
15	2	1	2	1	2	8	Good
16	2	2	2	2	2	10	Excellent
17	2	2	2	2	2	10	Excellent

After a 6-month follow-up, the clinical assessment for the 13 patients treated by the conservative method is in the following table (5):

0 cases were rated as excellent (0%).
4 cases were rated as good (30.76%).
3 cases were rated as fair (23.07%).
6 cases were rated as poor (46.15%).

Table 5. The clinical results assessment for patients treated by conservative methods after 6 months from starting treatment

No.	Pain	Burning pain	Tinel's sign	Sensory disturbance	Muscle atrophy	Scale rate		Result
1	1	1	2	0	2	6	Fair	2
2	0	1	0	1	2	4	Poor	2
3	1	1	2	0	2	6	Fair	2
4	1	1	0	1	2	5	Poor	2
5	2	1	2	1	2	8	Good	2
6	0	1	0	1	2	4	Poor	2
7	2	1	2	1	2	8	Good	2
8	0	1	0	0	2	3	Poor	2
9	2	1	2	1	2	8	Good	2
10	2	1	2	1	2	8	Good	2
11	0	1	0	0	2	3	Poor	2
12	1	1	2	0	2	6	Fair	2
13	0	1	0	0	2	3	Poor	2

For the feet of patients treated by the operative method (14 patients, 17 feet), the clinical assessment conducted six months after the initiation of treatment is presented in table (6).

9 cases were rated as excellent (52.94%).

3 cases were rated as good (17.64%).

1 case was rated as fair (5.88%).

4 cases were rated as poor (23.52%).

The comparison of clinical results for patients with TTS, treated either by conservative or operative methods, during follow-up at 2 months, 4 months, and 6 months is presented in table (7) and figue (1).

Table 6. The assessment of clinical results for patients who underwent operative treatment will be conducted 6 months after the start of their treatment

No.	Pain	Burning pain	Tinel's sign	Sensory disturbance	Muscle atrophy	Scale rate	Result
1	1	1	0	0	2	4	Poor
2	0	1	0	0	2	3	Poor
3	1	2	2	1	2	8	Good
4	2	2	2	2	2	10	Excellent
5	2	2	2	2	2	10	Excellent
6	2	2	2	2	2	10	Excellent
7	2	1	2	1	2	8	Good
8	0	1	0	1	2	4	Poor
9	2	2	2	2	2	10	Excellent
10	2	2	2	2	2	10	Excellent
11	0	1	0	1	2	4	Poor
12	1	2	1	1	2	7	Fair
13	2	2	2	2	2	10	Excellent
14	2	2	2	2	2	10	Excellent
15	2	1	2	1	2	8	Good
16	2	2	2	2	2	10	Excellent
17	2	2	2	2	2	10	Excellent

Table 7. Comparison of conservative versus operative clinical results according to the severity scoring scale for clinical assessment during follow-up at 2 months, 4 months, and 6 months

Clinical assessment		Follow up 2 months N (%)	4 months N (%)	6 months N (%)
Conservative	Poor	8 (61.5)	6 (46.2)	6 (46.2)
	Fair	3 (23.1)	4 (30.8)	3 (23.1)
	Good	2 (15.4)	3 (23.1)	4 (30.8)
Operative	Poor	3 (17.6)	3 (17.6)	4 (23.5)
	Fair	2 (11.8)	2 (11.8)	1 (5.9)
	Good	3 (17.6)	3 (17.6)	3 (17.6)
	Excellent	9 (52.9)	9 (52.9)	9 (52.9)

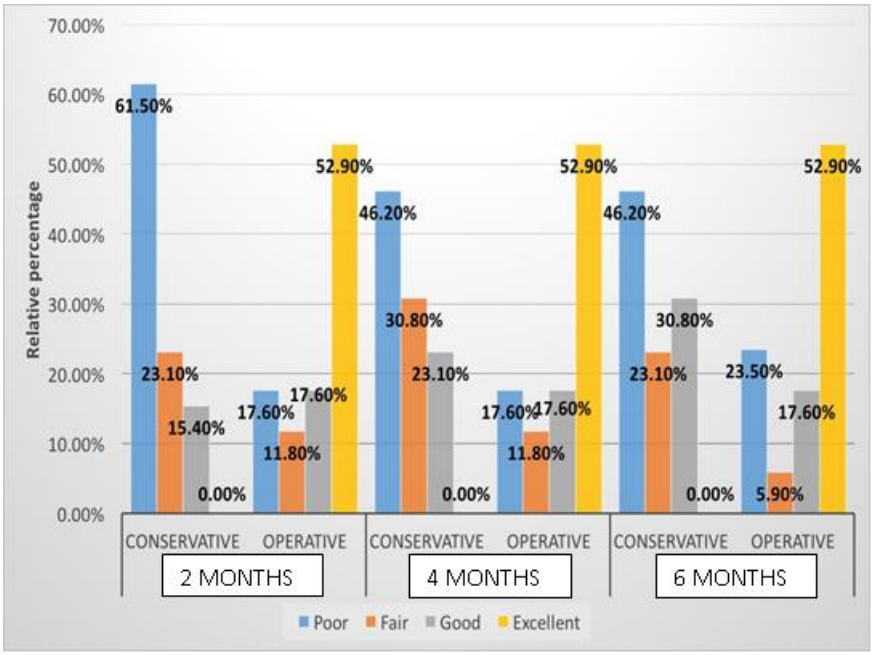

Figure 1. Comparison of conservative versus operative clinical results according to the scoring scale for severity during follow-up at 2 months, 4 months and 6 months

In the neurophysiologic studies, all cases showed a decrease in conductive velocity before treatment. At the 2-month follow-up, only 2 cases demonstrated improvement in the nerve conduction study; these were the same cases that had excellent clinical results after postoperative treatment. No changes were observed in the nerve conduction study for cases treated with conservative methods. At the 4-month follow-up, only 3 cases showed improvement in the nerve conduction study, which again were those with excellent clinical results postoperatively, while no changes occurred in conservative treatment cases. At the 6-month follow-up, four cases exhibited improvement in the nerve conduction study, specifically those that achieved excellent clinical outcomes following postoperative treatment. In contrast, only one case showed some improvement in the nerve conduction study among those treated with conservative methods.

Discussion

In this study, 23 of 27 patients were females (85.2%), and only 4 patients were males (14.8%). This result goes with Ürgüden, et al. [8] who reported 12 cases: 9 women and 3 men. Sammarco and Chang [9] conducted a study where sixty-two patients underwent tarsal tunnel release. There were 44 females and 18 males.

In this study, the duration of the symptoms was 6-18 months; this may be due to the fact that the cases were not diagnosed with TTS early and had taken different kinds of treatments before being diagnosed accurately, which goes with Ahmad et al. [10] in which the mean duration of symptoms is 31.9 (2-24) months.

In the present study, five patients (two with good responses and three with fair responses) showed some response to conservative treatment; this may be attributed to their early presentation and the presence of tenosynovitis or flexible foot deformities contributing to TTS [11].

These findings correspond with those of Kiel et al. [12], who reported that only 3 out of 10 patients were symptom-free following conservative treatment for tarsal tunnel syndrome. They are also consistent with the work of Kavlak et al. [13], who demonstrated

that patients receiving conservative treatment that included physiotherapy and supportive inserts experienced improvement. This finding indicates a significant correlation between the type of treatment for TTS and symptoms such as pain, burning sensations, sensory disturbances, and Tinel's sign, all of which showed greater improvement with surgical intervention compared to conservative treatment [14]. This may be due to the presence of certain pathology that causes pressure on the posterior tibial nerve or its branches; when decompression is done, the pressure is relieved and the symptoms decrease gradually.

In this study, no significant correlation was found between the treatment type for TTS and the outcomes of the neurophysiological assessment following treatment, as nearly all cases showed no substantial improvement. Only two cases that underwent surgery demonstrated some progress at the 2-month follow-up, with slight increases in improvement observed at the 4- and 6-month follow-ups.

This result goes with Rodríguez et al. [15], in which there was no association with the electrophysiological studies for the patients with tarsal tunnel syndrome post-treatment, and it goes with Jain et al. [16], in which there was no association with the electrophysiological studies for the patients with tarsal tunnel syndrome post-treatment.

In conclusion, for the available studies to be useful in diagnosing TTS, a thorough clinical examination and patient history are required. Early stages may benefit from conservative treatment, especially if the condition is associated with tenosynovitis or a flexible foot deformity. When the causes include things like tumours, varicose veins, or thickening of the flexor retinaculum, prompt surgery becomes necessary. There was little use for the neurophysiologic investigations in evaluating the clinical outcome and conducting early follow-up.

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Author contribution

Dr. Al-Banaa: study design and data analysis. Dr. Jasam: data collection and literature review. Dr. Alwan: writing and editing. All authors participated in final revision of the article.

Conflict of interest

None.

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