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ORIGINAL ARTICLE

Nonsurgical Treatment of Adolescent Idiopathic Spasmodic Valgus Foot

Ayman Y. Eltabbaa, Mahmoud El-Rosasy, Mohammed El Tabbakh, Elsayed Elforse
Department of Orthopedic Surgery, Faculty of Medicine, Tanta University, Tanta, Egypt.

Correspondence to *Ayman Y. Eltabbaa, MD, Department of Orthopedic Surgery, Faculty of Medicine, Tanta University, Tanta, Egypt.*
E-mail: ayman.eltabbaa@med.tanta.edu.eg

Background The absence of coalition in adolescent patients with spasmodic valgus foot is challenging as it usually has nonknown etiology, and the ideal treatment method is still unclear. This work evaluated the functional outcome after the nonsurgical treatment of adolescent idiopathic spasmodic valgus foot by local sinus tarsi injection followed by manipulation and casting.

Patients and Methods This retrospective study included 40 patients aged more than or equal to 10 years old, both sexes; 38 have unilateral, and two patients have bilateral spasmodic valgus feet with resistant foot pain and chronic peroneal muscle spasms. Sinus tarsi were injected with 2ml lidocaine 2% as a diagnostic test for the degree of immediate relaxation; if spasm was relieved, then injection of triamcinolone acetate 40mg plus 2ml lidocaine 2%, then manipulating the foot and casting in a position of maximum inversion of the hindfoot and plantarflexion for 6 weeks then shoes with high neck for 6 months to prevent a recurrence. Patients were functionally assessed using the American Orthopaedic Foot and Ankle Society Ankle–Hindfoot scale, with particular attention paid to the relapse of the condition 1 year after the procedure. Follow-up visits after 6 weeks, 3 months, 6 months, 12 months, and 18 months after the manoeuvre.

Results The American Orthopaedic Foot and Ankle Society score was significantly higher at 3,6,12, and 18 months than before treatment (P<0.001). Immediate relaxation occurred in 37(88.1%) feet, while five (11.9%) feet were still rigid. Five (11.9%) of the corrected 37 feet relapsed during follow-up.

Conclusions Nonsurgical treatment of adolescent idiopathic spasmodic valgus foot by sinus tarsi injection and casting is safe and effective in about 76% of cases, avoiding the need for hindfoot fusion in these patients.

Keywords Idiopathic spasmodic valgus, Rigid flatfoot, Sinus tarsi injection.
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INTRODUCTION

The symptomatic spasmodic valgus foot is the involuntary spasm of the foot muscles, causing valgus deformity of the hindfoot and abduction of the forefoot associated with pain during long-standing and effort [1]. This condition is typically emerging in the second decade of life [2].

While peroneal spastic planovalgus foot can result from a variety of arthritic and neuromuscular disorders, it is frequently linked to tarsal coalition, particularly calcaneonavicular or talocalcaneal coalition [3]. In cases where no specific cause is identifiable, the condition is referred to as idiopathic peroneal spastic flatfoot or idiopathic spasmodic planovalgus foot [4].

Clinical and radiological evaluations are essential for the accurate diagnosis of peroneal spastic flatfoot. Surgical intervention should only be considered in cases when nonoperative treatments have proven ineffective, with conservative therapy being the first approach for such situations [5].

Our observation is that local anesthetic injection can allow immediate relaxation of peroneal muscles, allowing

manipulation and casting. This approach is aimed at alleviating symptoms and correcting deformities without the need for surgery [6].

There is a shortage of available data regarding the nonsurgical treatment of adolescent idiopathic spasmodic valgus foot. Thus, this work aimed to evaluate the functional outcome after the nonsurgical treatment of adolescent idiopathic spasmodic valgus foot by sinus tarsi injection and casting.

PATIENTS AND METHODS

This retrospective study included 40 patients aged more than or equal to 10 years old, both sexes, who had spasmodic valgus feet (unilateral or bilateral) with resistant foot pain.

Patients' data was gathered from the records at the Emergency Hospital of Tanta University from 2018 to 2023. The study was done after approval from the Ethical Committee.

The tarsal coalition, autoimmune inflammatory arthritis, intertarsal arthritis, and neuromuscular disorders were excluded.

Data regarding history taking (age, sex, general health, body weight, the standard level of activity, and whether there is a recent involvement in strenuous activities or jobs requiring standing for a long time, a recent or repetitive foot or ankle trauma, mode of onset, and duration of symptoms), physical examination (for evaluating foot alignment and gait analysis, ankle, subtalar, and chopart joints range of motion, muscle tone especially of the peroneal, ankle, and toes extensors), radiological assessment, and laboratory investigations if underlying rheumatological pathology was suspected.

Radiographic, computed tomography, and MR imaging [7]

Radiographs in a standing position was done to search for the reason for the spastic peroneal condition, especially the presence of a bony bar. Computed tomography and MRI were routinely done if there was suspicion of coalition or other underlying reasons like osteochondral injuries or osteoid osteoma. For assessing the condition of patients, the Ankle–Hindfoot scale of the American Orthopedic Foot and Ankle Society (AOFAS) was used.

The radiological assessment included both resting and weight-bearing plain radiography anteroposterior (AP) and lateral radiographs, oblique tarsal views. The standard radiographical parameters were checked, including the talonavicular coverage angle, the AP and lateral CYMA line, the AP talar-first metatarsal angle, the AP talocalcaneal angle, and the calcaneal pitch angle. The intertarsal radiological abnormalities suggested developmental tarsal anomalies (hindfoot attitude and clarity of the subtalar joint, the presence of accessory navicular bone, prolongation of anterior process of calcaneus and talonavicular peaking) was checked [7,8] (Figures 1–3).

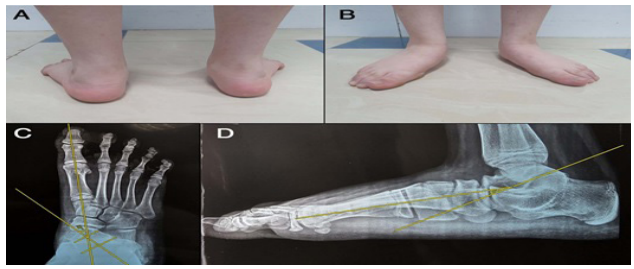

Figure 1: (A): Clinical photo of a patient with the bilateral spasmodic valgus foot from behind showing hindfoot valgus; (B): Clinical photo of a patient with the bilateral spasmodic valgus foot from the front showing planovalgus feet; (C): Precorrection anteroposterior standing radiograph showed no coalition and increased anteroposterior Meary's angle was 32 degrees; (D): Precorrection lateral radiograph showing C sign, lateral radiographic measurements of the lateral talar's first metatarsal angle was 18 degrees.

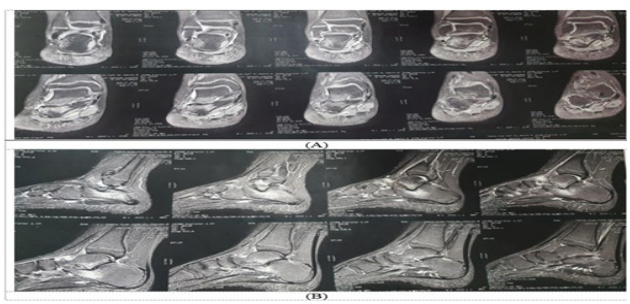

Figure 2: (A): Sagittal CT showing the absence of coalition; (B): Coronal CT showing the absence of coalition; CT: Computed Tomography.

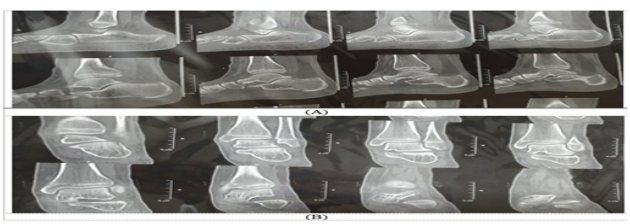

Figure 3: (A): Coronal MRI showing severe peritalar bone marrow edema; (B): Sagittal MRI showing severe peritalar bone marrow edema.

Outpatient sinus tarsi were injected with 2ml lidocaine 2% as a diagnostic test for the degree of improvement of the spasm; if the spasm was relieved within 2–3min, then injection of triamcinolone acetate 40mg plus 2ml lidocaine

2%, then manipulating the foot and casting in a position of maximum inversion of the hindfoot and plantarflexion to stretch the spastic ms to the maximum length for 6 weeks. The patient was instructed to remain nonweight bearing on crutches (Figure 4).

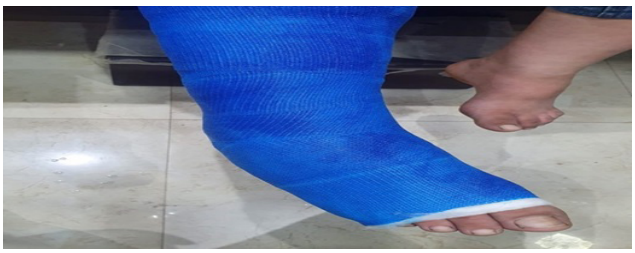

Figure 4: Postmanipulation cast.

After 6 weeks, the cast was removed, and the range of motion of the subtalar joint and the muscle tone of the peroneal and extensors were assessed again to confirm maintenance of the correction; then, the patients were instructed to wear the medial arch insole and high collar shoes for 6 months to prevent recurrence and avoid strenuous activity and avoid standing for long periods plus weight control.

Postmanipulation radiographs were obtained to evaluate changes in the radiographic parameters relative to their premanipulation values (Figure 5).

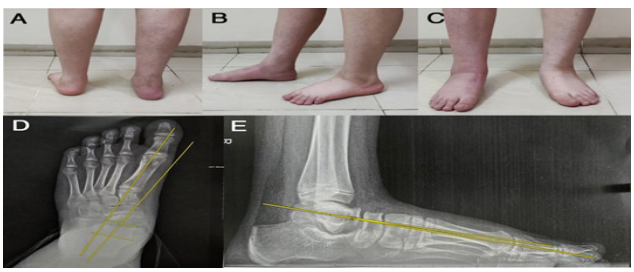

Figure 5: Clinical photos of right corrected spasmodic valgus after removal of the cast from behind; (A): from the side; (B): and from the front; (C): Radiograph after cast removal figure; (D): Anteroposterior radiograph showing mild talonavicular uncoverage anteroposterior and anteroposterior Meary's angle became 4 degrees; (E): Lateral radiograph showing the disappearance of the C sign and lateral Meary's angle became 2 degrees.

Active and passive movements of the foot and ankle (mainly the subtalar joint in the form of eversion and inversion) were tested after the removal of the cast.

Patients were functionally assessed using the AOFAS Hindfoot scale, with particular attention paid to the relapse of the condition 1 year after the procedure. Follow-up visits after 2 months, 4 months, 6 months, and 1 year after the manoeuvre.

STATISTICAL ANALYSIS

Statistical analysis was done using SPSS, v26 (IBM Inc., Chicago, Illinois, USA). Quantitative variables were presented as mean and SD and compared between the measurements utilizing repeated measure analysis of variance. Qualitative variables were presented as frequency and percentage (%). A two-tailed *P* value less than 0.05 was considered statistically significant.

RESULTS

The mean±SD value of age was 14.4±1.85 years. Twenty-nine (72.5%) patients were males, with unilateral affection in 38(95%) patients and bilateral affection in two (5%) patients (Table 1).Forty percent of the patients were overweight. Furthermore, 70% of them are working jobs that require 8h of standing (Table 2).

Table 1: Demographic data of the studied patients:

	***N*=40**
Age (years)	14.4±1.85
Sex	
Male	29(72.5)
Female	11(27.5)
Side	
Unilateral affection	38(95)
Bilateral affection	2(5)

Data are presented as mean±SD or frequency (%).

Table 2: Distribution of the studied cases according to weight and standing hours:

	***N*=40**
BMI (kg/m^2)	
≤25	24(60)
>25	16(40)
Mean±SD	23.35±3.02
Hours of standing	
<8	12(30)
>8	28(70)

Data are presented as mean±SD or frequency (%).

Seventy percent of the patients were working, while only 30% were not working (Table 3).

AOFAS score was significantly higher at 3,6,12, and 18 months than before treatment (P<0.001) (Table 4).

Immediate relaxation occurred in 37(88.1%) feet, while five (11.9%) feet were still rigid. Five (11.9%) feet were relapsed (Table 5).

Table 3: Professions of the studied patients:

Professions	*N*=40
Backer	4(10)
Car-related jobs	8(20)
Barber	3(7.5)
House building	5(12.5)
Farming	5(12.5)
Coffee shop	3(7.5)
Not working	12(30)

Data are presented as frequency (%).

Table 4: American Orthopaedic Foot and Ankle Society score of the studied patients:

	N=42				
AOFAS	Before treatment	3 months	6 months	12 months	18 months
	42.5±4.85	82.9±7.15	81±5.88	76.9±7.99	72.6±6.74
	P value	<0.001*	<0.001*	<0.001*	<0.001*

Data are presented as mean±SD; AOFAS, American Orthopaedic Foot and Ankle Society;*Significant as *P* value less than or equal to 0.05.

Table 5: Relaxation, relapse, and feet needed hindfoot fusion of the studied patients:

	N=42
Relaxation	
Immediate relaxation	37(88.1)
Still rigid	5(11.9)
Relapsed	5(11.9)

Data are presented as frequency (%).

The radiological parameters have significantly improved after manoeuvre (Table 6).

The relation between AOFAS results with BMI and hours of standing (Table 7).

Table 6: Radiological parameters premanipulation and postmanipulation of the studied patients:

	Premanipulation (*N*=42)	Postmanipulation (*N*=42)	*P* value
AP talus-first metatarsal angle	44.9±11.8	12.8±5.15	<0.001*
AP talocalcaneal angle	53.2±5.76	29.5±8.04	<0.001*
LAT calcaneal pitch angle	7.9±3.09	20.1±4.49	<0.001*

Data are presented as mean±SD; AP: Anteroposterior; LAT: Lateral.

Table 7: Relation between American Orthopaedic Foot and Ankle Society results with BMI and hours of standing (*N*=30):

	AOFAS (results)				
	N	Mean±SD	Median (minimum–maximum)	*t*	*P*
BMI (kg/m^2)					
≤25	24	74.50±1.62	75.0(72.0–76.0)	6.045*	<0.001*
>25	16	72.06±0.93	72.0(71.0–74.0)		
r(P)				−0.809*(<0.001*)	
Hours of standing					
<8	12	73.42±2.07	72.50(71.0–76.0)	0.243	0.810
>8	28	73.57±1.75	73.0(71.0–76.0)		

Data are presented as mean±SD; AOFAS: American Orthopaedic Foot and Ankle Society; *: Significant as *P* value less than or equal to 0.05.

DISCUSSION

Flatfoot, also known as pes planus, has been defined in different ways over time; commonly, it has been described as a foot with the entire inner edge of its plantar aspect in complete contact with the ground [9].

Peroneal spastic flatfoot is the symptomatic stiff planovalgus foot deformity that may arise from a variety of causes [10]. This disorder is often attributed to tarsal coalitions; nevertheless, they do not represent the only causative factor [11].

The absence of coalition in adolescent patients with spasmodic valgus foot is a challenge as it usually has no known etiology, and the ideal method of treatment is still unclear [12,13].

This study revealed that high body weight is an evident risk factor for the development of the peroneal spasmodic valgus feet condition, and this matches the correlation between high BMI and foot disorders [14].

In this study, the adolescent idiopathic spasmodic valgus foot is more frequent in males (72.5%). Also, Rizk and Kandil [13] reported that 15.2% were females and 84.8% were males. This may be attributed to the heavier weight of male adolescent patients with this spasmodic peroneal foot as well as the early enrollment of these male patients in manual jobs, which necessitate long-standing.

AOFAS score was significantly higher at 3,6,12, and 18 months than before treatment (P<0.001). Immediate relaxation was observed in 88.1% of the feet, while 11.9% remained rigid. A relapse rate of 11.9% was noted, which led to a decrease in the AOFAS score over time. Corresponding to our findings, Di Gennaro *et al.,* [15] stated that the AOFAS score was significantly higher at follow-up than baseline after nonsurgical treatment.

Also, Rizk and Kandil [13] reported that the AOFAS score was significantly higher at cast removal,3,9, and 18 months, than before treatment.

In 2008, Martus *et al.*, [16] first reported that intraarticular impingement in the accessory anterolateral talar facet caused rigid flatfoot (peroneal spastic flatfoot) during adolescence. Although we did not study the incidence of accessory anterolateral talar facet in the patients of this study, we can confirm that this was not present in most of them.

We have detected that some patients presented with a C sign in lateral radiograph, which is known to be characteristic of tarsal coalition, yet no coalition was found in these patients. The C sign disappears after correcting the peroneal spam, so we find that the C sign is a sign of excessive valgus of the calcaneus obscuring the normal subtalar joint line and not an essential sign of tarsal coalition pathology (Figures 1–3,5).

We have also detected the presence of talar and calcaneal evident bone marrow edema in MRI, which we suggest is caused by excessive mechanical overload attributed to long-standing jobs in adolescents with still-growing immature tarsal bone.

The literature reported that both surgical and nonsurgical [13,17–19] treatment of idiopathic spasmodic valgus foot showed improvement in functional outcomes; thus, we recommended the use of nonsurgical treatment to overcome the risks and complications of surgical interventions.

The small sample size and the single-center location limited the present study. Further studies are recommended to confirm our results. Further studies are needed to compare the results of the nonsurgical treatment with those of surgical approaches.

CONCLUSION

Nonsurgical treatment of adolescent idiopathic spasmodic valgus foot by sinus tarsi injection and casting showed effectiveness in most cases, with about a quarter of patients needing further surgical intervention.

CONFLICTS OF INTEREST

There are no conflicts of interest.

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