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OUTCOME STUDY OF CONSERVATIVE TREATMENT FOR CONGENITAL TALIPES EQUINOVARUS

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ABSTRACT

Background: Congenital talipes equinovarus is considered one of the most common serious musculoskeletal malformation that represents a major cause of physical disability globally. **Objective:** The aim of the current study was to determine the efficiency of Ponseti method in management of the defect, as well as determining the factors that associated with poor outcome. **Patients and Methods:** An analytic study included all children younger than one year who referred to the department of pediatric and orthopedic in Lattakia Hospital during the period two-years(2022-2024) who underwent conservative treatment. **Results:** A total of 27 patients(43 feet), 18 males (66.87%) and 9 females (33.3%) with mean age 3.61±0.8 months were included in the study. The defect was flexible in 58.1% and Achilles tenotomy was performed in 65.1% of cases. Before therapy, 90.8% of cases were with Pirani score 2-6 and after completion of treatment 88.4% were with score 1 or less, p:0.001. Initiation of treatment before age six months was associated with score ≤ 1, and male gender was associated significantly with higher frequency of Achilles tenotomy (p:0.04) and number of casts(p:0.04). Many of complications were developed in which skin irritation represented the most frequent one(6.9%). **Conclusion:** The current study revealed the importance of initiating therapy as early as possible in the first week of life with performing of Ponseti method in children older than 6 months who underwent other types of interventions.

KEYWORDS: Congenital, Ponseti, talipes equinovarus**,** therapy, Syria.

1. INTRODUCTION

Talipes equinovarus, or clubfoot, is defined as complex developmental deformity of the foot in which feet is excessively plantar flexed with the forefoot swung medially and sole facing inward.[1,2] It can be classified as congenital(idiopathic), syndromic and positional.[3,4] The prevalence of clubfoot is 1 to 3 per 1000 live births which varies among different ethnic groups, and males are affected predominately with male to female ratio has been reported to be 2:1.[5,6,7]

Risk factors for development of clubfoot include: family history of defect, presence of a fetal neuromuscular disorder or an extrinsic condition that restricts movement of fetal foot.[8,9,10]

Sonographic diagnosis depends on visualization of the planter surface of fetal foot in the same sagittal plane as both lower extremity bones, which is considered true after 13 weeks of gestation and 80% of cases are detected prenatally especially in bilateral cases or in presence of other anomalies.[11,12] Treatment is considered crucial due to long term disability, deformity and pain in untreated cases.[13,14] The Ponseti method consists of two equally important phases: corrective and maintenance and consist of serial manipulation, casting and tenotomy of the Achilles tendon, and this technique is rapidly becoming the most widely practiced method for initial treatment of congenital clubfoot.[15,16] Therefore, the aims of current study were:1- to detect outcome of conservative interventions for idiopathic clubfoot,2-to determine risk factors that associated with poor outcome.

2. PATIENTS AND METHODS

2.1. Study population

This was an analytical retrospective study of a group of children with primary clubfoot attending department of pediatric and Orthopedic at Lattakia Hospital in Syria during two-years period (from January 2022 to January 2024). The inclusion criteria were all children of both sexes younger than one year with clubfoot who underwent manipulation of the deformity by using Ponseti method. The exclusion criteria were presence one of the following: loss to follow-up, children older than one-year, secondary clubfoot, syndromic clubfoot and recurrent cases after surgery.

History and physical examination were performed for all patients, as well as performing of hip ultrasound. All

patients underwent correction by using Ponseti technique and clinical evaluation was performed weekly for 6 months, monthly until walking age, and every 6 months for four years afterward. In addition to, radiologic assessment of patients was obtained after 3 and 6 months depending on the following findings: Kite angle in anterposterior and lateral view, calcaneal- tibial angle in lateral view and talus-first metatarsal angle in anterposterior and lateral view.

2.2. Ethical consideration: After discussing the study with the patients, all of them gave a complete and clear informed consent to participate in the study. This study was performed in accordance with the Declaration of Helsinki and approval for the study was obtained from the institutional ethics committee.

2.3. Statistical Analysis

Statistical analysis was performed by using IBM SPSS version 25. categorical variables were reported as numbers and percentages and continuous variable were presented as mean± standard deviation (SD). Chi-square test was used to examine the comparisons between the two groups. Independent t student test was used to compare 2 independent groups. All the tests were considered significant at 5% types I error rate($p<0.05$), β:20%, and power of the study:80%.

3. RESULTS

The study included a group of 27 children (43 feet) who underwent conservative treatment for idiopathic clubfoot during the period of study. Age ranged from 1 day to 12 months, with mean age of 3.61±0.8 months. Males represented 66.7% and females 33.3% with sex ratio (male: female= 2:1), and delivery was vaginal for majority of patients (70.4%). Patients were classified according to the order a child was born in their family as follows; first-born (40.7%), second-born (25.9%), third-born (22.2%) and fourth-born (11.2%). Family history of clubfoot was detected in 4 patients (14.8%), and children were classified into three groups according to the family socioeconomic status; good in 14.9%, medium in 44.4% and low in 40.7%. At initiation of treatment, maternal age was <20 years in 18.5% of children, 20 to 30 years in 55.6%, 30 to 40 years in 14.8% and >40 years in 11.1%.

Table 1: Demographic characteristics of the study population.

Variable	Result
Age(months)	3.61±0.8
Sex, (n, %)	
Male	18(66.7%)
Female	9(33.3%)
Route of delivery	
Vaginal	19(70.4%)
Cesarean section	8(29.6%)
Birth order	
First	11(40.7%)
Second	7(25.9%)
Third	6(22.2%)
Fourth	3(11.2%)
Family history of clubfoot	
Present	4(14.8%)
Absent	23(85.2%)
Socioeconomic status of parents	
Good	4(14.9%)
Medium	12(44.4%)
Low	11(40.7%)
Maternal age at presentation(years)	
<20	5(18.5%)
20-30	15(55.6%)
30-40	4(14.8%)
>40	3(11.1%)

As shown in table (2), both feet were affected in 59.3% of cases and the right side was more frequently involved than the left (51.2% vs. 48.8%). Children were classified according to the clinical presentations of clubfoot into three groups; positional in 58.1%, resistant in 25.6% and rigid in 16.3%.

Traditional method was used in 27.9% of cases, bracing in 16.3%, short leg casting in 6.9% and long leg cast in 4.7%, without any intervention in 44.2%. Tenotomy of Achilles tendon was performed in 65.1%.

Table 2: Characteristics of clubfoot and previous treatment.

Variable	Result
Side of clubfoot	
Unilateral	11(40.7%)
Bilateral	16(59.3%)
Affected side	
Right	22(51.2%)
Left	21(48.8%)
Clinical classification of clubfoot	
Flexible	25(58.1%)
Resistant	11(25.6%)
Rigid	7(16.3%)
Hip ultrasound findings	
Normal	25(92.6%)
Hip dislocation	1(3.7%)
Hip subluxation	1(3.7%)
Previous treatment	
None	19(44.2%)
Traditional method	12(27.9%)
Bracing	7(16.3%)
Short leg cast	3(6.9%)
Long leg cast	2(4.7%)
Tenotomy of Achilles tendon	
Present	28(65.1%)
Absent	15(34.9%)

Children were younger than 6 months at initiation of treatment in 77.8% and older in 22.2%.

Before therapy, a foot (2.3%) was with a score 0-1, 3 feet (6.9%) with score 1.5 and 39 feet (90.8%) with score 2-6 according to Pirani scoring system. After treatment, 38 feet (88.4%) had become with Pirani score 0-1 with presence of significant difference, p:0.001.

Table 3: Distribution of the study population according to Pirani score.

Variable	Study sample		P- value
	Before therapy	After therapy	
Pirani score			
0-1	1(2.3%)	38(88.4%)	0.001
1.5	3(6.9%)	4(9.3%)	
2-6	39(90.8%)	1(2.3%)	

As shown in table (4), there was significant association between age at initiation of therapy and Pirani score in which 91.2% of the patients younger than 6 months were with Pirani score ≤1 after treatment, p:0.04. 86.2% of males were with Pirani score after therapy ≤1 and 13.8%>1, whereas 92.9% of females were with score ≤1 and 7.1% with score >1, p:0.07. In addition to, there were no significant association between presence of previous therapeutic interventions and Pirani score, p:0.7.

Table 4: Association between Pirani score after therapy and characteristics of patients.

Variable	Number of feet	Pirani score		
		≤1	>1	P
Sex				
Male	29	25(86.2%)	4(13.8%)	0.07
Female	14	13(92.9%)	1(7.1%)	
Age(months)				
>6	9	7(77.8%)	2(22.2%)	0.04
≤ 6	34	31(91.2%)	3(8.8%)	
Previous treatments				
Present	24	21(87.5%)	3(12.5%)	0.7
Absent	19	17(89.5%)	2(10.5%)	

Tenotomy of Achilles tendon was performed more frequently in males than females (72.4% vs. 50%, p:0.002), and in presence of previous medical interventions (87.5% vs. 36.8%, p:0.001). There were no significant association between ages of patients at initiation of therapy and tenotomy of Achilles tendon, which was performed in 66.7% of children >6 months versus 64.7% of children ≤ 6 months, p:0.1.

Table 5: Association between Tenotomy of Achilles tendon and characteristics of patients.

Variable	Number of feet	Tenotomy of Achilles tendon		
		Present	Absent	P
Sex				
Male	29	21(72.4%)	8(27.6%)	0.002
Female	14	7(50%)	7(50%)	
Age(months)				
>6	9	6(66.7%)	3(33.3%)	0.1
≤ 6	34	22(64.7%)	12(35.3%)	
Previous treatments				
Present	24	21(87.5%)	3(12.5%)	0.001
Absent	19	7(36.8%)	12(63.2%)	

As shown in table (6), number of casts was significantly higher in males than in females (8.42±0.4 vs. 7.16±0.8, p:0.04) and in children older than 6 months(8.9±0.5 vs. 6.72±0.2,p:0.01). There were no significant association between number of casts and presence of previous interventions; 8.18±0.8 vs. 8.20±0.6,p:0.5.

Table 6: Association between number of casts and characteristics of patients.

Variable	Number of feet	Variable	
		Number of casts	P
Sex			
Male	29	8.42±0.4	0.04
Female	14	7.16±0.8	
Age(months)			
>6	9	8.9±0.5	0.01
≤ 6	34	6.72±0.2	
Previous treatments			
Present	24	8.18±0.8	0.5
Absent	19	8.20±0.6	

Skin irritation represented the most frequent complication which observed in 6.9%, followed by swollen toes and recurrence as forefoot adducted for each of them is 4.7%. Less frequent, early recurrence as moderate equinus, recurrence as mild cavus, recurrence as mild equinus, decubitus ulcer, failure of correction, cast intolerance due to pain, wet split cast, slipped cast and exuviation of skin were occurred on average 2.3% for each of them.

Table 7: Distribution of the study population according to occurrence of complications.

Variable	Number of feet	Percentage
Skin irritation	3	6.9%
Swollen toes	2	4.7%
Recurrence as forefoot adducted	2	4.7%
Early recurrence as moderate equinus	1	2.3%
Recurrence as mild cavus	1	2.3%
Recurrence as mild equinus	1	2.3%
Decubitus ulcer	1	2.3%
Failure of correction	1	2.3%
Cast intolerance due to pain	1	2.3%
Wet split cast	1	2.3%
Slipped cast	1	2.3%
Exuviation of skin	1	2.3%

4. DISCUSSION

The current study of a group of patients with idiopathic talipes equinovarus who underwent conservative treatment showed the main findings: first, patients were of a wide range of ages with mean age of 3.61±0.8 months and 66.7% of them were male. A male predominance in the incidence of defect might be related to greater number of susceptibility genes required in

females than males to inherit clubfoot and therefore would be predicted to have a higher rate of transmission of affected phenotype to their children. Second, Order of birth was the first in 40.7% of the cases due to stronger uterine muscle tonic in the first delivery. Third, family history of talipes equinovarus was present in 14.8% of cases which agree with medical literature that presence of defect in one child increases the risk of defect in subsequent pregnancies. In addition to, age of mother was in the group 20-30 years in 55.6% of cases which represents the age of marriage and delivery in our country. Fourth, 77.8% of the patients were younger than 6 months and the socioeconomic status ranged from moderate to low in majority of cases which impacts on quality of therapy.

Hip subluxation was present in 3.7% of cases which considered significant, so it is crucial to assess hips in talipes equinovarus patients. Fifthly, there was significant improvement after treatment, in which majority of cases were with Pirani score 2-6 and 88.4% had become with score≤1 after therapy.

Furthermore, tenotomy of Achilles tendon was performed significantly in males and in presence of previous therapy, which might be related to either insufficiency of these interventions or presence of severe defect due to tight connective tissue related to biomechanical difference in collagen itself.

There was significant correlation regarding number of casts and gender which was higher in males and in cases that initiate therapy at six months of age and thereafter. Finally, skin irritation**,** swollen toes and recurrence as forefoot adducted represented the most frequent complications after therapy. The results of current study are consistent with the previous studies.

Goksan et al (2002) demonstrated in a study included 31 children (44 feet) with idiopathic talipes equinovarus (mean age 3 months, 80.6% males) who underwent Ponseti method for correction the following findings: outcome was good in 95% and tenotomy of Achilles tendon was performed in 50%. Complications included recurrence in 39% as well as skin lesions in some cases.[17]

Changulani et al (2006) demonstrated in a study included 66 children (100 feet) with idiopathic talipes equinovarus (mean age 3 months, 75.8% males) the following findings: mean of Pirani score was 5(4-6) at baseline which decreased to 0.5(0-1) after therapy, and tenotomy of Achilles tendon was performed in 85%. Outcome was good in 96% with development of the following complications: recurrence (32%), slipping of plaster (5 children), bruising of legs with swelling of toes (2 children) and vascular injury in one case.[18]

Lukasz et al (2012) demonstrated in a study included 35 children (47 feet) with idiopathic talipes equinovarus (mean age 3.61±0.8 months, 71.4% males) the following findings: Pirani score ranged from 4.5 to 6 at baseline and had become in the range 0.5-1.5 after therapy and the final outcome was good-very good in 75%. Tenotomy of Achilles tendon was performed in 97.1%.[19]

Tracey et al (2016) demonstrated in a study included 173 children (268 feet) with idiopathic talipes equinovarus (mean age 8 months, 68.8% males) the following findings: 89.9% of cases were with Pirani score 2-6 and 85% of cases had become with score 0-1 after therapy. Female gender was associated with Pirani score less than one (94% vs. 81.5% in males), and the number of casts was higher in children older than two years as well as in severe defects. In addition to, presence of previous interventions and higher degree of Pirani score were associated with high frequency of Achilles tendon tenotomy.[20]

5. CONCLUSION

The current study revealed significant benefits from initiating management of talipes equinovarus as early as possible after birth by using casting, and performing of Achilles tendon tenotomy is considered as a safe and crucial intervention to achieve successful correction.

Competing of Interests

All the authors do not have any possible conflicts of interest.

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