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Research Article

Complications of Ponseti Technique in Treatment of Idiopathic Club Foot

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ABSTRACT

***Background*:** Clubfoot, or talipes equinovarus, is a congenital deformity that consist of; supination and adduction of the forefoot and midfoot; equinus of hindfoot and varus. It was found that more than 100,000 babies are born each year with congenital clubfoot

Objectives: The purpose of this study was to investigate the complications of ponseti method for treatment of children with idiopathic club foot.

***Subjects and Methods*:** 50 children with 74 clubfeet were managed by Ponseti method from May 2019 to July 2020 in Al-Wasity teaching hospital with primary correction of the deformity followed sometimes by elongation of Achilles tendon then the patients were followed up till June 2021 and the complications were calculated.

***Results*:** complications were 10.8% incomplete correction (mostly equinus) and it was corrected by surgery, 6.7% ulcer on the medial surface of head of 1st metatarsal, 9.4% cast falling and 18.9% relapse.

***Conclusions*:** Ponseti technique is a safe and effective method for correction of clubfoot and decreases the need for corrective surgery with minimal complications that can be easily managed.

Introduction

Clubfoot, or talipes equinovarus, is a congenital deformity that consist of supination and adduction of the forefoot and midfoot; equinus of hindfoot and varus. It was found that more than 100,000 babies are born each year with congenital clubfoot. most cases occur in developing countries. clubfoot causes crushing physical, social, psychological, and financial effects on the patients, their families, and the society. (1,2,3)

Club foot is an important cause of disability among congenital musculoskeletal defects. In developed countries, children with clubfoot frequently undergo extensive corrective surgery, with many failures and complications. Sometimes with one or more revision surgeries . Usually the foot looks better after surgery but it is stiff, weak, and often painful. In adolescence, pain usually increases and becomes crippling (3,4).

Clubfoot in can be corrected in 2 months or less with Ponseti tehnique of manipulations and plaster cast applications, with simple surgery. This was confirmed by the results of Dr. Ponseti 30-year follow-up study in 1995 and confirmed in many clinics around the world(5,6). At least 95% of club foot can be corrected without the need for extensive surgery if the treatment started soon after birth (7,8).

Subjects and Methods

During the period from May 2019 to July 2020, 50 patients with 74 club feet were enrolled in a prospective study, at orthopedic unit

in Al-wasity hospital using serial manipulation and casting guided by the ponseti principles. Patient age from 3 days to 1.5 years,(mean age 9.1 months) 36 patients were male and 14 were female. 23 patients were bilateral club foot, 28 patients were unilateral, 16 left, 12 right.

Inclusion Criteria: Patients with typical idiopathic congenital club foot with no other congenital abnormality.

Exclusion Criteria: All patients with other causes of club foot like spina bifida, arythrogryposis were excluded from the research.

The method: All babies were assessed clinically after explaining the method to the parents and taking their consent as following:

1. History: Pregnancy, Type of delivery and antenatal history, Neonatal history, Family history, Treatment to date, Address of the patient and phone no.
2. Examination: General examination .Orthopedic .. spine .. hips .. upper extremities - lower extremities
3. Scoring:The scoring system of pirani have been employed for all patients, each foot received a total score (TS), hind foot contracture score (HFCS) and mid foot contracture score (MFCS). This score was repeated weekly at each visit, helping us to :

asses the rate of progression of the correction .

guide us for further management e.g (if the child need tendoachilles tenotomy or need major postero-medial release).

4.Procedure: All components of the deformity were corrected in weekly step- wise as follows :

Midfoot cavus, results from pronation of the forefoot compared to the hind foot, corrected by supinating the forefoot in alignment with the hind foot; with the medial longitudinal arch well molded and the forefoot in some supination.

The foot was abducted gradually under the talus, which is prevented from rotation in the ankle by counter pressure with the thumb on the lateral aspect of the head of the talus; until the anterior part of the calcaneum is abducted from underneath the talus, heel varus will correct when the entire foot is fully abducted under the talus; the heel is never touched.

Finally, the equinus is corrected by dorsiflexing the foot; (15 -20 degree), any lack in proper dorsiflexion of the foot could be corrected by a percutaneous Ahilles tendon tenotomy under local or general anesthesia

Percutaneous Achilles tenotomy was done under general or local anesthesia (xylocaine infiltration) with systemic sedation (ketamin) in operative theatre, a small blade knife (gauge 11 or 12) was used to tenotomise the tendon, and the wound was so small that we didn't need to suture it.

For keeping the correction gained by manipulation or following Achilles tenotomy, a plaster cast is applied in 2 parts for one cast. The first part from the toes to just below the knee, and the second part from the knee to the thigh. The knee is placed at a right angle, with molding of the cast over bony prominences.

Correction of the foot is increased gradually with each manipulation and plaster cast application until hypercorrection to 70° of abduction is gained.

The period of casting ranged from (3-7) weeks prior to tenotomy if needed, then we need a further three weeks of casting before starting with the brace.

The one deformity that we failed to correct was equinus, so we used open elongation of Achilles tendon and posterior capsulotomy of ankle and subtalar joints to correct it.

None of our patients needed full posteromedial release. The number of casts needed to gain full correction of the deformity was used as an indicator for severity of the deformity.

When correction is obtained, a foot-abduction orthosis is used to keep the correction. This brace contains a bar with shoes attached at 70° of outward abduction on the affected side and 40° on the normal side. The distance between the heels should be equal to the width of the child's shoulders. The brace is worn for 23 hours for to 3 months and at night (12 hours) and during naptime (4 hours) till the time this thesis was prepared.

After that we start to follow the patients up as below;

2 weeks (for compliance issues), (noncompliance when the foot abduction orthosis was not worn for at least 10 hours a day).

2 months (to start the night and naps schedule).

Every 6 months till 13 months of age.

Results

During the period of treatment and follow-up our complications were:

Ulcer at the medial aspect of head of first metatarsal, 4 patient with 5 feet (6.7%), all above 6 months, (table 1) , (figure 1).

Table 1: (feet with and without ulcer)

	Number of feet	Percent
Feet with ulcer	5	6.7%
Feet without ulcer	69	93.3
Total	74	100%

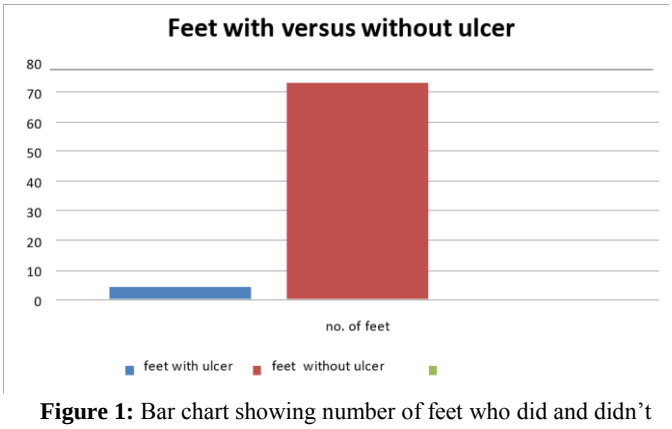

Figure 1: Bar chart showing number of feet who did and didn't develop ulcer

Cast falling4 patients with 7 feet (9.4%) , 2 cases with 3 feet were atypical club foot(short, stubby and stiff), (table 2) , (figure 2).

Table 2: (feet with and without cast falling)

	Number of feet	Percent
Feet with cast falling	7	9.4%
Feet without cast falling	67	90.6%
Total	74	100%

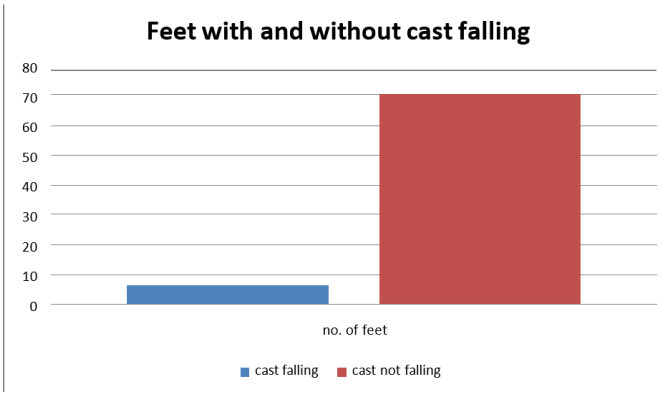

Figure 2: Bar chart showing number of feet with and without cast falling

Relapse Total of 10 patients with 14 feet (18.9%) had relapse , out of 6 noncompliant patients with 9 feet 5 patients with 6 feet (75%) had relapse, while of the other 44 compliant patients only 4patients with 6 feet (7.7%) had relapse , all above 3 months .

Relapse is defined as loss of abduction, dorsiflexion, recurrence of forefoot adduction or dynamic supination in toddlers any time after full correction which indicate poor compliance with the brace or muscle imbalance, (table 3), (figure 3).

Table 3: feet with and without relapse:

	Number of feet	Percent
Feet with relapse	14	18.9%
Feet without relapse	60	81.8%
Total	74	100%

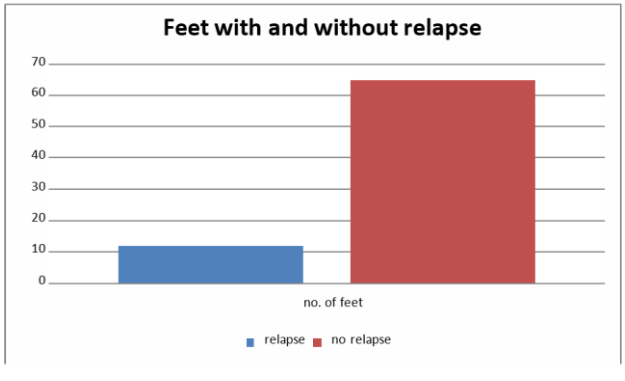

Figure 3: Bar chart showing number of feet with and without relapse

Incomplete correction were 5 patients with 8 feet (10.8%) (4 months – 1.5 years), incomplete correction is defined as inability to achieve 60-70 degrees abduction and 15-20 degrees dorsiflexion, (table 4).

Table 4: (feet with full and incomplete correction)

	Number of feet	Percent
Feet with full correction	66	89.2%
Feet with incomplete correction	8	10.8%
Total	74	100%

Discussion

Club foot is a serious cause of physical disability especially in developing nations , although treatable , many patients with this deformity undergo surgery ,leading to failures and complications , and may need for one or more revision surgeries , although the foot may look better after surgery , it is stiff , weak and painful from this observation Ponseti concluded that surgery is not the solution for children with club foot , so he started conducting his own method of serial manipulation and casting(9,10).

In this study we applied the Ponseti method for correction of idiopathic congenital club foot as it has not been used widely in our centers, we were careful in selecting patients with idiopathic congenital club foot and explained the whole program to the family before starting treatment.

The early results of this of this study demonstrate that with the use of the Ponseti method 91% of feet with idiopathic congenital club foot can be corrected with serial manipulation and casting .

Our result is a little bit lower than the result of Dr. Ponseti which was about 95%(11,12) , this may be due to our limited experience in the method , the level of education of the community which lead to less compliance of our patients with the method and less accurate follow up due the same reasons mentioned above.

The number of casts required to fully correct the deformity ranged from 3-7 casts, with the number of casts required increasing with older age and more severe stiffness of the foot, older patient have bigger, stiffer feet and more difficult to control during casting, younger patient with stiff feet also required more casts than patients of the same age which is comparable to the number of casts required by Ponseti (13,14).

We used Pirani score as a method of clinical assessment of the degree of the deformity, we found that it is a dependent measurement, it scores the amount of deformity and allows us document the progression of treatment (plotting), also it guides us to know when tenotomy is indicated (hindfoot score >1, midfoot score <1 and head of talus covered) and reassures the parents regarding progress (15).

Four of our patients (5 feet) developed ulcer on the medial aspect of head of first metatarsal due to pressure by the cast, all were above 6 months old, we think that in older patients the deformity is stiffer and more difficult to correct by casting, so lead to this pressure ulcer, all ulcers were treated easily by modification of technique (padding or opening a window in the cast).

We had 4 patients (7 feet) with the cast falling during the program, 2 of them (4 feet) had atypical club feet, they were managed by putting the cast in 120 degrees of knee flexion, and the other 2patients had cast falling due to poor hygiene by the mother.

We had 10 patients (14 feet) with relapse of the deformity, all above 3 months old, 6 had equinus and 4 equinovarus relapse, all were treated with serial manipulation and casting, then restarting the bracing protocol.

Our complications were comparable to those mentioned in the original paper published by Ponseti in 1995 (1,6,8,11) and to other recent publications.

The Ponseti method represents a complete protocol for the management of patients with club foot, including manipulation, casting, splintage, surgery and dealing with complications of treatment, so this method added greatly to other methods previously used.

Conclusion

Treatment of club foot still a challenge for many pediatric orthopedic surgeons, and knowing the pathology of the deformity is one the most important factors that can solve this problem.

The earlier the intervention of the deformity, the easier to correct it and the better the results.

We totally agree with those who dislike surgery as a primary treatment for idiopathic congenital club foot, because although surgery gives good anatomical correction (the shape of the foot), it has poor functional outcome (the foot is stiff and painful).

The Ponseti method is a safe and effective treatment for the correction of clubfoot that radically decreases the need for extensive corrective surgery, although the foot is not corrected as good as in surgery.

The minimal complications associated with Ponseti technique and the better functional results should encourage us to recommend this method as the standard in the primary treatment of congenital idiopathic clubfoot.

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Conflicts of interests

The authors declare that there are no conflicts of interest.

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