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Role of Ponseti's Method of Treatment in CTEV

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Abstract: ***Aim:*** ***To report 40 patients who underwent Ponseti method for the treatment of clubfoot deformity.*** ***Materials and methods:*** ***Records of 40 cases of congenital clubfoot with 16 cases having bilateral deformity and 24 having unilateral deformity were selected and serial casting and manipulation was done according to Ponseti method of treatment. The patients were followed up regularly for a period of 1 year and final outcome was graded as excellent, fair and poor according to the end treatment Pirani score.*** ***Results:*** ***Of the total number of cases, 85.7% our patients required percutaneous tenotomy after serial casting for full correction of deformity. Out of 56 feet 7% went into relapse. Good or excellent results were achieved in 48 feet (85.71%), fair result obtained in 4 (7.1%) of feet and another 4 feet (7.1%) went into relapse and were graded as poor outcome.*** ***Conclusion:*** ***In our study, Ponseti method of treatment showed excellent results in satisfactory number of cases and it offers adequate and simple method of correction of congenital clubfoot without the use of major surgical procedures.***

Keywords: Clubfoot, Ponseti method, serial casting, Congenital talipesequino varus.

Abbreviations: CTEV: Congenital talipesequino varus

1. Introduction

Congenital talipesequinovarus, also referred to as clubfoot, occurs in one in 1000 live births[1] and is one of the most common birth defects involving the musculoskeletal system. The term talipesequinovarus is derived from Latin: talus (ankle) and pes (foot); equinus: "horse like" (the heel in plantar flexion) and varus: inverted and adducted. Congenital meaning since birth.

The true clubfoot is characterized by cavus, adductus, varus and equinus. The adductus deformity takes place at the talonavicular and the anterior subtalar joints. In the varus component, the hind foot is rotated inwards and this occurs primarily at the talo-calcaneo-navicular joint. The equinus deformity is present at the ankle joint, talo-calcaneo-navicular joint and the forefoot. The cavus component involves forefoot plantar flexion, which contributes to the composite equinus. It is the talo-calcaneo-navicular joint dislocation with the soft tissue contractures around the ankle and talo-calcaneo-navicular joint that maintains this deformity. These contractures involve muscles, tendons, tendon sheaths, ligaments and joint capsules.[2]

Numerous etiologies have been proposed over the generations. One of the first ones, described by Hippocrates, was the mechanical theory[5] which postulates that clubfoot results from an elevated intrauterine pressure during pregnancy. In the past, a neuromuscular etiology has been proposed based on the histochemical analysis of the clubfeet.[3] Etiologically clubfoot can be classified into congenitaland acquired types.

Two classification systems are widely used in the initial evaluation of clubfoot deformities. One of these classification systems was developed by Dimeglio et al.[4] and the second by Pirani[5]. Both systems apply a point score based on a number of different physical findings, which when totaled lead to a score that correlates with clubfoot severity.

Congenital idiopathic club foot is a complex deformity which occurs in an otherwise normal child. Surgeons have struggled over the years to identify the best method of treatment for the congenital clubfoot deformity. This struggle has lessened over the last decade as the Ponseti method of clubfoot manipulation and casting, achilles tendon tenotomy, and foot abduction bracing has become the primary treatment for idiopathic clubfoot around the world.

The Ponseti method is a specific method of serial manipulation, casting, and tenotomy of the achilles tendon to achieve correction of the clubfoot.[6] Included in the method is the use of a foot abduction brace to prevent relapses as well as strategies to treat relapses once they occur based on age of the child.In general, treatment is ideally started within the first few weeks of life and consists of gentle manipulation of the foot in an office setting followed by serial application of a long leg cast as described by Ponseti.[6] The casts are changed every 7 to 10 days. In the author's experience, a tenotomy is required in over 90% of cases. After the final cast is removed, the patient goes directly into a foot abduction brace to prevent relapse.

This study intends to find the role of Ponseti method of casting and assess its importance in the treatment outcome of congenital idiopathic clubfoot.

2. Methods

Records of 40 cases which includes 16 bilateral and 24 unilateral cases (56 feet in total), aged between 1 to 80 weeks (mean age 18.55 weeks) at presentation, who underwent Ponseti method of treatment for clubfoot in the Department of Orthopaedics, Government Medical College, Patiala, Punjab, India, were reviewed. The patients included in the study were those having typical clubfoot and ranging from 1 day to 2 years of age at presentation. Patients with age more than 2 years and those having atypical clubfoot or clubfoot associated with Poliomyelitis, Arthrogryposis Multiplex congenita, Myelomeningocele or other syndromes were excluded from the study.

For each patient, complete work up of demographic details was done and all cases were allocated to the study after informed consent. Thorough clinical examination to assess the condition of skin, extent of deformity, muscle bulk, joint movement and neurovascular status of the foot was done. Clinical grading of main deformity of clubfoot was done as per Pirani's score.

The method of serial casting in our study is based on technique by Ignacio Ponseti.[6]The foot is manipulated first approximately for 1 or 2 minutes before application of plaster cast. A two-inch-wide soft roll is applied starting at toes and proceeding upward to the upper thigh. The cotton is applied snugly over the foot and loosely over the calf and thigh to avoid extra pressure.[2]

The plaster is than applied to the affected extremity as per the method. In our study, we used above knee cast in 90 degrees of flexion to prevent the casts from slipping off the child before they are ready for a change of plaster.

First cast application corrects the cavus deformity by aligning the forefoot with the hindfoot, supinating the forefoot to bring it in line with the heel, and elevating (dorsiflexing) the first metatarsal. One week after application, the first cast is removed, and after about 1 minute of manipulation, the next toe to groin cast is applied. Manipulation and casting are focused on abducting the foot around the head of talus, with care to maintain the supinated position of forefoot and avoid any pronation. Navicular can be felt reducing over the talar head by a thumb placed on the head of talus (left thumb for right clubfoot and right thumb for a left Clubfoot). Manipulation and casting is continued weekly for next 2 to 3 weeks to abduct the foot gradually around the head of the talus. The final cast is applied with the foot in the maximally abducted position of 70 degrees and dorsiflexed 15 degrees. In case 15° dorsiflexion cannot be achieved, percutaneous tenotomy[8] is to be done. After removing final cast, foot is kept in a brace to maintain the foot in its corrected position i.e. 70 degrees of external rotation and 15 degrees of dorsiflexion. The brace is to be worn 23 hours each day for the first 3 months after casting and then while sleeping for 2 to 3 years.

Percutaneous tenotomy: Tendoachillis tenotomy is planned when midfoot pirani score comes to zero after serial casting by Ponseti technique. The part is prepared with betadine solution and all aseptic precautions is taken. The tendoachillis is palpated as a tense cord when the foot is dorsiflexed. Sterile 15/11 number blade is chosen for the procedure. The foot is kept dorsiflexed to tense the tendoachillis and blade is inserted from the medial border of the tendoachillis about one finger breadth proximal to the insertion of tendoachillis or the posterior heel crease. The blade is used to cut the tense fibers of tendoachillis and a grating sensation can be felt and heard. A dorsiflexion force is continuously applied to the foot and as the tenotomy is completed a snap will be felt and heard with visible correction of dorsiflexion. A corrective cast is then applied for 3 weeks.[8]

The final results were graded as excellent, if the Pirani score remained zero; fair, if the total score was one (Hind foot score and mid foot score) or less and poor if the total score exceeded one. All feet with relapse were graded as a poor on using the Pirani score.[9]

3. Results and Discussion

In the present study, the mean pirani score at presentation was 5.49, which ranged from 3 to 6. The mean pirani score at presentation for unilateral cases was 5.29 and for bilateral cases was 5.64 which is comparable to studies done by Changulani M. et al (2006)[10], Bhaskar A et al (2006)[11], Brewster MB (2008)[12].

Table 1: Mean Pirani score at presentation among unilateral and bilateral cases.

S.No	*Laterality*	*Number of cases*	*Sum total of Pirani score*	*Mean*
1	Bilateral	32	180.5	5.64
2	Unilateral	24	127	5.29
3	Total	56	307.5	5.49

The higher mean pirani score for bilateral cases suggests greater degree of involvement of soft tissue and bony structures, which is also confirmed by the finding of higher number of casts required on an average for the bilateral cases as compared to the unilateral cases. The average number of casts applied for unilateral cases was 6.83 and for bilateral cases was 7.56 in the present study, which is similar to studies done by Changulani M. et al (2006)[10]and Moghaddam MH (2015)[13].

Table 2: Average number of casts required in unilateral and bilateral cases

S.No	*Laterality*	*Number of feet*	*Average number of casts required*
1	Unilateral	24	6.83
2	Bilateral	32	7.56
3	Total	56	5.08

Percutaneous tenotomy is required in almost 80 to 90 percentage cases of congenital clubfoot as also seen in studies done by Changulani M. et al (2006)[10], Bhaskar A et al (2006)[11]and Sayit E. et al in 2015[14]. The present study revealed similar results in which the percentage of cases requiring percutaneous tenotomy was 85.7%.

Table 3: Distribution of cases according to requirement of percutaneous tenotomy

S.No	*Percutaneous Tenotomy*	*Number of feet*	*Percentage*
1	Required	48	85.7
2	Not Required	8	14.2
3	Total	56	100

In the present study of 56 feet (40 cases; 16 bilateral and 24 unilateral) good or excellent results were achieved in 48 feet (85.71%). Fair result obtained in 4 (7.1%) of feet and another 4 feet (7.1%) went into relapse and were graded as poor outcome. Which is similar to the results obtained by Ponseti IV et al (2009)[15], Bhaskar A et al (2006)[11].

Table 4: Evaluation of result of treatment

S. No	*Grading*	*Number of feet*	*Percentage*
1	Good	48	85.71
2	Fair	4	7.1
3	Poor	4	7.1

4. Conclusion

Our experience with the use of the Ponseti method suggests that it is a simple and effective method of treating congenital idiopathic clubfoot. The Ponseti technique is reliable, with good long-term results. While talipesequinovarus is relatively easy to treat, mistreated or untreated clubfoot disease can cause severe disability, ranking it among the worst musculoskeletal diseases. No conservative method to treat orthopedic diseases is as effective as the Ponseti method. At the present time, the Ponseti method should be the first choice in the treatment of primary cases of clubfoot whether the physician prefers surgical or nonsurgical treatments. In our clinic, we found that while some cases do require surgical management, the first choice in clubfoot treatment should always be the Ponseti method because of its relative success rates, cost-effectiveness, safety, and reduced healing time.

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