

FUNCTIONAL OUTCOME FOLLOWING TREATMENT OF IDIOPATHIC CLUBFOOT USING PONSETI TECHNIQUE IN A TERTIARY CARE HOSPITAL IN SOUTH INDIA

Orthopaedics

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ABSTRACT

INTRODUCTION: Clubfoot, one of the most common congenital deformities of foot, requires early initiation of intensive treatment. Early initiation of treatment seems to result in better outcomes as observed by many orthopaedic surgeons. This study aims to assess the efficacy of Ponseti technique in correcting idiopathic congenital talipes equinovarus deformity of foot.

MATERIALS AND METHODS: It is a prospective study of 248 cases with 318 feet attending CTEV clinic in a tertiary care hospital from September 2011 to August 2018 all of whom were diagnosed to have idiopathic clubfoot. Patients with syndromic clubfoot, with neuromuscular diseases and those presenting after previous failed treatment were not included in this study. Pirani scoring system was used to assess the severity of clubfoot deformity and weekly scoring was made to assess the improvement during the course of treatment. All patients were treated by serial casting with Ponseti method. Achilles tenotomy was needed in 212 patients (85.4%).

RESULTS: In this study, good results were achieved in 96.7% of patients while 3.22% had fair results with Ponseti technique of treating congenital talipes equinovarus. No poor results were seen in this study indicating failure of treatment using Ponseti technique.

CONCLUSION: Ponseti method of manipulation followed by serial casting proves to be an effective way of managing idiopathic clubfoot provided the techniques and principles are adhered to and treatment started at the earliest.

KEYWORDS

Clubfoot, Pirani Score, Ponseti Technique

INTRODUCTION:

Clubfoot or congenital talipes equinovarus (CTEV) is a common congenital orthopaedic problem requiring early initiation of intensive treatment. The literature regarding treatment of this condition is vast with various modalities of treatment including conservative measures being suggested by Hippocrates, Kite and Ponseti and others favouring surgical treatment. However, the ultimate aim remains to achieve a supple, functional and plantigrade foot. Ponseti, in his study, has claimed to have avoided major surgery in treating clubfoot deformity by using his method of serial manipulation and casting, sometimes requiring minimal surgery. This study aims to assess the efficacy of Ponseti method in treating idiopathic CTEV.

MATERIALS AND METHODS:

This is a prospective study with 248 cases (178 unilateral and 70 bilateral) with 318 feet attending CTEV clinic in Government Coimbatore Medical College Hospital from September 2011 to August 2018. All patients were examined to rule out other associated congenital deformities like developmental dysplasia of hip, neuromuscular diseases and other syndromic associations. Patients with earlier failed operative treatment and those presenting late were excluded from this study. Informed consent was obtained from all patients before starting treatment.

INCLUSION CRITERIA:

- Age less than one year
- Unilateral or bilateral idiopathic clubfoot and
- Willingness to participate in the study.

EXCLUSION CRITERIA:

- Age more than one year
- Associated hip or spine pathologies
- Syndromic associations and
- Previous treatment history

All patients were thoroughly evaluated for any additional pathologies related to hip, spine and extremities. The severity of clubfoot deformity was assessed using Pirani scoring system (Table-1) which includes Midfoot Contracture Score (MFCS) and Hindfoot Contracture Score (HFCS).

Table – 1: Pirani scoring of severity of clubfoot deformity

Findings	Score 0 (Normal)	Score 0.5 (Moderate abnormality)	Score 1 (Severe abnormality)
Severity of medial crease	Multiple fine creases	One or two deep creases	Deep crease changing contour of arch
Curved lateral border of foot	Straight	Mild distal curve	Curve at calcaneocuboid joint
Palpation of lateral part of talar head	Cannot be felt	Less palpable	Easily felt
Severity of posterior crease	Multiple fine creases	One or two deep creases	Deep crease changing contour of arch
Emptiness of heel	Tuberosity of calcaneus easily palpable	More difficult to palpate	Not palpable
Rigidity of equinus	Normal ankle dorsiflexion	Ankle cannot dorsiflex beyond neutral	Cannot dorsiflex to neutral

THE PONSETI TECHNIQUE

The corrective process utilizing the Ponseti technique can be divided into two phases:

- The treatment phase, during which time the deformity is corrected, and
- The maintenance phase, during which time a brace is utilized to prevent recurrence.

According to Ponseti technique, the talus is the fulcrum around which reduction is made as opposed to calcaneocuboid joint in Kite's technique. The talus is stabilised by placing the surgeon's thumb over the lateral part of its head. In all cases, the first cast was applied to correct cavus by supinating the forefoot and dorsiflexing the first metatarsal as shown in Figure 1.



Figure 1: Shows position of foot after application of supination cast

As a first step, below knee casts are applied while holding the foot in reduction which is then converted to an above knee cast with knee in 90° of flexion. After application of each cast, the surgeon must ensure that the nail beds of all the toes are visible with good capillary refill. Each cast is retained for a week.

In the next visit, if cavus was not found corrected, the supination cast was repeated till cavus is corrected followed by progressive abduction casts as shown in Figure 2. Weekly abduction casts are applied till the foot can be abducted to 70°. Equinus is usually corrected with sequential abduction of foot.



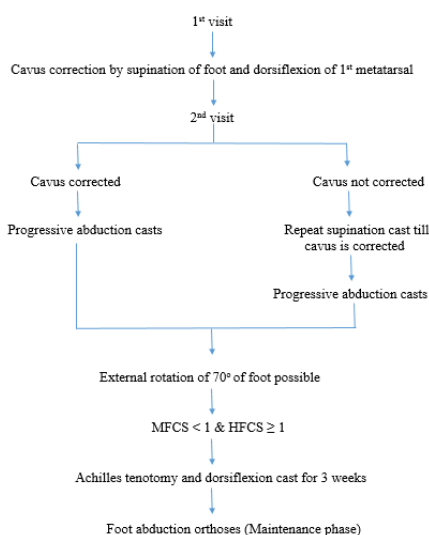
Figure 2: Showing progressive abduction casts with the foot in 70° of external rotation in final abduction cast

Complications such as vascular occlusion presenting as delayed capillary refill or bluish discoloration of toes, abrasions on the skin over skin creases or bony prominences, slippage of casts and blisters were identified and noted.

In cases with residual equinus, percutaneous Achilles tenotomy followed by application of toe-to-groin cast with the foot in 70° of abduction and 15° of dorsiflexion. Achilles tenotomy was performed with the child under anaesthesia (caudal block + IV sedation) using No. 15 blade. Once the pop of the Achilles tendon is felt, equinus can be corrected and the cast applied with foot in dorsiflexion.

After removal of the final cast, the maintenance phase is started by provision of a foot abduction orthosis which consists of shoes mounted on a bar. The shoes are externally rotated to about 70° with dorsiflexion of about 10-15°.

The order of correction in clubfoot as followed in our institution is shown in Flowchart 1.



All the feet were evaluated at each follow up visit using the Pirani score and maintained as a separate file for each patient. The appearance of sequential casts is shown in Figure 3.



Figure 3: Correct appearance of Sequential casts in Ponseti technique

During the first four months of maintenance phase, the orthosis is applied throughout the day i.e. 23 hours with rest only for changing the dress or cleaning the child. Then, the brace is worn during night time only till four years of age. At the end of the study, all feet were graded as good, fair or poor based on Pirani score at final follow up as follows:

- Good – All deformities corrected by Ponseti technique alone or with additional percutaneous Achilles tenotomy
- Fair – If Achilles tendon lengthening or a posterior release of the ankle and subtalar joint were done to achieve correction
- Poor – If Ponseti technique failed to give complete correction of deformity

RESULTS:

In this study, out of the total 248 cases (318 feet) of idiopathic clubfoot deformity, most of the children were below 1 month old. The youngest patient was 3 days old while the oldest was 26 weeks old. Treatment was initiated at a mean age of 8.03 weeks (range 1-26 weeks). 72% of the children were male. The male to female ratio in this series was 2.5:1. 178 (71.7%) patients had unilateral foot involvement while 70 (28.23%) patients had bilateral foot involvement. Overall mean Pirani score of all the feet that presented to us was 5.02. The mean Pirani score for male and female feet were 5.02 and 4.80 respectively.

Mean age of incidence of tenotomy was 12.6 weeks. Achilles tenotomy was done in 212 patients (85.4%) while 28 patients (11.3%) did not require tenotomy. Achilles tendon lengthening and posteromedial soft tissue release was required in 8 patients (3.23%). No patient in this study group required any extensive or bony surgical procedures for correction of idiopathic clubfoot.

The mean number of casts applied for correction was 8.8 in patients who required Achilles tenotomy while it was 6.8 in the non-tenotomy group. 240 patients (96.78%) under treatment showed good compliance with foot abduction brace while 8 patients (3.22%) were non-compliant with brace wear. All 8 patients had relapse of deformity which was treated with a second series of manipulation and casting. These patients were then counselled again and strictly followed bracing till correction. There were complications in 40 patients (16.13%) which constituted minor conditions like erythema, superficial abrasions especially the skin over talar head as can be seen in figure 4.



In this study, good results were achieved in 96.7% of patients while 3.22% had fair results with Ponseti technique of treating congenital talipes equino varus. No poor results were seen in this study indicating failure of treatment using Ponseti technique.

DISCUSSION:

More than 100,000 babies are born worldwide with congenital talipes equinovarus each year and 80% of this disease burden is seen in developing nations. It is therefore very important to diagnose this condition and aggressively treat it so that the physical, social, psychosocial and financial burdens on the patients, their families and society can be significantly brought down in neglected clubfoot patients. The treatment of clubfoot by Ponseti technique is economical and easy.¹

Ponseti technique for correction of congenital talipes equinovarus requires proper manipulation, serial corrective cast with long term brace compliance for achieving and maintaining correction. It has also been confirmed through various studies that the Ponseti method has led to reliable restoration of the clubfoot deformity to a functional, plantigrade foot in 95% of patients.^{1,2,3}

Treatment guidelines regarding patient selection and treatment protocol vary between investigators. However, treatment started as early as possible and followed under close supervision.^{4,5,6}

It has been seen from earlier studies in literature that treatment of clubfoot using Ponseti technique has yielded success rates ranging from 73%-100%.⁷ In our study, Ponseti technique for treating clubfoot deformity has yielded good results in 96.77% and fair results in 3.22%. Many patients who presented to us at an early age had supple foot and relatively lower Pirani scores requiring fewer casts for correction while those presenting late i.e. more than 8 weeks had rigid feet with higher Pirani score requiring more number of casts.⁸

Complications following manipulation and casting includes increased cavus deformity, apparent correction with mid-tarsal breach and rocker bottom deformity, pressure sores from casts and fractures due to excessive force application during manipulation and casting.⁹ In this study no major complications other than pressure sores were identified. This is possible by making sure that correction is centered on the fulcrum i.e. talar head, avoiding excessive force during manipulation and proper padding applied over bony prominences, heel and flexor creases.

Morcuende in his study noted relapse in 6% of compliant families and more than 80% of non-compliant families.¹⁰ In our study, relapse as a result of non-compliance of bracing protocol was seen in 3.22% of patients, all of whom were treated with a second series of Ponseti technique of manipulation and casting followed by strict bracing protocols.

According to Scher it is advisable to do tenotomy after achieving forefoot abduction of about 70°.¹¹ This protocol was adhered to in patients undergoing Achilles tenotomy in our study. Following tenotomy, dorsiflexion cast was applied with the foot in 10-15° of dorsiflexion for three weeks after which they were given foot abduction orthosis to maintain correction.

The foot abduction brace is worn for 23 hours a day during the next four months after which night-and-naps bracing is continued till the child reaches four years of age. In this study, it was noted that, non-compliance of brace wear was associated with relapse as was seen in other studies.

CONCLUSION:

In our study, the Ponseti method of casting for idiopathic congenital talipes equinovarus was successful in avoiding extensive surgery in more than 95% of our cases. Percutaneous tenotomy performed during the first few months of life has been shown by Cooper and Dietz¹⁰ to be a simple procedure, with no long term adverse effect on muscle strength or function. Although Ponseti method significantly reduces the need for surgery in clubfoot management, the surgeon must make sure to follow the techniques of manipulation and casting with strict adherence to bracing protocol as can be seen from this study.

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