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Evaluation of Results of CTEV Correction By Serial Casting of Ponisetty Technique

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Abstract

Background: Multiple treatment modalities have been reported for managing such cases like bone grafting, tissue transfers, antibiotic cement and Ilizarov technique. Bone grafting itself poses limitations of size and morbidity of the donor site. The aim of the present study was to determine the accuracy of Ilizarov technique in managing non-united infected tibial fractures. *Materials and Methods:* The present prospective study was conducted in the Department of Orthopaedics, Mata Gujri Memorial Medical College, Kishanganj, Bihar (India) for duration of 2 years. All the subjects were followed up for a period of 10 months. Under complete aseptic conditions, all the subjects were taken up for surgery. Debridement of the area was done, and the material was sent for sensitivity tests. Bone nibbling was performed until fresh bleeding was encountered. At regular intervals, X-rays were taken to determine the radiological extent of bone healing. Assessment was done based on Fernandez Esteve grading. In case of any discharge from the tract, infected pin was removed and exchanged in the same sitting. Once healing was satisfactory, ring and fixator were removed, and cast was applied. *Results:* The mean age of the subjects was 38.87 ± 3.22 years. There were 13 males (59.1%) and 9 females (40.9%) in the study. There were 3 males and 2 females with bone shortening of 1–3 cm. The union time amongst them was 6 weeks and the consolidation time was 9–10 months. *Conclusion:* Treatment using Ilizarov method with infected tibial fractures provides promising results. Optimal fixation was seen amongst subjects in the present study.

Keywords: Consolidation; Fractures; Ilizarov; Infected.

Introduction

Clubfoot is a condition, wherein one or both feet of the newborn are rotated inwards and downwards. Normally, in case of the affected foot, the foot would be smaller than the normal one. Most of the time, it is not associated with any other problem, though the patient walks on the sides of their feet. However, when left unattended, the problem magnifies, the joints become stiff and the arthritis sets in [1–3]. Of many deformities of the foot, clubfoot is one of the commonest congenital conditions seen in orthopedic practice. Though congenital talipes equinovarus (CTEV) exists from time immemorial, its etiology is unknown, pathology is complex and management is full of controversies.

It is estimated that more than 100,000 babies are born worldwide each year with congenital clubfoot.[4] Eighty percent of the cases occur in developing nations.[5,6] Most are untreated or poorly treated. Neglected clubfoot causes crushing physical, social, and financial burdens on the patients, their families, and the society. Globally, neglected clubfoot is the most serious cause of physical disability among congenital musculoskeletal defects. Two to three out of every 1000 children born in India suffer from Club Foot or Congenital Talipes Equino Varus (CTEV).[5]

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The prevalence of clubfoot has been reported in the orthopedic literature to be two per 1000 births, with the definitive treatment being largely surgical. This takes place between the ages of 3 months and 1 year. Non-operative treatment of idiopathic clubfoot has become increasingly accepted worldwide as the initial standard of care.

The Ponseti technique was described in the early 1960's, but it is only in the last decade that its benefits in the early treatment of clubfoot deformity have been highlighted. The method has been suggested as being particularly suited to the developing world because of its inherent simplicity and conservative methodology.[7] This Non-operative treatment of clubfoot provides a lower complication rate, less pain, and higher function as the patient ages than operative treatment. If treated before 7 months of age, the success rate is said to be 92% at an early follow up after casting was completed.[8].

Clubfoot in an otherwise normal child can be corrected in 2 months or less with ponseti method of manipulations and plaster cast applications, with minimal or no surgery. This method is particularly suited for developing countries like India. A well-organized health system is needed to ensure that parents follow the instructions for the foot abduction brace to prevent relapses. The treatment is economical and easy on the babies. If well implemented, it will greatly decrease the number of clubfoot cripples.[8]

This study was thereby conducted to study and to evaluate the results of correction of CTEV by ponsetti technique and its effectiveness as well as the its functional outcome.

Materials and methods

This prospective study was performed by the department of orhtopedics at Chalmeda Anand Rao institute of medical sciences over a period of two years. 28 patients below one year of age, who came to our hospital with idiopathic clubfoot on one or both feet were included into the study. The nature of the study was carefully explained to the parents or guardians and informed consent were taken from them. Patients who were above 1 year, or those who had postural, syndrommic, neglected or relapsed club foot were excluded form the study. Those patients who were non compliant or those who refused to consent to the study and those who were unfit for the procedure were also excluded from the study.

Complete history including consanguinity, birth history, family history and milestones were taken for all the patients. The severity of the deformity was graded according to according to Pirani Severity Score; clinical scoring, the initial total Pirani score and the final total Pirani score of each foot was calculated. Parents were explained about 6 to 10 casts at weekly interval; tenotomy and wearing of foot abduction brace till 3 to 4 years of age, and parents were also explained about other methods of treatment. Patients were followed up clinically for a minimum of six months after completion of treatment. Routine Blood investigations were done before tenotomy. Scoring of the foot was done before first casting and then on every visit before applying cast, and changes were scrutinised.

The Pirani scheme scores six clinical signs either 0 (normal), 0.5 (moderately abnormal), or 1 (severely abnormal). These clinical signs are three in the midfoot and three in the hindfoot. IN the mid foot score, grading the amount of midfoot deformity between 0 and 3 for Curved lateral border, Medial crease, Talar head coverage and the three signs comprising the Hindfoot Score (HS), grading the amount of hindfoot deformity between 0 and 3 was Posterior crease, Rigid Equinus, and Empty heel.

The treatment was in 2 stages: Correction of the deformity by weekly serial casting and Maintenance of that correction by bracing. Casting was begun as soon as possible after birth. Some babies had to be called a week later in view of fragile neonatal skin. In all babies, pirani scoring was done to assess the initial severity.

First Cast Application: Baby was allowed to sleep or bottle fed or breast fed on the mother's lap. Head of the talus palpated in front of the lateral malleolus, lifting the head of first metatarsal by holding it with thumb and index finger of one hand and pressing gently over the head of talus (as fulcrum) with thumb of other hand, cavus was corrected. This corrects the pronated forefoot, aligning it with already supinated hind foot.

After 1 to 2 minutes of gentle manipulation, cotton soft rolls of 3 inch width was wrapped from toe towards the thigh, while assistant holds the head of first metatarsal gently. Cotton soft rolls were applied covering half of its width in every rotation. It was applied snugly over the foot and the ankle, and loosely over the calf and thigh. Thigh was covered with extra cotton. Plaster bandage (3 inch width) applied from toe, while assistant holding the toe, towards knee. Initially 3 to 4 rotations given over the toe covering the assistant's finger then gradually proximated towards knee.

Plaster was applied snugly over the foot and ankle and loosely over calf.

The molding of casts was done according to the manipulation. Assistant leaves the foot and surgeon starts molding by lifting head of first metatarsal using head of the talus as fulcrum, making medial longitudinal arch normal. Molding was done over malleoli, talar head, medial arch and heel. Cast was extended upto thigh keeping knee at 90° of flexion, with more plaster over anterior aspect of knee and less over popliteal fossa. After applying cast, toes were checked for capillary filling and overcrowding or any excessive cry or leg banging of baby to rule out any abnormal pressure due to cast application. Patients were asked to revisit after 7 days.

First cast and all the cast were removed by soaking the whole cast with water and unrolling the so formed soft plaster bandage, by holding end of the plaster bandage which was left for identification.

Second to last cast to correct adduction and varus: After the entire preliminary requirement for baby's comfort, manipulation was started within hour of previous cast removal. The casting protocol is same.

Over the next 2 or 3 weeks the foot was serially abducted to bring about over correction. Additional casting would sometimes be needed. When the calcaneum was sufficiently abducted beneath the talus, scoring was assessed.

When midfoot score had fallen below 1 but hindfoot score remained over 1, it was indicative of residual equines deformity requiring release of the contracture. This was when the decision to perform Percutaneous Tendo-Achillis Tenotomy would be taken. Tenotomy was done under sedation achieved by syrup pedicloryl and local anaesthesia.

The last cast was applied after gaining 15–20 degrees of dorsiflexion and 50–70degrees of abduction and satisfactory varus correction. This cast was applied keeping the foot in 70 degrees of abduction and 15–20 degreesvof dorsiflexion for 3 weeks. After removal of cast, the outcome is, a painless, plantigrade with good mobility and cosmetically acceptable foot. After the removal of last cast, the brace was applied. Here we used Denis Browne splint keeping the heel at shoulder width apart with foot in abduction of 70 degrees and dorsiflexion of 15–20 degrees Knees are kept free. Weekly follow up was done during initial periods of bracing to ensure compliance and to periodically assure and educate the parents. Later monthly follow up was advised.

Results

In our study group total 28 patients with idiopathic congenital Talipes Equino Varus were treated conservatively with ponseti technique. A total number of 38 feet in 28 patients of clubfoot were treated. 18 patients (64.3%) were male, 10 (42.8) were female (Fig. 1).

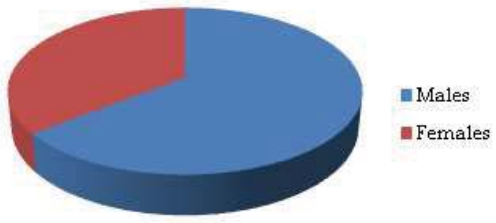

Fig. 1: Sexwise distribution of the patients

The mean age at presentation of all the patients were 2.8 month (84 days), with range of 0.16–10 months (5–300 days). The minimum age at presentation for starting treatment was 5 days. The most common age at presentation was between 0–4 months (71.4%), and the least common was between age 8–12 Months (7.2%) (Table 1).

Table 1: Agewise distribution of patients

Age	Number	Percentage
0–4 months	20	71.4%
4–8 months	6	21.4%
8–12 months	2	7.2%

Of the 28 patients 10 patients (35.7%) had bilateral involvement, 18 patients (64.3%) had unilateral involvement out of which 12 (42.9%) had right foot involvement and 6 (21.4%) had left foot involvement (Table 2). No relationship had been found with birth order or with family history.

Table 2: Laterality of clubfoot

Side	Number	Percentage
Right	12	42.9%
Left	6	21.4%
Bilateral	10	35.7%

Tenotomy was required in majority of the cases. 30 (78.9%) of the feet had casting with Tenotomy, while 8 (21.1%) had only casting (Fig. 3)

Table 3: Method of equinus correction.

Equinus correction	Number	Percentage
Casting	8	21.1%
Casting with Tenotomy	30	78.9%

The mean number of casts applied for 0–4 months age group was 5.4, between 4–8 months, it was 5.82 and for 8–12 months, it was 7. By using, the 10-point Pirani scoring system we calculated the average Pirani score for the age group 0–4 months to be 5.34, 4–8 months as 5.5 and 8–12 months as 5.75. A positive correlation was observed between the initial Pirani score and number of casts required for the correction which showed increase in number of casts as the score increased.

Table 4: Mean Pirani score and no of casts in relation to age.

Age group	Mean Initial Pirani score	Mean final Pirani score	Average no of casts
0–4 months	5.34	0.17	5.45
4–8 months	5.5	0.28	5.83
8–12 months	5.75	0.75	7

Discussion

Clubfoot or congenital talipes equinovarus is a complex deformity of foot whose etiopathogenesis remains poorly understood. Idiopathic is suspected to be the commonest type. The effect of the deformity on the social and physical life of the patients and their parents cannot be over emphasized. The method of serial manipulation and casting developed by Ponseti for congenital club foot was instituted in an effort to achieve a plantigrade, functional foot without the need to resort to major surgical intervention.

In the present study, a total 28 patients with idiopathic congenital Talipes Equino Varus were treated conservatively with ponseti technique. A total number of 38 feet in 28 patients of clubfoot were treated.

Ratio of male to female 1.8:1, which is similar to many other studies. Chesney *et al*.[10] reported a male :female ratio to be 2:1, Yamamoto reported 3:1 [11] and Ankur *et al*. reported 4:1.[5] In India higher incidence in male may be due to social bias, ignorance and increased attention towards males.

Number of casts per feet ranged from 5–7. Mean total number of casts applied for 0–4months, 4–8 months and 8–12 months are 5.4, 5.82 and 7 respectively in the present study. Number of casts increased with age at presentation (late presentation). There is correlation between the initial Pirani score and number of casts required for the correction which showed increase in number of casts as the score increased. In a study by Laaveg *et al*.[12], the mean number of casts was 7, Morcuende[13] reported 5 or less in 90% of the cases, Ankur *et al*.[5] reported 4.9 while Rebecca Kampal[14] reported 5.2.

Of the 28 patients 10 patients (35.7%) had bilateral involvement, 18 patients (64.3%) had unilateral involvement out of which 12 (42.9%) had right foot involvement and 6 (21.4%) had left foot involvement. Bilateral involvement was reported to be 37.6% and 4.% in studies by Ankur *et al*.[5] and Agarwal *et al*.[15] respectively.

Tenotomy was required in 30 feet out of 38 feet (78.9%). There was no apparent difference in proportion of tenotomy and cast application separately among male and female. Pirani carried out tenotomy in over 90% of his clubfoot patients, Laaveg *et al*.[12] in 78%, Dobbs *et al*.[16] in 91%, Ankur *et al*.[5] in 95 and Changulani M *et al*.[17] in 85%.

Conclusion

The Ponseti technique of clubfoot deformity correction is a very effective method providing the patient with painless, plantigrade, mobile, cosmetically acceptable foot with higher functional outcome. It is also an Easy, Effective and Economical method of CTEV correction. There is a strong link between the initial Pirani score and the duration of treatment treatment and requires more number of casts for the correction. Many centres now believe that most clubfeet can be treated by Ponseti casting technique rather than surgery

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