FUNCTIONAL OUTCOME OF IDIOPATHIC CLUBFOOT TREATED WITH PONSETI TECHNIQUE OF TREATMENT

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ABSTRACT

BACKGROUND

Globally neglected clubfoot is the most serious cause of physical disability among congenital musculoskeletal defects. It is estimated that more than 1,00,000 babies are born worldwide each year with congenital clubfoot. Eighty percent of the cases occur in developing nations. We studied the effectiveness and functional outcome of idiopathic clubfoot treated with Ponseti technique of treatment.

MATERIALS AND METHODS

In our study, 64 male and 32 female patients were enrolled with bilateral involvement in 53 cases. We treated 149 idiopathic clubfeet in 96 patients using Ponseti technique of manipulation and serial casting followed by foot abduction brace.

RESULTS

The mean age at onset of treatment was 68 days (range 7-180 days). 87.8% (79 patients) presented to us in first 8 weeks after birth, average Pirani severity score was 5.46 points (range 4.5-6 points). Mean followup was 18 months (range 10-54 months). On average, 5.6 casts (range 4-10) were needed before performing the tenotomy. Tenotomy was carried out in 119 feet (85%), the mean postoperative Pirani score was 0.32 showing good/excellent results in 132 (94.3%) feet. Relapse was encountered in 10 patients (9%) and 16 clubfeet (11.4%).

CONCLUSION

Ponseti treatment method is economical and easy on the babies. If well implemented, it will greatly decrease the number of clubfoot cripples. It is particularly suited for developing countries where there are few orthopaedic surgeons per million populations.

KEYWORDS

Clubfoot, Ponseti Technique, TA Tenotomy.

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BACKGROUND

The regular occurrence of inborn foot deformities had been recognised since ancient times. They appear as isolated foot deformities or as part of syndromes, e.g. multiple arthrogryposis; chromosomal abnormalities; aplasia of fibula; spina bifida, etc.

Clubfoot also known as Congenital Talipes Equines Varus (CTEV) is one of the common deformities. It has four components: Equinus, mid foot cavus, forefoot adduction and hindfoot varus.

The congenital is classified into idiopathic and non-idiopathic types. The idiopathic type is typically an isolated skeletal anomaly, usually bilateral, has a higher response rate to conservative treatment and a tendency towards a late recurrence.

The incidence of CTEV is 1-2 per thousand live births.(1) It is estimated that more than 1,00,000 babies are born worldwide each year with congenital clubfoot. Eighty percent of the cases occur in developing nations.(2) Globally, neglected clubfoot is the most serious cause of physical disability among congenital musculoskeletal defects.

In agrarian society, physical disability is associated with lack of employment opportunities and physical and financial dependence, which in turn causes mental distress to the patients and to their family. So, early identification and vigorous treatment of congenital clubfoot is mandatory to avoid the development of physical disability.

Most surgeons now treat clubfoot conservatively, International Clubfoot Study Group, established in 2003, has approved Kite's, Ponseti's and Bensahel's techniques as the standardised conservative regimes for the treatment of clubfoot all over the world.(3)

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The list of operative procedures is endless as no single procedure gives a long-lasting correction and after surgery the feet had become rigid, weak and painful.[2]

Looking at all the conservative options available to treat club foot, we decided to study the effectiveness and functional outcome of idiopathic clubfoot treated with Ponseti technique of treatment.

MATERIALS AND METHODS

Study was conducted from April 2008 to December 2015 in Shivamogga Institute of Medical Sciences, Shivamogga. In this study, 96 patients of age 1 week to 2 year with idiopathic clubfoot were enrolled after obtaining the informed consent from the parents. This was a prospective study.

All the patients were evaluated through detailed history and physical examination. They were investigated with routine blood and urine investigations to rule out any accompanying medical or surgical conditions. General examination was performed to rule out the possible complex syndromic malformations and neuromuscular disorders associated with clubfoot. These patients were excluded from our study. Patients treated earlier with other methods of plaster cast application, surgery and operated for clubfoot. Concomitant major illness were excluded. Informed consent was obtained from all the patients enrolled in our study.

All the clubfoot patients in this study were graded according to the Pirani severity score[4,5] for hind foot, midfoot and total score before the onset of treatment and compared with Pirani score after Ponseti technique[6] of manipulation and casting.

The Pirani scoring system consists of 6 categories, 3 each in the hind foot and midfoot. In midfoot, Curvature of the Lateral Border (CLB) of the foot, medial crease (MC), uncovering of the Lateral Head of the Talus (LHT) and in hindfoot Posterior Crease (PC), Emptiness of the Heel (EH) and degree of Dorsiflexion (DF). Each category is scored as 0, 0.5 or 1. The least (best) total score for all categories combined is 0 and the maximum (worst) score is 6.

All the patients in our study were treated with the Ponseti Method. According to this sequence: corrective manipulations, serial casting, tenotomy and bracing.

The Ponseti Technique

Ponseti technique is divided into two phases: Treatment phase and the maintenance phase. The treatment starts as soon as the skin condition permits the use of plaster casts, till that time regular corrective manipulation of the foot by the mother is carried out. The first cast is aimed to correct cavus by aligning the forefoot with the midfoot and hind foot and this is achieved by elevating the first ray so that forefoot is supinated with respect to the midfoot and hind foot.

While manipulating, talus is stabilised by placing the thumb over the lateral part of its head and well-padded groin to toe. Plaster cast is applied by holding this position and molding it well.

One week later, the first cast is removed and once the cavus has been corrected, then the foot is gently manipulated for short period by stabilising the talus with thumb placed over the lateral part of its head and foot is abducted gradually with each serial cast.

A crucial point in the Ponseti technique is that the heel is never directly manipulated. The correction of heel varus and ankle equinus takes place simultaneously because of coupling of the tarsal bones. Weekly plasters are applied till 70 degrees of abduction is achieved, then correction of residual equinus deformity is accomplished with a percutaneous surgical release of the Tendo Achillis (TA) tendon. After tenotomy, the final cast is applied with the foot in 70 degrees of abduction and 10-15 degrees of dorsiflexion. This cast is retained for three weeks. On removal of the final cast, an orthotic which typically consists of shoes mounted to a bar is used to maintain the foot in its corrected position.

On each followup visit, foot was evaluated for deformity correction using the Pirani score and the goniometric assessment of the deformity, which was charted on a graph paper. Achilles tendon tenotomy was performed when the hind foot score was more than 1 and the midfoot score was less than 1. We preferably performed tenotomy in operation room under general anaesthesia. After the final cast, all children were given orthotic as described in the Ponseti technique to maintain correction. The orthotic was applied full time except during bathing and cleaning for the first three months and then at night time and whenever baby sleeps (night and naps) for two to four years.

Patients not having satisfactory correction at the end of 10^{th} week were subjected to operative methods for deformity correction.

Our study included 64 male and 32 female patients. There was bilateral involvement in 53 cases. We treated 149 idiopathic clubfeet in 96 patients.

RESULTS

During initial part of our study though 96 patients got enrolled, but 5 patients were lost to follow up and one patient could not be revived after general anaesthesia given for TA tenotomy, so our final study group was of 90 patients (140 idiopathic clubfeet) after excluding these 6 patients.

The mean age at onset of treatment was 68 days (range 7-180 days). 87.8% (79 patients) presented to us in first 8 weeks after birth, however, 51.1% patients presented on second or third day after birth. For these patients, cast was applied at week of age when mother was usually discharged from the hospital. The mean severity of the clubfoot deformity assessed by the Pirani severity score was 5.46 points (range 4.5-6 points).

Mean followup was 18 months (range 10-54 months). On average, 5.6 casts (range 4-10) were needed before performing the tenotomy. Tenotomy was carried out in 119 feet (85%), the mean postoperative Pirani score was 0.32 showing good/excellent results in 132 (94.3%) feet. Relapse was encountered in 10 patients (9%) and 16 clubfeet (11.4%) mainly due to poor compliance with orthotic use (Denis Browne splint). All the relapses were treated with repeat manipulation and serial casting, which usually

responded with three to four casts and we could achieve the full correction.

Unilateral Clubfoot before Start of Treatment

Foot with Second Corrective Cast Application

Final Correction Achieved after Application Five Casts, Further Treated with Foot Abduction Brace

DISCUSSION

Clubfoot problem is a serious problem in the developing countries due to late presentation, high rate of dropout (of treatment) and superstitious beliefs attached to this congenital problem.[7] Along with these problems, there is a disproportionately low number of qualified orthopaedic surgeons available to manage this problem.

For better results, treatment should start as soon as possible.[2,6,7,4] We started our treatment as early as one week after birth when the biological response bone is best and can gradually reduce or almost eliminate the deformities in most clubfeet.

It's observed in clubfoot patients that there is an increase of collagen fibers and cells in the ligaments of neonates. The bundles of collagen fibers display a wavy appearance known as crimp. This crimp allows the ligaments to be stretched. Gentle stretching of the ligaments in the infant causes no harm. The crimp reappears a few days later allowing for further stretching. That is why manual correction of the deformity is feasible.[2,6]

Our study comprised of 64 male 32 female patients (2:1 ratio). In our series, female patients were more as compared to Pulak S et al[7] study, which consisted of 4:1 male-to-female ratio and Yamamoto H et al[8] had 3:1 ratio. 53 (58.8%) cases had bilateral involvement, which is near comparable to study by Pavone et al.[9] In their study, bilaterality observed in 49.2%, but Pulak S et al[7] reported only 35% bilateral cases.

In our study, 87.8% (79 patients) presented to us in first 8 weeks after birth and 51.1% patients presented on second or third day after birth, which is comparable to study by Pulak S et al[7] where 87.5% presented in first 6 weeks after birth.

In our study, initial mean Pirani severity score was 5.46 points (range 4.5-6 points), which is slightly lesser than from studies by Pavone et al[9] and Pulak S et al,[7] which reported 5.56 and 5.6, respectively.

On average, 5.6 (range 4-10) casts per feet were necessary before performing the tenotomy. Pavone et al[9] needed 6.6 (4 to 13) plaster. Pulak S et al applied three to ten (average 4.9) plaster. Study by Laaveg et al,[10] the mean number of casts during their treatment was seven. Morcuende[11,12] reported that 90.0% of the patients required five or fewer casts. In a series by Ponseti et al,[6] the number of cast per feet was five to ten (average).[11,13]

Feet with initial Pirani score 6 underwent more number of casts as compared to feet with lesser Pirani score. The duration decreased overtime as we mastered the technique of manipulation and casting.

In a study by Pulak S et al,[7] 94.3% patients needed tenotomy. Laaveg et al[10] did tenotomy in 78.0% cases. Pirani carried out tenotomy in over 90.0% of his clubfoot patients. Pavone et al[9] did tenotomy in 74.9%. In our study, tenotomy was done in 85% of patients and tenotomy was required in those patients who initially had severe deformity with Pirani score of 6.

Pavone et al[9] had only 3.9% relapse rate after the correction of deformity. Pulak S et al[7] encountered 5%

relapse rate, but in our series relapse was seen in 10 patients (9%) and 16 clubfeet (11.4%) increased rate of relapse in our series was mainly due to poor compliance with orthotic (Denis Browne splint).

In our study, mean postoperative Pirani score was 0.32 showing good/excellent results in 132 (94.3%), which is comparable to study by Pavone et al[9] and Pulak S et al.[7] The Ponseti method is an excellent method of treatment of clubfoot.[10,14-16,] It avoids the complications of surgery and gives a painless, mobile, normal-looking functional foot, which requires no special shoes and allows fairly good mobility.[2,6,10,]

In a developing country like India and in remote areas, this technique is a very safe, easy, result-oriented and economical method of clubfoot management. Though relapses could be treated with repeat manipulation and serial casting, adequate motivation and persuading the parents to accept long-term brace treatment helps to maintain the correction over a longer period of time and to prevent relapse.

CONCLUSION

Ponseti treatment method is economical and easy on the babies. If well implemented, it will greatly decrease the number of clubfoot cripples. It is particularly suited for developing countries where there are few orthopaedic surgeons per million populations.

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