ORIGINAL ARTICLE

A Prospective Study on Functional Outcome of Percutaneous Tendoachilles Tenotomy in CTEV

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Abstract:

Background and objectives: The most prevalent musculoskeletal birth abnormality, affecting 1 in 1000 live births. is idiopathic clubfoot. Clubfoot abnormalities include equinus, cavus, heel varus, and forefoot adductus. The Ponsetti approach has become the most common non-operative therapy for clubfoot across the world, and Percutaneous Tendo Achilles Tenotomy is a component of this procedure that is utilized to accelerate the correction of equinus deformity. Objectives: The purpose of this study was to assess the merits of percutaneous Tendo Achilles tenotomy in Ponsetti correction. Materials and Method: Twenty babies with 36 idiopathic clubfeet were treated at GMKMCH, Salem. The patients were followed prospectively for 2 years and assessed for the results. All feet were initially graded for the severity of deformity by PIRANI scoring, and treated according to the Ponsetti method. Results: Twenty babies underwent 36 Percutaneous Tendo Achilles Tenotomy. The average PIRANI score was 5.8 prior to casting. The average number of casts applied prior to surgery was 7.8. The average age at the time of surgery was 4.8months (range $1\frac{1}{2}$ –10 months).No child had a delay in discharge. No surgical or anaesthesia-related complications occurred. No child needed a repeat procedure due to an incomplete tenotomy. Conclusion: In conclusion percutaneous tendo Achilles tenotomy in the infantile period is safe and inexpensive procedure with a very low complication rate.

Keywords: Tendoachilles, Musculoskeletal birth abnormality, CTEV, Ponsetti Method, PIRANI score, Percutaneous Tendo Achilles tenotomy.

Introduction:

The most prevalent musculoskeletal birth abnormality, affecting 1 in 1000 live births, is idiopathic clubfoot. Clubfoot abnormalities include equinus, cavus, heel varus, and forefoot adductus^[1]. Management of CTEV

should begin soon after delivery. Several studies over the last two decades have shown that the Ponsetti technique successfully corrected >95% of clubfeet^[2,3]. This procedure has become the most common non-operative therapy for clubfoot all around the world, and percutaneous Achilles tenotomy is a portion of this treatment that is utilized to speed up the correction of equinus deformity, while casting can also be used to correct moderate cases of equinus^[4]. The clubfoot is with this managed non-operatively procedure. Manipulation is done with one hand's thumb over the talar head and the other hand's index finger and thumb on the first metatarsal head^[5]. Cavus is rectified by raising the first metatarsal head, and the following procedures are performed sequentially by abducting the forefoot in supination until the foot is maximally abducted. After achieving abduction, equinus is corrected by either a Percutaneous Tenotomy of Tendo Achilles or stretching with the palm of a hand^[6]. Stretching being done only in those feet where the foot can be brought to or within 5 to 10 degrees of neutral with gentle manipulation to achieve further dorsiflexion of at least 15 to 20 degrees^[7,8]. The purpose of this study was to assess the outcome following percutaneous Tendo Achilles tenotomy in CTEV. Our study included 20 children with 36 idiopathic clubfeet.

Material and Methods:

A prospective study of all patients with idiopathic clubfoot, who attended our clubfoot clinic between November 2020 and May 2023 was carried out. At presentation, each clubfoot was assessed clinically and scored using the PIRANI scoring system. Each foot was treated conservatively by serial manipulation and cast application according to the Ponsetti protocol. Percutaneous Achilles tenotomy was performed for feet with persistent equinus deformity following correction of forefoot deformities, prior to the application of the final cast. The percutaneous Achilles tenotomy sites were assessed after 3 weeks following removal of the final cast. Also, assessment of passive dorsiflexion as well as clinical scoring of all treated feet using the PIRANI

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system was done. We received Institutional ethical committee approval (GMKMC&H/4341/IEC/2019-399). Under general anesthesia, with the infant lying supine, the affected extremity was held by an assistant with the knee flexed, the ankle dorsiflexed, and the foot externally rotated. The area was then prepped in a sterile manner. The surgeon can then palpate the medial aspect of the tendoachilles approximately 1 cm superior to its insertion and insert a size 15 blade in a vertical manner just medial and anterior to the tendoachilles. The blade is then turned 90 degrees so that its cutting side is facing the tendoachilles and it is advanced laterally and posterior until the tendoachilles is felt to be completely severed, a pop sound is heard and a palpable gap is detected. A sterile bacteriostatic, nonadherent gauze dressing and cast padding are placed before a plaster long-leg Ponsetti cast is applied. Meticulous monitoring was done to check the capillary refilling of the toes during & after the application of the cast. This cast was continued for 3 weeks. After 3 weeks to prevent relapse of deformity, Dennis-Brown bar with shoes was applied for full time i.e., whole day and night, for about 3 months for 23 hours every day and later 2-4 hours a day and 12 hours at night(i.e., about 15-16 hour per 24 - hour period) till 2 years of age. Patients with idiopathic CTEV, Patient treated with ponsettti casting technique, Final Mid foot PIRANI scores at zero after ponsetti casting technique, Primary and follow-up treatment done completely at our institution and Age of the patient less than one year were included in the study. Patients with Syndromic CTEV, Patient's parents not giving consent for study and not willing to be part of study were excluded from the study.

Results:

Among n=20 patients, 12 (60%) were male and 8 (40%) were female as show in Fig 1. The male & female ratio was 1.5:1. The mean age of this study population was 4.8 months with a range of $1\frac{1}{2}$ – 10 months. Among the patients, 15 cases (60%) were in the age group of 1-6 months, 5 cases in the age group of 6-12 months. Among these 20 patients, none of them had family history. We found that 16 patients (80%) had bi-lateral club feet & 4 patients (20%) presented with unilateral club foot. Among the unilateral cases, three of them were left sided & only one wasright sided club foot.In this study, Pre tenotomy mean PIRANI score was found 2.08 which 3 weeks after tenotomy& final casting, became 0.33 as shown in Fig 2,3. The mean number of above knee POP cast applied on patients were 7.8 (range between 4-14)as shown in the Table 1 and 2.

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TABLE-1:	Demographic	Profile o	of Study	Population
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Variable		Number	Frequency
Gender	Male	12	60%
	Female	8	40%
Age	1-6 Months	15	75%
	6-12 MONTHS	5	25%
Family	Positive	0	0%
History	Negative	20	100%

Figure 1: Images showing deformity of foot in different angles



Figure 2 : Correction of deformity by Percutaneous Tendoachilles Tenotomy

a. A15 blade is inserted along the medial border of the tendon approximately one finger width above its insertion, and its tip is toggled anteroposterior while gradually moving from medial to lateral until a snap of complete tenotomy is felt.

b. The blade is removed; the foot is kept in dorsiflexion.



Figure 3 : Final dressing and casting procedure is done when there is no ooze from the incision site. Images showing corrected foot



 Table 2: Relationship between PIRANI score before

 cast and after cast removal

Sr				PIRANI Score		
No ·	Age/Se x	Diagno sis	Procedure	Before Cast	Pre Op	Foll ow Up
1.	4 Months Fch	B/L CTEV	B/L Percutaneous Tenotomy	6/6	2/3	0/0 .5
2.	4 Month Mch	LEFT CTEV	Left Percutaneous Tenotomy	6	2.5	0
3.	8 Months Mch	B/L CTEV	B/L Percutaneous Tenotomy	5.5/6	1.5/ 2	0/0 .5
4.	10 Months Mch	B/L CTEV	B/L Percutaneous Tenotomy	6/6	2/2. 5	0/1
5.	2 Months Fch	B/L CTEV	B/L Percutaneous Tenotomy	6/5.5	1.5/ 1.5	0/0
6.	1½ Months Fch	B/L CTEV	B/L Percutaneous Tenotomy	6/5	2/1. 5	0.5 /0
7.	1½Mon ths Mch	B/L CTEV	B/L Percutaneous Tenotomy	6/6	2/2	0.5 /0. 5
8.	7 Months Mch	B/L CTEV	B/L Percutaneous Tenotomy	5/6	1.5/ 2.5	0.5 /1
9.	8 Months Mch	B/L CTEV	B/L Percutaneous Tenotomy	6/5.5	2/1. 5	0.5 /0
10.	2 Months Fch	LEFT CTEV	Left Percutaneous Tenotomy	5.5	2	0.5

11.	3 Months Mch	B/L CTEV	B/L Percutaneous Tenotomy	6/6	2/3	0/0. 5
12.	2 Months Fch	RIGHT CTEV	Percutaneous Tenotomy	6	2.5	0
13.	2 Months Mch	B/L CTEV	B/L Percutaneous Tenotomy	5.5/6	1.5/ 2	0/0. 5
14.	4 Months Fch	LEFT CTEV	Percutaneous Tenotomy	5.5	2	0.5
15.	5 Months Mch	B/L CTEV	B/L Percutaneous Tenotomy	6/5.5	1.5/ 1.5	0/0
16.	9 Months Mch	B/L CTEV	B/L Percutaneous Tenotomy	6/5	2/1. 5	0.5/ 0
17.	5 Months Mch	B/L CTEV	B/L Percutaneous Tenotomy	6/6	2/2	0.5/ 0.5
18.	4 Months Mch	B/L CTEV	B/L Percutaneous Tenotomy	5/6	1.5/ 2.5	0.5/ 1
19.	5Months Fch	B/L CTEV	B/L Percutaneous Tenotomy	6/5.5	2/1. 5	0.5/ 0
20.	4 Months Fch	B/L CTEV	Percutaneous Tenotomy	6/6	$\frac{2/2}{5}$	0/1

Discussion:

In this study, 20 individuals with a combined 36 club feet were included. Male patients made up 12 (60%) of the instances, while female patients made up 8 (40%). Desai et al. observed that Male : Female ratio was 2:1 ratio in his study[^{10,11]}. Haft, Walker, and Crawford also reported in 2007 that 65% of their patients were male. Among the 52 patients, 18 (34.61%) had bilateral involvement, 19 (36.53%) had right foot involvement, and 15 (28.84%) had left foot involvement. Laaveg and Ponseti discovered a similar sort of finding earlier. Yamamoto discovered that bilateral and unilateral afflicted cases were nearly equal in number in another study^[12,13]. In their study, Changulani et al. found 52% bilateral and 48% unilateral club foot. None of the participants in this research had a similar family history. Dietz reported a favourable family history in 2002, showing that one-third of patients had club foot. In this study, the mean PIRANI before tenotomy was score 2.08:Matuszewski, Gil, and Karski discovered that the

pre-treatment PIRANI score for their patients varied from 4.5 to $6.21^{[12,13,19]}$. In our patients, the average number of plaster casts used was 7.8 (range: 4-14). Dyer and Davis said that the average number of casts required throughout the course of treatment was 5.31 (2 to 9). Singh et al. made a comparable observation. According to Changulani et al., the mean PIRANI score at presentation was 5.0 (4 to 6), at the conclusion of first therapy was 1.5, and the mean number of casts required was six (2 to 12), which is similar to the results of this investigation. In our investigation, the PIRANI score after the final casting was $0.33^{[14,15,19]}$. Matuszewski, Gil, and Karski discovered a 0.5 PIRANI score at 8 months and a 1.5 PIRANI score 42 months following Achilles tenotomy. There were no complications during or after the percutaneous tenotomy procedure. Changulani et al. discovered that 68% of patients relapsed after starting therapy^[16,19,20]. Janicki et al. also observed a 31% recurrence that necessitated further therapy^[17,18]. In our investigation, none of the feet required conversion or open tenotomy. In any of our instances, there was no skin/soft tissue infection. However, post-tenotomy infection was detected in the studies of Lourenço and Morcuende in 2007, as well as in another study by Dyer and Davis^[22-25]. Because we focused mostly on percutaneous tenotomy in this study, the average follow-up length for these patients was 4.5 months (1 to 8 months). Changulani et al. evaluated the

Ponsetti procedure for an average of 18 months (6 to 30)^[13,19,25]. In their study, Lourenço and Morcuende also followed up on clubfoot patients for an average of 3.1 years (ranging from 2.1 to 5.6)^[25]. Both authors evaluated the outcome of Ponsetti therapy in clubfoot patients. The primary goal of this research is to raise awareness of this procedure and encourage other surgeons to utilise and validate it, since additional data is needed to define the technique's limitations.

Conclusion:

This percutaneous tenotomy surgery provides a safe and effective method for treating Equinus deformity in CTEV newborns using the Ponsetti technique. This treatment is minimally invasive, leaves no scars, is easy to do. In our study, 18 feet out of 10 patients had an optimal correction. There was no inflammation of the skin or soft tissues. In our study, no foot required conversion or open tenotomy. The surgical blade percutaneous tenotomy technique with 15 size surgical blades is a successful way to execute Achilles tenotomy with a very low probability of failure. It is a straightforward surgical procedure used to treat idiopathic clubfoot patients who had their Ponsetti method corrected. However, more evidence in the form of prospective comparative studies will be needed to support this percutaneoustenotomy as a standard procedure in clubfoot management. Sources of supports: Nil

Conflicts of Interest: Nil

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