

Frequency of Achilles' Tenotomy in Club foot treated By Ponseti Method

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Abstract

Background

Idiopathic clubfoot is the most frequent and difficult musculoskeletal congenital disability, affecting approximately one in every 750 babies. We intended to evaluate clubfoot defect outcomes using the Ponseti procedure because of its stated success rate of 93 percent. When compared to operational therapy, it is said to have a reduced complication rate, less discomfort, and improved functional outcomes at effected foot.

Methods

This analytical case series was conducted in Abbasi Shaheed Hospital, Karachi, Pakistan, from September 2021 to September 2022. The data were collected from medical records of patients by non-probability consecutive sampling techniques. Patients with CTEV defects were included. The various parameters of interest were included in questionnaire. The SPSS version 21 was used to analyze data.

Results

A total of 170 patients were registered with the CTEV history, the patient's age distribution was 1 year with a mean 5.21 ± 2.3 , median 5, and age range was 10 months, most patients were with 5 months of age (4.85 – 5.55 at 95% I). 137 patients were less than 6 months of age (80.6%), and 33 patients (19.4%) registered with a club foot. 78% of patients were males, while 22% of patients were females. Regarding club foot deformity, 110(64.7%) suffered unilateral CTEV, while 60 (35.3%) had bilateral CTEV. Achilles tenotomy was performed in 123 patients (72.4%). None of the variables were found significant in this study regarding tenotomy in CTEV patients, either unilateral or bilateral (p -value > 0.05)

Conclusion

Achilles' tenotomy is typical in our setting when using the Ponseti manipulation and serial casting approach to treat patients with CTEV up to 8 months of age. Before beginning the Ponseti manipulation and serial casting for CTEV, it must be thoroughly addressed with the child's parents.

Keywords

Clubfoot, Ponseti, Achilles Tenotomy, Congenital, Talipes, Equinovarus

Introduction

Clubfoot or congenital talipes equinovarus (CTEV) is the most prevalent congenital orthopaedic disorder needing severe treatment (1 to 2 in 1000 live births). (1,2) A variety of theories on the genesis of congenital clubfoot have been postulated, including a halt in embryonic development. (3) A retractive fibrotic reaction is proposed as a second theory for the etiology of clubfoot. (4)

The innate stiffness of clubfeet was clarified by Zimny and colleagues, who identified myofibroblastic retractile tissue in the medial ligaments (5) The association of clubfoot with various neurologic entities is well known, with some of the most severe clubfeet being associated with paralytic disorders such as arthrogryposis and spina bifida (6,7)

It is rarely difficult to identify a true clubfoot in a newborn. The classic appearance of the heel in marked equinus, with the foot inverted on the end of the tibia, giving the foot an upside-down appearance in more severe cases, is difficult to mistake for anything else. Lack of correct ability separates a true clubfoot from the milder postural clubfoot. The milder manifestations represent an in utero postural deformity, identified by the fact that it is fully or nearly full correctable passively and by the conspicuous absence of the significant contractures and deep skin creases of a true clubfoot. A postural clubfoot exhibits none of the atrophy and rigidity of true talipes equinovarus. Postural deformity can frequently be passively corrected at initial evaluation by several minutes of gentle stretching. In addition to distinguishing the severity, it is also essential to search for associated anomalies and neuromuscular conditions that define a nonidiopathic deformity. If surgical release of a clubfoot is needed, it must be done judiciously rather than aggressively or completely because the foot will have a propensity to be overcorrected and overcorrection will result in an equally severe and perhaps unreconstructable calcaneovalgus deformity if the laxity of the

underlying syndrome is not taken into account. On the other hand, patients with arthrogryposis, diastrophic dysplasia, Möbius' or Freeman-Sheldon syndrome, are notorious for defying correction and subject to severe recurrence. Although there have been recent reports of correction of patients with arthrogryposis and spina bifida by Ponseti's nonoperative technique, the need for surgical correction should be expected. Such techniques as primary bone resection (e.g., lateral column shortening, talectomy) and complete division of tendons rather than lengthening are often used in the management of these syndromic types of clubfeet.

Determination of the initial severity index is an important assessment of each component of talipes equinovarus because it alerts the surgeon and family to the need for heel cord tenotomy or possible surgical release. (8,9) Almost all orthopaedists agree that the conservative treatment of idiopathic clubfoot should be a first choice. Most also agree that the earlier the treatment is begun, the more likely that it will be successful because of the relatively viscoelastic character of the newborn foot. (10) However, enthusiasm for non-operative treatment remains at an all-time high on account of the success that is currently being achieved with the Ponseti and the French physiotherapy techniques. (11-13) The assessment of severity and its response to treatment can be evaluated by using Pirani scoring system. (14)

The Ponseti procedure of treating clubfoot is beneficial when performed promptly after delivery, but it has also been found to be useful in children as young as two years old, even after previous failed non-surgical therapy. (15) The Ponseti technique has a claimed success rate of 93 percent. (16) The Ponseti technique is a safe and successful treatment option for CTEV that significantly reduces the need for substantial corrective surgery. (17)

When compared to operational therapy, it is said to have a reduced complication rate, less discomfort, and improved function as the patient matures. (18) Correction of the deformity is done in the sequence of C.A.V.E.; cavus is rectified first, then adductus, varus, and finally equinus. Currently, there is frequently a residual equinovarus that necessitates a percutaneous Achilles' tenotomy. (19) Ponseti casting has been shown to be effective in lowering the number of patients who require extensive surgical releases and has therefore become a vital element of paediatric orthopaedic therapy. (20) However, some equinovarus deformity may remain, necessitating Achilles' tenotomy (21), as part of the Ponseti clubfoot repair procedure. (22) Achilles' tenotomy was necessary in 61.4 percent of patients, according to local research done in Peshawar. (23)

The aim of this study is to determine whether Achilles' tenotomy is required or not following ponseti treatment in cases of CTEV. To our knowledge, there is no such consensus available regarding Achilles' tenotomy.

Materials and methods

This was a case study of 6 months from September 2021 to September 2022, after the Departmental Research Committee (DRC) and ethical review committee ERC approval.

The study was conducted in the Club foot clinic of the Orthopedics Department at Abbasi Shaheed Hospital, Karachi, Pakistan. Only registered club foot patients based on the Pirani score and Ponseti method from age day 1 to 1 year were included. Patients who were not fit for Achilles tenotomy or club foot deformity with syndromes like arthrogryposis, nail-patella syndrome, congenital constrictive bands, and muscular dystrophies, diastrophic dwarfism, and lead poisoning and children above 1 year of age were not included in this study. A sample of 162 patients was calculated via a non-probability consecutive sampling technique. The patient's parents were thoroughly briefed on the Ponseti procedure, and a written informed consent was obtained from the parents by a skilled surgeon with at least five years of expertise. Following selection of permission, the patient's foot will be assessed using the Pirani scoring method (appendix I) and put into the performa. The Ponseti manipulation and casting technique were followed. Each cast was applied for 7 days. This method was repeated weekly until the sixth cast, with any additional castings documented in the performa up to a total of eight casts. At each visit, equinus, cavus, and varus correction were evaluated, and the Pirani score was recorded when the cast was removed. Improvement in the score was noted. Each cast and foot were tallied individually. At the last visit (6th cast \pm 2 casts), it is noted whether the equinus is corrected upto 10 degrees above neutral and the need for Achilles' tenotomy assessed subsequently.

Under local anaesthesia, percutaneous achilles' tenotomy was performed by an experienced orthopedic surgeon with five years of experience in Achilles tenotomy. A 3ml of 2% lignocaine was diluted in 2ml distilled water. Bleeding from the incision was also observed after procedure and a three-week cast was applied. Each child's clotting and bleeding time were recorded prior to tenotomy. All the recorded data with their descriptive frequencies were analyzed through SPSS version 19.

Results

A total 170 patients were registered with the age distribution of club foot patient was 1 year with mean 5.21 ± 2.3 with median 5 and age range was 10 months, mostly patients were 5 months of age, 137 patients were less than 6 months of age (80.6%) and 33 patients (19.4%) registered with club foot clinic. Most of the patients were male 78% while 22% patients were females as shown in table 1.

Regarding club foot deformity 110 (64.7%) were suffered with unilateral CTEV while 60 (35.3%) had bilateral CTEV. 57 patients (33.5%) were treated with 9 casts while only one patient had up to 12 casts. Achilles tenotomy was performed in 123 patients (72.4%) in which 96 patients were male and 27 were female.

Table 1: Clinical summary of 170 patients.

Table I:

Variable		Mean \pm SD n(%)
Age (Years)		5.21 \pm 2.3
Gender	Male	132(78.0%)
	Female	38 (22.0%)
Club foot deformity	Unilateral CTEV	120 (64.7%)
	Bilateral CTEV	60(35.3%)
No of cast applied	6	38(22.4%)
	7	22(12.9%)
	8	49(28.8%)
	9	57(33.5%)
	10	3(1.8%)
	12	1(0.6%)
Achilles Tenotomy on Club Foot Patients	Yes	123 (72.4%)
	No	47(22.6%)

Table 2 represents cross tabulation of achillestenotomy according to gender, club foot, number of cast applied and age groups. According to table, 75 patients with unilateral club foot were gone through achillestenotomy while 48 patients with bilateral club foot deformity need tenotomy. Mostly patients were less than 6 months were required tenotomy 80.6%. 6 (3.5%) Similarly 7 patients (4.1%) and 14 patients (8.2%) do not need Achilles tenotomy after application of 7 and 8 cast respectively while 15 patients (8.8%) after 7 casts and 35 patients (20.6%) need Achilles tenotomy after 8 casts. None of the variables were found significant in this study regarding tenotomy in CTEV patients either unilateral or bilateral (p value > 0.05)

Table 2: Cross tabulation of Achilles Tenotomy

Variable		Done n(%)	Required n(%)
Gender	Male	96 (56.5%)	36 (21.2%)
	Female	27(15.9%)	11(6.5%)
		Yes n(%)	No n(%)
Clubfoot	Unilateral CTEV	75(44.1%)	35(20.6%)
	Bilateral CTEV	48(28.2%)	12(7.1%)
Number of cast applied	6	32 (18.8%)	6 (3.5%)
	7	15 (8.8%)	7 (4.1%)
	8	35 (20.6%)	14 (8.2%)
Age Groups	1-6 months	100 (58.80%)	37 (21.80%)
	More than 6 months	23 (13.50%)	10 (05.90%)

*Values are given as n(%)

Discussion

CTEV is one of the most common inborn malformations. It is a difficult to correct complicated deformity that includes equinus, varus, adductus, and cavus. It takes a lot of efforts and skills of the operating surgeon and team to improve the deformity¹¹. The aim of the procedure was to minimize deformity as much as possible.

Over the last decade, there has been a shift away from substantial soft-tissue release surgery for CTEV and toward minimally invasive techniques that rely more on manipulation and casts. The Ponseti casting procedure for CTEV deformity treatment necessitates a series of casts and braces for long term to maintain deformity correction. The Ponseti casting technique produced acceptable anatomical and functional outcomes while being simple, effective, minimally intrusive, affordable, and suitable for many nations and cultures. According to the study, the results were better if this treatment procedure was begun as soon as feasible after delivery (19,11).

More over half of the CTEV patients in our study were born prematurely. This has been the experience of other authors, and it is most likely related to the current increased consciousness of the parents' entity. The mean pre-treatment Pirani score groupings in these series were identical to those previously reported. In our series, the average number of plaster casts required per foot was 6.25. All studies, including ours, found that inflexible feet required more casts than non-rigid feet.

In our study, 123 (72.4 percent) of the patients underwent percutaneous tenotomy. Tenotomy was required in 95% of patients in Gupta et al study and 91% of patients in Dobbs et al study⁽²⁴⁾. All the studies demonstrate that tenotomy is essential in individuals who have a significant malformation from the start. "A foot that requires several casts for the first repair is more likely to require future further surgery," according to Bor et al. A vast percentage of paediatric orthopaedic surgeons believe that the Ponseti casting technique's effectiveness is dependent on whether casting begins within hours of birth.

The most challenging aspect of the Ponseti casting procedure is sticking to the bracing routine. Our study group's parents noted that the first two or three days were important, during which patients were restless and attempted to remove the splint. Following that, the patients were fitted with splints. Parental compliance can be increased by educating parents on the correct use of bracing as well as the dangers of improper or inadequate bracing.

Another challenging aspect of the study was the follow-up. Restoring the foot with a serial cast, with or without tenotomy, is simply one aspect of complete care. With the first correction of the foot, parents mistakenly believe that the most difficult aspect of the therapy is complete, and as a result, they do not return for follow-up. We motivated the parents and their family members to help us solve this challenge. Though none of our patients dropped out of follow-up, one patient's follow-up was highly erratic; this patient later required further surgical therapy.

A Royal College of Surgeons investigation found 38 male and 12 female clubfeet in 27 cases, with bilateral involvement. A local research found that 30% of patients had bilateral malformation, with 12.5 percent men and 17.5 percent females. (22)

Our findings are consistent with earlier research that reveal a male gender preponderance and unilateral CTEV involvement. In our study, 43 (61.4 percent) of patients had Achilles tenotomy to correct equinovarus, while 27 (38.6%) had repaired foot with Ponseti casting without tenotomy. Except for the tenotomy, no other surgical treatment was used to repair the deformities in our research, reported that tenotomies were performed on 55 of the 71 feet, or 77.5 percent, whereas studies reported that twenty-four (32%) of the CTEV requires some addition surgeries other than tenotomy, including tendon transfer for tibialis anterior in 21% patients in previous study. (25) Used ultrasonography to study the detrimental effect of Achilles tenotomy on clubfoot-related calf muscle atrophy and discovered that Achilles tenotomy had no serious negative short-term repercussions on calf-muscle atrophy correlated with clubfoot. (26) According to study, reported the benefits of pain control, the ability to do surgery in a much better way and the possibility of diminishing the pain response of the infant, and nearly all patients can be discharged on the day of surgery. (27) Researcher have argued that direct visualisation of the tendon through a mini-open incision may lower the risk of neurovascular damage, particularly for inexperienced surgeons. (28) Another study assessed the safety of this approach for the treatment of clubfoot when conducted as a "office operation" without sedation or general anaesthesia during the last stage of the serial casting regimen, collecting data retrospectively. (29) They discovered that tenotomy performed in the office under topical and local anaesthetic is a safe treatment with no significant readmission rate to the emergency department. We have also done percutaneous Achilles' tenotomy under local anesthesia using diluted 2% lignocaine without any complications.

Conclusion

CTEV is one of the most common birth deformities in children. Achilles' tenotomy is typical in our setting when using the ponseti manipulation and serial casting approach to treat patients with CTEV up to 8 months of age. Parents or guardians must be counselled properly before beginning the ponseti manipulation and serial casting for CTEV. Education and awareness programs can help to enhance parental compliance.

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