

# Neglected CTEV in a 3-year-old Boy Treated by Triple Achilles Hemisection, Anterior Tibial Tendon Transfer and Posteromedial Capsular Release: A Case Report

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**Abstract:** CTEV is one of the most common congenital disabilities of the musculoskeletal system. It has been demonstrated that the Ponseti method is the gold standard for treating clubfoot. Although relapses do occur, this represents a significantly smaller proportion. A 3-year-old boy came with relapsed crooked right foot after 2 years of Achilles tenotomy. The patient previously had a serial plaster cast using the Ponseti method for 6 times, then it was decided to do an Achilles tenotomy surgery with an above knee cast immobilization. However, after followed by the use of a removable orthotic for up to 6 months, the parents did not comply with the foot abduction brace protocol. The Pirani pre-operatively was 3.5. We performed an Achilles tendon lengthening surgery with triple Achilles tendon hemisection, with anterior tibial tendon transfer and posteromedial capsule release. The foot was immobilized for three weeks in a above knee cast. After the surgery, the Pirani score was reduced to 0.5. The Ponseti approach, which is an efficient and secure therapy for clubfoot, has been shown to be the gold standard. After Ponseti method, the corrected foot can relapse for several reasons. Noncompliance with the foot abduction brace was associated with an increased risk of relapse and worsening of the deformity. This emphasizes the importance of parent education, support, and close frequent monitoring of patients in order to identify any compliance issues early on and modify the brace accordingly.

**Keywords:** CTEV, ponseti, clubfoot relapse, abduction brace protocol.

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## I. INTRODUCTION

Congenital talipes equinovarus (CTEV) is a disability characterized by leg deformities in hindfoot varus, forefoot (metatarsus) adductus, an augmented midfoot arch (cavus), and equinus which can affect one or both legs [1]. CTEV is one of the most common congenital disabilities of the musculoskeletal system [2]. According to epidemiological studies that have been published, over the past 55 years, the birth prevalence of clubfoot is between 0.5 to 2.0 cases per 1000 live births [3]. Meanwhile, the incidence of CTEV in Indonesia ranges from 0.76 to 3.49 cases per 1000 live births [4]. Without treatment, it will worsen until adulthood, causing morbidity such as pain and long-term dysfunction [5].

The main cause of CTEV is still unknown. The development of CTEV thought to occurs in the second trimester of pregnancy [6]. An individual's likelihood of being born with CTEV is increased by a family history of the condition. There is a 2-4% possibility that a CTEV patient's siblings will also have the disease. A child is more likely to have CTEV (from 10% to 20%) if both parents, a prior child, or another family member does. The likelihood that a new family member will be born with CTEV increases as the number of family members with CTEV increases [7]. Honein et al (2000) found a link

between CTEV and maternal smoking during pregnancy in a research involving 346 CTEV neonates and 3029 control births [8]. The adjusted risk ratios for smoking on its own were 1.34, 6.52 for family history alone, and 20.30 for maternal smoking and family history together. This suggests that genetic variables and tobacco exposure interact with one another. Another systematic review by Hacksaw et al (2011) also found a significant positive association between smoking and CTEV with odds ratio of 1.28 [9].

The commencement of the treatment is crucial for achieving positive outcomes. As soon as feasible, any foot deformity should be corrected to promote balance [10]. During the initial weeks of life, conservative treatment is advised [11]. Although it has been demonstrated that the age at which treatment begins does not make a significant difference, clubfoot can be corrected at a later age [12]. It has been demonstrated that the Ponseti method is the gold standard for treating clubfoot because it is effective and secure [13]. Using this method, the success rate is typically around 90% [14]. Although relapses do occur, this represents a significantly smaller proportion. The objective of this paper is to present cases of patients with CTEV relapse and explain a about the causative factors related to it. The current study has been reported in accordance with SCARE 2020 standards.

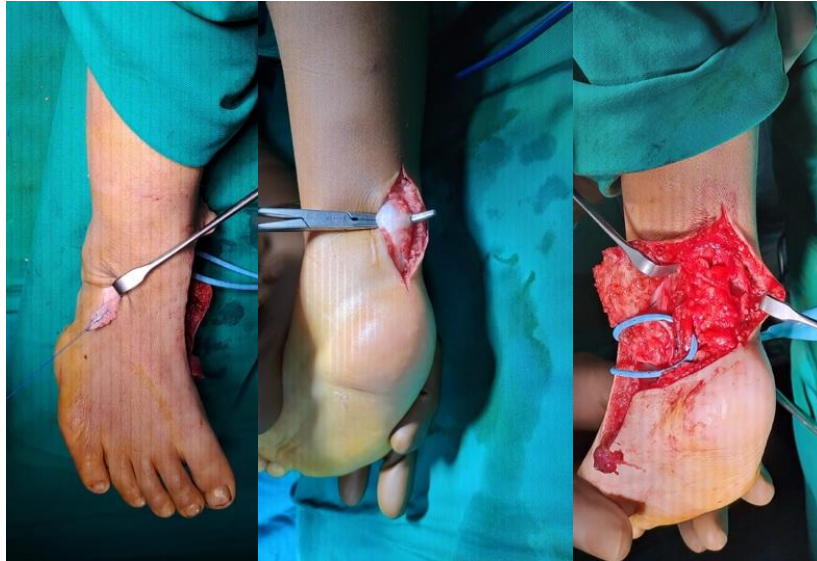
## II. CASE DESCRIPTION

A 3-years-old boy came with a crooked foot since birth. The patient was born at full term with a normal delivery. There were no complications during the pregnancy or delivery. Neither was he born as a twin nor was he discovered to be born in the breech position. No other congenital deformities or congenital deformities in the patient's family are known. The patient had a serial plaster cast using the Ponseti method for 6 times followed by the use of a removable orthotic for up to 6 months. At 6<sup>th</sup> month, there was still a deformity in the patient's foot, so it was decided to do an Achilles tenotomy with an above knee cast application. However, the parents did not comply with the foot abduction brace protocol following the surgery. On examination, the patient was strolling with his feet internally rotated and was prone to falling. He was unable to stand for more than 10 minutes and required help from the parents at any time. On physical examination, there was a deformity on the patient's foot as seen in Fig. 1. The Pirani scoring system showed a total score of 3.5 with a presence of lateral border = 1; posterior crease 0.5; talar head 0.5; equinus 1; empty heel 0.5.



**Fig. 1 Patient's clinical picture.**

From the physical examination and x-ray, we assessed the patient with relapsed congenital talipes equinovarus of the right foot. Preoperative planning was carefully established taking into account the patient's age and foot characteristics, which included dynamic forefoot supination, midfoot cavus, and hindfoot equinus. The following was the planned procedure for correction: Achilles tendon lengthening, anterior tibial tendon transfer and posteromedial capsule release. Triple Hemisection (Hoke) approach was done to lengthen the Achilles. Then, to reveal the insertion of the tibialis anterior tendon at the base of the first metatarsal and medial cuneiform, a linear incision was performed over the first tarsometatarsal joint. After being separated from the bone, the tibialis anterior tendon was prepped using 3-0 polypropylene suture as seen in Fig. 2. The tibialis anterior tendon was then moved subcutaneously to the lateral cuneiform and fastened with a button anchor.



**Fig. 2. Tibialis anterior tendon transfer and Achilles tendon lengthening**

The foot was immobilized for three weeks in above knee cast with -10-degree dorsiflexion and 70-degree abduction following surgery followed by application of Dennis-Browne splint protocol as seen in Fig. 3. The patient began a weight-bearing program three weeks following surgery, followed by quadriceps, peroneal, and tibialis anterior muscle strengthening exercise. After his surgery, the patient has improved his standing and walking balance, his capacity for high-impact activities, and—most importantly—his ability to interact socially with his peers. The Pirani rating system assigned a score of 0.5 to the clinical appearance.



**Fig. 3. Above knee cast and Dennis-Browne splint protocol**

### III. DISCUSSION

Since the Ponseti method of treatment was introduced, the management of CTEV has undergone a complete transformation. The Ponseti approach, which is an efficient and secure therapy for clubfoot, has been shown to be the gold standard [15]. The method consists of delicate and repetitive manipulations intended to gradually stretch the soft tissues, followed by weekly cast immobilization. First, it is necessary to identify the various musculoskeletal structures so that the manipulations can be performed correctly and precisely, followed by the placement of a weekly-changing cast. Finally, the equinus deformity is corrected by executing a minimally invasive Achilles tendon tenotomy, followed by three weeks of cast immobilization. After the removal of the cast, an abduction splint is applied [16]. Corrective bracing is utilized for the Ponseti treatment's short-term effects [17].

The biggest worry is a relapse, which is expected to occur more than 50% of the time [18]. A relapsed clubfoot is the recurrence of any component of deformity following a complete clubfoot correction [19]. Equinus and adductus, alone or in combination, with or without dynamic supination, are the most prevalent relapse manifestations [20]. According to

Ponseti, CTEV has an endogenous tendency to relapse, expressing the unknown pathogenesis of the deformity. Relapses are actually brought on by the same condition that first led to the malformation [21]. After using the Ponseti procedure, repaired foot can relapse for unclear reasons. There appears to be a correlation between relapses and the intensity of collagen synthesis as the foot develops. Thus, premature infants experience relapses more frequently than older infants [21]. According to published reports, the maximum recurrence rate occurs between the ages of 1.5 and 4 [22]. Therefore, even for children with CTEV who are beginning to walk, correction is still necessary.

The likelihood that a deformity will reoccur depends on several factors such as the degree of the deformity, the number of casts needed to repair it, accuracy, and adherence to the recommended orthotic treatment [23]. Compared to more flexible deformities, rigid clubfoot has a greater propensity to recur [24]. The relapse of clubfoot following the Ponseti technique may be caused by a number of factors, including insufficient gait training, muscle imbalance, insufficient correction of the initial deformity, and noncompliance with the abduction brace protocol [25]. Noncompliance with the abduction brace protocol is regarded as a significant contributor to the loss of correction following the Ponseti method [20].

In the literature, there is no consensus on the definition of 'non-compliance' to foot abduction brace. Zhao et al (2014) stated that noncompliance with foot abduction brace is the most significant risk factor for relapse [26]. The range of reported noncompliance is 0% to 51% [27] [28]. Chand et al (2018) reported that 86% of relapsed clubfoot patients did not adhere to the foot abduction brace protocol with sixty-six percent had more than three deformities [20]. Thus, noncompliance with the foot abduction brace was associated not only with an increased risk of relapse, but also with a worsening of the deformity. According to Mahan et al (2017), relapse in patients younger than two years was more strongly associated with noncompliance than relapse in patients older than two years [29]. Therefore, compliance with brace abduction protocol is extremely relevant to Ponseti technique outcome (recurrence) in the treatment of idiopathic talipes equinovarus.

#### IV. CONCLUSION

The underlying etiology of CTEV remains unknown. Since the introduction of the Ponseti treatment method, CTEV management has witnessed a complete transformation. It has been demonstrated that the Ponseti method is the gold standard for treating clubfoot because it is effective and secure. The greatest concern is a relapse, which is anticipated to occur in excess of fifty percent of cases. The relapse of clubfoot following the Ponseti technique may be caused by a number of factors, including inadequate gait training, muscle imbalance, inadequate correction of the initial deformity and noncompliance with the abduction brace protocol. Noncompliance with the abduction brace protocol is regarded as a significant contributor to the loss of correction following the Ponseti method. As a result, this emphasizes the importance of parent education, support, and close frequent monitoring of patients in order to identify any compliance issues early on and modify the brace accordingly. In the future, there may be need to assess parents' level of education with the incidence of clubfoot relapse in Indonesia.

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