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### Percutaneous tenotomy of the Achilles tendon using a 16 gauge needle in the management of clubfoot

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#### Abstract

**Objective:** To clinically evaluate, the effectiveness of percutaneous tenotomy of Achilles tendon using a 16 gauge needle in clubfoot treatment by ponseti technique.

**Material and methods:** forty five affected foot were prospectively evaluated in Twenty five patients with ctev attending orthopedics OPD in K R Hospital, Mysore and treated conservatively using ponseti technique between June 2016 and November 2017.out of forty five affected feet ,thirty nine feet required tenotomy and percutaneous tenotomy done using a 16 gauge needle and assessed clinically.

**Results:** all 39 feet successfully managed, the reported complications of conventional tenotomy by knife [excessive bleeding, pseudo-aneurysm or neurovascular compromise] were not encountered with this technique.

**Conclusion:** This percutaneous tenotomy technique using a 16 needle is a simple procedure, safe and very effective and gives predictable results without any complications which were reported with tenotomy by knife.

**Keywords:** Percutaneous tenotomy, Achilles tendon, 16 gauge needle, management, clubfoot

#### Introduction

Clubfoot or CTEV( congenital talipes equino-varus ) with an incidence of about 1 in 1000 live births <sup>[1, 2]</sup> makes it one of the most commonly encountered congenital deformity in clinical practice. Equinus at ankle joint, varus of hind foot, fore-foot adduction, and mid-foot cavus are the four components of this deformity <sup>[3-6]</sup>. Historically, Hippocrates introduced the conservative management for clubfoot in around 400 BC <sup>[10, 11]</sup>. Later, Kite introduced a method <sup>[12]</sup> in 1993, which included manipulation and casting technique, but the success rate was poor <sup>[7, 8, 13]</sup>. Later, in 1963 Ponseti developed a conservative method, called as Ponseti technique, which consists of serial manipulation and casting followed by tendoachilles tenotomy, if needed to correct residual equinus and casting and it takes about four to five weeks to achieve the full correction of all four components of the deformity <sup>[14, 15]</sup>.

Ponseti management, over the past two decades has become accepted throughout the world as the most effective and less expensive treatment of ctev. The technique involves serial manipulation and casting and possible percutaneous tendoachilles tenotomy. However, in about 85% of the cases there was a residual equinus deformity which needed further correction by tenotomy of Achilles tendon <sup>[16-19]</sup>

Originally, as Ponseti described, tenotomy is performed using a surgical blade, such as a no.11 or no.15, or any other small blade, such as an ophthalmic knife. However, complications related to the procedure, such as excessive bleeding <sup>[23]</sup>, formation of a pseudo-aneurysm <sup>[24]</sup> and neurovascular injuries <sup>[25]</sup>, were described. To avoid these complications, many modifications have been introduced. Recently, new technique by using wide bore surgical needle is increasingly used which was first described by Minkowitz *et al.* <sup>[20, 21, 22]</sup>. The technique of performing tenotomy with a needle may have advantages over other tenotomy techniques, as the approach is minimally invasive, simple procedure and with very low morbidity. <sup>[23, 24]</sup>. It can be performed in an outpatient setting under local anesthesia, without incising the skin.

The study is aimed to present our experiences in clinical outcome of percutaneous tenotomy of tendo-achilles using a 16 Gauge needle to correct the residual eqinus in management of congenital idiopathic clubfoot.

**Materials and Methods**

This study was performed in the Department of Orthopedics, Mysore medical college and research institute, Mysore. Between, June 2016 to November 2017, all the children with CTEV presenting to orthopedics opd in KR hospital during this period were treated by the Ponseti casting technique. Only the idiopathic CTEV cases were included in the study. The Children with other other congenital deformities, syndromes or neurological causes of club feet and children with incomplete follow up were excluded from the study.

25 children with 20 bilateral and 5 unilateral affected foot met with inclusion criteria were included in the study and managed by ponseti technique i.e. weekly manipulation and casting of affected foot, PIRANI scoring system used to asses correction and tendoachilles tenotomy is planned when midfoot - pirani score is zero. In 2 children with bilateral affected foot and 2 children with unilateral foot affected, acceptable dorsiflexion achieved by casting and not considered for tenotomy. Hence a total of 39 affected feet have undergone tenotomy for tendo Achilles using a 16G needle.

All tenotomies are performed in our outpatient setting under an oral sedative of calculated dose for each child and we followed the technique as recommended by Minkowitz *et al* [11] to perform percutaneous tenotomy. The child was placed in supine position, with the knee flexed to 90 degrees and the

hip abducted to make the heel easily accessible. An assistant maintains the position till the procedure is complted. tendoachilles is easily palpated when foot is forced into dorsiflexion, which makes the tendon tense. With all the aseptic precautions using povidine iodine and 1%lignocaine of ~0.2ml given using an insulin syringe, medial border of tendo Achilles palpated and a 16 gauge sterile needle was inserted from the medial border of the tendo-achilles about 1 to 2 cm proximal to the tendo-achilles insertion into calcaneum. Sectioning of the tendon performed using the beveled tip of the needle through lateralization and elevation movements of the cutting end. A grating sensation perceived once tenotomy is completed with sudden loss of resistance to dorsiflexion and increase in dorsiflexion. Success of the tenotomy confirmed with below mentioned clinical signs; a palpable depression over the tendon in the sectioned region, increase in dorsiflexion and positive Thompson sign (Manual squeezing of the calf). Any bleeding from needle insertion site controlled by light pressure applied over the site. The circulatory status of the toes was observed by seeing nail blanching. The corrective POP cast is applied with knee in 90degrees flexion and foot in maximum dorsiflexion and abduction of ~70 degrees and the child observed for 30 minutes to assess circulatory conditions of the ankles, the general state and signs of bleeding. Postoperatively, paracetamol was administered orally for pain relief.



**Fig 1**



**Fig 2**



**Fig 3**



**Fig 4**



Fig 5



Fig 6

### Observation and results

Between June 2016 to November 2017, twenty five patients who met with criteria for inclusion, with forty-five affected foot, among which were twenty cases with bilateral foot affected and five cases with unilateral affected foot. But in four cases, Two with bilateral involvement and two with unilateral involvement equinus correction achieved by manipulation and casting are not considered for tenotomy. Hence a total of thirty nine affected feet were considered for tenotomy.

The mean age when treatment started was 6.5 weeks, with seven weeks of standard deviation and ranged from 3days to 30 weeks. The mean number of plaster changes was eight. The mean age at the time of tenotomy was 15 weeks and ranged from 5.9 to 40 weeks.

After complete tenotomy, clinically, equinus correction achieved in all cases, evidenced from increase in visible dorsiflexion and depression formed between the stumps, with tendon gap that can be easily palpated. When Thompson maneuver performed, there was no movement transmission from calf muscles to the heel.

There were three cases of abnormal bleeding after tenotomy, which stopped with digital pressure and did not compromise foot perfusion. Two foot with procedural difficulty as tendon was not easily palpable; neuro-vascular compromise, formation of pseudoaneurysm and local infection were not seen.

### Discussion

Residual equinus deformity of ankle in ctev treatment with the Ponseti method has receive much attention of treating clinicians, as it is resistant to manipulations and changes from casting procedure. According to Ippolito and Ponseti [26] the retraction of posterior ligaments of the hind foot causes plantar flexion, however there is associated shortening of the triceps surae, which makes the equinus correction difficult by the manipulative method [3]. Hence the sectioning of Achilles tendon becomes necessary to obtain a plantigrade foot in clubfoot patients.

As been routinely followed worldwide, the conventional tenotomy with a knife has been originally described by ponseti himself, achieves good results, but there are reported complications such as excessive bleeding [23], formation of pseudo aneurysm [24] and neurovascular compromise [25]. Minkowitz *et al* were the first to describe the use of wide bore needle to perform the percutaneous tendoachilles tenotomy which reportedly avoids the complications noted with

conventional tenotomy using a knife [20, 21, 22]. The fear of exposing the child to surgical procedure and illiteracy, may lead to parents dropping out from treatment. The simplicity of the procedure performed just by a needle, if explained to parents may overcome this barrier and treatment completion and hence, morbidity reduction.

In our study, for all cases treatment started as originally described by ponseti i.e., weekly manipulation and casting to correct cavus, adduction of forefoot and varus. However, to correct the residual equinus we performed tenotomy using a needle[16 gauge], as described by Minkowitz *et al*, as we consider the technique is simple, easy to perform, less expensive and with fewer complication rates.

A total of 25 patients [45 affected feet] were included in the study. Among the 25 patients 14(56%) were boys and 11(44%) were girls. Bilateral involvement was found in 20(88.8%) cases and unilateral involvement in 5(11.2%) cases.

Pretreatment mean Pirani score was 4.9 in this study. matsuszewski, gil and karski found a pretreatment Pirani score range from 4.5 to 6.[27]. The mean age when treatment started was 6.5 weeks, with seven weeks of standard deviation and ranged from 3days to 30 weeks. The mean number of plaster changes was eight. The mean age at the time of tenotomy was 15 weeks and ranged from 5.9 to 40 weeks. Two cases with bilateral involvement and two cases with unilateral involvement did not require tenotomy for equinus correction. Hence a total of thirty nine affected feet were considered for tenotomy using a 16 Gauge needle.

There were three cases (7.7%) of abnormal bleeding after tenotomy, managed with digital pressure, foot perfusion was not compromised. In 2 cases (5.12%) as tendon was not easily palpable which needed forced dorsiflexion, residual equinus corrected in all the cases. There were no cases of pseudo aneurysm formation, neurovascular compromise, and local infection at tenotomy site or blister formation. We found that the modified technique of tenotomy described here is viable, relatively simple and yields good results similar to other's experiences. The result supports to the safety of the procedure, but the upper limit of age for its performance has not yet been established. Even though this technique yields good results, very minimal data available in literature. More and more surgeons need to perform and validate this technique to bring out the limitations and its usefulness in clubfoot with associated syndromes and in older or delayed cases.

## Conclusion

This percutaneous tenotomy technique using a 16 needle is easy to perform, a simple procedure, least invasive, safe and very effective, ideally can be performed in an outpatient department and gives predictable results without any complications which were reported with tenotomy using a knife.

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