



**PERCUTANEOUS TENOTOMY USING A NEEDLE IN THE OPD FOR THE  
MANAGEMENT OF CLUB FOOT**

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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:** In orthopaedics OPD of Neta Ji subhash Chandra boss medical college Jabalpur, percutaneous needle tenotomy was done in 45 feet of 32 patients. from august 2017 to feb 2018 by the same orthopedic surgeons for the management of CTEV by Ponseti technique percutaneous tenotomy done using a 16 gauge needle and assessed clinically. **Results: in our study out of 45 feet, all 40 feet corrected by this method and 5 feet out of 45 feet had some complications in context to the Tenotomy.** Among these, 2 feet had procedural difficulties due to aberrant flattening of tendo Achilles. In 2 patients, there was minor bleeding from the vessel. **Conclusion:** This percutaneous tenotomy technique using a 16 G 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 talipesequino-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 tendoachillestenotomy, 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 tendoachillestenotomy. 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> Open Tenotomy Was

Subsequently Aided By Antiseptic And Aseptic Precautions, Tendon Exposure Became Safe And Encouraged Section With Tendon Overlap, By Cutting Obliquely, By Z-Lengthening In Either Sagittal Or Frontal Planes Or By Zigzag As Devised By Poncet Of Lyon To Overcome Post-Traumatic Shortening.

At Present, During The Treatment Of Clubfoot Deformity By Ponseti Technique, Percutaneous/ Open Tenotomies Were Performed In 85% Children.

Originally, 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 (keratome). 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.

In Practice, Achilles Tenotomies Were Performed When Midfoot Pirani Score Came To Zero After Serial Casting By Ponseti Technique.

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 equinus in management of congenital idiopathic

#### MATERIAL AND METHOD

In orthopaedics OPD of Neta Ji subhash Chandra boss medical college Jabalpur, percutaneous needle tenotomy was done in 45 feet of 32 patients. from august 2017 to feb 2018 by the same orthopedic surgeons for the management of CTEV by Ponseti technique.

All tenotomies are performed in our outpatient setting under an oral sedative/ Local anaesthesia of calculated dose for each child and we followed the technique as recommended by Minkowitz *et al.*<sup>[11]</sup> to perform percutaneous tenotomy.

#### TECHNIQUE

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 completed. 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 (about one finger breadth proximal to the insertion of tendo-Achillis or the posterior heel crease). 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 patient is then sent back to her mother's lap for 15 minutes. Then, under aseptic precaution wound & dorsiflexion were checked and a sterile bandage was applied on the tenotomy wound. The circulatory status of the toes was observed by seeing nail blanching. The corrective below knee POP cast is applied 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. Cast continue for 10 days.

#### Why needle is safe compare to stabbing knife ?

**in needle** have beveled tip, transection area less, depth of cutting edge is less compare to 11 number knife which was more transection area, depth and width of cutting edges more, which cause more soft tissue damage.



Fig: 1.



Fig: 2.



Fig: 3.



Fig: 4.



Fig: 8.



Fig: 5.



Fig: 9.



Fig: 6.



Fig: 10.

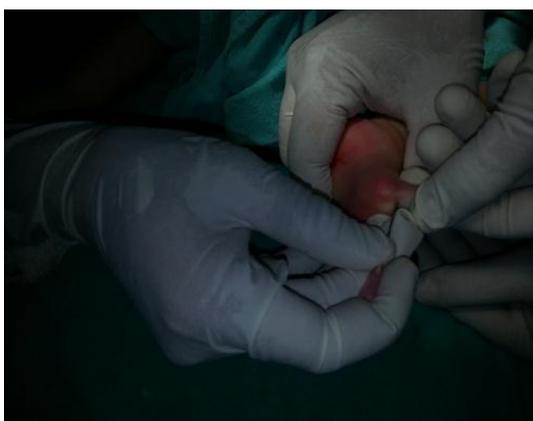


Fig: 7.

- Fig 1: Showing both needle and 11 no knife.  
 Fig 2 and fig 3: Clinical pics before correction.  
 Fig 4 & fig 5: Percutaneous release of tendo Achilles.  
 Fig 6: After release, there was no scar or cut mark.  
 Fig 7: Percutaneous release of FHL for augmented the correction.  
 Fig -8: Percutaneous release of planter fascia.  
 Fig -9: After triple release, below knee cast apply with full correction.  
 Fig 10: After cast, steinback brace.

#### OBSERVATION AND RESULT

Among the patients, 20 (62.5%) were male and 12 (37.5%) were female. The male & female ratio was 1.6:1. The mean age of this study population was 4.76

months with a range of 1 – 22 months. Among these 32 patients, 27 patients (84.3%) had no positive family history but 5 patients (15.6%) had positive family history (two were sibling). Considering the number of involved foot, we found that 13 patients (40.6%) had bi-lateral club feet & 19 patients (59.4%) presented with unilateral club foot. Among the unilateral cases, right sided unilateral club feet were 11 & left sided club feet were 8. In this study, Pre tenotomy mean Pirani score was found 4.9 which 10 days after tenotomy & final casting, became 0.8. The mean number of above knee POP cast applied on patients were 5.8 (range between 4-10). In this study, 5 feet out of 45 feet had some complications in context to the Tenotomy. Among these, 2 feet had procedural difficulties due to aberrant flattening of tendo Achilles. In 2 patients, there was minor bleeding from the vessel (which was controlled by applying pressure bandage over the tenotomy puncture wound for 12 minutes). Foot deformity was not corrected in 1 feet (Due to neglected type of CTEV which were later treated by soft tissue release surgery). In this study, we did not encounter any skin or soft tissue infection.

## DISCUSSION

In orthopaedics OPD of Neta Ji subhash Chandra boss medical college Jabalpur, percutaneous needle tenotomy was done in 45 feet of 32 patients. from august 2017 to feb 2018 by the same orthopedic surgeons for the management of CTEV by Ponseti technique.

Desai *et al.*<sup>[46]</sup> reported that boys were more commonly affected than girls and his study ratio was 2:1. In 2007, Haft, Walker and Crawford also reported that 65% of their patients were male.<sup>[47]</sup> Among those 32 patients, bilateral involvement was found in 13 patients (40.61%). Similar type of result was previously found by Laaveg and Ponseti.<sup>[48]</sup> In another study, Yamamoto found that bilateral and unilateral affected cases were almost equal in numbers.<sup>[49]</sup> Changulani *et al.* reported 52% bilateral and 48% unilateral club feet in his study.<sup>[50]</sup> Pre-tenotomy mean Pirani score in this study was 4.9; Matuszewski, Gil and Karski found pre-treatment Pirani score for their patients 4.5.<sup>[52]</sup> The mean number of plaster cast applied in our patients were 5.8 (range between 4-10). Dyer and Davis mentioned mean number of casts required during his study were 5.31 (2 to 9).<sup>[53]</sup> Similar observation was demonstrated by Singh *et al.*<sup>[54]</sup> In this study, as we mainly focused on the percutaneous needle tenotomy, the mean follow up period for these patients were 4.5 months (1 to 8 month). Changulani *et al.* assessed the Ponseti technique for a mean period of follow-up of 18 months (6 to 30).<sup>[50]</sup> Lourenço and Morcuende also followed-up clubfoot cases by mean period about 3.1 years (2.1 to 5.6) in their study.<sup>[56]</sup> Both the author assessed the outcome of the Ponseti management in clubfoot patients.

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 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.<sup>[3]</sup> 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<sup>[23]</sup>, formation of pseudo aneurysm<sup>[24]</sup> and neurovascular compromise.<sup>[25]</sup> Minkowitz *et al* were the first to describe the use of wide bore needle to perform the percutaneous tendoachillestenotomy which reportedly avoids the complications noted with conventional tenotomy using a knife.<sup>[20,21,22]</sup> 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.

The mean age when treatment started was 4.76, and ranged from 1 month days to 7 month. The mean number of plaster changes was 5.8. The mean age at the time of tenotomy was 15 weeks and ranged from 5.9 to 40 weeks. In this study, 5 feet out of 45 feet had some complications in context to the Tenotomy. Among these, 2 feet had procedural difficulties due to aberrant flattening of tendo Achilles. In 2 patients, there was minor bleeding from the vessel (which was controlled by applying pressure bandage over the tenotomy puncture wound for 12 minutes). Foot deformity was not corrected in 1 feet (Due to neglected type of CTEV which were later treated by soft tissue release surgery). In this study, we did not encounter any skin or soft tissue infection.

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.

## REFERENCES

1. Dobbs MB, Gurnett CA. Update on clubfoot: etiology and treatment. *Clinical orthopaedics and related research*, 2009; 467(5): 1146. pmid:19224303
2. Davies RW. Family studies for the cause of ctev, talipes calcaneo-valgus and metatarsus varus. *J Bone Joint Surg Br.*, 1964; 46: 445–63.
3. Ponseti IV. *Congenital clubfoot: fundamentals of treatment*: Oxford University Press, USA, 1996.
4. Simons GW, Sarrafian S. The microsurgical dissection of a stillborn fetal clubfoot. *Clinical orthopaedics and related research*, 1983; 173: 275–83.
1. Mckay DW. New concept and the approach to clubfoot treatment. *Journal of Pediatric Orthopaedics*, 1982; 2(4): 347–56.
5. Irani RN, Sherman MS. *The Pathological Anatomy of Club Foot*. *JBJS*, 1963; 45(1): 45–52.
6. Ponseti IV. Treatment of congenital club foot. *JBJS*, 1992; 74(3): 448–54.
7. Kite JH. Nonoperative treatment of congenital clubfoot. *Clinical orthopaedics and related research*. 1972; 84:29–38. pmid:503
8. McKay DW. New Concept of and Approach to Clubfoot Treatment: Section II-Correction of the Clubfoot. *Journal of Pediatric Orthopaedics*. 1983; 3(1):10–21. pmid:634140
9. Strach E. *Club-foot through the centuries. Historical Aspects of Pediatric Surgery*: Springer, 1986; 215–37.
10. Turco V. *Clubfoot: current problems in orthopaedics*. New York: Churchill Livingstone, 1981.
2. Kite J. Principles involved in the treatment of congenital club-foot. *JBJS*, 1939; 21(3): 595–606
3. Herzenberg JE, Radler C, Bor N. Ponseti versus traditional methods of casting for idiopathic clubfoot, *Journal of Pediatric Orthopaedics*, 2002; 22(4): 517–21.
4. Ponseti IV, Smoley EN. Congenital club foot: the results of treatment. *J Bone Joint Surg Am.*, 1963; 45(2): 261–344.
5. Morcuende JA, Abbasi D, Dolan LA, Ponseti IV. Results of an accelerated Ponseti protocol for clubfoot, *Journal of Pediatric Orthopaedics*, 2005; 25(5): 623-6.
6. Ponseti IV. *Congenital clubfoot: fundamentals of treatment*, Oxford: Oxford University Press, 1996.
7. Ponseti IV. Clubfoot management. *J Pediatr Orthop*, 2000; 20: 699-700
8. Ponseti IV. Treatment of congenital club foot, *J Bone Joint Surg Am.*, 1974; 448-54.
9. Ponseti IV, Smoley EN. The classic: congenital club foot: the results of treatment, 1963. *Clin Orthop Relat Res.*, 2009; 467: 1133-45.
10. Minkowitz B, Finkelstein BI, Percutaneous tendo-Achilles lengthening with a large-gauge needle: a modification of the Ponseti technique for correction of idiopathic clubfoot. *J Foot Ankle Surg*, Jul-Aug, 2004; 43(4): 263-5.
11. Maranha, Daniel Augusto Carvalho, Nogueira-BARBOS Marcello Henrique, Simon, and VOLPON Novelino Marcelo José Batista. Use of large-bore needle in sectioning of percutaneous Achilles tendon in congenital clubfoot, *ortop Act. Bras.*[Online], 2010; 18: 5. [cited 01/30/2012], 271 to 276.
12. Hussain N, Khan T, Ahmed A. Complete subcutaneous tenotomy of tendo-achilles in clubfoot patients – A four year follow up. *J Surgery*, 2004; 2(1): 17-9.
13. Patwardhan S, Shyam AK, Sancheti P. Percutaneous Needle Tenotomy for Tendo-achilles Release in Clubfoot – Technical Note. *J Ortho Case Reports*, 2012; 2(1): 35-6.
14. Sirsikar A, Kiradiya N. A Prospective Study of Outcome of Percutaneous Needle Tenotomy for Tendo-achilles Release in Congenital TalipesEquino Varus. *Inter J Medical Sci Res Prac*, 2014; 1(3): 84-88.
15. Dyer PJ, Davis N. The role of the Pirani scoring system in the management of club foot by the Ponseti method. *J Bone Joint Surg Br.*, 2006; 88: 1082-1084.
16. Ippolito E, Ponseti IV. Congenital club foot in the human fetus. A histological study. *J Bone Joint Surg Am.*, 1980; 62: 8-22.
17. Matuszewski L, Gil L, Karski J, Early results of treatment for congenital clubfoot using the Ponseti method. *Eur J Orthop Surg Traumatol*, 2012; 22: 403-406.
18. Dyer PJ, Davis N. The role of Pirani scoring system in the management of CTEV, by the Ponseti technique. *J Bone Joint Sur [Br]*, 2006; 88(8): 1082-1084.
19. Lourenco AF, Morcuende JA, Correction of neglected idiopathic club foot by Ponseti technique, *J Bone Joint Surg [Br]*, 2007; 89(3): 378-381.
20. Pandey S. Neglected club foot. *Foot*, 2002; 12: 123-41.
21. Thilenius MG. *Medicinische und Chirurgische Bemerkungen*. Frankfurt: Bronner, 1789; 335.
22. Michaelis C F. *Ueber die Schwachung der Sehne durch Einschneidung eines Mittelbeinmanchen Gliederverunstaltungen*. [Article in German]. [Abstract]. *J Pract Heilk*, 1811; 33(5): 3-26.
23. Poncet A. De l'allongement dun tendon divist, avec Bcartement plus au moins considerable de ses deux bouts par des incisions en zigzag pratiquées sur ses bords: Allongement en accord & on. [Article in French]. [Abstract]. *Gaz Hebdom de Med Chir*, 1891; 48: 575-7.
24. Bor N, Coplan JA, Herzenberg JE. Ponseti Treatment for idiopathic clubfoot: minimum 5-year follow-up. *Clin Orthop Relat Res.*, 2009; 467: 1263-70.
25. Maranhão DAC, Nogueira-Barbosa MH, Simão MN, Volpon JB. Use of a large gauge needle for percutaneous sectioning of the Achilles tendon in

- congenital clubfoot. *Acta Ortop Bras*, 2010; 18(5): 271-6.
26. Hussain N, Khan T, Ahmed A. Complete subcutaneous tenotomy of tendo-achilles in clubfoot patients – a four year follow up. *J Surg.*, 2004; 2(1): 17-9.
  27. McGowan DD. Minimal incision tenotomy for hallux interphalangeal joint extensus. *Clin Podiatr Med Surg*, 1991; 8: 1-8.
  28. Herzenberg JE, Radler C, Bor N. Ponseti versus traditional methods of casting for idiopathic clubfoot. *J Pediatr Orthop*, 2002; 22: 517-21.
  29. Goksan SB. Ponseti technique for the correction of idiopathic clubfeet presenting up to 1 year of age: a preliminary study in children with untreated or complex deformities. *Arch Orthop Trauma Surg*, 2006; 126: 15-21.
  30. Minkowitz B, Finkelstein BI, Bleicher M. Percutaneous tendo-Achilles lengthening with a large-gauge needle: a modification of the Ponseti technique for correction of idiopathic clubfoot. *J Foot Ankle Surg*, 2004; 43: 263-5.
  31. Pandey S, Pandey AK. The classification of clubfoot a practical approach. *Foot*, 2003; 13: 61-5.
  32. Ponseti IV. Treatment of congenital club foot. *J Bone Joint Surg Am*, 1992; 74: 448-54.
  33. Dobbs MB, Gordon JE, Walton T, Schoenecker PL. Bleeding Complications Following tendoachilles percutaneous tenotomy in the Treatment of clubfoot deformity. *J Pediatr Orthop*, 2004; 24: 353-7.
  34. Desai L, Oprescu F, Dimeo A, Mocuende J A. Bracing in the treatment of children with clubfoot: past, present, and future. *The Iowa Orthopaedic Journal*, 2010; 30: 15-30.
  35. Haft G F, Walker CG, Crawford HA. Early clubfoot recurrence after use of the Ponseti method in a New Zealand population. *J Bone Joint Surg Am*, 2007; 89(3): 487-493.
  36. Laaveg SJ, Ponseti IV. Long term results of treatment of congenital clubfoot. *J Bone Joint Surg [Br]*, 1980; 62(1): 23-31.
  37. Yamamoto H. A clinical, genetic and epidemiologic study of congenital clubfoot. *Jap. Human Genet*, 1979; 24: 37-44.
  39. Changulani M, Garg NK, Rajagopal TS, Bass A, Nayagam SN, Sampath J, Bruce CE. Treatment of idiopathic clubfoot using the Ponseti method: Initial experience. *J Bone Joint Surg [Br]* 2006; 88(10): 1385-1387.
  40. Dietz F. The genetics of idiopathic clubfoot. *Clin Orthop Relat Res.*, 2002; 401: 39-48.
  41. Matuszewski L, Gil L, Karski J. Early results of treatment for congenital clubfoot using the Ponseti method. *Eur J Orthop Surg Traumatol*, 2012; 22: 403-406.
  42. Dyer PJ, Davis N. The role of Pirani scoring system in the management of club foot by the Ponseti method. *J Bone Joint Surg [Br]*, 2006; 88(8): 1082-1084.
  43. Singh NJ, Keshkar S, De P, Kumar R. Management of club foot by Ponseti technique-our experience. *IJPMRk*, 2011; 22: 12-16.
  44. Janicki JA, Wright JG, Weir S, Narayanan UG. A Comparison of ankle foot orthoses with foot abduction orthoses to prevent recurrence following correction of idiopathic clubfoot by the Ponseti method. *J Bone Joint Surg [Br]*, 2011; 93(5): 700-704.
  45. Lourenco AF, Morcuende JA. Correction of neglected idiopathic club foot by Ponseti Method.
  46. *Bone Joint Surg [Br]*, 2007; 89(3): 378-381.