



STUDY FUNCTIONAL OUTCOME OF TENDO-ACHILLES TENOTOMY IN CLUBFOOT PATIENTS MANAGED BY PONSETI METHOD UNDER 2 YEARS OF AGE.

Orthopaedics

Dr Sanjiv Gaur	Professor and Head, Department Of Orthopaedics, Gandhi Medical College, Bhopal, M.P, India.
Dr Abhishek Chaturvedi*	MS Orthopaedics, Assistant professor, Department of Orthopaedics, Gandhi Medical College Bhopal M.P., India. *Corresponding Author
Dr Rohit bansal	MS Orthopaedics, Department of Orthopaedics, Gandhi Medical College, Bhopal, M.P, India.
Dr Suresh Uikey	Associate Professor, Department of Orthopaedics, Gandhi Medical College, Bhopal, M.P, India.

ABSTRACT

Ponseti reported the use of subcutaneous tenotomy in 70-90% cases of clubfoot treated conservatively. All the components of the deformity are corrected simultaneously except the equinus which is corrected by percutaneous tenotomy of tendo-achilles. Patients with idiopathic CTEV who presented less than 2 year age in the outpatient department were included in the study. Study included 30 patients with 47 feet. Male was 18 (60%) and female 12(40%). Bilateral 17 patients (56.6%) unilateral 13(43.4%) of which right sided 9(30%) left sided 4 (13.4%) patients. Quantification of various components of clubfoot deformity was done by using the Pirani score. Simple percutaneous tenotomy of the Achilles tendon is done. The Ponseti method with tenotomy over 15 months of followup obtained painless, plantigrade and cosmetically acceptable foot in 93.6% feet in patients within two year of age.

KEYWORDS

CTEV, Ponseti method, Pirani score, Tenotomy

INTRODUCTION:-

Clubfoot or Congenital talipes equinovarus (CTEV) was introduced in the medical literature by Hippocrates around 300 B.C. Idiopathic clubfoot is approximately twice common in males as comparison to females. Clubfoot is an obvious deformity easily recognized. Subcutaneous tenotomy of Tendo Achilles was a minor procedure, first described by Lorenz (1782) in Frankfurt and Delpech (1823) in France.^{1,2}

Turco advocated open tenotomy of the Achilles tendon at musculotendinous junction under direct vision, but Ponseti reported the use of subcutaneous tenotomy in 70-90% cases of club feet treated conservatively and dorsiflexion beyond 15 degrees was not possible at the ankle.^{2,3}

All the components of the deformity are corrected simultaneously except the equinus which is corrected by percutaneous tenotomy of tendo-achilles.^{4,5}

Percutaneous tenotomy by surgical knife is widely uses all over across the world but now a day new technique by using wide bore surgical needle is increasingly used in the last decade which was first described by Minkowitz et al. Minkowitz et al published a modification for the sectioning of tendo-achilles tendon, performing this procedure percutaneously with a large gauge needle.⁶

Ponseti tenotomy is performed by a tenotomy blade, such as a #11 or #15 no. However, complications associated with procedure, such as excessive bleeding, formation of a pseudoaneurysm and neurovascular injuries, were described. To avoid these rare but serious complications, many modifications like mini-open tenotomy and needle tenotomy, have been developed.^{7,8}

MATERIALANDMETHODS:-

Study was conducted in the Department of Orthopaedic Surgery, Gandhi Medical College, Bhopal Madhya Pradesh during the period from August 2018 to August 2020. Patients with idiopathic CTEV who presented within 2 year age group in the outpatient department were included in the study. Study included 35 patients. 5 patients lose to the follow up hence study composed of 30 patients with 47 feet.

Inclusion criteria: (1) Children with idiopathic CTEV, treated by the Ponseti technique and submitted to tenotomy of the Achilles tendon for correction of residual equinus. (2) Where midfoot pirani score came to zero after serial casting by ponseti technique. (3) Primary and follow-

up treatment done completely at same institution. (4) Age birth to 2 year. Exclusion criteria: (1) > 2 years of age. (2) The non-acceptance of the parents in participation in the study. (3) Operated previously. (4) Non-idiopathic club foot e. g. Secondary congenital talipes equinovarus types (Postural, Neglected, and Relapsed) excluded from this study. (5) Neuromuscular disorder Associated with syndromes.

Quantification of various components of clubfoot deformity was done by using the Pirani score. Pirani (1995)^{9,12} described a system for grading of clubfoot. It is composed of 6 different physical examination findings, each scored 0 for no abnormality, 0.5 for moderate abnormality, or 1.0 for severe abnormality. Each foot was assigned a total score of less than or equal to 1, a higher score indicating a more severe deformity.

Manipulation and corrective casting by ponseti protocol. Cavus is corrected by elevating the 1st metatarsal head and aligning the forefoot with the hindfoot by supinating the forefoot. Correction of the adduction and heel varus deformity by abduction of foot in supination and planter flexion while maintaining the thumb pressure over the lateral aspect of the head of the talus as fulcrum. During this manipulation, the navicular and cuboid is displaced lateral and the calcaneum will be shifted outwards and upward from its initial position, thus correcting the varus deformity of the heel. After manipulation a thin well moulded toe to groin cast is applied to maintain the correction. The casts are changed weekly after gentle manipulation.

Equinus is corrected by dorsiflexion of the whole foot after adduction and varus are corrected. The aim is to get minimum of 15° of dorsiflexion at the ankle joint.

A percutaneous Achilles tenotomy was performed if the foot could not be dorsiflexed to 15° prior to application of the final cast. Simple percutaneous tenotomy of the Achilles tendon is done without any local anaesthesia on the sedated child, by a 15 number blade under aseptic precaution. Immediately after the tenotomy dorsiflexion of about 15-20° is achieved. After tenotomy, the puncture wound dressing with a sterile gauze piece and a cast is given for 3 weeks.

After removal of final cast, correction was maintained by foot abduction braces (FAB). After application of the brace the patient was called up for follow up visits as follows: At 2 weeks to troubleshoot compliance issues. At 3 months to shift to nap and night time bracing. Every 4 months to check for relapses and compliance.

RESULTS:-

This study included 30 patients (47 feet). Male was 18 (60%) and female 12(40%). Bilateral 17 patients (56.6%) unilateral 13(43.4%) of which right sided 9(30%) left sided 4 (13.4%) patients. The maximum follow-up was 15 months.

Mean Pre-Correction Midfoot Pirani Score is 2.5. Mean Precorrection Hind foot Pirani Score is 2.34. Mean pre-Correction Total Pirani Score is 4.47.

Mean Post-Correction Midfoot Pirani Score is 0.16. Mean Post-Correction Hind foot Pirani Score is 0.32. Mean Post-Correction Total Pirani Score is 0.23.

Tenotomy was done in 44 feet (93.6%) and required repeat tenotomy 3 feet (6.4%).

Table 1. Outcome Of Study On Basis Of Pirani Score

Result	Total no. of feet	Percentage %	Total Outcome
Excellent (Pirani score 0)	33	70.2	93.6 %
Good (Pirani score 0.5-1)	11	23.4	
Poor (Pirani score>1)	3	6.4	6.4 %
Total	47	100	100

Complications related to the treatment is residual equinus in three feet (6.4%), plaster sore in one foot (2.1%), residual supination in one foot (2.1%). Total complication seen in five feet (10.6%).



Figure 01:- Precorrection (Left) and Postcorrection (Right)



Figure 02:- Precorrection (Left) and Postcorrection (Right)

DISCUSSION:-

There was a study to evaluate the effectiveness of Ponseti method with tenotomy in children in Indian setup. So, we conducted the study and compared the observation of current study with the available literature. The clubfeet were classified according to the classification given by Ponseti (2003)^{10,11}, in present study and maximum number of cases was of the untreated type. Mean precorrection Midfoot Pirani scores in our study was 2.50. Zoran rakonjac et al (2019) mean precorrection midfoot Pirani scores in study 2.58.

Mean post correction Midfoot score in study was 0.16. Zoran rakonjac et al (2019) mean post correction midfoot score in study was 0.11

Mean precorrection Hind foot score in study was 2.34. Sharma A, Shukla S. et al (2018) mean precorrection hind foot score in this study was 2.87. Zoran rakonjac et al (2019) mean post correction hindfoot score in study was 2.78.

The mean post correction Hind foot score in present study was 0.32. Zoran rakonjac et al (2019) mean post correction hind foot score in study was 0.5.

Mean precorrection Total Pirani score in present study was 4.71 .This can be compared with the literature. The mean precorrection in sharma

A., Shukla S., et al (2018) calculated mean precorrection Pirani score 5.02 in their study.

Mean post correction Total Pirani score in present series was 0.23. This was comparable with the literature. Zoran Rakonjac et al (2019) achieved mean post correction pirani score 0-1(78.8%). Sharma A. Shukla S. et al (2018) study.

We have assessed the role of the Pirani score in predicting the number of casts required and the need for tenotomy in the management of clubfoot by the Ponseti method. In current study 100 % patients subjected to a percutaneous tenotomy of tendon Achilles. This observation is substantiated by literature. Percutaneous tenotomy of tendon Achilles was done in 39 feet out of 45 cases (86.6 %) in study done by Shreyas, Deepak et al (2017). A percutaneous tenotomy of tendo-achillis was performed in 100 % patients in a study done by Aimal sattar, muhd shabbir et al (2019). Tenotomy was effective in 92% patients and was not effective in 8% patients.

In current study a repeat tenotomy was required in 6.4% of the patient. We did repeat tenotomy in those patients who lost some degree of dorsiflexion due to poor brace compliance. We motivated these patients to wear brace after second tenotomy and achieved desired dorsiflexion till latest follow up. Hegazy, Mohameda; Nasef, (2009) reported that 9.4% of the patients of their study required repeated tenotomy.

In current study the average number of casts used was 5. This is compared with the number of casts used in a study done by kumar Dinesh, Jain Mahendra et al (2020) Their average number of casts was 4.3(range from 3 to 8). Sharma A. Shukla S. et al (2018) reported that the average number of casts used in their study was 5.10.

Complication in the form of superficial plaster sore developed in one patient. This was treated conservatively by avoiding cast for 1 week. Choubey Raghvendra et al (2015) two cases developed plaster cast. Repeat Tenotomy was done for residual equinus in 3 feet (6.4%). Shaheen Samir, Abdulla Musaab et al (2015) Persistent Equinus deformity after the tenotomy was observed in five feet (3.7%).

In present study the mean Dorsiflexion possible after correction was 16°. Agrawal Sunny, Suresh B et al (2017), noted that mean dorsiflexion possible after correction was 12.5° (10-15°) in their study. The longest duration of follow-up in our study was 15 months. Average follow up was 10 months. We are aware that the follow up in current study is small and further follow up will be necessary to understand fully the limits of this method in older children with club feet.

However, the results of study were very encouraging for the treatment of idiopathic clubfoot in older children by a simple, effective, and inexpensive method in developing nations.

CONCLUSION:-

Achieved a successful correction by Ponseti method with tenotomy less than two year age group patients was 93.6% feet according to Pirani scoring system. This method is not associated with major complications. Three feet has residual equinus and only one foot developed superficial plaster sore. Only one foot required surgery.

The Ponseti method with tenotomy obtained painless, plantigrade and cosmetically acceptable foot in 93.6% feet in patients less than two year of age. Both the patients and their parents were very satisfied with the result of treatment by this method.

REFERENCES:-

- Wynne-Davis R. Family studies and the causes of congenital clubfoot: Talipes equinovarus, talipes calcaneal valgus, and metatarsus varus. *J Bone Joint Surg Br* 1964;46: 445-63.
- Ponseti I.V., Smoley E.N. Congenital club foot: The results of treatment. *J Bone Joint Surg Am* 1963;45-A: 261-34.
- Helal B and Wilson D editors. *The Foot*. London: Churchill Livingstone Longman, 1st ed, 1988, pp 219-34.
- Ponseti I.V. Clubfoot: Ponseti Management: Global Help Publications; 2003.
- Scher DM, Feldman DS, van Bosse HJP, Sala DA, Lehman WB. Predicting the need for tenotomy in the Ponseti method for correction of clubfeet. *J Pediatr Orthop*. 2004;24(4):349-52.
- Minkowitz B., Finkelstein B.I., Bleicher M. Percutaneous tendo-Achilles lengthening with large-gauge needle: a modification of the Ponseti technique for correction of idiopathic clubfoot. *J Foot Ankle Surg*. 2004 Jul-Aug; 43(4): 263-5.
- Burghardt R.D., Herzenberg J.E. A. 2008. Ranade Pseudoaneurysm after Ponseti percutaneous Achilles tenotomy: a case report. *J Pediatr Orthop*. 28:366-9.
- Dobbs M.B., Gordon J.E., Walton T, Schoenecker P.L. 2004. Bleeding Complications Following tendo-achilles percutaneous tenotomy in the Treatment of clubfoot

- deformity. *J Pediatr Orthop*. 24:353-7
9. Pirani S. A method of evaluating the virgin clubfoot with substantial inter-observer reliability POSNA Miami Florida 1995.
 10. Ponseti I.V.: clubfoot fundamentals of treatment, oxford university press, 1996.
 11. Ponseti I.V. editorial, clubfoot management. *J pediatr orthop*. ;20:699-700: 2000
 12. Pirani S., Zenzik L., and Hodges D.: Magnetic resonance imaging study of the congenital clubfoot treated with Ponseti method. *J. Pediatr. Orthp.*, 21: 6, 719-726, 2001.
 13. Choubey Raghvendra, Jain Ashish; Comparison of percutaneous tenotomy techniques for correction of equinus deformity in congenital talipes equinovarus (ctev) in children: a randomized clinical trial. *J of Evolution of Med and Dent Sci*. July 2015 eISSN- 2278-4802, pISSN- 2278-4748, Vol. 4, Issue 57.
 14. Shaheen Samir M., Abdalla Musaab; Safety and Efficacy of Achilles Tenotomy under Local Anaesthesia: as Part of the Ponseti Clubfoot Management -Experience at the Sudan clubfoot clinic. *Gezira Journal of Health Sciences* Dec 2015 Volume 11(2).
 15. Agarwal Sunny, B. Suresh, Mathew Varghese, Khanna Vishesh, Bajaj Mandeep S.; Functional outcome of tendoachilles following Ponseti's tenotomy for treatment of congenital talipes equinovarus in children older than two years. *Int J Res Orthop*. 2017 Sep;3(5):1057-1061.
 16. Alva Shreyas, M.K. Deepak, Patil Neelangowda VP, H.P. Vinay; Percutaneous tenotomy of the Achilles tendon using a 16 gauge needle in the management of clubfoot. *Inter J of Orthop Sciences* 2017; 3(4): 776-779.
 17. Sharma A, Shukla S, Kiran B, Michail S., Agashe M.; Can the Pirani Score Predict the Number of Casts and the Need for Tenotomy in the Management of Clubfoot by the Ponseti Method. *Malaysian Orthopaedic Journal* 2018 Vol-12, No 1.
 18. Satt Aimal, M. Shabbir, Inayat Ur Rehman, Zeeshan Faisal, M.Wali; Efficacy of percutaneous needle tenotomy during ponseti technique in the management of congenital club foot deformity in children. *Pak J Surg* 2019; 35(4):316-19.
 19. Zoran Rakonjac; The impact of the early tenotomy of Achilles tendon on the length and results of congenital clubfoot severe forms treatment. *Vojnosanit Pregl* 2019; 76(8): 795-801.
 20. Kumar Dinesh, Jain Mahendra P. and Joshi Vinay; A comparative study to assess idiopathic clubfoot treatment between less than 3 month and more than 3 months of age by Ponseti's Technique in a tertiary care hospital. *International Journal of Orthopaedics Sciences* 2020; 6(1): 1312-1315.