Frequency of Achilles Tenotomy in Patients with Congenital Talipes Equinovarus (CTEV) Treated with Ponseti Technique.

Nadeem ur Rehman[1], Basit Hussain[2], Hassan Janan[3], Junaid Zeb[4], Sajawal Khan[5], Abdullah[6]

[1,3-5]Resident Department of Orthopaedic Surgery, Khyber Teaching Hospital, Peshawar
[2,4]Senior Registrar Orthopaedic Surgeon, DHQ Teaching Hospital KDA Kohat

Authorship and contribution Declaration: Each author of this article fulfilled ALL 4 Criteria of Authorship:

1. Conception and design or acquisition of data, or analysis & interpretation of data.
2. Drafting the manuscript or revising it critically for important intellectual content.
3. Final approval of the version for publication.
4. All authors agree to be responsible for all aspects of their research work.

Corresponding author:
Junaid Zeb
E-mail: junaidzeb@gmail.com

ABSTRACT

Objective: To determine the frequency of Achilles tenotomy in patients with Congenital Talipes Equinovarus (CTEV) treated with Ponseti serial castings.

Methods: This descriptive study was conducted in department of Orthopedic Surgery Khyber Teaching Hospital Peshawar from 12th September 2019 to 12th December 2020. All children of CTEV who were treated with Ponseti serial castings and fulfilled our inclusion criteria were enrolled in this study. Achilles tenotomy was performed at the end of casting in those children who had corrected cavus, varus with head of talus covered and with Pirani Equinus score of 1 or 0.5. The frequency of tenotomy was noted. Important variables of children with tenotomy were stratified and post stratification Chi-square test was applied to calculate *P* value. *P* value< 0.05 was considered significant.

Results: We treated 86 feet in 69 children with Ponsti serial castings. Majority (75.36%,n=52) of children had unilateral club foot deformity while 17(24.63%) had bilateral deformity. Male children were 41(59.42%) while 28(40.57%). The mean age at the time of Achilles tenotomy was 10.3±0.28 weeks. The initial Pirani score was 3±0.74 and final Pirani score was 1±0.74. Correction was achieved in 5±0.84 castings. Achilles tenotomy was done in 57 (66.27%) feet to correct the equinus deformity before application of final cast.

Conclusion: The frequency of Achilles tenotomy after Ponesti serial casting was high as more than half our children had persistent equinus deformity.

Key words: Achilles, Club foot, Pirani, Ponesti, Tenotomy.

This article may be cited as: Rehman NU, Hussain B, Janan H, Zeb J, Khan S, Abdullah. Frequency of Achilles Tenotomy in Patients with Congenital Talipes Equinovarus (CTEV) Treated with Ponseti Technique. J Pak Orthop Assoc 2021;33(3):

INTRODUCTION

Congenital Talipes Equinovarus (CTEV) also known as congenital clubfoot is one of the most common birth defects involving the musculoskeletal system with an incidence of 1 to 2 per 1,000 live births.[1] Male children are affected more than female with the ratio of 2-2.5:1 and the involvement is bilateral in almost half of the cases.[2] The management of clubfoot has been passed through evolutionary stages since Hippocrates (400 BC), Guerin(1836), Kite(1964) and Ponseti(1972).[3,4] Ponseti technique of weekly manipulation and serial casting is an effective method of treating idiopathic clubfoot now a days and is considered as the gold standard.[5,6] Percutaneous Achilles tenotomy is an integral component of the Ponseti method and is usually required for correcting persistent equinus deformity following correction of the forefoot and midfoot deformities.[7] The frequency of percutaneous Achilles tenotomy ranges from 60 to 90%[3,8-10] with an overall 95% the success rate of Ponseti technique.[4,6,8,10] Tenotomy can be performed under local anaesthesia as an outpatient procedure.[11,12]

The objective of our study was to determine the frequency of Achilles tenotomy in patients with congenital talipes equinovarus (CTEV) treated with Ponseti serial castings. By estimating the exact frequency of Achilles tenotomy in our population we would convince those surgeons who do not believe in or are reluctant to perform Achilles tenotomy or

erroneously believe that the equinus of CTEV is corrected when in fact it is not. Furthermore fear of complications of Achilles tentomy or unavailibilty of anaesthesia should not be the justification for avoiding Achilles tenotomy.

METHODS

We conducted this descriptive study in department of Orthopedic Surgery Khyber Teaching Hospital Peshawar from 12th September 2019 to 12th December 2020.All new born children of either gender and age upto 2 years with idiopathic club foot presented to Orthopaedic OPD of our hospital were included in this study. Children with cerebral palsy, Arthogryposis Multiplex Congenita, neuropathic club foot, myelomeningocele, and previously treated club foot deformity in other hospitals were excluded.The study was approved by the Ethical Committee of our hospital. Informed written consent was taken from parents of all children. All children were examined from head to toe before the start of Ponseti serial casting. The severity of clubfoot was graded with Pirani scoring from 0 to 6 points with 6 being the sever deformity.[13] Ponseti serial casting was done on weekly basis. Children who do not have residual equinus deformity at the end of serial casting were started brace treatment without tenotomy. Percutaneous Achilles tenotomy under local anaesthesia was performed at the end of casting in those children who had corrected cavus, varus with head of talus was covered and with Pirani Equinus score of 1 or 0.5.After Achilles tenotomy the final cast was applied for two weeks.

All the data was analyzed using SPSS version 21. All quantitative variables like age, initial and final Pirani scores and number of casts required were expressed as mean and standard deviation. Frequencies and percentages were calculated for qualitative variables like gender, unilateral or bilateral deformity and tenotomy. Tenotomy was stratified among gender,side, age, initial Pirani score, and number of casts to see effect modifications. Post stratification Chi-square test was applied keeping P value equal to or less than 0.05. Data was presented in table where necessary.

RESULTS

In this study 69 children(86 feet) with CTEV were enrolled for Ponseti serial casting. Majority(75.36%,n=52) of children had unilateral club foot deformity while 17(24.63%) had bilateral deformity. Male children were 41(59.42%) while 28(40.57%). The mean age at the time of Achilles tenotomy was 10.3 ± 0.28 weeks. The initial Pirani score was 3 ± 0.74 and final Pirani score was 1 ± 0.74. Correction was achieved in 5 ± 0.84 castings. Achilles tenotomy was done in 57 (66.27%) feet to correct the equinus deformity before final cast application. Unilateral tenotomy was performed in 45(88.2%) children while bilateral in 6(11.7%) children. No statistical significance was found when the frequency of Achilles Tenotomy was compared with side, one or both limbs, age, gender, initial Pirani score and number of castings.(P value > 0.05).No complication was reported.

DISCUSSION

In our study the frequency of Achilles tenotomy was 66.2%. Our results are comparable to other international and local studies(Table I). Many authors have revealed that higher the initial Pirani score higher was the frequency of Achilles tenotomy in children with idiopathic club foot.[12,14] Kulambi19 had shown that the need for tenotomy was more in children with an overall Pirani score more than 5.0 or 2-3 hind foot score. However the need for tenotomy was not associated with bad outcome. Adewole[23] was of the opinion that children requiring tenotomies needed more casts than others.(5.9 versus 4.9) Jain[27] conducted an interesting study. He delivered a didactic session on Ponseti technique to one group of residents(Additionally Trained Group) while the other group (Classically Trained Group) did not get such training. He compared the outcome of clubfeet managed by these two groups and noted a significantly increased frequency (P=0.03). of tenotomy by the additionally trained group than the other (73.3% tenotomies versus 51.5%).He concluded that the increased frequency of Achilles tenotomies were due to increase confidence of the trained group on performing Achilles tenotomy after attending training session. Sharma[28] concluded that since the initial higher Pirani score is associated with increased number of casts and probably Achilles tenotomy therefore parents of such children should be counselled that the treatment would be prolonged and would have minor surgical procedure.

In our study we did not document any complications of percutaneous tenotomy. Studies have however reported vascular injuries resulting in bleeding, pseudoaneurysm, nerve injury resulting in neurological deficit and incomplete tenotomy.[29--32]

Our study had few limitations. The design of our study was descriptive. Our sample size was small. Further studies recommended to confirm our results.

Table I: Frequency of Achilles tenotomy in CTEV during Ponsti casting in international and local studies.

S. No	Name of Author	Year of publication	Frequency of tenotomy
1	Ponseti IV[14]	1997	70%
2	Khan AM[15]	2020	59%
3	Islam MS[16]	2020	86.4%
4	Ayehualem S[17]	2019	76%
5	Anisi C[9]	2018	66.4%
6	David BH[18]	2017	45%
7	Kulambi V[19]	2017	67.3%
8	Shah MQ[20]	2017	84.7%
9	Smythe T[21]	2016	78.9%
10	Aydin BK[22]	2015	85.1%
11	Adewolev OA[23]	2014	26.6%
12	Khan MK[24]	2014	61.4%
13	Khan MK[25]	2013	61.4%
14	Lebel E[12]	2012	73%
15	**Our study**	**2020**	**66.2%**

CONCLUSION

The frequency of Achilles tenotomy after Ponesti serial casting was high as more than half our children had persistant equinus deformity. Percutaneous Achilles tenotomy however should be performed meticulously under aseptic conditions to avoid complications. Parents must be counselled that tenotomy does not mean failure of treatment or bad outcome.

Conflict of Interest: None
Grants/Funding: None

REFERENCES

1. Asuquo JE, Abang IE, Anisi C, Urom S, Agweye P, Ngim NE, *et al.* Descriptive epidemiology and predisposing factors to idiopathic talipes equino varus in South South Nigeria. J Public Health Epidemiol 2016;8:147-150.
2. Khan S, Khanzada S. Ponseti treatment for idiopathic clubfoot deformity, Role of secondary care Hospitals. J Pak Med Assoc 2016;66(1):111-114.
3. Jaqueto PA, Martins GS, Mennucci FS, Bittar CK, Zabeu JL. Functional and clinical results achieved in congenital clubfoot patients treated by Ponseti's technique. Rev Bras Ortop 2016;51(6):657-659.
4. Ponseti IV, Smoley EN. Congenital club foot: the results of treatment. J Bone Joint Surg Am 1963;45(2):261-264.
5. Sinha A, Mehtani A, Sud A, Vijay V, Kumar N, Prakash J. Evaluation of ponseti method in neglected clubfoot. Indian J Orthop 2016;50(5):529-535.
6. Hernigou P, Gravina N, Potage D, Dubory A. History of club-foot treatment; part II: tenotomy in the nineteenth century. Int Orthop 2017;41(10):2205-2209.
7. MacNeille R, Hennrikus W, Stapinski B, Leonard G. A mini-open technique for Achilles tenotomy in infants. J Child Orthop 2016;10(1):19-23.
8. Anisi CO, Asuquo JE, Abang IE, Eyong ME, Osakwe OG, Ngim NE. The role of Pirani scoring in predicting the frequency of casting and the need for percutaneous Achilles tenotomy in the treatment of idiopathic clubfoot using the ponseti method. Paediatr Orthop Relat Sci 2017;3:55-40.
9. Anisi C, Asuquo JE, Abang I, Agweye P. Frequency of percutaneous Achilles tenotomy in the treatment of idiopathic clubfoot using the ponseti method.. Niger J Med 2018;27:163-167.
10. Parikh K, Moradiya NP. Outcomes of congenital talipes equino varus treated with ponseti method.Int J Con Med Res 2019;6(1):27-30.
11. Dobbs MB, Morcuende JA, Gurnett CA, Ponseti IV. Treatment of idiopathic clubfoot: an historical review. Iowa Orthop J 2000;20:59-64.
12. Lebel E, Karasik M, Bernstein-Weyel M, Mishukov Y, Peyser A. Achilles tenotomy as an office procedure: safety and efficacy as part of the Ponseti serial casting protocol for clubfoot.J Pediatr Orthop 2012; 32(4):412-415.
13. Pirani S, Outerbridge H, Moran M, Sawatsky B. A Method of Evaluating the Virgin Clubfoot with

Substantial Inter-observer Reliability. Read at the POSNA Annual Meeting; 1995.
14. Ponseti IV. Common errors in the treatment of congenital clubfoot. Int Orthop 1997;21:137-41.
15. Khan AM, Anwar SF, Saif AB, Awan SA. Effectiveness of Pirani Score in predicating selection of Achilles tenotomy in idiopathic club foot: A case control study. Pak Armed Forces Med J 2020; 70 (5): 1376-80
16. Islam MS, Masood QM, Bashir A, Shah FY, Halwai MA. Results of a Standard versus an Accelerated Ponseti Protocol for Clubfoot: A Prospective Randomized Study.Clin Orthop Surg 2020;12(1):100-106.
17. Ayehualem S, Asmare Y, Abrha M, Muche A.Prediction of Number of Casts and Need of Tenotomy Using Pirani Score in the Management of Clubfoot. Journal of Craniofacial Surgery 2019; 30(5):477-481.
18. David BH, Olayinka A, Oluwadare E, Ayodele OE, Joseph M, Olujide A. Predictive value of Pirani scoring system for tenotomy in the management of idiopathic clubfoot. J Orthop Surg (Hong Kong) 2017;25(2):145-151.
19. Kulambi V, Gaurav M, Naveen D S. Study of factors predicting the need for tenotomy in correction of clubfeet by ponseti method. J Orthop Traumatol Rehabil 2017;9:38-40
20. Shah MQ, Khan A, Zardad MS, Iqbal R, Ahmed S. Ponseti Technique For Management Of Congenital Idiopathic Club Foot.J Ayub Med Coll Abottabad 2017;29(2):246-249.
21. Smythe T, Chandramohan D, Bruce J, Kuper H, Lavy C, Foster A. Results of clubfoot treatment after manipulation and casting using the Ponseti method: experience in Harare, Zimbabwe. Trop Med Int Health 2016;1:1311–1318.
22. Aydin BK, Senaran H, Yilmaz G, Acar MA, Kirac Y. The need for Achilles tenotomy in the Ponseti method. Journal of Pediatric Orthopaedics B 2015; 24(4):341–344.
23. Adewole OA, Williams OM, Kayode MO, Shoga MO, Giwa SO. Early Experience with Ponseti Club Foot Management in Lagos, Nigeria. East and Central African Journal of Surgery. 2014;19(2):72–77.
24. Khan MK, Kabir SK, Iqbal J, Durrani Z.Frequency of Achilles? Tenotomy in Club Foot treated by Ponseti Method. Ophthalmol Update 2014;12(1):72-74.
25. Khan MK, Kabir SK, Khan MS, Iqbal J. Outcome of ponseti technique for idiopathic clubfoot using pirani scoring system. J Med Sci 2013; 21(4): 190-93.
26. Scher DM, Feldman DS, van Bosse HJ, Sala DA, Lehman WB. Predicting the need for tenotomy in the Ponseti method for correction of clubfeet. J Pediatr Orthop 2004: 24: 349-352.
27. Jain G, Lenka S, Chandra M, Mohanty T. Higher Rates of Achilles Tenotomy after a Didactic Session on Ponseti Method Arch Bone Jt Surg 2020;8(4):549-551.
28. Sharma A, Shukla S,B 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? Malays Orthop J 2018;12(1):26-30.
29. MacNeille R, Hennrikus W, Stapinski B, Leonard G. A mini-open technique for Achilles tenotomy in infants with clubfoot. J Child Orthop 2016;10(1):19-23.
30. Sharma S, Butt MF, Singh M, Sharma S. The posterior to anterior controlled technique of percutaneous Achilles tenotomy in the correction of idiopathic clubfoot: a technical report. J Pediatr Orthop *B* 2013;22(3):249-251.
31. Dobbs MB, Gordon JE, Walton T, Schoenecker PL. Bleeding complications following percutaneous tendoachilles tenotomy in the treatment of clubfoot deformity. Journal of Pediatric Orthopaedic. 2004 ;24(4):353–357.
32. Burghardt RD, Herzenberg JE, Ranade A. Pseudoaneurysm after Ponseti percutaneous Achilles tenotomy: a case report. Journal of Pediatric Orthopaedics 2008 ;28(3):366–369.