

Idiopathic congenital clubfoot: our experience with the Ponseti method of treatment

Naji Ullah Khan, Zahid Askar, Awal Hakeem, Zaffar Durrani, Israr Ahmad, Mohammad Ayaz Khan, Faheem Ullah

Abstract

Objective of this study was to present our experience with the Ponseti method in correcting idiopathic clubfoot deformity.

Patients and methods: This study was conducted in the Orthopaedic Unit of Khyber Teaching Hospital, Peshawar from April 2007 to December 2009. The study was conducted on 149 patients with 223 clubfeet. Severity of the deformity was graded into 4 grades according to the grading system of Dimeglio et al. All the patients were managed by ponseti method according to the standard protocol. All the patients were followed up regularly till the age of three years.

At the last follow up, all feet were reassessed for correction by the Dimeglio grading system. Eight patients with 13 clubfoot were lost to follow up and the study was completed on 141 patients with 210 idiopathic clubfeet.

Results: Out of 141 patients, 85 (60.3%) patients were male and 56 (39.7%) were female. Bilateral foot involvement was in 69 (48.9%) patients, right foot was involved in 40 patients and left foot was involved in 32 patients.

Mean age at initial casting was 4.5 weeks, mean number of casts applied were 5.1. Mean duration of casting was 3.0 months. Grade I deformity was present in 59 (28.0%) patients, grade II in 78 (37.1%) patients, grade III in 51 (24.3%) patients and grade IV deformity was present in 22 (10.5%) patients. Percutaneous tenotomy was performed in 201 (95.7%) of clubfeet at an average age of 2.5 months. 199 of 210 clubfeet were successfully corrected, 11 patients developed relapse, 4 patients needed operative treatment to achieve correction. No child had acute complication from conservative or operative treatment.

Conclusion: The Ponseti method is a safe and effective method of treatment for congenital idiopathic clubfoot, it has markedly reduced the need for the operative treatment and the complications associated with operative treatment and other forms of nonoperative treatment. Long term results of our study are awaited.

Key Words: Clubfoot, idiopathic, Ponseti, conservative treatment,

Introduction

Congenital Talipes Equino Varus (CTEV) or clubfoot is a common congenital deformity of foot.¹ Its incidence is about 1 in 1000 live births with approximately 50% of cases are bilateral.^{2,3} Male to female ratio is 2.5:1 and 24.4 % have family history of idiopathic talipes equino varus.⁴ CTEV may occur as an isolated birth defect i.e. idiopathic or may be associated with other

congenital deformities e.g. Edward syndrome, Spina bifida, Arthrogryphosis, Meningomyelo-coele and Cerebral palsy.⁵ The deformity consist of four components including equinus, hind foot varus, fore foot adduction and cavus or medial subluxation of navicular bones.^{5,6}

Treatment of CTEV can be challenging and when poorly treated can result in ongoing dis-

Department of
Orthopaedic,
Khyber Teaching
Hospital, Peshawar
NU Khan
Z Askar
A Hakeem
Z Durrani
I Ahmad
MA Khan

Khyber Medical College,
Peshawar
Faheem Ullah

Correspondence:

Naji Ullah Khan
Post Graduate Trainee,
Department of
Orthopaedic,
Khyber Teaching Hospital,
Peshawar.
Mobile No: 0333-9308151
Drnaji03@Yahoo.Com &
Drnaji77@Gmail.Com

ability and pain. There is a general consensus that initial treatment should be conservative.⁷ Previously both nonoperative manipulations^{8,9} and operative treatment¹⁰⁻¹² have been advocated for the treatment of CTEV. Earlier manipulative treatment as described by Kite and Lovell correct each component of the deformity separately therefore it take a longer time and several cast changing to slowly correct the condition.¹³

Extensive surgical releases were proposed to avoid complications and duration of casting technique but operative treatment was associated with a risk of infections, vascular injuries, stiffness, pain, extensive scarring, over correction, muscle weakness, shortening of foot and arthritic changes.^{14,15}

Recently, interest has been renewed in the non operative method of gentle manipulation and serial casting proposed by Ponseti.² Successful correction is reported in 90-98% of cases treated by ponseti method.² Ponseti method consist of treatment phase and maintenance phase, treatment phase consist of serial gentle manipulations and casting to gradually correct the clubfoot deformity and percutaneous tenotomy of the Achilles tendon to correct the residual ankle equinus. Maintenance phase consist of wearing of foot abduction braces for 2-3 years to maintain the correction.^{2,5}

Objective of this study was to present our experience with the Ponseti method in correcting idiopathic clubfoot deformity.

Material and methods:

This study was conducted in the Orthopaedic Unit of Khyber Teaching Hospital, Peshawar from April 2007 to December 2009. A total of 197 patients with 280 clubfoot were registered during the study period. Patient of clubfoot associated with other congenital deformities eg Spina bifida, Arthrogryphosis multiplexa congenita, Cerebral palsy, Myelomeningocele were excluded from the study, and patients with only idiopathic clubfoot were included in the study. After exclusion study was conducted on 149 patients with 223 clubfoot.

Written informed consent was obtained from all individuals. Every patients was assessed clinically and radiographically, the severity of the deformity was assessed according to the grading system of Dimeglio^{5,16} et al. and graded into 4 grades i.e. grade-I mild deformity, grade-II moderate deformity, grade-III severe deformity, grade-IV very severe deformity.

All the patients were managed by ponseti method according to the standard protocol.^{17,18} Treatment was started usually within the first 2 weeks of life, it consists of weekly gentle manipulations and serial castings, generally 4-8 casts were needed, after removal of the last cast foot was assessed for correction, any residual equinus was treated with simple percutaneous tenotomy of the Achilles Tendon under local anesthesia. After tenotomy, a cast was applied and left in place for 3 weeks to allow the Achilles tendon to heal.

Foot abduction orthosis was used to prevent relapse of the deformity. The brace was fitted on the same day as the last POP cast was removed. The orthosis was worn for 23 hours per day for the first 3 months and then for 12 to 14 hours during night and napes for the next 3 years. Parents were instructed to perform range of motion exercises for the ankle and foot when it is out of the brace.

All the patients were followed up on a weekly basis during the initial stages of treatment, after orthosis was applied the patients were seen on monthly basis for 3 months and then every 3 month till the patient was three year of age.

At the last follow up all feet were reassessed for correction by the Dimegilo grading system.

Eight patients with 13 clubfeet were lost to follow up and the study was completed on 141 patients with 210 idiopathic clubfeet.

Results:

Out of 141 patients, 85 (60.3%) patients were male and 56 (39.7%) were female. Bilateral foot involvement was in 69 (48.9%) patients with 138 club foot, right foot was involved in 40 patients and left foot was involved in 32 patients. Mean

Table 1: Demographic data of the patients (n=141)

Male	85 (60.3%)
Female	56 (39.7%)
Bilateral feet involvement	69 (48.9%)
Right foot involvement	40 (28.4%)
Left foot involvement	32 (22.7%)
Mean age at initial casting	4.5 weeks (range 1-19 weeks)
Mean No of casts	5.1 (range 4-8)
Mean duration of casting	3.0 months (range 2.5-4.5 months)

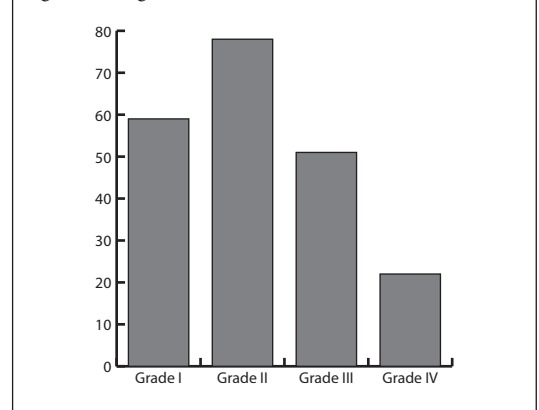
age at initial casting was 4.5 weeks (range 1-19 weeks), mean number of casts applied were 5.1 (range 4-8), more number of casts were needed in very severe deformity. Mean duration of casting was 3.0 months (range 2.5- 4.5 months). Table 1. All deformities were classified according to Dimeglio grading system. Grade-I deformity was present in 59 (28.0%) patients, grade-II in 78 (37.1%) patients, grade-III in 51 (24.3%) patients and grade-IV deformity was present in 22 (10.5%) patients. Fig 1.

Percutaneous tenotomy was performed in 201 (95.7%) clubfeet at an average age of 2.5 months (range 2 – 4 months) to correct the residual deformity.

At the last follow-up, all clubfeet were re-assessed, all grade deformities showed excellent results and the average severity score dropped significantly from 12.7 to 3.8. The mean amount of ankle dorsiflexion after Achilles tendon tenotomy was 23.3° (range 15°-34°). At the last follow-up the mean amount of ankle dorsiflexion was 19.3° (range 10°-31°)

199 Of 210 clubfeet were successfully corrected with the standard Ponseti protocol, 11 feet developed recurrent deformity, of these 11 feet, 7 were treated successfully with re-manipulations and re-casting alone and 4 feet needed postromedial release to achieve the full correction.

No child had acute complications from manipulations, castings, or operative procedures e.g infection, skin necrosis, neurovascular compromise, or profuse post-tenotomy bleeding.

Figure 1: Number of clubfeet deformities according to Dimeglio Grading

Discussion:

Idiopathic clubfoot has been recognized as a difficult and frustrating deformity to treat.¹⁹ Proper treatment of clubfoot has long been debated in orthopaedic literature, while details of various surgical procedures are available, manipulative techniques and their results are rarely described.²⁰ In a study by Nather²¹ et al. 174 feet were conservatively treated with a success rate of 58 % but the manipulative technique was not described. In a study by Ikeda²² initial good results were obtained by conservative treatment however long term follow up revealed high rates of residual deformities. Another study from Tokyo²³ reported 64 % of success rate with conservative management. Other means of conservative management such as physiotherapy and continuous passive motion were laborious to perform and the subsequent need for surgery ranges from 32 to 95 % depending on the initial severity of the club foot.⁹⁻²⁴

Kite²⁵ technique involve many months of weekly serial manipulation and casting to obtain only a partial correction of the deformity, feet not responding to manipulation were described as resistant and they subsequently underwent extensive corrective surgeries.²⁶ In non of the afore-mentioned studies, Achilles tendon tenotomy was performed as a part of the conservative management. Due to unsatisfactory results of conservative treatment of clubfoot, operative treatment was adopted like postromedial release. The major concern in the operative treatment of congenital clubfoot was the functional

outcome. After the initial good results, for the first 10 years of life, the functional results often deteriorates as the child grows. Open surgical release often leads to scarring and stiffness of the ankle with resulting limitation of motion and strength.^{16,19,27} Aronson²⁸ showed that patients who had undergone postromedial release had reduced planterflexion motion and diminished push-off strength. With the poor long term functional outcome after operative treatment, interest has been renewed in the conservative management proposed by Ponseti.^{17,18}

Ponseti method is based on strict rules established from anatomical evidence. The goal is to impose simultaneous supination and abduction of the foot, once the calcaneopadal block has been derotated, percutaneous tenotomy of the Achilles tendon was performed to correct the residual equinus.^{16,29} Ponseti technique has been reported with 92-98 % successful results for the treatment of idiopathic clubfoot.^{2,7,27} The key to the success of Ponseti technique is to realign the calcaneus together with the forefoot under and in front of the talus. Percutaneous tenotomy under local anesthesia in a clinical sitting was well tolerated by the patients and their parents and was free of complications.¹⁹ Studies have shown that after adopting the ponseti technique the need for postromedial release has been dropped from 57% to 6%²⁰ and 94% to 3%.²²

Three dimensional CT reconstruction of the whole foot also showed that cavus, supination and adduction are corrected much better with ponseti technique.³⁰

In our study male to female ratio was 1.5:1 which is consistent with the earlier studies.^{6,13,31} Bilateral involvement was almost 50% and right side was more involved then the left side which is also comparable to the previous studies.^{6,32}

We have successfully corrected 199 of 210 club-foot deformities using Ponseti method. 11 club-foot develop recurrence of the deformity, main reason of recurrence was non compliance with the use of orthosis. This reason has been widely reported to be the main factor causing failure of

the technique.^{3,7,27} Reason for the non compliance was mainly intolerance, other issues were blistering, non fitting of the orthosis due to recurring of the deformity, lack of parents education, and poverty.^{5,6} We have excellent initial results and our results are comparable with the other studies.^{5,16,20} Long term result of our study are awaited.

The Ponseti method is a safe and effective method of treatment for congenital idiopathic club foot. It has markedly reduced the need for the operative treatment and the complications associated with operative treatment and other forms of nonoperative treatment.

References

1. Riaz A, Sohail MT. Turco's one stage postromedial release in idiopathic CTEV. *J Pakistan orthop Assoc* 1992; 2(5): 67-76.
2. Beatty JH. Congenital Anomalies of the lower extremity. In: Canale ST, Beatty JH, editor. *Campbell's operative orthopaedics*. 11th ed. Philadelphia: Mosby 2008: 1063-1179.
3. Doobs MB, Rudzki JR, Purcell DB, Walton T, Porter KR, Gurnatt CA. Factors predictive of outcome after use of ponseti method for treatment of idiopathic club foot. *J Bone Joint Surg (Am)* 2004; 86(1): 22-7.
4. Lochmiller C, Johnston D, Scott A, Risman M, Hecht J. Genetic epidemiology study of idiopathic talipes equinovarus. *Am J Med Genet* 1998; 79:90-6.
5. Gerlach DJ, Gurnett CA, Limpaphayom N, Alaei F, Zhang Z, Porter K et al. Early results of the ponseti method for the treatment of clubfoot associated with Myelomeningocele. *J Bone Joint Surg Am* 2009;91:1350-9.
6. Shahab-ud-din, Shah SA, Hayat S. conservative management of congenital talipes equino varus (club foot). *JPMI* 2004;18(3):368-72.
7. Mercuende JA, Dolan LA, Dietz FR, Ponseti IV. Radical reduction in the rate of Extensive corrective surgery for clubfoot using ponseti method. *Pediatrics* 2004;113:376-80.
8. Kite JH. Non operative treatment of congenital clubfoot. *Clin Orthop Relet Res* 1972;84:29-38.
9. Dimeglio A, Bonnet F, Mazeau P, De Rosa V. Orthopaedic treatment and passive motion mechanism: consequences for the surgical treatment of clubfoot. *J Pediatr Orthop B*. 1996;5:173-80.
10. Dobbs MB, Nunley R, Schoenecker PL. Long-term follow-up of patients with clubfoot treated with extensive soft-tissue release. *J Bone Joint Surg Am*. 2006;88:986-96.
11. Ippolito E, Farsetti P, Caterini R, Tudisco C. Long-term comparative results in patients with congenital clubfoot treated with two different protocols. *J Bone Joint Surg Am*. 2003;85:1286-94.
12. Green AD, Lloyd-Roberts GC. The results of early posterior release in resistant clubfeet. A long term review. *J Bone Joint Surg Br*. 1985;67:588-93.
13. Cummings JR, Davidson RS, Armstrong PF, Lehman, W. Congenital clubfoot. *J Bone Joint Surg [Am]* 2002;84(2):290-308.
14. Docker C, Lewthwaite S, Kiely N. Ponseti treatment in the management of clubfoot deformity-a continuing role for pediatric orthopaedic services in secondary care centers. *Ann R Coll Surg Engl* 2007;89:510-2.
15. Carroll NC. Clubfoot: what have we learned in the last quarter century? [Editorial]. *J Pediatr Orthop* 1997;17:1-2.

16. Agrawal RA, Suresh MS, Agrawal R. Treatment of congenital clubfoot with ponseti method. *IJO* 2005;39(4):244-7.
17. Ponseti IV. *Congenital clubfoot: fundamental of treatment*. Oxford: Oxford university Press;1996.
18. Ponseti IV. Treatment of congenital clubfoot. *J bone Joint Surg Am* 1992;74:448-54.
19. Elshenawy EM, Hassanen EY, Ramadam AI, Ibrahim MM. The Mansoura experience in the treatment of idiopathic clubfoot deformity using the ponseti technique. *Acta orthop Belg* 2008;74:658-66.
20. Seveg E, Keret D, Lokiec F, Yavor A, Wientroub S, Ezra E, et.al. Early experience with the ponseti method for the treatment of congenital idiopathic clubfoot. *Isr Med Assoc J*. 2005;7:307-10.
21. Nather A, Bose K. Conservative and surgical treatment of clubfoot. *J Pediatr Orthop* 1987;7:42-8.
22. Ikeda K. Coservative treatment of idiopathic Clubfoot. *J Pediatr Orthop* 1992;12:217-23.
23. Yamamoto H, Muneta T, Morita S. non surgical treatment of congenital clubfoot with manipulation. cast and modified Danis Browen splint. *J Pediatr Orthop* 1998;18:538-42.
24. Bensahel H, Guillome A, Czukonyi Z, Desgrippes Y. Results of physicial therapy for idiopathic clubfoot: a long term follow-up study. *J Pediatr Orthop* 1990;10:189-92.
25. kite JH. Non operative treatment of congenital clubfoot. A review of one hundred cases. *South Med J* 1930;23(4):337-45.
26. Dobbs MB, Morcuende JA, Gurnett C, Ponseti IV. Treatment of idiopathic clubfoot: An historical review. *Lowa orthop J* 2000;20:59-64.
27. Herzenberg JE, Radler C, Bor N. Ponseti versus traditional methods of casting for idiopathic clubfoot. *J Pediatr Orthop* 2002;22(4):517-21.
28. Aronson J, Puskarich CL. Deformity and disability from treated clubfoot. *J Pediatr orthop* 1990;10:109-12.
29. Chotel F, Parot R, Durand JM, Garnier E, Hodgkinson I, Berard J. Initial management of congenital varus equinus clubfoot by ponseti's method. *Rev Chir Orthop Reparatrice Appar Mot*. 2002;88(7):710-7.
30. Ippolito E, Fraracci L, Farsetti P. The influence of treatment on the Pathology of clubfoot- CT study at maturity. *J Bone Jiont Surg (Br)* 2004;86(4):574-80.
31. Mahboob G. Management of Congenital Telipes Equino Varus (CTEV) at Jinnah postgraduate medical center, Karachi. *J Pakistan orthop Assoc* 1994;10:75-7.
32. Cahuzae JP, Baunin C, Luu S. assessment of hind foot deformity by the three dimensional MRI in infant clubfoot. *J Bone Joint Surg* 1999;81B:97-101.