

The Results of Posteromedial Release in Clubfoot below the Age of 3 Years

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Research Article

Abstract: **Specific objectives:** Congenital Talipes Equinovarus (Clubfoot) is one of the most common foot anomalies which can be treated by serial casting technique with high rate of success. Surgery is indicated for deformities that do not respond to conservative treatment or the patients that seek medical intervention too late. In this study, we reviewed the results of posteromedial release in clubfoot below 3 years. **Materials and methods:** Between May 2009 to June 2013, we treated sixty four feet (64) with idiopathic CTEV in forty (40) children who were below 3 years, who were evaluated and operated using posteromedial release in Father Muller Medical College Hospital, Mangalore. All the feet were given a trial of serial manipulation and cast application till the deformities were no more correctable. Medial release was done with the separate incision, only when full correction could not be obtained with posterior release. Sutures were removed after 15 days followed by manipulation and cast application. Postoperative cast immobilization continued for 2 months in an over corrected position, followed by immobilization with CTEV splint and CTEV shoe. At the end of 6 and 12 months all the feet were evaluated according to the modified Wynne – Davies Scoring system. **Results:** All 64 feet were operated between ages of 3 months to 18 months with a mean age of 8.4 months. Out of the 64 feet 10 feet required only posterior release whereas rest of the 54 feet required posterior and medial release. Postoperatively the patients were followed up for a minimum of 12 months to a maximum of 48 months with a mean of 30 months. Post-Operative evaluation was done according to the total score obtained by the modified Wynne – Davies Scoring system. According to this, 40 feet were evaluated as excellent, 12 were good, 4 were fair and 8 were poor. 22 patients had residual deformity. Among the residual deformities noted, forefoot adduction was by far the commonest and hindfoot varus came next. Gait was considered normal in 22 feet only. Among 64 feet assessed, 4 feet were regarded as poor on clinical grounds. All 4 had residual deformities i.e Forefoot adduction, hindfoot varus and hindfoot equinus. All relapsed cases were treated by JESS application with gradual stretching and correction of the deformity. All except one foot showed good results following this procedure. **Conclusion:** The timing of surgery did not change the final outcome considerably below 3 years of age in clubfoot. With posterior and posteromedial release 81.25 percent of cases had excellent to good results. Importance should be given to adequate soft tissue release and immediate post-operative splinting for obtaining good result. Relapses did not occur in 2 year follow-up period, in those cases, where good correction was obtained initially. Mild forefoot adduction was the commonest residual deformity, which did not lead to any functional

outcome. Controlled differential fractional distraction by the application of JESS is more suitable for the correction of relapsed cases, than second surgical procedures. Since we treated only 4 cases by this method, it is difficult to comment on the final outcome

Keywords: Congenital talipes equinovarus, posteromedial release.

Introduction

Idiopathic congenital talipes equinovarus (clubfoot) is a common complex deformity that occurs in approximately one or two per 1000 newborns¹. The long-term goal of treatment is a functional, pain-free, plantigrade foot with good mobility, without calluses, and without the need for shoe wear modification^{2,3}. Treatment of congenital talipes equinovarus (clubfoot) begins as soon as possible with serial casting techniques⁴ with 20-95% of success rate.⁵ However, in cases of failure of serial casting or recurrence, or in whom parents seek medical intervention too late, surgical treatment can be performed. There are different types of surgical procedures according to the remaining deformities ranging from simple posterior release and tendon transfers to extensive procedures like postero-medial release⁶ and complete subtalar release.⁷ Theoretically, as the child becomes older, soft tissues become more contracted and difficult to be corrected because of longstanding deformity and secondary contractures. Turco⁸ reported that the best results from the surgical treatment of congenital clubfoot were obtained in children operated on between the ages of one and two years and years and the thereafter the number of the excellent results diminished as the age at operation increased. Hence this study reviewed the results of clubfoot treated with posteromedial release below 3 years.

Materials and Methods

This study was conducted in the Department of Orthopaedic surgery, Father Muller Medical College Hospital, Mangalore with sixty four feet (64) with idiopathic congenital talipes equinovarus (CTEV) in forty (40) children, who were evaluated and operated below the

age of 3 years between May 2009 to June 2013. The exclusion criteria were clubfoot secondary to some other disorders such as cerebral palsy, arthrogryphosis multiplex congenita, myelodysplasia or congenital dislocation of the hip. All the feet were given a trial of serial manipulation and cast application till the deformities were no more correctable. At the end of all feet was clinically re – examined and graded into one of the 3 grades according to the following criteria:

Grade I: (supple feet) – where the deformity of the feet could be passively corrected to near normal.

Grade – II (rigid feet) – where the deformity could only be corrected partially and passive correction offered resistance.

Grade III (rigid feet) where the deformity could not be corrected at all and offered marked resistance

We used two separate incisions, one on posterior aspect of tendoachilles and one on the medial aspect of foot. The surgical treatment comprised of posterior release which included lengthening of tendoachilles and tibialis posterior, partial tenotomy of flexor digitorum longus and flexor hallucis longus, capsulotomies of ankle and subtalar joints, release of talofibular ligament and inferior tibiofibular ligament. The medial and plantar release

included release of abductor hallucis and flexor hallucis brevis near their origin, release of abnormal plantar insulation of tibialis anterior when present, capsulotomies of talonavicular and naviculocuneiform joints, release of ligaments including superficial deltoid ligament and master knot of Henry. The release of plantar fascia and plantar muscles from calcaneus is done whenever required. Then the foot and ankle are manipulated to an over – corrected position, to align the bony elements in anatomical position. Medial release was done only when the full correction could not be obtained after posterior release. Sutures were removed after 15 days followed by manipulation and cast application. Patients were followed up post – operatively at regular intervals. Postoperative cast immobilization continued for 2 months in an over corrected position. Early discontinuation of casts required when the patient had been maintaining the cast poorly. Following the cast discontinuation, CTEV splints were given up to the age of 10 months. Corrective shoes with high ankle and lateral wedge were given after 10 to 11 months of age. At the end of minimum of 6 and 12 months all the feet were re-examined were evaluated according to the modified Wynne – Davies Scoring system.

Clinical Assessment

Appearance		Score
1.Plantigrade	Yes	4
	No	0
2. Borders of foot	Curved	0
	Straight	2
3. Medial Longitudinal Arch	Formed	2
	Mobile	2
4. Fore Foot: (a) Adduction	Nil	4
	Mild	3
	Moderate	1
	Severe	0
(b) Inversion	Nil	4
	Mild	3
	Moderate	1
	Severe	0
(c) Equinus	Nil	4
	Mild	3
	Moderate	1
	Severe	0
5.Hind Foot (a) Adduction	Nil	4
	Mild	3
	Moderate	1
	Severe	0

(b) Inversion	Nil	4
	Mild	3
	Moderate	1
	Severe	0

Appearance		Score
(c) Equinus	Nil	4
	Mild	3
	Moderate	1
	Severe	0
6. Gait		4
	a. Normal	3
	b. Simultaneous heel toe gait	2
	c. Mild toe heel gait/slapping gait	1
	d. Pigeon toe gait	0
7. Movements		
	(a) Ankle	
	Full	4
	Mild Restriction	2
	Severe restriction	0
(b) Subtalar	Full	4
	Restricted	0
8. Evertor Muscle Power	Grade V	4
	Grade IV	3
	Grade III	2
	Grade II	1
	Grade I and 0	0
Total		50

The results are classified as

Excellent	46 to 50
Good	41 to 45
Fair	36 to 40
Poor	Below 35

Results

This study included 26 males and 14 female children in the ratio of 1.8 :1. Bilateral limb involvement was far commoner in the ratio of 3:2. Out of 40 children 24 had bilateral deformities and 16 had unilateral deformities. In unilateral cases, 12 were on the right side and 4 were on the left side. Right foot was commonly involved in the ratio of 3:1. All 64 feet were graded clinically showed 46 feet of Grade – III, 18 feet of Grade – II. All 64 feet were operated between ages of 3 months to 18 months with a mean age of 8.4 months. Out of the 64 feet 10 feet required only posterior release whereas rest of the 54 feet required posterior and medial release. Period of post – operative immobilization varied 2 months. Post operatively the patients were followed up for a minimum of 6 months to a maximum of 48 months with a mean of 22.5 months. Post Operative evaluation was done according to the total score obtained by the modified Wynne – Davies Scoring system. According to this, 40 feet were evaluated as excellent, 12 were good, 8 were fair and 4 were poor. No residual deformity was appreciated clinically in 18 feet. All other feet had some residual deformity. Among the residual deformities noted,

forefoot adduction was by far the commonest (44 feet) and hindfoot varus came next (28 Feet). Gait was considered normal in 22 feet. The commonest abnormal finding was the pigeon –toed gait. 36 feet were considered to have the normal range of ankle movement while 50 were assessed as having normal range of subtalar movement. A normal event or power was observed in very few feet. It must be noted however, that this was a very difficult parameter to check in young children. Among 64 feet assessed 4 feet were regarded as poor on clinical grounds. All 4 had residual deformities. Forefoot adduction (moderate) was present in all 4 feet. Hindfoot varus was present in all 4 feet (which was moderate in 2 feet and mild in 2 feet). Hind foot equinus was also present in all 4 feet (moderate in 3 feet and mild in 1 foot). Gait was unsightly in all the four feet, with pronounced limp. All four feet had marked reduction of the range of ankle and subtalar movement. All relapsed cases were treated by JESS application with gradual stretching and correction of the deformity. All except one foot showed good results following this procedure.



Figure 1: Full correction after only posterior release



Figure 2: Excellent result after long term follow up

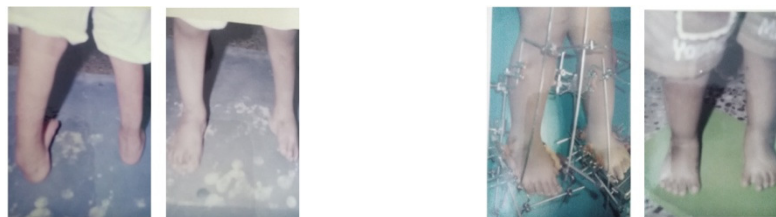


Figure 3: Residual forefoot adduction



Figure 4: Relapsed clubfoot on left side with right foot showing good results



Figure 5: Bilateral relapsed deformities treated with JESS and Good result following treatment with JESS

Discussion

There are many studies regarding functional and radiographical results of different surgical intervention for resistant clubfoot. Although nowadays there is a trend to treat all clubfoot patients with Ponseti method of casting,^{9,10} or it is advised for the treatment of recurrent clubfoot in patients after posteromedial release^{11,12} and even some investigators advise using casting along with postero-medial release.¹³ Previous reports generally advised earlier surgical intervention and extensive posteromedial release for congenital clubfoot cases.¹⁴ Karakurt et al¹⁵ in a study compared the results of complete subtalar release by Cincinnati and posteromedial incisions in 40 clubfeet and found 18.5% superficial skin necrosis and 78% of soft tissue swelling in patients treated by posteromedial release. He finally concluded that posteromedial incision is a suitable and safe incision for complete subtalar release. The sex ratio (M.F. =1.9:1) observed in the present study was almost similar to that observed by Turco¹⁶ and Kite. Bilateral involvement (3:2) was far more common than what was observed by Turco¹⁶ and Palmer¹⁷. The data collected by Truco¹⁶ revealed that right and left sides were equally involved. Here, the involvement of right side was found to be more common than left side. Attenborough¹⁸ was of the view that, some feet which initially appear postural, later may show signs of resistance to non-operative treatment. During manipulative treatment some feet which were initially grade III responded well to non-

operative treatment. So it is necessary to grade the clubfeet in the course of treatment rather than during the initial presentation. Among the operated cases 72 percent were of Grade III and 28 percent were grade II. These grading are comparable with grading observed by Chacko et al.¹⁹ Controversy over the timing of posteromedial release for club – foot exists throughout the literature. Most of the authors are of the opinion that early surgery has better results.^{20,21,22,8} 65 percent of our patients were below 6 months of age. Similar outcome was observed following surgical release irrespective of the timing of surgery. Ghali et al²³ had observed similar results. Hussain et al²⁴ in a study of 70 surgically treated patients by modified Turco posterior medial release concluded that this operation can be successfully used in all the cases of resistant clubfoot until three years. Posterior release has been advocated by many authors (Attenborough 1966, Hutchins et al 1985, Lloyd Roberts 1985). All of them claimed good results in most of their cases. Out of 64 feet 10 feet showed good correction after only posterior release. 8 out of these 10 feet were Grade II. Following surgery all 10 feet showed excellent results. Main et al²⁵ used both posterior and posteromedial release in their patients and satisfactory results were obtained in 50 percent of the cases. With the posterior and posteromedial release, we had excellent to good results in 81.25 percent, fair results in 12.5 percent and poor in 6.25 percent of cases. Hussain et al.²⁴ study showed excellent results in 65.38%, good in 17.30%, fair 3.84%, and poor in 13.46% patients. Following

posteromedial release in 54 feet there were 78 percent of excellent to good results. These results are comparable to the results obtained by many others including Chacko et al (70 Percent),¹⁹ Turco (87 percent),⁸ Bensahel et al (88 percent).²⁶ Mazone²⁷ also found 76.6 excellent and good results in 23 clubfeet in the patients with mean age of 7.7 months (range 3.5-19 months) treated by posteromedial release. Historically postoperative assessment studies have given little consideration to dynamic foot correction. Most of them have focused on correction of static deformity. This study includes a scoring system which is both functional and static. Although radical procedures like pantalar release and osteotomies have been advocated by Turco (1979),⁸ Ghali et al (1983),²³ Simons (1987),⁷ our results with single stage posterior or posteromedial release have been excellent to good in 81.25 percent of cases. Hence a radical surgery may not be necessary as a primary procedure, in this age group. Porter²⁸ advocates that it is reasonable to offer staged surgeries until we can identify those feet which will require both hind foot and forefoot correction. Hooker (1979), Turco (1979)⁸ obtained good results after post-operative immobilization in an above knee plaster cast for a minimum period of 4 months. They predicted poor results if immobilization done for a lesser period and if a below knee cast is used. Immobilization carried out for an average of 3 months in most of our patients in an above knee cast. We had satisfactory correction in 52 out of 64 feet. Some cases where immobilization was done for only 2 months also showed good results. Poor results were seen in those children who repeatedly broke or soiled the cast during this period. Ryoppy and Sairanen²⁹ and many others are of the opinion that, recurrence eventually occurs between the first and second year of operation, if at all it occurs. This was a short term follow-up study with an average of 22.5 months. Relapses did not occur in 2 years following surgery in those cases where the correction was good initially. We encountered poor results in two children (4 feet). All had bilateral rigid deformities. Posteromedial release was done at the age of 9 months in 2 children. All the tight structures were released and full correction was obtained. Difficulty has been faced in maintaining the correction following surgery. These patients broke, soiled or loosened the plaster cast repeatedly. CTEV splints were given earlier than usual to maintain the correction. After 6 months of follow up, almost all deformities found to be relapsed. The causes of these relapses were not clear cut. One of the causes may be failure in identifying and releasing tight lateral structures. Also failure to align the bony elements anatomically may be one of the causes for relapse. It is quite difficult to make out clinically whether all foot bones are in good alignment, especially in a chubby foot. Porter²⁸ reported that if the correction is not

maintained or balanced the deformity will recur. In his series he balanced the correction by lengthening the invertors and shortening the peroneus longus. This shows intrinsic factors like unbalanced foot could have been responsible for the relapse in our cases. It is always not very easy to apply a good corrective cast for a club foot, especially so if it is a nonsedated child. It is more important to maintain the cast in good condition, which most of the patients fail to do. This could be one of the causes for the poor results. Commonest residual deformity was forefoot adduction (62.5 percent), which was mild in most of the case. Residual forefoot adduction was noted in a sizeable proportion of children in other studies as well.^{30,31,32} Otremski et al³³ observed reduced incidence of residual forefoot adduction by performing the surgery at an earlier age and by the release of short plantar muscles and fascia. Early relocation of talonavicular joint is one of the cause for reduced incidence of residual forefoot adduction in a younger age. Simons⁷ noted that one of the main disadvantages of complete subtalar release is the tendency to overcorrect. There were 3 cases with mild hindfoot valgus, which had no symptoms. Problem of overcorrection is less when posteromedial release along was done. Yamamoto H et al³⁴ in a review of 19 children for whom one stage posteromedial release were performed at the age of 5 years or older, found good radiographic alignment of tarsal bone but mild adduction and varus deformity as complications. Kaewpornawan et al³⁵ in a study comparing modified posteromedial release and complete subtalar release in resistant clubfoot, found 15% mild forefoot adduction, 6% soft tissue infection, and 3% reoperation and 85.5% good and excellent results in patients treated by modified posteromedial release.

Conclusion

Similar outcome was observed following surgical release irrespective of the timing of the surgery (from 3 months to 18 months). With posterior and posteromedial release 81.25 percent of cases had excellent to good results. Radical surgical procedure like complete subtalar release or osteotomy may not be necessary in this age group as a primary procedure. Importance should be given to immediate post-operative immobilization. Serial application of a good above knee POP cast for a minimum of 3 months is necessary for obtaining a good result. Relapses did not occur in 2 year follow-up period, in those cases, where good correction was obtained initially. Mild forefoot adduction was the commonest residual deformity, which did not lead to any functional problem. On analyzing the poor results, the causes of failure can be placed at viz- inadequate realignment of bony elements, inadequate release of lateral structures, failure to correct the muscle imbalance between invertor

– plantar flexors and evertor – dorsiflexors. Controlled differential fractional distraction by the application of JESS is more suitable for the correction of relapsed cases, than second surgical procedures. Since we treated only 4 cases by this method, it is difficult to comment on the final outcome.

References

- Wynne-Davies R. Genetic and environmental factors in the etiology of talipes equinovarus. *Clin Orthop Relat Res.* 1972;84:9-13.
- Porat S, Milgrom C, Bentley G. The history of treatment of congenital clubfoot at the Royal Liverpool Children's Hospital: Improvement of results by early extensive posteromedial release. *J Pediatr Orthop* 1984;4(3):331-338.
- Karakurt L, Belhan O, Varol T, Yilmaz E, Serin E. Comparison of the mid-term results of complete subtalar release by the Cincinnati and the posteromedial incisions in clubfoot. *Eklem Hastalik Cerrahisi* 2009;20(1):32-40.
- Weimann-Stahlschmidt K, Krauspe R, Westhoff B. Congenital clubfoot. *Orthopade* 2010;39(11):1071-1084.
- Deniz G, Bombaci H, Tuygun H, Gorgec M. Long-term results of extensive surgical dissection in the treatment of congenital clubfoot. *Acta Orthop et Acta Orthop Traumatol Turc* 2008;42(1):44-52.
- van Gelder JH, van Ruiten AG, Visser JD, Maathuis PG. Longterm results of the posteromedial release in the treatment of idiopathic clubfoot. *J Pediatr Orthop* 2010;30(7):700-704.
- Simons GW. The complete subtalar release in clubfeet. *Orthop Clin North Am* 1987;18(4):667-88.
- Turco VJ : Surgical correction of the resistant clubfoot. One Stage posteromedial release with internal fixation. A preliminary report. *J Bone joint Surg.* 53-A : 477, 1971.
- Halanski MA, Davison JE, Huang JC, Walker CG, Walsh SJ, Crawford HA. Ponseti method compared with surgical treatment of clubfoot: A prospective comparison. *J Bone Joint Surg Am* 2010;92(2):270-278.
- Van Bosse HJ. Ponseti treatment for clubfeet: An international perspective. *Curr Opin Pediatr* 2010;30(8):813-817.
- Nogueira MP, Ey Battle AM, Alves CG. Is it possible to treat recurrent clubfoot with the Ponseti technique after posteromedial release?: A preliminary study. *Clin Orthop Relat Res* 2009;467(5):1298-1305.
- Garg S, Dobbs MB. Use of the Ponseti method for recurrent clubfoot following posteromedial release. *Indian J Orthop* 2008;42(1):68-72.
- 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- A(7):1286-1294.
- Porat S, Milgrom C, Bentley G. The history of treatment of congenital clubfoot at the Royal Liverpool Children's Hospital: Improvement of results by early extensive posteromedial release. *J Pediatr Orthop* 1984;4(3):331-338.
- Karakurt L, Belhan O, Varol T, Yilmaz E, Serin E. Comparison of the mid-term results of complete subtalar release by the Cincinnati and the posteromedial incisions in clubfoot. *Eklem Hastalik Cerrahisi* 2009;20(1):32-40.
- Turco VJ : Clubfoot. Churchill Livingstone, New York, 1985.
- Palmer RM : The genetic of Talipes equinovarus. *J Bone Joint Surg* 46A : 542, 1964.
- Attenborough CG: Severe congenital talipes equinovarus. *J Bone Joint Surg (Br)* (1) : 31, 1966.
- Chacko V, Mathew T: Some observations in the treatment of congenital clubfoot. *Indian Journal of Orthopaedics.* 10:127-131, Dec-1976.
- Main Bj, Cride Rj : An analysis of residual deformity in clubfoot submitted to early operation. *J Bone Joint Surg* 60 B : 536, 1878.
- Ponseti IV, Smoley EN : Congenital clubfoot, the results of treatment. *J Bone Joint Surg* 45A: 261, 1963.
- Schlaflly B, Butler JE, Siff SJ et al : The appearance of tarsal navicular after posteromedial release for clubfoot. *Foot Ankle* 5: 222, 1985.
- Ghali NN, Smith RB : The results of pantalar correction in the management of congenital talipes equinovarus. *J Bone Joint Surg* 65-B: 1-7, 1983 Jan
- Hussain SA, Khan MS, Ali MA, Shahabuddin. Modified Turco's postero-medial release for congenital talipes equinovarus. *J Ayub Med Coll Abbottabad* 2008;20(3):78-80.
- Main Bj, Cride Rj : An analysis of residual deformity in clubfoot submitted to early operation. *Bone Joint Surg* 60 B : 536, 1878.
- Bensahel H, Osukonyi Z, Desgrippes Y, Chaumein JP: Surgery in residual Club Foot : One stage medioposterior release "a la carte". *J Pediatr Orthop* 7: 145, 1987.
- Mazone P. Clubfoot surgical treatment: Preliminary results of a prospective comparative study of two techniques. *J Pediatr Orthop B* 1999;8(4):246-250.
- Porter RW: Congenital talipes equinovarus; IIA staged method of surgical treatment. *J Bone Joint Surg* 69-B : 826- 831, 1987.
- Ryoppy S, Sairanen H: Neonatal operative treatment of clubfoot. *Bone Joint Surg* 65-B : 320-325 1983.
- Porat S, Kaplan L : Critical analysis of results in clubfeet treated surgically along the Norris Carroll approach. Seven years experience. *J Pediatr Orthop* 9: 137, 1989.
- Hutchins PM, Foster BK, Paterson DC, Cole EA. Long-term results of early surgical release in clubfeet. *J Bone Joint Surg Br* 1985; 67:791-99.
- Harvey AR, Uglow MG, Clarke NM. Clinical and functional outcome of relapse surgery in severe congenital talipes equinovarus. *J Pediatr Orthop B* 2003; 12:49-55
- Otremski I, Salmaa R et al : Residual adduction of the forefoot – *J Bone Joint Surg* 69-B : 832-834, 1987.
- Yamamoto H, Muneta T, Ishibashi T, Furuya K. Posteromedial release of congenital club foot in children over five years of age. *J Bone Joint Surg Br* 1994;76(4):555-558.
- Kaewpornawan K, Khuntisuk S, Jatunarat R. Comparison of modified posteromedial release and complete subtalar release in resistant congenital clubfoot: A randomized controlled trial. *J Med Assoc Thai* 2007;90(5):936-941.