

# The Cincinnati Approach To Ctev Correction; A Study On 43 Feet Treated By The Modified Mckay Procedure

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## Abstract

**Aim:** Adequate surgical correction of congenital talipes equinovarus (CTEV) is a challenge to orthopedicians aiming to address all aspects of this complex foot deformity. Various exposures have been elucidated with varying results. This study discusses the Cincinnati approach advocated by McKay and whether it addresses the various aspects of clubfoot correction. **Materials and methods:** Pantalar release using the circumferential Cincinnati incision was done in 43 feet of 30 patients aged between 9 months to 3 years. The right side was involved in 11, the left in 6 and bilateral involvement present in 13 cases. All cases were found to be resistant to correction by the conservative method proposed by Ponseti. **Results:** The patients were followed up for a minimum period of 2 years. Excellent results were seen in 18%, good in 46%, fair in 20% and poor in 14% cases. More than half of the cases had a preop talocalcaneal index of 21-30 percent which converted to 51-60 percent after surgery. **Conclusion:** The Cincinnati approach is ideal to achieve pantalar reduction, is cosmetically more acceptable and gives a better range of motion.

## INTRODUCTION

Congenital talipes equinovarus (CTEV) or clubfoot is one of the commonest foot deformities and its incidence is approximately one in every 1000 live births.<sup>1</sup> It is a complex deformity that is notoriously difficult to correct. Corrected, it has a tendency to recur until the age of six or seven years.<sup>2</sup> Manipulative treatment, though effective when instituted early, has also resulted in increased cavus deformity, rocker bottom deformity, longitudinal breech, flattening of the proximal surface of talus, lateral rotation of the ankle and increased stiffness of the ligaments and joints.<sup>3, 4, 5</sup>

Some authors advise early and primary operative treatment of clubfoot.<sup>2</sup> In 1978, Turco introduced the one stage soft tissue posteromedial release.<sup>6</sup> The posteromedial release of Turco has been used for a long time with good results in most CTEV cases but it was always felt that this procedure did not address the deformities on the lateral aspect i.e. the peroneal tendons and retinaculum, sural nerve, calcaneofibular ligament, bifurcate ligament, lateral joint capsule, dorsal calcaneocuboid ligament, EDB origin etc. which remain unexposed. These structures must be released to reverse the tethering of the posterior calcaneus to the fibula and to allow calcaneocuboid relocation to correct the midfoot and forefoot adduction and varus as well as talar relocation into the medial column<sup>7</sup>. Carroll and Gross

advocated a twin-incision approach using a posterolateral and a medial incision to improve access, especially on the lateral side<sup>13</sup> but the cosmesis and correction were less desirable.

Douglas McKay introduced a circumferential release of the posterior, medial, lateral and plantar aspects of the foot which is now the preferred exposure at the Mayo Clinic as well<sup>7</sup>. The advantages with this approach are that it provides excellent exposure of the subtalar joint and is useful in patients with a severe internal rotation deformity of the calcaneus and allows increased visualization of the medial, lateral, plantar and posterior structures with simultaneous evaluation of the released structures in a sagittal, frontal and transverse fashion<sup>7, 8</sup>. The lateral extension of the incision allows clear access to the lateral structures, thus avoiding the inability of the hockey stick incision to address the lateral deformities.

## MATERIAL AND METHODS

This study was conducted on 30 children (aged between 9 months to 3 years) and 43 feet and the results assessed 2-4 years postoperatively. The purpose was to assess the efficiency of the Cincinnati incision in providing surgical access to the main affectations and the success measured in functional terms 2 years after the procedure.

In our study, all children operated had idiopathic CTEV. Children with deformities secondary to neuromuscular deformities were excluded. For the purpose of this study, we chose the Harold and Walker classification<sup>9</sup>. For the purpose of avoiding bias at the time of compilation of results, we only took Grade 2 or 3 clubfeet for surgery. Radiological assessment of the foot deformity was done in accordance with the guidelines laid down by Beatson and Pearson<sup>10</sup>.

Surgery was done in the prone position. The incision running from the base of the first metatarsal around the heel 5 mm above the heel crease to just short of the tip of the lateral malleolus was used. Soft tissue release procedure as described by McKay<sup>5</sup> was done (Figure 1 and 2).

**Figure 1**

Figure1- posterior-medial soft tissue release



**Figure 2**

Figure2- Lateral extension of same incision



According to Ghali et al<sup>16</sup> the objective of treatment is to achieve a pantalar reduction without disturbing the growth of the talar bones. The talocalcaneal interosseous ligament and the lateral portion of the calcaneocuboid ligament alone are sacrosanct. Post operatively the cast was kept for 2 weeks and the pins removed at 6 weeks. Cast changes were done at 2 week intervals. The foot was then measured for brace and placed back into short leg cast till 12 weeks. The patient was then placed in a Denis Browne splint for nights/naps. At 2 years the assessment was done as per the Mark Levin criteria.<sup>11</sup>

## RESULTS

The study was conducted on 30 patients and 43 feet. The age range of the study was between 9 months to 3 years with an average age of 1 year and 6 months. The follow up was done for a period of 24-48 months with an average of 36 months. According to the Harold Walker classification 9 feet were of grade 2 deformity and 34 feet were in grade 3. The right side was involved in 11, the left in 6 and bilateral involvement present in 13 cases. All cases were found to be resistant to correction by the conservative method proposed by Ponseti. The preoperative talocalcaneal index (TCI) was measured radiographically (Table 2). Maximum number of patients (23) had a TCI from 21-30 degrees i.e.53.49%.

The surgery done on all the feet was the one advocated by Douglas McKay.<sup>8</sup> One case required a vertical extension of the incision, two required lateral column shortening out of which one required a medial skin graft.

The post operative talocalcaneal index (TCI) in the operated feet was measured radiographically and recorded (Table 3).The commonest post op TCI was between 51-60 degrees i.e. 51%.

No intraoperative complications were encountered in 36 feet. Difficulty in skin closure occurred in 5 feet. Difficulty in tendo Achilles lengthening and lateral ray reduction was encountered in one case each.

The post operative complications that we encountered during the study are reproduced in table 4. Commonest seen were sloughing, wound infection and pin tract infection.

## ASSESSMENT OF RESULTS

Assessment was done as per the criteria given by Levin et al<sup>11</sup> and the results obtained at the end of the study are reproduced in table 5. Overall, more than 65 % results were

good to excellent, 21% were fair and 14% were poor. It is seen from the follow up that the horizontal rotation of the talus, as seen by the improved talocalcaneal index, was achieved. This resulted in a more normal appearing foot.

**Figure 3**

Table 1. HAROLD AND WALKER CLASSIFICATION OF CLUBFOOT

Grade	Definition
I	Foot correctable beyond neutral
II	Pushed to neutral, but with fixed equinus or heel varus < 20°

**Figure 4**

Table 2. PREOPERATIVE TALOCALCANEAL INDEX (TCI):

S.No.	Preop TCI in degrees	Number of feet	Percentage
1.	10-20°	4	9.30
2.	21-30°	23	53.49
3.	31-40°	14	32.56
4.	41-50°	2	4.65

**Figure 5**

Table 3. POSTOPERATIVE TALOCALCANEAL INDEX (TCI) IN OPERATED FEET

S.No.	Postop TCI in degrees	Number of feet	Percentage
1.	40-50°	11	25.58
2.	51-60°	22	51.16
3.	61-70°	8	18.61
4.	71-80°	2	4.65

**Figure 6**

Table 4. POSTOPERATIVE COMPLICATIONS

S.No.	Complication	Number of feet	Percentage
1.	Wound dehiscence	1	2.32
2.	Wound infection	2	4.65
3.	Swelling	1	2.32
4.	Pin tract infection	1	2.32
5.	Bronchitis	1	2.32
6.	Skin slough	3	6.97

**Figure 7**

Table 5. ASSESSMENT OF RESULTS

Result	Number of feet	Percentage
Excellent	8	18.60
Good	20	46.51
Fair	9	20.93
Poor	6	13.96

**DISCUSSION**

Although clubfoot or congenital talipes equinovarus has been recognized since the time of Hippocrates, its etiology is still incompletely understood. The condition is not simply an isolated foot deformity, rather it is a complex three dimensional deformity of the foot consisting of 4 components\_ equinus, varus, adductus and cavus deformities.

Surgical treatment remains the only option for patients with failed conservative treatment assessed by positive telescropy, forefoot adductus, persistently tucked up heel. Attenborough was the first to describe the posterior release reporting a 63% success rate.<sup>12</sup> It is now generally accepted that the posterior release is insufficient to correct the deformity. The more extensile posteromedial release as popularized by Turco proved more successful with 15 year excellent or good results in 84% of patients.<sup>15</sup> However, inability to address the tethering of the posterior calcaneus to the fibula due to the lateral structures did not allow complete calcaneocuboid relocation for correction of the midfoot and forefoot adduction and varus as well as talar relocation into the medial column<sup>7</sup>. McKay commented that the surgeons must rid themselves of a deep seated pessimism that surfaces in

such statements as “that is a good looking foot for a clubfoot”.

At the root of the cause of optimism is the understanding that it is the talocalcaneal joint that has abnormal rotation in three dimensions i.e. sagittal, coronal and horizontal.<sup>7</sup>

Operative exposure should be sufficient to allow access to the subtalar, ankle, talonavicular and calcaneocuboid joints. It must also allow exposure of the Achilles tendon for tendon lengthening.<sup>12</sup> Carroll and Gross proposed the two-incision approach through posterolateral and medial incisions. This allows good access but is not cosmetically ideal.<sup>13</sup> The more extensive release of McKay allows greater hindfoot correction and better range of motion.<sup>12</sup> The Cincinnati transverse posterior skin crease incision given by Crawford provides a more cosmetic approach and allows access to the Achilles tendon and the peritalar structures.<sup>14</sup>

The often repeated axiom is that the failure of clubfoot surgery rests more in the surgeon’s hand than in the child’s foot e.g. incomplete subtalar release does not allow the surgeon to correct the calcaneal rotation beneath the talus. The normalization of the talonavicular and calcaneocuboid joints requires a complete release of these joints. Otherwise, the forefoot adduction will persist. Full bony repositioning is possible only with the circumferential approach. In the cases of accurate pinning, the previous bony incongruity resolves because of the remodelling potential of bone and cartilage. Failures in bone fixation lead to overcorrection or undercorrection with secondary foot deformities. The circumferential Cincinnati incision provides the surgeon with the best exposure for soft tissue release and bony repositioning.

## References

1. Canale, S.T. Campbell’s Operative Orthopedics. 10th ed. Vol. 2, Mosby 2003, 988-1005.
2. Ponseti, I.V. Current concepts review. Treatment of congenital clubfoot. J.B.J.S., 1992; 74-A, No.3.
3. Aronson, J. and Puskarich, C.L. Deformity and disability from treated clubfoot. J. Ped. Orthop., 1990, 10, 109-119.
4. Karski, Tomasz and Wosko, Ignacy. Experience in the conservative treatment of congenital clubfoot in newborns and infants. J. Ped. Orthop., 1989; 9, 134-136.
5. Kuhlmann, R.F., Bell, J.F. A clinical evaluation of operative procedures for congenital talipes equinovarus. J.B.J.S., 1957; 39-A, 265-283.
6. Turco, V.J. Resistant congenital clubfoot. One stage posteromedial release with internal fixation. A follow up report of 15 years experience. J.B.J.S., 1978; 61-A, 805-814.
7. McKay, D.W. New Concept of and Approach to Clubfoot Treatment. Section 2: Correction of the clubfoot J. Ped. Orthop., 1983; 3, 10-21.
8. McKay, D.W. New Concept of and Approach to Clubfoot Treatment. Section 3: Evaluation of results. J. Ped. Orthop., 1983; 3, 141-148.
9. Harold, A.J. and Walker, C.J. Treatment and prognosis in congenital clubfoot. J.B.J.S., 1983; 65-B, 8-11.
10. Beatson, T.R., and Pearson, J.R. A method of assessing correction in clubfeet. J.B.J.S., 1966, 48-B, 40-50.
11. Mark N. Levin, Ken N. Kuo, Gerald F. Harris & Donald V. Matesi. Posteromedial release for idiopathic talipes equinovarus. A long term follow up study. Clinical Orthopaedics and Related Research, 1989; 242.
12. Ballantyne, J.A. and Macnicol, M.F. Congenital talipes equinovarus (clubfoot). An overview of the etiology and treatment. Current Orthopaedics 2002; 16, 85-95.
13. Carroll, N.C. Congenital clubfoot: Pathoanatomy and treatment. AAOS Instr. Course Lect 1987; 36:117
14. Crawford, A.H., Marxsen, J.L., Osterfeld, D.L. The Cincinnati Incision: A comprehensive approach for surgical procedures of the foot and ankle in childhood. J.B.J.S., 1988; 70-A: 1108.
15. Turco, V.J. Surgical correction of resistant congenital clubfoot. One stage posteromedial release with internal fixation. A preliminary report. J.B.J.S., 1971; 53-A: 477-496.
16. Ghali, Smith, Clayden and Silk. The results of pantalar reduction in the management of clubfoot. J.B.J.S., 1983; 65-B, 1-7.
17. Somppi, E and Sulamaa, M Early operative treatment of congenital clubfoot. Acta Orthop. Scand., 1971; 42, 513-520.

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