

Research Article

A comparative analysis of the two most common surgical exposures for clubfoot

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ABSTRACT

Background: The surgical release of clubfoot should address all the pathological structures, including a complex soft tissue release of the hind foot and mid foot, possibly one of the most complicated procedures performed in orthopedic surgery. As in any surgical procedure involving multiple anatomic steps, exposure is the key to a successful comprehensive release. This study was conducted with the aim of comparing two of the most widely used surgical exposures in clubfoot.

Methods: This was a prospective study of 35 patients having 60 diseased feet, aged between 1 to 3 years. Patients with neglected idiopathic clubfoot who did not respond to initial Ponseti's casting; and were planned for Posteromedial soft tissue release (PMSTR) surgery were included in this study. Group I (18 patients-30 feet) underwent surgery using the hemi-cincinnati incision and group II (17 patients-30 feet) by turco method of exposure. 2 patients (3 feet) of the turco group were lost to follow-up. Preoperative and postoperative pirani scores were calculated and compared. Other clinical follow-up parameters included pain (were assessed using FLACC behavioral pain assessment scale) and wound complications (necrosis, adhesions and scar hypertrophy). Radiological parameters were also assessed.

Results: As per the difference between pre and postoperative (3 months) pirani score, 5 feet had a good result, 22 had satisfactory, and 3 had poor results in group I while in group II, 3 had good, 19 had satisfactory, and 5 had poor results. 2 feet in group I and 10 feet in group II had wound necrosis in the immediate postoperative period. There was no substantial difference in the postoperative angles in both groups.

Conclusions: PMSTR is an acceptable surgical method for treating neglected idiopathic clubfeet. The hemi cincinnati incision has lesser number of wound complications and also better deformity correction as evaluated by pirani scores. This study supports the use of hemi cincinnati incision over turco incision in posteromedial soft tissue release for treating idiopathic clubfoot.

Keywords: Hemi-cincinnati, Turco, Clubfoot, Pirani

INTRODUCTION

The term Talipes equinovarus was first introduced into literature by Hippocrates in 400 B.C.^{1,2} The nomenclature is derived from Latin. Talus means ankle and pes means foot, equinus means horse like and varus means inverted and adducted. Clubfoot is the most common (1 to 2 in

1,000 live births) congenital dysplasia affecting all musculoskeletal tissues distal to the knee.² The initial treatment of clubfoot is always non-operative. Surgery in clubfoot is indicated for deformities that do not respond to conservative treatment by serial manipulation and casting. Despite recent improvements in the surgical correction of congenital clubfoot deformity, the ideal

treatment protocol remains controversial. Soft tissue procedures form the benchmark of surgical treatment of clubfoot. Posteromedial soft-tissue release surgery involves a surgical release of all tight soft tissue structures in the posterior aspect of the ankle and the medial side of the foot.³ Multiple surgical approaches have been reported for posteromedial soft-tissue release surgery. Most common being hemicircinatti incision and turcos and carrols twin incision.⁴⁻⁷ As in any procedure involving multiple anatomic steps, exposure is the key to a successful comprehensive release. Hence, this study was conducted to compare the turco and the hemicircinatti incision, with the aim of finding the ideal incision for performing PMSTR surgery.

METHODS

This was a randomized prospective interventional study carried out at a tertiary care medical college and hospital in southern India. 35 patients (60 feet), age between 1 to 3 years (average 18.75 months) with idiopathic clubfoot presenting to our outpatient department, who did not respond to initial ponseti's casting; and were planned for posteromedial soft tissue release (PMSTR) surgery were included in this study. Syndromic, recurrent and relapsed clubfeet were excluded from the study. The study group comprised 20 males and 15 females. These patients were thoroughly evaluated, and preoperative pirani midfoot and hindfoot score were calculated and recorded.^{7,8} A detailed history, including prenatal history, birth history and family history of congenital anomalies was taken. Comprehensive orthopedic examination of hips, spine, and all extremities was performed. Severities of the deformity and calf circumferences were recorded. The length and width of the feet were measured.

Radiological assessment was carried out by anteroposterior (AP) and stress dorsiflexion lateral radiographs of ankle and foot, measuring the talocalcaneal (TC) angle on AP and lateral views, talo 1st metatarsal angle on AP view and calcaneo-1st metatarsal angle on lateral view. Selected patients were randomized into 2 groups based on the odd-even randomization. Group I (18 patients with 30 clubfeet) patients underwent surgery using the hemi-circinatti incision (medial half of the circinatti incision). Group II (30 feet) patients underwent surgery using the turco's incision.

Following skin incision, the abductor hallucis muscle was sectioned. The achilles tendon was lengthened by Z-plasty. The tibialis posterior tendon and flexor digitorum longus (FDL) were lengthened by z-plasty. Following the FDL, flexor hallucis longus was identified and tenotomised. The posterior capsules of the ankle and subtalar joint, entire medial capsule of sub-talar joint, superficial deltoid ligament and talo-navicular capsule were divided as per "a la carte" approach described by Bensahal et al.⁹ In both the groups primary wound closure was done in two layers. An above knee cast was applied in 90° knee flexion with foot held in plantigrade for two

weeks. Immediate postoperative FLACC behavioral pain scale was done after recovery from anaesthesia and was recorded.¹⁰ Regular wound inspection was done at 2nd POD, 5th POD and 7th POD through a window made in the cast. The sutures were removed under anesthesia on the 14th postoperative day and foot was manipulated into maximum dorsiflexion and eversion and maintained with new groin to toe cast for 4 weeks. Foot abduction braces were continued after cast removal.

Clinical evaluation with postoperative pirani scoring, adherence of scar to deeper tissues and presence of hypertrophic scar was done at 3 months post op. The postoperative radiological evaluation was also done at 3 months post op. The preoperative and postoperative pirani scores were compared. The difference between preoperative and postoperative scores of greater than 4 was considered as good correction, 2-4 as satisfactory and less than 2 as poor.

RESULTS

There were 20 males and 15 females out of which group I had 11 boys and 7 girls and group II had 9 boys and 8 girls (Table 1).

Table 1: Sex distribution of cases.

Sex	Group I	Group II
Male	11	9
Female	7	8

Chi-square with Yates correction; Chi squared equals 0.021 with 1 degrees of freedom; The two-tailed P value equals 0.8836; not Significant.

In immediate postoperative period all patients were assessed with FLACC behavioral pain scale and we found that out of 18 patients in group I, 2 had severe pain (score 7-10), 7 had moderate pain (score 4-6) and 9 had mild discomfort (score 1-3).

Table 2: Post-operative pain evaluation by FLACC behavioral analysis.

FLACC Score	Group I (n=18) (number of patients)	Group II (n=17) (number of patients)
Severe pain (7-10)	2	4
Moderate pain (4-6)	7	8
Mild pain (1-3)	9	5
Comfortable (0)	0	0

Mann whitney test ; The Z-Score is -1.2212. The p-value is 0.022246. The result is significant at $p \leq 0.05$

In group II out of 17 patients, 4 patients had severe pain, 8 patients had moderate pain and 5 patients had mild discomfort (Table 2). Wound inspections were done at regular intervals at 2nd, 5th and 7th postoperative days and wound condition was assessed. 2 out of 30 feet in group I

and 10 out of 30 feet in group II had wound necrosis in immediate postoperative period, which were managed with regular dressings and healed by secondary intention without need for further procedures (Table 3).

Table 3: Immediate wound complications.

Complication	Group I (n=30) (number of feet)	Group II (n=30) (number of feet)
Skin necrosis	2	10

Chi-square with Yates correction: Chi squared equals 5.104 with 1 degrees of freedom. The two-tailed P value equals 0.0239→ Significant.

2 patients (3 feet) of the turco group (group II) were lost to follow-up and did not present to us after cast removal. At 3 months follow-up, adherence of scar to underlying tissues and hypertrophy of the scar was assessed. Scar adherence to deeper structures was found in 2 out of 30 feet in group I and 7 out of 27 feet in group II. Hypertrophic scar was seen in 2 out of 30 feet in group I and 6 out of 27 feet in group II (Table 4).

As per the difference between pre and postoperative (3 months) pirani score, 5 feet had good result, 22 feet had satisfactory result, and 3 had poor results in group I (30 feet) while in group-II (27 feet), 3 had good result, 19 had satisfactory result, and 5 had poor results (Table 5). On comparing preoperative and postoperative radiological parameters, there was a significant increase

in talo-calcaneal angle (AP), talo-calcaneal angle (lateral), talo-1st metatarsal angle and calcaneo-1st metatarsal angle as compared to preoperative values. However, there was no substantial difference in the postoperative angles in both groups (Table 6, 7).

Table 4: Delayed wound complications.

Complication	Group I (n=30) (number of feet)	Group II (n=27) (number of feet)
Adherence to deeper structures	2	7
Hypertrophic scar	2	6

Adherence: Chi-square with Yates correction; Chi squared equals 2.648 with 1 degree of freedom. The two-tailed P value equals 0.0103→ Significant; Scar: Chi-square with Yates correction; Chi squared equals 1.707 with 1 degree of freedom. The two-tailed P value equals 0.0191→ Significant

Table 5: Improvement in pirani score postoperatively.

Preop-postop (pirani score)	Group I (n=30) (number of feet)	Group II (n=27) (number of feet)
Good (>4)	5	3
Satisfactory (2-4)	22	19
Poor (<2)	3	5

Mann Whitney test: The Z-Score is 0.7751. The p-value is 0.0435→ Significant

Table 6: Radiological evaluation: group I.

Angle	Group I	Group I
	Pre-op (mean with range)	Post-op (mean with range)
Talo-calcaneal angle (ap)	16.14±8	28.5±6.5
Talo-calcaneal angle (lat)	14.66±8.25	22.85±5.25
Talo-1 st metatarsal angle	49.53±16.25	07.25±6.00
Calcaneo-1 st metatarsal angle	119.7±18.54	138.05±12.25

Table 7: Radiological evaluation: group II.

Angle	Group II	Group II
	Pre-op (mean with range)	Post-op (mean with range)
Talo-calcaneal angle (ap)	16.2±7.95	26.55±8.5
Talo-calcaneal angle (lat)	15.23±8.15	23.85±7.25
Talo-1 st metatarsal angle	49.36±16.75	06.25±4.70
Calcaneo-1 st metatarsal angle	118.95±19.00	139.05±10.25

DISCUSSION

Many controversies in the treatment of idiopathic talipes equinovarus exist in medical literature, such as the role of operative versus non-operative treatment, optimum age for surgery, post-operative immobilization regimen and type of incision. Posteromedial soft-tissue release surgery is an established procedure to correct the deformity in patients who did not respond to ponseti's casting.³ Both

hemicincinnati and the turco release are established approaches to do a posteromedial soft tissue release.^{4,5} In this study, we have made an observation regarding the immediate postoperative pain and found that there was an appreciable difference in both groups. The turco incision group had more patients with severe and moderate pain as compared to hemicincinnati. There is no similar observation done in recent medical literature. It is presumed that this may be due to more extensive soft

tissue dissection and increased need of retraction in turco's incision as compared to hemicincinnati incision.

Immediate wound complication like skin necrosis also was more pronounced in the turco cohort as compared to the hemicincinnati in this study. The findings are concomitant with Crawford et al and Joseph et al, who showed excellent results with the use of hemicincinnati incision in terms of wound complication.^{4,11} Wellington K et al. reported 19.2% wound complications in clubfeet treated with turcos incision.¹² The observations regarding late wound complication like scar adherence and hypertrophic scar show increased incidence of these in turco group as compared to hemicincinnati group. Similar observations could not be found on review of recent literature.

Postoperative deformity correction has been assessed in our study using the pirani hind-foot and mid-foot scoring system. The difference between the pirani scores preoperatively and postoperatively was better with the hemicincinnati cohort as compared to the turco cohort and this result was significant. This again suggests that the hemicincinnati approach may be a better approach to do a PMSTR. Previously Varma HS et al used the pirani scoring system to see postoperative deformity correction using the two-incision technique for PMSTR surgery.¹³ The clinical and radiological results of this study are comparable to studies by Yamamoto H et al and Kaewpornawan K et al who showed excellent results with PMSTR and also appreciable improvement in radiological parameters.^{14,15}

CONCLUSION

PMSTR is an acceptable surgical method for treating neglected idiopathic clubfeet. Comparing the two incisions we could conclude that hemicincinnati incision has lesser wound complications and also better deformity correction as seen by pirani scores. Also, the superiority of this incision is proved due to decreased postoperative pain as shown by less FLACC pain scores. Moreover, it is also more cosmetic as the strap of the sandal hides it. This study supports the use of hemi-cincinnati incision over turco incision in posteromedial soft tissue release for treating idiopathic clubfoot.

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