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Comparison of pre operative and post operative clinical and radiological angles of foot in equinovarus deformity in cerebral palsy hemiplegic.

KEYWORDS: Cerebral Palsy, Hemiplegia, Tibiocalcaneal angle, Talocalcaneal angle

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ABSTRACT Cerebral Palsy (CP) is a common disability affecting children. It has been estimated that around 30% of CP, have hemiplegia. In hemiplegia the common foot deformity is equinovarus. The aim is to study the effectiveness of soft tissue procedure in equinovarus foot deformity by comparing pre and post operatively passive range of motion (ROM) at ankle with knee flexion and extension and radiologically by assessing Tibiocalcaneal angle in lateral view and Talocalcaneal angle in AP view. In our study we have included 25 patients having equinovarus foot deformity in which 18 patients underwent tendoachilles lengthening and 7 patients underwent tendoachilles lengthening with split tibialis posterior transfer. The results were statistically compared and showed ROM and angles improved post operatively.

Introduction

Cerebral Palsy (CP) is one of the common disabilities affecting children. The prevalence varies worldwide but it is approximately 0.6 to 7 cases per 1000 live births [1]. It has been estimated that around 80% of the CP children have spastic type, with 30% having spastic hemiplegia [1]. In cerebral palsy spasticity and muscle imbalance can cause one or more of the following deformities of the foot: equinus, varus, valgus, cavus, [1] [8]. In the foot, commonest deformity is equinus or equinovarus, affecting 70% of CP children [1]. Surgical management of the foot is to prevent fixed deformities and improve gait pattern while walking [7] [9]. The aim is to study the effectiveness of soft tissue procedure in equinovarus foot deformity in CP hemiplegic by comparing the results, pre and post operatively by clinical and radiological assessment.

Methods

Aims

1. To study effectiveness of soft tissue surgical procedure in management of equinovarus foot deformity in CP hemiplegia.
2. Comparison of preoperative and post operative range of motion in ankle.
3. Comparison of preoperative and post operative radiological angles in foot.
4. To provide a plantigrade foot for ambulation with or without orthosis

Assessors

1. Dr. Amit Mhambre : outcome assessor, performed intervention, performed statistical analysis of data
2. Dr. Badrinath Athani : performed intervention

Study population

1. A total of 25 patients were included in the study. The study was conducted for a period of two years. The follow up period was fifteen months to eighteen months and the mean follow up period was twelve months.
2. The patients with cerebral palsy hemiplegia with equinovarus deformity were included
3. The following patients were excluded from the study,

a. Patients having involuntary movements like chorea, dystonia, etc.

b. Patients with severe or profound mental retardation

c. Patients who are unfit for anaesthesia.

4. All the patients were admitted in AIIPMR and were evaluated in detail for the foot deformities.
5. Pre-operative and postoperative functional assessment of the lower limb was done by measurement of passive range of motion at the ankle namely dorsiflexion with knee in flexion and extension
6. The radiological assessment of the ankle and foot was done both preoperatively and postoperatively.
7. The Tibiocalcaneal angle in lateral view [Fig 1] for equinus deformity of more than 90^0 and talocalcaneal angle in anteroposterior view [Fig 2] for varus deformity of less than 15^0 were selected [2].
8. The investigation was conducted with Institutional Review Board approval.
9. Patient and in case of patient less than 18 years, patient's guardian consented to be in the study and informed consent was taken.

Intervention

The patients with equinus were subjected to the surgical procedure of Z- plasty lengthening of Achilles tendon [1] [3].

The patients with equinovarus deformity with heel varus were subjected to surgical procedure of Z- plasty lengthening of Achilles tendon and split tibialis posterior transfer to peroneus brevis [1] [3] [4] [6].

Among the twenty five patients, eighteen underwent tendoachilles lengthening and seven underwent tendoachilles lengthening and split tibialis posterior transfer for correction of equinovarus foot deformity [Table 3].

After the surgery, the lower limb was maintained in corrected position by an above knee POP cast with ankle in neutral position and knee in 5° flexion for two weeks [7].

Suture removal was done after two weeks followed by a below knee cast for four weeks.

After six weeks of immobilization, the POP cast was removed and the patients were then put on a post-operative rehabilitation programme which included,

1. Mobilization and range of motion exercises for ankle joint.
2. Stretching exercises for the spastic muscles.
3. Strengthening exercises for the ankle dorsiflexors, intrinsic muscles of the foot and quadriceps.
4. Gait training.
5. Ankle foot orthosis for positioning of foot and ambulation.

Outcome

Preoperative and Post-operative assessment of the foot was done for

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measurement of passive range of motion at the ankle with knee in flexion and extension every three months, six months and twelve months during the first year after surgery.

Pre-operative and post-operative radiological angles namely the Tibiocalcaneal angle in lateral view and Talocalcaneal angle in AP view were assessed.

The assessment was made by me and the outcome was based on physical examination of ankle and radiological measurement of foot angles.

The patients were explained that even after the operative procedure exercise program should be continued and orthosis would be needed initially which could be gradually weaned off.

Ethics
The Ethics approval was taken from the necessary ethics committee.

- **Statistical methods**

The results were statistically evaluated by paired t test. The paired t test was applied as it fulfilled the following criteria of random sample, quantitative data, sample size was less than thirty and comparison was done preoperatively and postoperatively.

The difference in each set of paired angles preoperatively and postoperatively was calculated.

The Standard Deviation and Standard Error of mean from same was calculated. The degree of freedom and t value was calculated. Since the t value is higher than the tabulated t value the difference is statistically significant.

Results
Among the twenty five patients eighteen were males and seven were females.

The patients included in the study were between the ages five to twenty five years. Among these, ten were in the age group between 5 to 9 years, nine between 10 to 15 years, three between 16 to 20 years, and three between 21 to 25 years.

Out of the twenty five subjects, fifteen had left side involvement and ten had right side involvement.

On clinical examination, the mean preoperative range of motion at ankle in knee extension was 11.4^{o} PF and mean postoperative range of motion at ankle in knee extension was 1.2^{o} DF [Table 1]. The mean preoperative range of motion at ankle in knee flexion was 3.3^{o} PF and mean postoperative range of motion at ankle in knee flexion was 5.7^{o}DF [Table 1]. The results were observed over a period of one year.

On radiological measurements, the Talocalcaneal angle in AP view and tibiocalcaneal angle in lateral view were compared preoperatively and postoperatively. The preoperative mean Talocalcaneal angle in AP view was 16.6^{o} and postoperative mean Talocalcaneal angle in AP view was 26.8^{o} [Table 2]. The preoperative mean Tibiocalcaneal angle in Lat view was 117^{o} and postoperative mean Tibiocalcaneal angle was 87.7^{o} [Table 2].

Discussion
Among the twenty five patients eighteen underwent tendoachilles lengthening and seven underwent tendoachilles lengthening and split tibialis posterior transfer for correction of equinovarus foot deformity. Among the seven cases that underwent tendoachilles lengthening and split tibialis posterior transfer it was observed that the tibialis posterior was overacting and hence a transfer was performed

After the operative procedure clinically range of motion at ankle improved.

The mean preoperative and postoperative talocalcaneal and tibiocalcaneal angles improved.

The change was significant in age groups between 5 to 15 years and less in the age groups between 16 to 25 years both clinically as well as radiologically.

The study observed that soft tissue procedures were effective in correction of deformity in the age group between 5-15 years and were less effective in correction of deformity in the age group between 16 to 25 years.

Leon Root observed that in cerebral palsy hemiplegia with equinovarus deformity, along with gastrosoleus, tibialis posterior is overacting. He performed tendoachilles lengthening and split tibialis posterior transfer in thirty hemiplegic patients and had twenty seven good results [5]. Out of the seven split tibialis posterior transfer we have done, we had five good results

The follow up could be carried out over a longer period of time to assess the postoperative outcome of surgery in terms of improvement in range of motion at ankle and recurrence of deformity. Preoperative and post operative gait analysis using the gait and motion analysis laboratory would have lead to better interpretation of results.

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Declarations
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Conflict of interest: none declared
Ethical approval: From ethic committee

TABLES

Table 1: Pre and post operative mean Ankle ROM in Knee Extension (KE) and Knee Flexion (KF)

Age Group	Preoperative ROM (KE)	Postoperative ROM (KE)	Preoperative ROM (KF)	Postoperative ROM (KF)
5-10 years	9.6^{o}PF	3.4^{o}DF	2.1^{o}DF	6.9^{o}DF
11-15 years	12.6^{o}PF	2.3^{o}DF	2^{o}PF	5.1^{o}DF
16-20 years	13^{o}PF	4^{o}PF	8.3^{o}PF	2.7^{o}PF
21-25 years	15^{o}PF	7.7^{o}PF	10^{o}PF	5^{o}PF

Table 2: Pre and post operative mean: Anteroposterior (AP) talocalcaneal angle and Lateral tibiocalcaneal angle

Age group	AP Talocalcaneal Angles (mean)		Lateral Tibiocalcaneal Angles (mean)	
	Pre operative	Post operative	Pre operative	Post operative
5-10 years	15.8^{o}	27^{o}	112.4^{o}	89.2^{o}
11-15 years	16.7^{o}	26.7^{o}	117.4^{o}	89.5^{o}
16-20 years	17.3^{o}	24.3^{o}	123.3^{o}	96^{o}
21-25 years	18.7^{o}	24.7	126.7^{o}	99.3

FIGURES

Fig 1 TIBIOCALCANEAL ANGLE IN LATERAL VIEW

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Fig 2 TALOCALCANEAL ANGLE IN AP VIEW

References

[1] Jeffrey R. Sawyer, Cerebral Palsy in : S, Terry Canale, James H. Beaty, Cambell Operative Orthopedics, Volume II, 12th edition,2013, pp 1202-1254

[2] Lenox D. Baker and Lowell M. Hill, Foot Alignment in the Cerebral Palsy Patient, J Bone Joint Surg Am. 1964;46:1-15.

[3] Gulzar Saeed Ahmed Bilal Fazal Shaikh, Abdul Rauf Memon, Surgical Treatment of Equinovarus Deformity of Foot In Children With Cerebral Palsy, MC Vol.17-No.3- 2011 (21-24)

[4] Maria Vlachou, Alex Beris, Dimitris Dimitriadis, Split tibialis posterior tendon transfer for correction of spastic equinovarus hindfoot deformity, Acta Orthop. Belg., 2010, 76, 651-657

[5] L Root, SR Miller and P Kirz, Posterior tibial-tendon transfer in patients with cerebral palsy, Bone Joint Surg Am. 1987;69:1133-1139.

[6] NE Green, PP Griffin and R Shiavi, Split posterior tibial-tendon transfer in spastic cerebral palsy, J Bone Joint Surg Am. 1983;65:748-754H

[7] Thomas S. Renshaw, Neil E. Green, Paul P. Griffin And Leen Root, Cerebral Palsy: Orthopaedic Management, J Bone Joint Surg Am. 1995;77:1590-1606.

[8] Julieanne P. Sees Freeman Miller, Overview of foot deformity management in children with cerebral palsy, J Child Orthop (2013) 7:373–377

[9] YTF Kling, H Kaufer and RN Hensinger, Split tibialis posterior tendon transfer in children with cerebral spastic paralysis and equinovarus deformity, J Bone Joint Surg Am. 1985;67:186-194

[10] RS Bisla, HJ Louis and P Albano, Transfer of tibialis posterior tendon in cerebral palsy, J Bone Joint Surg Am. 1976;58:497-500.