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

KEYWORDS
Cerebral Palsy, Hemiplegia, Tibiocalcaneal angle, Talocalcaneal angle

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 equinovarous. The aim is to study the effectiveness of soft tissue procedure in equinovarous 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 equinovarous foot deformity in which 18 patients underwent tendoachilles lengthening and 7 patients underwent tendorcovies 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 equinovarous, 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 equinovarous 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 equinovarous 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 equinovarous 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° and talocalcaneal angle in anteroposterior view [Fig 2] for varus deformity of less than 15° 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 equinovarous 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 tendorcphies lengthening and split tibialis posterior transfer for correction of equinovarous 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...
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.

**Acknowledgement**

I would also like to appreciate the help from anesthetist Dr. Ramesh Dhadke and Dr. Yuvraj Deepak Kumar for their anaesthesia services during the procedures.

**Declarations**

Funding: none
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)

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Preoperative ROM (KE)</th>
<th>Postoperative ROM (KE)</th>
<th>Preoperative ROM (KF)</th>
<th>Postoperative ROM (KF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-10 years</td>
<td>9.6°PF</td>
<td>3.4°DF</td>
<td>2.1°DF</td>
<td>6.9°DF</td>
</tr>
<tr>
<td>11-15 years</td>
<td>12.6°PF</td>
<td>2.3°DF</td>
<td>2°PF</td>
<td>5.1°DF</td>
</tr>
<tr>
<td>16-20 years</td>
<td>13°PF</td>
<td>4°PF</td>
<td>8.3°PF</td>
<td>2.7°PF</td>
</tr>
<tr>
<td>21-25 years</td>
<td>15°PF</td>
<td>7.7°PF</td>
<td>10°PF</td>
<td>5°PF</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Age group</th>
<th>Pre operative Talocalcaneal Angles (mean)</th>
<th>Post operative Talocalcaneal Angles (mean)</th>
<th>Pre operative Lateral Tibiocalcaneal Angles (mean)</th>
<th>Post operative Lateral Tibiocalcaneal Angles (mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-10 years</td>
<td>15.8°</td>
<td>27°</td>
<td>112.4°</td>
<td>89.2°</td>
</tr>
<tr>
<td>11-15 years</td>
<td>16.7°</td>
<td>26.7°</td>
<td>117.4°</td>
<td>89.5°</td>
</tr>
<tr>
<td>16-20 years</td>
<td>17.3°</td>
<td>24.3°</td>
<td>123.3°</td>
<td>96°</td>
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<tr>
<td>21-25 years</td>
<td>18.7°</td>
<td>24.7°</td>
<td>126.7°</td>
<td>99.3</td>
</tr>
</tbody>
</table>

**FIGURES**

Fig 1 TIBIOCALCANEAL ANGLE IN LATERAL VIEW
References


