



**“THE OUTCOME OF PONSETI METHOD IN CONGENITAL TALIPES EQUINOVARUS WITH ASSIST OF PERCUTANEOUS TENDOACHILLIS TENOTOMY AND SOFT TISSUE RELEASE IN CHILDREN”**

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**INTRODUCTION:**

Congenital talipes equino varus is one of the commonest congenital anomaly of lower extremity in children. Talipes is derived from Latin word talus meaning ankle and pes meaning foot (the deformity causes the patient to use ankle as foot). It is also called clubfoot as it resembles to the club of a golf stick. congenital talipes equinovarus have various deformities including cavus, adductus, varus and equinus at various level due to soft tissue contracture and bony abnormality .commonest etiology of clubfoot is idiopathic. Incidence of idiopathic clubfoot is about 1-2 per 1000 live births.<sup>1</sup>

The incidence in India being 0.9 per 1,000 live births and the prevalence being 1.29 per 1,000 live births<sup>12</sup>. A sex ratio of 2-2.5 males per female. It seems that clubfoot is considered a multifactorial disease.<sup>3,4</sup>

There are many theories were put forward to explain the origin of clubfoot, there are several intrinsic or extrinsic factors causing clubfoot e.g. interruption in foetal development; intrauterine position of the foetal, mechanical compression or increase of intrauterine hydraulic pressure; viral infections; vascular deficiencies; muscular alterations; neurological alterations; defect in the development of bones structures and genetic defects. The anatomic abnormalities associated with clubfoot are equinus and inversion at subtalar joint , equinus at ankle, medial migration of navicular.

It is observed that both legs are usually equal in length but the overall size of all tarsal bones is smaller in the clubfoot than in normal foot thus producing asymmetric size in a unilateral deformity<sup>14</sup>.

In clubfoot, the foot is shorter than normal. The muscles ligaments and tendons have more fibrous contents than normal foot. The muscles are more atrophied. The medial and posterior soft tissue are short and contracted. neurovascular bundle which is present posterior to posterior tibial artery is contracted. More the age of child without previous manipulation and stretching more the dense and thickened contractures<sup>6</sup>.

There are various plans of management for correction of clubfoot are proposed. various plans of management which includes strapping, stretching and casting by kites and ponseti method but definitive modality to achieve the aim of functional, pain-free, plantigrade foot with good mobility, cosmetically acceptable foot and without calluses is still not found. Both nonsurgical and surgical treatment have advantages and disadvantages.

Nonsurgical management generally leads to inadequate correction whereas surgical management often develops extensive scarring of the soft tissue, more stiffness, residual pain and arthritis in long term. Initially during ancient times deformities of congenital talipes equinovarus was corrected after the child has passed early infancy and it was single staged correction of all deformities.

During middle era deformities of clubfoot was corrected by Kites method in which gradual manipulation and stretching was done using calcaneocuboid joint as fulcrum. Recently trend has changed and deformities of congenital talipes equinovarus is corrected with help of Ponseti method in which gradual and sequential manipulation and stretching is done by using talus as fulcrum<sup>12</sup>.

Among all treatments described including nonoperative and operative, ponseti method of manipulation and serial casting is the most acceptable treatment method at present day which could show even better result with assist of percutaneous tendoachillis tenotomy<sup>12</sup>.

Recent trend for clubfoot treatment includes serial manipulation, stretching, immobilization, percutaneous tendoachillis tenotomy and for the relapse and resistant cases management includes soft tissue release procedures with osteotomy and immobilization<sup>12,13</sup>.

The problems often faced with conservative and surgical managements are high tendency to relapse, extensive soft tissue handling, scarring and need for repeated surgeries which eventually gives non flexible painful foot with disabilities.

**AIMAND OBJECTIVES:**

- To study the epidemiology of Congenital Talipes Equino Varus.
- To study the corrective success rate of Ponseti method in idiopathic club foot.
- To study percentage of cases requiring percutaneous Tendoachillis tenotomy and soft tissue release.
- To study various complication of Tendoachillis tenotomy and their percentage.

**MATERIALS AND METHODS:**

**Study Setting –**

The present study was conducted in medical college and tertiary care hospital in a Department Of Orthopaedics.

**Study Design** -This is prospective observational study.

**Study Population -**

All walk outdoor patient and indoor patient with clubfoot in tertiary care hospital in Department Of Orthopaedics.

**Sample Size-**

232 patient with affected 264 feet from 01/01/2019 -01/07/2020.

**Study Duration** -18 months.

**Inclusion Criteria:**

- All newborns with clubfoot deformity.
- All new as well as neglected patients with clubfoot deformity till the age of 7 years.

**Exclusion Criteria:**

Non idiopathic clubfoot like neuropathic clubfoot, postural clubfoot, syndromic clubfoot, metatarsal adductus.

**METHODOLOGY:**

After approval from the Ethics Committee and with written informed consent from relatives have been taken. Detailed personal history was recorded and a thorough general & local examination was carried out. Full clinical examination was done to assess the general condition of the neighboring joints and deformity was scored according to **PIRANI SEVERITY SCORING** at time of presentation and at each visit before applying cast. patient was included according to inclusion and exclusion criteria.

An accelerated Ponseti method casting was followed in management of these study population in which standard weekly manipulation and change of plaster was accelerated and weekly manipulation of foot and application of cast. At the end residual equinus deformity is corrected with percutaneous tendoachillis tenotomy. Patients were followed up weekly for corrective casting till tenotomy. We performed tenotomy under general anaesthesia. All patients would be assessed with regard complications of percutaneous tendoachillis tenotomy like blood loss, nerve injury and infection and scarring etc. and postoperative functional outcome using **PIRANI SEVERITY SCORING** system. After every tendoachillis tenotomy post tenotomy above knee cast in a functional position applied. The patients were started on bracing protocol with Dennis Browne splint till walking age. Patients were followed up on 1st, 2nd, 3rd and 6th month Post operatively. Result are concluded by paired T test.

**PIRANI Method Of Clubfoot Evaluation<sup>15,16</sup>:**

Dr.Shafique Pirani had identified 6 well described clinical signs of clubfoot. Three of these signs indicate primarily hind foot contracture (HFC) and three signs indicate primarily midfoot contracture (MFC).

The abnormal area on the involved foot is compared to the same area on the normal foot (if the deformity is not bilateral) and scored:- 0 = no deformity 0.5= moderate deformity 1.0= severe deformity.

**Method:** The foot is evaluated every week during serial cast treatment. The infant is kept supine and is examined while feeding & relaxed position.

- **Look:** CLB (Curved lateral border) MC (Medial Crease) PC (Posterior Crease)
- **Feel:** LHT (Lateral Head of Talus) EH (Emptiness of Heel).
- **Move:** RE (Rigidity of Equinus)



Image -sequence of cast application

**TENOTOMY:** It is an outdoor procedure.

**Indication:** If dorsiflexion is not beyond 10 degree of dorsiflexion, tenotomy is indicated, provided that the adductus and varus are fully corrected.

**Preparation-** informed the family by explaining that it is an minor procedure and it will be done under local anaesthesia or short general anaesthesia.

**Skin Preparation-** Skin preparation should be done with an antiseptic solution from mid calf to mid foot.

**Equipment-** Tenotomy blade should be #11 or #15 or tenotomy scissor, Xylocaine 2% etc.

**Anaesthesia-** Xylocaine 2% is infiltrated in the region of tenotomy with sedation. The quantity should not be too much to hinder with proper palpation of tendon which looks bluish in colour.

Scalpel with blade of #11 or #15 was put from medial side of tendon. The point of insertion of blade is 1.5 cm proximal to the attachment of tendo achillis on calcaneum. By keeping the blade parallel to the tendon, to avoid the injury to the neurovascular bundle which is present

anteromedial to it blade is inserted just anterior and touching to the tendon.

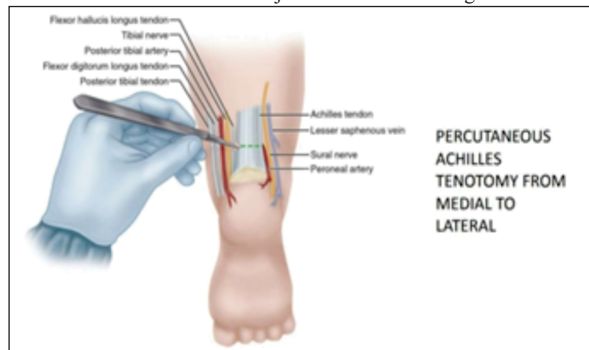


Image -steps for percutaneous tenotomy

Now the sharp edge of blade is rotated posteriorly to cut the tendon using its tip. After successful tenotomy a "POP or SNAP" is felt, which gives an additional 15° to 20° of dorsiflexion. Wound is dressed. If required stich take stich. Single dose of injectable antibiotic given before procedure and started with oral/rectal NSAID and antibiotic for 3 days.

**Post Tenotomy Cast Application:**

It was applied after gaining 15 to 20° of dorsiflexion and 40 to 50° of abduction and satisfactory varus correction. This cast was applied keeping the foot in 40 to 50° abduction and 20 to 30° of dorsiflexion for 3 weeks. After removal of cast, the functional outcome is check which is a painless, plantigrade with good mobility and cosmetically acceptable foot.

After the removal of last cast , correction was maintained by using Dennis-Browne splint. The brace was worn according to ponseti protocol. The patients were reviewed at 14 days after application of Dennis-Brown splint .In subsequent visits patients were reviewed once in three months. Some patient have relapsed or recurrence of clubfoot and some patient are categorised as neglected clubfoot then such patient are managed by either soft tissue release procedure (5 years old).

**Surgical Treatment:**

**Indications -**

- a. Deformities that do not respond to conservative treatment by serial manipulation and casting.
- b. Type of surgery in the treatment of club foot is tailored to the age of the child and to the deformity to be corrected.

**Treatment By Age-**

- (1) **Soft Tissue Procedures-** In children less than 5 years, correction can be achieved by soft tissue procedures.
- (2) **Bony Procedures-** In children more than 5 years, correction can be achieved only by bony procedures along with soft tissue procedures. (3) If the foot is mature, triple fusion may be needed.

**Various Soft Tissue Procedures:**

**Tendoachillis Tendon Lengthning –**

Anaesthesia and position under general caudal block in a semilateral position, we operated all our cases. Tourniquets were used throughout the surgery to ensure a bloodless operating field. Under all aseptic precaution after painting and drapping of foot.



Image – Tendoachillis tendon lengthning

By Making a skin incision over posterior aspect of ankle an identifying Tendoachillis tendon Z-plasty is performed by releasing the medial half distally and lateral half proximally for distance of 2.5 to 4 cm. Gently do plantarflexion and dorsiflexion of the foot. perform the transverse capsulotomy at the most medial aspect stopping at the sheath of posterior tibial tendon place the foot in 10 degrees of dorsiflexion and approximate the achillis tendon to asses tension .place the foot in plantar flexion and repair the achillis tendon at the appropriate length .closure of incision done in layers .apply a long leg with bent knee cast with the foot in 5 degrees of dorsiflexion.

### Various Incision Used For Soft Tissue Release Procedure Which Include

#### 1) One stage posteromedial release-

TURCO<sup>22</sup> Useful in mild deformities with no severe internal rotational deformity of the calcaneus.

#### 2) Carroll double incision technique<sup>6</sup> -

(a)It give excellent exposure of the entire anatomy. (b) To promote good healing with minimal scarring and good cosmesis. (c) To allow protection of the neurovascular structures.

Carroll<sup>24</sup> emphasized the plantar fascial release and capsulotomy of the calcaneocuboid joint since forefoot adduction and supination were not addressed by Turco's procedure.

#### 3) Extensile Release-

Mckay procedure<sup>11,12</sup> Cincinnati incision-transverse circumferential incision is used.

### COMPLICATIONS OF TREATMENT:

1. rocker bottom foot
2. bean shaped foot
3. fractures
4. pressure sores
5. failure of correction
6. relapse of deformity
- 7.flat top talus
- 8.wound infection
- 9.wound dehiscence
10. failure to achieve correction/loss of reduction

### RESULT:

Total 270 patients entered in our study group. 30 (18 Male and 12 female) patients discontinued the treatment. 8 patients are transferred to private hospital by themselves. So the management with Ponseti technique was completed with 232 patient with affected foot 264.

- Mean age at presentation of all the patients were 5.1 month (153 days), with range of 0.33-18 months (10-540 days). Most frequent age at presentation was 2.0 months.
- The minimum age at presentation for starting treatment was 10 days. The most common age at presentation was between 0-6 months, and the least common was between age >18-24 months with no patient in our study.
- Presentation for both sexes individually is also maximum between 0-6 months. The male to female ratio is 1.9:1.0 (19/10).
- There were 101 (38.25%) of bilateral and 163 (61.74%) unilateral cases. Among the unilateral cases there were 98 (37.12%) right and 65 (24.62%) left cases.
- Mean of total number of cast applied for 264 foot to completing the study was 7.97. The average number of total cast requirement increased according to age and Pirani severity scores.
- Average number of cast required for Pirani severity score <1.5 month was 5 and in pirani severity score between 5.0 to 6.0 was 7.43.
- For Pirani score 2.0-3.0 average number of cast required are 5 to 6, for Pirani score 3.5 to 4.5 average number of cast required are 6 to 7 and for Pirani score 5.0 to 6.0 average number of cast required are 7 to 8.
- Equinus was corrected by cast or tendo achillis tenotomy. Out of 34 foot, tenotomy was done to 78.78% (208) foot, and cast correction was done for 21.21% (56) foot.
- Among the tenotomised foot, 62.65% of foot were of male and rest 37.34% were of female. Among cast applied foot the male constituted 72.72% and female 27.27%.
- Pirani severity score ranging 3.5-4.5 was the most common score among foot counting 184.
- 12.complications after tenotomy like superficial infection and incomplete release was 09 and 03 respectively which were treated

by oral antibiotics and analgesics and revision procedure.

**Table 1-**

Method Of Equinus Correction In Foot		
	Frequency	Percent
tenotomy	208	78.78%
cast	56	21.21%
Total foot	264	100%

**Table 2-**

Distribution Of Sex Among Cast Applied And Tenotomised Foot, For Eq. Corr.				
	tenotomy		cast	
	frequency	percent	frequency	percent
male	104	62.65%	48	72.72%
female	62	37.34%	18	27.27%
total	166	100%	66	100%

**Table-3**

Percent Of Posteromedial Soft Tissue Release		
PMR	Frequency	Percent
Not done	253	95.83%
Done	11	4.17%

### DISCUSSION:

- In our study, the most common age range for presentation was 0-6 months. This constitutes 62.07%. The ratio of male to female in our study was 1.9:1. This similar male to female ratio was found in David A. Spiegel's study<sup>3,6</sup>. In P.Harnett et al's series male to female ratio was 1:1, this study has smaller study population when compared to other studies.
- In our study, the average age of presentation was earlier in male than female. This may be due to, that the patients coming here are more from villages and are of low socioeconomic status and with less education.
- Patients with isolated right side clubfoot constitutes 37.12% and bilaterally clubfoot are 38.25%. Least common was isolated left sided clubfoot are 24.62%.our study shows bilateral affection of clubfoot are more than right side. In general, studies shows bilateral affection of clubfoot patients more common, as in R.A Agrawal et al's 40% , Ankur G. et al's<sup>9</sup> 37.66% ,P.Harnett et al (52.5% bilateral and 47.5% unilateral)<sup>8</sup>.
- The average number of cast application required to achieve full correction of the deformity in patients with Pirani score of 4.5 to 6.0 was 7.43 and the average number of casts required to achieve full correction of deformity in patients with Pirani score less than 4.5 are 6.3.
- The range for number of cast applied was 5-9 in our study and the same for Ankur Gupta et al's study<sup>9</sup>, whose range was 3-10 and in study of Ponseti IV and Smoley EN . it is 5-10. Our average number of cast application was 7.97, comparatively higher to Rebecca Kampa et al's<sup>13</sup> and Ankur et al's study<sup>9</sup>.
- Among cast applied patients ,48 (72.72%) are male and 18 (27.27%) are female for correction of equinus. The tenotomy required by Ankur et al. was 95%. Pirani did 90% tenotomy, Laaveg et al<sup>9</sup> did 78% and Dobbs did it 91% . So requirement of tenotomy is towards the lower side in our study.
- Among the sample size of 232 patients only 11 patients required posteromedial soft tissue release procedure and it counts about 4.17%.

### CONCLUSION:

1. We conclude the Ponseti technique of clubfoot deformity correction is very effective method providing the patient with painless, plantigrade, mobile and cosmetically acceptable foot.
2. The number of cast depends on both age and mean Pirani severity score at presentation. The number of cast increases by the increase of Pirani severity score.
3. Early intervention for correction of clubfoot deformity with Ponseti technique gives excellent result like a painless, plantigrade, mobile and cosmetically acceptable foot provided the patient is compliant with follow up.
4. Ponseti method of clubfoot treatment has excellent results, with minimum surgical intervention (percutaneous tenotomy), without major complication and it is cost effective.
5. There were no any major complications of tenotomy and posteromedial soft tissue release procedure. Some minor complications like superficial infections and incomplete tenotomy which were treated by oral antibiotics and analgesics and revision procedure.

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