

# A Comparative Correlation between Photographic Assessment of Clubfoot And Delmingo Scoring

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## ABSTRACT

**Background:** The aim of the study is to find correlation between photography and Delmingo scoring in the clubfeet managed by Ponseti technique.

**Methods & Materials:** Total 30 subjects (42 club feet) were studied, which were corrected by Ponseti technique. The subjects are evaluated photographically and clinically (Delmingo Scoring) both before and after the correction.

**Results:** Severity of the deformities and clinical correction was assessed by Delmingo Scoring and simultaneously by photographs. All patients achieved good clinical results. The pre and post correction difference in photographically was statistically significant.

**Conclusion:** 4 photographic views proved as cost effective analysis of its result. Various reported scores for congenital Talipes Equinovarus are presented with observer variations and lack in objective evidence of severity of deformity and correction was correlated and compared with Pirani scores 0.5-2, 2.5-4, 4.5-6 as grouped I to III for mean and Standard Deviation in 42 club feet in 30 children. Photography gives an

objective assessment of the severity of deformity and can be used as objective evidence of improvement/deterioration of deformity.

**Keywords:** Idiopathic CTEV, Pirani Score, Ponseti Technique, Photography.

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## INTRODUCTION

The Congenital Talipes Equinovarus (CTEV), a hereditary foot deformity is one of the commonest congenital foot anomalies presenting to a pediatric orthopedic surgeon. Its incidence is 1 to 3 per 1000 live births<sup>1</sup>, varying with race and Geography. Males are more commonly affected in the ratio of 3:1.<sup>1</sup> In more than 40 percent of cases, there is bilateral type of deformity.<sup>2</sup> All clubfeet are not the same. There is a spectrum of deformity ranging from the newborn positional deformity (Usually corrected with one or two casts) to the stiff callused foot of the adolescent. (deformed foot has never been treated). The goal of any type of CTEV management is to reduce, if not to eliminate all elements of the clubfoot deformity, and hence achieving a functional, pain free, normal looking Plant grade, mobile, callous free and normally shoe able foot.<sup>3</sup> Assessment can be done by:

**1. Sonography:** It is used for prenatal diagnosis of clubfoot but is effective only after 18-22 weeks of gestation with mean age of 22.1 weeks. At earlier weeks of gestation it gives highly false

positive result. The normal foot looks similar to a clubfoot during 9<sup>th</sup> week of gestation but gradually gets corrected over growth.<sup>4</sup>

**2. Radiological:** It is cost effective but had radiation hazard to use as post natal diagnostic tool. It is not very helpful while assessing the deformity at 0-2 year's age group as ossification occur late in children.

**3. Photography:** It provides better static picture. It shows shape & appearance of foot which can be used for comparison after correction. They can reveal subtle change of shape & helps in recognition of early relapse. It is used as core assessment of deformity correction. It should be done in every case before treatment and in every follow up. Mainly 4 views are taken.

- Medial view -To assess-equines deformity
- Back (Posterior) view -To assess-varus/valgus deformity
- Top view -To assess-Midfoot rotational deformity
- Bottom (Planter) view -To assess-forefoot adduction deformity<sup>5</sup>

This helps to assess Dimeglio classification<sup>6</sup> which is more objective & responsible method of scoring. Dimeglio classifications include:

- 1) Hind foot Equines
- 2) Heal Varus/Valgus
- 3) Mid Foot Rotational
- 4) For Foot Adduction
- 5) Posterior Crease
- 6) Medial Crease
- 7) Cavus
- 8) Abnormal Underlying Musculature

Kite and Ponseti have developed techniques to manage the club feet. As compared to Kite method, Ponseti method<sup>7</sup> is considered better for manipulation, serial casting and correction of all components of deformity in shortest duration with less incidences of recurrence. Ponseti considered head of talus as the center of all the components of this deformity. Thus in this study we aimed to perform a comparative analysis of club feet management using photography and Delmingo scoring by Ponseti technique.

### MATERIALS AND METHODS

This observational study was conducted on all the patients of 0-2 years of age since July 2016 to March 2018 at Anugrah Narayan Magadh Medical College & Hospital, Gaya, Bihar.

Out of 33 cases 30 are treated by plaster cast & tenotomy. 3 Patients which were treated by JESS application & TA lengthening were excluded.

#### Inclusion Criteria

All patients of CTEV fulfilling following criteria, such as presenting first time for the management of clubfoot in our OPD, patients managed earlier conservatively but not fully corrected and all previous conservatively corrected clubfoot presented with relapse of deformity, were included.

#### Exclusion Criteria

- Patients above 02 years of age,
- Previous operated patients
- The patients associated with secondary causes & were treated by JESS application & TA lengthening.

All the patients were thoroughly assessed clinically and photographically. In the radiological assessments, measurements of various angles were done in anteroposterior and lateral view in stress dorsiflexion in all cases. X rays were studied for talocalcaneal angle, talo-1<sup>st</sup> metatarsal angle, talo-5<sup>th</sup> metatarsal angle (all in AP view), Talocalcaneal angle, Tibiocalcaneal angle and Calcaneal pitch (all in lateral view). For deformity correction, the classical Ponseti Technique was adopted. Catteral Pirani scoring system was used in this study to assess the severity of deformity and to assess the correction achieved after final casting.



Fig 1: Normal leg-foot relationship

Patients were regularly followed up at an interval of seven days. Correction was continued by serial casting till foot was corrected clinically. Cavus is almost always corrected with first cast.<sup>3</sup> As per following criteria:

- Extent of deformity,
- Position of heel,
- Range of dorsiflexion,
- Shape of foot,
- Sinha Index,
- Active range of eversion and dorsiflexion of foot on stimulating the sole of child and Pirani Score.
- Photographically evaluation done both and after the clinical correction of feet.

After Full correction of the foot by Ponseti Technique Dennis Brown splint to be worn for at least 23 hours a day for 3-4 month of age and after 3-4 months corrected CTEV shoes were given for the day time and corrected CTEV splint for night time. The importance of bracing was emphasized to the parents and they were advised strictly to follow bracing protocol. All parents were advised to come regularly every month for six months and then six month, thereafter till the age of 4 years. After that they were told to report in case of relapse of any deformity. In case of relapse, it was corrected by the same technique as was used previously. Cases were considered as failure if:

- a) There was no or incomplete clinico-photo-podo correction
- b) Complications like joint subluxation, rocker bottom deformity occurred.

Recommendations for Clubfoot Bracing Schedules (based on current knowledge)

- A. Fully correction can be achieved after 4-5 serial cast
  1. Denis Brown split should wear 23 hours/day for first 3-4 months
  2. After 3-4 month of age continue brace (12-14hours/day) at night time as the child grows which continue for up to age of 4-5 years
- B. At the age of 8-9 months child with corrected foot is ready for crawling or walking
- C. Set the split shoe at 60-70 degrees of abduction and at 10-15 degrees of dorsiflexion

- Do not stop using the brace as there is a risk of relapse

The time in the brace does not need to be consecutive, but it is important for the child to wear the brace while sleeping (e.g., at night, during naps) to encourage mobility during waking hours. If the child attends daycare, consider leaving the brace on in the morning and instructing the daycare as to what time each day that the brace should be removed. If possible, instruct them how to remove and reapply the brace for nap times.



Fig 2: Clubfoot

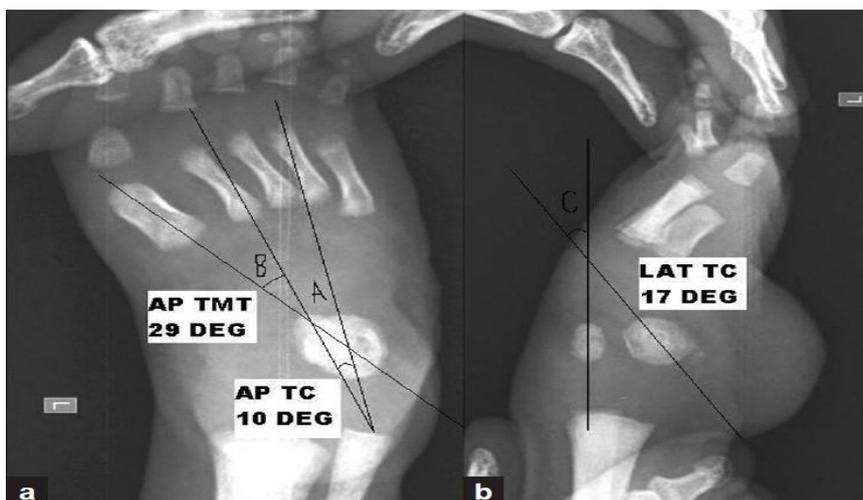


Figure 3: Anteroposterior (a) and lateral (b) radiographs of clubfoot<sup>8</sup>



Figure 4: Deformity of Foot

Table 1: Demography of Study

Total patients	30
Total feet	42
Age (Months)	22 (73.3%) 06 (20%) 02 (6.7%)
Male/Female	24/6
Bilateral/unilateral	13/19
Right/Left	33/9
Associated Congenital Anomaly	
Absent/Present	25/5

Table 2: Radiographic evaluation of clubfoot<sup>7</sup>

JOINTS	ANGLE
Talocalcaneal angle	Anteroposterior view: 30-55 degrees Dorsiflexion lateral view: 25-50 degrees
Tibiocalcaneal angle	Stress lateral view: 10-40 degrees
Talus-first metatarsal angle	Anteroposterior view: 5-15 degrees

Table 3: Dimeglio Scoring

Reducibility	Points	Other parameters	Points
90° to 45°	4	Posterior Crease	1
45° to 20°	3	Medial Crease	1
20° to 0°	2	Cavus	1
<0° to -20°	1	Poor Muscle Condition	1

**Table 4: Classification of clubfoot**

Classification Grade	Type	Frequency (%)	Score
I	Benign	20	<5
II	Moderate	33	=5<10
III	Severe	35	=10<15
IV	Very severe	12	=15<20

**Table 5: Tenotomy in relation to Clinico-Radiological Parameters**

Tenotomy	Pirani Score (Mean)		Tibiocalcaneal Angle (Mean)	
	Pre	Post	Pre	Post
Yes	5.3	0.8	102.8	68.4
No	4.9	1.1	92	70

**Table 6: Catteral Pirani Scoring System**

Parameter	Normal	Moderate	Severe
Midfoot	1	0	0.5
Curved lateral border	1	0	0.5
Medial crease	1	0	0.5
Talar head coverage	1	0	0.5
Hindfoot	1	0	0.5
Posterior crease	1	0	0.5
Rigid equines	1	0	0.5
Empty heal	1	0	0.5

## RESULTS

Demography of the study has been shown in table 1. We presented our observations on 30 patients (42 feet) treated prospectively by Ponseti method.<sup>4</sup> The mean pre correction equines deformity was 47. The mean dorsiflexion achieved after correction was 17.9 in these patients. The mean pre correction adduction deformity was 24 and the mean post correction abduction achieved was 5 in these patients. The mean pre correction heel varus was 39.3 while the mean post correction value of varus was 5.5. Before correction 25 (59.5%) feet had cavus deformity, which was corrected in all of these patients. The mean pre correction Sinha index was 0.7 and after correction the mean Sinha index achieved was 1.07. Most current studies report a high degree of success over the short term by Pirani score.<sup>5</sup> Minor complications developed in 11 (26.2%) feet. These include superficial plaster pressure sore formation in 3 cases (7.14%); abrasions over thigh developing as a result of inadequate padding at superior edge of cast were seen in 6 feet (14.3%). All these were managed by leaving them open with some antiseptic ointment over it. A relapse of deformity was present in 4 feet (9.5%). In all of these 4 patients, the deformity recurred was adduction. On inquiring, parents accepted the poor compliance for the orthosis. These relapses were unrelated with age of presentation and severity of deformity. All these 4 recurrence were managed again successfully by manipulation only. To evaluate our end results, the subjects were graded on a scale of good to poor using Pirani Score. A final Pirani score of 0-2 was regarded as good clinical correction achieved. All patients were reverted to 0-2 group i.e. good outcome. Pirani score<sup>9,10</sup> has high inter-observer, intra-observer reliability & is used as clinical tool for assessment of clubfoot for <2 years age group. Catteral Pirani scoring system was used in this study to assess the severity of deformity and to assess the correction achieved after final casting.

## DISCUSSION

The Ponseti Technique has been well accepted method of choice to correct CTEV. The correction can be achieved early with a low recurrence rate. Deformity correction by Ponseti Technique occurred when forefoot is abducted in supination with thumb on the lateral aspect of the head of the talus, which allows calcaneum to rotate under the talus. If counter pressure were applied to the calcaneocuboid joint, varus correction of hind foot and inversion of calcaneum should not be achieved.<sup>11</sup>

We observed that 1<sup>st</sup> metatarsal was more planter flexed than 5<sup>th</sup> metatarsal. Improvement in Sinha Index (Medial/ Lateral border ratio) was observed in all subjects although we were not able to achieve complete reversal of medial to lateral border ratio, due to the probably that the duration of observation was short. In unilateral cases, affected foot remains smaller in comparison to the normal foot but was cosmetically acceptable to all parents.

As per our observations, radiological parameters return to normal range. The possible explanation for this could be that the primary pathology in CTEV is, soft tissue contractures around midfoot and hind foot while the bony articulation changes are not initially present as skeleton is mainly cartilaginous. The purpose of casting is to immobilize the contracted ligaments at the maximum stretch obtained after each manipulation. All the joints are interconnected and proper bony alignment can be achieved, if treatment is started early<sup>[26]</sup>. The difference in pre and post correction Pirani Scores in these patients was found statistically significant (p=0.01).

Gokson et al (2006)<sup>12</sup> performed tenotomy in 85% of feet. Similarly, Ebehardt et al (2006)<sup>13</sup> treated 39 clubfeet with average Pirani score of 4.9 and we showed that tenotomy were necessary to perform in 34 (87.2%) of the clubfeet. Herzernberg et al (2002)<sup>14</sup> performed tenotomy in 31 (91%) of 34 feet whereas Segev et al (2005)<sup>15</sup> did the same in 95% of feet treated.

As per Radler et al (2007)<sup>16</sup> the lateral Tibiocalcaneal angle and degree of dorsiflexion measured clinically, was changed significantly after tenotomy ( $p=0.05$ ). He showed that after tenotomy the mean Tibiocalcaneal angle was 69. We observed that tenotomy was required in those cases that had severe deformity both clinically (Pirani score  $>5$ ) and radiologically (Tibiocalcaneal angle  $>100$ ).

Colburn et al (2003)<sup>17</sup> and Morcuende et al (2004)<sup>18</sup> reported relapses of adduction in approximately 10% and 11% of cases respectively, while in our study it was approximately 9.5%. They also found in compliance with brace as the cause for relapse.

Our final results were comparable to study of Ebehardt et al<sup>13</sup> that treated 41 clubfeet by Ponseti Technique of manipulation and presented 95% good results. He emphasized that with this technique, need of extensive surgery has decreased. Results were also comparable to Lourenco AF et al<sup>19</sup> (2007), Segev et al<sup>15</sup>, Goksan et al<sup>12</sup> and Morcuende et al<sup>18</sup> with approximately 92%, 94%, 84% and 98% good results respectively.

It also correlates with the Clinico- Radiological parameters of deformity correction in idiopathic CTEV. Photography and Pirani scoring is easy, reproducible, predictive and statistically significant.

## REFERENCES

1. Smythe T, Kuper H, Macleode D, Foster A, Lavy c. Trop med Int health, 2017; 22(3):269-85.
2. Ippolito E, Farsetti P, Caterni R, Tudisco C. Long term comparative results in patients with congenital clubfeet treated by two different protocols. JBJS Am, 2003; 85A(7): 1286-94.
3. Frick SL: The Ponseti method of treatment for congenital clubfoot: Importance of maximal forefoot supination in initial casting. Orthopedics, 2005; 28(1):63-5.
4. Goksan SB. Treatment of congenital clubfoot with Ponseti method. Acta Orthop Traumatol Turc, 2002;36(4): 281-87.
5. Herzenberg JE, Radler C, Bor N. Ponseti versus traditional methods of casting for idiopathic clubfoot. J Pediatr Orthop, 2002; 22(4):517-21.
6. Dimeglio A, Bensahel H, Soucher F, Mazeau p, Bonnet F. Classification of clubfoot. J Pediatr orthop, 1995; B4:129-36.
7. Ponseti IV, Georges Y, Khoury EL, Ippolito E, Weinstein SL. A radiographic study of skeletal deformities in treated clubfoot. Clin orthop relat res, 1981;160:30-42.
8. Bhargava SK, Prakash M, Tandon A, Arora SS, Bhatt S, Bhargava S. Sonographic Evaluation of Clubfoot. IMSA, 2013; 26(1):9-13.
9. Pirani S, Zeznik L, and Hodges D. Magnetic resonance imaging study of the congenital clubfoot treated with the Ponseti method. J Pediatr Orthop, 2001; 21(6):719-26.

10. Mejabi JO, Esan O, Adegbehingbe OO, Orimolade EA, Asuquo J, Badmus HD, Anipole AO. The pirani scoring system is effective in assessing severity and monitoring treatment of clubfoot in children, British journal of medicine and medical research, 2016;17(4):1-9.

11. Ponseti IV. Common errors in the treatment of congenital clubfoot. Int Orthop, 1997; 21(2):137-41.

12. Goksan SB, Bursali A, Bilgili F, Sivacioglu S, Ayanoglu S. Ponseti technique for the correction of idiopathic clubfeet presenting up to 1 year of age: A preliminary study in children with untreated or complex deformities. Arch Orthop Trauma Surg, 2006 Jan; 126(1): 15-21.

13. Eberhardt O, Schelling K, Parsch K, Wirth T. Treatment of congenital clubfoot with Ponseti method. Z Orthop Ihre Grenzgeb, 2006; 144(5) 497-501.

14. Herzenberg JE, Radler C, Bor N. Ponseti v/s traditional methods of casting for idiopathic clubfoot. J Paed Orthop, 2002;22(4): 517-21.

15. Segev E, Keret D, Lokiec F. Early experience with the Ponseti method for the treatment of congenital idiopathic clubfoot. Isr Med Association J, 2005; 7(5): 307-10.

16. Radler C, Manner HM, Suda R, Burghardt R, Herzenberg JE, Ganger R, Grill F. Radiographic evaluation of idiopathic clubfeet undergoing Ponseti treatment. JBJS Am, 2007 Jun; 89(6): 1177-83.

17. Colburn M, Williams M. Evaluation of the treatment idiopathic clubfoot by using Ponseti method. J Foot Ankle Surg, 2003; 42(5): 259-67.

18. Morcuende JA, Dolan LA, Dietz FR, Ponseti IV. Radical reduction in the rate of extensive corrective surgery for clubfoot using Ponseti method. Pediatrics, 2004; 113(2):376-80.

19. Lourenco AF, Morcuende JA. Correction of neglected idiopathic clubfoot by the Ponseti method. JBJS Br, 2007 Mar; 89(3):378-81.

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