

The Role of the Pirani Scoring System in the Management of Club Foot under the Age Two Years by the Ponseti Method

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Abstract

The Pirani scoring system, together with the Ponseti method of club foot management, was assessed for its predictive value. The data on one hundred patients having one hundred and forty nine deformed feet treated by the Ponseti method and scored by Pirani's system between 01/01/2016 to 31/12/2017 at the Dept. of Orthopaedics and Traumatology, Rangpur Medical College and Hospital were assessed. Among them sixty patients having eighty feet deformity were randomly selected and analyzed. There was a significant positive correlation between the initial Pirani score with number of casts and needs of tenotomy required to correct the deformity.

A foot scoring 4 or more is likely to require at least four casts and scoring less than 4 will require three or fewer casts. Scores ≥ 5 require tenotomy, scores ≤ 3.5 do not require tenotomy, scores between 3.5 and 5.0 may need tenotomy. A foot with a hindfoot score of 2.5 or 3 has 88.68% chance of requiring a tenotomy.

The Pirani scoring system is reliable, quick, easy to use, and provides a good forecast about the likely treatment for an individual foot but a low score does not exclude the possibility that a tenotomy may require.

The Ponseti method of club foot management has been shown to be effective, producing better results and fewer complications than traditional surgical methods.¹ The deformity is reduced by weekly manipulation and plaster casting. Most feet also require a percutaneous Achilles tenotomy. Correction is maintained by a foot abduction brace. Recent studies suggest that the Ponseti method can be successful in up to 98% of feet.²

Key words: Pirani scoring, ponseti, orthopaedics, traumatology, percutaneous, tenotomy

Club foot Scoring Systems:

There is no agreed method of grading the severity of deformity or monitoring the natural history, but there is a reported need for such a classification,³⁻⁵ which should be reliable, reproducible, feasible in a clinical setting, and predict appropriate treatment.³ Pirani et al⁶ devised a simple scoring system based on six clinical signs of contracture. Each is scored according to the following principle:

- 0 - No abnormality;
- 0.5 - Moderate abnormality;
- 1 - Severe abnormality.

The six signs are separated into three- related to the hind foot (severity of the posterior crease, emptiness of the heel and rigidity of the equinus), and three- related to the mid foot (curvature of the lateral border of the foot, severity of the medial crease and position of the lateral part of the head of the talus).

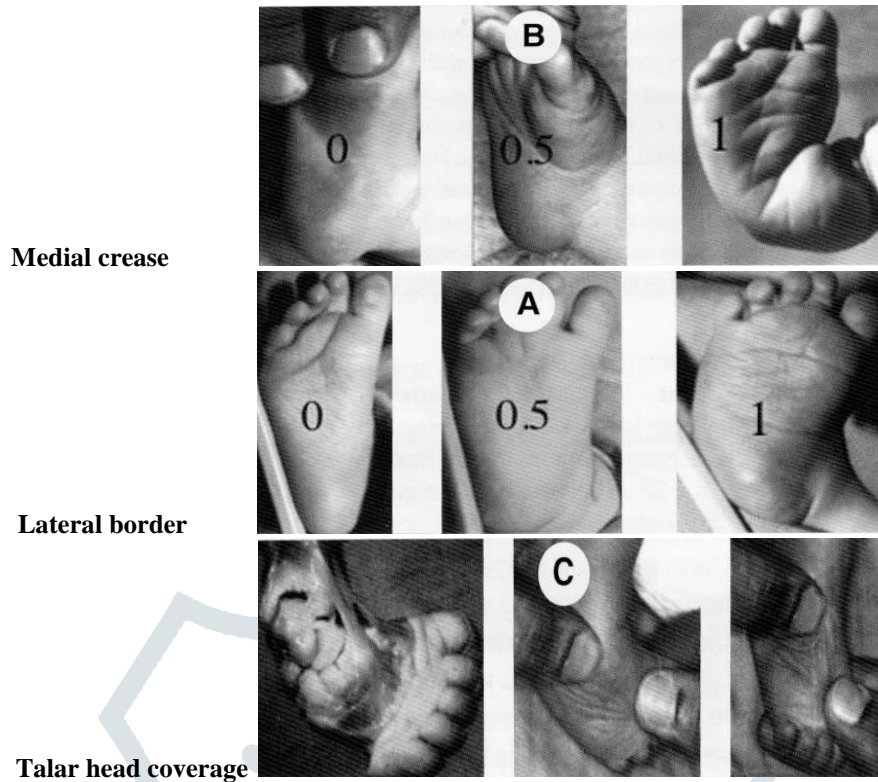
Thus each foot can receive a hind foot score between 0 and 3, a mid foot score between 0 and 3 and a total score between 0 and 6.

S. Pirani Scoring System:

Three signs for mid foot score, grading the amount of deformity between 0 and 3

Sl	Mid-foot	Normal	Moderately abnormal	Severely abnormal
1	Curved lateral border	0	0.5	1
2	Medial crease	0	0.5	1
3	Talar head coverage	0	0.5	1
	Total	0	1.5	3

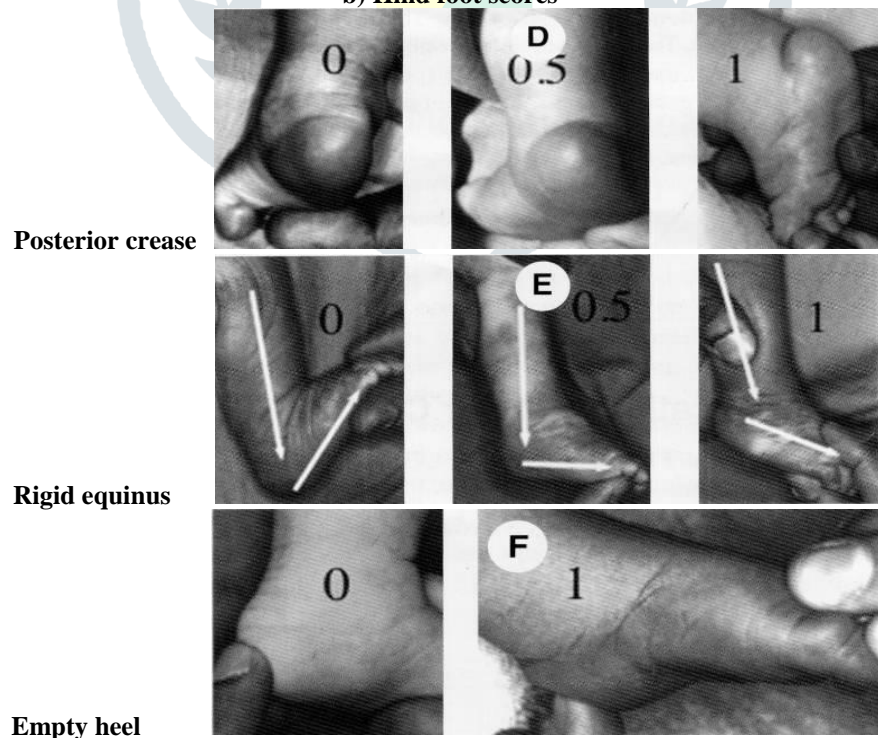
a) Mid foot scores



Three signs for Hind foot score, grading the amount of deformity between 0 and 3.

Sl	Hind-foot	Normal	Moderately abnormal	Severely abnormal
1	Posterior crease	0	0.5	1
2	Rigid equinus	0	0.5	1
3	Empty heel	0	0.5	1
	Total	0	1.5	3

b) Hind foot scores



When assessed for inter-observer reliability, the kappa score showed this to be almost perfect and much better than any of previous scoring system.^{3,6} We find it simple and reliable. A foot can be assessed in less than a minute and no technical equipment is required. Although we know the scoring system describes the deformity, we do not know whether it can yield any further information such as treatment required, prognosis and outcome.

Scher et al⁷ compared Pirani et al⁶ and Dimeglio et al⁸ scores with the need for a tenotomy. For both systems they established a link between a high-scoring foot and the need for tenotomy. In relation to Pirani, 85% of feet with a score above 5 required tenotomy, significantly more than those that did not ($p = 0.0003$).

Parents whose children are starting Ponseti treatment are likely to enquire whether a tenotomy will be required. Scher's study suggests that the Pirani system would answer this question.

Another concern is the number of casts their baby will require. We wondered if the Pirani score would allow the surgeon to give more specific advice.

This study evaluated the Pirani foot scoring system during the early stages of Ponseti treatment.

- Initial Pirani score predicts need for tenotomy and number of cast.
 - Scores ≥ 5 require tenotomy.
 - Scores ≤ 3.5 do not require tenotomy.
 - Scores between 3.5 and 5.0 may need tenotomy.
 - Total score of 4, needs at least 4 casts.
 - Total score of <4 , needs fewer casts.

Patients and Methods

Sixty patients having eighty deformed feet treated by the Ponseti method and scored by Pirani's system were evaluated between 01/01/2016 to 31/12/2017 at the Dept. of Orthopaedics and Traumatology, Rangpur Medical College and Hospital. In each week and between casts, all feet were scored according to the Pirani system.

Complete documentation was available for one hundred patients of one hundred and forty nine feet with idiopathic club feet treated purely by the Ponseti method.

Patients of idiopathic congenital club foot attended at Rangpur Medical College and Hospital were the study population. A total of 80 feet of 60 patients (both rigid and non-rigid variety, unilateral or bilateral) under the age of 2 years irrespective of sex, were included in the study. Patients with other congenital deformity, relapsed club foot, neglected club foot and age above 2 years and drop out cases were excluded from the study.

The records were studied in relation to the Pirani score and number of casts required. Hind foot and mid foot scores were considered separately and a relationship between the initial score and need for tenotomy was sought.

The relationship between the number of casts and the respective Pirani scores were assessed using the Spearman's rank correlation coefficient with the level of significance Pirani scores and the need for tenotomy set at $p = 0.05$. The relationship between Pirani scores and the need for tenotomy was investigated using the chi-squared test with $p = 0.05$ was considered to be significant.

Results

Of the 80 fully corrected feet, the mean number of casts required was 4.11 (1 to 8). Tenotomy was required in 60 feet (75%).

The mean number of casts was 5.08 (2 to 8) for the tenotomy group and 1.9 (1 to 5) for the non-tenotomy group. The former required significantly more plasters ($p < 0.0005$).

The initial Pirani score and number of casts show a positive correlation using the chi-squared test (Fig. 1 and Fig. 2) which is also seen between the tenotomy and non-tenotomy groups.

Group	No of cast		No of feet
	Total	Mean	
Tenotomy group	2-8	5.08	60
Non tenotomy	1-5	1.9	20

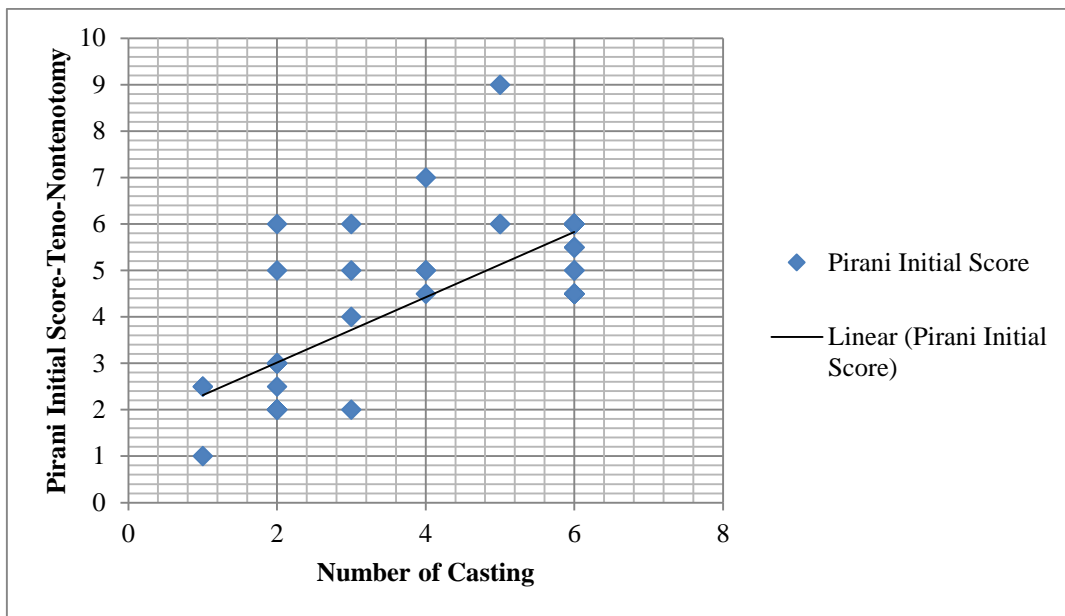


Figure 1: Plot of initial score against total number of cast (Tenotomy-Nontenotomy)

Correlations		Cast	Initial Score (SM+SH)
Cast	Pearson Correlation	1	.796**
	Sig. (1-tailed)		.005
	N	80	80
Initial Score (SM+SH)	Pearson Correlation	.796**	1
	Sig. (1-tailed)	.005	
	N	80	80

** . Correlation is significant at the 0.05 level (1-tailed).

The correlation between Initial Score and no of cast is strongly positively correlated. The correlation between initial score and number of cast is 0.796 which indicates that they are positively correlated.

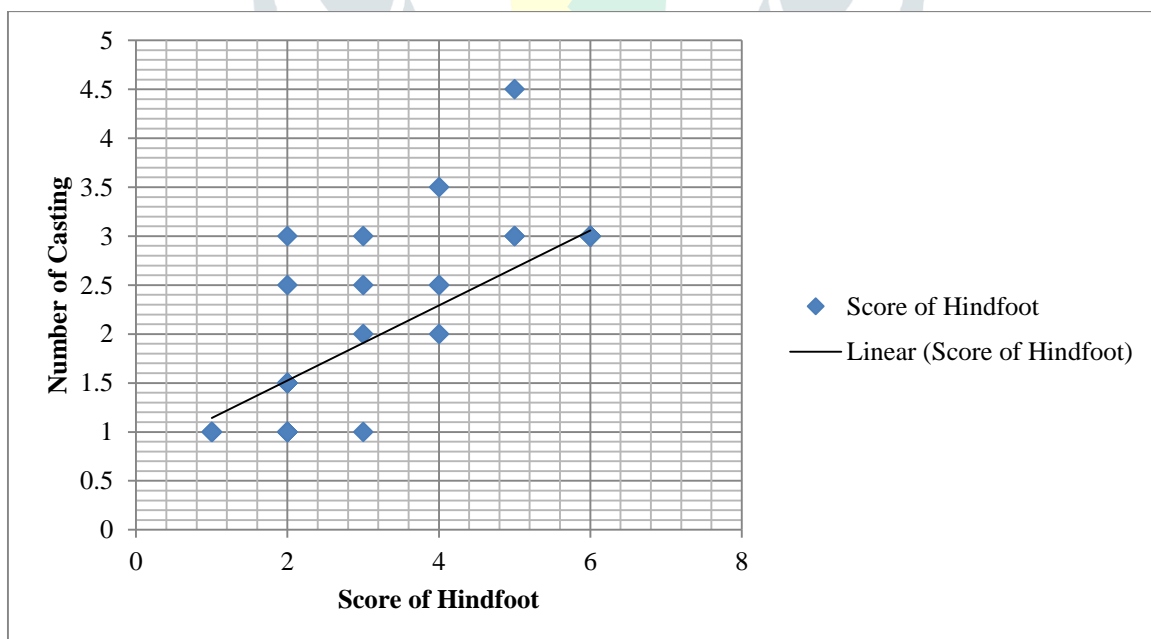


Figure 2: Plot of Hind foot score against total number of casts (Tenotomy-Without tenotomy)

Correlations		Cast	Hind-foot Score)
Cast	Pearson Correlation	1	0.863197
	Sig. (1-tailed)		.005
	N	80	80
Hind-foot Score	Pearson Correlation	0.863197	1
	Sig. (1-tailed)	.005	
	N	80	80

** . Correlation is significant at the 0.05 level (1-tailed).

The correlation between hind foot score (Tenotomy-without Tenotomy) and number of cast is 0.863197 which indicates that they are strongly positively correlated.

Spearman's rank correlation coefficient is highly significant and confirms a positive correlation between the initial Pirani score and the number of casts ($r = 0.79$, $p < 0.0005$); the hind foot component and duration of treatment ($r = 0.863197$, $p < 0.0005$).

In the non-tenotomy group there is a highly positive correlation between the initial Pirani score and the number of casts ($r = 0.89$, $p < 0.0005$). The hind foot ($r = 0.76$, $p < 0.0005$) scores are significantly correlated.

The tenotomy group also shows a strong positive correlation between initial score and number of casts ($r = 0.83$, $p < 0.0005$). There is a significant difference between the mean initial Pirani scores for the tenotomy (5.08 (2 to 8)) and non-tenotomy (1.9 (1 to 5)) groups, respectively ($p = 0.012$).

There is a highly significant difference in the mean initial hind foot scores for the two groups. The mean is 2.78 (1.5 to 3) for the tenotomy and 1.59(0 to 3) for the non-tenotomy group.

Of the tenotomy group 75% (60) have an initial hind foot score of 2.5 or 3, compared with 25% (10) of the non-tenotomy group.

Discussion

This study shows that the Pirani scoring system can be used to clarify the need for tenotomy and allows an estimate of the number of weekly plaster casts required.

The most striking finding is a strong link between the initial Pirani score and the duration of treatment shown graphically and by Spearman's correlation coefficient. This is the best evidence yet that a more deformed foot requires greater intervention.

This correlation persists when the tenotomy and non-tenotomy groups are compared. The pirani scores are important predictors of the duration of treatment and number of cast. There is no relation between tenotomy group and mid foot score but correlated with the number of casts. This is likely to be a spurious finding because in the tenotomy group the hind-foot score is almost always 2.5 or 3.

The study found a significantly higher initial Pirani score in feet requiring a tenotomy, which also required significantly more casts, suggesting that the better feet correct without the need for surgical intervention.

It was also clearly shown that it is the hind foot rather than the mid foot component of the Pirani score that predicts the need for tenotomy. This is to be expected, as it is the hind foot equinus that the tenotomy is correcting.

Of the feet with a hindfoot score of 2.5 or 3 at initial scoring, 75% (60) required a tenotomy, compared to 25% (20) of those scoring less than 2.5. The scores, although significant, are too variable for confident predictions to be made. One must be careful not to give parents whose children have lower scores the impression that operation will be unnecessary.

We have found the Pirani scoring system to be practicable, reproducible and helpful in the management of idiopathic club feet by the Ponseti method.

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