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Kumar Satyam
Department of Orthopaedics, Bokaro General Hospital, Bokaro, Jharkhand, India

Nikesh Panchbhai
Department of Orthopaedics, Bokaro General Hospital, Bokaro, Jharkhand, India

Deepak Kumar
Department of Orthopaedics, Bokaro General Hospital, Bokaro, Jharkhand, India

Narendar Karsh
Department of Orthopaedics, Bokaro General Hospital, Bokaro, Jharkhand, India

Ganesh Biruly
Department of Orthopaedics, Bokaro General Hospital, Bokaro, Jharkhand, India

ND Kachhap
Department of Orthopaedics, Bokaro General Hospital, Bokaro, Jharkhand, India

MM Kumar
Department of Orthopaedics, Bokaro General Hospital, Bokaro, Jharkhand, India

Corresponding Author:
Kumar Satyam
Department of Orthopaedics, Bokaro General Hospital, Bokaro, Jharkhand, India

To study the relapse pattern of clubfoot and its management which occured following ponseti method of clubfoot treatment

Kumar Satyam, Nikesh Panchbhai, Deepak Kumar, Narendar Karsh, Ganesh Biruly, ND Kachhap and MM Kumar

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Abstract
Background: CTEV (Clubfoot) is the most common congenital orthopaedic condition of lower limb and being treated worldwide by the Ponseti method. The treatment is started as soon as possible after birth. Despite treatment with ponseti method many patients develop relapse during follow up. A study was conducted with the aim to find out pattern of relapse and its subsequent management.
Methods: It is a Oupatient department based retrospective (Medical Record) along with prospective (Follow-up) study design,during period of June 2017 to November 2018 with medical record data since year 2012 of all enroled CTEV relapse cases. The method used for the management was serial manipulation and long leg plaster of Paris casting after getting the Pirani score at every visit.
Results: A total of 30 children (with age 0-5 year) with relapsing CTEV were selected and treated with Ponseti method. Patients showed a significant decrease in the mean Pirani score post treatment.
Conclusion: Ponseti method in management of relapsing CTEV showed excellent results (82%) followed by good (17%) and fair (1%).

Keywords: Clubfoot, ponseti method, pirani score, relapse, plaster of paris

Introduction
Clubfoot or congenital talipes equino varus (CTEV) is a common but complex deformity of foot characterized by a complex 3 dimensional deformity of foot. The incidence of CTEV is 1-2 per thousand live births. [1] The involvement is bilateral in about 50% of cases and among unilateral cases the right side is affected slightly more common than left. [2] The deformity of the foot in an otherwise normal child consisting of four components: cavus, forefoot adductus, heel varus and equines.[3-5]
The Ponseti technique of clubfoot treatment has gained considerable popularity in the last decades, with success rate of over 90% for initial correction [6, 7] However, relapses are not uncommon and the rate varies from 10% to 30% depending upon amount of follow up. [8-11]
Most authors define "relapse" as any foot requiring further intervention following successful treatment with Ponseti technique [12, 13] Pirani and Dimeglio scoring system are commonly used to rate the relapse [8-11] Clubfoot relapses has been also classified as minor or major depending on extent of invasive surgery required on these feet [14] However, no definitive classification exists to grade clubfeet relapse after the completion of Ponseti's technique.
We have observed that the relapse in clubfoot undergoing correction with the Ponseti regime follows a pattern; the initial relapse are supple, as the muscle imbalance causes dynamic deformities which if not addressed in time, can lead to static or rigid deformities. The relapse pattern may be influenced by the foot abduction orthosis (FAO) which is an important component of Ponseti regimen until 3-4 years of age [15-18].
The aim of current study is to observe the relapse pattern of clubfoot which occurred following Ponseti method of treatment, its type and classification with other objectives including;
1. Underlying cause behind this relapse.
2. To assess whether the patient would require non operative or operative management.
3. To study the change in Pirani score with subsequent management

Material and Methods

A retrospective (medical records) along with prospective (follow up) study was conducted on a sample size of 30 children with relapsing clubfoot on outpatient basis at department of orthopedics, Bokaro General Hospital during period of Medical records; Data since year 2012 of cases enrolled as CTEV relapse with follow up from June 2017 to November 2018. We have treated all patients with Ponseti method and serial monitoring with Pirani scoring. Patient who has developed relapse was graded as per Atul Bhasker and Patni classification system and managed with serial manipulation and long leg cast application weekly till tendoachilles tenotomy. After tenotomy patient was put on foot abduction brace for maintenance of correction achieved, Patient who had developed dynamic forefoot adduction and supination were treated with tibialis anterior tendon transfer surgery and long leg plaster cast for 6 weeks.

Table 1: Inclusion and Exclusion criteria

Inclusion criteria	Exclusion criteria
• Idiopathic clubfoot. • Children under 5years of age at the time of surgery. • Patients whose parents/LAR have given consent for study.	• Postural clubfoot • Syndromic clubfoot • Neuropathic clubfoot. • Children for whom parents/guardian are not willing for consent. • Patients missing follow up visits.

Parameters for evaluation

A. Patient to be managed non-operatively or operatively.
B. Non operative management- no. of casts applied/time duration in change in Pirani score.
C. Operative management- type of surgery to be done and its effect on Pirani score.
D. Improvement in Pirani score. Final Pirani score was considered as Fair- 1-2, Good- 0.5-1, and Excellent- < 0.5.
E. Prognosis of relapse pattern

Statistical tool

Continuous variables were presented as MEAN ± SD. Categorical variables were expressed as frequencies and percentages. The comparison of normally distributed continuous variables between the groups was performed using Student's t test. Nominal categorical data between the groups was compared using Chi-square test.

Observations and Results

1. Age group distribution amongst study population:

The most common age group amongst study population was 6.1 months to 1 year (27%) followed by less than 6 months (20%), 1 year to 2 years (16%), 3 to 4 years (16%) and 4 to 5 years (11%).

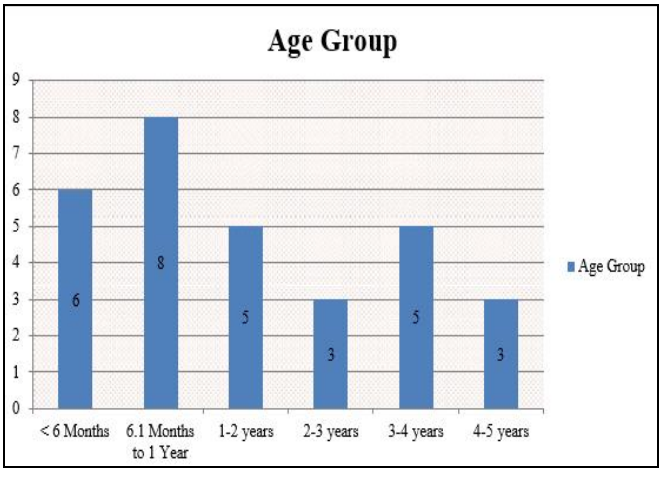

Fig 1: Age group distribution amongst study population

2. Sex distribution amongst study population

There was male predominance amongst study population (67%) as compared to female (33%)

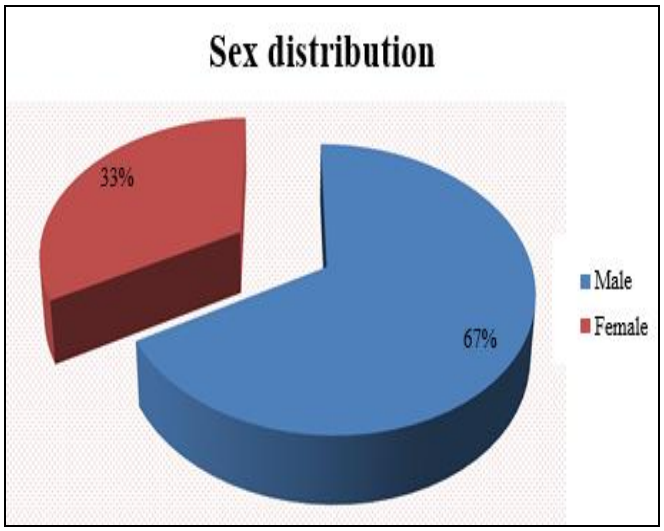

Fig 2: Sex distribution amongst study population

3. Relapse pattern

Grade IB (42.9%) was the most common relapse pattern in bilateral clubfoot followed by grade IA (33.3%) and in unilateral feet, grade IA (44.4%) was the most common relapse pattern grade IB (33.3%).

Table 2: Relapse Patterns among Study population

Relapse	Side		Total
	Bilateral	Unilateral	
IA	7 (33.3%)	4 (44.4%)	11(36.67%)
IB	9 (42.9%)	3 (33.3%)	12(40%)
IIA	2 (9.5%)	1 (11.1%)	3(10%)
IIB	2 (9.5%)	1 (11.1%)	3(10%)
III	1 (4.8%)	0 (0%)	1 (3.33%)
Total	21 (100%)	9 (100%)	30(100%)

4. Reasons of relapse amongst study population

Not following management protocol (94%) was the most common reasons of relapse followed by idiopathic (6%).

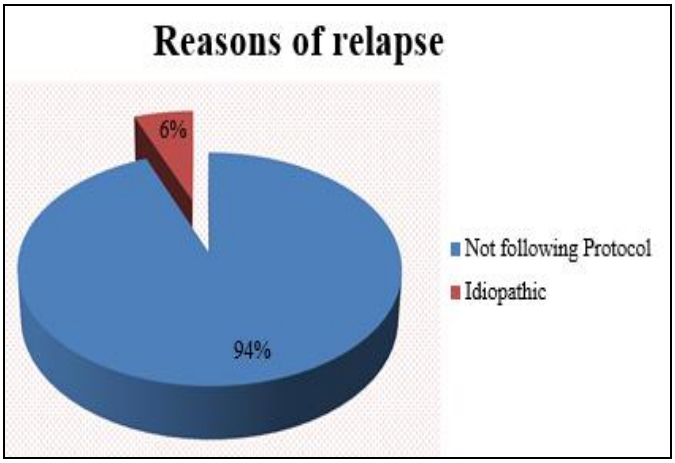

Fig 3: Reasons of relapse

5. Mode of management amongst study population
Manipulation with long with long leg cast application followed by Tendoachilles Tenotomy and Tibialis anterior tendon transfer was the mode of management in 100% and 17% of study population respectively.

6. Mean Pirani Score at pretreatment, 1 month, 3 month and 6 month interval amongst study population
There was significant improvement in the mean Pirani score at 1 month, 3 month and 6 month interval as compared to pretreatment.

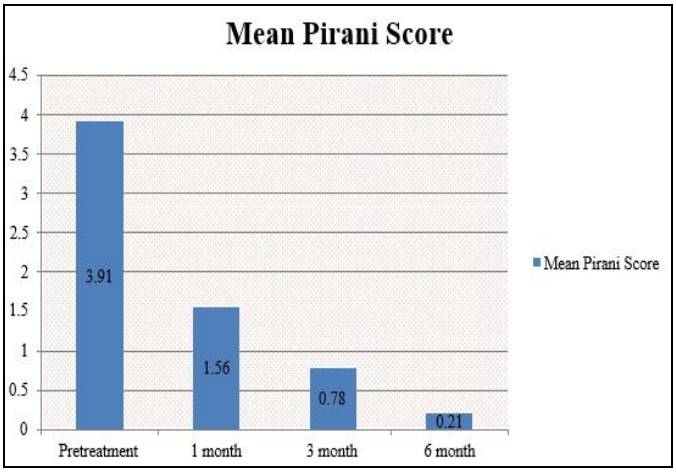

Fig 4: Mean Pirani Score

Final outcome amongst study population
Most of the study population had excellent results (82%) followed by good (17%) and fair (1%).

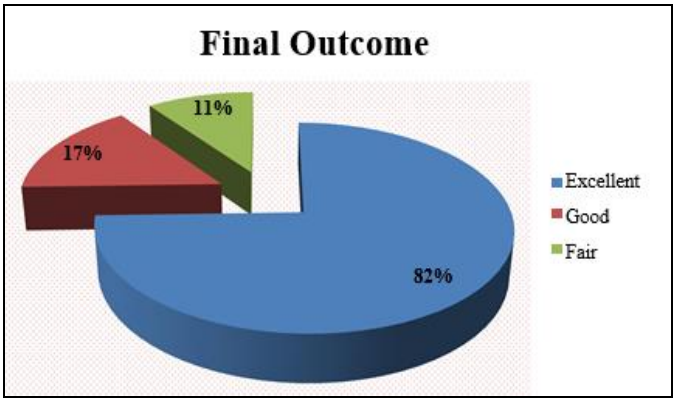

Fig 5: Final outcome amongst study population

Fig 6: Tibialis Anterior Tendon Transfer Surgery

Discussion
In our study the relapse was most commonly found in males (67%) and maximum number of patients was in age group of 6.1 month to 1 year and these observations are in agreement with the study conducted by R Malhotra *et al*. [19] and Atul Bhaskar *et al* [15]. The most common cause of relapse was found to be non compliance of bracing protocol as observed by other researchers. In the present study, grade IB (42.9%) was the most common relapse pattern in bilateral clubfoot followed by grade IA (33.3%) and in unilateral feet, grade IA (44.4%) was the most common relapse pattern grade IB (33.3%). Similarly in the study conducted by Atul Bhaskar *et al*., in which twenty four (46 feet; 32%) children had dynamic adduction or supination (Grade IB) on walking and the foot progression angle was negative (in-toeing). In the present study, most of the study population had excellent results (82%) followed by good (17%) and fair (1%). In the present study, there was significant improvement in the mean Pirani score at 1 month, 3 month and 6 month interval as compared to pretreatment. This clearly implies that the earlier the treatment begins, the better are the results [20-21].

Conclusion
Grade IB was the most common relapse pattern in bilateral clubfoot followed by grade IA and in unilateral feet, grade IA was the most common relapse pattern followed by grade IB. Not following management protocol was the most common reasons of relapse followed by idiopathic. Tendo Achilles tenotomy with long leg cast application and Tenotomy (for application of Brace) and Tibialis anterior tendon transfer was the commonest mode of management. Most of the patients had excellent results followed by good and fair. There was significant improvement in the mean Pirani score at 1 month, 3 month and 6 month interval as compared to pretreatment.

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