

Radiographic Analysis of Resistant and Neglected Clubfoot treated by Fixator

¹Manish Khanna, ²Mithilesh Kumar

ABSTRACT

Sixteen resistant and neglected clubfoot deformities in patients of age group from 8 months to 11 years were treated with external fixator during December 2012 to November 2013. The radiological evaluation of feet was done to know the alignment of bones to decide the extent of correction required. Results were graded as good.

Keywords: Clubfoot, External fixator, Radiographic analysis.

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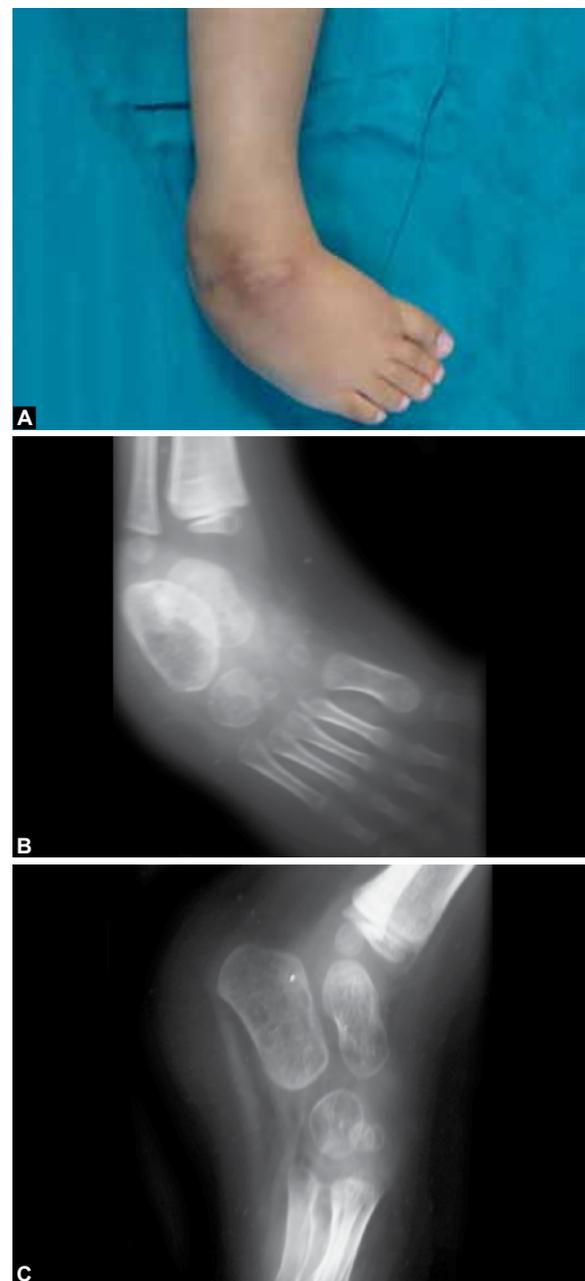
Conflict of interest: None

INTRODUCTION

Mc Cauley¹ in 1947 noted that all clubfoot deformity tend to recur except those completely corrected, readily in few months. Radiographic evaluation of results was done and was pointed out that X-ray standards of corrections are more reliable than clinical appearance. Simons⁶ recommends taking the lateral and anteroposterior view in maximally corrected position. There occurs late ossification of navicular and, therefore, malpositioning of navicular on talus (talonavicular subluxation) is frequently not recognized before the treatment is started. Harzenberg et al³ using three-dimensional computer modeling of a normal foot and a clubfoot showed the long axis of calcaneum in the normal foot but was tilted 55° medially in the clubfoot. It was further demonstrated that talar neck is internally rotated in the mortis and calcaneum was found to be internally rotated with the sloped articular surface of calcaneocuboid joint causing additional internal rotation of mid foot. In external fixator, the principle of controlled differential fractional distraction is followed to correct all the aspects of deformity by gradual sequential stretching of soft tissues to obtain plantigrade feet with satisfactory radiographic appearance.

MATERIALS AND METHODS

The study was conducted on 16 resistant and neglected clubfoot of age group from 8 months to 12 years during December 2012 to November 2013 at Government Medical College, Ambedkar Nagar, Uttar Pradesh, India, of the 16 cases, five patients had bilateral deformity and six cases were unilateral (Figs 1A to C). Male patients were more



Figs 1A to C: (A) Preoperative photograph of right-sided clubfoot, (B) AP view (preoperative) and (C) lateral view (preoperative)

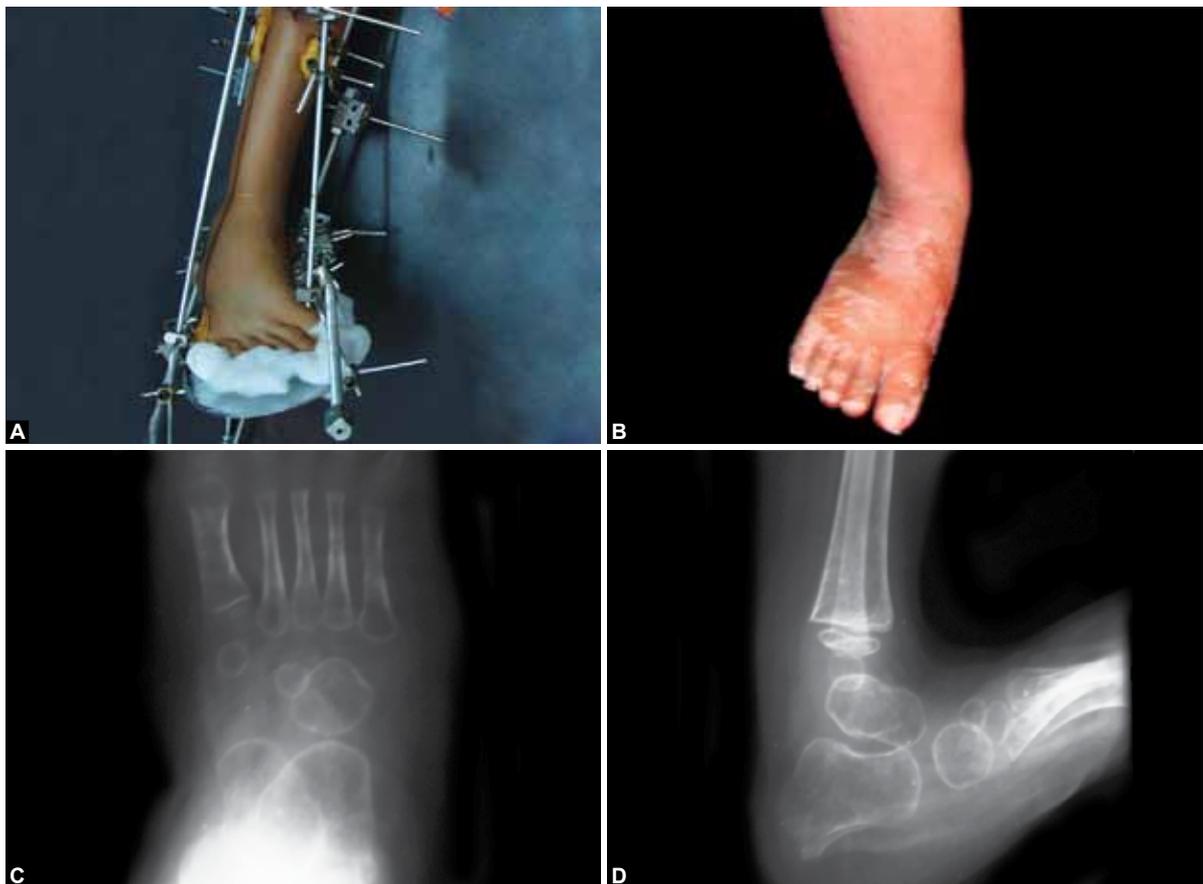
¹Associate Professor, ²Senior Resident

^{1,2}Department of Orthopedics, Government Medical College Ambedkar Nagar, Uttar Pradesh, India

Corresponding Author: Manish Khanna, Associate Professor Department of Orthopedics, Government Medical College Ambedkar Nagar, Uttar Pradesh, India, Phone: 9415167349 e-mail: manishvenus@rediffmail.com

than female. All cases were treated by external fixator (Figs 2A to D). Differential distraction was started on third postoperative day distraction was done for 3 to 6 weeks followed by static phase of 4 to 6 weeks with post fixator plaster maintenance give for 8 to 10 weeks. The average duration of distraction was 4.4 weeks. Thereafter appropriate orthopedic shoes were given to maintain the corrected position for prolonged period to prevent recurrences.

In the present study, radiological evaluation of feet was done by measuring angles (talocalcaneal angle AP and lateral view, talocalcaneal index, talo 1st metatarsal angle) (Table 1). Although subjective evaluation of results was done on the basis of correction of deformity, gain in stability, gain in gait and locomotion but so as to access the accuracy of correction achieve the detailed radiological analysis was done. Roentgenographic evaluation



Figs 2A to D: (A) Fixator in position after 3 weeks of distraction, (B) postoperative photograph showing correction of deformity after removal of JESS, (C) after removal of fixator—AP view and (D) after removal of fixator—lateral view

Table 1: Various preoperative and postoperative angles

Cases	Talocalcaneal (AP view)		Talocalcaneal (lateral view)		Talo 1st metatarsal angle	
	Preoperative	Postoperative	Preoperative	Postoperative	Preoperative	Postoperative
Amit	12	25	0	35	+45	9
Sultan	15	40	18	37	+25	-15
Sunno	17	25	15	38	+35	0
Jeevan	10	40	0	35	+10	-8
Mintu	12	35	20	34	+10	-10
Prince	8	18	12	32	+22	2
Suman	4	16	6	28	+16	0
Duggu	6	8	4	12	34	22
Rjeesh	12	25	0	35	45	-9
Sujata	15	40	18	37	+25	-15
Anubhav	17	25	15	38	+35	0
Aditya	10	40			10	-89
Ranu	12	35	20	34	+10	-10
Anjali	8	18	12	32	+22	2
Meera	4	16	6	28	+16	0
Meena	12	35	20	34	+10	-10

of foot was done to know the alignment of bones to decide the extent of correction required. Normal values of angle measured are talocalcaneal angle (AP view) 20 to 40°, talocalcaneal angle (lateral view) 35 to 55°, talocalcaneal index of more than 40°, talo 1st metatarsal angle (AP view) 0 to 20°. Radiographic findings in AP view of the hindfoot shows talus and calcaneum parallel to each other or actually superimposed with loss of talocalcaneal angle. An talocalcaneal angle (AP view) of less than 20° show hindfoot varus (Wisbrun 1932, Davis and Hatt 1955).⁴ The talocalcaneal (lateral view) of less than 35° indicates hindfoot equinus.⁴ The talo first metatarsal angle on the anteroposterior view in positive direction is abnormal. This angle indicates medial deviation of the foot at either the distal or proximal rows of tarsal joints or both and is quite helpful when it is used in conjunction with talocalcaneal angle, thus, talonavicular subluxation was present in all cases where the talo first metatarsal angle was greater than 15°.

RESULTS

Besides objective evaluation of results (Main et al 1977), the radiological criteria for assessment of results were summarized (Table 2).

DISCUSSION

The anteroposterior talocalcaneal angle, talo 1st metatarsal angle and lateral talocalcaneal angle represent varus angulation of hindfoot, forefoot adduction and equinus of hindfoot respectively. However, it was seen that, in some cases despite radiological incompletely corrected

talocalcaneal angle (AP lateral view), there was significant improvement in clinical result. It was noted that, in those cases, treated by various surgical procedure other than JESS, there were few relapses. The reason seems that the surgical releases often limited solely to the apparently more severe components of deformity. However, post-operatively, the lesser components of deformity become more apparent. Poor results were also due to difficulty in maintaining the corrected position in postoperative cases due to noncompliant parents more so when patient was not hospitalized.

Ghali et al² reported four cases of 113 cases having talocalcaneal index of less than 40°. These narrow talocalcaneal angles show the clubfoot to be resistant there is strong association between the talocalcaneal index and clinical results.

Otremski et al⁵ observed fore foot adduction in 21 (48%) feet in 44 cases. Here, maximum number of cases were having adduction of more than 20° and these cases actually gave poor results with primary conservative treatment as also reported by Laaveg and Ponset (1980), and Ryoppy and Sairane (1983).

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Table 2: Radiological results

Angles	Good	Fair	Poor
Talocalcaneal (AP view)	> 20°	10–20°	< 10°
Talocalcaneal (lateral view)	> 35°	14–35°	< 14°
Talocalcaneal index	> 40°	20–40°	< 20°
Talo 1st metatarsal angle	0–20°	– 20 to 15°	> 15°
Evaluation	72%	24%	4%

Results: According to Main et al 1977 criteria