

Ilizarov's Technique for Treatment of Madelung's Deformity by Lengthening and Re-Axation of the Distal Extremity of the Radius

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Abstract

Seven children (12 to 15 years) having madelung's deformity were considered for the study. All the children complained of aesthetic deformity with functional difficulties with their daily life activities. Ilizarov's technique by lengthening and re-axation of distal extremity of the radius was used as therapeutic modality. The short term follow up provides satisfactory results. However, long term study is needed to say with certainty that the technique prevents subsequent secondary osteo arthritis.

Key Words

Madelung's deformity, Distal extremity of radius, Osteoarthritis

Introduction

Madelung's deformity is due to a premature fusion of the anterior and medial part of epiphysis. It was first described by Malgaigne in 1885 and later by Madelung in 1878 (1). It is characterized by a typical deformity of the carpus with dorsal subluxation of the ulnar styloid and a forward and inward curvature of the radial epiphysis. It is usually diagnosed during adolescence and not only causes pain but also impedes mobility and aesthetic appearance.

The different surgical procedures performed for this deformity include Darrach's excision of distal ulnar head, the radial osteotomy which may be closing or open wedge as needed for alignment, ulnar shortening (Milch recession) in skeletally immature patients, balanced radial osteotomies combined with matched ulnar resection and in some cases stabilization of distal radio

ulnar joint is also associated (2-6). An original method of lengthening and axial distraction of the distal extremity of the radius using Ilizarov technique is described.

Material and Methods

We performed surgery in 7 cases, which included two males and five females in the age group of 12 to 15 years. Two had bilateral deformity with the contralateral side having only slight deformity and no surgery was done on that side. All the cases had an idiopathic etiology. Five of the seven cases had marked anterior and internal incurvation of the radial epiphysis while as two of the cases had mostly predominant component of shortening and anterior incurvation of the radius. The anterior subluxation of the carpus was predominant in all the cases. All the patients complained aesthetic deformity and functional difficulties with their daily life and school

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activities (Fig 1.3 & 5.6) and more over of pains which had been gradually increasing for more than a couple of years.

Operative procedure : The surgical principles obey the rules of the progressive distraction discovered by Ilizarov. Only two-ring construct was used in all the cases.

The distal ring is put just near the distal end of the radius parallel to its distal articular surface and stabilized with two cross pins fixed in the extremity of the radius. The proximal ring is put around the mid radius and stabilized with two cross wire pins perpendicular to the plane of ulna. Here one of the cross wire pins is passed through both radius and ulna to avoid augmentation of pressure on the radial head. The osteotomy is done on radial edge of the distal extremity of the radius and distraction performed with a progressive angular

correction. The distraction is started from the 5th day of osteotomy at the rate of 0.25 mm every 6 hours (total 1 mm per day). After initial distraction of whole assembly for a couple of days, a differential distraction is done to get desired correction of articular surface of radius by proper use of hinges and distraction rod and a curve regenerate is formed when distal ring becomes parallel to the proximal ring (Fig7). Plane osteotomy and re-axation and progressive angular correction in the course of the lengthening process was performed 5 times. Because of short length of lengthening callus necessary to correct deformity properly, better results were achieved with cuneiform osteotomy which permitted better axial correction and simple distraction compared to plane osteotomy. Here the partial correction was done pre-operatively, followed gradual re-axation. This osteotomy was performed in two cases.



Fig. 1



Fig. 2

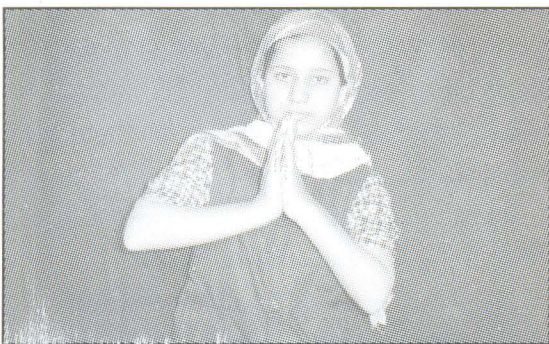


Fig. 3

Before Surgery

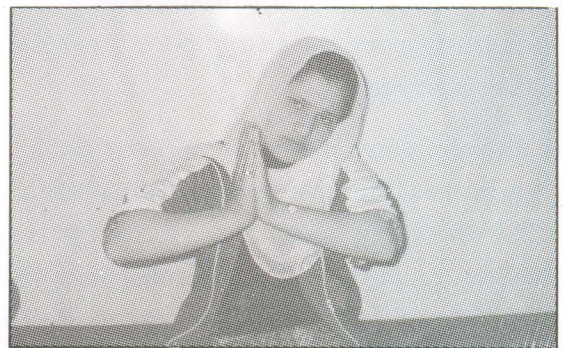


Fig. 4

After Surgery

Fig. 1 to 4 : Photographs of the patient showing decreased prominence of lower end of the ulna and improved dorsiflexion of the left wrist after the Ilizarov procedure.

Results

The lengthening necessary for the correction ranged between 13 to 25 mm (17-mm average). The apparatus was maintained for two months after completion of distraction process followed by long arm cast for additional one month to achieve consolidation of the regenerate. The average treatment time was 4.4 months. The functional gain was obtained in the form of restoration of extension from an average preoperative status of 32° extension to

62.8° (net gain of 28.7°). The aesthetic appearance was improved with reduction of subluxation (Fig 2.4). Radiologically, the distal extremity of radius was lifted to the level of the ulnar styloid making the re-axation of the carpus possible. The volar tilt of the articular surface improved from an average of 21.5° to 12° and ulnar tilt improved from an average of 52.8° to 38.5° (Fig 8). None of the patients complained of pain and all were satisfied with regard to aesthetic appearance (Table 1).

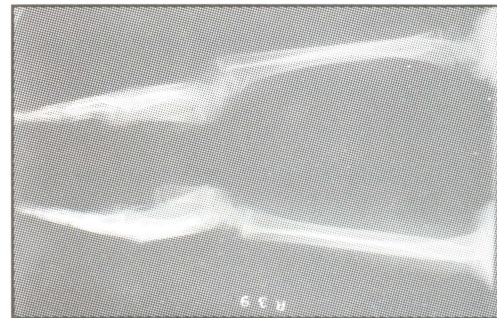
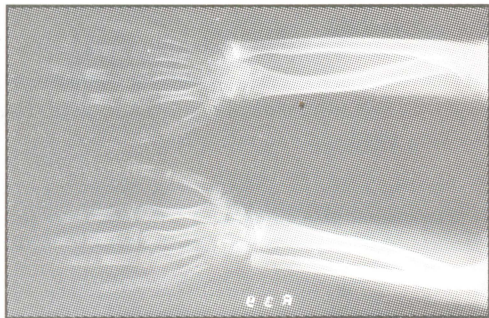


Fig. 5 & 6 : X-ray both wrists showing Madelung deformity on left side.

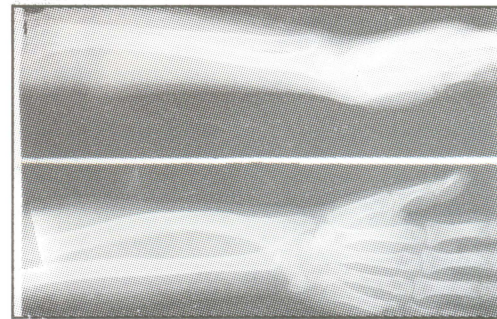
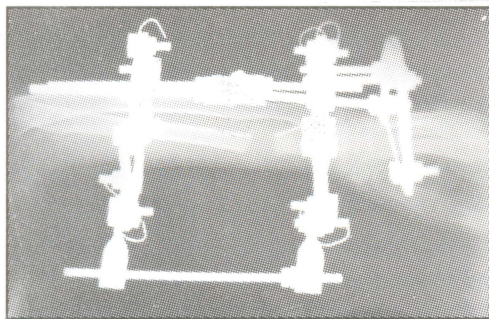


Fig. 7 & 8 : X-rays left wrist-showing reduction of the volar subluxation of the carpus and correction of volar tilt of the distal articular surface of radius.

Table 1

S.No	Age in Yrs	Sex	Lengthening		Treatment time in months	Radial tilt		Volar tilt		Extension of wrist			DRUJ Dislocation	Complications
			mm	%		Preop	Postop	Preop	Postop	Preop	Postop	Gain		
1	13	F	15	7	4	50°	40°	20°	13°	32°	60°	28°	Reduced	PTI
2	12	F	17	9	4.6	60°	50°	22°	12°	42°	62°	20°	Subluxation	Nil
3	15	M	14	6	4.2	55°	40°	21°	13°	30°	55°	25°	Reduced	Nil
4*	14	F	13	6	4	60°	45°	23°	14°	28°	60°	32°	Reduced	Nil
5	15	F	18	9	4.8	50°	30°	19°	10°	30°	60°	30°	Reduced	Nil
6	13	M	25	16	5	45°	25°	24°	12°	28°	64°	36°	Reduced	Nil
7*	12	F	18	9	4.6	50°	40°	22°	11°	35°	65°	30°	Subluxation	PTI
Mean	13.4		17.1	8.8	4.4	52.8°	38.5°	21.5°	12°	32°	60.8°	28.7°		

*Cases in which cuneiform osteotomy was done.
PTI indicates pin tract infection.

Discussion

Ilizarov technique for the correction of Madelung deformity is relatively a new technique. Sporadic cases of correction of this deformity through Ilizarov's technique have been reported (1,7,8). Due to limited number of cases it is as yet difficult to compare the results of this technique with other surgical procedures. The short term follow up study have provided satisfactory results especially with regards to realignment of distal articular surface of radius, restoration of radial length, cosmesis, improvement in wrist motion especially dorsiflexion and pain relief (1). Also the majority of results with other surgical procedures have been performed on generally older population. Surgery might benefit patients before they suffer from articular disabling pain in the carpus.

The results have been reported better with cuneiform osteotomy with partial per-operative axial correction followed by gradual re-axation than with plane osteotomy with re-axation and progressive angular correction. Because of the short length of lengthening callus necessary to correct the deformity properly makes the correction aleatory when plane osteotomy is done. Further the number of rings did not affect the results. Immobilization of the wrist have not been found much beneficial because passive and active mobilization of fingers and wrist limits decalcification and favors consolidation of lengthening callus.

Although short-term results have been encouraging but it needs long term study to say with certainty that the technique prevents subsequent secondary osteoarthritis of wrist. Also a secondary pressure effect on carpus lunate in the long run is to be seen.

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