ROLE OF MULTIPLANAR LIGAMENTOTAXIS IN THE MANAGEMENT OF DISTAL RADIUS FRACTURES USING A MODIFIED EXTERNAL FIXATOR SPANNING THE WRIST

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Introduction

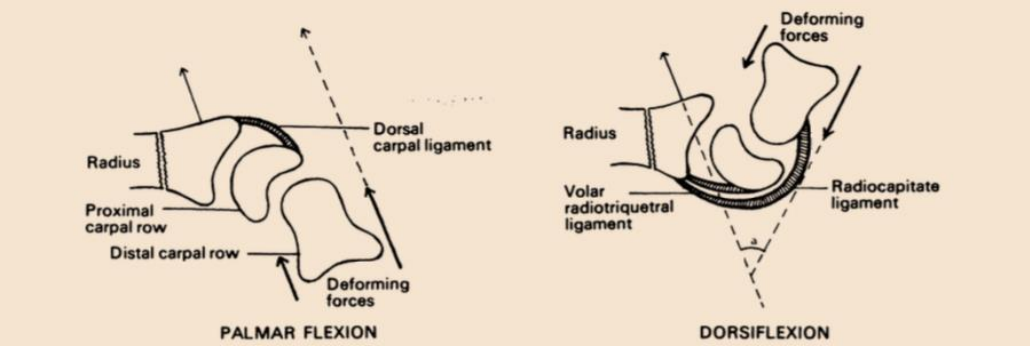
External fixation is a well accepted modality of treatment for distal radius fractures especially the unstable ones. They employ the principles of ligamentotaxis for fracture reduction and maintenance. However, most of the conventional fixators use uniplanar ligamentotaxis which fails to restore normal volar tilt. Hence, for a better restoration of volar tilt and overall hand function we modified our fixator in two ways.

Employing principles of multiplanar ligamentotaxis by immobilising wrist in dorsiflexion

Inserting a dorsal pin directly into the distal fragment

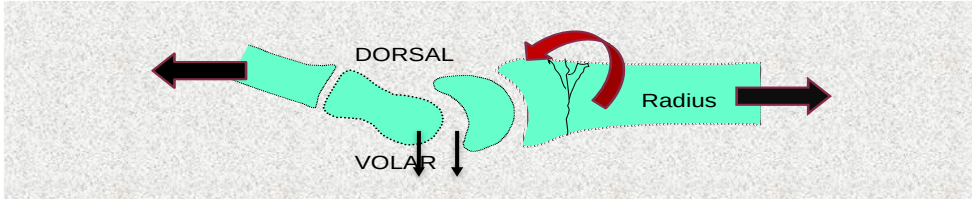
Gupta A(1991) described that the manual volar thrust and flexion at the fracture site kept the dorsal periosteal hinge taut while wrist dorsiflexion was utilized to keep the strong volar carpal ligament taut(compared to weaker dorsal carpal ligament which span only the proximal carpal row) and confer ligamentotaxis.(1)

Also, forces applied in the line of the dorsiflexed carpus act at an angle which tends to reduce the fracture.

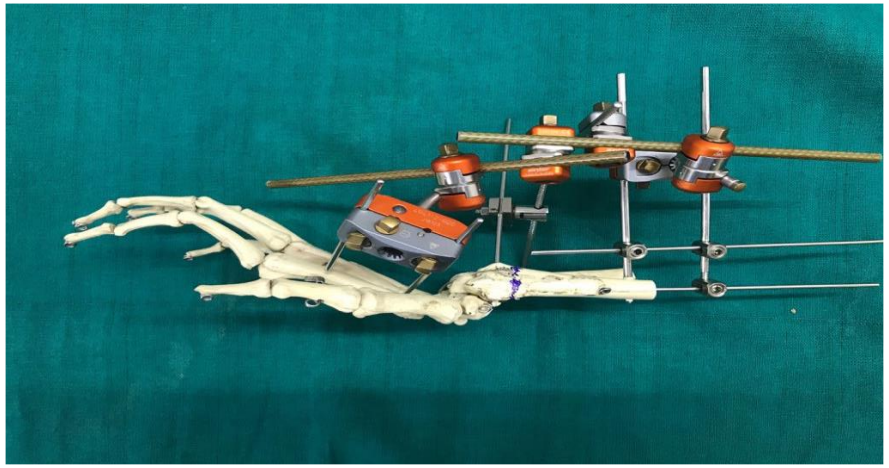


Dorsiflexion

This pin not only helps in restoring the volar tilt directly but produces ligamentotaxis also. Applying a volar push to the distal fragment through pin, produces flexion of the fracture fragment which in a fixed length configuration automatically confers some dorsiflexion to the adjoining intercalated mobile segment at wrist thus conferring ligamentotaxis.



Dorsal pin

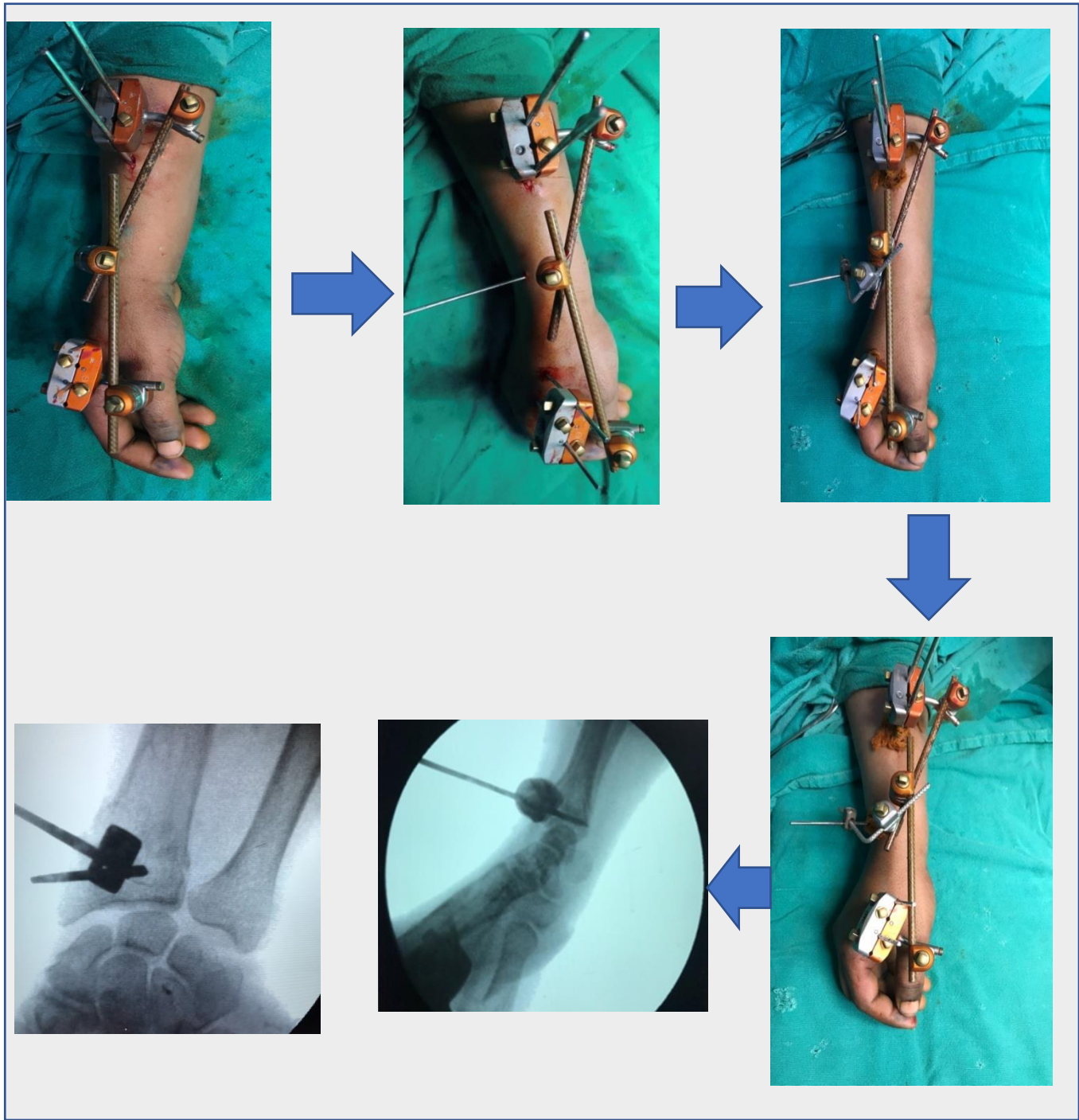


Aims and Objectives

To assess the efficacy of modified multiplanar external fixator in treating distal radial fractures in terms of restoration of normal anatomy and hand function.

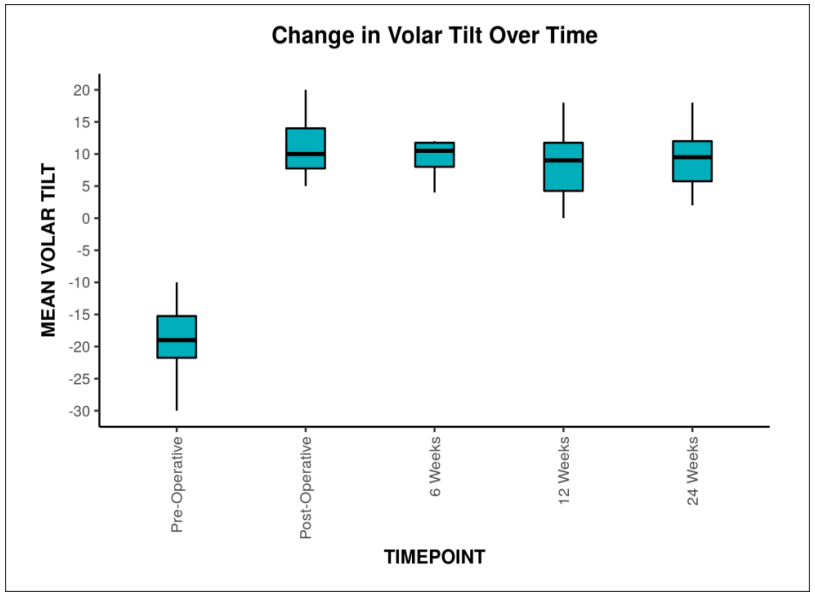
Methodology

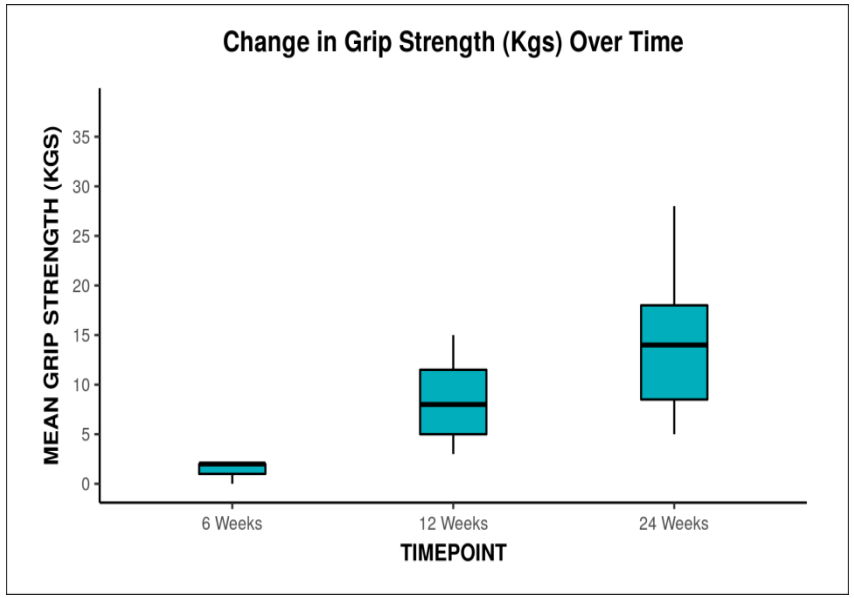
10 patients with unstable distal radius fractures with metaphyseal comminution were operated and followed up till 6 months for radiological and functional parameters.

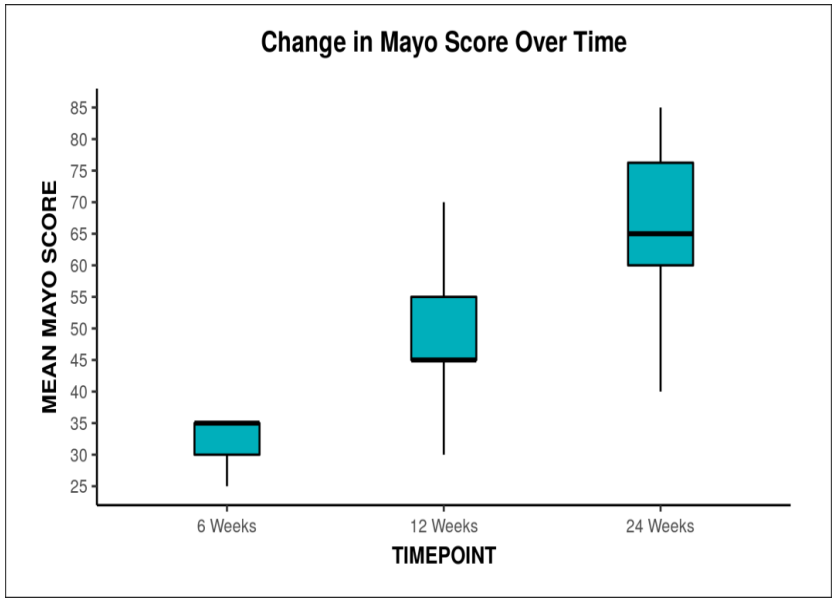


Results

Parameter	Pre-op(mean)	6-months(mean)	% of normal side(mean)
Radial Tilt(degrees)	19.40 ± 6.20(dorsal)	9.60 ± 5.13(volar)	84.79%
Radial Height(mm)	5.16 ± 1.96mm	6.65 ± 1.86 mm	64.28 %
Radial Inclination(degrees)	20.30 ± 2.75	20.80 ±5.20	95.93%
Grip Strength(kgs)	--	14.78 ± 4.44 kgs	48.18%
MAYO Score	--	65.50 ± 13.43	--
Range of Motion(degrees)	--	Flexion/extension-55.50/69.50 Pronation/supination-69.50/78.80 Radial/ulnar deviation-17.20 /29.40	Flexion/extension-76.91/86.94% Pronation/supination-94.17/90.77% Radial/ulnar deviation-75.07/81.80%







Conclusion

Our modified multiplanar external fixator offered excellent results including the restoration of normal volar tilt. All radiological parameters showed good improvement with volar tilt performing the best followed by radial inclination and the radial height. Range of motion at 6 month was very much comparable to the contralateral wrist with most of the patients achieving >80% of normal range of motion. Grip strength improved significantly achieving 48.18 ± 21.43% of grip strength of normal side. Seven out of ten patients returned to regular pre-injury status. However, a larger duration of follow-up is required to establish true functional outcome.

The proposed fixator offers promising results in restoring normal anatomy and good hand and wrist functions. It has shown to be very effective in restoring normal volar tilt of the distal radial articular surface which otherwise is seen to be the most difficult parameter to be restored with other prevalent external fixators.

Acknowledgement

1. Gupta A. The treatment of Colles' fracture. Immobilisation with the wrist dorsiflexed. J Bone Joint Surg Br.1991 Mar;73(2):312-5.