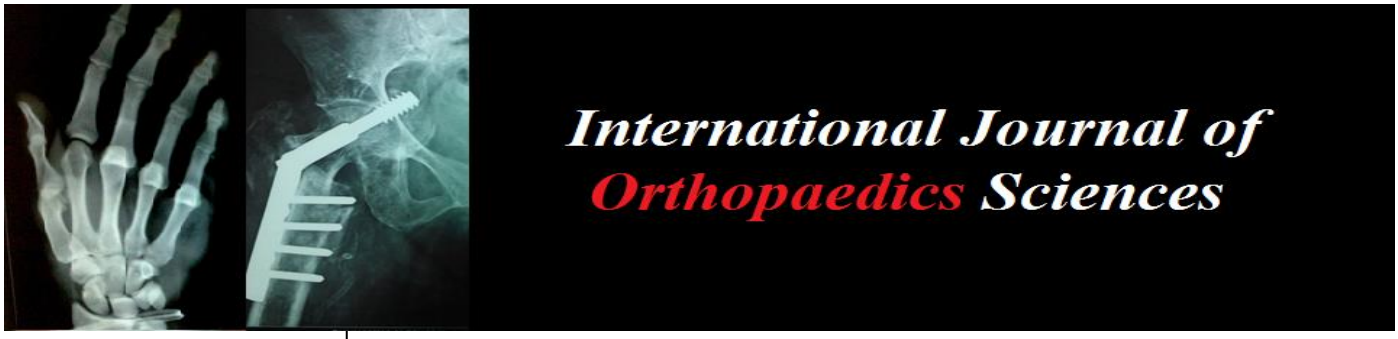

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Functional outcome of external fixator application vs volar plating for intrarticular distal radius fractures: A long term prospective study

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Abstract
Fractures of distal end radius are common fractures of the upper limb, and constitute 17% of all fractures and 75% of all forearm fractures. This fracture shows bimodal distribution of age with the fracture more commonly seen in children and elderly. Fractures that involve the articular surfaces of the distal radius can jeopardize the congruence and kinematics of the wrist joint. Anatomical articular reduction greatly reduces the incidence of post-traumatic osteoarthrosis and the quality of reduction relates directly to the final outcome. These types of fractures have been treated by various methods. Many fixation techniques have been described including pin and plaster fixation, percutaneous pinning, intramedullary pinning, external fixation (bridging or nonbridging, static or dynamic) and various forms of internal fixation with customised implants. The advantages of external fixation are the relative ease of application, minimal surgical exposure, and reduced surgical trauma. The disadvantages are prolonged immobilisation of the radiocarpal joint, indirect reduction of fracture fragments, loss of ligamentotaxis over time, and pin related complications. The advantages of plate osteosynthesis are direct fracture reduction, stable rigid fixation, and the possibility of immediate postoperative motion. Open reduction of the fracture allows reduction of the fracture under direct vision and should lead to accurate restoration of anatomy. Dorsal plates were associated with tendon rupture, tenosynovitis, reoperation, and 25% of collapse while the complication of volar plating is relatively low. The volar surface of the distal radius may be biologically more acceptable for open reduction and internal fixation than the dorsal surface because the flexor tendons are not as close to the bone sur faceas the extensor tendons.

Keywords: Intraarticular distal radius fractures, ligamentotaxis, volar locking plate

1. Introduction
Fractures of distal end radius are common fractures of the upper limb, and constitute 17% of all fractures and 75% of all forearm fractures [1]. The increasing incidence of these injuries may be attributed to an aging population (osteoporotic fractures) and the growing participation in outdoor activities [2, 3]. They attribute to almost one sixth of all the fractures treated in the emergency department [4]. There are three main age groups of distal radius fracture occurence. The first is between ages 5 to 14, the second in males under 50 years of age and the third is in females over the age of 40 years [4-6]. Displacements described by Sir Reginald Jones are Impaction, lateral displacement, lateral rotation, dorsal rotation, dorsal displacement, supination tilt of the dorsal fragment [7]. Many of these fractures are also associated with ulnar styloid process fracture. Sir John Charnley described distal radius fracture as a fracture of cancellous bone and it is bound to collapse at the fracture site [8]. Over the past 30 years the treatment of distal radius fractures has shifted from cast immobilization to numerous surgical options such as the use of external fixation and volar locking plates [9-12]. There are distinctive diffrences in these two surgical techniques and post operative rehabilitation protocols. Previously some authors have compared volar locked plating with external fixation, but the evidence is insufficient regarding which gives the best result [13, 14].

2. Materials and Methods
A prospective Randomized study was performed on distal end of radius fracture with

intraarticular extension among 60 patients during the period of 2016 to 2017 in Sanjay Gandhi Institute of Trauma and Orthopaedics Bangalore. In this study fracture were classified and studied as per frykman's classification. Among 60 patients, 30 patients were treated with External fixator and 30 patients were treated with volar locking plate. Patients were followed up till 2 years after surgery. The assessment of pain, Range of motion, grip strength and activity were assessed at each follow up visit and scored according to the Green and O'Brien scoring system and Mayo's wrist score.

External fixator procedure was performed under general or regional anaesthesia. Parts prepared and draped with or without tourniquet. Stab incision was made over dorso-radial aspect of the second metacarpal base and neck, two 2.5mm shanz pins were inserted. Another incision was made atleast 4 cm proximal to fracture of radius where the radial shaft is easily palpable and a 3.5mm distal radius shanz pin was inserted, another shanz pin of same thickness was inserted atleast 2 cm proximal to the distal shanz pin. Pins were interconnected and with connecting rod and clamps. Reduction was achieved by manual traction, checked under c-arm in antero-posterior, lateral and oblique views for acceptable radial length and acceptable reduction in displacement.

Volar locking plate procedure was performed under either general or regional anaesthesia. 7-8cm longitudinal incision was made over radial border FCR tendon. The sheath is opened and tendon retracted toward ulna. Under FCR lies flexor pollicislongus (FPL) retracted ulnarly to expose Pronator Quadratus muscle (PQ). Pronator Quadratus muscle was elevated from origin to expose distal radius. Fracture site was disimpacted articular surface was elevated and reduced. Bone grafting with iliac crest graft was done in cases of large metaphyseal defects. Volar plate placed checked under c-arm, 3.5mm self tapping screw was inserted. Wound closed in layers and sterile dressing done.

Post operatively patients were encouraged to mobilize elbow and shouler joint. Average time at suture removal] was 12 days, surgical site and pin tract dressing were done at post operative days 3 and 7. External fixator was removed at an average of 6 weeks, once the bridging callus was seen radiologically. In patients who underwent volar plating mobilization of wirst joint was encouraged at 3 weeks whereas in patients who underwent external fixation mobilization was encouraged soon after the removal of external fixation.

3. Results and Discussion

Table 1: Distribution of Age among study subjects in both the groups

		Group			
		External Fixation		Volar Plating	
		Frequency	%	Frequency	%
Age Group	Less than 25 Years	1	3.3%	7	23.3%
	25-35 years	8	26.7%	10	33.3%
	35-45 years	6	20.0%	9	30.0%
	More than 45 Years	15	50.0%	4	13.3%

Chi square = 11.61 p= 0.009

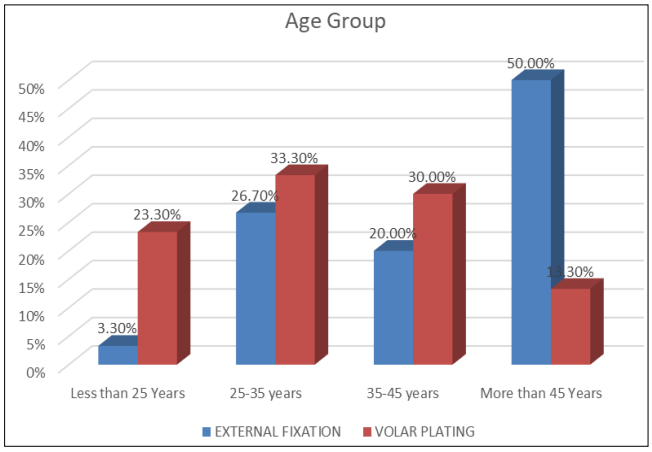

Fig 1: Graph wise distribution of Age in both the group

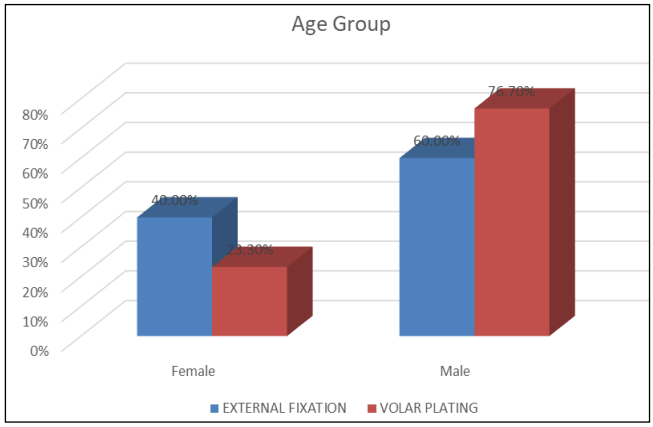

Fig 2: Graph wise distribution of Gender among study subjects

Table 2: Distribution of Gender among study groups

		Group			
		External Fixation		Volar Plating	
		Frequency	%	Frequency	%
SEX	Female	12	40.0%	7	23.3%
	Male	18	60.0%	23	76.7%

Chi square= 1.926 p= 0.165

Table 3: Distribution of Side of Injury among study subjects in both the groups

		Group			
		External Fixation		Volar Plating	
		Frequency	%	Frequency	%
Side of Injury	Left	19	63.3%	15	50.0%
	Right	11	36.7%	15	50.0%

Chi square = 1.086 p= 0.297

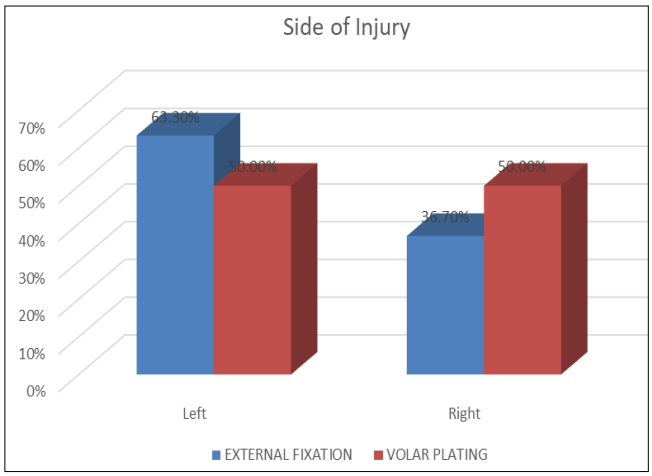

Fig 3: Graph wise distribution of Side of Injury among study subjects in both the groups.

Table 4: Distribution of Frykman's Type of fracture in both the groups

		Group			
		External fixation		Volar plating	
		Frequency	%	Frequency	%
Frykman's Type	3	6	20.0%	7	23.3%
	4	4	13.3%	7	23.3%
	5	12	40.0%	9	30.0%
	6	4	13.3%	5	16.7%
	7	4	13.3%	2	6.7%

Chi square = 2.101 p= 0.717

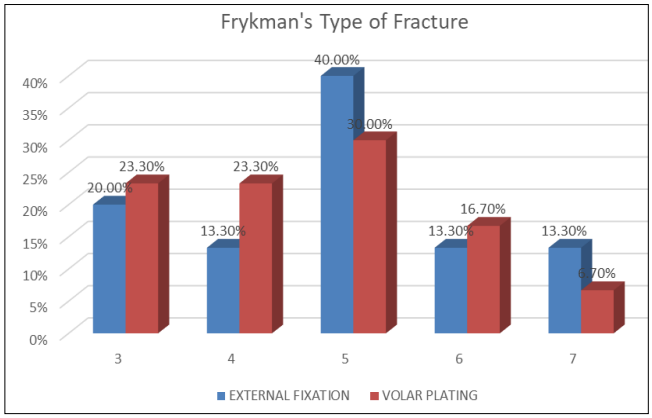

Fig 4: Graphwise distribution of frykman's type of fracture

Table 5: Distribution of Associated Injuries among study subjects in both the groups

		Group			
		Ligamentotaxis		Volar Plating	
		Frequency	%	Frequency	%
Associated Injuries	Chest Injury	1	3.3%	0	0.0%
	Contralateral BB Forearm#	0	0.0%	1	3.3%
	Contralateral BB Leg#	0	0.0%	2	6.7%
	Contralateral Femur#	2	6.7%	0	0.0%
	Head Injury	0	0.0%	1	3.3%
	Ipsilateral BB Leg#	2	6.7%	3	10.0%
	Ipsilateral Femur#	1	3.3%	0	0.0%
	Ipsilateral Humerus#	1	3.3%	0	0.0%
	NIL	23	76.7%	23	76.7%

Table 6: Distribution of Green and Obrien Score among study subjects in both the groups

Green and Obrien Score	Group				P value (t test)
	Ligamentotaxis		Volar Plating		
	Mean	Standard Deviation	Mean	Standard Deviation	
3M	79.8	8.5	84.3	6.5	0.023
6M	83.9	7.4	87.4	6.3	0.058
1YR	87.4	6.9	90.5	5.8	0.059
2YR	89.4	6.7	92.4	5.3	0.061

Table 7: Distribution of Mayo's Wrist score among study subjects in both the groups

Mayo's Wrist Score	Group				P value (t test)
	Ligamentotaxis		Volar Plating		
	Mean	Standard Deviation	Mean	Standard Deviation	
3M	79.7	7.6	83.5	6.3	0.039
6M	83.5	7.3	87.1	5.6	0.039
1YR	86.3	7.2	90.4	5.3	0.015
2YR	88.3	7.0	91.9	5.4	0.031

Distal radius fractures are extremely common injuries and tend to occur in a bimodal age distribution. They are seen most frequently in young adults and again later in life in elderly, osteoporotic women.

The management of distal radius fractures has changed considerably since cassebaum (1950) supported Abraham colles statement that a patient with a colles feature will not have pain or serious functional disability despite considerable deformity. This is no longer acceptable. Mc Queen and Casper's (1988) have shown a clear correlation between anatomical reduction and functional results [15]. Distal radius fractures account for 20% of all fractures and are only second to hip fractures in terms of incidence in the elderly population [16]. In our study 18 (30%) of the patients were in the age group of 25 to 35years. This shows that distal radius fractures is not necessarily confined to geriatric age group. Thus the incidence of distal radius fractures is increasing in younger age group too. In our series, the number of male patients were 41(68%) male and 19(31%) were female patients indicating that the incidence of distal radius fractures is no longer limited to females. In the study Fryakmans classification was used for classification of the fracture type. The Frykman type 5 was the commonest fracture pattern observed and the least type was Frykmann type 7.A number of studies have reported favourable results with external fixation. In a landmark study in 1979, Cooney *et al.* [17, 18] reported only a slight loss of motion in patients who were followed for 2 years or more [19]. In the present study 50% patient were treated with external fixation and 50% patient treated with volar plating had an excellent or good result. Kapoor *et al.* [20] reported 80 and 63% with good or excellent results in external fixation and volar plating groups respectively, However in our study it was 67% and 90% respectively. As expected higher levels of pain and stiffness were observed inpatients having an external fixator. It is thought that volar locking plates allow faster rehabilitation than external fixators, However at 2 years there were no significant differences between the volar locking plate and external fixator groups based on objective and subjective functional assessments.

4. Conclusion

Inintraarticular distal radius fractures treated with volar locking plates and external fixator at three month and six month follow up of functional assessment it was found that volar locking plate method had better outcome than external fixator. However at a long term follow up of one year and two years there was no significant difference in the functional outcome of two methods.

5. References

1. Colles A. On the fracture of the carpal extremity of the radius. Edinb Med Surg, 1814:10:181. Clin Orthop Relat Res. 200; 445:5-7.
2. Knirk JL, Jupiter JB. Intra-articular fractures of the distal end of the radius in young adults. JBJS Am. 1986; 68:647-659.
3. Jupiter JB, Ring D, Weitzel PP. Surgical treatment of redisplaced fractures of the distal radius in patients older than 60 years. J Hand Surg Am. 2002; 27:714-723.
4. David Ruch S. Rockwood & Green's USA, Lippincott: Williams & Wilkins, chapter, 26, 910.
5. Swiontkowski MF. Increasing rates of forearm fractures in children. JAMA. 2003; 209(24):3193.
6. Solgaard S, Petersen VS. Epidemiology of distal radius fractures. Acta Orthop Scand. 1985; 56(5):391-393.
7. Sir John Charnley. The closed treatment of common fractures 5 library of congress cataloging-in-publication Data, Hand surgery.
8. Clayburn TA. Dynamic External Fixation for comminuted Intra articular Fracture of Distal End of Radius, JBJS (Am). 1987; 69A:248-254.
9. Slutsky DJ. External fixation of distal radius fractures. J Hand Surg Am. 2007; 32:1624-1637.
10. Chung KC, Watt AJ, Kotsis SV, Margaliot Z, Haase SC, Kim HM. Treatment of unstable distal radius fractures with volar locking plating system. J Bone Jt Surg Am. 2006; 88:2687-2694.
11. Schnall SB, Kim BJ, Abramo A, Kopylov P. Fixation of distal radius fractures using fragment specific fixation system. Clin Orthop. 2006; 445:51-57.
12. Konstantinos CX, Dionysios AV, Konstantinos JK. Classifying fractures of the distal radius fractures: impossible or unnecessary? Review of the literature and proposal of a grouping system. Med Sci. Monit. 2009; 15(3):RA67-RA74.
13. Kapoor H, Agarwal A, Dhaon BK. Displaced intra-articular fractures of distal radius: a comparative evaluation of results following closed reduction, external fixation and open reduction with internal fixation. Injury. 2000; 31:75-79.
14. Wright TW, Horodyski M, Smith DW. Functional outcome of unstable distal radius fractures: ORIF with a volar fixed-angle tine plate versus external fixation. J Hand Surg Am. 2005; 30:289-299.
15. Nazar MA, Mansingh R, Bassi RS, Wasim M. Is there a Consensus in the management of Distal Radius Fractures? The Open Orthopaedics Journal Oct, Bentham Open, 2009, 3:96-99.
16. James Pritchett W. External Fixation or Closed Medullary Pinning for Unstable Colles Fracture, British Journal of Bone and Joint Surgery, March. 1995; 77B, No 2:267-269.
17. Richard Y, Kim MD, Melvin P, Rosenwasser MD. Internal Fixation of Distal Radius Fractures, Am J Orthop. 2007; 36(12):2-7.
18. Avid P, Green MD. Pins and Plaster Treatment of Comminuted Fractures of Distal end of Radius, British Journal of Bone and Joint Surgery. 1975; 57A, No 3:304-310.
19. Sennwald GR. Distal Radius Fracture, Palmar or Dorsal Approach? JHS. 1995; 20-A:1021-27.
20. Kapoor H, Agarwal A, Dhaon BK. Displaced intra-articular fractures of distal radius: a comparative evaluation of results following closed reduction, external fixation and open reduction with internal fixation. Injury. 2000; 31:75-79.