

## Original Article

### Condylar orientation pre-contoured plating in distal humerus fractures

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#### ABSTRACT:

**Background:** The distal humerus is unique among all the bones of the body by having the most complicated articular surface, which is part of a condyle that is rotated in three planes in relation to the diaphysis. The present study was conducted to assess the outcome of technique of condylar orientation pre-contoured plating in distal humerus fractures. **Materials & Methods:** 90 patients of distal humerus fractures of both genders were classified based on association for osteosynthesis (AO) type C3, C2 and C1. Surgical procedure was carried out with pre-contoured Sherman plates. Patients were assessed clinically (using mayo elbow performance score [MEPS]) and radio-graphically. **Results:** Out of 90 patients, there were 50 males and 40 females. Left side was involved in 35 and right in 55. Mode of trauma was RTA in 42, fall from height in 30 and violence in 18. Associated injury was ulnar nerve injury in 25 and side sweep injury in 14. Type was C3 in 54, C2 in 26 and C1 in 10 cases. The mean MEPS was 94.2, average extension was 16 degree and average flexion was 132 degree. Outcome found to be excellent in 56, good in 28, fair in 5 and poor in 1 patient. The difference was significant ( $P < 0.05$ ). **Conclusion:** Condylar orientation plating technique achieves a greater range of elbow motion and treatment outcome.

**Key words:** Condylar orientation plating, elbow motion, humerus fractures

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#### INTRODUCTION

The distal humerus is unique among all the bones of the body by having the most complicated articular surface, which is part of a condyle that is rotated in three planes in relation to the diaphysis. The condyles project antero-inferiorly out of mid-sagittal plane of the humerus at an angle of 30°, known as anterior humeral angle. In the coronal plane, the metaphysis is tilted 6-8° laterally to form carrying angle.<sup>1</sup> The elbow changes to neutral alignment at 90° flexion as the forearm moves from extension to flexion, but goes back to valgus in full extension. In addition, the distal humeral articular surface is 5-7° internally rotated (axially) in reference to the line connecting the epicondyles.

Intra-articular fractures of the distal humerus constitute 0.5%–7% of all fractures and 30% of elbow fractures.<sup>2</sup> Distal humeral fracture occurs in the younger age-groups secondary to high-energy trauma and in elderly women as a result of relatively low-

energy trauma. The chances of functional impairment and deformity are very high following conservative treatment of such distal intra-articular fractures of the humerus, and stable internal fixation may be difficult to achieve due to the complexity of the fracture and associated osteoporosis.<sup>3</sup> Good anatomical alignment, stabilization, and early mobilization can provide satisfactory results. Severe comminution, bone loss, and osteopenia predispose to unsatisfactory results because of inadequate fixation of the fracture. Over 25% of such fractures develop significant complications during treatment and a few of them may need further surgery.<sup>4</sup>

Standard surgical techniques are used for fixation of both columns, using a combination of reconstruction plates, dynamic compression plates, locking compression plates, and screws and K-wires. In rare situations primary total elbow arthroplasty (TEA) may be considered.<sup>5</sup> The present study was conducted to assess the outcome of technique of condylar

orientation pre-contoured plating in distal humerus fractures.

**MATERIALS & METHODS**

The present study comprised of 90 patients of distal humerus fractures of both genders. They were recruited in the study with the written consent. Demographic profile was recorded. Parameter such as pain, movement was recorded. Fractures was

classified based on association for osteosynthesis (AO) type C3, C2 and C1. After thorough clinical examination of the site surgical procedure was carried out with precontoured Sherman plates. Patients were followed up regularly. They were assessed clinically (using mayo elbow performance score [MEPS]) and radio-graphically. Results thus obtained were subjected to statistical analysis using chi- square test. P value less than 0.05 was considered significant.

**RESULTS**

**Table I Distribution of patients**

Total- 90		
Gender	Males	Females
Number	50	40

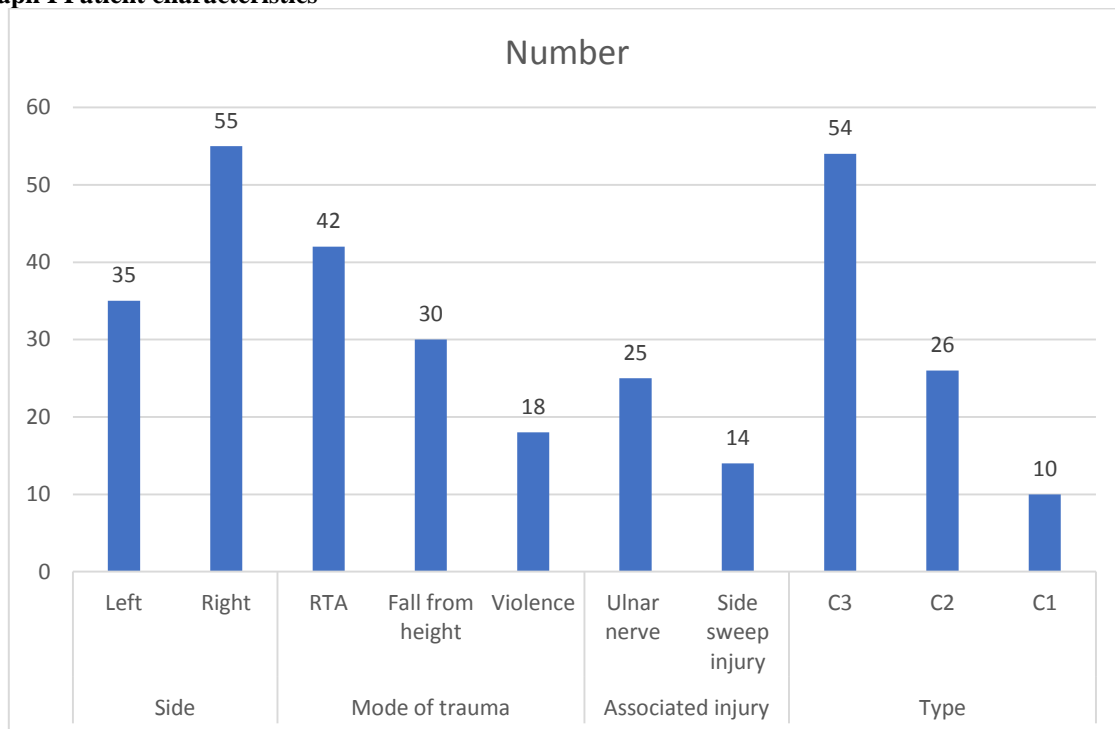
Table I shows that out of 90 patients, there were 50 males and 40 females.

**Table II Patient characteristics**

Variables	Parameters	Number	P value
Side	Left	35	0.05
	Right	55	
Mode of trauma	RTA	42	0.12
	Fall from height	30	
	Violence	18	
Associated injury	Ulnar nerve	25	0.04
	Side sweep injury	14	
Type	C3	54	0.02
	C2	26	
	C1	10	

Table II, graph I shows that left side was involved in 35 and right in 55. Mode of trauma was RTA in 42, fall from height in 30 and violence in 18. Associated injury was ulnar nerve injury in 25 and side sweep injury in 14. Type was C3 in 54, C2 in 26 and C1 in 10 cases. The difference was significant (P< 0.05).

**Graph I Patient characteristics**



**Table III Outcome of treatment**

Parameters		Value	P value
MEPS		94.2	-
Average extension		16 degree	-
Average flexion		132 degree	-
Outcome	Excellent	56	0.01
	Good	28	
	Fair	5	
	Poor	1	

Table III shows that mean MEPS was 94.2, average extension was 16 degree and average flexion was 132 degree. Outcome found to be excellent in 56, good in 28, fair in 5 and poor in 1 patient. The difference was significant ( $P < 0.05$ ).

## DISCUSSION

The main challenge in the treatment of distal humerus fracture is to achieve stable joint with a good range of pain free movement. Despite the anatomical reduction of the articular surface, this cannot always be achieved.<sup>6</sup> It has been observed and hypothesized that distal humeral metaphysis has a peculiar orientation which is responsible for providing the elbow such range of motion.<sup>7</sup> All fixation technique addresses the anatomical reduction of the articular surface and or stability of the construct. However, the principles of orientation of the condyles have not been applied so far.<sup>8</sup> The present study was conducted to assess the outcome of technique of condylar orientation pre-contoured plating distal humerus fractures.

In present study, out of 90 patients, there were 50 males and 40 females. Sarkhel et al<sup>9</sup> in their study seventy- one consecutive patients with comminuted intraarticular adult distal humerus fractures were treated with the condylar orientation plates. 43 fractures were Association for osteosynthesis (AO) type C3, 24 were C2 and 4 were C1. Six were open cases and two were of non-union distal end humerus. On medial and posterolateral side of the distal humerus, pre-contoured Sherman plates were applied. Patients were followed up for a mean of 3 years. They were assessed clinically (using mayo elbow performance score [MEPS]) and radio-graphically. Sixty (84.5%) patients regained MEPS of 90 or more that is an excellent result (range of movement and functional status). One patient had non-union with implant failure, and two patients developed heterotopic ossification. The mean MEPS was 95. Average extension and flexion was 15° and 133°. The result was graded as excellent in 60, good in 7, fair in 3 and poor in 1. At the time of most recent follow up, 63 elbows were painless, and eight had mild pain.

We found that left side was involved in 35 and right in 55. Mode of trauma was RTA in 42, fall from height in 30 and violence in 18. Associated injury was ulnar nerve injury in 25 and side sweep injury in 14. Type was C3 in 54, C2 in 26 and C1 in 10 cases. Wolfe and Ranawat<sup>10</sup> osteoanconeus flap approach provides excellent exposure and preserves the continuity of the triceps mechanism, which allows easy repair and rapid rehabilitation. The conventional approach is either olecranon osteotomy or Campbell triceps

splitting approach. These approaches usually disrupt the extensor mechanism with possible risks of osteotomy non-union, extensor weakness or later hardware problem.

We found that mean MEPS was 94.2, average extension was 16 degree and average flexion was 132 degree. Outcome found to be excellent in 56, good in 28, fair in 5 and poor in 1 patient. Total elbow arthroplasty provides good early outcomes when treating complex distal humerus fractures in elderly patients, with immediate postoperative mobilization and quick return to activities of daily living. Implantation of a semi-constrained total elbow arthroplasty in patients having an average age of 81 years led to good results in 83% of patients.<sup>11</sup> Helfet and Hotchkiss<sup>12</sup> studied the rigidity and fatigue performance of several methods including the dual-plate fixation. Although there are many fixation construct, the biomechanical behavior of the osteosynthesis depends more on plate configuration than plate type. They concluded that the dual-plate technique, with the plates oriented in two planes at 90° angles to each other, offered the most rigid and fatigue resistant construct especially in cases of comminution in which interfragmentary compression was precluded. Surgeon experience and preference may dictate the choice of a plate construct for this fracture configuration.

## CONCLUSION

Authors found that condylar orientation plating technique achieves a greater range of elbow motion and treatment outcome.

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