

**Original article :**

## **Study of Evaluation of Lateral Surgical Approach for Diaphyseal Fractures of Distal 2/3rd of Radius at a Tertiary Care Teaching Centre**

**Chandra Prakash Singh**

Associate Professor, Department of Orthopaedics, Career Institute of Medical Sciences & Hospital, Ghaila, Lucknow, Uttar Pradesh, India.

**Corresponding Author:** Dr. Chandra Prakash Singh, Associate Professor, Department of Orthopaedics, Career Institute of Medical Sciences & Hospital, Ghaila, Lucknow, Uttar Pradesh, India.

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**Abstract:**

**Background:** The current standard treatment for the forearm bone fractures in adults is open reduction and internal fixation with plating in compression mode. The aim of this study a lateral approach for plating of the lower 2/3<sup>rd</sup> diaphyseal fractures of the radius in terms of surgical exposure, intra- operative problems and any post- operative effects.

**Material & Methods:** This is a prospective study in which 25 cases of lower 2/3<sup>rd</sup> diaphyseal fractures of the radius with or without fracture ulna in adults. Patients were treated in Department of Orthopaedics, Career Institute of Medical Sciences & Hospital, Ghaila, Lucknow, Uttar Pradesh, India. The average age ranged between 16-45 years. The patients were assessed for fracture union, function and complications.

**Results:** The range of movements and grip strength is good. Excellent and good result was obtained in 24cases (96%) and fair result in 1 cases (4%). Infection occurred in one case and delayed union occurred in one case.

**Conclusion:** Our study has proven that open reduction and internal fixation of lower 2/3<sup>rd</sup> diaphyseal fractures of radius can be best done with lateral surgical approach which has given an excellent to good result.

**Key words:** Diaphyseal Fracture, Radius, Lateral Surgical Approach, Functional Outcome.

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### **INTRODUCTION**

The incidence of forearm fractures are increasing faster than the predicted rate due to increase in population, increasing number of vehicles rapid industrialization, increased incidence of violence and various sports activities have contributed to the increased incidence of fracture shaft of both bones forearm. The radial bow should be maintained for the good functional outcome. It is important to regain the length of the bones, good opposition and alignment without any malrotation.

The current standard treatment for the forearm bone fractures in adults is open reduction and internal

fixation with plating in compression mode.<sup>1</sup> Various types of plates are available for fixation. Small dynamic compression plates, 1/3<sup>rd</sup> tubular plates are generally preferred for the distal 2/3<sup>rd</sup> radial diaphyseal fractures, as they suit the profile of the bone. There are two standard approaches to expose the distal radius<sup>2</sup>, namely, a) Anterior approach (Henry) and b) Posterior approach (Thompson).

When using either of these approaches, screws applied across the plate will project either anteriorly or posteriorly which may cause irritation and may lead to early plate removal. As per AO principles, eccentrically loaded bones have one cortex loaded in

tension and one in compression with the tension coming on the convex side and compression on the concave side. This principle has to be strictly followed in lower extremity bones like the femur, where the forces are enormous. In the upper extremity forces are less and this rule can be relaxed. Since the convex side of the distal radius is the lateral aspect, so ideally the plate should be applied on the lateral side. Lateral plating allows us to restore proper magnitude and location of the radial bow to within 4% to 5% of the normal, which if not done has been shown to create more than 20% loss of forearm rotation and loss of grip strength.<sup>3</sup> The aim of this study a lateral approach for plating of the lower 2/3<sup>rd</sup> diaphyseal fractures of the radius in terms of surgical exposure, intra- operative problems and any post-operative effects.

#### **MATERIALS & METHODS**

This study was conducted in the Department of Orthopaedics, Career Institute of Medical Sciences & Hospital, Ghaila, Lucknow, Uttar Pradesh (India). The study included a minimum 25 cases of lower 2/3<sup>rd</sup> diaphyseal fractures of the radius with or without fracture ulna.

#### **Inclusion Criteria**

- (a) All adult patients of either sex
- (b) Fractures involving lower 2/3<sup>rd</sup> diaphysis of the radius with or without fracture ulna
- (c) Transverse /oblique/ spiral fracture

#### **Exclusion Criteria**

- (a) Open fractures.
- (b) Damaged or infected skin or soft tissue around the fracture.
- (c) Pre-existing deformity of forearm due to any disease.
- (d) Proximal diaphyseal, metaphyseal and intraarticular fractures.

- (e) Pathological fractures.
- (f) Fractures with comminution.

Patients were thoroughly evaluated and all vitals monitored. Detailed evaluation was done regarding injured limb and general condition. Written informed consent for the surgery taken from all patients.

#### **Surgical Procedure**

All surgeries performed on an elective basis under standard aseptic precautions. A direct lateral approach used for the exposure. The skin incision would be centered over the fracture site keeping the elbow flexed 90 degrees and the forearm in supination. Lateral cutaneous nerve of forearm and superficial branch of radial nerve were identified, preserved and retracted. Then muscles and tendons of brachioradialis, flexor carpi radialis and extensor carpi radialis were identified and plane of dissection between the brachioradialis and extensor carpi radialis. Fracture site exposed and fracture ends then be cleared of soft tissue. Reduction achieved with help of small hook and bone holders. Plate length selected as per fracture type and site. The plate contoured with the help of plate benders and then put over the lateral aspect of the radius across the fracture site, maintaining convexity laterally. The plate fixed with cortical screws of required length.

#### **Closure**

Subcutaneous layer closed with Vicryl Rapid 3-0 and skin closure with Ethilon 2-0, after removal of tourniquet and hemostasis.

#### **Intraoperative Problems**

Nerve related, Plane related, contouring related and closure related was noted.

#### **Postoperative Management**

Patient was assessed for any motor and sensory loss immediately after surgery. Every six hourly

monitoring of blood pressure, pulse rate, temperature and respiratory rate was done for the first 24 hours.

#### **Check X ray**

Postoperative radiographs taken in AP and Lateral views for the operated site on 2<sup>nd</sup> post-operative day and they were assessed for :

1. Contour of the radius: by comparing with the normal side.
2. Accuracy of reduction.
3. Screw projections

#### **Exercises**

Active finger movements was started on 1<sup>st</sup> postoperative day or as soon as patient compliance allows.

#### **RESULTS**

The present study showed the mean age of patients was 37.8 years and maximum number of patients occurred in 16-25 years of age group (table 1). Most common mode of injury in our study is RTA, having 12 patients, which is 48% of total (table 2). Transverse fracture (60%) was most common type of fracture in forearm (table 3). Only 24% cases and 32% cases interference superficial Radial nerve & lateral cutaneous nerve in forearm respectively during surgery (table 4).

According to Anderson criteria only 1 patient has more than 50% loss of union, 7 patients have 30% loss of flexion or extension in wrist movement and 8 patients have more than 50% loss in supination & pronation at 6 weeks (table 5). In present study observed that only 1 patient has more than 50% loss of union, 4 patients have 30% loss of flexion or extension in wrist movement and 3 patients have more than 50% loss in supination & pronation at 12 weeks (table 6).

#### **DISCUSSION**

In our study, fracture was commoner in the second decade, with average age of 37.8 years. Our findings are comparable H.Nevile Burwell and A.D. Charnley in 1964 witnessed 50% of the patients between second and third decade and an average of 44.8 years.<sup>4</sup>

Moed B. R. et al, accounted 50% of his cases to road traffic accident, 20% due to industrial accident, 14% due to fall, 12% due to direct blow and 4% due to gunshot injuries.<sup>5</sup>

Thomas Grace et al. noted about 29 (45%) patients with automobile or motorcycle accident, 14 (22%), in falls 2(3%), had gunshot wounds and remainder had other miscellaneous types of injuries.<sup>6</sup> Smith noted about 45% of his cases due to RTA, 36% were due to fall and 19% were due to industrial accidents.<sup>7</sup>

In our series 48% of cases had road traffic accidents, 24% had fall and 28% had direct blow (assault). Our series is comparable to Grace et al.<sup>7</sup>, and Smith series.<sup>7</sup>

M. W. Chapman et al, series noted about 53% of fractures as comminuted and 47% were transverse/short oblique.<sup>8</sup> Our series accounted 88.0% of fractures as transverse/short oblique and 12.0% were comminuted. The results were not comparable to the previous studies, which can be attributed to low velocity trauma in our country.

The primary goals of surgery are to restore normal radio-ulnar length to prevent subluxation of the proximal or DRUJs, to reestablish muscle length, to restore rotational, alignment that is essential for forearm rotation, and to restore the normal radial bow.<sup>9</sup> With respect to the latter, one should strive to restore the magnitude of the maximum bow within 1.5 mm of normal and the location of the maximum bow within 4.3% of normal to achieve a minimum of

80% of normal forearm rotation.<sup>10</sup> Results that are reported in different retrospective studies are difficult to analyze and compare because of the many uncontrolled variables within the same cohort, such as the proportions of acute fractures versus delayed unions or non-unions, the locations and types (comminuted versus non-comminuted) of fractures, the number of open injuries versus closed injuries, and the extent of associated soft tissue damage and other injuries that may affect outcome.<sup>9</sup>

Anderson et al.<sup>11</sup> noted that errors in technique, including the use of a plate of inadequate length, the failure to center the plate over the fracture, and the insertion of screws too close to the fracture line with inadequate compression, were noted to be significant contributing factors. Presence of a fracture gap on postoperative radiographs has also been shown to increase the incidence of nonunion.<sup>12</sup> Patient age or gender did not influence the incidence of nonunion in a series by Brakenbury et al.<sup>13</sup>

In this series out of 25 cases 24(96%) cases are graded excellent and good; fair 1(4%) case and 4

cases were immobilized with above elbow slab and bandage, delayed union 1 case, infection in 1 case.

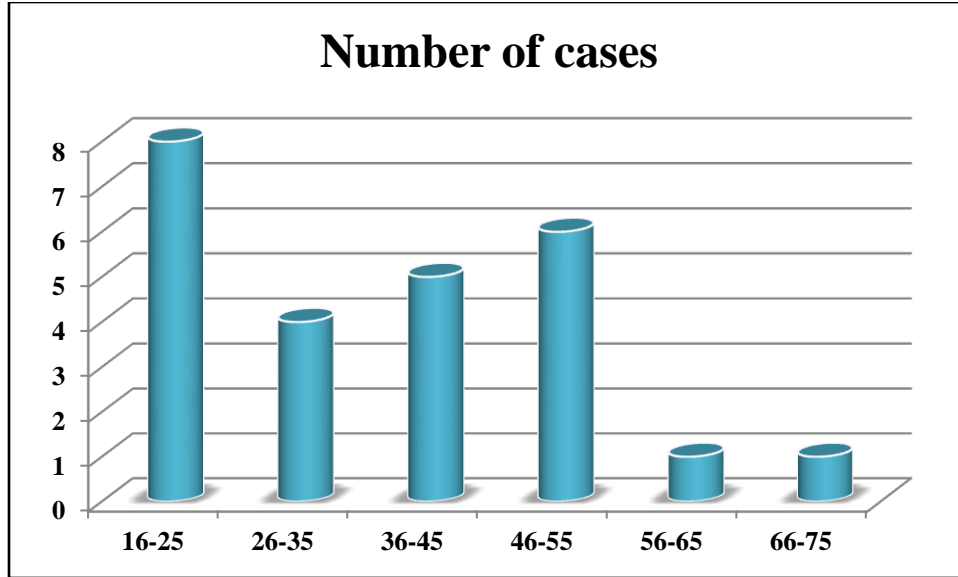
Chapman et al reported 36 (86%) cases as excellent, 3 (7%) satisfactory, 1 (2%) unsatisfactory and 2 (5%) failure.<sup>9</sup> Frankie Leung reported 98% cases as excellent and 2% satisfactory results.<sup>14</sup> In our series we had 24 (96%) cases with excellent results, 1 (4%) satisfactory results.

**CONCLUSION**

Our study has proven that open reduction and internal fixation of lower 2/3<sup>rd</sup> diaphyseal fractures of radius can be best done with lateral surgical approach which has given an excellent to good result. The complications of the procedure are negligible .The outcome is determined by principles of proper plating. The soft tissue care is utmost important i.e. minimum periosteal stripping on the surface of the bone on which plate is applied. This maintains optimal vascularity at the fracture site. Proper preoperative planning, operative technique and postoperative rehabilitation program are key points for the excellent outcome.

**Table 1: Age wise distribution of cases**

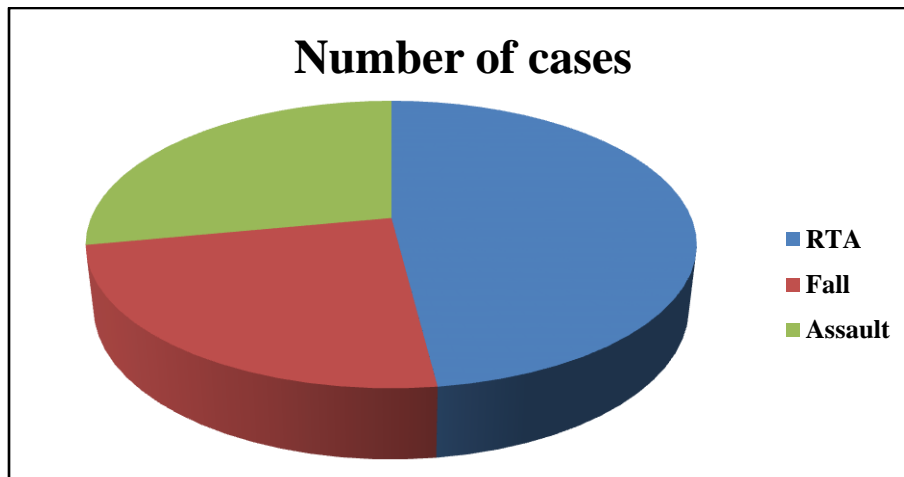
Age group (Years)	Number of cases	Percentage (%)
16-25	8	32%
26-35	4	16%
36-45	5	20%
46-55	6	24%
56-65	1	4%
66-75	1	4%
<b>Total</b>	25	100%



Graph 1: Age wise distribution of cases

Table 2: Distribution of cases according to mode of injury

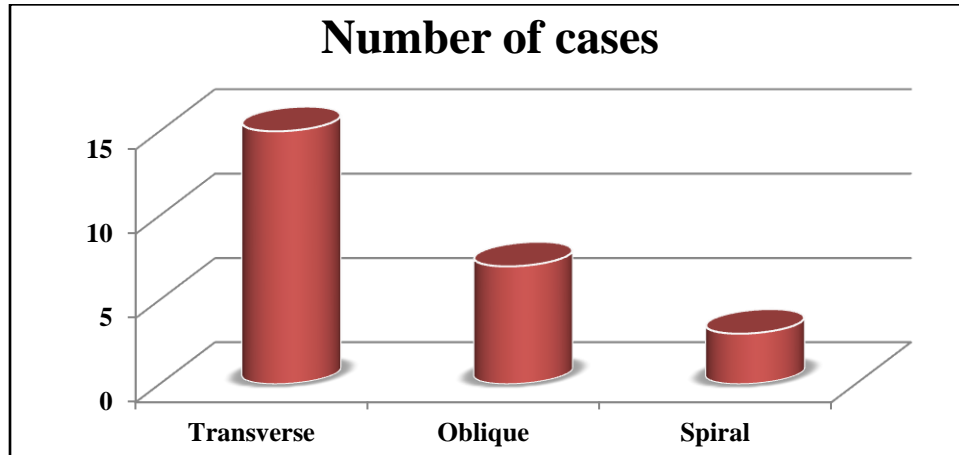
MOI	Number of cases	Percentage
RTA	12	48
Fall	06	24
Assault	07	28



Graph 2: Distribution of cases according to mode of injury

**Table 3: Types of fracture wise distribution of cases**

Type of Fracture	Number of cases	Percentage (%)
Transverse	15	60
Oblique	07	28
Spiral	03	12



**Graph 3: Types of fracture wise distribution of cases**

**Table 4: Distribution of cases according to nerve interference during surgery**

Interference		Number of cases	Percentage (%)
Superficial Radial nerve	Yes	06	24%
	No	19	76%
Lat. Cut. Nerve forearm	Yes	8	32%
	No	17	68%

**Table 5: Follow-up at 6 weeks (Andersson criteria)**

Follow-up		Number of cases	Percentage (%)
Union	<50%	24	96%
	>50%	1	4%
F/E @ wrist	<20% Loss	18	72%
	<30% Loss	7	28%
Supination /Pronation	<50% Loss	17	68%
	>50% Loss	8	32%

**Table 6: Follow-up at 12 weeks (Anderson criteria)**

Follow-up		Number of cases	Percentage (%)
<b>Union</b>	<50%	24	96%
	>50%	1	4%
<b>F/E @ wrist</b>	<20% Loss	21	84%
	<30% Loss	4	16%
<b>Supination /Pronation</b>	<50% Loss	22	88%
	>50% Loss	3	12%

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