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Dynamic compression plating in adult Forearm fractures: Results from a clinical study

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Abstract
Background: Adult Diaphyseal Fractures of the radius and ulna require anatomical reduction and rigid internal fixation to restore the complex biomechanics of forearm rotation. Dynamic Compression Plate (DCP) fixation continues to be a widely practiced and dependable technique for achieving stable fixation. This study evaluates the functional and radiological outcomes of DCP plating in adult forearm diaphyseal fractures.
Methods: A clinical study was conducted on 15 adult patients with closed diaphyseal fractures of one or both forearm bones. All patients underwent open reduction and internal fixation using a 3.5 mm DCP plate. Postoperative assessment included radiographs at regular intervals to evaluate fracture union. Functional outcomes were assessed using the Anderson scoring system, focusing on pain, union, range of motion, and return of daily activities. Patients were followed up for a minimum of 6 months.
Results: Radiological union was achieved in 14 of 15 patients (93.3%) with a mean union time of 11.2 weeks. According to the Anderson criteria, 10 patients (66.7%) had excellent outcomes, 3 patients (20%) good outcomes, 1 patient (6.7%) fair outcome, and 1 patient (6.7%) poor outcome. Complications observed included superficial infection in 1 patient (6.7%), delayed union in 1 patient (6.7%), and transient stiffness of wrist/elbow in 2 patients (13.3%), which resolved with physiotherapy. No non-union, implant failure, or neurovascular complications were noted.
Conclusion: Dynamic Compression Plating provides reliable stability, high union rates, and excellent functional recovery in adult diaphyseal forearm fractures. With precise surgical technique and structured rehabilitation, DCP remains an effective and cost-efficient method for restoring forearm anatomy and function.

Keywords: Dynamic Compression Plate, Forearm Diaphyseal Fracture, Anderson Criteria

Introduction

The forearm is a key determinant of upper limb function, serving as a mechanical link between the elbow and wrist and enabling the complex movements required for daily activities [1].

The incidence of forearm fractures is rising faster than anticipated due to industrialization, increasing interpersonal violence, falls, road traffic accidents, sports-related trauma, and direct injury. Suboptimal management may lead to significant functional deficits [2].

Therefore, these fractures necessitate management approaches distinct from those used for other diaphyseal fractures [3].

Open reduction and internal fixation with plate osteosynthesis is considered the standard of care for displaced adult diaphyseal forearm fractures.[5] The dynamic compression plate (DCP) was first described by Bagby and Denham [6]. Compression plating is associated with reduced non-union rates, earlier rehabilitation, and decreased joint stiffness [7, 8].

This study assessed the functional and radiological outcomes of DCP fixation in adult diaphyseal forearm fractures.

Need for the Study

Fractures of the diaphysis of the radius and ulna are common injuries that significantly affect upper limb function because the forearm acts as a complex rotational unit essential for pronation and supination. Improper or inadequate treatment may lead to malunion, non-union, restricted forearm rotation, and long-term disability, thereby affecting activities of daily living and occupational performance [1].

Open reduction and internal fixation with plate osteosynthesis has become the standard method of treatment for displaced adult forearm fractures, as it provides stable fixation, restoration of radial bow, and early mobilization [2-4]. However, despite established principles, variations still exist in functional outcomes, union rates, and complication profiles reported in different studies [1, 8, 9].

Dynamic compression plating (DCP) remains widely used, particularly in resource-limited settings, because of its biomechanical advantages, cost-effectiveness, and reproducible surgical technique [5, 6]. Nevertheless, complications such as infection, delayed union, implant failure, and stiffness continue to be reported, and outcomes may vary depending on surgical technique, patient factors, and rehabilitation protocols [1, 9, 10].

Furthermore, many studies in the literature have relatively small sample sizes, heterogeneous patient populations, or limited follow-up, making it necessary to generate additional prospective data evaluating both radiological union and functional outcomes using standardized scoring systems [8].

Therefore, the present study was undertaken to evaluate the functional and radiological outcomes of dynamic compression plating in adult diaphyseal forearm fractures and to assess complication rates in our clinical setting, thereby contributing to the existing evidence and helping optimize treatment strategies.

Objectives

- To assess the time to radiological union following DCP plating in adult forearm shaft fractures.
- To evaluate postoperative functional outcomes using a standardized forearm function scoring system.
- To study the radiological outcomes of DCP plating in adult forearm diaphyseal fractures
- To study the complications associated with DCP plating

Methodology

Study Design: This was a prospective cohort study.

Study Setting: The study was conducted in the Department of Orthopedics at K.V.G. Medical College & Hospital,

Study Period: 18 months from March 2024 to September 2025

Study Population: Patients presenting with forearm shaft fractures, who were treated surgically with open reduction and internal fixation in our institute.

Inclusion Criteria

1. Age ≥ 18 years
2. Diaphyseal fractures of radius and/or ulna (both bone or isolated bone forearm fractures).
3. Closed fractures and Gustilo–Anderson Type I and II open fractures
4. Patients willing for surgery and follow-up, with minimum follow-up of at least 6 months.

Exclusion Criteria

1. Paediatric forearm fractures
2. Gustilo–Anderson Type III open fractures.
3. Pathological fractures (tumor/metabolic bone disease).
4. Associated injuries affecting functional assessment, like ipsilateral elbow dislocation, wrist fracture-dislocation or neurovascular injury.

Study Procedure

Preoperative Assessment

- All patients underwent a detailed clinical evaluation, including history of injury, mechanism of trauma, side involved, and functional limitation of the affected forearm.
- Radiological assessment was performed using standard anteroposterior (AP) and lateral views of the forearm.

Fig 1: Pre operative clinical and radiological images

Surgical Technique

Henry's (Volar) Approach

- **Position & Incision:** Supine, forearm supinated; longitudinal incision along the brachioradialis–FCR interval from lateral biceps tendon toward radial styloid.
- **Interval & Exposure:** Develop plane between brachioradialis and FCR, protect radial artery and superficial radial nerve; deepen via pronator teres proximally and elevate pronator quadratus distally to expose radius.
- **Safety & Closure:** Keep forearm supinated to move PIN away, elevate muscles subperiosteally, repair PQ, and close in layers.

Subcutaneous Approach for ulna-

- Straight longitudinal incision over subcutaneous border of ulna, centered on fracture site
- Sharp skin and subcutaneous dissection; ulna is directly subcutaneous Muscle handling
- Minimal periosteal stripping; no muscle detachment required Anatomical reduction under direct vision.

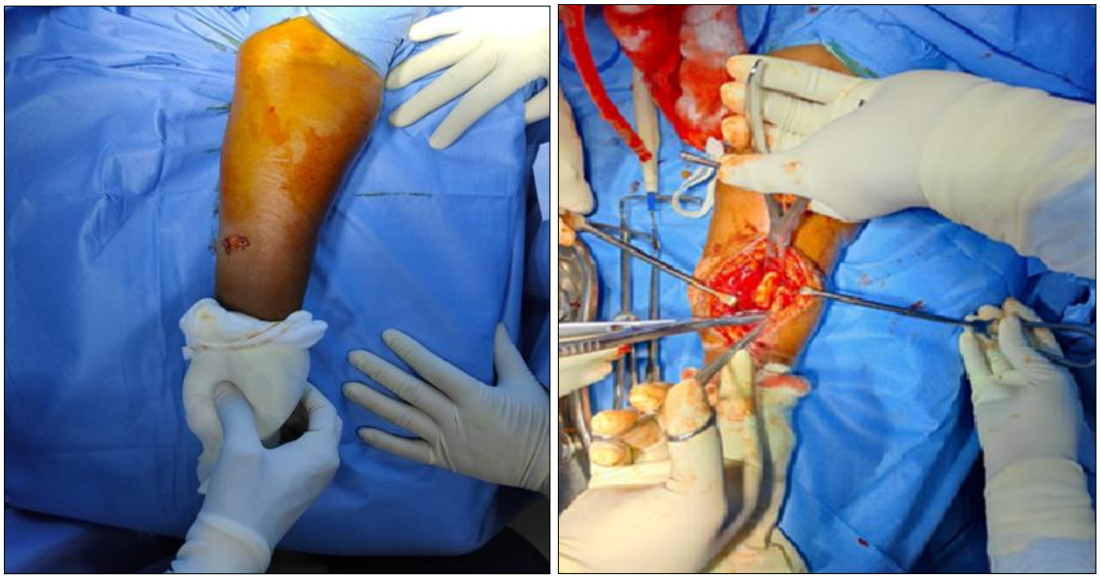


Fig 2: Intra operative images

Postoperative Rehabilitation

- **2 weeks:** wound check + suture removal, ROM assessment
- **6 weeks:** clinical + X-ray evaluation (AP/Lateral forearm including wrist & elbow)
- **12 weeks:** assess union, start strengthening if union progressing
- **6 months:** final functional assessment + complications
- **1 year:** long-term functional outcome assessment on the basis of Anderson Criteria.

Fig 3: Case 1- pre operative, post operative radiographic images of a 36 years old female patient

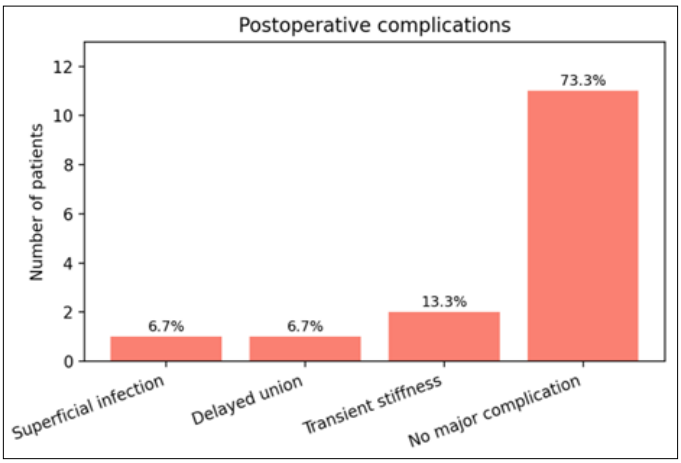
Fig 4: Case 2- pre operative, post operative radiographic images of a 21 years old male patient

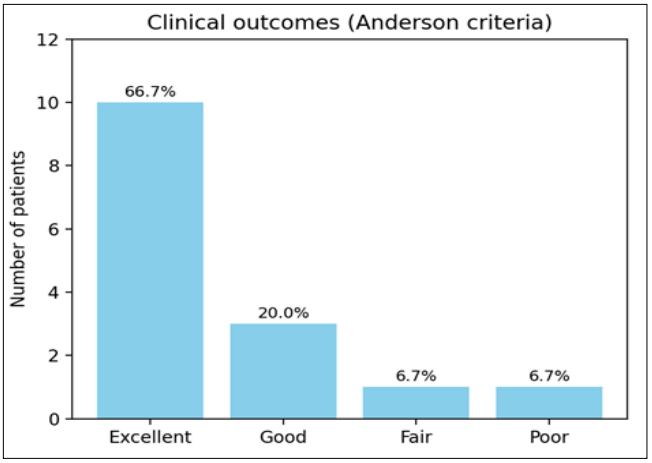
Outcome Measures

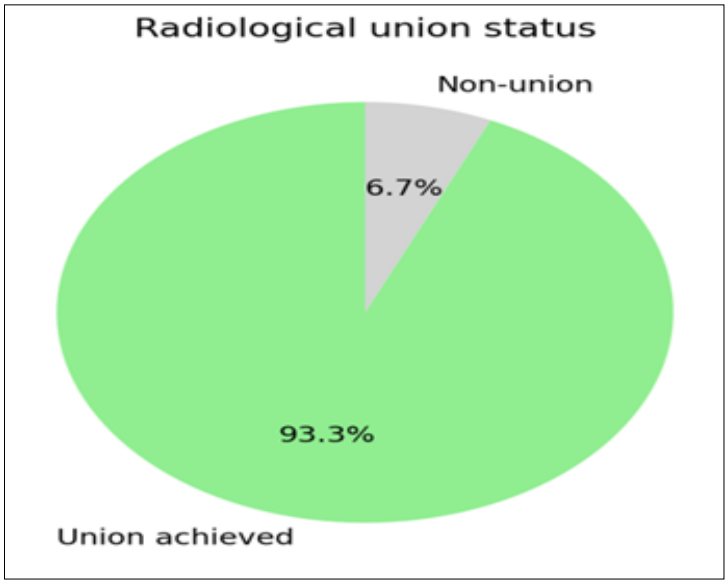
- Radiological assessment of fracture union was performed using standard anteroposterior and lateral forearm radiographs. Union was defined as the presence of bridging callus and loss of fracture line visibility.
- Functional outcomes were evaluated using the Anderson scoring system, assessing pain, union, range of motion, and return to daily activities.

Results

- **Mean age:** 35 years
- **M > F**
- **Commonest mode of injury:** RTA (56.01%)
- **Mean time to Radiological Union:** 11.2 weeks







Discussion

- In our study, mean age of patients with forearm bone fracture was 35 years, with majority of patients below 40 years of age. This is in accordance with previous studies [2, 3, 8, 9].
- Male (78%) dominance was observed in our study similar to previous literature [2,3,9].
- RTA was commonest mode of injury (56.01%), followed by fall from height 21%, as was observed in the studies by Shekhawat SS *et al* [1] and Pushkarna V [9].
- Radiological union was achieved in 14 of 15 patients (93.3%) with a mean union time of 11.2 weeks, while Mathew JJ *et al* [8] and Pushkarna V [9] observed that average time for fracture union of both bones of forearm were 14 weeks and 8.46 weeks, respectively in their studies, while D'Souza AR *et al* [10] observed shorter average time for fracture union (4 weeks).
- One similar study from Ajmer observed that average time for fracture union varied from 13.8 weeks to 21.4 weeks, which is longer than our study [1].
- According to the Anderson criteria, in our study, 66.7% had excellent outcomes, 20% had good outcomes, 6.7% had fair outcome, and 6.7% had poor outcome. Pushkarna V [9] observed Excellent outcome in 80% cases, satisfactory in 17%, and failure in 3% of cases.
- We observed complications such as superficial infection in 6.7%, delayed union in 6.7%, and transient stiffness of wrist/elbow in 2 patients (13.3%), which resolved with physiotherapy.
- Shekhawat SS *et al* [1] observed superficial infection (9.5%), delayed union (7.1%), non-union (4.8%), implant failure (2.4%), and restricted forearm rotation (7.1%) in their study.
- However, there were no cases of non-union, implant failure, or neurovascular complications were noted.

Limitation: Single centre study and Small Sample size

Conclusion

Dynamic compression plating offers stable fixation, high rates of fracture union, and favorable functional outcomes in

adult diaphyseal forearm fractures. When combined with meticulous surgical technique and structured rehabilitation, DCP remains a reliable and cost-effective method for restoring forearm anatomy and function.

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