

## Original Research Article

# Comparative study of surgical management of humeral shaft fractures with dynamic compression plate in Henry's and Thompson's approach in adults

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## ABSTRACT

**Background:** Fractures of the humeral shaft account for roughly 3% to 5% of all fractures. The predominant causes of humeral shaft fractures include simple falls or rotational injuries in the older population and higher energy mechanisms in the younger patients including motor vehicle accidents, assaults, fall from height and throwing injuries. Treatment options for humeral fractures vary according to the type of fracture, age group, bone density, soft tissue status and associated complications. Surgical management of shaft humerus fractures by plating can be done mainly through Thompson's (posterior) approach and Henry's (antero-lateral) approach.

**Methods:** The study was conducted in patients treated for shaft humerus fracture at Adichunchanagiri Institute of Medical Science, BG Nagara from the month of August 2014 to January 2016. Twenty patients diagnosed as shaft humerus fracture were taken into the study, all were undergone open reduction and internal fixation using dynamic compression plate in Thompson's and Henry approach. Patients' age more than 18 years were taken up for the study. Patients were followed up at 3 weeks, 6 weeks, 6 months.

**Results:** The sample consisted of twenty shaft humerus fracture patients with 10 males and 10 females. The patients' ages were more than 18 years where 13 cases (65%) between 26 to 55 years. Among these 20 patients, 10 involved the right side and 10 involved the left side. All patients achieved clinical and radiological union at 6 month follow up. According to Constant Murley Score, excellent result were found in 11 patients (55%), good in 2 patients (10%) and fair in 7 patients (35%). According to Mayo elbow performance index, 17 patients showed excellent outcome (85%) and 3 patients showed good outcome (15%).

**Conclusions:** Dynamic compression plating is the best modality of management for the internal fixation of humeral shaft fractures. It is found that the fracture fixation of upper and middle one-third humerus in Henry's approach is easier, lower one-third humeral fractures are not possible because the plate at the supracondylar ridge poses difficulty to fix. Fracture fixation of the lower one third and middle one third is easier in Thompson's approach because of the flat surface of the bone and offers better plate contour.

**Keywords:** Fracture shaft humerus, Dynamic compression plate, Thompson approach, Henry's approach

## INTRODUCTION

Fractures of the humeral shaft account for roughly 3% to 5% of all fractures. The predominant causes of humeral shaft fractures include simple falls or rotational injuries in

the older population and higher energy mechanisms in the younger patients including motor vehicle accidents, assaults, fall from height and throwing injuries. Road traffic accidents was the commonest mode of injury in most of the studies accounting to about 70% and the mid

shaft being the most common part of the humerus being affected.<sup>1,2</sup>

Diaphyseal fractures of humerus occur frequently and represent three to five percent of the fractures of the human body. They present a bimodal peak, i.e. one time of highest incidence between the second and third decades of life and another between sixth and eighth decades.

The humerus is a well vascularized bone that is surrounded by several muscles, which facilitates the consolidation process. The great majority of diaphyseal fractures of the humerus present good results with conservative treatment. Charnley stated, the humerus “is perhaps the most easiest of the major long bones to treat by conservative methods”.

Most of the fractures will heal with appropriate conservative care, although a small but consistent number will require surgery for optimal outcome. Most of these fractures are inherently unstable due to distraction force of the gravity in the upper limb and strong muscles contraction accounting for the instability.<sup>3,4</sup>

The objectives of the study was to compare the advantages and disadvantages of surgical management of diaphyseal fracture humerus with dynamic compression plating (DCP) in Henry’s and Thompson’s approach, to study the effectiveness of dynamic compression plate in achieving anatomical reduction and stability of fixation and to analyze the end result of surgery with respect to bony union, function of the shoulder and elbow joints and the duration of post-operative immobilization required in Henry’s and Thompson’s approaches.

**METHODS**

It is a comparative study of surgical management of humeral shaft fractures with DCP in Henry’s and Thompson’s approach in adult in Adichunchanagiri Institute of Medical Sciences, B.G Nagara. In this study 20 cases of shaft of humerus fractures were treated by open reduction and internal fixation using dynamic compression plate in Thompson’s approach and Henry’s approach.

**Source of data**

The patients admitted to the department of orthopaedics at Adichunchanagiri Institute of Medical Sciences, BG Nagar with shaft of humerus fractures during the period from august 2014 to september 2016 are selected. A sample size of 20 patients operated during this period will be considered.

**Inclusion criteria**

Cases of closed fractures of the diaphyseal humeral shaft (age group >18), type I compound {Gustillo Anderson

criteria} diaphyseal fractures of the humerus and cases of diaphyseal fracture humerus associated with radial nerve injuries.

**Exclusion criteria**

All compound fractures (Type II and Type III, Gustillo Anderson criteria), diaphyseal fractures of humerus, pathological fractures and humeral fractures having intra articular extensions.

**Operative planning**

When the surgical approach was decided on, certain pre-operative steps were routinely taken. The affected limb was immobilized in a U-slab during the entire pre-operative period. Pre-operative X-rays were taken in antero-posterior and lateral views including shoulder and elbow joints. The characteristics of the fracture were studied and technical aspects of the surgery were planned. Consent for surgery was taken from the patient and the patient’s attenders after explaining the procedure and all the possible complications. Inj. Tetvac was given. Antibiotic injections were given 1 hour pre-operatively. The limb was shaved from shoulder to hand including the axilla one day before the surgery.

**RESULTS**

The twenty cases taken for this study have been categorized according to age and classified into 4 groups 1st group from 18-25 years, 2<sup>nd</sup> group from 26-40 years, 3rd group from 41 to 55 years and the 4th group from 56-70 years. Out of 20 cases 10 were right humerus fractures and 10 were left humerus fractures. There were no pre-op complications in 16 cases and 4 cases had wrist drop. Wrist drop complications taken in both the approaches, 3 cases out of 4 were taken by Thompson’s approach and 1 cases was treated by Henry’s approach.

Out of 20, 19 cases had no complications. 1 case had superficial infection. The post-op complication of one patient which had superficial complication this case was done in the Henry’s approach. Of the 10 patients treated in Henry’s approach, the superficial infection constitutes to 10%. All the 20 cases taken up for this study showed union irrespective of the approach used. Out of the 20 cases 17 cases were excellent and 3 cases were good.

**Table 1: Union achieved in the study participants.**

		Henry	Thompson	Total
<b>Union achieved</b>	Yes	10 (100%)	10 (100%)	20 (100%)
	No	0 (0%)	0 (0%)	0 (0%)
<b>Total</b>		10 (100%)	10 (100%)	20 (100%)

## DISCUSSION

The study was conducted to compare the outcome of shaft of humerus fractures operated in Thompson's and Henry's approach. 20 cases of fracture shaft of humerus were selected randomly and treated with open reduction and internal fixation with DCP.<sup>5</sup>

10 cases were operated in Thompson's approach and 10 cases were operated in Henry's approach, choice was left to the operating surgeon. Standard narrow DCP 4.5 mm plate was put, where necessary inter-fragmentary screws were used.

The observations of the present study were evaluated and compared with various studies and analysis was as follows.

### *Age distribution*

Fractures of the shaft of the humerus are commonly seen in the young and middle aged individuals. The average age in this study was 36.4 with the most patients belonging to the third and fourth decades. The age distribution in this study is similar to the studies conducted by Griend et al. Other studies showed a slightly higher average age in their studies.<sup>6</sup>

### *Sex distribution*

There was male preponderance in the present study with 12 (60%) males and 8 (40%) females. The observations were similar to the observation of other studies.

### *Side affected*

Out of the 20 patients taken for the present study 10 patients had left humerus fracture and 10 patients had right humerus fracture. This showed that the right and left sided fractures were equal. The majority of the fractures were sustained due to road traffic accidents, out of the 20 patients taken up for this study 13 cases were due to motor vehicle accidents constituting to 65%.<sup>7</sup> This finding is in accordance to the literature shown in the previous studies.

### *Pre-op complications*

The most common complication encountered pre-operatively was radial nerve palsy. Out of the 20 cases taken up for this study 4 cases had radial nerve palsy pre-operatively, constituting to 20 percent. A systematic review published by Shao et al stated that the overall prevalence of radial nerve palsy after fracture of the shaft of the humerus was around 11.8%.<sup>8</sup>

### *Post-op complications*

In our study 20 patients were taken up for study, 1 patient encountered superficial infection. There was no clear

published literature on the prevalence of superficial infections after the management of the shaft of humerus fractures with surgery. Of the 20 patients, 1 patient had infection, constituting to 5%.

The one patient who had a superficial infection was treated with DCP in the Henry's approach. The difference in the approach did not show any significance with regard to the superficial infection.<sup>9</sup> The infected patient was treated with regular dressing and antibiotic cover, the patient recovered well in 2 weeks and was ready for discharge.

### *Fracture union*

Out of 20 cases, all the 20 cases (100%) went on for good bony union. There were no cases of delayed or non-union reported in our study. The results in the present study are comparable to those obtained by various other studies. Literature showed higher prevalence of non-union with management of shaft of humerus fractures with conservative treatment but the non-union rates were reportedly low with surgical management. No significant difference was seen in the bone union of the treated fracture with respect to the two different exposures as all the 20 cases had good union without any difference.<sup>10</sup>

### *Range of mobility of shoulder and elbow*

Out of the 20 patients in the present study no patients had poor mobility of the shoulder and elbow joints. The present study results in this aspect, i.e. mobility of the shoulder and elbow joints are comparable with those of McCormack RG et al, Bell MJ et al and Gongol et al. The lower percentage of stiffness indicates proper patient education and physiotherapy and the stressed importance of both during post-operative management. The range of movements when compared to both the exposures had very good outcomes both in the Henry's and Thompson's approach. The posterior brachialis splitting approach did not seem to affect the range of motions of the elbow nor shoulder.<sup>11</sup>

### *The Mayo elbow performance index*

All the 20 cases in the present study were evaluated at 6 weeks for the recovery of the elbow joint by the Mayo elbow performance index. The MEP takes into consideration the pain, motion, stability and function, and the scoring is given for 100 points. Out of the 20 patients taken up for surgery, 17 patients showed excellent outcome and 3 patients showed good outcome, constituting to 15%. Both the shoulder and elbow scoring system was evaluated for all the 20 patients and the outcome was recorded. This study showed 65% excellent to good results and 35% fair results with respect to the recovery of the shoulder joint post operation.

The 35% fair results were due to the time of recovery. The fair results of palsy and superficial infection is a

preventable complication using strict adherence to AO principles, attention to sepsis, patient education and good postoperative rehabilitation.

When strict plating principles were followed, DCP fixation of humeral shaft fractures, results in better compliance and satisfaction in both the Henry's and Thompson's approach. Humeral shaft fracture fixation with DCP showed better compliance and functional outcome in both the Henry's and Thompson's approach.

## CONCLUSION

The study was conducted to compare the surgical management of humeral shaft fractures with DCP in Henry's and Thompson's approach in adults. Fracture of shaft of humerus was common in young males. The most common mode of injury being road traffic accident. Most number of cases was between 35 to 45 years with average being 36.4 years. Males were slightly more prone to fracture of humerus than females. Both sides are equally affected. Range of movements were not affected by both the approaches i.e. Thompson's and Henry's. Dynamic compression plating of the humerus is a better method than conservative method because it avoids prolonged immobilization which leads to stiffness and induces dystrophy. It also gives early active early immobilization. Dynamic compression plating of the humerus gives comparable results to antegrade nailing. It gives access to radial nerve exploration during palsy and also avoids shoulder impingement. Dynamic compression plating is the best modality of treatment for the shaft of humerus fractures. Complications of surgery was radial nerve palsy, superficial infection. These complications are preventable. With correct anatomical knowledge, good preoperative planning, minimal soft tissue dissection, adherence to AO principles, asepsis precautions, both Thompson's and Henry's approach gave good to excellent outcome. However the amount of time taken for surgery in Thompson's approach is more by 20 minutes than in Henry's approach. Blood loss was found to be more in Thompson's approach, this can be constituted to the muscle splitting and was compared by the number of mops used.

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