

## Clinical Outcome of Triceps Reflecting Approach in the Management of Distal Two Third Shaft Of Humerus Fractures

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### Abstract:

**Background :** Fracture of shaft humerus accounts for nearly 3%<sup>1</sup> of all fractures. Unlike fractures of other bones there is no over-riding, on the contrary there is incidence of delayed / non union as the weight of the limb acts as distracting force, there is danger of interposition of soft tissue. Open reduction and Internal fixation with dynamic compression plate gives following advantages: This is a method of achieving a stable fixation with almost perfect anatomical reduction, with plate placed on the tensile side, that is on the posterior aspect of humerus. As there is no need for C- arm the medical staff has no radiation hazards. Can avoid post operative shoulder morbidity after posterior plating which is common in interlocking nailing of humerus, can also have lesser post operative pain, lesser blood loss during surgery, better range of movements at elbow as compared to triceps splitting approach..

**MATERIAL & METHODS:** This study included 30 patients with fracture shaft of distal two third humerus admitted in Department of Orthopedics in Government General Hospital, Vijayawada from August 2019 to October 2021, patients were evaluated for intra-operative blood loss, pain during early post operative period and, range of movements at elbow in the post-operative period, time taken for the union of fracture, overall range of movements and functional outcome based on ASES Score<sup>2</sup> and STEWART & HUNDLEY's criteria<sup>3</sup>.

**RESULTS:** In 30 patients with mean follow up of 2 years, mean age was 40.6 years ,and blood loss was less than 50 ml in 19 ,immediate post operative pain was mild in 24 ,and fracture was consolidated by 13 to 15 weeks in 18 and post operative elbow movements were in the range of 140 to 150 degrees in 27.

**CONCLUSION:** For the humerus bone tensile side is posteriorly present ,to expose tensile side there are two approaches Triceps reflecting and Triceps splitting approach.

Triceps reflecting approach has following advantages

- a) Less intra-operative blood loss
- b) Lesser operative time
- c) Less immediate post-operative pain
- d) early mobilization in the post-operative period and better elbow range of movements
- e) no shoulder post operative morbidity that was seen after interlocking nailing of humerus.
- f) Functional outcomes according to American Shoulder & Elbow Surgeon's Score (A.S.E.S. Score)<sup>2</sup>, and Stewart & Hundley's criteria<sup>3</sup> was better.

**Keywords:** Distal two third humerus shaft, Triceps Reflecting Approach ,ASES<sup>2</sup> ,Stewart and Hundleys criteria<sup>3</sup>.

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### I. Introduction

Fracture of shaft humerus accounts for nearly 3%<sup>1</sup> of all fractures. Unlike fractures of other bones there is no over-riding, on the contrary there is incidence of delayed / non union as the weight of the limb acts as distracting force, there is danger of interposition of soft tissue. Open reduction and Internal fixation with dynamic compression plate gives following advantages: This is a method of achieving a stable fixation with almost perfect anatomical reduction, with plate placed on the tensile side, that is on the posterior aspect of humerus. As there is no need for C- arm the medical staff has no radiation hazards. Can avoid post operative shoulder morbidity after posterior plating which is common in interlocking nailing of humerus. It is observed

that Good functional outcome in Triceps reflecting approach in early post operative period that is upto 2 years and equal outcome in both approaches after 2 years of surgery

## **II. Material And Methods**

This prospective study is conducted to Evaluate the outcome of posterior plating of distal two- third shaft humerus by triceps reflecting approach at siddhartha medical college, government general hospital ,Vijayawada ,Andhra Pradesh ,india from August 2019 to October 2021 in 30 patients.

**Study design:** A Prospective study.

**Study location:** This is a tertiary care teaching hospital based study done in Department of Orthopaedics, at Siddhartha medical college/ Government General hospital, Vijayawada, Andhra Pradesh, India.

Study period: August 2019 -October 2021

Sample size: 30 patients.

### **INCLUSION CRITERIA**

1. Adults above the age of 18years.
2. Fresh fractures without neurological deficits.

### **EXCLUSION CRITERIA**

1. Pathological fractures.
2. Malunited fractures.
3. Compound fractures.
4. Infected fractures.
5. Ununited fractures.
6. Below 18 years of age

### **Procedure methodology**

Instruments used for Surgery

- 1.Periosteum elevator
2. bone holding clamp
3. Bone curette
4. Plate holding clamp
- 5.T handle
- 6.Hand piece of the Drill with cord
7. Check-key
- 8.Metal scale
9. Plate bender
10. Screw driver
11. Tap
12. Depth gauge
13. Drill bit
14. Drill guide
15. Broad Dynamic compression plate
16. Narrow Dynamic compression plate
17. Cortical screws.



**TRICEPS REFLECTING APPROACH SKIN INCISION** Starting at the olecranon's tip, incise the skin. The incision runs proximally along the arm's posterior midline in a straight line. It crosses radial nerve in the mid humeral region and the axillary nerve proximally superficial dissection done by Incising the deep fascia in line with skin incision.**ULNAR WINDOW:** As a first step, identify and mobilize the ulnar nerve. It may be helpful to protect it with a vessel loop. Proximally, follow the ulnar nerve along its course on the medial intermuscular septum. Next, mobilize the triceps muscle and retract it laterally. This may be achieved by bluntly dissecting medial head of triceps from the posterior aspect of humerus. **RADIAL WINDOW:** Split the triceps fascia and mobilize lateral head of triceps from lateral intermuscular septum and humerus towards ulnar side. If necessary dissect remaining muscle fibers, still attached to posterior aspect of the humerus, from lateral side. This ends up in a liberated muscle complex containing the long head, lateral head and medial head of triceps. This permits the whole triceps muscle to be moved towards either lateral or medial side, to provide access to humerus known as "triceps flip"<sup>79</sup>Radial nerve can be detected at its penetration through intermuscular septum and followed upwards in the radial groove. The bone is exposed. The fracture identified, freshened by curetting and approximated. Fracture fragments are Reduced and Plate is Held with clamps and fixed with screws. when required Inter-fragmentory screws are placed. The wound is closed in layers and dressing done,slab is applied.



**TRICEPS REFLECTING APPROACH**



**Pre operative and Post operative radiographs**



**Post operative follow up of Triceps Reflecting Approach.**

**III. Results**

Comparison of thirty patients with fractures of humerus shaft were treated by open reduction and internal fixation with dynamic compression plate by triceps reflecting approach .

**TABLE—01 AGE INCIDENCE**

Age Group	no of patients	percentage
20-30	7	23.33
31-40	8	26.66
41-50	8	26.66
51-60	5	16.66
61-70	2	6.66

Most of the patients were among 31-50 years of age group followed by 20-30 years.

**TABLE-02 SEX INCIDENCE**

SEX	NO. OF PATIENTS	PERCENTAGE
MALE	18	60
FEMALE	12	40

majority were male patients i.e., 18, accounting for 60% and females were 12, i.e., 40%.

**TABLE-03 SIDE EFFECTED**

SIDE EFFECTED	NO .OF PATIENTS	PERCENTAGE
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RIGHT	14	46.66
LEFT	16	53.33

Out of 30 patients, majority of patients had their right arm injured accounting to 53.33 % i.e., 16 persons and 14 patients had injury of left arm i.e., 46.66%

**TABLE-04 MODE OF INJURY**

MODE OF INJURY	NO. OF PATIENTS	PERCENTAGE
RTA	16	53.33
ACCIDENTAL FALL	9	30
ASSAULT	5	16.66

most common mode of injury is road traffic accidents accounting for 16 patients i.e., 53.33%, followed by accidental fall in 9 patients i.e., 30%

**TABLE-05 LEVEL OF INJURY**

LEVEL OF INJURY	NO. OF PATIENTS	PERCENTAGE
M/3	13	43.33
M/3--L/3	7	23.33
L/3	10	33.33

Majority of patients had injury at middle 1/3<sup>rd</sup> of shaft i.e., 13 patients i.e., 43.33%, followed by lower 1/3<sup>rd</sup> in 10 patients i.e., 33.33% and lower 1/3<sup>rd</sup> in 10 patients i.e., 10%

**TABLE-06 TYPE OF FRACTURE**

TYPE OF FRACTURE	NO. OF PATIENTS	PERCENTAGE
TRANSVERSE	18	60
OBLIQUE	7	23.33
SPIRAL	5	16.66

majority had transverse fracture i.e., 18 persons accounting for 60%, followed by oblique type in 7 patients i.e., 23.33% and spiral fracture in less number of patients i.e., 5, accounting for 16.66%.

**TABLE- 7 BLOOD LOSS DURING SURGERY BY TRICEPS REFLECTING APPROACH**

BLOOD LOSS ( ML)	NO OF PATIENTS	PERCENTAGE
< 50	19	63.33
50-100	8	26.66
>100-150	3	10
>150-200	0	0
>200	0	0

Among 30 patients blood loss was less than 50 ml in 19 patients i.e 63.33%, and blood loss in the range of 50-100ml in 8 patients i.e 26.66% and in 3 patients it was in the range of 100-150 i.e 10%

**TABLE- 8 POST OPERATIVE PAIN AT 4 DAYS BY TRICEPS REFLECTING APPROACH**

	NO OF PATIENTS	PERCENTAGE
NO PAIN	0	0
MILD PAIN	24	80
MODERATE PAIN	6	20
SEVERE PAIN	0	0

Under complete analgesic coverage, none of them had severe pain on visual analogue scale<sup>4</sup> and moderate pain was reported in 6 ,i.e., 20% of people whereas mild pain was reported by 24,i.e., 80% of patients immediately after four days of surgery.

**TABLE-9 TIME TAKEN FOR UNION TRICEPS REFLECTING APPROACH**

WEEKS	NO .OF PATIENTS	PERCENTAGE
13—15	18	60
16—18	8	26.66
20—22	4	13.33

Among 30, 18 patients ,i.e., 60% had complete union with in 13-15 weeks and 8 patients, i.e., 26.66% had complete union within 16-18 weeks, whereas 4 patients, i.e., 13.33 % had delayed union up to 20-22 weeks.

**TABLE-10 RANGE OF POST OPERATIVE ELBOW FLEXION**

Range of Elbow Flexion	NO .OF PATIENTS	PERCENTAGE
120--130	1	0.0003
130—140	2	6.66
140--150	27	90

Among 30, 27 patients ,i.e., 90% had elbow flexion of 140—150 and 2 patients, i.e., 6.66% had elbow flexion of 130-140, whereas 1 patients, i.e., 0.0003 % had 120—130 elbow flexion.

**TABLE-20 FUNCTIONAL OUTCOME-TRICEPS REFLECTING APPROACH BY ASES SCORE<sup>2</sup>**

ASES SCORE <sup>75</sup>	NO.OF PATIENTS	PERCENTAGE
Grade 1	27	90
Grade 2	2	6.66
Grade 3	1	3.33
Grade 4	0	0

In our study among patients who under went triceps reflecting procedure, 27 patients,i.e., 90% had better outcome with Grade-I of ASES score<sup>2</sup>, 2 patients,i.e., 6.66% had Grade-II and one patient came under Grade-III score.

**TABLE-22 FUNCTIONAL OUTCOME BASED ON Stewart and Hundley’s Criteria<sup>3</sup> – TRICEPS REFLECTING APPROACH**

RESULTS	NO.OF PATIENTS	PERCENTAGE
EXCELLENT	27	90
GOOD	2	6.66
FAIR	1	3.33
POOR	0	0

In our study among patients who under went triceps reflecting procedure, 27 patients,i.e., 90% had excellent outcome according to Stewart and Hundleys criteria.

#### IV. Discussion

Extra articular distal humerus fractures can be exposed by Triceps reflecting approach which avoids direct injury to the triceps and uses bloodless planes and this is the primary reason for improved elbow ROM and less post operative pain and elbow contracture seen after this approach This study was conducted for the functional outcome of posterior plating of distal two third humerus by triceps reflecting approach In our series of 30 patients of humerus fractures were treated with triceps reflecting approach . In 2014 Emmanuel M Illical<sup>5</sup> et al did a study on retrospective comparison of the triceps-sparing approach to the triceps-split approach for extra-articular distal humerus fractures demonstrated significant motion-related outcome benefits with the triceps-sparing approach..In our study there was no incidence of post operative radial nerve palsy in any of the patients. At a mean 24-month follow-up, the 27 out of 30 patients in whom the triceps reflecting approach was used demonstrated greater elbow motion and strength. Careful dissection is paramount to success with the triceps-sparing approach.In Triceps Reflecting approach described by Gerwin et al<sup>6</sup> first the posterior antibrachial cutaneous nerve is identified with subsequent dissection along this nerve to radial nerve proper ,with careful reflection of the lateral head of Triceps off the lateral intermuscular septum When dissection is performed in this manner, the radial nerve can be reliably identified, the triceps reflected medially, and broad

exposure of the posterior aspect of the humerus obtained. Gerwin et al<sup>6</sup> demonstrated that the triceps-sparing approach permits visualization of 94% of the posterior humerus, relative to 55% with the standard triceps-split approach (limited by the radial nerve in the spiral groove proximally).

In our study of 30 patients with mean follow up of 2 years, mean age was 40.6 years, which is similar to studies conducted by Griend et al<sup>9</sup>

In our study there was male preponderance which is similar to studies conducted by Mc Cormack et al<sup>7</sup> and Tingstad et al<sup>8</sup>.

In our series Left humerus was involved in 16 and right humerus in 14 which is similar to studies conducted by Griend et al<sup>9</sup>, Strong et al<sup>10</sup>. In our series Majority of the cases sustained fractures from road traffic accidents which is similar to studies conducted by Strong et al<sup>10</sup> and Tingstad et al<sup>8</sup>.

Among 30 patients in our study blood loss was less than 50 ml in most of the patients

In our series the immediate post operative pain was mild in 80% of patients according to visual analogue scale.

In our study of 30 patients fracture consolidated by 13 to 15 weeks in 60% of patients as the Triceps reflecting approach has lesser interference with biology of the bone.

In our study Among 30 patients, 27 patients i.e., 90% had elbow flexion of 140—150 and 2 patients, i.e., 6.66% had elbow flexion of 130-140, whereas 1 patient, i.e., 0.0003 % had 120—130 elbow flexion, which is similar to study conducted by Emmanuel M Illical et al in 2014<sup>5</sup>.

In our study among patients who underwent triceps reflecting procedure, 27 patients, i.e., 90% had better outcome with Grade-I of ASES score<sup>2</sup>, 2 patients, i.e., 6.66% had Grade-II and one patient came under Grade-III score which is similar to study conducted by Mc Cormack et al<sup>7</sup>

In our series among patients who underwent triceps reflecting procedure, 27 patients, i.e., 90% had excellent outcome which is similar to studies conducted by Mc Cormack et al<sup>7</sup> and Tingstad et al<sup>8</sup>

In 2014 Emmanuel M Illical et al<sup>5</sup> did a study on Comparison of outcomes after triceps split versus reflecting surgery for distal humerus fractures and concluded that triceps reflecting approach for surgical treatment of distal humerus fractures can give better elbow ROM and triceps strength than a triceps-splitting approach. Both approaches, however, result in reliable union and similar functional outcome Which was also found in our study.

## V. Conclusion

The triceps reflecting approach has better functional outcome in terms of less intraoperative blood loss, lesser operative time, less immediate post operative pain, lesser interference with biology of the bone, early union rates, and early post operative range of movements at elbow, better functional outcomes according to ASES score<sup>2</sup> and Stewart and Hundleys criteria<sup>a</sup>.

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