

Functional Outcome of Cambell's Triceps Tongue Flap Approach in Patients with AO "Type C" Distal Humerus Fracture

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Cambell's Triceps Tongue Flap with AO "Type C" Distal Humerus Fracture

ABSTRACT

Objective: To determine functional outcome of cambell's triceps tongue flap approach in patients with AO "Type C" distal humerus fractures in patients between 16 to 50 years of age.

Study Design: Descriptive case study

Place and Duration of Study: This study was conducted at the Department of Orthopedic Surgery, Civil Hospital Bahawalpur/Quaid-e-Azam Medical College, Bahawalpur from January 2012 to November 2012.

Materials and Methods: 196 cases between the ages of 16 –50 years with "Type C" distal humerus fractures according to AO classification were studied and samples were taken by a non-probability purposive sampling. Risen-borough and Radin criteria was used to assess the functional outcome of the results. All patients were evaluated at 16th postoperative week and range of elbow flexion with the help of goniometer measured to draw a meaningful conclusion in terms of satisfactory (Good and fair) and unsatisfactory (poor) functional outcome.

Results: According to Risen-borough and Radin criteria evaluation of these cases at final follow up (16th post operative week) revealed that 100 (54.3%) patients had good functional results with 60 (32.6%) male and 40 (21.7%) female whereas 55 (29.9%) patients had fair results with 40 (21.7%) male and 15 (8.2%) female. Poor results were found in 29 (15.8%) patients with 21 (11.4%) male and 8 (4.3%) female patients.

Conclusion: From our study we conclude that triceps tongue flap approach affords adequate exposure with ample space to fix the intra-articular fractures of distal humerus using both pillar fixations if required, in adults with satisfactory functional recovery in majority of the patients.

Key Words: AO type C. Distal humerus fractures, Triceps tongue flap.

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INTRODUCTION

Complex fractures of distal humerus are one of the difficult fractures to treat. AO type C fractures are multifragmentary and result from high energy trauma in young individuals while in elderly people low energy trauma like fall from height is usually responsible for such fractures¹. A severe blow on the point of the elbow drives the olecranon process upwards, splitting the condyles apart².

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The danger with conservative treatment is the strong tendency to stiffening of the elbow and persistent pain. Operative management is usually the appropriate treatment for the fractures with displacement².

A variety of approaches have been recommended for exposure and fixation of distal humerus fractures³. Triceps mechanism is the key for surgical approaches whether it is divided to make better exposure or kept intact with reasonable exposure⁴. Most commonly, a posterior approach with an olecranon osteotomy has been used as it provides the best fracture exposure³. Although it provides a good exposure, it also has disadvantages of delayed union, nonunion and implant related complications at the osteotomy site⁵. Significant osteotomy complications have prompted a search for alternative approaches⁶.

In different studies good results were reported with cambell's triceps tongue flap approach. According to a study of 34 patients conducted at Chengdu Modern Hospital in China, stable fixation and a high rate of union of complex distal humeral fractures can be achieved with double-plate fixation through triceps tongue-shaped flap approach. Elbow functional activity can be achieved in patients with early stage.

Excellent rate was 85.29%.⁷In one study 20 cases were treated by triceps tongue flap approach, the excellent and good rate was 60%.⁸ In another study 22 patients were operated by Campbell's triceps tongue flap approach showed 59.09% good results.⁴

The proposed study is designed because there is difference in outcome of these studies and no local work has been done in which functional outcome of Campbell's triceps tongue flap approach for reduction and internal fixation of AO type C distal humerus fractures has been evaluated. The results of this study will further be helpful in treatment and management protocol.

MATERIALS AND METHODS

Medical College, Bahawalpur, from 23th January 2012 to 22th November 2012, involving patients either male or female reporting in OPD or emergency within one week of injury having AO type C distal humerus fractures diagnosed on standard anteroposterior and lateral radiographs of the elbow. 196 cases between the ages of 16 –50 years with "Type C" distal humerus fractures according to AO classification were taken by a non-probability purposive sampling.

Risen-borough and Radin criteria was used to assess the functional outcome of the results. All patients were evaluated at 16th postoperative week and range of elbow flexion with the help of goniometer measured to draw a meaningful conclusion in terms of satisfactory (Good and fair) and unsatisfactory (poor) functional outcome.

RESULTS

According to Risen-borough and Radin criteria evaluation of these cases at final follow up (16th post-operative week) revealed that 100 (54.3%) patients had good functional results with 60 (32.6%) male and 40 (21.7%) female whereas 55 (29.9%) patients had fair results with 40 (21.7%) male and 15 (8.2%) female. Poor results were found in 29 (15.8%) patients with 21 (11.4%) male and 8 (4.3%) female patients. The results were divided into two groups with 155 (84.2%) patients in satisfactory (Good, Fair) and 29 (15.7%) patients in unsatisfactory (poor) group. The Mean age was 33 ± 8.3 while mean range of motion was 99 degrees (range 70°-118°).

Table No.1: Showing 100(54.3%) patients with Good Functional Outcome (Range of Motion)

No. of Patients	6	12	16	20	17	29
Range of Motion	18-136°	20-128°	22-122°	24-120°	26-118°	28-116°
Arc	118°	108°	100°	96°	92°	88°
Result	Good					

Table No.2: Showing 55 (29.9%) patients with Fair Functional Outcome (Range of Motion)

No. of Patients	4	5	7	11	12	16	4
Range of Motion	30-130°	36-126°	40-122°	44-120°	48-118°	56-116°	64-112°
Arc	100°	90°	82°	76°	70°	60°	48°
Result	Fair						

Table No.3: Showing 29 (15.8%) patients with Poor Functional Outcome (Range of Motion)

No. of Patients	6	7	12
Range of Motion	68-108°	70-106°	74-100°
Arc	40°	36°	48°
Result	Poor		

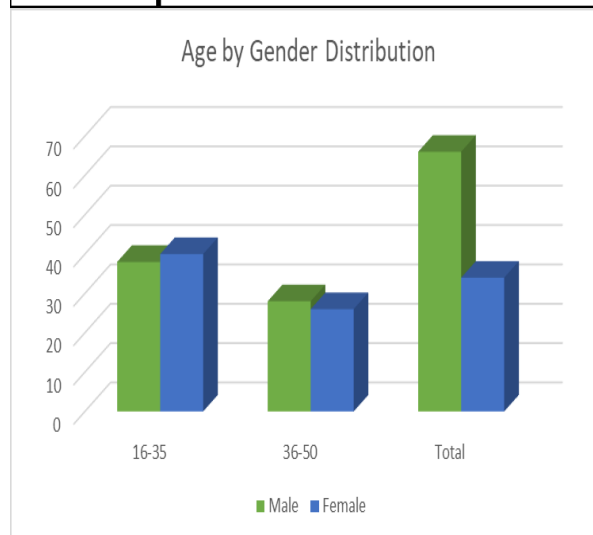


Figure No.1: Figure showing percentage of male and female in two age groups.



Figure No.2: Per-operative picture showing Triceps tongue flap

Table No.4: Percentage of complications of surgery among 196 patients

Complications	Total	Percentage
Superficial Wound Infection	12	6%
Neurapraxia	5	2.5%
Hardware Irritation	16	8%
Non-Union	5	2.5%
Heterotrophic Ossification	18	9.7%

DISCUSSION

The majority of distal humerus fractures have complex fracture patterns, with displaced articular segments, requiring operative intervention. The goals of surgery are anatomic reduction and rigid internal fixation via an operative approach that balances maximum required exposure with minimum soft tissue or bony disruption⁹. Most commonly, a posterior approach with an olecranon osteotomy has been used as it provides the best fracture exposure.³ Although it provides a good exposure, it also has disadvantages of delayed union, nonunion and implant related complications at the osteotomy site.⁵ Significant osteotomy complications have prompted a search for alternative approaches⁶. In my study 196 patients were treated by triceps tongue flap approach that divides triceps mechanism providing good exposure for open reduction and internal fixation of AO type C distal humerus fractures and functional outcome was determined.

Age wise distribution results with mean age 33 ± 8.39 (16-50) were in agreement with the studies of Majeed N, Salim M, Islam Q (36.95 ± 4.21)⁴ in 2007, Pankaj A, Mallinath G et al (32 ± 4.5)¹⁰ in 2007 and Babhulkar S in 2011 with maximum number of cases in 30-40 year group¹¹.

Gender distribution results with 130 (66.3%) males and 66 (33.7%) females were comparable with the studies of Pankaj A, Mallinath G et al¹⁰ in 2007 with 28 (70%) males and 12 (30%) females and Babhulkar S in 2011¹¹ with 139 (75%) males and 45 (25%) females¹¹.

The dominant right arm was more injured than left arm with 132 (67.34%) cases of right elbow and 64 (32.65%) cases of left. These results were similar with the studies of Pankaj A, Mallinath G et al¹⁰ in 2007 with 27 (67.5%) patients of right elbow and 13 (32.5%) of left and Babhulkar S in 2011¹¹ with 134 (72.82%) patients of right and 50 (27.17%) of left elbow.

Analysis of complications developed after surgery revealed that superficial wound infection developed in 12 (6%) patients and satisfactorily controlled with aggressive wound toilet and appropriate antibiotics. Neurapraxia of radial nerve was seen in 5 (2.5%) patients due to tourniquet and spontaneously recovered within 8-10 weeks. Hardware irritation was seen in 16 (8%) patients due to K-wires and malleolar screws and treated by removing the hardware. These results

disagree with the study of Majeed N, Salim M, Islam Q, where hardware irritation and superficial infection rate was 4.5%⁴.

Slight higher rate of complications in my study demonstrated the need for further implant and surgical procedure improvement.

Our results were better regarding heterotrophic ossification with 18 (9.7%) patients whereas the study by Yan Zhou, Xin Qu revealed heterotrophic ossification in 40% patients⁸. We started early gentle mobilization, taught the patient to move his limb and elbow himself without anyone aggressively doing the exercise that helped in preventing heterotrophic ossification in our study group. Message was strictly condemned only self-supervised ROM exercises were advised. This helped in reducing the incidence of heterotrophic ossification in our patients.

In Tyllianakis M, Panagopoulos A, et al study reported complications were postoperative ulnar nerve palsy 3.8%, wire migration 15%, heterotrophic ossification 11.5% and infection 7.6%¹². In our study no ulnar nerve palsy was seen, as we isolated and saved the ulnar nerve while exposing the fracture. Rest of the complications rate was almost comparable to our study. All 184 patients were evaluated and 100 (54.3%) patients had good functional results with 60 (32.6%) male and 40 (21.7%) female whereas 55 (29.9%) patients had fair results with 40 (21.7%) male and 15 (8.2%) female. Poor results were found in 29 (15.8%) patients with 21 (11.4%) male and 8 (4.3%) female patients. In the poor result group on exploring it was found that majority belonged to age group between 40-to-50 years, their cooperation level as compared to younger patients was found to be low even though their recovery regarding wound and bone healing was comparable to the satisfactory result patient group.

A variety of approaches including olecranon osteotomy, triceps tongue flap, triceps-splitting, triceps-reflecting, triceps-reflecting anconeus pedicle (TRAP), anconeus flap transolecranon (AFT), and paratricipital approaches have been described for reduction and fixation of distal humerus fractures. Intra-articular exposure is dependent on triceps mobilization.

Majority of studies have small number of patients and diversity of classification systems and criteria for assessment makes it hard to compare the outcomes. In our study functional outcome was range of elbow motion measured with goniometer and results of elbow motion arc can be easily compared with other studies irrespective of the criteria used.

We started mobilization with active small range flexion and extension in 3rd week. In Majeed N, Salim M, Islam Q study, the patients were also motivated to perform active flexion and extension exercises early⁴. Talha, Toulemonde SI et al also advised early physical rehabilitation (between 3 and 21 days) provided satisfactory fixation was made¹³.

Early postoperative mobilization depends on surgical approach, types of fractures and types of internal fixation of the fractures. In our study early physical rehabilitation was successful in 140 fractures due to primary stable osteosynthesis. In 44 cases additional immobilization was carried out for 10 to 28 days with extensive fracture comminution and less stable fracture construct. In these patients outcome tilted towards fair results in the final analysis, as extended period of immobilization caused more stiffness in the joint and the soft tissue which required managed rehabilitation with much stress on the patients self involvement in his exercise regimen. These patients ended up with somewhat reduced arc of elbow motion with no weakness in the use of the limb.

Tang Lin-jun, Lu Bo, Tang Hua et al conducted study on 34 patients with double-plate fixation for AO type C-3 fractures of humerus using triceps tongue-shaped flap approach and elbow functional activity was achieved in early stage with early physical rehabilitation. Results were assessed with Mayo Elbow Performance Score (MEPS). Twenty-nine patients (85.29%) had a good or excellent results with mean flexion-extension arc 92 degrees (88°-107°)⁷. In our study result the patients were divided into two groups with 155(84.2%) patients in satisfactory (Good, Fair) and 29(15.7%) patients in unsatisfactory (poor) group. The mean flexion-extension arc was 88 degrees (60°-118°) in satisfactory group (Good, Fair) of patients. Thus results of our study were comparable to Tang Lin-jun, Lu Bo, Tang Hua et al study.

In Liu YK, Xu H, Liu F et al study 38 patients were treated for humeral intercondylar type-C fractures by exposing 32 patients through trans-olecranon osteotomy and the Campbell (Van Gorder) Triceps tongue-flap approach and stabilised with dual plating. Results were evaluated with Aitken and Rorabeek criteria. Twenty-nine patients (82.9%) had a good or excellent results with elbow flexion averaged 119 degrees (range 90°-135°)¹⁴. In our study average elbow flexion was 120 degrees (range 116°-136°). Our results were relatively better because we started early gentle mobilization, taught the patient to move his limb and elbow himself. The patients were instructed to support the wrist with the opposite hand and gently flex and extend the elbow, gradually increasing the range of motion without anyone else aggressively doing the exercise. This helped in achieving better range of motion.

Majeed N, Salim M, Islam Q compared triceps tongue flap approach with olecranon osteotomy approach and revealed 59.09% good and 27.27% fair results with triceps tongue flap approach⁴. These results were corresponding to 54.3% good and 29.9% fair results of our study. Thus satisfactory (Good, Fair) results of our study 84.2% are similar to Majeed N, Salim M, Islam Q study 86.36% satisfactory (Good, Fair) results. In our study percentage of good results were relatively less

and fair were more. Although the difference in the results of both studies were not significant but additional immobilization in patients with comminuted fractures tilted our results more towards fair with somewhat reduced elbow arc of motion.

Triceps tongue flap approach was easy to perform, proved to be safe, and provided adequate intra-articular exposure to fix fractures while avoiding delayed union, nonunion and implant related complications at the osteotomy site in most commonly used olecranon osteotomy approach. For better elbow arc of motion results more work needs to be done regarding stable fixation of the fractures and stronger triceps tongue flap repair after surgery so that early rehabilitation could be instituted at the earliest.

CONCLUSION

From our study we conclude that triceps tongue flap approach affords adequate exposure with ample space to fix the intra-articular fractures of distal humerus using both pillar fixations if required, in adults with satisfactory functional recovery in majority of the patients.

Author's Contribution:

Concept & Design of Study:	Kashif Siddiq
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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