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Research Article

Prospective Observational Study For Fixation Of Diaphyseal Humerus Fracture By Anterior Bridge Plate Using Minimally Invasive Technique

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Abstract

A prospective study to be conducted on 20 patients at a tertiary care hospital having diaphyseal humerus fracture to be treated using anterior bridge plating with minimally invasive technique, to evaluate the functional outcome of the surgical technique and to evaluate the adequacy of this treatment option and its effect and impact on the quality of life of the patient. The patients were evaluated using UCLA and MEPS score. Radiological evaluation was also a major criteria in the evaluation.

Keywords: Diaphyseal humerus fracture, anterior bridge plate,UCLA and MEPS score

Introduction:

Fracture humerus is commonly presents in polytrauma cases especially in road traffic accidents and accounts for approximately 3% of all orthopaedic injury(1,2,3).Biological fixation and relative stability has advantage over absolute anatomical reduction with compromising soft tissue and vascularity(4).Precise reduction and absolute stable fixation has its biological price(5).Evidence shows that a biological fixation is far superior over a stable mechanical fixation (6). From conservative cast and braces to internal fixation with nailing, plating and screw, treatment of humeral fracture has evolved a lot with their complications[7-12]

Minimally invasive technique for humerus shaft fracture has shown promising results recently [13-16].

Aim To evaluate the results of fixation of diaphyseal humerus fractures by anterior bridge plating

Objctives

1. To evaluate the post operative condition
2. To observe the time period for union
3. To compare the post operative range of motion with the normal range of motion
4. To assess radiological and functional outcome

Materials And MethoDS

The study will be carried out at a 1000 bedded tertiary care hospital. It is a prospective, non competitive, observational result oriented study.

The study would be carried out after approval from ethics committee.

The study would be carried out on 20 patients

4.5 mm LCDCP will be used

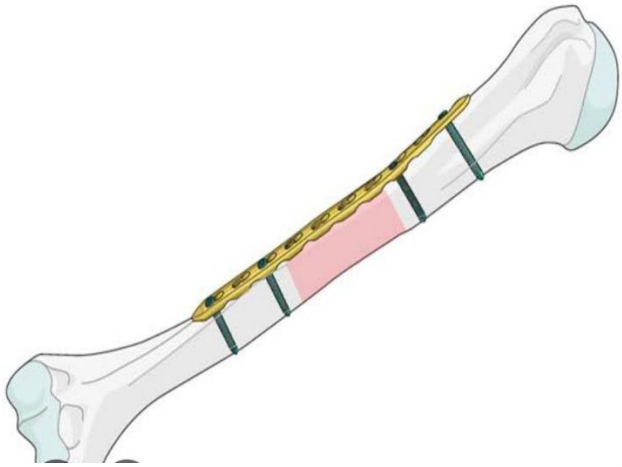
The study would be carried for a duration of 1 year from September 2024 to May 2025.

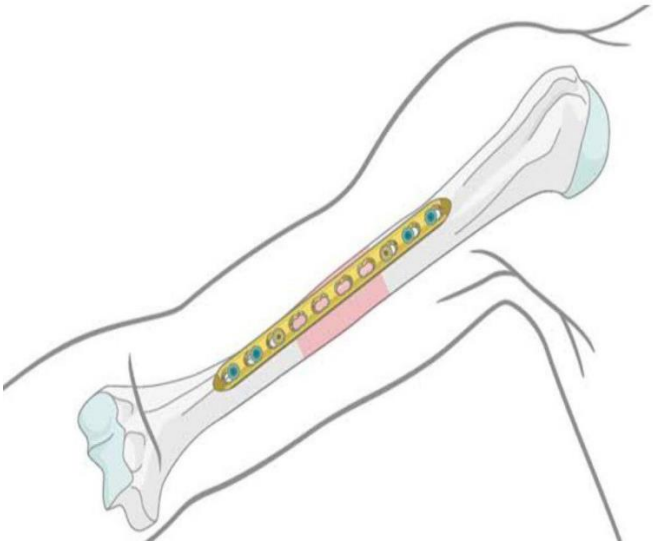
The functional outcome would be evaluated using UCLA shoulder score and MEPS score

Follow up at 0 6 and 12 months.

Inclusion criteria
Adult patients above 18 years
No head injury
No neurovascular injury
Grade 1 open fractures

Exclusion criteria
Age less than 18 years
Grade 2 and 3 open fractures
Head injury
Neurovascular injury
Intra articular fractures
Patients unfit for surgery





Surgical Technique
The patient positioned supine, brachial plexus block given
2-3 cm incision between medial border of deltoid and proximal biceps, 5 cm caudal to acromion process was made.
Retraction of biceps to expose musculocutaneous nerve overlying brachialis muscle, brachialis split
Sub-brachialis, extra-periosteal tunnel was created and a 4.5 mm DCP was passed through the incision. Angulation, length and rotation are restored using traction.
Confirmation of reduction done. Each side of plate is fixed by two screws in anterior to posterior direction.Tunnel is created in such a way to avoid any iatrogenic nerve injury.

Meps Score

Function	Definition	Points	Score classification
Pain	None	45	Excellent > 90
	Mild	30	
	Moderate	15	
	Severe	0	
Motion	Arc > 100	20	Good, 75–89
	Arc 50–100	15	
	Arc < 50	5	
Stability	Stable	10	Fair, 60–74
	Moderate instability	5	
	Gross instability	0	
Function	Comb hair	5	Poor < 60
	Feed	5	
	Hygiene	5	
	Shirt	5	
	Shoe	5	
Total		100	

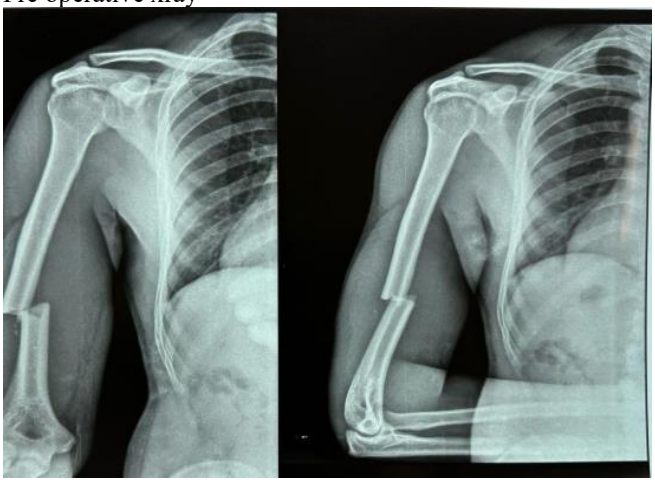
UCLA score

Patient satisfaction
0 Patient feels procedure was not successful
5 Patient feels procedure was a success
Active forward flexion range of motion
0 Less than 30°
1 30°-45°
2 45°-90°
3 90°-120°
4 120°-150°
5 Greater than 150°
Strength of forward flexion
0 No active contraction
1 Evidence of slight muscle contraction, no active elevation
2 Complete active forward flexion with gravity eliminated
3 Complete active forward flexion against gravity
4 Complete active forward flexion against gravity with some resistance
5 Complete active forward flexion against gravity with full resistance
Pain
1 Present always and unbearable, strong medication frequently
2 Present always but bearable, strong medication occasionally
4 None or little at rest, present during light activities; salicylates frequently
6 Present during heavy or particular activities only, salicylates occasionally
8 Occasional and slight
10 None
Function
1 Unable to use limb
2 Only light activities possible
3 Able to do light housework or most activities of daily living
6 Most housework, shopping, and driving possible; able to do hair and to dress and undress, including fastening brassiere
8 Slight restriction only, able to work above shoulder level
10 Normal activities
Total
Excellent: 34-35
Good: 28-33
Fair: 21-27
Poor: 0-20

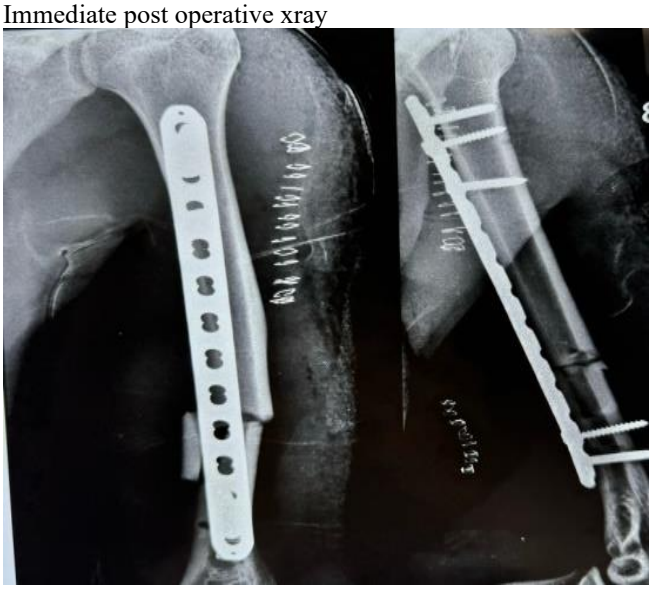
Follow Up

35 year old male patient suffering from closed displaced diaphyseal humerus fracture without distal neurovascular deficit. Follow up was taken at 3months post operatively and 12 months post operatively

Pre operative xray



Immediate post operative xray



3 months follow up

12 month follow up

CLINICAL IMAGES

Results

Arm was immobilized in a neck wrist sling or broad arm pouch for pain control in the first 5 days if necessary, mainly at night while sleeping. Stitches were removed on 12th post-operative day. The patients were advised to perform passive gentle limb range of motion exercises as their pain control permits. Immobilizer was removed after stitch removal. However they were informed to take out the limb and perform informed exercise for 8 to 10 times a day. After radiological signs of healing, a rehabilitation program was started. The aim was to gain full mobility, muscular strengthening and proprioception as soon as possible. The total rehabilitation period depends on the individual patient's progression. The final goal is to restore ache free functional to full range of motion and strength. The union time and complications were noted. The follow up was taken at 6, 12 and 18 months.

The patients shoulder and elbow function were analyzed using the UCLA shoulder score18 and the Mayo elbow performance score (MEPS)19 The UCLA shoulder score was graded into excellent to good (>27 points), fair to poor (<27 points). Elbow function was graded on the MEPS basis into excellent (≥90 points), good (75–89 points), fair (60–74 points), or poor (<60 points). Based on the anteroposterior and lateral radiographic view Union was accepted as the presence of bridging callus in three of the four cortices and absence of pain. Also any loss of fracture reduction was analyzed in similar radiographs.

Discussion And Conclusion

Despite the requirement of high surgical expertise and time taken for adaptation of the procedure, the MIPO technique seems to be reproducible and applicable in almost all types of shaft humeral fractures. Lower rates of iatrogenic nerve injury with minimal bone vascularity disruption, and soft tissue dissection are all the advantages over conventional plate technique. Though indirect reduction and plate placement is technically difficult and requires experience, Plates can be safely used anteriorly or anteromedially over the humeral shaft. Bridging the fracture fragment, with fixation only at either ends of the plate and bone.

Excellent to good results have been achieved with sub brachialis plating with no major soft tissue problems and with functional results as per other methods. Open technique of plating interferes with the local vascularity, leading to osteonecrosis underneath the plate, which may cause delayed healing to non healing

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