



The Influence of Oblique Inferomedial Screws on Secondary Loss of Reduction and Functional Outcome in Proximal Humerus Fractures Treated with Locked Compression Plating - A Comparative Study

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ABSTRACT

Aim: To investigate the influence of calcar screws on secondary loss of reduction and functional outcome in proximal humerus fractures treated with Locked compression plate.

Materials and Methods: All patients who underwent proximal humerus plating for 3 part and 4 part displaced fractures between January 2012 and October 2014 in HGM Hospital Muttuchira, were included. All patients were operated by deltopectoral approach and underwent same post-operative care. Total 47 patients, with an average age of 58, 27 patients without calcar screws were in 1st group, 20 patients with calcar screws were in 2nd group. Radiological and functional outcome were assessed post operatively and at follow up in 6 weeks, 3 months, 6 months and 1 year. The functional outcome was assessed using UCLA shoulder score.

Results: The results showed there is significant loss of reduction in follow up X rays compared to immediate post op X rays in 1st group. In 2nd group, varus collapse and loss of reduction were minimal. In the 2nd group, the average loss of humeral head height was 1.2 mm. In the 1st group (without an appropriately placed inferomedial oblique screw), loss of humeral height averaged 5.8 mm.

Discussion: The presence of medial support had a significant effect on the magnitude of subsequent reduction loss. All fractures in both groups healed without delay. Subsequently, UCLA score and functional outcome were also significantly better for patients in 2nd group. The placement of calcar screws in proximal humerus fracture fixation is associated with less secondary loss of reduction and varus collapse and yields better outcome

Keywords: Calcar screws, Inferiomedial screw, Proximal humerus fractures, Varus collapse,

Introduction

Proximal humeral fractures are very common injuries, especially in elderly. These fractures heal very well as there is a broad cancellous surface with rich vascularity. Minimally displaced fractures can be effectively treated non-operatively. But patients with displaced and unstable fractures will benefit from surgical fixation as conservative treatment result in high morbidity and poor functional outcome.

Secure fixation of displaced three and four part fractures is a challenging problem. The introduction of locking plate system was a milestone in such fractures. In recent literature, the presence or absence of medial support was described as a significant predictor of loss of reduction and putting an oblique inferomedial screw ('calcar screw') was suggested as a simple way of gaining medial support.

We noticed that some of our patients after plate fixation had poor functional outcome. They were found to have loss of reduction and varus collapse. On further evaluation it was found that collapse occurred more in fractures where calcar screw was not put and where there were medial comminution. In this context this study was designed.

Aim

Aim of the study was to investigate the influence of calcar screws on secondary loss of reduction and functional outcome in proximal humerus fractures treated with Locked compression plating.

Materials and Methods

All patients who underwent proximal humerus plating for 3 part and 4 part displaced fractures between January 2012 and October 2014 in HGM Hospital Muttuchira, Kottayam were included. Out of these, a total of 47 patients, who came for follow up, were selected for the study. Patients with open fractures, fracture dislocation, with previous ipsilateral fractures of the humerus and bony metastasis were excluded.

All surgeries were performed by a deltopectoral approach by same surgeon. All patients underwent a standardised post-operative treatment schedule and rehabilitation. These 47 patients were put in to two groups. Patients without calcar screws were assigned to the 1st group and with calcar screw to the second group. They were assessed for both radiological and functional outcome. Radiological assessment was done by reviewing serial Antero-Posterior radiograph of shoulder post operatively and at follow ups in 6 weeks, 3 months, 6 months and 1 year. Differences in height between humeral head and the proximal end of the plate were determined on true AP radiographs of the shoulder and any evidence of varus collapse was looked for.

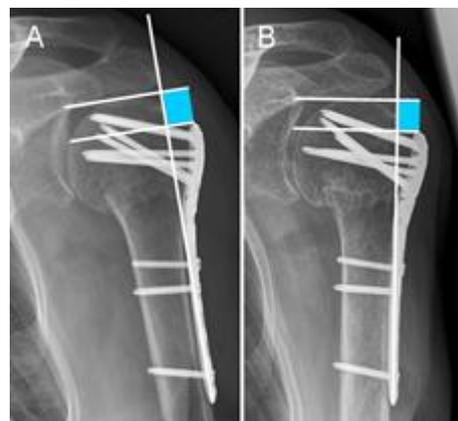


Figure 1. Measurement of Varus collapse.

Height between humeral head and the proximal end of the plate on true AP radiographs was measured at immediate Post Op and after 6 months post op, and the difference more than 5 mm was taken as significant varus collapse. The functional outcome was assessed using UCLA shoulder score. At 1 year follow up, patients filled the questionnaire and assessment was done with respect to with point score system as follows

Pain- 10 points

Function- 10points

Active forward flexion- 5points

Strength of forward flexion- 5 points

Satisfaction of the patient- 5points

Results

Out of the total 47 patients, there were 31 females and 16 male patients with an average age of 58. 27 patients without calcar screws were in in 1st group. 20 patients with calcar screws were in 2nd group.

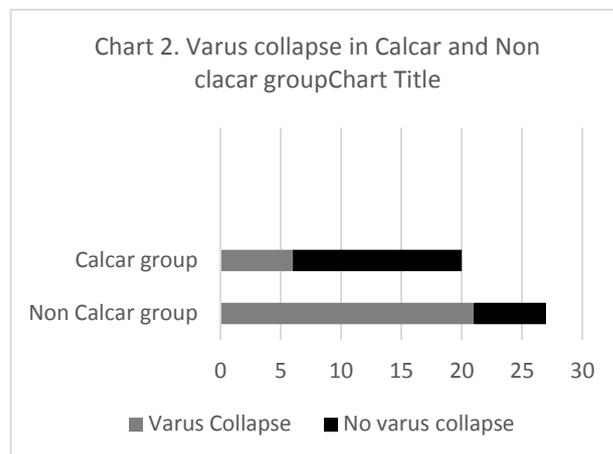


Figure 2. X Ray of patient without “Calcar” screw (1 st group)



Figure 3 X-Ray with “Calcar” screw (2 nd group)

When X-rays were reviewed, among the 1st group, where a calcar screw was not put, out of 27 patients, in 6 patients, fractures united without any collapse. But the rest 21 had varus collapse to varying degrees. In the second group, when the 20 patients were assessed, X-rays showed minimal varus collapse in 6 patients only.



In 1st group UCLA score was excellent in 2 patients, good in 7, fair in 11 and poor in 7. Average UCLA score was 22. Five of those cases needed revision surgery. In 2nd group UCLA score was excellent in 4 patients, good in 9, fair in 4 patients and poor in 3. Average UCLA score was 29. There was no re-surgeries in this group.

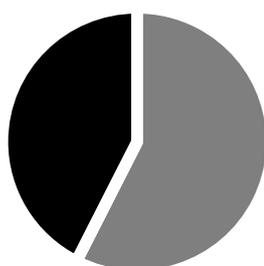
Table 1. UCLA score of Non calcar group and Calcar group

	Excellent (34-35)	Good (28-33)	Fair (21-27)	Poor (less than 20)
Non calcar group	2	7	11	7
Calcar group	4	9	4	3

Table 2. Average UCLA score

	Average UCLA score
Non calcar group	23.4
Calcar group	29.5

Chart 1. Distribution of patients in Non calcar group and Calcar group



· Non Calcar group · Calcar Group

Discussion

The results shows that there is significant loss of reduction in follow up x rays when compared to immediate post op X rays in the 1st group were calcar screws were not put.



Figure 4. Varus collapse in non-calcar screw group

In the calcar group, varus collapse and loss of reduction were minimal. Subsequently, UCLA score and functional outcome were also significantly better for patients in which an inferomedial calcar screw was put. Even with calcar screw, 6 patients had varus collapse. These patients had severe medial comminution. Hence Calcar screw alone may not be enough to give medial column support in such fractures. Locked plating with Endosteal fibular strut graft may be beneficial as a primary procedure. The placement of calcar screws in proximal humerus fracture fixation is associated with less secondary loss of reduction and varus collapse by providing an inferomedial support. Hence it is recommended always to put the calcar screw for better results.

Conclusion

It is important to achieve mechanical support of the inferomedial region of the proximal humerus for the maintenance of fracture reduction. Locked plates in general are unable to support the humeral head alone from a lateral position.. Achieving an anatomic or slightly impacted stable reduction, as well as meticulously placing a superiorly directed oblique locked screw in the inferomedial region of the proximal fragment, may achieve more stable medial column support and allow for better

maintenance of reduction. However, there are several factors that are in the surgeon's control that may improve the mechanical environment. The placement of calcar screws in proximal humerus fracture fixation is associated with less secondary loss of reduction and varus collapse. Hence it is recommended always to put the calcar screw to prevent varus collapse in displaced proximal humerus fractures for better results.

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Appendix i**UCLA Shoulder rating scale**

Clinician's Name: _____ Patient's Name: _____

Section 1 - Pain

1. Present always and unbearable; strong medication frequently
2. Present always but bearable' strong medication occasionally
3. None or little at rest' present during light activities; salicylates used frequently
4. Present during heavy or particular activities only; salicylates used occasionally
5. Occasional and slight
6. None

Section 2 - Function

1. Unable to use limb
2. Only light activities possible
3. Able to do light housework or most activities of daily living
4. Most housework, shopping, and driving possible; able to do
5. hair and to dress and undress, including fastening bra
6. Slight restriction only; able to work above shoulder level
7. Normal activities

Section 3 - Active forward flexion

1. 150°
2. 120°-150°
3. 90°-120°
4. 45°-90°
5. 30°-45°
6. <30° Grade 0 (nothing)

Section 4-Strength of forward flexion (manual muscle testing)

1. Grade 5 (normal)
2. Grade 4 (good)
3. Grade 3 (fair)
4. Grade 2 (poor)
5. Grade 1 (muscle concentration)

Section5 - Satisfaction of patient

1. Satisfied and better
2. Not satisfied and worse

Total UCLA Shoulder score is: _____

Interpreting the UCLA Shoulder rating scale >27 Good / Excellent <27 Fair / Poor

The maximum score is 35 points.

Excellent / good indicates satisfactory results, where as fair / poor indicates unsatisfactory results.