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Dr. Maulik Jhaveri
Senior Resident, Sumandeep Vidyapeeth (University), Piparia, Vadodara, Gujarat, India.

Jay Turakhiya
Resident, Sumandeep Vidyapeeth (University), Piparia, Vadodara, Gujarat, India

Dr. Parth Rathi
Resident, Sumandeep Vidyapeeth (University), Piparia, Vadodara, Gujarat, India

Dr. Prakhar Jain
Resident, Sumandeep Vidyapeeth (University), Piparia, Vadodara, Gujarat, India

Dr. Paresh Golwala
Head of Department, Sumandeep Vidyapeeth (University), Piparia, Vadodara, Gujarat, India

Correspondence
Jay Turakhiya
Resident, Sumandeep Vidyapeeth (University), Piparia, Vadodara, Gujarat, India

Proximal humerus non-union: treated with open reduction and internal fixation with PHILOS plate and iliac crest tri-cortical bone graft

Dr. Maulik Jhaveri, Dr. Jay Turakhiya, Dr. Parth Rathi, Dr. Prakhar Jain and Dr. Paresh Golwala

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Abstract
Proximal humerus fracture comprise 5 percent of all fractures. Non union of proximal humerus is rare. In this study we have studied the treatment modality and its result in total 10 patients with average injury to surgery duration of 6.9 months. We operated patients with deltopectoral approach and PHILOS plate. We harvested iliac crest tricortical bone graft for bone deficit and reconstruction of lateral wall. The average duration of follow up is 9.6 months. The Constant shoulder score is used for evaluation. We got 50% of Excellent, 30% of Good, 10% of Fair and 10% of Poor result.

Keywords: Proximal humerus non-union, iliac crest tricortical bone graft, PHILOS

Introduction
Proximal humerus fracture comprise 5 percent of all fractures [3]. Non unions are uncommon, but when they occur they are difficult to treat. Open reduction and internal fixation combined with autologous tricortical bone grafting can result in reliable healing of the fracture. Patient often developed stiff shoulder or elbow and significant pain for prolonged time. Insertion of deltoid limits proximal plating making it a difficulty for surgeon.

Discussion
Case study was done on 10 patients. Eight of my patients had history of road traffic injuries. They had no history of loss of consciousness, ENT bleed, vomiting or any systemic disease. 1 patient had history of fall from height, 1 patient due to domestic violence.
Mean duration between trauma and surgery was 6.9 months followed by restriction of movement and painless hyper mobility at the fracture site for which patients were admitted. On x-rays and CT scan there were significant degree of non-union and bone gap present on proximal humerus, for which PHILOS platting with bone grafting were done followed by shoulder immobilization till the signs of union seen clinically and radiologically.
Though proximal humerus non-union is uncommon but when they occur they are difficult to treat. In our study mechanism of injury is mostly from road traffic accident, trivial injury to shoulder. Risk factors include multiple medical problems, severity of the fracture, alcoholism, obesity and loss of fixation caused by osteoporosis, soft tissue interposition, infection etc [1].
6 out of 10 cases we have seen cancellous bone of head of humerus got absorbed partially or nearly complete. In five of the cases we faced lateral wall deficit, Screw hold in these patients were questionable so we have taken tricortical graft from iliac crest for reconstruction of lateral wall and bridge the gap between two end of the fractures and in 3 of the patients we held these graft with screw from the plate for the better fixation and better holding of the graft [3]. From 10 of our patients four were diabetic, 3 were smokers.

Table 1: The following table suggests the relation between nonunion and age of the patients.

Mean Age	Number of Patient
30-40	2
40-50	3
50-60	5

Thus with increase in age rate of nonunion increases

Table 2: The following table suggests the relation of mode of injury with nonunion.

Mode Of Trauma	Number of Patient	Average
Road Traffic Accident	8	80%
Fall From Height	1	10%
Domestic Injury	1	10%

So, with modernization severity of trauma has increased and it also correlate with rate of nonunion.

Post op protocol

Immobilization of shoulder joint for 1 month and immediate elbow and wrist ROM exercise were started. Follow up x-ray taken after 1 month and before starting shoulder ROM we have confirmed that it is uniting and fixation is rigid.

Material and Method

We have used PHILOS plate, tri cortical autologous bone graft from iliac crest and thick k wire (2.5/3mm) [4].

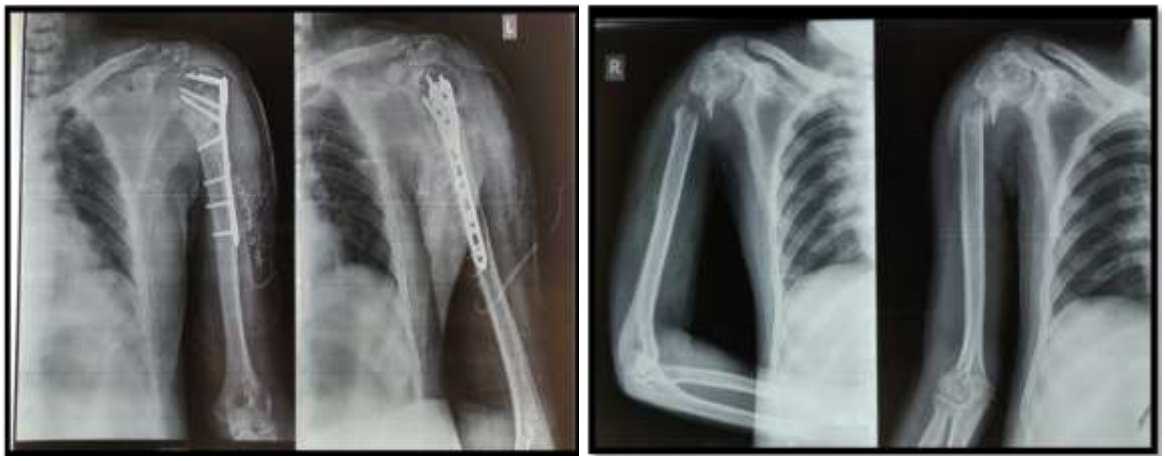
In general supine postion under aseptic precaution extended anterolateral approach was used but we found difficulty in some patients to mark the coracoid process and it was not in its anatomical postion[5].In only 4 of our patient we could appreciate the cephalic vein and deltopectoral groove [6].

After reaching to the bone refreshing of the bone was done. Rimming done in shaft, excessive soft tissue was removed and reduction was held by thick K-wire. K-wire was placed from head through shaft vertically oblique. Then fracture was fixed with long PHILOS plate. Tri cortical bone graft was placed between fracture site and reduction was checked in IITV. Valgus angle of head was checked with the normal site [7].

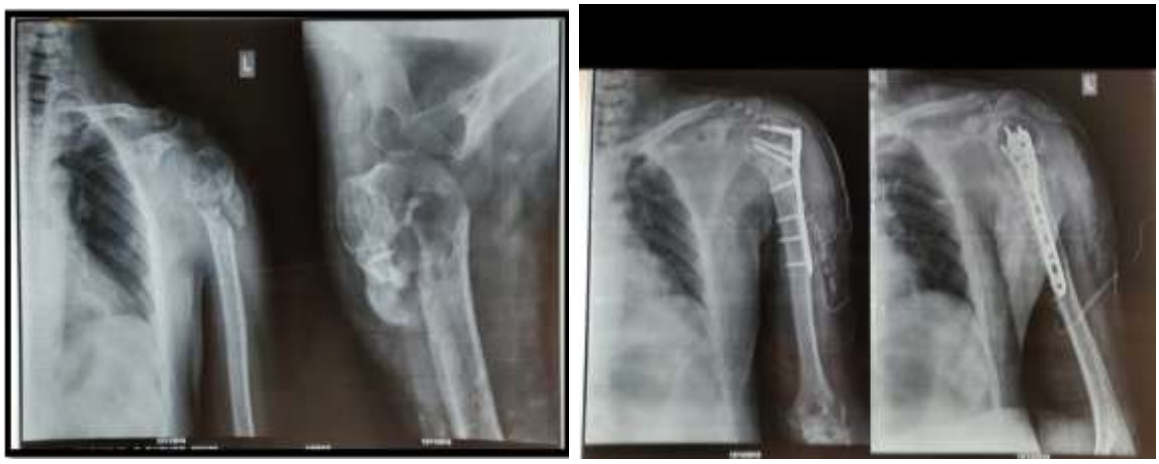
Results

Nonunion of the proximal humerus results in marked disability because of Instability [8]. Patients develop various degree of adhesive capsulitis because of immobility of the shoulder. There were restriction of movement all around the joint. After operative treatment with tricortical iliac crest graft in combination with PHILOS plate over proximal humerus we have got good outcomes [9, 10].

Return to work (months)	Number of Patients
3	8
4	1
5	1



Case 1: 50 year old had a history of fall from bike 6 months back, there was no history of any associated injuries. Patient was managed conservatively. Patient came to OPD with inability to lift left shoulder for which PHILOS platting and bone graft was done.



Case 2: 55 year male had a history of fall from the bike 5 months back there was brachial plexus injury in the same limb. Patient was managed conservatively. Patient with restriction of movement of right shoulder. Patient was operated with PHILOS plate and autologus tri cortical iliac crest bone graft.

Conclusion

As per constant shoulder score we have achieved 50% excellent, 30% good, 10% fair, 10% poor results.

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