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Closed reduction percutaneous pinning (CRPP) in proximal humerus fractures in adult: A prospective study of 36 cases

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Abstract
Objectives: To evaluate the results of CRPP in different types and severity of proximal humerus fractures both clinically and radiologically.
Methods: 40 patients with proximal humerus fracture were included in study, out of them 2 patients died and 2 were lost follow up 36 patients were considered for final evaluation. Out of them 22 male and 14 female patients aged 20 to 70 years (mean 46) treated with CRPP. Patients were assessed for six months radiological, clinically and functionally using Neer's score and DASH score.
Results: According to Neer's classification fractures were classified into two part fracture (n=24), three part fractures (n=12). At 6 month follow up 19 had good results and 13 had fair and 04 poor results. Only 02 patients had pin tract infection and 02 had pin migration which was removed at 06 week when fracture had united. No patient developed nonunion, implant failure, avascular necrosis or reflex sympathetic dystrophy like complication.
Conclusion: CRPP achieves favorable biological fixation for proximal humerus fractures with few complication. Even with osteoporotic bone no complication noted. The outcome primarily depends upon patient's age, severity of the injury, bone quality and early post-injury intervention, good surgical technique and anatomical reduction, stable biological fixation and early postoperative mobilization.

Keywords: CRPP, closed reduction, proximal humerus fracture

Introduction
Proximal humerus fractures are one of the commonest fractures occurring in the skeleton. They account for approximately 4 – 5% of the fracture attendance at the hospital. They occur more commonly in elderly patients with osteoporosis. Because of increasing incidence of high velocity trauma, complicated fracture pattern in proximal humerus are becoming increasingly common even in younger population. These fractures can be extremely disabling and their management often demands experienced surgical skills. The objective of this method to reduction (displacement, rotation, angulation, length) of each fragment and hold it in place with an k wire.
Aim of this study was to assess the results of CRPP in fracture of proximal humerus both clinically and radiologically and come to conclusion about outcome and complications of CRPP in proximal humerus fractures according to the pattern of fracture and patient selection.

Methods
This study was carried out from May. 2016 to November 2018, I have included forty patients of proximal humerus fractures after applying inclusion and exclusion criteria.

Inclusion criteria
A] Adult patients
B] Proximal humerus fractures complex variety. [Neer's classification: grade 2 to grade 3].

Exclusion criteria
a. Medically unfit patients.

b. Fractures in pediatric age group.
c. Shaft humerus fractures with proximal extension.
d. Neer's GRADE 1 AND GRADE 4 fractur
e. Open fractures
f. Neurovascular injuries

Sample size: 36 patients.

After the patients with proximal humerus were admitted all the necessary clinical details were recorded in a trauma sheet. (Annexure 1) Radiographic evaluation of the shoulder was done according to Neer's trauma series which consists of:

- Anteroposterior (AP) view of the scapula,
- Axillary view.

Fractures were classified according to the Neer's classification and patients were shifted to the ward after initial temporary immobilization with Universal shoulder immobilizer. All the routine investigations were done on all the patients pre-operatively with complete medical and anesthetic fitness of patient for surgery.

All patients were given 1.5 gm of cefoperazone preoperatively, followed by 2 additional doses during the first 24 hours

In a modified beach-chair position and with the aid of an X-ray image intensifier closed reduction performed and fixed using 2.5, 3.5 k wire fixed with clamp. CRPP was used in all patients.2 k wire inserted from upper shaft and 2 k wire from head and fixed using clamp.

After surgery the arm was placed in a sling and all patients were referred to a physiotherapist. The sling was used for 4 weeks and after that the patients were allowed to use it at their own convenience. Pendulum exercise were started from the first postoperative day and after 4 weeks the patients were allowed a free active range of motion (ROM). K wire removed at 8 week postoperative after confirmation of clinical and radiological union. Strengthening exercises were begun after 3 months.

Image 1: Preop X-ray

Image 2: post op xray

Follow-Up

The patients were first followed up at 2 weeks for check xray; then at 4 weeks to assess the sign of radiological union, detect any early complication and for removal of implants.than follow up at 8 week for removal of k wire.

Then after, patients were regularly followed up at 3 months and 6 months intervals. On each visit, patient is evaluated for following parameters.

Clinical evaluation

Neers score
DASH score

Radiological evaluation

Signs of Union

If any complication was noticed, it was managed accordingly. Once a patient had regained the pre-injury status in both personal and professional aspects, the final follow-up of the patient was done. Final neers score and DASH score were obtained. Standard AP and axillary radiographs were taken to evaluate:

- Joint Status
- AVN head of humerus
- Arthritis of head
- Head shaft angle

The final results were classified into three categories: Good, Fair and Poor according to following final scores.

Complications

Pin migration

Injury to musculocutaneus nerve, axillary nerve, cephalic vein
Pin tract infection

Discussion

Before the era of good quality implant proximal humerus fracture were treated conservatively. It was saying that proximal humerus fracture does not require fixation. But nowdays almost all proximal humerus fracture treated operatively. Because patient want to back to work as early possible. Its only possible with operative management. Now we have variety of option for fixation for proximal humerus like philos plate, cortico cancellous screw, tension band wire, anchor suture, k wire, humerus nail.

In philos platting many study proven good result, but with that there is complication like infection, bleeding which are not affordable in old age and comorbid patient. Nailing in proximal humerus fracture have varus collapse and chronic shoulder pain problems and risl of injury to neuro vascular structure while locking the nail. And these implants were costly.

On other hand CRPP is less expensive, minimal blood loss, no chances of infection, less post operative pain and good clinical outcome. So our study show good result with CRPP. Only 4 patient have complication of pin tract infection and pin migration.

Results

According to Neer's classification fractures were classified into two part fracture (n=24), three part fractures (n=12). Only 04 out of 36 (11.90%) of patients operated by CRPP shows loss of reduction due to pin migration and pin loosening. At 6 month follow up 19 had excellent, 13 had good results and 4 had poor results.92.86% of patients had same occupation as before injury. Only 4.76% of patients had changed occupation

after treatment. Only one patient (2.38%) had retired from duty but was due to other associated injuries.

Only 2 patients had pin tract infection 2 pt had pin migration which was removed at 6 week when fracture had united. no any injury to axillary nerve and musculocutaneus nerve noted. No patient developed nonunion, implant failure, avascular necrosis or reflex sympathetic dystrophy like complication.

Table 1: results of CRPP

Head shaft angle on f up	Total	
	Number	**Percentage**
GOOD 130^0-150^0	19	52.7%
FAIR 115^0-130^0 150^0-175^0	13	36.33%
POOR $<115^0>175^0$	4	11.76%
Total	36	100%

Conclusion

CRPP achieves favorable biological fixation for proximal humerus fractures with few complication. Principle of fixation reduction of shaft and head, including the restoration of the anatomy, stable fixation, with minimal injury to the soft tissues preserving the vascular supply. An adequate surgical technique will minimize complications and an aggressive rehabilitation regime will ensure the best possible result.

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