FRACTURE OF PROXIMAL HUMERUS & SHAFT MANAGED WITH CLOSED REDUCTION & EXTERNAL FIXATION BY JOSHI EXTERNAL STABILISATION SYSTEM (JESS) – A CASE REPORT

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ABSTRACT

We are presenting a case of proximal humerus& shaft fracture in a 50 year old female. She sustained injury on her left upper limb in a road traffic accident. It was managed with closed reduction & external fixation by Joshi External Stabilisation System (JESS). Lacerated wound over her left shoulder & arm region was managed with skin grafting. The post-operative period was uneventful.

KEY WORDS: Proximal humerus fracture, humerus shaft fracture, closed reduction, external fixation, Joshi External stabilisation system (JESS), Lacerated wound, Skin grafting

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INTRODUCTION

Proximal humerus fractures account for 4-5% of all fractures; most of them involving elderly and osteoporotic people[1]. 51% of such fractures are displaced[2]. Fractures with minimal displacement, regardless of the number of fracture lines, can be treated with closed reduction and early mobilization, but anatomical reduction in displaced fractures is difficult to obtain and the incidence of pseudarthrosis is high[3-5]. Open reduction and internal fixation entails an extensive surgical exposure and risks damage to the vascular supply of the fragments. Fixed angle locking plates enable fixation of many complex fractures[6] although their long term functional outcomes remain unknown. It provides early functional recovery, but we had to pay special attention to some of the surgical details to minimize complications. Locked intramedullary nails can be inserted using a minimally invasive technique[7] but for the risk of proximal impingement. Closed reduction and percutaneous pinning has a low risk of neurovascular complications or interference with glenohumeral joint motion[8]. Transcutaneous reducation and external fixation achieves a satisfactory fracture stability once closed reduction is achieved, safer healing, superior functional result, low cost and less patient morbidity as compared to conservative treatment [9]. We present a case of an open fracture of the proximal humerus& shaft managed with closed reduction & external fixation by Joshi External Stabilisation System (JESS).

CASE REPORT

A 50 years old female patient presented to the Casualty Department of Universal College of Medical Sciences Teaching Hospital with an alleged history of road traffic accident (hit by bus) following which she sustained an open wound, pain & swelling on her left shoulder & arm region. Pain was sudden in onset, sharp & shooting in character, non-radiating, associated with swelling, continuous, exacerbated by movement & relieved on rest & increasing in severity. Swelling was also sudden in onset & localized over the mid-arm region. She was unable to move her left upper limb because of the wound, pain and swelling. There was no history of loss of consciousness, vomiting or ear, nose & throat bleeding. Her bladder & bowel habits were normal. Past, family & personal history were not significant.

On a quick general examination, her airway, breathing & circulation was intact. Chest compression, pelvic compression & spinal tenderness were negative. On local examination, there was a lacerated wound of about 15x5 cm in size extending from anterior & superior aspect of her left shoulder to the anterior & lateral aspect of her arm. External bleeding was present. Swelling & tenderness were present in the mid-arm region just below the wound. Her radial pulse was palpable & she was able to actively move the fingers of her left hand. Wrist & fingers extension was present.

After administering analgesics & local anesthetic, the wound was immediately washed in the casualty department with copious amount of normal saline (about 3 liters) maintaining all aseptic precautions. Dead & devitalized tissues from the wound were excised. Sterile wound dressing was done & a long arm slab was applied before sending the patient for X-ray.

Her X-ray of left shoulder including arm showed fractures of the proximal humerus (NEER- two-part fracture) and shaft (Figure 1). She was admitted in the Orthopedics ward and kept under broad spectrum antibiotics cover. All pre-operative investigations were sent and she was planned for surgery.

She was operated on the next day under general anesthesia. Under guidance of C-arm, the fractures in the proximal humerus& shaft were reduced by traction & counter-traction. It was secured in place with 2 long intra-medullary K-wires (3mm)passed from the proximal humerus towards the shaft. These 2 long K-wires crossed the fracture line & reached just above the humeral condyles. The ends of the K-wires were cut & bent. Then 3 partially threaded K-wires (Guide-wires) (2mm) were passed on the head of humerus from lateral to medial direction reaching just near to the far cortex but not crossing it. Another 2 guide-wires were passed about 5 cm below the first 3 & then again another 3 K-wires were passed about 10 cm below the first in the same direction. Small clamps were placed on these guide-wires, 2 connecting rods passed through them, bent & the clamps were tightened using Allen key. In this way, the fracture of the proximal humerus& shaft was secured with external fixation by Joshi External Stabilization System (JESS) (Figure2&3). Post-operatively, she was kept on a left shoulder immobilizer.

Regular sterile dressing was done on the lacerated wound on her shoulder & arm region. After 3 weeks of her admission & after sufficient granulation tissue had formed on the wound bed (Figure4), split-thickness skin grafting was done on the wound (Figure5). Graft was harvested from the antero-lateral region of her left thigh.

Gradual range of motion exercises of her left shoulder & elbow were started after 4 weeks of operation (Figure 6).
Graft on the lacerated wound showed good uptake & the wound was healthy.

Figure 1. X-ray AP left shoulder: At the time of admission

Figure 2. Wound with JESS fixator: At the time of operation

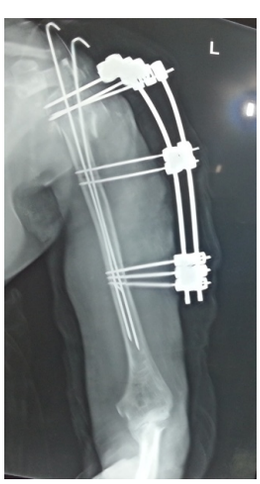

Figure 3. X-ray AP left shoulder: On the day of operation

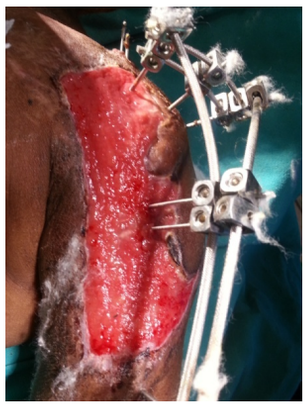

Figure 4. Wound appearance: After regular dressing in preparation for skin grafting

Figure 5. Wound appearance: 5th post-operative day after skin grafting

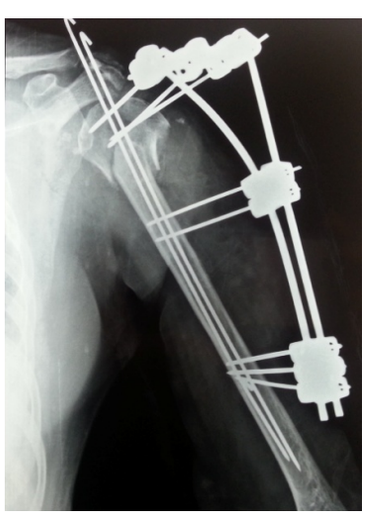

Figure 6. X-ray left shoulder AP: 1 month after operation

DISCUSSION

The proximal humeral fractures have been treated with a wide range of options, namely non-operative, open reduction internal fixation, external fixation, closed K-wire fixation, percutaneous screw fixation, and tension band fixation. Each procedure has some limitations and complications. A major disadvantage of non-operative treatment is failure to obtain early mobilization, which results in a high rate of shoulder stiffness and pain, and malunion or nonunion is likely with certain fracture types[10-12]. JESS fixator application in our study allowed sound fracture union. A disadvantage of open internal fixation is difficulty in achieving rigid fixation in the osteoporotic cancellous bone of proximal humerus. Cortical bone in osteoporosis constitutes only a thin shell of bone and provides weak purchase for the screws. Presence of comminution offers difficulty in internal fixation while external fixation works on principle of ligamentotaxis. Internal fixation has been reported to have increased complication rates in these patients due to hardware loosening and pullout of the screws[13-15]. Additionally, the use of internal fixation device prolongs the operative time, increases intraoperative bleeding, and increases the risk of avascular necrosis of humeral head because of the disruption of the residual vascularity[14,15]. Postoperative adhesions further limit the range of motion as a result of extensive dissection needed in cases of open reduction and internal fixation[16]. However, recent studies have shown good long term results of proximal humerus fractures managed by PHILOS plate[17,18].

The use of external fixators in the management of proximal humeral fractures has begun to gain acceptance over the last 10 years. The idea of minimal fixation now lends to the fact that the blood supply to the head of the humerus is preserved. Hoffmann's external fixators were used for this type of fracture by many authors, but their use was hindered by bulky Steinman pins, increasing the risk of injury to soft tissue and limiting the space for application of multiple pins in different planes. The smaller K-wires used in JESS have lesser risk of soft tissue, neural, and vascular injury. Multiple K-wires used in different planes add to the rotational stability to a reduced fracture. The principles of management for complex proximal humeral fractures are minimal soft tissue dissection to avoid the occurrence of avascular necrosis of the humeral head, adequate fixation to provide good stability for early rehabilitation, and an intact rotator cuff for an optimal functional outcome. Closed reduction and the use of JESS achieve these principles adequately.

Complications encountered by external fixation of fractures of proximal humerus are K-wire loosening, pin tract infection, malunion, and elbow stiffness. The use of partially threaded K-wire (Guide-wire) increases the pullout strength. The undue tension on skin should be avoided to avoid pressure necrosis.

CONCLUSION

JESS used in the management of proximal humeral fracture has lesser risk of soft tissue, neural and vascular injury minimizing the occurrence of avascular necrosis of the humeral head. It also provides adequate fixation with rotational stability for early rehabilitation and optimal functional outcome.

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