Three-part Head-splitting Proximal Humerus Fracture Through a Unicameral Bone Cyst

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abstract

Unicameral bone cysts are rare in adults and are most often found incidentally on radiographs. However, they can persist from the adolescent period and may be present in locations that predispose to or exacerbate fractures.

This article describes a case of a healthy 40-year-old woman who sustained a proximal humerus trauma that involved a large unicameral bone cyst, resulting in a 3-part head-splitting fracture. The epiphyseal location of the cyst contributed to the severity and extent of the fracture that resulted from a simple fall. Given the age of the patient, open reduction and internal fixation with a locking plate and lag screws was performed. The patient chose open reduction and internal fixation to preserve a hemiarthroplasty procedure in case of future revision. Successful humeral head reconstruction was achieved, and the patient fully recovered. One year postoperatively, the patient underwent arthroscopic debridement to alleviate subjective stiffness and decreased range of motion.

Multipart head-splitting fractures require complex repair strategies. The gold standard for the treatment of these injuries is hemiarthroplasty. However, the decision process is difficult in a young patient given the average survival of autoplastic prostheses and the added difficulty of later revision. The current case demonstrates the complexity of decision making resulting from a rare injury in a young, healthy patient and shows that open reduction and internal fixation can provide acceptable reconstruction in such situations.

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Figure: Prereduction computed tomography scan of the right proximal humerus fracture (A). Three-dimensional computed tomography reconstruction of the 3-part head-splitting humeral fracture (B).
Unicameral bone cysts are benign, fluid-filled, lytic lesions most commonly found in the long bones of skeletally immature children. In addition, a male predominance exists, ranging from 3:1 to 2:1, and approximately 94% of unicameral bone cysts exist in the proximal humerus and femur, with the humerus being 2 times more likely to be affected than the femur. Unicameral bone cysts are rarely found in adults, and when present are more common in the iliac, radius, and ribs.

This article describes the complexities of treatment of a devastating proximal humerus fracture secondary to a unicameral bone cyst.

**Case Report**

A 40-year-old woman presented with a proximal humerus fracture dislocation (Figure 1) after slipping on an icy train platform and landing on her right arm. She reported no relevant medical history and no history of musculoskeletal disease. Preoperative right shoulder plain radiographs and computed tomography scan (Figure 2) showed a 3-part head-splitting proximal humerus fracture dislocation through a large unicameral bone cyst. She was urgently reduced and held in a sling and swathe until she underwent surgery the next morning (Figure 3). Given the patient’s activity level and age, open reduction and internal fixation (ORIF) was performed to salvage the humeral head.

The patient underwent ORIF via the deltopectoral approach using a locking humeral plate, an interfragmentary screw, and two 4.0 cancellous screw fixations of the humeral head. The unicameral bone cyst was well corticated and allowed for humeral head reduction with a 1-mm stepoff. The unicameral bone cyst was packed with crushed cancellous bone and silicated calcium phosphate bone graft, and anteroposterior and lateral radiographs confirmed the filling of the cyst. Once the humeral plate was secured and the shoulder was anatomically reduced, the humerus was put through a full range of motion and was stable. Postoperative plain radiographs showed cortication of the cyst and acceptable humeral head reduction (Figure 4).

The patient was discharged on postoperative day 4 with no right shoulder or upper-extremity neurovascular deficit. The fracture healed well, but the patient reported continued stiffness and decreased range of motion following physical and occupational therapy. Approximately 1 year postoperatively, the patient underwent arthroscopy with manipulation, decompression, and lysis of the adhesions in her right shoulder with a satisfying improvement in symptoms (Figure 5).

**Discussion**

Multipart head-splitting fractures are devastating injuries, especially in young, active patients. The complexity of the current patient’s fracture care was increased because of the involvement of the unicameral bone cyst in the humeral head. Unicameral bone cysts usually form in the diaphysis and spread distally with bone growth. However, reports have been published of unicameral bone cysts with epiphyseal extension in an older age group, proposing the mechanism whereby juxtaphyseal cysts extend into the epiphyseal region after skeletal maturity. A literature review revealed no published reports of adult proximal humerus fractures associated with a previously undiagnosed, persistent unicameral bone cyst.
Case Report

Multipart head-splitting proximal humerus fractures can result in a high incidence of avascular necrosis. They usually result from trauma in individuals this age.\textsuperscript{10,11} The current patient’s fracture can be described as a 3-part head-splitting fracture dislocation of the proximal humerus.\textsuperscript{11} In head-splitting fractures of the proximal humerus, hemiarthroplasty or arthroplasty are the preferred methods of repair to grant immediate mobilization without instability.\textsuperscript{11-14} Despite hemiarthroplasty being the gold standard, with the consideration of age, the current studies show 59\% to 88\% survival of hemiarthroplasty at 15 years, with lower survivals in patients with sequelae of trauma.\textsuperscript{15} Furthermore, almost half of all patients younger than 50 years who have undergone shoulder arthroplasty have reported an unsatisfactory result.\textsuperscript{15} In the current case, sparing the native bone was an acceptable alternative given the suboptimal long-term results of hemiarthroplasty. A plan was made for ORIF, and the option of a hemiarthroplasty or arthroplasty will still be available for an unsatisfactory result in this treatment sequence.\textsuperscript{16,17}

**CONCLUSION**

This article describes the difficulties in treatment plan decision making for severe head-splitting fractures in the setting of a unicameral bone cyst in a young, active patient. Achieving successful reduction and vascular supply preservation to a head-splitting humerus fracture can be accomplished by performing ORIF while retaining acceptable shoulder joint range of motion.

**REFERENCES**