

Case Report

A Different Method for Treating Pseudoarthrosis of the Surgical Neck of the Humerus: A Case Report

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Abstract

Pseudoarthrosis of the surgical neck of the humerus is a very rare condition which comprises humeral neck fracture nonunion with deficient bone stock. Treatment can be challenging, and many surgical techniques have been described in the literature, but each technique has its own drawbacks. We describe a new and far simpler technique to treat pseudoarthrosis of the surgical neck of the humerus using a femoral head allograft, bone marrow aspiration, and proximal humerus locking plate fixation, which resulted in both bony union and markedly improved clinical outcomes.

Key words: Pseudoarthrosis, surgical neck of the humerus, allograft, bone marrow aspirate, locking plate

Introduction

Pseudoarthrosis of the surgical neck of the humerus is a rare condition which can be associated with pain and major limitation of shoulder function^[1,2]. Treatment is challenging owing to excessive fracture site mobility, humeral head cavitation with deficient bone stock, concomitant osteoporosis, and head-shaft size mismatch^[3].

Both reconstructive and replacement type surgeries have been described; however, reconstructive methods with any form of open reduction internal fixation and bone grafting are preferred because the reported results of replacement surgeries have been poor^[3].

Several reconstructive techniques were described, such as impaling the shaft onto the head^[4], placing a tension suture through the rotator cuffs^[4,5], or using an intramedullary corticocancellous autograft to improve construct stability^[6]. However, each technique has its own drawbacks, such as donor site

morbidity, ongoing nonunion, and the need for metal ware removal^[4,5,6].

Here we present a case of pseudoarthrosis of the surgical neck of the humerus treated with a combination of femoral head allograft, bone marrow aspirate, and a locking plate, which resulted in bony union and improved clinical outcomes. Combined allograft and bone marrow aspirate have previously been described for treating long bone nonunions^[7], but, to the best of our knowledge, its use in treating pseudoarthrosis of the surgical neck of the humerus has not been reported in literature.

Case Report

A 63-year-old housewife fell on her right shoulder in March 2014 with resultant right humerus surgical neck fracture, which was initially treated conservatively. She presented to our clinic 4 months later complaining of ongoing pain and an inability to elevate her shoulder. Clinically, she had an abduction of only 30° and forward elevation of only 40°. Radiographs of her right shoulder showed pseudoarthrosis of the right humeral neck with resorption and cavitation of the head fragment (Fig. 1). The risks and benefits of surgical management were discussed with her in detail.

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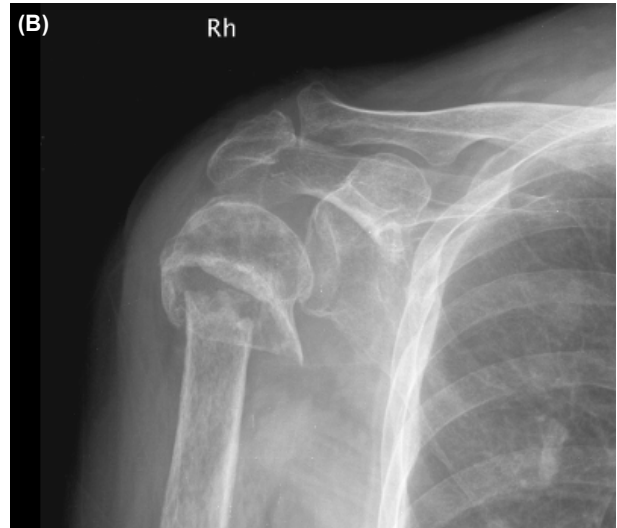


Fig. 1 Anteroposterior radiograph of right shoulder joint with shoulder joint in (A) internal rotation (B) external rotation showing deficient bone stock with humeral head cavitation.

The deltopectoral approach was utilized to expose the fracture after the skin incision was made. There was severe cavitation of the head fragment with little cancellous bone remaining, leaving a near egg-shell head wrapped around by rotator cuffs. The fibrous scarring tissue was excised, and both ends of the fractured surface were decorticated with a high-speed burr.

An allograft femoral head was prepared by removing its overlying cartilage and shaped so that it could be fitted into the head fragment cavity. Bone marrow aspirate was obtained simultaneously from the ipsilateral iliac crest using a large bore needle and syringe. The prepared allograft was then soaked in the bone marrow aspirate before being placed into the head fragment cavity. The head fragment containing the allograft was reduced onto the shaft and temporarily fixed with two Kirschner wires. Once a satisfactory reduction was confirmed using an image intensifier, the rotator cuffs were sutured onto the shaft using Ethibond through drill holes. Lastly, a proximal humerus locking plate was applied with the proximal locking screws purchasing into both the head fragment and allograft. The two Kirschner wires were then removed, and the stability and range of motion of the shoulder was checked. The wound was irrigated with saline, and the remaining bone marrow aspirate was injected into the fracture site before wound closure. An immediate postoperative radiograph confirmed satisfactory overall alignment. (Fig. 2)

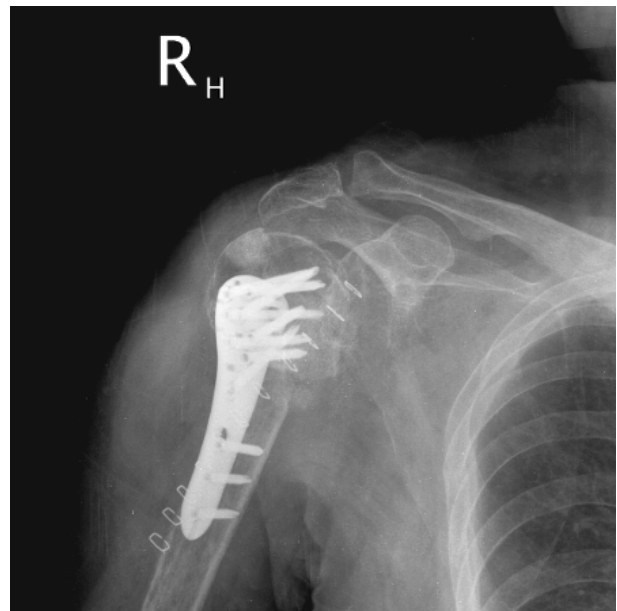


Fig. 2 Immediate post-operative radiograph confirmed satisfactory implant and allograft position with good overall alignment.

Postoperative management included 24 h of prophylactic antibiotics and 2 days of hospital stay. The shoulder was immobilized in a brace for 6 weeks with gentle pendulum exercises initiated at home after 2 weeks. Active shoulder range of motion was initiated at 8 weeks.

At 2 months, the femoral head allograft seemed to be incorporated into both the head and shaft

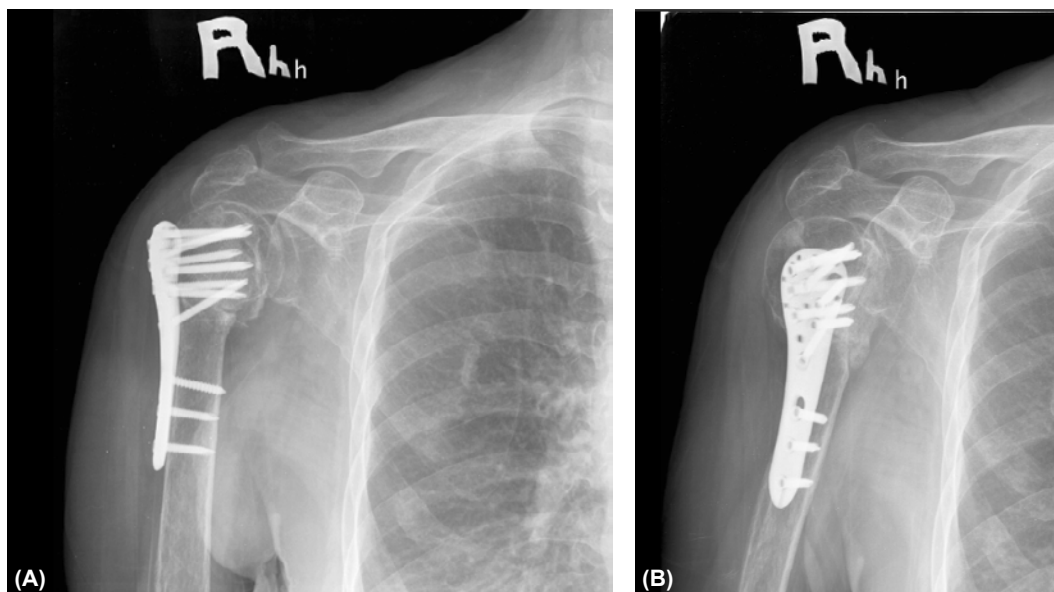


Fig. 3 Two months post-operative radiographs showing good incorporation of allograft with head and shaft fragment and new bone formation. (A) Anteroposterior and (B) lateral view.

properly, with only a fine fracture line visible over the shaft-graft junction (Fig. 3). At 5 months, the right shoulder was pain-free and had regained motion to a 110° of abduction and 100° of forward elevation. Radiographs taken at the time showed complete bony union (Fig. 4).

Discussion

Nonunion of the surgical neck of the humerus is an uncommon condition. It can be divided into two types: nonunion with preserved bone stock, more commonly observed, and nonunion with deficient bone stock, the other rare type which is termed as pseudoarthrosis^[1,2].

Treatment of pseudoarthrosis can be challenging; therefore, several methods of reconstruction were described. Scheck^[4] described a technique of improving fracture stability by impaling the distal fragment into the head followed by tension-band wiring of the rotator cuffs to the shaft and use of a lateral extramedullary strut to enhance overall stability. However, most of these cases needed spica immobilization and secondary implant removal. Neer and Rockwood^[5] reported better union rates with the use of the tension band technique with intramedullary rods to improve stability through fracture site compression. However, 20% of their patients

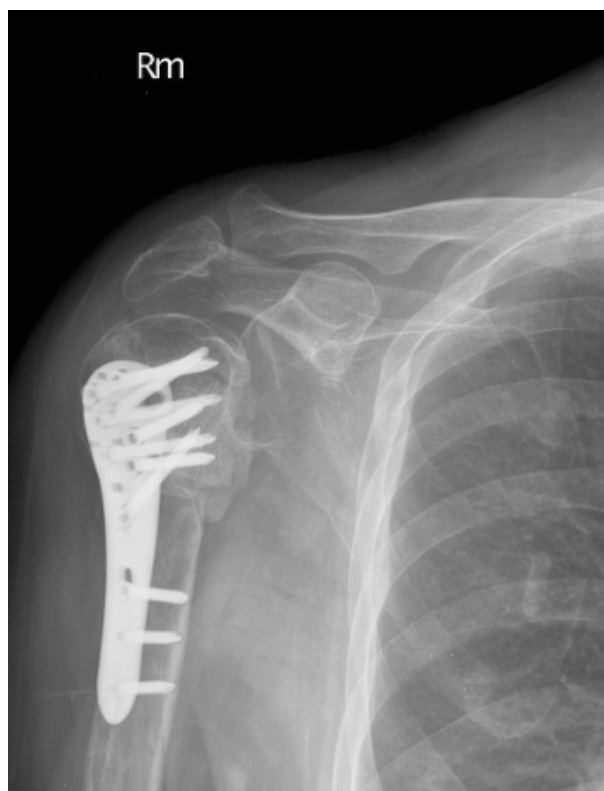


Fig. 4 Anteroposterior right shoulder radiograph taken at 5 months showing complete bony union.

had ongoing nonunion and 80% required hardware removal because of irritation. An intramedullary bone peg technique with a corticocancellous autograft harvested from the patient's iliac crest, anterior tibia, or fibula to supplement fixation was described by Walchet al.^[6]; this technique showed a very high union rate of 96%. However, it was associated with significant donor site morbidity: 50% of the patients developed pathological fracture after bone harvesting from the anterior tibial crest. Some authors used the iliac crest autograft alone, but they also reported a high incidence of donor site morbidity with a significant percentage of the patients experiencing postoperative donor site pain^[8,9,10].

In our case, we used a much more simple technique to treat pseudoarthrosis of the surgical neck of the humerus. The femoral head allograft used provided good medial support against varus collapse of the humeral head, and the construct was further strengthened by the use of a locking plate. The combined allograft and bone marrow aspirate helps promote new bone formation without the associated donor site morbidity secondary to autograft harvesting. However, more cases should be performed to accurately assess the limitations and potential complications of this new technique.

Conclusion

Locking plate fixation combined with femoral head allograft and bone marrow aspirate appears to be a valid option for treating pseudoarthrosis of the surgical neck of the humerus.

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治療肱骨外科頸假性關節的另類方法：病例報告

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摘要

肱骨外科頸假性關節是一種非常罕見的疾病，它包括肱骨外科頸骨折不癒合併骨量的缺乏。治療通常具有挑戰性，文獻中記載了許多手術治療的技術，但每個都有各自的缺點。我們採用了一個新的簡單技術治療肱骨外科頸假性關節且得到不錯的結果，不但骨折處癒合並顯著的改善了病人的臨床症狀。

關鍵詞：假性關節、肱骨外科頸骨折、異體骨、骨髓穿刺、互鎖式鋼板
