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Case Report

Revision of Aseptic Loosening Reverse Baseplate with Glenoid Bone Loss Using Alternative Scapular Spine Line Positioning

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Abstract

The authors present a case of aseptic loosening of a reverse baseplate due to poor positioning, in which the technique used for positioning the new baseplate was an alternative scapular spine line.

Keywords: Revision Arthroplasty; Aseptic Loosening; Shoulder Arthroplasty; Scapular Spine Line

Introduction

Early failure of the glenoid component of reverse shoulder arthroplasty is rare, at 0.74%-1.2%, and this can be influenced by several factors, including rheumatoid arthritis, diabetes, preoperative glenoid bone deformity, and use of non-locking fixation screws [1,2]. In cases with poor spatial positioning of the baseplate, especially involving the placement of the component with an upward inclination, mechanical shear forces can quickly lead to loosening, with consequent bone damage to the glenoid, creating a difficult situation for the surgeon to resolve.

Herein, we present a case of poor positioning of a primary reverse arthroplasty that led to aseptic loosening and rapid deterioration of the glenoid bone stock. The clinical and radiological investigations of this case were authorized by the institutional ethics committee under protocol number 88801225600005331.

Case Report

An 80-year-old male patient presenting with pain and limited range of motion in the right shoulder 3 years after a primary reverse shoulder arthroplasty performed in another hospital was electively examined on January 8, 2021.

Radiographic history evaluation revealed that the patient previously underwent Zimmer® brand Trabecular Metal Reverse Shoulder System® reverse arthroplasty. The baseplate of this system is 28 mm in diameter and is coated with trabecular metal, as well as a 15-mm post. The postoperative radiograph from July 2018 showed that the baseplate component had a significantly superior tilt (Figure 1, yellow arrow). Unfortunately, the incidence of postoperative radiography did not allow measurement of this tilt. Radiography performed in 2020, which is 2 years postoperatively, showed increased superior tilt with loosening of the baseplate and broken screws (Figure 2A). Upon arrival at our hospital, the radiograph performed in 2021 showed a loose baseplate and broken screws and demonstrated significant bone consumption of the glenoid (Figure 2B).

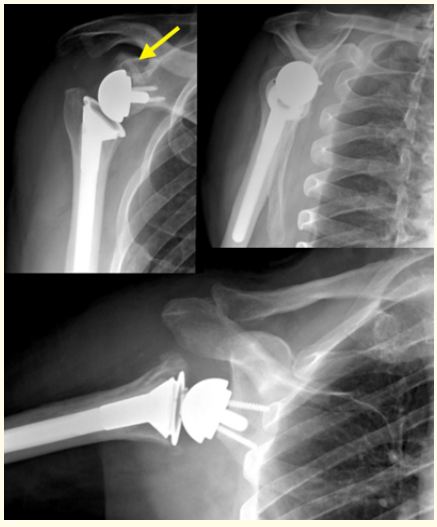

Figure 1: Postoperative radiograph of the right shoulder.

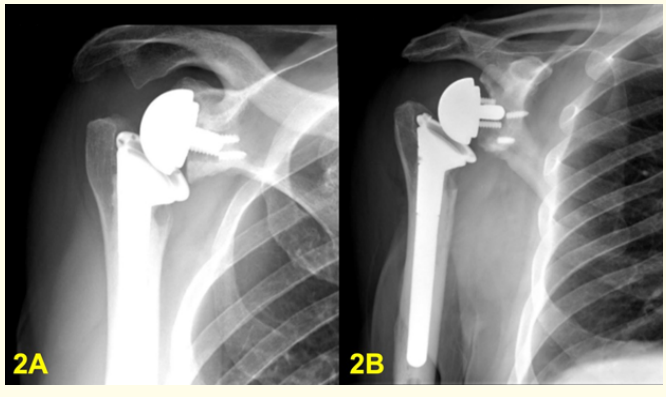

Figure 2: 2A: 2-year postoperative radiograph of the right shoulder in 2020; 2B: 3-year postoperative radiograph of the right shoulder in 2021.

In January 2021, the right upper limb suffered from pseudoparalysis. Limitations to active forward flexion (AFF) of 0°, a negative lateral active rotation (LR) of 10°, a painful medial rotation (MR) bringing the right thumb to the spinous process of L2, and lateral abduction (LA) of 20° were noted.

On February 19, 2021, revision reverse shoulder arthroplasty was performed using the deltopectoral approach in the right shoulder. The humeral component, with a cervicodiaphyseal angle of 127°, was well fixed in a 20-degree retroversion and preserved. The loose base plate and broken screws were then removed. A new Zimmer Biomet® augmented large baseplate was positioned in a location with better bone stock for its fixation using the "alternative scapular spine line" (ASSL) concept (Figure 3). Arthroplasty was stabilized by increasing the thickness of the metal and polyethylene components of the humeral component (Figure 4).

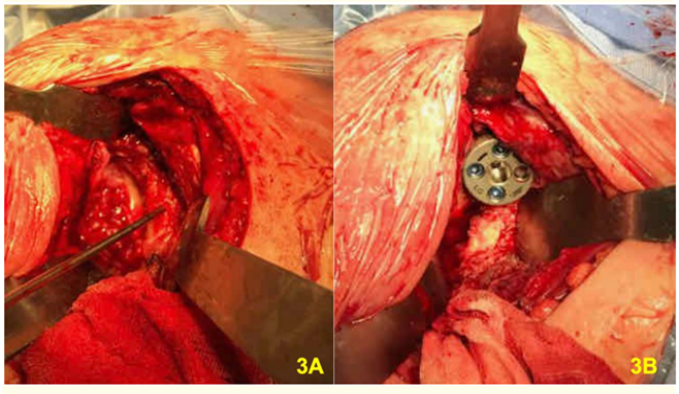

Figure 3: 3A: Central baseplate guide positioned on the alternative scapular spine line. 3B: Baseplate position.

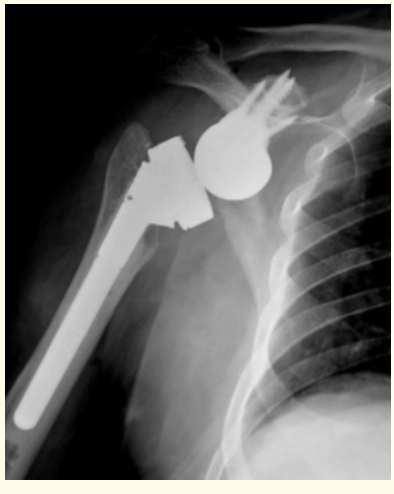

Figure 4: Postoperative radiograph of the right shoulder after revision surgery.

Postoperative management did not differ from that in other operated cases. The patient was immobilized with a sling for 15 days to maintain neutral rotation of the upper limb. Active range of motion exercises were started 15 days postoperatively, and deltoid isometric strengthening exercises and isotonic reinforcement of the scapular stabilizers were started 30 days postoperatively.

Clinical revisions were performed monthly by the surgeon until the sixth postoperative month, after which the patient was instructed to return to the hospital annually for routine visits. Figure 5 shows the function achieved by the patient at the 1-year postoperative follow-up.

Figure 5: One-year functional outcomes of revision surgery.

The last registered elective visit was on February 12, 2025 at 48 months postoperatively (4 years). The patient did not complain of pain and was satisfied with his ability to perform activities of daily living. The range of motion parameters verified at this visit was as follows: AFF of 150°, negative 20° for LR, the right thumb could reach the spinous process of T12 for MR, and an LA of 90° (Figure 6).

At the 4-year postoperative visit, the right shoulder of the patient was tomographically examined to verify baseplate integration, identify early signs of loosening, and measure the angle of the glenoid component in relation to the anatomic centerline of the scapula (Figures 7-9).

Figure 6: Four-year functional outcomes of revision surgery.

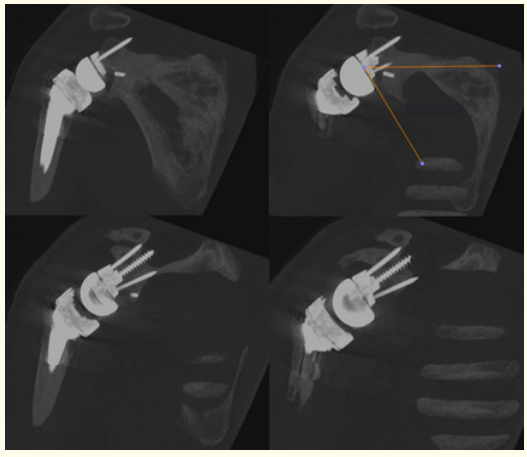

Figure 7: Coronal tomographic sections demonstrating 31° of inferior angulation of the baseplate in relation to the anatomic centerline.

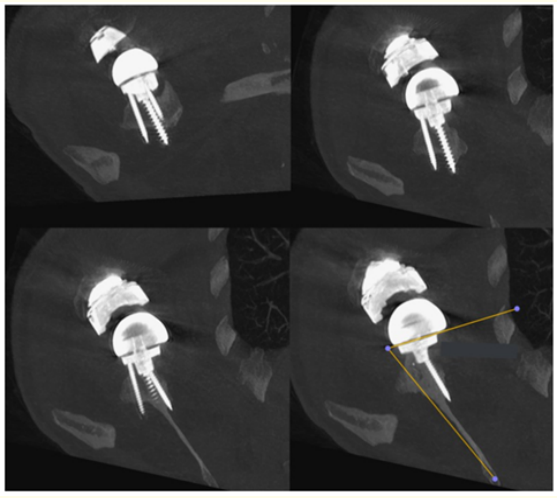

Figure 8: Axial tomographic sections demonstrating 23° of anterior angulation of the baseplate in relation to the anatomic centerline.

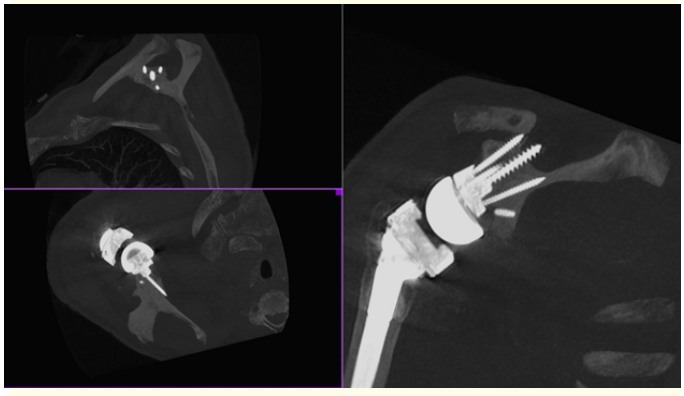

Figure 9: OSIRIX software page with three simultaneous baseplate implantation plans in relation to the alternative scapular spine line.

Discussion

Analysis of the patient's postoperative radiograph suggested incorrect positioning of the reverse baseplate with an upward inclination, although radiographic incidence did not allow the assessment of the exact angle of its placement. An upward inclination of the glenoid component of approximately 20° generally leads to early failure owing to the increase in shear forces acting on component [3]. Thus, the ideal time for performing the revision surgery may have been when early loosening occurred in 2020. At this time, the glenoid bone stock was not completely destroyed. The structural modification of the damage to the glenoid observed in the comparison between the 2020 and 2021 radiographs was very large, which may have been caused by the continued use of the right upper limb, even during prosthetic loosening.

Technical options for revision surgery with glenoid bone loss include the use of bone grafts from a tissue bank, autologous bone grafts, customized baseplates, and positioning of the baseplate in an alternative fixation site.

The use of bone from a tissue bank allows for superior postoperative results in revision arthroplasty with glenoid bone loss, as verified by Frankle., *et al*. [4]. In this particular case, the decision on how to approach bone loss involved was affected by the coronavirus disease pandemic, which interrupted the collection and supply of tissue banks throughout the country. As of January 2021, no studies have reported on the resumption of tissue bank operations in our country.

The decision to use an autologous bone graft from the patient's iliac crest raised concerns regarding donor-site morbidity, available volume, and the quality of the bone to be harvested in the 80-year-old patient [5].

Customized baseplates were not available in our country at that time and are not currently available.

ASSL was used for placement of the new baseplate, as recommended by Klein., *et al.* [6]. In this technique, the baseplate is anteverted on the densest bone in the region where the body of the scapula joins the spine. Klein et al. [6] have demonstrated very good initial fixation in this region, although studies evaluating the durability of the construction are lacking. Colley., *et al*. [7]. have reported no difference in outcomes, range of motion, or complications between reverse shoulder arthroplasties that were positioned using the alternative centerline technique and those that were positioned using the anatomic centerline, with an average radiographic follow-up of 48 months for both groups.

Tomographic examination 4 years postoperatively demonstrated complete integration of the baseplate at the implantation site, without any signs of progression to loosening. The tomographic measurements allowed verification of a 31-degree inferior angulation and a 23-degree anterior angulation of the baseplate in relation to the anatomical centerline. Thus, these angulations may not favor the work of the deltoid lever arm, as ideally recommended for reverse shoulder arthroplasties, and may be responsible for the active external rotation deficit observed in this patient.

Conclusion

Performing revision surgery for aseptic loosening of the reverse arthroplasty was possible by using alternative scapular spine line positioning, thereby achieving good and durable clinical outcomes.

Acknowledgments

Conflicts of Interest: The authors declare no conflicts of interest regarding this study.

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