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Case Report
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# Irritation of the Suprascapular Nerve during Screw Placement in the Glenoid Component Implantation in Reverse Total Shoulder Arthroplasty: A Case Report

*Christopher Child, Laurenz Jaberg, Janic Fischer, JoEllen Welter and Florian Hess**

*Department of Orthopedic Surgery and Traumatology, Cantonal Hospital Frauenfeld, Switzerland*

## Abstract

**Background:** Despite the anatomical risk of suprascapular nerve irritation following reserve shoulder arthroplasty, limited information on the development of this complication has been reported in the medical literature.

**Methods:** In this case report, we describe a 62-year old female patient who presented with inexplicable pain one year after anatomical shoulder arthroplasty. Initial treatment involved conversion to an inverted shoulder prosthesis without changing the stem. However, her pain persisted for two additional years. Multiple diagnostic (radiological and neurological) and therapeutic examinations eventually led to the diagnosis of suprascapular nerve irritation caused by the cranial base plate screw.

**Results:** After a positive diagnostic infiltration of the suprascapular nerve with ropivacaine, we removed the superior base plate screw and exchanged the inlay and glenosphere of the prosthesis. Two weeks after surgery, the patient was free of pain, and six weeks postoperatively, her range of motion had improved substantially.

**Conclusion:** Implantation of RSA components, especially the posterior and superior drilling and extra osseous placement of the cranial base plate screw, risks irritating and damaging the suprascapular nerve. Surgeons ought to use the available tools, like diagnostic infiltration and CT scans, to exclude this type of adverse event when treating patients suffering from persistent postoperative pain following RSA.

**Keywords: Suprascapular nerve; Reverse total shoulder arthroplasty; Iatrogenic nerve injuries; Glenoid baseplate; Scapular notch; Complication**

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***Correspondence:***
*Florian Hess, Department of Orthopedic Surgery and Traumatology, Cantonal Hospital Frauenfeld, Pfaffenholzstrasse 4, 8501 Frauenfeld, Switzerland, Tel: 0041 52 723 77 11;*
*E-mail: florian.hess@stgag.ch*

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## Introduction

Reverse total Shoulder Arthroplasty (RSA) is the preferred method for treating elderly patients with rotator cuff arthropathy with or without symptomatic arthrosis. Most patients who undergo RSA experience significant improvements in shoulder functioning [1]. This procedure, however, has been associated with complications such as dislocation, joint infection, aseptic loosening, acromial insufficiency [2,3], and suprascapular nerve palsy [4,5]. Moreover, the risk of neurological damage is reportedly higher with RSA than anatomical shoulder arthroplasty [6]. Prominent superior and posterior screw placement can irritate or even damage the suprascapular nerve [7]. The suprascapular nerve is responsible for 70% of sensitive innervations of the shoulder joint and motor innervation of the supraspinatus and infraspinatus muscles [8].

When we reviewed the medical literature, we found that most currently available publications were limited to anatomical studies that describe possible injuries to the suprascapular nerve. Only one case report has been published on suprascapular nerve irritation after RSA, despite the apparent anatomical risk posed [5,6,8-11]. In the present case report, we describe the clinical course of a patient with suprascapular nerve irritation at the cranial base plate screw after implantation.

## Case Presentation

A 62-year old female patient with symptomatic omarthrosis on the left side presented to our outpatient clinic. Since the patient's rotator cuff was still intact, we performed anatomical shoulder arthroplasty. She regained full range of motion and was pain-free for nine months.

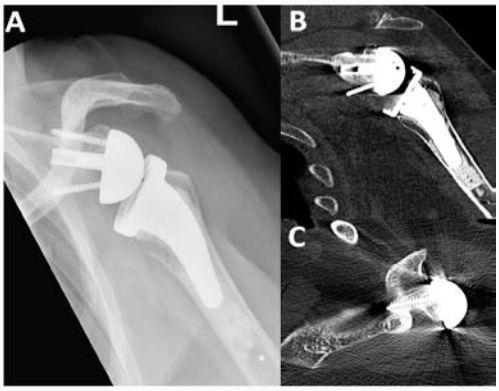


**Figure 1:** Glenoidal screw positioning. Conventional a.p. view of the shoulder after implanted reverse arthroplasty and conversion from an anatomic shoulder arthroplasty (A). The cranial screw runs towards the suprascapular notch. Images B and C provide axial and coronar view using CT scan, which show the penetration of the cranial baseplate screw into the suprascapular notch.

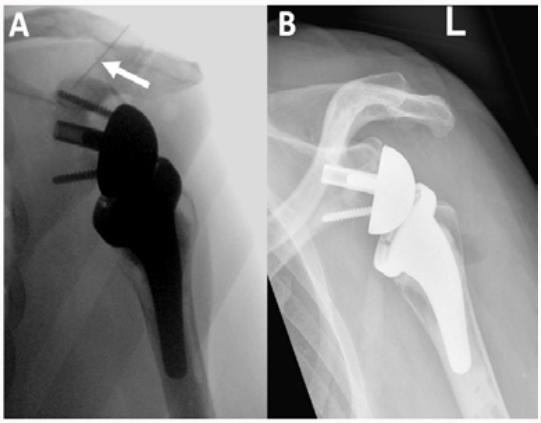


**Figure 2:** Glenoidal screw positioning. (A) Using fluoroscopy, the image shows local infiltration at the tip of the cranial baseplate screw. When moving the needle (white arrow) forward towards the screw tip, the patient complained of intense, neuropathic pain in the dorsocranial area of the shoulder. Five minutes after the infiltration of local anesthesia (ropivacaine), the patient was pain-free. (B) a.p. view after screw removal.

At the one-year follow-up, though, she complained of pain during movement and weight-bearing. MRI and ultrasound imaging indicated a potential supraspinatus tear. We used diagnostic arthroscopy with seven biopsies to confirm the tear and rule out an infection. Intraoperatively the supraspinatus tear included approximately the middle 50% of the width of the tendon. We decided to convert the anatomic prosthesis into inverted shoulder prosthesis without exchanging the stem. Six weeks after surgery, the patient reported constant posterosuperior pain that increased during load and forward flexion. She was given long-term physiotherapy (nine months) focused on the scapulothoracic area. However, the patient's function and pain levels did not improve. The clinical outcomes are summarized in Table 1.

During the next treatment course, we performed a CT scan to exclude an insufficiency fracture, and we carried out neurological assessments with electromyography (EMG) of the suprascapular nerve to check for irritation. An insufficiency fracture could then be excluded, and the neurological exam did not show any pathology of

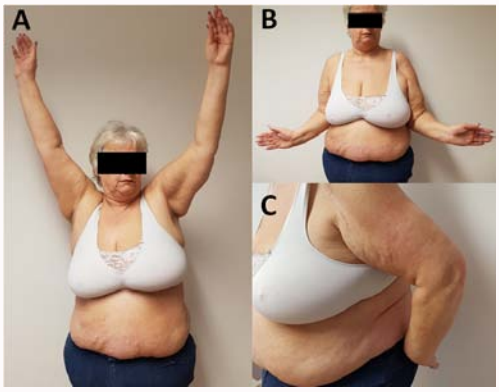


**Figure 3:** Clinical result at the one-year follow-up. Active range of motion one year after revision. The patient was pain-free, had an acceptable anterior elevation (A) and external rotation (B), but a limited internal rotation (C).

**Table 1:** Clinical scores and active shoulder mobility before implantation of RSA, before the revision and after one year.

| Variable | Before RSA | Before revision | One-Year Follow-up |
|---|---|---|---|
| Constant Murley Score | 30 | 9 | 66 |
| ASES | 33.3 | 16.6 | 48.3 |
| Pain (0-10) | 6 | 8 | 0 |
| Subjective Shoulder Value (SSV) | 25% | 10% | 60% |
| **Active Shoulder Mobility** | | | |
| Anterior elevation | 90° | 130° | 145° |
| External rotation | 20° | 30° | 45° |
| Internal rotation | L2 | Gluteal | Gluteal |

the suprascapular nerve. The CT scan revealed, however, prominent placement of the superior glenoid baseplate screw with penetration of the supraspinous fossa (Figure 1). Since the electromyography was negative, we decided against revision surgery.

After two years of conservative treatment, the patient's condition remained unchanged. The disabling pain continued, and she eventually requested a surgical revision of the arthroplasty. Using fluoroscopy in two planes, we performed an infiltration of the suprascapular nerve at the suprascapular notch with ropivacaine 0.5% 10 ml (Figure 2). Since the patient was pain-free for a few hours, we removed the superior baseplate screw and exchanged the inlay and glenosphere of the prosthesis. At this time, we did an intraoperative biopsy (seven samples) to exclude the presence of a low-grade infection. Two weeks after surgery, the patient was pain-free and had an improved range of motion six weeks after surgery. Figure 3 presents the patient's clinical results one year after cranial screw removal.

## Discussion

This case of suprascapular nerve irritation at the cranial baseplate screw after RSA showed that full recovery was possible within six weeks after screw removal and the patient was pain-free after two weeks. Given that RSA is increasingly used to treat various injuries and conditions requiring shoulder replacement, the incidence of complications is likely to rise as well [2,3,12].

Studies on cadavers report an elevated risk of injury to the suprascapular nerve due to its complex anatomy, and although it is a commonly known complication after implantation of an RSA, only

one case has been described in the literature [5-10,13-15]. According to the findings of Kim et al. [16], only two of the 182 patients assessed for neurological injuries after RSA suffered from a postoperative suprascapular nerve injury. Both these patients recovered within seven months after surgery. In our case, only by performing the infiltrations were we able to detect the irritation of the suprascapular nerve. The neurological assessments failed to identify this complication.

Lopiz et al. [17] demonstrated an increased risk of injury to the axillary and suprascapular nerves by measuring changes using electromyography three and six months after implantation of RSA. All their cases were chronic, and most were transitory. When we used electromyography, however, we were unable to detect any noticeable motor or sensory damages, although the nerve was clearly irritated. Likewise, findings from the MRI showed no signs of edema in the supra- and infraspinatus muscles.

By preoperatively using a high-resolution CT scan, Distefano et al. [13] investigated the optimal screw placement of the base plate fixation in RSA. This study, which was carried out on cadavers, showed that the ideal placement for the cranial baseplate screw was lateral or inferior to the suprascapular notch the inferior screw ought to be placed anteriorly into the inferior pillar of the scapula. In our patient, the screw was too superiorly and posteriorly angled, which caused the suprascapular notch to be penetrated. In another study, the authors identified a safe location for the passing of suprascapular nerve to the suprascapular notch at 11 mm, with a mean distance of 16.6 mm to the nerve. They determined this location by analyzing the shoulders of 22 human cadavers [6].

The implantation of the RSA components poses a risk of irritating and damaging the suprascapular nerve, especially during posterior and superior drilling and extra-osseous cranial baseplate screw placement. Given the anatomical complexity of the scapula, extra care should be taken when implanting the glenoid component. Many theoretical and anatomical studies address this topic and potential risks. This risk was also described in Ekelund's review on complication management after RSA [18]. Preoperative assessment of screw angulation and placement of the baseplate can increase precision and help to avoid damage to the suprascapular nerve. As was demonstrated with our case, a negative EMG test result should not be cause for dismissing potential iatrogenic suprascapular nerve irritation.

In the daily practice of shoulder surgeons, we believe it is essential to check the upper screw position and length to prevent irritation to the scapular nerve. This may be done by intraoperative X-rays or three-dimensional planning of the maximum length of the upper screw. A third possible approach would be a navigated screw placement combined with patient-specific instruments.

## Conclusion

In conclusion, we found that only the diagnostic infiltration and CT scans were sensitive enough to diagnose the suprascapular nerve irritation. As such, we recommend these methods when the potential for suprascapular nerve irritation exists. Although this is a relatively uncommon complication, surgeons ought to use the available tools to exclude this type of adverse event when treating patients suffering from persistent postoperative pain following RSA.

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