



## Case Report

# Anatomical Total Shoulder Arthroplasty Despite Subscapularis Deficiency: A Case Report

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### Abstract

Anatomical Total Shoulder Arthroplasty (TSA) for glenohumeral Osteoarthritis (OA) is usually reserved for patients with a functional and intact rotator cuff. In contrast, little is known about TSA in insufficient rotator cuff muscles. We report a case of a 50 years old male patient with painful glenohumeral OA and Goutallier grade IV fatty infiltration of the Subscapularis (SSC) muscle, related to a previous open shoulder surgery over 20 years ago, treated with TSA. To our knowledge, this is the only reported case of a patient with glenohumeral OA and a degenerated SSC muscle managed with anatomical TSA. At two years' follow-up he has a good clinical shoulder function, a stable joint and he is back to all previous activities.

### Introduction

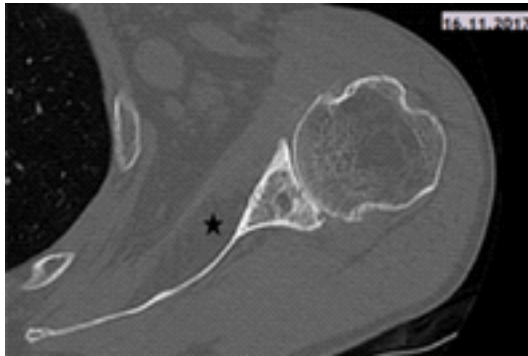
The presence of a functioning rotator cuff is a prerequisite to obtain a good result in anatomical Total Shoulder Arthroplasty (TSA) [1]. In addition to proper component orientation, successful arthroplasty requires accurate restoration of soft tissue forces around the joint to maximize function. The Subscapularis (SSC) muscle plays a key role in shoulder biomechanics. It works as an internal rotator and depresses the humeral head. In addition, it's the anterior component of the glenohumeral force couple and provides anterior shoulder stability [2]. In patients treated with anatomical TSA, postoperatively occurred SSC tendon tears lead to significant weakness in internal rotation strength as well as worse Disabilities of the Arm, Shoulder and Hand (DASH) scores [3]. Fatty degeneration of the subscapularis was found to be a negative prognostic indicator in shoulder arthroplasty performed for primary osteoarthritis (OA) and exhibited a negative influence on the average postoperative scores (pain, mobility, strength, total Constant Score) [4].

### Case Report

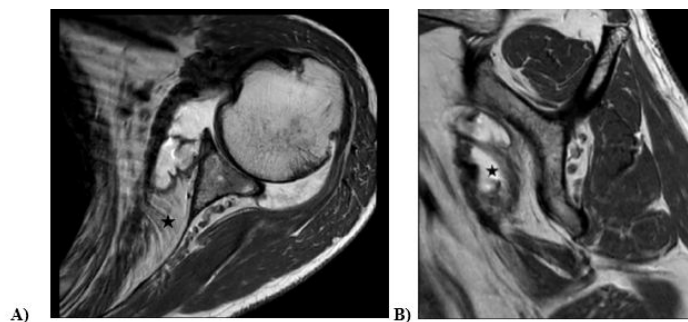
We report a case of a 50-years old labourer with a painful and debilitating secondary OA of the left shoulder and a history of an unknown previous shoulder surgery more than 20 years ago. Conventional X-ray, Computed tomography (CT) and Magnetic Resonance Imaging (MRI) showed fatty infiltration of the SSC muscle Goutallier grade IV [5, 6], but full integrity of the scarred SSC tendon, with otherwise intact rotator cuff tendons (Figure 1-3). Active Range of Motion (ROM) was limited to abduction 90°, flexion 140°, external rotation 40°, and internal rotation until midthoracic spine. The Lift-off test and the Belly-press test were positive, as well as the internal lag sign. The conservative therapy failed, and the pain persisted on a high level and was intolerable for the patient, therefore surgical treatment was required. Because of the young age of the patient, a anatomical TSA was planned and a SSC repair or augmentation with pectoralis major transfer was considered, depending on intraoperative findings.



**Figure 1:** Pre-operative Anteroposterior (AP)- and scapular Y-radiographs of the left shoulder showing a high-grade glenohumeral osteoarthritis.

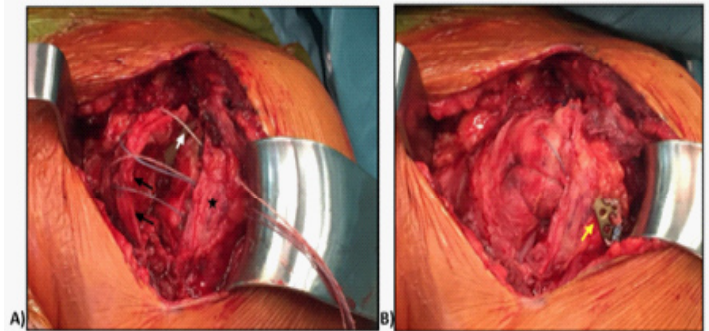


**Figure 2:** Axial Computed Tomography (CT) slice of the left shoulders at the level of the humeral head. Narrowing of the glenohumeral joint as well as fatty infiltration of the SSC muscle (black star) can be observed.

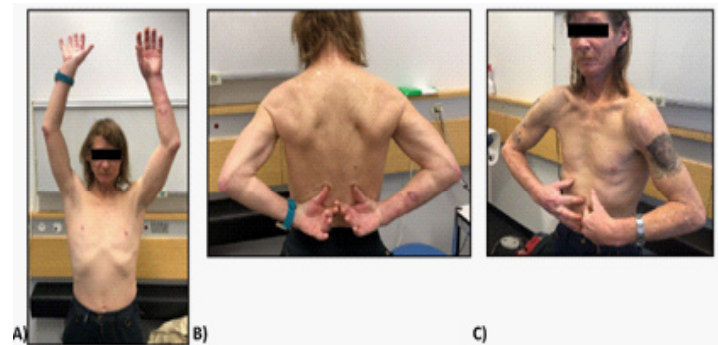


**Figure 3:** **A)** Axial slice of the preoperative Magnetic Resonance Imaging (MRI) of the left shoulders at the level of the humeral head showing again fatty infiltration of the SSC muscle (black star). **B)** Parasagittal view of all rotator cuff muscles shows again fatty infiltration of SSC muscle (black star) Goutallier grade IV.

Intraoperatively, the SSC showed a stable remodelled scar tissue, which correctly inserted to the lesser tuberosity, so we decided against an additional pectoralis major transfer (Figure 4). A stemless TSA (Affinis short, Mathys Ltd., Bettlach, Switzerland) was implanted through a lesser tuberosity osteotomy and transosseous refixation of the scarred SSC using #2 FiberWire (Arthrex, Naples, FL, USA) was performed. One and two years postoperatively, the patient was pain free and back at work, the active ROM was 140° for flexion and abduction, 45° for external rotation and internal rotation was similar to the preoperative finding until the midthoracic spine with a positive Lift-off and Belly-press test (Figure 5). Anterior apprehension sign could not be elicited in the clinical examination. X-rays showed a stable and centered TSA (Figure 6). Constant Score was 87, ASES Score 100 and subjective shoulder value was 100%.



**Figure 4:** Intraoperative view. The images show the SSC remodeled scar tissue (black arrows) after the lesser tuberosity (black star) osteotomy, before (A) and after (B) the transosseous refixation using #2 FiberWire® (Arthrex) (white arrows). In B, the sutures over the Button Plate Reinforcement (DePuy Synthes) for transosseous fixations is shown (yellow arrow).



**Figure 5:** 2 years Follow-up: Flexion 140° (A), internal Rotation until the midthoracic spine (B), positive Belly-press Test (C).



**Figure 6:** 2 years post-operative AP, axial and scapular Y radiographs of the left shoulder show a well-centred glenohumeral joint.

## Discussion

SSC repair, healing, and integrity are described as essential features following TSA to achieve good clinical results. It is known, that open surgeries using a SSC tenotomy may lead to atrophy and fatty infiltration of the SSC muscle, resulting in postoperative SSC dysfunction [7]. SSC dysfunction should be addressed depending on the cause. Primary repair of the ruptured SSC is performed if the tissue is amenable to repair [8, 9]. A pectoralis major or latissimus dorsi tendon transfer or reconstruction with Achilles tendon allograft or hamstring autograft may be used for augmentation of repairs in which the available tissue is inadequate for complete repair [10, 11]. Augmentation of a SSC deficiency can also be performed after initial implantation of an anatomical TSA and shows acceptable clinical results [10].

During surgery for TSA, SSC detachment is needed to visualize the humeral head and for optimal component positioning. The best technique for SSC reattachment during TSA is currently still controversial [12]. SSC tear after TSA and repair of the detached SSC seems to be more frequent than diagnosed with physical exam [3]. Nevertheless, integrity of the SSC repair does not always correlate with the clinical outcome. The results of

our Case Report show that a high-grade fatty infiltration of the SSC in a young patient with glenohumeral OA is not an absolute contraindication for TSA. Despite poor preoperative functional status and SSC muscle fatty infiltration good clinical shoulder function and stability can be achieved at two-years follow-up without the need of a muscle transfer or augmentation, depending on the intraoperative findings. Certainly, the long-term course needs to be followed.

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