



Original article

## ROTATOR CUFF REPAIR IN SHOULDER ARTHROPLASTY WITH REVERSE SHOULDER ARTHROPLASTY

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### ABSTRACT:

This communication aims to present that shoulder arthroplasty has established itself as a treatment method for proximal humerus fractures. The use in clinical practice of the inverted type of shoulder arthroplasty, combined with rotator cuff repair, has expanded the options for surgeons and enabled better clinical outcomes in the treatment of this type of damage.

**Purpose:** Presenting the early results of reverse shoulder endoprosthesis when combined with restoration of the rotator cuff tendons.

**Material and methods:** We present five patients with proximal humerus fractures, in which a humeral reverse endoprosthesis was used, combined with repair and reinsertion of rotator cuff tendons.

**Results:** From the achieved results, the rapid progress in restoring the range of motion in the shoulder joint and the mild limitation of external rotation are impressive, and we rate these early results as very good.

**Conclusions:** We believe that rotator cuff structures restoration is important to ensure the stability of the shoulder joint in reverse shoulder arthroplasty and has a direct relation with the achievement of good clinical results in the early postoperative period.

**Keywords:** Reverse shoulder arthroplasty, rotator cuff, shoulder arthroplasty,

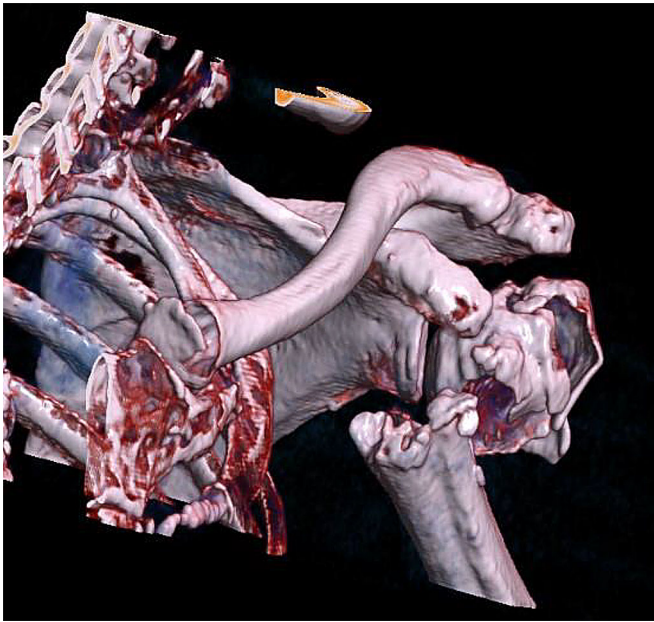
### INTRODUCTION

Shoulder arthroplasty for complicated fractures of the proximal humerus aims to restore the function and stability of the shoulder joint to improve the quality of life and rapid resocialization of patients [1]. Very often, these fractures are combined with damage to the rotator cuff and fragmentation of the proximal humeral diaphysis with the formation of a bone deficit of varying size. [2] The reverse shoulder endoprosthesis was presented by its author Grammont, as an alternative for the treatment of shoulder arthropathy in chronic degenerative rotator cuff injuries. In 2004, it was approved and registered for use in clinical practice by the US Food and Drug Commission. In recent years, there has been an increase in clinical cases of reverse shoulder endoprosthesis in the world and in Bulgaria as the reason for this is the expansion of the medical indications for the application of this system. The choice of surgical access and restoration of the rotator cuff musculature remains debatable [3], as factors influencing the stability of the shoulder joint and the correlation with the achieved clinical results [4]. Opinions in the literature on these issues are quite diverse, and there is no unified doctrine.

### MATERIAL AND METHODS:

For the period 2022 – 2023, 5 patients with proximal humerus fractures were operated on in our clinic, where humeral reverse endoprosthesis was used combined with repair and reinsertion of rotator cuff tendons. This group includes patients with four-fragment and four-fragment fractures-luxations according to the Neer classification. (Fig. 1)

**Fig. 1.** 3D reconstruction of a proximal humerus fracture.



All patients were female, and the average age was 62.4 years. The implant we use is an RSE Delta Xtend with a hydroxyapatite metal glenoid and a cemented humeral stem. The position of patients on the operating table is a beach chair with the possibility of scopic X-ray control. In all patients, we used a deltoid-pectoral approach because, in our opinion, it provides the best opportunity to expose the cavitas glenoidalis, the rotator cuff tendons, and the proximal humeral shaft. After the surgical access, we differentiated and sutured the tendons of the rotator cuff. A key point in reverse shoulder arthroplasty is the correct positioning of the metal glenoid. Its position should be along the lower edge of the glenoid, and its incorrect positional orientation is a prerequisite for the occurrence of scapular notching, impingement and shoulder instability. We performed the metal glenoid implantation according to the surgical technique and its final fixation with four screws. After treatment of the humeral canal, we used a trial humeral stem positionally and rotationally oriented according to the surgical technique. Individually, for each patient, we used trial standard or eccentric glenosphere and the required cup size. Under scopic x-ray control, we performed a trial range of motion testing in the shoulder joint to prevent existing scapular notching and shoulder instability. Positioning the trial humeral stem cranially allows compensation of the accompanying bone defect within 3 cm. After the final implantation of the humeral stem and repositioning of the joint, we reinserted the tendons of the rotator cuff and m.subscapularis through the openings of the humeral stem and bone tunnels. (Fig. 2)

**Fig. 2.** Postoperative radiographic evaluation



Postoperatively, we immobilized the limb with an abduction shoulder brace for 15 days, then we started early dosed rehabilitation of the shoulder joint.

**RESULTS:**

All patients were followed clinically at follow-up examinations at the first, third and sixth months postoperatively. To assess pain and functional satisfaction, we used VAS, and the range of motion (elevation, abduction, internal rotation, and external rotation) was measured and tracked dynamically at each follow-up examination. The clinical results achieved are presented in Table 1.

**Table 1.** Clinical Results

Month:	First month	Third month	Sixth month
Elevation	90°	130°	170°
Abduction	87°	125°	160°
Internal rotation	30°	50°	70°
External rotation	10°	20°	45°
Pain	4	1	0

From the achieved results, the rapid progress in restoring the range of motion in the shoulder joint and the mild limitation of external rotation are impressive, and we rate these early results as very good. (fig.3)

**Fig. 3.** Internal/external rotation at the first follow-up examination.



At follow-up examinations and radiographs, we have had no cases of shoulder instability as well as accompanying vascular or neurological complications.

We believe that reverse shoulder arthroplasty combined with rotator cuff repair allows for shorter postoperative immobilization, early active rehabilitation, and good functional outcomes.

#### **DISCUSSION:**

We discuss the choice of surgical access and the need to restore and reinsert the structures of the rotator cuff [5]. In our opinion, a deltoid pectoral approach is recommended because it is an intraneural approach that allows good exposure and visualization of the proximal humerus and glenoid, dedifferentiation and repair of the tendons of the rotator cuff and correct positioning of the glenoid and humeral implant [6]. At the same time, n.axilaris is protected, and the integrity of m.deltoideus is not violated. The advantages of the deltoid, pectoral approach listed above are directly related to possible postoperative joint instability and poor final results [7]. The anterior-superior approach is an alternative in reverse shoulder arthroplasty that provides good visualization of the glenoid and proximal humerus while preserving the integrity of the m.subscapularis tendon as Molé D et al. stated in their study [8]. As a disadvantage, in our opinion, the integrity of the m.deltoideus is violated in the first place, and

this access creates difficulties in the positioning of the glenoid component in the anterior-inferior aspect of the cavitas glenoidalis. An extensive study by Zumstein MA et al. [9] analyzed 617 cases of using the deltoid-pectoral approach and 137 cases of using the anterior-superior approach and indicated that the anterior-superior approach offered poorer visualization and difficulty in inferior glenoid implant positioning. In the same study, he reported 9% shoulder instability in this series, with a deltoid-pectoral approach used in over 90% of these cases. It has been hypothesized that the cause of this instability in the deltoid-pectoral approach is a weakness of the dynamic stabilizers of the shoulder joint. According to some authors, like Clark et al., there is no significant difference in the incidence of shoulder instability and dislocation comparing patients with and without rotator cuff tendon repair. Similar results were reported by Grassi FA, et al. [10], who reported no dislocation in the series with rotator cuff nonrepair. We believe that the restoration and reinsertion of the rotator cuff structures is a key point in the stability of the reverse shoulder arthroplasty, which also helps to achieve an optimal range of motion because these muscles participate in the scapula-thoracic rhythm and are directly responsible for the abduction, adduction and external rotation of the shoulder joint. On the other hand, reverse shoulder arthroplasty is associated with a change in the rotation center of the shoulder joint, and the restoration of the rotator cuff is a key dynamic stabilizer of the shoulder joint through the generation of compressive forces during an abduction. Our observations have also been confirmed by other authors, such as – Ackland DC, et al. [11].

#### **CONCLUSIONS:**

We believe that rotator cuff structures restoration is important to ensure the stability of the shoulder joint in reverse shoulder arthroplasty and has a direct relation with the achievement of good clinical results in the early postoperative period. Failure to restore it could lead to the development of multidirectional shoulder instability and the need for a subsequent revision surgical procedure.

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