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Mini Review

Surgical Tips for Successful Reverse Total Shoulder Arthroplasty

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Abstract

Reverse total shoulder arthroplasty (RTSA) has continuously evolved into an alternative to total shoulder arthroplasty for various shoulder disorders that cannot be managed with the traditional arthroscopic procedure. The indications have expanded and currently it is being used for multiple diagnoses. It has been developed continuously since original Grammont design, but still there is on debate over which model to choose and which is better. The purpose this mini-review is to describe several surgical tips for RTSA, as range of motion after reverse arthroplasty is not only affected by implant-related factors, but also surgeon's technical factors such as retroversion of humeral component and soft tissue reconstruction like subscapularis repair. In a decision-making process for the successful treatment, it is important to consider various relevant factors and to have enough communication with patients to determine the most beneficial strategy for them.

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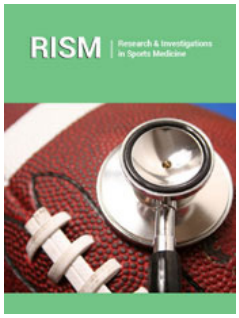

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Introduction

Reverse total shoulder arthroplasty (RTSA) has become a standard treatment for cuff tear arthropathy (CTA) in older individuals. The indications have expanded and currently it is being used for multiple diagnoses including fracture sequelae, revision arthroplasty, instability and tumors as well as CTA and massive rotator cuff tear. Surgical outcomes after RTSA are reported favorably, and RTSA reliably and effectively restores ranges of motion and provides shoulder pain relief. Range of motion (ROM) after RTSA can be influenced by 2 categories of factors: surgical factors that are considered modifiable (version of the humeral component, balancing of soft tissues, and so on) and prosthetic factors that are considered non-modifiable (size of the implant, neck-shaft angle of the humeral component, and so on). Neer suggested that implants with a design that mimicked the normal anatomy would provide the best function and durability. Therefore, many factors are related to restore the normal anatomy during performing RTSA, and the selection of the ideal configuration and placement of the components to optimize shoulder function outcomes remains an issue of debate. So, the purpose this mini review is to describe several surgical tips for successful RTSA.

Surgical Tips for Reverse Total Shoulder Arthroplasty

Since Paul Grammont introduced the biomechanical concept based on the medialization of the center of rotation and the downward translation of the humerus in 1985, RTSA has continuously evolved into an alternative to total shoulder arthroplasty for various shoulder diseases [1]. By medialization of the center of rotation, RTSA minimizes the torque of the glenoid components and recruits more fibers of deltoid muscle to act as the primary elevator of the shoulder, especially in patients with pseudoparalysis. However, this sort of medialized implants has higher incidents of complications, such as scapular notching, which is reported [2,3] as high as 60%, and limited ranges of motions. The recent designs of lateralized components have been used to reduce scapular notching and improve passive internal and external rotation of shoulder. Cuff et al. [4] reported that 96 patients with CTA had observed at least two years after lateralized RTSA and there were no mechanical failures or scapular notching. However, the torque and shear force at the baseplate-glenoid interface increases when using a lateralized glenoid component, it occurs to increase the failure rate of glenoid component [5].

The neck-shaft angle of humeral component can affect the outcomes of the RTSA. The 135° neck shaft angle is more anatomical, less scapular notching, and favorable for passive internal rotation and external rotation, even though the risk of instability [5]. However, original

Grammont's 155° neck shaft angle has good joint stability and is effective for lengthening deltoid muscle and improving ability of forward elevation. However, according to the biomechanical study [6], the 155° neck-shaft angle was more prone to scapular contact during adduction, but was more stable at the internal rotation, which was the least stable humeral rotation position.

Furthermore, although there are still debates on the role of subscapularis repair in RTSA, several previous studies presented similar clinical outcomes regardless of subscapularis repair in lateralized RTSA. Werner et al. [7] reported that ASES scores were significantly less improved in patients who underwent subscapularis repair and glenosphere lateralization. But, Vourazeris et al. [8] reported that primary RTSAs have similar clinical outcome scores, range of motion, strength, and rates of complications, including dislocations with or without subscapularis repair at 3 years of follow-up. Oh et al. [9] reported that there was no significant difference in range of motion and functional scores regardless of subscapularis repair in the lateralized RTSA.

Proper retroversion of humeral component in RTSA is also on debate. Implants with a design which mimicked anatomical position would provide best function and durability and increasing retroversion would lead to higher external rotation and lower internal rotation [2]. Some study had argued that fixed humeral retroversion between 0 and 30 degrees showed no significant differences in RTSA [10]. However, these studies were biomechanical cadaveric or finite element analysis studies, and few studies had compared clinical results of native humeral retroversion to fixed one. We must look at the recent clinical study presented better clinical outcomes including range of motion in the individualized retroversion group than fixed 20° group [9].

By the way, the current RTSA implants are designed for the United States and western European patients. The anatomical differences of the shoulders between Asian and Western populations should be considered. Asians have a smaller glenoid diameter and a larger lateral extension of acromial overhang than the Western population [11]. These anatomical differences might result in different clinical outcomes and complications of RTSA in the Asian population [12], yet there have been no previous studies regarding factors that might affect the results of RTSA in this patient group. Oh et al. [13] investigated radiological factors affecting clinical outcomes, and the deltoid lengthening (mean, 2.3cm) and inferior glenosphere overhang (mean, 2.9mm) should be chosen for the better outcomes, while the center of rotation should be individualized according to patient characteristics in the Korean population.

Conclusion

RTSA is the first-line treatment for elderly patients with cuff tear arthropathy for reduction of pain and restoration of active elevation function, and also can be considered for massive rotator cuff tear with superior migration of the humeral head. For a decision-making process of the successful RTSA, it is important to consider various relevant factors and to have sufficient communication with patients to determine the most beneficial strategy for them.

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