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ORIGINAL ARTICLE

Standard versus bony increased-offset reverse shoulder arthroplasty: a retrospective comparative cohort study

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Background: To date, only a few comparative studies with small sample sizes have compared a traditional reverse shoulder arthroplasty (tRSA) to a bony increased-offset RSA (BIO-RSA). We hypothesized that the BIO-RSA would lead to lower notching rates and improved range of motion (ROM) compared with a tRSA.

Methods: A retrospective review was performed of 69 tRSAs and 61 BIO-RSAs performed by a single surgeon. At 2 years postoperative, ROM and Constant scores were compared. Radiographs were examined for scapular notching, scapular spurring or ossification, and graft healing.

Results: At the 2-year follow-up, the BIO-RSA group demonstrated improved anterior forward flexion compared with the tRSA group ($145^\circ \pm 20^\circ$ vs. $138^\circ \pm 20^\circ$, respectively; $P = .017$). There was no difference in external or internal rotation between the 2 groups. The BIO-RSA group had a higher Constant score than the tRSA group (69 ± 9 vs. 61 ± 13 ; $P < .001$). The radiographs showed no difference between the 2 groups, including scapular notching ($P = .150$).

Conclusion: At the 2-year follow-up, BIO-RSA does not lead to a clinically significant improvement in ROM, Constant scores, or change in scapular notching compared with a tRSA.

Level of evidence: Level III; Retrospective Cohort Design; Treatment Study

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Keywords: Shoulder prosthesis; reverse shoulder arthroplasty; bony increased-offset; BIO-RSA; glenoid and humeral lateralization; range of motion (ROM); postoperative function

The Comité d'Ethique de Recherche Clinique Vivalto Santé approved this study (CERC-VS-2016-07-1).

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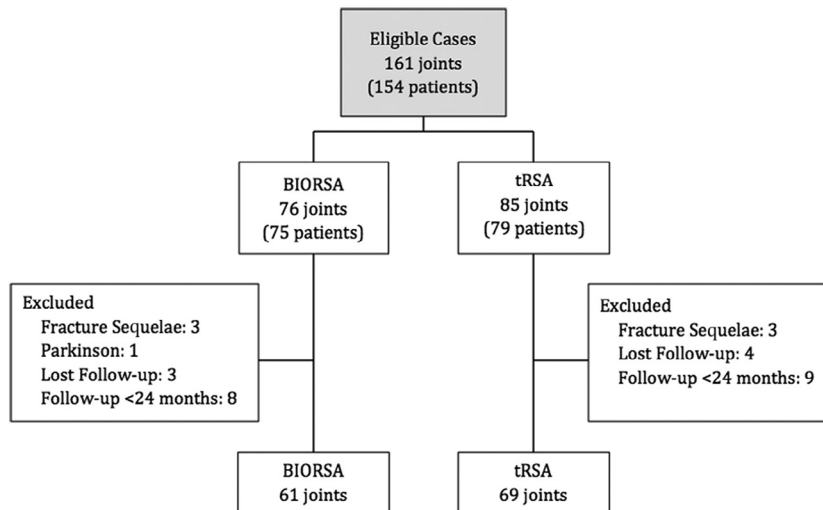


Figure 1 Flowchart of the study. *BIORSA*, bony increased-offset reverse shoulder arthroplasty; *tRSA*, traditional reverse shoulder arthroplasty.

Several problems after reverse shoulder arthroplasty (RSA), including scapular notching, lack of improvement in rotation, instability, and loss of shoulder contour, have been attributed to the medialized glenoid design.^{10,24} To address these problems, some authors have proposed increased glenoid lateralization via bone grafting, termed bony increased-offset RSA (BIO-RSA), or prosthetic lateralization of the sphere or baseplate.^{3,12}

Reported advantages of increased lateralization include decreased scapular notching and improved external and internal rotation.³ However, lateralization may have negative consequences such as decreased mechanical advantage of the deltoid and the need for graft healing in the case of a BIO-RSA. To date, only a few comparative studies with small sample sizes have assessed BIO-RSA compared with the traditional RSA without a bone graft (tRSA).^{1,11}

The aim of this study was to compare the clinical and radiologic results of tRSA to BIO-RSA. The hypothesis was that patients with BIO-RSA would have decreased scapular notching and improved range of motion (ROM) and functional outcome.

Materials and methods

Study design, study population, and data collection

A retrospective review of prospectively collected data was performed of RSAs performed at a single institution between November 2009 and October 2013 to compare tRSA with BIO-RSA. Inclusion criteria were a primary RSA with a minimum follow-up of 2 years. Patients with fracture sequelae, history of infection, or presence of neurologic problems, such as Parkinson disease, or glenoid bone loss were excluded. Bone loss was excluded because inclusion would have prevented analyzing the effect of lateralization. Effectively, the goal of the study was to compare standardized

surgeries with no or 10 mm of glenoid lateralization. The flowchart in Fig.1 shows the patient selection.

Surgical technique

All operations were performed by an experienced^{13,22} shoulder surgeon (P.C.) who had performed more than 250 RSAs before the study period. During the study period, a change occurred in technique for treatment of the glenoid. From November 2009 to June 2011, all patients were treated with a tRSA. The BIO-RSA technique was then adopted, and this was the standard approach for RSA from July 2011 to October 2013. The Aequalis Reversed shoulder prosthesis system (Wright Medical, Montbonnot, France) was used for both the tRSA and the BIO-RSA.

A standard deltopectoral approach was used. The only difference between the 2 procedures was the BIO-RSA addition of harvesting of a 10-mm humeral head autograft and application to a 25-mm-long post baseplate (rather than a 15-mm post in the tRSA) before placement in the glenoid.³ A 29-mm Aequalis Reversed circular baseplate was implanted at the inferior edge of the glenoid surface, and a centered 36-mm glenosphere with a center of rotation at the glenoid surface was placed over the baseplate. All humeral stems had a neck-shaft angle of 155° and were cemented after insertion of a cement restrictor plug.

Postoperatively, the arm was placed in a sling for 4 weeks. Passive elevation and external rotation were allowed immediately after the operation.¹⁵ After 4 weeks, the sling was discontinued, and active ROM was initiated.¹⁸ Activities of daily living were progressed, but strengthening was not specifically recommended.⁴

Clinical evaluation

Baseline characteristics recorded included age, gender, and limb dominance. All patients in both groups were examined preoperatively and 2 years postoperatively. Shoulder ROM and Constant score were evaluated by an examiner (S.G.) independent of the operating surgeon.⁶ ROM was assessed on a video recorded physical examination. Active forward flexion in the plane of the scapula and external

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