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Letter to the Editor regarding: "Clinical results of bony increased-offset reverse shoulder arthroplasty (BIO-RSA) associated with an onlay 145° curved stem in patients with cuff tear arthropathy: a comparative study"

To the Editor:

We read with much interest the article titled "Clinical results of bony increased-offset reverse shoulder arthroplasty (BIO-RSA) associated with an onlay 145° curved stem in patients with cuff tear arthropathy: a comparative study."[7] The article is a retrospective analysis of 79 primary reverse shoulder arthroplasties (RSAs) with a lateralized onlay 145° curved stem performed with and without additional bony glenoid lateralization (BIO-RSA). Patients were operated on between July 2014 and December 2015 for cuff tear arthropathy (CTA). At a mean follow-up of 24.9 ± 1.4 months, this study showed no significant difference in functional results between patients who underwent RSA and those who underwent BIO-RSA. In addition, the authors did not find any statistically significant differences in scapular notching rates between the 2 groups (17.2% in the RSA group vs. 13.3% in the BIO-RSA group).

They stated in their introduction that "the humeral lateralization can be achieved in different ways; the most common is to use stems with a neck-shaft angle of <155°," and they conclude from their series that "humeral lateralization alone is sufficient to decrease notching and to improve external rotation."

There appears to be a confusion in this article between the effects of humeral lateralization and of humeral neck-shaft angle (NSA). Indeed, the modification of the NSA only leads to a very minimal change in humeral lateralization, which can very easily be calculated as shown in Figure 1. According to this formula, shifting the NSA from 155° to 145° with a 36-mm glenosphere only increases the lateral offset by 2.72 mm whereas the specific stem used in the study by Franceschetti et al leads to a humeral lateralization of 10.7 mm compared with a Grammont stem.[16]

Humeral lateralization in RSA is not mainly due to changes in the NSA but to modifications of the shape of the stem (using a curved stem instead of a straight stem) and to using an onlay construct instead of an inlay design.

Humeral and glenoid lateralization have both common and specific theoretical effects that need to be clarified. The common effects are the effects related to bringing the lesser and greater tuberosities back to a more anatomic position than with a standard Grammont medialized design. These include (1) improvement of the length/tension curve of the remaining cuff[6]; (2) increased resting tension of the remaining cuff and of the deltoid, thus increasing the compressive forces on the joint and thereby improving joint stability[2,8,10,13]; and (3) restoration of the wrapping angle of the deltoid.[14]

However, glenoid lateralization has specific effects that cannot be obtained solely by humeral lateralization as opposed to what is described in the conclusion from the article by Franceschetti et al. In terms of lateralization, indeed, only glenoid lateralization can (1) reduce scapular notching[1,11,15] and (2) improve impingement-free motion.[9,12] A design with a more vertical polyethylene opening angle (135° vs. 155°) will decrease impingement-free range of motion and notching not due to a major change in humeral lateralization but to less contact between the medial polyethylene and the scapula. As lateralizing as the stem may be, the contact zone between the scapular pillar and the humeral polyethylene tray will always remain in the same position; thus, scapular notching cannot be decreased by humeral lateralization. This contact zone can only be influenced by 4 factors: (1) the location of the center of rotation of the glenosphere relative to the glenoid bone, (2) humeral NSA, (3) the shape of the scapular pillar, and (4) the shape of the scapular neck, which can be elongated by a glenoid bone graft.

In the study mentioned above, a curved onlay stem was used. This stem design does lateralize a fair amount, and we agree that this lateralization may be enough to restore appropriate length and tension of the remaining cuff. In this setting, the effect of an additional bone graft (BIO-RSA)

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may be too minimal in comparison to the lateralization provided by the humeral stem to influence postoperative range of motion, as observed in the study. However, as opposed to humeral lateralization, the 145° NSA of the stem, compared with a 155° Grammont, does provide effects similar to those of glenoid lateralization as it pushes away the polyethylene humeral bearing from the scapular pillar. This can explain the low notching rate of 16.95% observed in this study. Nevertheless, theoretically, glenoid lateralization should provide an additional beneficial effect on scapular notching by increasing the distance between the scapular pillar and the polyethylene humeral bearing even further. This might explain the difference observed in notching rates in both groups: 17.2% in the standard RSA group vs. 13.3% in the BIO-RSA group. With the numbers available, this difference may not have reached statistical significance, but both groups have not been controlled for the shape/type of scapular neck, which might be a confounding factor, and this study may be underpowered to show a significant difference in notching rates.

Finally, although the negative clinical effect of scapular notching has been unclear for a long time, results from a recent long-term study by Favard et al[4,5] have shown very clearly the relationship between scapular notching and glenoid loosening. Similarly, Ernstbrunner et al[3] have demonstrated that patients with grade 2 or greater notching had worse Constant scores, worse range of motion, and more pain. We, therefore, believe that scapular notching must be considered as a complication with adverse consequence, and not merely an irrelevant radiographic observation.

We, therefore, disagree with the statement of the article regarding humeral lateralization as sufficient alone to decrease notching. In fact, as observed in this study, glenoid notching is decreased by a humeral neck-shaft angle at 145°. Some amount of glenoid lateralization is probably useful and may be necessary to reduce it further. However, care must be taken when combining both glenoid and humeral lateralization not to lateralize excessively and overstuff the shoulder joint.

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