

# Editorial Commentary: Rotator Interval Closure of the Shoulder Continues to Be a Challenge in Consensus on Treatment



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**Abstract:** In discussions of repair or plication of rotator interval capsular tissue and the respective surgical techniques, there is great variability in the procedures used to accomplish this, as well as a lack of consensus in defining rotator interval closure and the complex associated anatomy. The concept of rotator interval closure and how it is performed has shown wide variation and numerous definitions. In the future, it is recommended that one truly define what type of closure is performed, what tissues are imbricated, and where these tissues are imbricated, because both medial and lateral imbrications around the joint can have significant differences in terms of rotation, stability, and overall efficacy. Through this work, we can improve diagnostic capabilities, as well as examination capabilities, and better delineate the overall rotator interval closure procedure based on diagnostic and clinical findings. In this manner, we will be better able to define when rotator interval closure is necessary and most beneficial to patients. In our opinion, clinical indications for rotator interval closure are as follows: (1) multidirectional instability with increased capsular volume, (2) anterior instability—and especially a failed arthroscopic instability repair—that could benefit from imbrication of the coracohumeral ligament, (3) a sulcus that persists in external rotation in the setting of symptomatic instability, and (4) posterior instability with a multidirectional component.

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Coughlin, Bullock, Shanmugaraj, Sell, Garrigues, Ledbetter, and Taylor<sup>1</sup> should be congratulated for their work, “Outcomes After Arthroscopic Rotator Interval Closure for Shoulder Instability: A Systematic Review,” regarding providing a thorough synthesis of the available literature looking at outcomes of shoulder instability specific to the rotator interval (RI). In addition, they sought to report the differences in technical descriptions as well as surgical indications for this procedure. As one might expect, only 15 studies met the overall search criteria, with a total of 524

patients. Unfortunately, the authors found that the overall indications for rotator interval closure (RIC) were not consistently reported, including limited information on history and physical examination, and that the surgical techniques used a variety of methodologies. The overall conclusion was that the heterogeneity of these outcome measures, as well as the multiple differences in the type of closure, surgical technique, indications, type of patient, and type of instability, made it difficult to provide definitive conclusions regarding when RIC may be beneficial for patients. Although the conclusion of this systematic review is not surprising, it does underscore the importance of improving our diagnostic capabilities, examination, history, and surgical techniques to clearly define when this potentially important adjunct of RIC can be beneficial for patients.

In discussions of repair or plication of RI capsular tissue and the respective surgical techniques, there is great variability in the procedures used to accomplish this, as well as a lack of consensus in defining RIC and the complex associated anatomy. The role of the RI in

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The authors report the following potential conflicts of interest or sources of funding: M.T.P. receives royalties from and is a consultant for Arthrex; receives royalties from SLACK; and is a consultant for the Joint Restoration Foundation (Allosource). Full ICMJE author disclosure forms are available for this article online, as [supplementary material](#).

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0749-8063/18896/\$36.00

<https://doi.org/10.1016/j.arthro.2018.08.047>

shoulder instability remains at issue. Defined as the tissue between the supraspinatus (SS) and subscapularis (SSc) tendons, the RI is composed of several anatomic structures, including the coracohumeral ligament (CHL), superior glenohumeral ligament, and joint capsule.<sup>2</sup>

### What Is an RIC?

Although there has been previously published literature on the routine plication of the RI for the treatment of posterior and multidirectional instability, as well as challenging instability,<sup>3</sup> there are numerous techniques that have been attempted for RIC. We would be remiss if we did not start with the important findings of Harryman et al.<sup>3</sup> that showed how a medial-to-lateral open RIC can help specifically with inferior and posterior instability of the shoulder. However, it should be noted that this RIC technique is a medial-to-lateral open shift, which takes advantage of the CHL, which helps stabilize the shoulder inferiorly, as well as some component posteriorly. The CHL rises from the base of the coracoid and attaches at the top of the lesser tuberosity, and it is a very important overall structure, especially in static inferior stability of the shoulder. This open technique, however, was extrapolated to what was performed arthroscopically. Unfortunately, there were erroneous conclusions made when an arthroscopic approach was performed for RIC using the open work of Harryman et al.<sup>3</sup> with an open medial-to-lateral shift and actual imbrication of the CHL, as well as the RI capsular structures. When using the arthroscopic technique, most authors performed a superior-inferior shift of the RIC.<sup>4,5</sup> This is not the same in its vector, nor is it the same direction advocated by Harryman et al.<sup>3</sup> In addition, Huffman et al.,<sup>6</sup> in a cadaveric study, actually looked at an arthroscopic technique that would provide improvement in posterior and inferior stability of the shoulder with anchor imbrication of the CHL to the humerus and shortening of the CHL. This did provide very beneficial inferior as well as posterior translation in a cadaveric biomechanical model. Moreover, it has been shown that open and closed arthroscopic techniques for RIC are not the same and that an RIC performed in a superior-to-inferior fashion with imbrication of the SS and SSc may not provide posterior or inferior stability of the shoulder joint because one is not truly shortening the CHL in a medial-to-lateral (east-to-west) direction.<sup>2,7</sup>

Thus, the concept of RIC and how it is performed has shown wide variation and numerous definitions. In the future, it is recommended that one truly define what type of closure is performed, what tissues are imbricated, and where these tissues are imbricated, because both medial and lateral imbrications around the joint can have significant differences in terms of rotation, stability, and overall efficacy.

### What Are the Clinical Indications for RIC?

The clinical indications for RIC are still not fully defined at this point. However, several authors have advocated performing RIC with a superior-to-inferior arthroscopic closure, imbricating the SS to the SSc and subsequently tightening down the RI.<sup>8,9</sup> This technique is specific to multidirectional instability patients or posterior instability patients and has produced overall reasonable results, as this systematic review has shown.<sup>1</sup> However, patients with the following findings should be referred to undergo RIC based on clinical experience:

- In patients with multidirectional instability, RIC can be performed to decrease overall capsular volume.
- RIC can be performed in patients with anterior instability who have a challenging anterior shoulder condition, and imbrication of the CHL could be used because there is a significant anterior-inferior component to the instability, as well as associated hyperlaxity of the joint especially inferiorly. This could also potentially be performed in failed anterior instability cases because an RIC has been shown biomechanically and clinically to improve anterior instability outcomes in these select patients.
- Patients who have a sulcus sign of the shoulder with the arm in adduction that persists in external rotation, as well as patients who have a sulcus sign that persists in external rotation with the arm at the side and have symptomatic shoulder instability, are candidates for RIC.
- RIC can be performed in certain cases of posterior shoulder instability. Although an arthroscopic closure was not believed to benefit such patients, there may be some cases in which there is hyperlaxity in the setting of posterior or posterior-inferior instability for which an RIC could be beneficial.

Regarding the appropriate context for either open or arthroscopic RIC, it is imperative to discuss which situations and anatomic conditions necessitate closure of the RI. We concur with statements made in the systematic review at hand saying that there is inconsistency in reporting of indicating factors, as well as an overuse of ambiguous language when reporting diagnostic methods. Although there is an absence of reliable intra-articular examination methods to determine a clear definition of a pathologic RI, lesions of the biceps pulley suggest some degree of RI structural incompetence.<sup>3</sup>

The “circle concept” of the shoulder was first introduced in an abstract by Warren et al.<sup>10</sup> in consideration of RIC in the setting of instability. This concept is founded on the assumption that capsular injuries that occur on one side of the shoulder in the setting of glenohumeral dislocation also occur on the corresponding, opposite side. Thus, the circle concept was

put forth to identify patients with posterior instability or posterior multiple subluxations who likely have incompetence of the RI. However, this has been refuted by Weber and Caspari,<sup>11</sup> who dislocated shoulders posteriorly in a cadaveric model and did not find any RI lesions. Certainly, there remains controversy in terms of what happens in posterior instability, but the aforementioned recommendations would address this, especially in a laxity situation.

Regardless, the challenge of determining when RIC should truly be performed and how to do so remains. In patients with significant multidirectional instability or laxity, it is clear that the open approach of Harryman et al.<sup>3</sup> described in 1992 has stood the test of time and is truly the gold standard for RIC. The work of Coughlin et al.<sup>1</sup> in the current article is important to help highlight how we can improve diagnostic capabilities, as well as examination capabilities, and better delineate the overall RIC procedure based on diagnostic and clinical findings. In this manner, we will better be able to define when RIC is necessary and most beneficial to patients.

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