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Do corticosteroid injections compromise rotator cuff tendon healing after arthroscopic repair?

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Background: Rotator cuff tears are associated with capsular contraction and stiffness that should be restored before surgical repair. Corticosteroid injections (CSIs) are frequently used as conservative treatments before surgical repair. This study aimed to determine the influence of preoperative and postoperative CSIs on clinical and anatomic outcomes after rotator cuff repair.

Methods: The authors analyzed the records of 257 patients who had arthroscopic rotator cuff repair, of whom 212 were evaluated at 3.1 ± 1.0 years (median, 2.9 years; range, 1.4-7.1 years) by clinical (Constant score) and ultrasound (Sugaya classification) examinations. Univariable and multivariable regressions were performed to determine associations between outcomes and administration of preoperative and postoperative CSIs, patient characteristics, and tendon characteristics.

Results: The Constant scores improved from 56.4 ± 15.1 to 80.8 ± 12.5. Multivariable regression confirmed that postoperative scores were associated with postoperative CSIs ($P < .001$), preoperative scores ($P < .001$), gender ($P < .001$), and fatty infiltration ($P < .005$). Retears (Sugaya types IV-V) were observed in 27 shoulders (13%). Multivariable regression clarified that retear rates were associated only with postoperative CSIs ($P = .007$) and stage 3 fatty infiltration ($P = .001$). Adjusting for confounders, an additional postoperative CSI would decrease scores by 4.7 points and double retear risks.

Discussion: Preoperative CSIs had no influence on clinical scores and retear rates, whereas postoperative CSIs were associated with lower scores and more retears. Although we can infer that preoperative CSIs do not affect outcomes, we cannot determine whether postoperative CSIs compromised outcomes or were administered in patients who had already poor outcomes. Our findings may resolve controversies about the administration of preoperative CSIs.

Symptomatic rotator cuff tears, characterized by pain and loss of strength, are frequently associated with capsular contraction that reduces shoulder mobility.[53] The consequent stiffness should be restored before surgical repair to optimize postoperative outcomes.[10,42,54] Therefore, combinations of physical therapy and corticosteroid injections (CSIs) are frequently used in conservative treatments[4,34] and have been shown to relieve pain and to recover passive mobility in 80% of stiff shoulders,[7,9,20,35,40,47] within 12-16 weeks.[1,14,27] Furthermore, some studies demonstrated that CSIs could be effective to relieve persistent pain and to reduce stiffness after rotator cuff repairs,[22] although their efficacy and safety remain debatable.[46]

The benefits of CSIs must be balanced against their potential harms, reported in laboratory and animal studies.[5,28,31,45,50,52] Whereas biopsy studies revealed that CSIs could reduce microvascularization at the rotator cuff footprint[8] and decrease cell proliferation,[13] other studies reported no deleterious effects.[6,17,33] The controversy led to more cautious use of CSIs in the clinical setting, for example, to improve needle positioning using radiology-assisted techniques.[15,24,32,37,41] The use of CSIs before or after rotator cuff repair therefore remains controversial in the absence of sizable comparative studies,[31] and patients are often concerned that CSIs could compromise tendon integrity.

The purpose of this study was therefore to evaluate the influence of preoperative and postoperative CSIs on clinical scores and tendon healing after arthroscopic rotator cuff repair. The hypothesis

The Institutional Review Board of Centre Osteoarticulaire des Cèdres (Grenoble, France) approved this study in advance: No. COAC 2007-03. All patients provided their written informed consent.

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was that administration of CSIs before or after surgery will be significantly associated with lower clinical scores and greater retear rates.

Materials and methods

Study design

The authors retrospectively analyzed the records of 257 patients who had arthroscopic rotator cuff repair by the senior surgeon (J.B.) between January 2007 and June 2010. The surgical technique remained unchanged during the inclusion year period as neither new equipment nor new strategies were introduced. The global clinical and radiographic outcomes of this series were recently published.[3] The inclusion criteria were full-thickness tears repaired by double-row suture technique and complete clinical and ultrasound evaluations at a minimum follow-up of 1 year. The exclusion criteria were partial-thickness tears (n = 4), revision cases (n = 9), Hamada stage >2 (n = 9), and concomitant surgery on the ipsilateral shoulder (n = 11). Of the 224 patients included, 8 (3.6%) did not have ultrasound evaluation at 12 or more months, 3 (1.3%) were excluded because they had subsequent surgery on another joint, and 1 (0.4%) died before the end of the follow-up period (Fig. 1). The remaining 212 patients were assigned to 1 of 4 groups according to whether they received at least 1 CSI preoperatively, postoperatively, or both (no-CSI, pre-CSI, post-CSI, or both-CSI).

Preoperative evaluation

Patients were evaluated clinically using the absolute Constant score and radiographically using computed tomography arthrography or magnetic resonance imaging (MRI) to assess muscle fatty infiltration (modified Goutallier classification[16,18,51]); tendon tear size and retraction were assessed following the classification of Patte.[38] In all cases, fatty infiltration of the supraspinatus muscle was considered the reference as it was the most frequently torn rotator cuff tendon (>80%). The use of different imaging modalities may represent some bias, but recent articles indicate that equivalent assessment of fatty infiltration could be archived using either computed tomography arthrography or MRI.[30,35]

Surgical technique

All operations were performed with the patient in the beach chair position, under general anesthesia and interscalene block. Intraoperative diagnosis of rotator cuff tears was confirmed after excision of the inflammatory subacromial bursa, and tear size was measured. The intraoperative torn tendon was noted as "healthy" if it appeared normal or "degenerated" if it was delaminated, thinned, or cleaved. Depending on tear size, 2-4 triple-loaded 5.5-mm bioabsorbable anchors (Bio-Corkscrew FT; Arthrex Inc., Naples, FL, USA) were used for the double-row repair. The bursa and synovitis were then cleaned in the subacromial space; the rotator cuff was reduced by tightening the lateral row, and the footprint was covered by a medial row suture.

Postoperative rehabilitation

Passive motion exercises were initiated on the first postoperative day, and the arm was supported in a 20° abduction sling during the first 6 weeks; if possible, hydrotherapy was attempted after skin healing. Active shoulder motion was allowed after 6 weeks; active passive motion was started earlier according to the preoperative tear size. Patients were not allowed to perform any strengthening or strenuous work for 6 months after the operation. Light sports and demanding activities were allowed after 6 months.

Postoperative assessment

Patients were evaluated at a minimum follow-up of 12 months. A single blinded clinician (L.B.) who did not perform the operation collected the absolute Constant score.[11,12] The integrity of the repaired rotator cuff was assessed using ultrasound, which was recently adapted from the MRI classification of Sugaya et al,[3,49] and regrouped as either intact (types I-III) or retorn (types IV and V). The ultrasound assessments were performed by a blinded radiologist (R.B.) using a linear transducer set at either 7-11 MHz for heavier morphotypes (deep penetration but lower spatial resolution) or 14-18 MHz for lighter morphotypes (shallow penetration but higher spatial resolution) and a Xario SSA-660A and SSA probe with precision 660 LG (Toshiba Medical Systems, Otawara, Japan). During the ultrasound assessment, the patients were seated with the

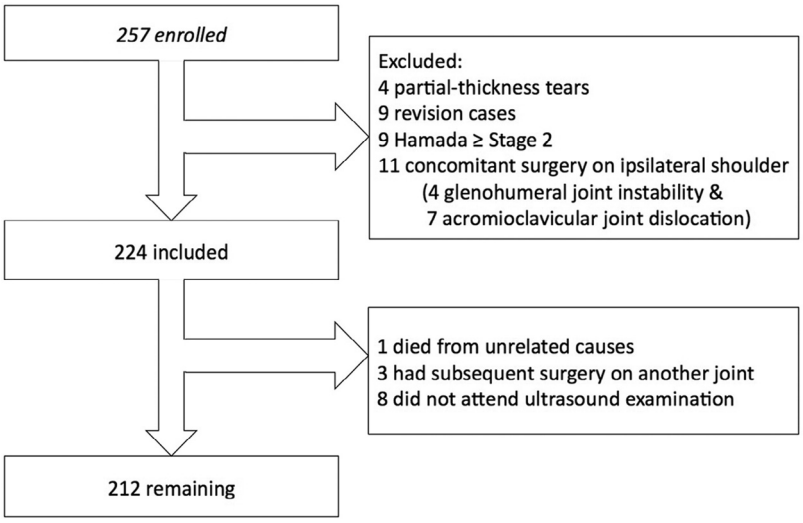

Figure 1 Flow chart of patient inclusion and enrollment with details for those who were excluded.

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