

# Editorial Commentary: “Doctor, Are You Sure the Steroid Injection Won’t Harm My Shoulder?” Perhaps We Should Stop Injecting Corticosteroids and Just Repair Those Rotator Cuffs



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**Abstract:** Analysis of insurance records indicates that 2 or more corticosteroid injections before rotator cuff repair could triple the odds of revision. The cause-and-effect relationship cannot be ascertained because it remains unclear whether steroids worsen outcomes or are injected in shoulders that are worse to start with. Registry studies cannot adjust for lesional determinants of prognosis and should be interpreted with caution to avoid depriving patients from safe and simple treatments to delay or circumvent surgery. The risks of corticosteroids could be mitigated using radiographically guided infiltration and, ultimately, by rapid surgical repair in young patients before the advent of fatty infiltration and tendon retraction.

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**A**t last we have what many of us have long waited for: A nationwide investigation of the potential risks of shoulder corticosteroid injections (CSIs) before rotator cuff repair (RCR). The outstanding study of Desai, Camp, Boddapati, Dines, Brockmeier, and Werner,<sup>1</sup> entitled “Increasing Numbers of Shoulder Corticosteroid Injections Within a Year Preoperatively May Be Associated With a Higher Rate of Subsequent Revision Rotator Cuff Surgery,” addresses the issue using big data, from both public and private insurance records, and with sophisticated statistics. The authors found that patients who had 2 or more shoulder CSIs in the year before RCR were nearly 3 times more likely to require revision surgery. The cohort sizes are compelling (110,567 and 12,892), the differences in revision rates are substantial (3.4%-3.8% vs 7.0%-9.4%), and the findings are consistent across public and private databases. Although the authors acknowledge that they could not establish causality, their findings could easily be seen as “undisputable evidence” of the harms of

subacromial CSIs and potentially deprive patients from a conservative treatment that could well delay or completely circumvent surgery.

Combinations of CSIs and physiotherapy are often prescribed in symptomatic shoulders<sup>2,3</sup> and have been shown to relieve pain and alleviate stiffness in 80% of patients<sup>4-7</sup> within 3 or 4 months.<sup>8, 9</sup> CSIs are also used to treat pain and stiffness following RCR,<sup>10-12</sup> although some studies reported that they are associated with worse outcomes<sup>13</sup> because of apoptosis at the injection site,<sup>14</sup> and decreased microvascularisation,<sup>15</sup> cell proliferation,<sup>16</sup> and pull-out strength of suture anchors.<sup>17</sup>

There is no consensus at present regarding the dosage or timing of CSIs, and the guidelines of the American Academy of Orthopaedic Surgeons remain inconclusive, deferring the choice to the discretion of clinicians.<sup>18-20</sup> The dilemma persists because the cause-and-effect relationship between CSIs and outcomes cannot be ascertained from observational studies, no matter their cohort sizes or statistical models. It could well be that CSIs compromise tissue quality and lead to poor outcomes of RCR, but it could also be that CSIs were given to patients who had more pain or stiffness to start with and hence worse prognosis for RCR.<sup>13</sup> Moreover, although large registry studies may be sufficiently powered, their respective databases seldom contain details of lesion characteristics and patient activities that

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correlate with retear rates and functional outcomes. Randomized trials and case series may adjust for such factors, conversely, but remain underpowered to detect differences in revision or retear rates.

The multivariable analysis of Desai et al.<sup>1</sup> controlled for a large number of demographic variables and medical comorbidities, but could not adjust for the strongest predictors of RCR outcomes: tear size and pattern,<sup>21,22</sup> tendon retraction,<sup>23</sup> fatty infiltration,<sup>21,22</sup> and overhead manual activities.<sup>24,25</sup> In our recent work,<sup>13</sup> we found that adjusting for the aforementioned factors, preoperative CSIs did not compromise RCR outcomes, whereas postoperative CSIs were associated with significantly compromised RCR outcomes. Contrary to the understanding of Desai et al.,<sup>1</sup> we did indeed account for the number of CSIs administered in our multivariable analyses because we considered preoperative and postoperative CSIs as distinct continuous variables. We also acknowledged that our sample size may be insufficient to affirm that preoperative CSIs do not cause deleterious effects and that our data cannot be used to determine whether postoperative CSIs compromised outcomes or whether postoperative CSIs were administered in patients with worse outcomes to start with.

In our practice, delivering CSIs under ultrasound or fluoroscopic guidance is key to their success, and to avoid their adverse effects.<sup>26-28</sup> Image-guided infiltrations ensure that the steroid is delivered at the desired subacromial or intra-articular zone, maximizing its anti-inflammatory effect, and minimizing tendon damage by needling.<sup>29,30</sup> It is uncertain whether CSIs delivered in the study of Desai et al. were guided in any way and whether rotator cuff tissue was potentially damaged by the corticosteroids, or by repetitive contact with sharp needles. In our experience, shoulder stiffness because of tissue adhesions and capsular contractions should also be resolved before RCR to optimize outcomes.<sup>31,32</sup> Finally, rapid surgical repair is advised, particularly for young or active patients, to prevent fatty degeneration, as even the first stage can compromise long-term outcomes.<sup>33</sup> Better diagnosis and early intervention could therefore reduce the need for CSIs and obviate their potential harms, although those recommendations may be difficult to implement, because access to magnetic resonance imaging remains limited and surgery on older patients may not be advisable.

In my opinion, future research should focus on means to render advanced imaging more accessible and to empower clinicians with computer-aided diagnosis to facilitate rapid and accurate detection of rotator cuff tears. Such advancements could improve the outcomes of RCR by offering rapid intervention to patients that need it and hence avoid repetitive CSIs in those who are likely to require subsequent surgery. Naturally, a large and rigorous randomized controlled trial is also

necessary to determine whether preoperative CSIs compromise outcomes of RCR, but the study design, ethical considerations and large sample required would be challenging to overcome. Until then, Desai et al.<sup>1</sup> demonstrated that 1 preoperative CSI does little or no harm, so unless contraindicated, try that 1 injection, but consider other conservative or surgical treatments before giving a second injection.

## References

- Desai VS, Camp CL, Boddapati V, Dines JS, Brockmeier SF, Werner BC. Increasing numbers of shoulder corticosteroid injections within a year preoperatively may be associated with a higher rate of subsequent revision rotator cuff surgery. *Arthroscopy* 2019;35:45-50.
- Nunley RM, Wilson JM, Gilula L, Clohisey JC, Barrack RL, Maloney WJ. Iliopsoas bursa injections can be beneficial for pain after total hip arthroplasty. *Clin Orthop Relat Res* 2010;468:519-526.
- Baumbach SF, Lobo CM, Badyine I, Mutschler W, Kanz KG. Prepatellar and olecranon bursitis: Literature review and development of a treatment algorithm. *Arch Orthop Trauma Surg* 2014;134:359-370.
- Griesser MJ, Harris JD, Campbell JE, Jones GL. Adhesive capsulitis of the shoulder: A systematic review of the effectiveness of intra-articular corticosteroid injections. *J Bone Joint Surg Am* 2011;93:1727-1733.
- Oh JH, Oh CH, Choi JA, Kim SH, Kim JH, Yoon JP. Comparison of glenohumeral and subacromial steroid injection in primary frozen shoulder: A prospective, randomized short-term comparison study. *J Shoulder Elbow Surg* 2011;20:1034-1040.
- Ranalletta M, Rossi LA, Bongiovanni SL, Tanoira I, Elizondo CM, Maignon GD. Corticosteroid injections accelerate pain relief and recovery of function compared with oral NSAIDs in patients with adhesive capsulitis: A randomized controlled trial. *Am J Sports Med* 2016;44:474-481.
- Shin SJ, Lee SY. Efficacies of corticosteroid injection at different sites of the shoulder for the treatment of adhesive capsulitis. *J Shoulder Elbow Surg* 2013;22:521-527.
- Ando A, Sugaya H, Hagiwara Y, et al. Identification of prognostic factors for the nonoperative treatment of stiff shoulder. *Int Orthop* 2013;37:859-864.
- Diercks RL, Stevens M. Gentle thawing of the frozen shoulder: A prospective study of supervised neglect versus intensive physical therapy in seventy-seven patients with frozen shoulder syndrome followed up for two years. *J Shoulder Elbow Surg* 2004;13:499-502.
- Huberty DP, Schoolfield JD, Brady PC, Vadala AP, Arrigoni P, Burkhart SS. Incidence and treatment of postoperative stiffness following arthroscopic rotator cuff repair. *Arthroscopy* 2009;25:880-890.
- Shin SJ, Do NH, Lee J, Ko YW. Efficacy of a subacromial corticosteroid injection for persistent pain after arthroscopic rotator cuff repair. *Am J Sports Med* 2016;44:2231-2236.
- Kim IB, Jung DW. An Intra-articular steroid injection at 6 weeks postoperatively for shoulder stiffness after

- arthroscopic rotator cuff repair does not affect repair integrity. *Am J Sports Med* 2018;46:2192-2202.
13. Baverel L, Boutsiadis A, Reynolds RJ, Saffarini M, Barthelemy R, Barth J. Do corticosteroid injections compromise rotator cuff tendon healing after arthroscopic repair? *JSES Open Access* 2018;2:54-59.
  14. Ramirez JP, Bonati-Richardson F, Garcia MP, et al. Intra-articular treatment with corticosteroids increases apoptosis in human rotator cuff tears. *Connect Tissue Res* 2018;1-8.
  15. Bonneville N, Bayle X, Faruch M, Wargny M, Gomez-Brouchet A, Mansat P. Does microvascularization of the footprint play a role in rotator cuff healing of the shoulder? *J Shoulder Elbow Surg* 2015;24:1257-1262.
  16. Geary MB, Elfar JC. Rotator cuff tears in the elderly patients. *Geriatr Orthop Surg Rehabi* 2015;6:220-224.
  17. Dolkart O, Chechik O, Bivas A, et al. Subacromial corticosteroid injections transiently decrease suture anchor pullout strength: Biomechanical studies in rats. *J Shoulder Elbow Surg* 2017;26:1789-1793.
  18. Donohue NK, Prisco AR, Grindel SI. Pre-operative corticosteroid injections improve functional outcomes in patients undergoing arthroscopic repair of high-grade partial-thickness rotator cuff tears. *Muscles Ligaments Tendons* 2017;7:34-39.
  19. Pedowitz RA, Yamaguchi K, Ahmad CS, et al. Optimizing the management of rotator cuff problems. *J Am Acad Orthop Surg* 2011;19:368-379.
  20. Varkey DT, Patterson BM, Creighton RA, Spang JT, Kamath GV. Initial medical management of rotator cuff tears: A demographic analysis of surgical and nonsurgical treatment in the United States Medicare population. *J Shoulder Elbow Surg* 2016;25:e378-e385.
  21. Barth J, Andrieu K, Fotiadis E, Hannink G, Barthelemy R, Saffarini M. Critical period and risk factors for retear following arthroscopic repair of the rotator cuff. *Knee Surg Sports Traumatol Arthrosc* 2017;25:2196-2204.
  22. Godeneche A, Freychet B, Lanzetti RM, Clechet J, Carrillon Y, Saffarini M. Should massive rotator cuff tears be reconstructed even when only partially repairable? *Knee Surg Sports Traumatol Arthrosc* 2017;25:2164-2173.
  23. Nove-Josserand L, Saffarini M, Hannink G, Carrillon Y. Influence of pre-operative tear size and tendon retraction on repair outcomes for isolated subscapularis tears. *Int Orthop* 2016;40:2559-2566.
  24. Djahangiri A, Cozzolino A, Zanetti M, et al. Outcome of single-tendon rotator cuff repair in patients aged older than 65 years. *J Shoulder Elbow Surg* 2013;22:45-51.
  25. Seidler A, Bolm-Audorff U, Petereit-Haack G, et al. Work-related lesions of the supraspinatus tendon: A case-control study. *Int Arch Occup Environ Health* 2011;84:425-433.
  26. Koivikko MP, Mustonen AO. Shoulder magnetic resonance arthrography: A prospective randomized study of anterior and posterior ultrasonography-guided contrast injections. *Acta Radiol* 2008;49:912-917.
  27. Patel DN, Nayyar S, Hasan S, Khatib O, Sidash S, Jazrawi LM. Comparison of ultrasound-guided versus blind glenohumeral injections: A cadaveric study. *J Shoulder Elbow Surg* 2012;21:1664-1668.
  28. Rutten MJ, Collins JM, Maresch BJ, et al. Glenohumeral joint injection: A comparative study of ultrasound and fluoroscopically guided techniques before MR arthrography. *Eur Radiol* 2009;19:722-730.
  29. Hsieh LF, Hsu WC, Lin YJ, Wu SH, Chang KC, Chang HL. Is ultrasound-guided injection more effective in chronic subacromial bursitis? *Med Sci Sports Exercise* 2013;45:2205-2213.
  30. Kim YS, Lee HJ, Kim YV, Kong CG. Which method is more effective in treatment of calcific tendinitis in the shoulder? Prospective randomized comparison between ultrasound-guided needling and extracorporeal shock wave therapy. *J Shoulder Elbow Surg* 2014;23:1640-1646.
  31. Cho NS, Rhee YG. Functional outcome of arthroscopic repair with concomitant manipulation in rotator cuff tears with stiff shoulder. *Am J Sports Med* 2008;36:1323-1329.
  32. Seo SS, Choi JS, An KC, Kim JH, Kim SB. The factors affecting stiffness occurring with rotator cuff tear. *J Shoulder Elbow Surg* 2012;21:304-309.
  33. Godeneche A, Elia F, Kempf JF, et al. Fatty infiltration of stage I or higher significantly compromises long-term healing of supraspinatus repairs. *J Shoulder Elbow Surg* 2017;26:1818-1825.