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CORR Insights

CORR Insights®: What Influence Does Progression of a Nonhealing Rotator Cuff Tear Have on Shoulder Pain and Function?

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Where Are We Now?

The number of rotator cuff repairs has increased steadily since 1995 [12, 13], and most patients do well following these procedures [5, 11, 14]. But despite advances in instrumentation and surgical techniques, including novel suture materials, modified stitch designs, and inventive fixation devices, the risk of patients failing to heal the cuff tendons after repair remains high [6, 11]. Possible reasons for this include tear size, time from injury, tendon quality, fatty atrophy, or surgical repair technique [1, 4, 7, 10].

Patients whose tendons fail to heal still can get pain relief, although most do not achieve perfect function, and in general patients whose repairs do heal indeed achieve higher patient-reported outcomes scores [1, 4]. Galatz and colleagues [4], evaluated the functional and anatomic results after arthroscopic repair of large and massive rotator cuff tears at a minimum followup of 2 years and found that 95% had retorn, with worse results in most of the nonhealed tendons at latest followup. Boileau and colleagues [1], also reported decreased functional outcomes in nonhealed tendons, particularly in terms of postoperative strength.

It is not clear whether the results stabilize in the longer term or if they continue deteriorating over time. In comparing functional outcomes of 20 patients with a rerupture of the rotator cuff at a mean of 3.7 years and 7.6 years postsurgery, Jost and colleagues [8] did not find a difference in satisfaction between the two study periods. It is important to note that many patients in this series whose rotator cuff tendons reruptured developed progressively larger tears over time. Similarly, Koh and colleagues [9] evaluated retears with MRIs in 31 patients who underwent complete repair for full-thickness rotator cuff tears at an average of 6 months and 19 months postsurgery. The two sets of MRI scans showed exactly the same statuses (no tear progression). The authors did observe improvements in clinical parameters between the two time periods. However, another study [4] reported improvement in the short-term, but the results deteriorated rapidly in those with previously large and massive tears [4].

This CORR Insights® *is a commentary on the article* "What Influence Does Progression of a Nonhealing Rotator Cuff Tear Have on Shoulder Pain and Function?" *by Jeon and colleagues available at:* DOI: 10.1007/s11999-017-5251-7.

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In the current study, Jeon and colleagues found that among patients with nonhealed rotator cuff tendons after surgery, those with decreased tear size observed on their 6-month postoperative MRI showed better shoulder function and muscle strength than those with increased tear size.

Where Do We Need To Go?

Although patients with partially-healed (or unhealed) rotator cuff repairs may improve clinically, the evidence shows that patient-reported outcomes scores improve when the tendons actually heal [1, 4]. In fact, the authors of the current study reported that compared with patients with nonhealed tendons after rotator cuff repair, patients with healed repairs had improved ASES scores, better Constant scores, greater strength, and better internal and external rotation. Complete tendon healing, therefore, should be considered a primary objective of rotator cuff repair. Even with modern surgical techniques, better fixation devices, and enhanced arthroscopic knots to increase repair strength, a risk of rerupture of 20% has been observed [2]. This leads to two questions: (1) Which other factors may contribute to better outcome, if not maximized repair stability? (2) How can we optimize the biologic environment for rotator cuff healing?

How Do We Get There?

The use of growth factors, cell therapy, and tissue engineering [2, 3, 11] are emerging strategies that can potentially improve the natural environment around the repair site, promote regeneration of the insertion site, and prevent scar tissue development.

While these are promising avenues to explore, we need more robust studies. It is not recommended to use these treatments in daily practice due to the absence of good evidence. They should be limited to study protocols until higher-quality evidence emerges in support of them.

Several growth factors have been shown to play an integral role in enthesis healing by regulating inflammation and matrix synthesis, cell migration, proliferation, and differentiation [2]. Even though these cytokines have demonstrated the potential to improve rotator cuff healing in animal models, there is little information about the correct concentration and timing of the more than 1500 cytokines that interact during the healing process [2, 4].

While stem cell therapy is a potentially effective therapy to enhance rotator cuff healing, more basic science studies are needed to understand how to enhance the potential of these stem cells in a safe and efficient way. Animal studies have shown promising results to promote tendon-to-bone healing, but the current literature is limited for humans [14].

We are seeing more research focus on the novel production of synthetic, biomimetic, and degradable scaffolds with the goal of reproducing the structure and function of the rotator cuff tendon [4]. The majority of scaffolds produced, however, represent simplified mimics of natural extracellular matrix components without a clear advantage over the current repair techniques [2, 4].

While it is vital to achieve stable repairs and maximize rehabilitation strategies, the management of rotator cuff tears likely will rely on improving the biologic environment around the healing tendons. We must allocate human and financial resources to perform rigorous preclinical translational studies and clinical trials to ensure safety and efficacy of treatments like growth factors, cell therapy, and tissue engineering before they can be transferred into standardized clinical practice.

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