Management of Rotator Cuff Tears

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Every year approximately 18 million Americans report shoulder pain, a large percentage of which are a result of rotator cuff disease. Rotator cuff tear progression can be difficult to predict. Factors associated with tear enlargement include increasing symptoms, advanced age, involvement of 2 or more tendons, and rotator cable lesion. Nonsurgical treatment can be effective for patients with full-thickness tears. When conservative treatment fails, surgical repair provides a reliable treatment alternative. Recurrent tears after surgery can compromise outcomes, particularly for younger patients with physically demanding occupations. Revision surgery provides satisfactory results for those with symptomatic re-tears. If the tear is deemed irreparable, addressing concomitant biceps pathology or performing partial repairs can reliably improve pain and potentially reverse pseudoparalysis. The reverse shoulder arthroplasty has limited indications in the setting of rotator cuff tears and should be reserved for patients with painful pseudoparalysis and associated arthropathy. *(J Hand Surg Am. 2015;40(2):399–408.*

Key words Appropriate Use Criteria (AUC), irreparable tears, natural history, recurrent tears, rotator cuff tears.

Rotator cuff pathology places a growing burden on our aging society.[1] It remains one of the most frequently encountered and surgically addressed diseases treated by the upper extremity surgeon.[2] Since the last update 3 years ago, a plethora of new literature has been published on rotator cuff disease and this article will highlight key findings and advancements.[2]

ANATOMY

The rotator cable, initially described in the early 1990s,[3] has received renewed attention secondary to its important mechanical function.[4,5] The cable can be visualized as a semilunar arch within the rotator cuff.[3] It is a 1-cm thickening within the supraspinatus and infraspinatus tendons that originates anteriorly near the rotator/biceps tendon interval and terminates between the infraspinatus and teres minor insertions[6] (Fig. 1). The cable's collagen fibers run perpendicular to the long axis of both the supraspinatus and infraspinatus tendons, in the sagittal plane.[6] Anatomical studies have demonstrated that it is a continuation of the coracohumeral ligament.[6] The cable forms an arching semicircular cord around the adjacent lateral cuff, named the rotator crescent.[3] The rotator crescent is typically 2 to 3 times thinner than the cable and attenuates with age.[3] The majority of rotator cuff tears seem to originate within the crescent tissue.[2]

The rotator cable appears to stress shield the crescent during loading. The cable's ability to transfer load may explain why the rotator cuff continues to function despite a tear. As long as the cable remains attached, the humeral head can maintain its center of rotation even in the presence of a large to massive tear.[3,7,8] A recent study has shown that a tear in the anterior cable, as opposed to a crescent, creates a larger gap, increases cuff strain, and loses its stress shielding capabilities.[4]

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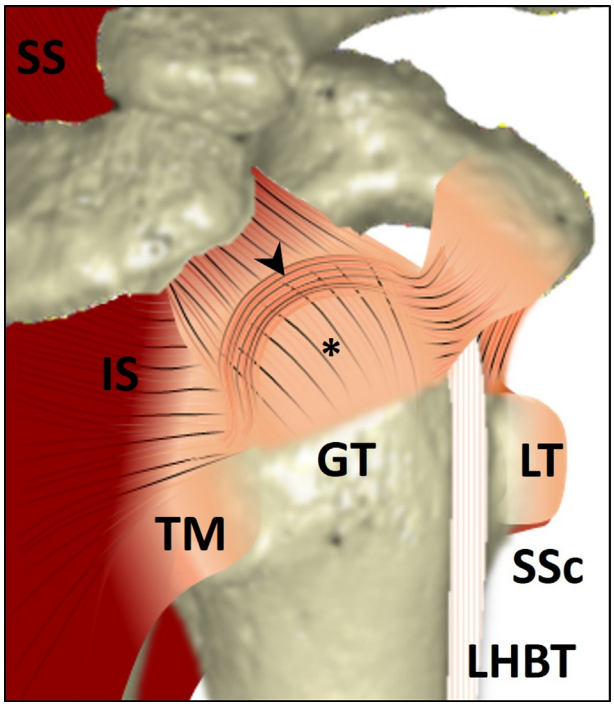

FIGURE 1: The schematic depicts the rotator cable (arrowhead) and crescent (asterisk). The cable is a semilunar arch that originates near the rotator interval/biceps tendon and terminates between the infraspinatus and teres minor. The cable forms an arching semicircular cord around the thinner lateral cuff called the rotator crescent. SS, supraspinatus; SSc, subscapularis; IS, infraspinatus; TM, teres minor; LT, lesser tuberosity; GT, greater tuberosity; LHBT, long head biceps tendon.

NATURAL HISTORY

Rotator cuff disease develops in the supraspinatus tendon mostly as a result of an intrinsic attritional process that leads to partial and then eventually full-thickness tearing.[2] Once developed, the fate of a tear remains difficult to predict.[2,9–11] Some tears continue to increase in size, whereas many others remain dormant and do not show signs of propagation. Those that do increase in size typically do so gradually, with only a minority (18% to 49%) enlarging > 5 mm in 3 years of surveillance.[9–12]

A concern for the patient and surgeon is a lesion that rapidly progresses in size without symptoms (Fig. 2). Fortunately, these progressive types of tears are uncommon. In 1 study they represent 13% of tears that increased more than 10 mm.[9] Although this type of progression is uncommon, continued vigilance remains warranted during nonsurgical management. Shoulder ultrasound seems to be a cost-effective way to monitor propagation that upper extremity surgeons can use with similar predictive values as experienced radiologists.[13]

RISK FACTORS FOR PROGRESSION

Several factors predict the risk for symptoms and/or tear expansion.

Tear size: Small 1-tendon tears may remain dormant, while larger 2-tendon lesions are more likely to undergo structural deterioration.[10,14] Zingg et al reported that approximately 50% of their patients with initially repairable massive rotator cuff tears progressed dramatically, becoming irreparable within 4 years.[14] The critical size for tipping a tear toward rapid decline has yet to be defined. Biomechanically, enlargement of a supraspinatus tear to involve the infraspinatus tendon appears to be the critical change for substantially altering humeral head kinematics.[8]

Symptoms: A strong correlation exists between tear propagation and the development of symptoms. Patients with enlarging rotator cuff tears are 5 times more likely to develop symptoms than those with tears that remain the same.[11]

Location: The location of a tear within the cuff also may impact the risk of progression. Anterior tears are more likely to involve the rotator cable and become associated with advanced cuff degeneration.[15] A recent biomechanical study has shown that anterior rotator cuff cable tears had significantly greater tear migration, decreased tendon stiffness, and increased regional tendon strain in comparison to an equally sized crescent tear posterior to the cable.[4]

Age: Full-thickness tears in younger patients appear to be more capable of withstanding the stress and tear propagation better than those in older patients.[10] Maman and colleagues reported that 17% of their younger patients (< 60 years) developed a measurable increase in the size of their symptomatic cuff tear in comparison to 54% of their older patients (> 60 years).[10]

TREATMENT

The recently published American Academy of Orthopedic Surgeons Rotator Cuff Guidelines, which preferentially weights higher-level evidence, determined that the strength of recommendation for repair of a full-thickness rotator cuff tear was "weak."[16] This finding created concern within the orthopedic community because rotator cuff repair has historically been an extremely successful procedure that decreases pain and improves function.[17] To address this concern, the American Academy of Orthopedic Surgeons developed the Appropriate Use Criteria (AUC) for treatment of full-thickness rotator cuff tears.[18] Partial-thickness cuff