Rotator cuff tears: repair and reconstruction

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Abstract

The management of rotator cuff pathology amongst surgeons can vary widely.[1] In recent years, there have been increasing efforts to standardize treatment. However, the evidence base for repair and reconstruction for rotator cuff tears is limited. In this article we review some of the current evidence available for the management of these tears and aim to better equip the surgeon in the decision making process. The article focuses on the surgical options for the management of cuff tears and aims to inform on how to repair torn rotator cuff tendons, including surgical techniques and current concepts on reconstruction, discussion on timing of repair and the pitfalls and challenges which can be faced when attempting to repair large tears.

Keywords arthroscopic cuff repair; augmentation; double row; open cuff repair; rotator cuff reconstruction; rotator cuff repair; rotator cuff tear; single row

Introduction

'Rotator cuff tear' refers to structural failure in one or more of the four muscles and tendons that form the rotator cuff. It is estimated that the overall prevalence of tears is 34% and that the risk increases significantly with age.[3] Predicting which patients become symptomatic, which tears are likely to enlarge quickly, which tears are reparable and the optimum time for surgical intervention remains a challenge. Currently in clinical practice, the surgical management of rotator cuff tears can vary[1] widely and is influenced by referral patterns from primary care and decision-making and attitudes in both patients and surgeons. Attempts have been made to create guidelines to help standardize treatment however, many unknowns persist.[2]

In this review we aim to discuss the merits of the surgical management in treating symptomatic rotator cuff tear patients. This includes: the rationale behind repairing torn tendons, when to consider surgical repair, techniques for repair and reconstruction, and options in patients when repair is not possible.

Why repair?

Degeneration of the rotator cuff is a common pathology that is associated with the process of ageing. The development of chronic tears does not always result in pain and functional loss, suggesting that the shoulder joint has some capacity to adapt to these changes. It is considered that acute traumatic rotator cuff tears result in sudden functional loss and more pain than do chronic degenerative tears.

Shoulder pain is the third most common type of musculoskeletal pain presenting in primary care. Amongst the elderly, around 1 in 5 patients suffer with shoulder pain and rotator cuff disease appears to be the most common cause.[4] Many patients with a full thickness rotator cuff tear are asymptomatic or respond satisfactorily to conservative treatment: these patients who have no compromise in their activities of daily living and remain pain free do not necessarily need to be considered for further intervention.

In general there are three reasons to consider operative intervention: 1) to reduce pain and disability in patients in whom conservative treatment has failed 2) to reduce the risk of tear progression, which could lead to a tear which becomes irreparable and 3) to reduce the risk of cuff tear arthropathy.

For patients who suffer significant limitations and pain, surgery may serve to offer symptom relief and there is now a reasonable evidence base in support of open or arthroscopic rotator cuff repair surgery.[3] In patients who subsequently undergo surgical rotator cuff repair, good outcomes are reported in a significant proportion of patients even though re-rupture of the cuff may occur in over half of these patients postoperatively. Outcomes following surgery range from 85% to 91% satisfactory or better at mid- to long-term follow-up.[3,5]

The prospect of tear progression can lead to a degree of ambiguity for shoulder surgeons as to the ideal time for operative intervention. Patients may present with only mild symptoms or occasional problems. The issue here is with the possibility of the tear worsening and enlarging, becoming more difficult to repair and sometimes becoming irreparable. Several studies have demonstrated that the function and appearance of a torn rotator cuff has been shown to deteriorate with time.[6,7] Surgery therefore may subsequently become more technically demanding, with poorer biological cuff tissue and in the case of massive tears, often requiring more advanced experimental techniques with augments or even reverse shoulder replacement surgery. The predicted rate of rotator cuff tear progression in patients over time is difficult to assess. However, from the literature, certain risk factors may make disease progression more likely. Apart from increasing age, the most significant of those identified risk factors for tear progression appear to be tear severity, smoking and hand dominance.[6,7] Full thickness tears compared with partial thickness tears are more likely to enlarge. Whilst hand

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dominance initially suggested that activity level may promote disease progression, the authors of the paper found that shoulder activity level and occupational demand level were not predictive of tear enlargement.

As a result of these factors and our inability to reliably predict how rapidly rotator cuff tears progress, the optimum time for surgical intervention can be difficult to determine and is therefore likely best decided clinically on an individual patient-by-patient basis. It has been suggested that following patients up regularly, with appropriate imaging, may be helpful in determining when a small tear is worsening or when an asymptomatic tear is progressing to a symptomatic one. However this would be very resource intensive and probably not justified for all in this large patient population.[6] A more pragmatic approach may be to inform the patient of the symptoms that should encourage them to seek further review.

Finally, the third indication for repair is to reduce the risk of cuff tear arthropathy. This results from a torn rotator cuff which has persisted, leading to arthropathic changes in the shoulder over time. The exact cause for cuff tear arthropathy is unknown, and is likely multifactorial. One theory is that it is a result of mechanical and nutritional factors.[8] Mechanical factors associated to a cuff tear can lead to shoulder imbalance and wearing of the glenohumeral joint surface from repetitive abnormal motion. The nutritional factors are related to disruption of the normal joint environment, leading to loss of fluid pressure. This may result in a reduction in quality of the synovial fluid causing bone and cartilage atrophy. Over time chronic shoulder weakness, superior migration of the humeral head and significant pain ensues such that the function of the shoulder is markedly reduced.

When to repair

In consideration of repair it is pertinent to consider the typical patient pathway in those suffering rotator cuff tears. The British Elbow and Shoulder Society (BESS)/British Orthopaedic Association (BOA) patient care pathways provide a helpful guide to the clinician. It reiterates the importance of history and examination in the primary care setting, with a useful management algorithm embedded in the document.[9]

The pathway stresses the significance of being aware of those patients who may have had trauma to the shoulder with acute pain and weakness, which could be due to an acute rotator cuff tear. In these circumstances an urgent referral to a shoulder specialist should be made and/or consideration of imaging of the rotator cuff. If an acute tear is sustained, there is some evidence that early repair (<8 weeks) improves the chances of long-term repair integrity and function.[10,11]

Primary care treatment should explore conservative and medical therapies; rest, analgesia, physiotherapy and injection if possible. Although an ultrasound or MRI scan can be of value, some people over 65 years have asymptomatic cuff tears, as previously discussed above, and guidelines suggest that MRI and ultrasound are rarely needed in primary care and so imaging should therefore be requested and interpreted in this context.

Referral to secondary care is merited if there is a poor response to conservative and medical therapy or should the patients' suffer severe symptoms and disability. Surgical decision-making here then refers to the consideration of repair acutely versus delayed repair, the timing of which remains controversial with no definitive evidence.

A systematic review in 2013 demonstrated that clinical outcomes do not significantly vary depending on time to surgery for acute rotator cuff repair comparing those operated in under 3 months from presentation, to those over 3 months. Whilst both groups demonstrated clinical improvement with surgical repair, no definitive consensus could be drawn in respect of when rotator cuff repair should be performed for optimal postoperative outcomes. However the authors concluded that there was a trend for earlier time to surgery producing better postoperative Constant scores and range of movement. The authors highlight the difficulty in distinguishing between acute tears, acute tear on chronic tears, or acute symptoms of a chronic tear which provides a degree of ambiguity and a confounding factor when attempting to draw salient conclusions.[11]

How to repair

Following failed conservative treatment (rest, physiotherapy and a cortisone injection) surgical management may be considered. There are several options for surgery. The decisions to consider when repairing cuff tears include: 1) open or arthroscopic 2) with or without subacromial decompression 3) single row or double row repairs 4) the use of augments.

Open or arthroscopic cuff repair

The aim of reparative and reconstructive surgery is to reattach torn tendons to the tuberosities of the humeral head. Arthroscopic rotator cuff surgery has seen an increase of 600% in the USA in the last 10 years whilst open rotator cuff repair increased by only 34%.[12] A recent multicentre randomized control surgical trial in the UK found there to be no difference in clinical outcome when comparing open rotator cuff repair versus arthroscopic rotator cuff repair at 2 years' follow-up.[3] The study, which analysed data from 273 patients across 19 centres, reports that the mean Oxford Shoulder Score improved from 26.3 to 41.7 at 24 months for arthroscopic surgery and from 25 to 41.5 at 24 months for open surgery. In addition the study found no significant difference in terms of overall clinical cost or tear re-rupture rate between the two methods.

Clearly, the most important aspect for a successful rotator cuff repair, is that the surgeon is able to perform a procedure which allows for healing whilst withstanding physiological loads during the healing process. Suture material that is sufficiently strong and the use of anchors along with a reliable operative technique and configuration, should be used to ensure a strong repair but without compromising tissue biology. Many anchor implant products exist, all with claimed advantages but with little real evidence to support the use of one type over another. For example, bioabsorbable anchors are said to offer an advantage over non-absorbable plastic anchors or metal anchors in that there is no lasting foreign object, a graduated loss of strength to help the healing process, no imaging artefact and eyelet structures that are favourable with regards to suture abrasion.[13] However the disadvantages of bioasorbable anchors is that if degradation occurs too quickly the construct may fail, the eyelet can rupture or a reaction to a foreign body can occur.

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