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Degenerative rotator cuff tear, repair or not repair? A review of current evidence

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ABSTRACT

INTRODUCTION We review the literature and highlight the important factors to consider when counselling patients with non-traumatic rotator cuff tears on which route to take. Factors include the clinical outcomes of surgical and non-surgical routes, tendon healing rates with surgery (radiological outcome) and natural history of the tears if treated non-operatively.

METHODS A PRISMA-compliant search was carried out, including the online databases PubMed and EMBASE from 1960 to the end of June 2018.

FINDINGS A total of 49 of the 743 (579 PubMed and 164 EMBASE) results yielded by the preliminary search were included in the review. There is no doubt that the non-surgical route with an appropriate physiotherapy programme has a role in the management of degenerative rotator cuff tears. This is especially the case in patients with significant risk factors for surgery, those who do not wish to go through a surgical treatment and those with small, partial and irreparable tears. However, rotator cuff repair has a good clinical outcome with significant improvements in pain, range of motion, strength, quality of life and sleep patterns.

KEYWORDS
Rotator cuff tears – Degenerative – Repair – Shoulder – Impingement

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Introduction

The increased demands of an ageing population in already struggling healthcare systems have placed the various health systems around the Western world under considerable financial burden. In the NHS, the growing demand is not met by a health funding budget increase of an average of 1.2% per annum in real terms.[1] Acute NHS trusts ended the 2015–16 financial year with a deficit of over £2.5 billion/year.[1] Over the past 15 years we have witnessed a significant increase in the number of rotator cuff repairs in the Western world.[2] In England, the total cost of rotator cuff repair surgery to the NHS was in excess of £60 million, whereas in United States, the estimated annual cost of repair is reported to between US $1.2–1.6 billion.[2–4] Additionally, a number of studies have raised doubts over the benefits for rotator cuff repair compared with non-operative treatment in the management of non-traumatic rotator cuff repair.[5] A 2018 randomised controlled trial concluded that subacromial decompression did not offer extra benefit over arthroscopy alone for subacromial shoulder pain'.[6] These publications, against the background of severe financial pressure, have led healthcare funders to question the cost effectiveness of rotator cuff repair, especially when compared with the non-operative option for non-traumatic/degenerative rotator cuff tears.

Different treatment options are available for massive rotator cuff tears, including debridement and subacromial decompression, partial repair, transfer of the subscapularis tendon, transfer of the teres major muscle, deltoid flap reconstruction, transfer of the latissimus dorsi or the pectoralis major, superior capsule reconstruction (using a synthetic, auto- or allograft to replace the torn tendon), augmented cuff repair (using a synthetic, auto- or allograft to augment the repaired tendon), subacromial balloon (a balloon is inserted and inflated under the acromion to

prevent proximal migration of the humeral head) and reverse total shoulder replacements.

We review the literature and highlight the important factors to consider when counselling patients with non-traumatic rotator cuff tears on which route to take. These factors include the clinical outcomes of the surgical and non-surgical routes, tendon healing rates with surgery and natural history of the tears if treated non-operatively (Fig 1). Equally, in the current milieu of economic constraints, we correspondingly feel that clinicians treating patients with rotator cuff tears should be mindful of the financial burden and implications of the two management strategies.

Methods

We have included all accessible clinical literature exploring the management of rotator cuff tears. Language, design and risk of bias did not initially exclude any study. Our search was entirely limited to studies involving human subjects.

Search strategy

A PRISMA-compliant search was carried out.[7] This included the online databases PubMed and EMBASE from 1960 to the end of June 2018. The Medical Subject Heading terms used included 'Rotator cuff' 'Full thickness' AND 'tears' AND 'injuries' AND 'ruptures' AND 'repair'. A formal research question was developed:

- population: both sexes, skeletally mature, human adults older than 18 years
- intervention: non-operative and operative interventions
- comparison: operative, non-operative, control, placebo, education, physiotherapy or sham procedure
- outcomes: clinical outcomes, return to sport, radiological outcomes, strength and function of the shoulder.

Eligibility criteria

Following inclusion criteria were defined: randomised clinical trials and observational studies that reported on operative and non-operative treatment of degenerative rotator cuff tears; both sexes over the age of 18 years with rotator cuff repairs. Outcomes were presented as continuous outcomes reliable for analysis and studies reporting the functional and radiological outcomes. We excluded the use of a patch to bridge and/or augment repair and superior capsule reconstruction. We excluded studies based on the following criteria: studies that were not accessible in English, superior capsular reconstruction, studies including partial repair with augmentation and duplicate references. We also excluded all forms of augmentation such as platelet-rich plasma, bone marrow aspirate concentrate, long head of biceps and balloons.

Critical appraisal

Eligible studies were independently appraised by two authors using the Critical Appraisal Skills Program checklist.[8] Disagreements between reviewers were resolved by consensus or by the third reviewer, wherever applicable. For the purpose of the narrative review, appropriate studies were included irrespective

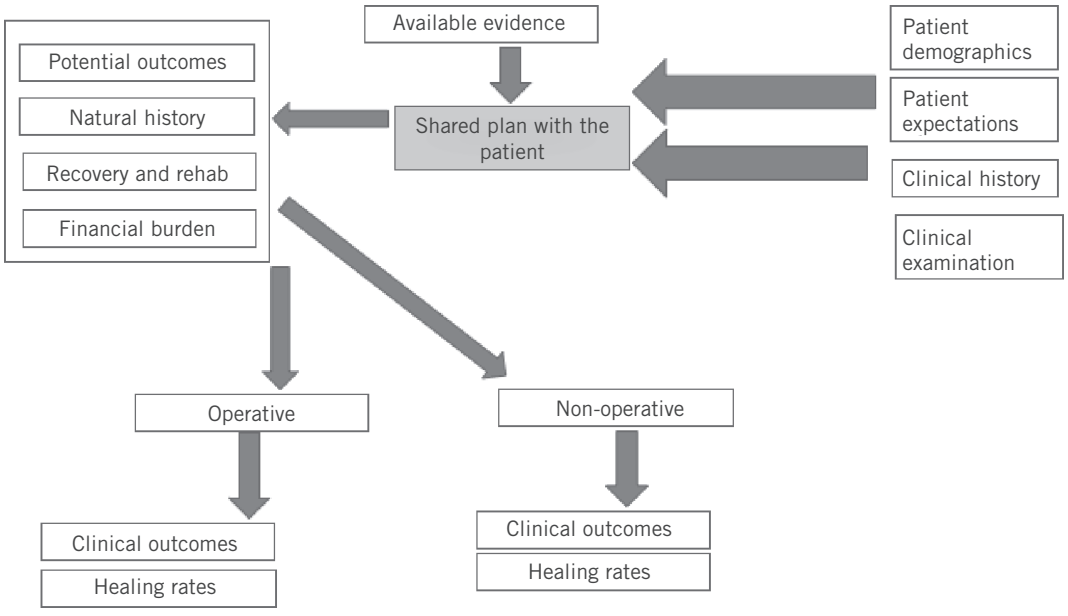

Figure 1 Footprint of the thinking thought in managing degenerative rotator cuff tears.

of methodology or level of evidence. Data mining and reference tracking of the six previously published reviews was performed for relevant papers.

Study selection

Two independent reviewers assessed the studies identified by the searches for potential inclusion in our study. They applied the inclusion/exclusion criteria to the studies identified by first screening the abstracts and then the full text of any studies appearing to fulfil the inclusion criteria. Any discrepancies as to whether to include a study were resolved by a third independent evaluator.

Heterogeneity of included studies

Owing to the inclusion criteria, predefined before commencement of the study, of accepting randomised and non-randomised clinical trials, calculation of heterogeneity across studies was considered unsuitable on the foundation of methodological heterogeneity.

Findings

A total of 47 of the 743 (579 PubMed and 164 EMBASE) results yielded by the preliminary search were included. Abstract exclusions (596 publications) included duplicate records, letters, animal studies, cadaveric studies, partial thickness tears, traumatic full thickness rotator cuff tears and records irrelevant to our search topic. Some 102 articles were excluded by full text; 78 articles were excluded as they did not meet the inclusion criteria and 24 were eliminated as per the exclusion criteria. A total of 49 studies were included: 15 case series, 12 retrospective and 8 prospective cohort studies, 2 case–control studies, 2 economic analyses and 5 randomised control trials. Additionally, five related systematic reviews were identified.

Literature review

It is important to appreciate that, for rotator cuff tears, it can be difficult to decide what that a satisfactory outcome looks like. Pain, in particular night pain, must rank very highly on the desired optimal outcome list but what about range of movement, strength, return to sports and work? What do patients desire from rotator cuff treatment? Or should we pay more attention to the radiological outcome with evidence of healing?

Good clinical outcome does not always imply radiological healing (as highlighted later in this review). In one study involving 303 patients, Yoon *et al* investigated patients expectations following rotator cuff repair. In patients younger than 65 years of age, the top three hopes were pain relief, anatomical healing without repeat tearing and range of motion recovery, in that order, as reported by both sexes.[9] In the over 65 years age group, the preferences were pain relief, range of motion followed by healing. Do the numerous outcome functional scores used in the various studies on management of rotator cuff tears reflect what patients really desire from a successful rotator cuff treatment strategy?[10,11] As yet, to the best of our knowledge, this is a question not yet answered appropriately in the literature and in clinical experience.

Clinical outcomes

There are numerous studies that have assessed clinical outcome of the non-operative route and following rotator cuff repairs.[12–14]

Clinical outcome with non-operative management

In a multicentre study, Kuhn *et al* reported outcomes in 452 patients with atraumatic rotator cuff tears, which were treated with physiotherapy.[13] There were significant improvements in patient-reported outcome scores at 6 and 12 weeks. Despite this good early outcome, 26% of the 381 patients at the two-year follow-up had decided to have surgery. Levy *et al* assessed the role of anterior deltoid exercise in 17 patients with massive rotator cuff tears.[14] They reported significant improvement in the range of motion and function at a minimum follow-up of nine months after treatment. Collins *et al* evaluated the efficacy of a specific rehabilitation programme for massive irreparable rotator cuff tears.[12] At the two-year follow-up, 24 of the 45 patients had more than 160 degrees of anterior elevation, but treatment failure was common in patients with massive rotator cuff tears involving three or more tendons.

Clinical outcome with operative management

There are a number of studies with large number of patients and long-term follow-up that have evaluated the outcome of rotator cuff repairs.[15–24] In a retrospective cohort study of prospectively collected data from 1600 consecutive rotator cuff repairs, Robinson *et al* demonstrated significant improvement in pain with overhead activity, as well as the range of motion, at the six-month follow-up.[15] In another study, Millet *et al* analysed the long-term survivorship and clinical outcomes following surgical repair of full-thickness rotator cuff repairs in 263 shoulders.[16] Survivorship was defined as a shoulder that did not require additional surgery and was 94% at 5 years and 83% at 10 years. Additionally, there was significant improvement in the outcome scores at a mean follow-up of 6.3 years. Patients, however, do appear to show significant improvement in function only at the six-month mark and not before.[17] Furthermore, superior clinical results are reported with acute traumatic tears if the repairs are performed within six months of the injury.[18]

What about return to sports? Are patient able to return to their recreational sports following rotator cuff repair?

In a retrospective study involving 67 patients with a mean age of 57 years, Antoni *et al* showed that 88% of patients returned to sports activity and 68% returned to the same sport practised prior to the injury.[19] Moreover, 78% of patients reported a return to a sporting level that was better or identical to the preoperative level. A meta-analysis revealed that the overall rate of return to sports after

rotator cuff repair was 84.7%, with 65.9% of patients returning to play at a similar level after 4–17 months.[25]

What is the effect of rotator cuff repair on patients sleep disturbance? Does surgery improve sleep patterns and mood in those patients?

Sleep disturbance is a frequent ailment among patients with rotator cuff tears and is usually the symptom that drives them to surgery.[28] Sleep disturbance is a common complaint in patients with degenerative rotator cuff tears and is clinically present in over 85% of such patients.[20] In a study of 56 patients undergoing rotator cuff repair, a significant improvement in sleep quality and pattern was observed as early as three months post-surgery; at six months post-surgery, only 38% of the patients reported sleep disturbances (this is comparable to the rate reported in the general public).[20] This observation is consistent with the findings of another study of 31 patients who had underwent rotator cuff repair.[26] There are also studies that have demonstrated improved symptoms of depression and anxiety in patients undergoing rotator cuff repair.[27]

Horneff *et al* demonstrated that after arthroscopic rotator cuff repair, patients had a significant improvement in sleep quality by three months.[28] This enhancement was maintained until six months after surgery, with about two-thirds (62%) of patients describing healthy sleep manners; this persisted at more than two years post-surgery.

Patient age and clinical outcome: are the clinical outcomes of rotator cuff repair poorer in the older population?

In a prospective, multicentre comparative study involving 40 patients younger than 50 years and 40 patients older than 70 years, functional gain was reported to be equivalent in both groups.[21] In another, multicentre prospective French study involving 145 patients older than 70 years, Flurin *et al* reported that clinical results were not correlated with age and that there were significant improvements in the clinical outcome, even in patients over 70 years.[22] Similar findings have been observed in 25 patients over the age of 75 years who had rotator cuff repairs.[23] The common believe of decreased outcomes in elderly populations was not supported by these studies.

Physiotherapy or surgery, which is better?

There are limited high-level studies comparing surgery with physiotherapy. In a randomised controlled trial involving 160 patients with a two-year follow-up, Kukkonen *et al* reported no clinical difference between the three groups which were: physiotherapy only; acromioplasty and physiotherapy; and rotator cuff repair, acromioplasty and physiotherapy.[5] This was a well-conducted randomised controlled trial with significant patient numbers and a two-year follow-up. However, it must be noted that the mean sagittal size of the isolated supraspinatus tendon tear at baseline magnetic resonance imaging (MRI) was 9.6 mm in the physiotherapy only group, 9.1 mm in the acromioplasty and physiotherapy group, and 8.4 mm in the rotator cuff repair, acromioplasty and physiotherapy group. By most classification systems, these are regarded as small tears and it would have been interesting to see if the authors would have reached the same conclusions had they included more patients with medium and large tears. Furthermore, they reported that the changes in the Constant score subgroups of pain and activities of daily living were significantly lower in the physiotherapy group as compared with the other two groups. The improvements in the Constant score were greater in rotator cuff repair group than in the physiotherapy group, but the difference between the two groups was not thought to be significant.[5]

In another randomised clinical trial with a five-year follow-up, Moosmayer *et al* compared functional outcome in 52 patients undergoing rotator cuff repair to that of 51 patients treated by physiotherapy.[29] Tears greater than 3 cm were excluded and either an open or mini open technique was used. Additionally, 24% of the patients who were initially treated by physiotherapy eventually had secondary repair, as they had insufficient treatment effect with the initially non-operative route. At the five-year follow-up, the increase in Constant score was significantly larger after primary tendon repair compared with the physiotherapy only group. Although the Constant score increase in the primary repaired group was more than that in those 12 patients who underwent secondary repair, they reported that difference in increase was not significant.

In a Dutch randomised controlled trial, surgical repair was compared with physiotherapy combined with subacromial steroid injection and analgesics in 56 patients with degenerative tears.[30] Although the visual analogue scale pain and disability scores were significantly lower in the surgery group, the difference between the two groups' Constant score was not significant (at one year the Constant score for the surgical group was 81.9 whereas for the non-surgical group it was 73.7), bearing in mind that the follow-up period was only 12 months in this study. Furthermore, the repeat tear rate at one year for the surgically treated patients was very high (74%). In the surgical group, a mini open approach was used with a varying reconstruction technique including side to side repair only in a number of their patients.

What are the radiological outcomes of tendons healing?

Different modalities of radiology can be used to identify tears at the time of diagnosis as well as for tendon healings with increased preference to the use of MRI.[22,33] MRI can define the aetiology of the tear (traumatic versus degenerative)[33] but clinical history remains the main identifier. Repeat tearing following rotator cuff repair is common and reported rates vary anywhere between 10% and 90%.[21,22,31,32] In a meta-analysis involving 13 studies and 1161 patients, re-tear rates for medium tears were rarely substantially higher than 20% and for large tears the rates varied between 20% and 40%.[32] For massive tears, repeat tear rates varied between 20% and 57%.[31]

Postoperative ultrasound[21,22,35] or MRI[23,24,30,32,33] was used to assess repair integrity in the included studies.

In a British multicentre study involving 217 patients who underwent arthroscopic or mini open repairs by 65 surgeons from 47 hospitals, the overall re-tear rate at one year was found to be 44% (34% for small tears, 36% for medium tears, 53% for large tears and 73% for massive tears).[32] In a French multicentre involving 80 patients who had arthroscopic repair, re-tear rate at final follow-up (minimum 12 months follow-up) was reported to be 5% in those under 50 years and 17.5% in those older than 70 years.[21] The healing rate in another multicentre study by the French Arthroscopic Society, which involved 135 patients, was 89%.[22]

What factors influence tendon healing rates?

Evidence seems to support the correlation of negative predictors such as increased age and tear size, as well as higher degree of fatty degeneration and repeat tears.[33,34] It is also of interest to consider the relevance of history of trauma on the healing rates. In a study published in 2016 that included 1300 consecutive patients, there was no significant difference in re-tear rates when comparing those patients who had a history of trauma with those with no history of trauma; however, those patients with a history of trauma who have waited longer than 24 months had a higher re-tear rates (20%) than those who had their surgery earlier (13%).[35]

Why is there disparity between clinical and radiological outcome in a cohort of patients?

It is well established that there may be significant improvement in functional outcomes and pain, even in those with radiological evidence of re-tearing.[36] In a prospective study from Zurich, involving 20 patients with MRI evidence of failed repair, Jost *et al* reported a significant decrease in pain accompanied by a significant improvement in function and strength at an average follow-up of 38 months.[37] Based on their findings, they suggested that 'the potential for re-rupture should not be considered a formal contradiction to an attempt at repair if optimal function recovery is the goal of treatment'.[37] Similarly, a level III study published in 2014, which included 61 patients with 'structural failure of rotator cuff repair' as confirmed by ultrasound, showed that successful outcome was achieved in 54% of the patients with failed rotator cuff repair at a mean follow-up of 51.7 months.[38] In a systemic review and meta-analysis of 108 studies and 8011 shoulders in 2014, the authors reported that patient-reported outcomes were generally improved whether or not the repair restored the integrity of the rotator cuff.[39]

Why is it that despite lack of radiological evidence of rotator cuff healing, patients clinically do better?

There are a number of thoughts and theories as to why, despite no radiological evidence of rotator cuff healing, patients clinically do better; symptoms in patients with rotator cuff tears may have a number of origins. It has been proposed that symptoms in patients with rotator cuff tears arise as a result of stiffness, weakness, unstable motion, failure of the fibrous endoskeleton cable mechanism, roughness and the pain associated with all these elements. Weakness is secondary to direct muscular detachment of the anterior and posterior cuff, detachment of the fibrous endoskeleton cable complex or disruption of the muscular insertion in the cable complex. Unstable motion occurs when the fine tuning of shoulder motion is compromised as a result of disturbance in the 'force coupling' mechanism secondary to cable complex rupture or detachment antero- or posterosuperiorly.[40] Deltoid may compensate for this disturbance of the fine tuning. So, in essence, a tear may not be symptomatic if this fine tuning is not compromised or it is well compensated for by deltoid, and undeniably a high majority of tears are asymptomatic.[41]

Similarly, this would also offer some explanation on why partially repaired massive tears, when full repair has not been possible, may deliver satisfactory clinical outcomes.[42] Then again, stiffness might be secondary to synovial thickening and fibrosis, muscular degeneration and capsular contraction.[40] Roughness is thought to be caused by damaged or inflamed surfaces that are not able to glide smoothly.[40] Conclusively, a cuff repair with poor radiological evidence of healing, may have a good clinical outcome if, despite the repeat tear, the shoulder might have achieved fine tuning through balanced and optimally coupled forces. The tear may be smaller in size than before surgery or in the location where the fine tuning is still maintained. Jost *et al* did, indeed, report from their study of 20 failed repairs, that the size of the re-tear was smaller in 16 of the 20 patients.[37] In another study in patients with 'non-healed' rotator cuff tendons after surgery the authors observed that those with decreased tear size at six months post-surgery, compared with preoperative tear size, showed superior shoulder function and muscle strength than those with increase tear size.[43] Additionally, by attempting to repair the tear, one may slow down the rate of its progression despite evidence of radiological failure.

Another explanation for the inconsistency between clinical and radiological outcome may be that during the rotator cuff repair, some of the other elements that may contribute to the presenting symptoms can be addressed in addition to the attempted tendon repair itself. Arthroscopic debridement and acromioplasty performed during the repair, may address the roughness whereas the release of contracture might improve the stiffness.[40] In a similar manner, other pain generators, such as the long head of biceps or the acromioclavicular joint, can be managed simultaneously. Moreover, It may be that following the repair, patients have taken a greater interest and active role in their physiotherapy and rehabilitation regimen than they would otherwise because they have had surgery and are keen for the operation to succeed.

A number of studies have looked at the parameters, which may increase the likelihood of improved clinical outcome despite poor radiological outcome. In a level II cohort study which involved 180 patients with rotator cuff

repair, in younger patients with re-tears, those with lower education level and workers compensation claims, were all found to be associated with poor outcome.[44] Namdari *et al* also illustrated that in patients with failed rotator cuff repair, those who self-identified their occupation as being labour-intensive had a poorer outcome following the failed repair.[38] This was a level III study, which included 69 patients with failed rotator cuff repair.

Do patients with healed repairs have better outcomes than those without?

There is also considerable evidence to suggest that patients with a healed tendon have better rotator cuff strength than those with repeat tears. There is also some limited evidence that those with healed repairs have better functional outcome scores than those with unhealed repairs.[36] There is a debate as to whether healing has any significant influence on pain scores.[36,45] In a case–control level III study involving 73 patients with repairs of anterosuperior massive rotator cuff repairs, Kim *et al* reported better outcome and pain scores as well as range and movement at two-year follow-up in the healed group than in the re-tear group.[45] Better functional scores in patients with healed repairs were also demonstrated in another level III South Korean study.[43] Similar conclusions have been published.[36] Other studies have not shown any difference in the function when comparing healed with re-tear groups.[15,39] In a level III study with 1600 consecutive rotator cuff repairs, cuff integrity did not influence overhead pain severity and patient-reported outcome scores.[15] The healed group did, however, have a significantly better supraspinatus strength. A 2014 systematic review, did not find a 'consistent' relationship between the integrity of the repair and the clinical outcome.[39]

What is the natural history of rotator cuff tears?

To be able to counsel patients with rotator cuff tears on the treatment options, it is of vital importance that clinicians are aware of the natural history of rotator cuff tears if treated non-operatively. It is well established that full thickness tears do not heal without surgical intervention.[46] Furthermore, there appears to be a progression of the tear size, the rate of which is related to the size of the tear, degree of fatty infiltration and patient's age.[47] In a study which investigated the rate of tear size progression and cuff arthropathy in 69 patients with rotator cuff tears who underwent isolated acromioplasty without rotator cuff repair, at the average follow-up of 22 years, 87% of the full thickness tears had progressed in size and 74% had developed cuff arthropathy.[46] Some 42% of patients with partial thickness tears had progressed in size and only 7% had developed cuff arthropathy.[43] In another (level II study), mean tear size increased by 8.3 mm in anteroposterior plane and 4.5 mm in the medial-lateral plane in 49 patients with small to medium full-thickness tears at an average follow-up of 8.8 years.[48] Kim *et al* have also reported a tear progression in over 80% of the patients with symptomatic full thickness tears treated non-surgically at an average follow-up of 24 months.[49] Similarly, in another study, over 50% of full thickness tears treated non-operatively increased in size at a minimum follow-up of six months.[47] In a recent Japanese prospective case–control study involving 174 patients, tear size of symptomatic rotator cuff tears progressed in 47% of the shoulders during a mean follow-up of 19 months at a rate of 3.8 mm/year in length and 2 mm in width. Tear progression was associated with medium-sized tears, full-thickness tears and smoking.[50]

What is the financial burden of rotator cuff repair?

The total number of rotator cuff repairs performed in the NHS in England in 2017 was just over 9000.[3,4] The in-hospital cost for each episode is around £6,000, so the total cost of rotator cuff repair surgery to NHS England in 2017 was over £60 million (this includes the additional cost of outpatient follow-up and physiotherapy). With a health service that is under tremendous financial pressure, it is of vital importance that clinicians critically consider cost effectiveness (outcome vs cost) of rotator cuff repair. However, when evaluating healthcare value, it is also important to consider indirect cost of both operative and non-operative management, not just the crude costs of a surgical intervention. Another question to ask is what is the financial impact of missed workdays, disability payments and probability of employment and household income of the two management strategies?

In a US study based on a Markov decision model, which took into consideration the indirect as well as the direct cost (including probability of employment, household income, missed workdays and disability payments),[51] it was reported that there is a cost saving of around US $12,000/patients aged 70–79 years in favour of operative intervention as compared with non-operative route (in patients aged 30–39 years); this cost saving was over US $77,000/patient. There is no argument that it is imprudent to compare the health economics of the United States with that of European countries, particularly the UK, nevertheless this study highlights the importance of considering indirect costs not just mere crude costs, when evaluating the cost effectiveness of two rotator cuff tear management options.

It has been shown (at least in US hospitals) that the supply cost (including direct implant cost) accumulates to over 35% of the total rotator cuff repair direct cost.[2] Additionally, there appears to be a huge variability in surgeon directed cost of rotator cuff repair in the United States.[52] In a 2016 study involving 62 isolated rotator cuff repairs by 17 surgeons over a 13-month period, the total surgeon directed cost/case ranged from US$293 to US $3,752, with the most expensive repair totalling approximately 12 times the least expensive repair. The most expensive suture anchor cost approximately 23 times more than the least expensive suture anchor.[52] It is reasonable to argue that not all rotator cuff repairs are the same and there would be an inconsistency even with a single surgeon, depending on factors such as size, morphology, anatomy of the tear, bone quality, tissue

quality, age of the patient and the number of tendons involved. Nevertheless, this alone would not explain the huge variability that has been documented in the published US literature. It is also of interest to note that, in a recent study, factors that increased costs were found to be outcome neutral and most factors that improved outcome were found to be cost neutral, so the procedural costs does not appear to be necessary related to better outcome.[2]

Conclusions

There is no doubt that a non-surgical route with an appropriate physiotherapy programme has a role in management of degenerative rotator cuff tears. This is especially the case in patients with significant risk factors for surgery, those who do not wish to go through a surgical treatment, as well as those with small, partial and irreparable tears. Nevertheless, it is fair to conclude that rotator cuff repair has a good clinical outcome with significant improvements in pain, range of motion, strength, quality of life and sleep patterns. However, the radiological outcome is not as good as the clinical outcome, but despite this inconsistency, for reasons not completely clear a significant proportion of patients with repeat tears appear to have a good clinical outcome. Furthermore, full thickness tears that are treated non-operatively, particularly large tears with fatty degeneration in the more elderly patients, appear to increase in size in time to an extent that they may not be repairable.

If we are treating patients with symptomatic rotator cuff tears non-operatively, it is our duty to advise them of the natural history. Therefore, we feel that despite increased financial pressures in health systems, it is erroneous to entirely disregard the surgical option on clinical grounds in the absence of further high-quality randomised controlled trials with longer follow-ups comparing the two routes for management for symptomatic rotator cuff tears.[6] It is, however, fair to argue that surgeons treating patients with rotator cuff tears must be aware of the cost effectiveness of their chosen strategy. Therefore, it is reasonable to evaluate the variability of the cost of rotator cuff repairs in different units and among different surgeons with the aim of standardising these costs without compromising the clinical outcomes. Additionally, all efforts should be made to analyse surgical techniques, as well as to explore technological advances which may improve healing rates or radiological outcome.[11,53–56]

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