



Outcome at 3 to 5 years of a treatment algorithm for rotator cuff tears in an elderly population

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The purpose of this study is to evaluate the results of a conservative approach of rotator cuff tears in an elderly population at 3 to 5 years of follow-up.

Prospective comparative study. All patients started with a program of exercises of at least 1 to 3 months. When no satisfying results for pain relief and ADL were achieved, surgery for cuff tear repair was offered. Patients were contacted after 3 to 5 years for evaluation by questionnaire, an ultrasound and a strength measurement exam.

97 patients (104 shoulders) with a mean age of 68,5 years were included.

47.1% of shoulders were treated conservatively whereas 52.9% switched to surgical treatment.

Evaluation after 3 to 5 years showed no significant difference between type of treatment and post treatment test scores (Constant score, SF12v2, OSS and WORC).

Delaying surgery for 3 months does not seem to influence outcome negatively.

Keywords: RCT ; rotator cuff ; geriatrics ; treatment ; shoulder.

in over 60% (21). Available treatment options are surgery, or conservative therapy such as physical therapy and/or corticosteroid injection. Purpose of treatment is pain reduction and restoration of mobility and strength. The method of treatment depends on characteristics of the tear at time of diagnosis, the symptoms and age.

Recommendations for surgery based on tear characteristics are often weak or inconclusive (23). However, surgery is often recommended in case of full thickness tears as it has little capacity to heal without operative intervention (11,18). Also, large ruptures of M. supraspinatus and multiple tendon tears are often treated surgically (8). Surgery is recommended when strength is reduced and in presence of a painful arc and a positive drop test. Furthermore, severe nocturnal pain is also an argument for early surgery (2,27). Patients who are less than 50 years old will be preferably treated surgically, especially with traumatic tears. Patients who are older than 50 years old will be initially

INTRODUCTION

Tears of the rotator cuff (RCT) are among the most commonly diagnosed upper extremity orthopaedic conditions (7). In an elderly population of >60 years old, a rotator cuff tear can be found

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treated conservatively, because of the morbidity associated with surgery and the often unsatisfactory results (19,22). When conservative treatment fails, surgery can be offered (18). Surgery is said to be offered preferably within the following three months. Waiting longer than 6 months is not recommended because of the potential expansion of the rupture, muscle atrophy and fatty degeneration (4,27). The treatment algorithm of conservative treatment, possibly followed by surgery, was promoted by various studies (4,13,20,27). Conservative treatment of RCT is said to have a success ratio of 40 to 80% after 6 months (4,17). Most improvement is made on pain relief, mobility and Constant score, whereas less improvement in strength is seen (24). However, this has little impact on the ADL activities of the elderly, as they often have reduced functional needs (30). Additional physiotherapy focussed on improvement of muscle strengthening of the deltoid, scapular and rotator cuff muscles and the use of ergonomic devices can improve the quality of life of older patients (1).

Few studies have evaluated the result of a conservative treatment as opposed to surgery, especially with a longer follow up. Most reports with longer-term results concern surgically treated patients. In this study, we have treated elderly patients with rotator cuff tears conservatively, followed by surgery in case of insufficient symptom relief and functional improvement. Mid-term outcome was evaluated after 3 to 5 years.

MATERIAL AND METHODS

From 2003 to 2007, we prospectively entered all patients that presented to our outpatient clinic with rotator cuff pathology into a database. The diagnosis was made by clinical examination and confirmed by ultrasound. Our classic treatment algorithm for rotator cuff tears in elderly patients is primarily conservative and consists of physiotherapy for strengthening exercises of the rotator cuff, scapular muscles and deltoid, the recommendation for breaststroke swimming and analgesic treatment. Dependent on pain and patient demand, up to 3 corticosteroid infiltrations were injected.

Patients were clinically evaluated after 1, 3 and 6 months of conservative treatment. Patients that showed improvement in function and pain were followed until satisfying functional recovery (activities of daily living) and/or until they were pain free. This usually occurred between 3 to 6 months follow-up visit.

When insufficient functional and analgesic improvement was observed, patients were offered surgery. Surgical candidates underwent a CT- or MR arthrography to delineate tear characteristics.

From 2008 to 2010, thus 3 to 5 years post-treatment, all elderly patients listed in the database with a rotator cuff tear were contacted by telephone and asked to participate in this follow-up study. They were evaluated by questionnaire and were invited to attend the hospital for strength measurement using a handheld dynamometer. This allowed computing a Constant score. Range of movement was measured in degrees using a goniometer, except for internal rotation which was measured up the back. At the same time they were offered the opportunity to undergo an ultrasound (US) evaluation of the rotator cuff, to be compared to the original ultrasound protocol. As US has shown to be a valid option for evaluation of the rotator cuff (10,12), we chose to evaluate by US for practical reasons (time for appointment, cost,..). In addition, because an initial ultrasound was available in all patients, results from baseline to final follow-up could be compared. In our department, only patients that are bound to undergo surgery will have an MRI, MR- or CT-arthrogram, which precluded comparison between baseline and follow-up in the conservatively treated group when using one of these modalities for follow-up.

The study was approved by the Local Ethical Committee and Informed consent was obtained.

The questionnaire consists of a Flemish or Belgian-French version of the Oxford Shoulder Score (OSS) as well as the Western Ontario Rotator Cuff Score (WORC). The OSS is a 12-item questionnaire combined to produce a single score ranging from 0 (worse) to 48 (best score). The Western Ontario Rotator Cuff Index is a condition-specific self-reported instrument to assess Quality of Life. It consists of 21 visual analog scales and

results in a percentage score with a maximum (best result) of 100%. Both OSS and WORC scores are patient-oriented and can be administered by mail or by phone. In addition a general Health-related Quality of Life Outcome Questionnaire was assessed to exclude interference with non-shoulder-related complaints. We used the SF12v2 questionnaire (26), which consists of 12 questions inquiring the common physical and mental health of the patient.

RESULTS

The database finally included 573 patients with rotator cuff pathology. From this database we tried to contact patients over 60y with an ultimate diagnosis of RCT. Many of these patients could not be reached (deceased, invalid address). Others

were not willing to participate due to advanced age, transportation problems, no personal benefit, no more pain. By telephone, 148 patients agreed to come to the outpatient clinic. However, only 84 patients did show up at their appointment. People who were not willing to come to the outpatient clinic, were sent the outcome score questionnaires by mail. By telephone 31 patients agreed to return the outcome questionnaires but only 17 actually did send them in, of which only 13 were completely filled in and valid. Therefore, this study includes 97 patients (104 shoulders) diagnosed with rotator cuff tear in the UZ Brussels from 2003 to 2007. The study population consists of 64 % female and 36 % male patients with a mean age of $68,5 \pm 9,7$ years old.

The distribution of the pathology at the time of diagnosis was isolated rupture of M. supraspinatus

Table 1. — Questionnaire scores

| Descriptive Statistics | | | | | | |
|------------------------|--------------|-----|---------|---------|--------|----------------|
| Test | Group | N | Minimum | Maximum | Mean | Std. Deviation |
| Cons sc | conservative | 38 | 31,00 | 99,00 | 77,03 | 20,005 |
| | surgery | 52 | 24,00 | 100,00 | 76,39 | 18,478 |
| | total | 90 | 24,00 | 100,00 | 77,39 | 18,379 |
| SF12 PCS | conservative | 43 | 24,00 | 59,40 | 42,32 | 9,785 |
| | surgery | 42 | 21,40 | 58,80 | 41,03 | 10,545 |
| | total | 85 | 21,40 | 59,40 | 41,72 | 10,131 |
| SF12 MCS | conservative | 43 | 18,10 | 63,60 | 50,13 | 10,008 |
| | surgery | 42 | 28,20 | 74,50 | 49,13 | 9,433 |
| | total | 85 | 18,10 | 74,50 | 49,74 | 9,524 |
| SF tot | conservative | 43 | 63,80 | 119,10 | 92,46 | 13,883 |
| | surgery | 42 | 59,10 | 110,60 | 90,16 | 13,031 |
| | total | 85 | 59,10 | 119,10 | 91,45 | 13,477 |
| OSS | conservative | 48 | 22,00 | 48,00 | 40,45 | 7,110 |
| | surgery | 54 | 10,00 | 48,00 | 38,96 | 8,642 |
| | total | 102 | 10,00 | 48,00 | 39,85 | 7,820 |
| Worc | conservative | 49 | 0,00 | 1912,00 | 522,24 | 509,171 |
| | surgery | 53 | 0,00 | 1908,00 | 584,89 | 567,866 |
| | total | 102 | 0,00 | 1912,00 | 535,27 | 539,508 |
| Worc % | conservative | 47 | 8,90 | 100,00 | 76,17 | 24,229 |
| | surgery | 55 | 9,14 | 100,00 | 73,17 | 27,048 |
| | total | 102 | 8,90 | 100,00 | 75,00 | 25,558 |

in 72.7%. In 21.3%, two tendons were affected, M. supraspinatus and M. infraspinatus (6.1%) or M. supraspinatus and M. subscapularis (15.2%). In three percent there was a rupture of the M. supraspinatus, M. subscapularis and M. infraspinatus. An additional tear of M. biceps brachii was seen in 2.4% of RCT patients. Almost three-quarters of patients (75.4%) had full thickness tears. Four shoulders showed an avulsion fracture. Retraction was present in 10.7% of patients. Concomitant problems were calcifications (6%), tendinitis (8.3%) and bursitis (6%).

At the time of initial consultation, 13.4% of patients suffered limitation of range of motion but little pain. 45.4% complained of severe pain. 9.3% of patients had a painful arc as well and 32% of patients suffered from nocturnal pain. Most of the patients presented a loss of strength and had difficulty in performing tasks of daily living.

Of the entire group, 49 shoulders (47.1%) improved sufficiently without surgery. For 55 shoulders (52.9%) surgery (37 arthroscopic (35.6%), 18 (mini)open (17.3%)) was chosen after failure of conservative treatment. Isolated supraspinatus tendon tears, were treated conservatively in 54.4%. When multiple tendons were involved, surgery was chosen in 64.7% (44.4% arthroscopic, 22.3% open surgery).

A painful arc with reduced ROM at initial presentation was the least predictive of the need for surgery (37.5% surgery), followed by pain as the only complaint (52.3% surgery). Patients presenting with decrease in strength and nocturnal pain were more likely to end up with surgery (61.5% and 70% respectively).

Three to five years post treatment, an ultrasound evaluation of the RCT was made. Patients who underwent surgery for a full thickness tear had a re-tear present on the US image in 55%: in 40% the tear determinants were comparable to the ones at time of diagnosis, in 5% the tear was larger. In 10% we found a positive evolution in regard to the original protocol, with only the presence of a small partial tear. 45% of shoulders were healed, with no tear present on US. The ultrasound image of the conservatively treated patient group with full thickness tears was in 47% comparable to the image

at time of diagnosis, worse in 23.5% and apparently improved in another 23.5%. In 6% of shoulders ultrasound could no longer detect a RCT. Both in the conservatively and surgically managed full thickness tears there was slightly more retraction to be found after 3 to 5 years. The partial thickness tears that were repaired surgically showed a re-tear in only 17%, whereas no more tear could be found on US evaluation in 83%. There was no retraction in this group. Partial thickness tears that were conservatively managed, however, evolved to a larger or complete tear in 75% on US evaluation, half of them with visible retraction. The other 25% was the partial tear appeared smaller or became undetectable on ultrasound.

The mean Western Ontario Rotator Cuff Score (WORC) was $75\% \pm 25.56$ (range 9-100). The mean Oxford Shoulder Score (OSS) after 3 to 5 years was 39.85 ± 7.82 (range 10-48). The mean Constant score was 77.39 ± 18.38 (range 24-100). The mean score of the SF12v2 test was 91.45 ± 13.47 . This can be divided in a mean PCS score for physical health of 41.72 ± 10.13 (range 21.4-59.4) and a mean MCS score for emotional health of 49.74 ± 9.52 (range 18.1-74.5). Scores were compared with types of treatment. The results are shown in table 1.

Statistical analysis of variance (ANOVA) proved no significant difference between type of treatment (conservative vs surgery) and post treatment test scores (Constant score, SF12v2, OSS and WORC).

Regression analysis proved no significant difference between post treatment scores and pain at time of diagnosis. Furthermore there was no correlation between types of rupture (partial or full thickness) or affected tendons and the test scores at 3-5 years post treatment.

We did find a strong positive correlation between the Constant score and the OSS (Pearson's r 0.871) and Worc% (Pearson's r 0.739) scores as well as between the OSS and the worc% (Pearson's r 0.827). Correlation was less between the SF12PCS questionnaire and the Constant score (r 0.511), OSS (r 0.574) and worc% (r 0.542).

DISCUSSION

Although RCT is a remarkably common disorder in patients with a mean age of 60 years or older, evidence for recommendations for treatment is scarce (11,15,25). Previous studies showed good results after conservative treatment of RCT in elderly patients (5,16,17,28,30). Kijima H. *et al.* (16) evaluated 103 patients (mean age of 62 years old) at 13 years after diagnosis. Outcome of pain score and activities-of-daily-life score measured with the Japanese Orthopaedic Association shoulder scoring system were good. About 90% of patients had no pain or only slight pain and 70% had no disturbance in activities of daily life. The results seemed to be age related: the younger patients tended to have more pain and disturbances. In addition, conservative treatment has been shown to be successful even in the presence of full thickness tears (3,5,14,17). Baydar *et al.* (3) evaluated conservative management of patients (mean age 60.9 y) with full thickness RCT. There seemed to be significant improvement in pain, motion, function and quality of life on short term follow-up of 6 months. Moreover they found significant improvement in isokinetic measurements of shoulder abduction, external and internal muscle strength. Koubâa *et al.* (17) prospectively evaluated the conservative management of 25 patients with full thickness rotator cuff tears. The mean age was 59 years. They had a 75% success rate after six months of conservative treatment of full thickness tears. Bokor *et al.* (5) documented the long term outcome of symptomatic full thickness RCT treated non operatively. In 40 patients the onset of symptoms was associated with an injury. Evaluation with physical examination and questionnaire in 53 patients (mean age 62.2 years) at an average of 7.6 years showed improvement in most patients, with regard to the ability to perform activities of daily living. 74% of patients stated to have only slight or no shoulder discomfort at follow up evaluation. In spite of the satisfactory results in pain, range of motion, and function, 94% had evidence of weakness on muscle testing and 56% had demonstrable muscle atrophy. Pain was said to

be settled within six months for more than half of the patients. This supports the recommendation to consider a short trial of conservative therapy.

In concurrence with these previous studies, our study found no difference in outcome after conservative treatment versus surgery, based on the provided questionnaires and the constant score. Results after 3 to 5 years of conservative treatment are good. Mean Constant score was 77.39 ± 18.38 , which is a good result as opposed to the reference values, seen that a normal of near-normal shoulder function has a Constant score of 80 or more (29). Similar outcomes have previously been described in conservative treatment studies (17) as well as in post-surgery treatment studies (9). Koubâa *et al.* (17) found a Constant score of 74.7 ± 15.2 after 6 months of conservative treatment of full thickness tears. Dawson *et al.* (9) described a Constant score of 74,0 at 4 years follow up after surgical treatment of 93 patients (22-83 years old) with rotator cuff tear. The OSS score, a measure of patient well-being seemed to be fair in all of our treatment groups (conservative vs surgery). The mean score of the SF12v2 test was 91.45 ± 13.48 with a mean PCS score of 41.72 ± 10.13 and a mean MCS score of 49.73 ± 9.52 . The mean score of a healthy person is 50 ± 10 . Mean score in a random American population (>45 years old) in 1988 is 49.9 ± 8.69 for MCS and 49.35 ± 9.05 for PCS. Above 75 years old these scores are 48.89 ± 9.33 for MCS and 39.75 ± 9.3 for PCS. In the Netherlands these scores tend to be slightly higher (13). As such, mean scores of the SF12v2 questionnaire measured from the patients in this study did not seem to differ much from those of a random population.

There seemed to be no significant differences whatsoever in Constant score, WORC, OSS and SF12v2 questionnaire outcomes after conservative treatment as opposed to surgery. Correlation between these questionnaires, as found in our study, has been previously described (9).

On ultrasound evaluation, results after 3 to 5 years seemed to be most improved in surgically treated full thickness tears. However, re-tearing was present in 44% of them. Tear recurrence is a well-known problem and is often seen within the first

three months after cuff repair (6). US evaluation of conservatively treated rotator cuff tears showed no prominent differences after 3 to 5 years.

Patients generally have surgery after several months of failed conservative treatment. Evidence is needed to determine whether surgery should be delayed, and if so, for how long and for whom (25). Our treatment algorithm for elderly patients based on a primarily conservative treatment showed no significant differences in outcome measured either by physical and ultrasound investigation nor by objective questionnaires after 3 to 5 years. Patients who obtained satisfactory pain relief and function with conservative treatment had similar outcome to those patients that eventually opted for surgery because of insufficient improvement. Thus, in our opinion, surgery can be postponed and avoided, independent of the clinical presentation at time of diagnosis and the type of rupture (full thickness or partial thickness tear). However, partial tears that are not operated on tend to evolve towards a full thickness tear in the majority of patients, even though outcome may be similar.

The most important limitation of this study is the low participation grade of database-listed patients in the follow-up study. This may create a bias in the outcome. However, a similar number of patients in both groups was evaluated. Besides, patients for whom we lacked contact information, many patients declined to participate because of advanced age, transport problems or simply because they had no shoulder complaints. Therefore, patients with a potentially better outcome as well as patients with a worse outcome may have been missed. Another drawback is that we cannot compare outcome scores with initial scores because these were not registered initially. This could have led to a relatively more active and symptomatic control group. Also, we did not exclude patients based on the origin of the pathology. Therefore we had some post-traumatic tears as well as degenerative pathology. Strengths of this study are that it is a relatively large cohort study and that all patients who were seen at our outpatient clinic were evaluated by the same surgeon which minimises the intervariability of physical examination results.

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