Arthroscopic suprascapular neurotomy for the painful irreparable rotator cuff tear

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Abstract

Background: Massive irreparable rotator cuff tears are becoming increasingly difficult to manage.

Methods: Patients were considered for treatment if they had a painful shoulder in the presence of a compensated cuff tear. All patients had radiological evidence of a massive irreparable cuff tear and underwent suprascapular neurotomy, arthroscopically.

Results: There were 15 males and 25 females with a mean age of 74 years (range 59 years to 88 years). The mean pre-operative Oxford Shoulder Score (OSS) in all patients was 17.7, with a mean pre-operative visual analogue score (VAS) of 8.0. The mean post-operative OSS was 30.8 [27.42–34.18 = confidence interval (CI) 95%] with a mean VAS of 3.6 (2.64–4.56 CI 95%) at the 3-month (short-term) period ($n = 32$). The medium-term (1-year) OSS and VAS had improved to 33.6 (32.27–34.93 = CI 95%) and 3.7 (0–8.39 CI 95%) respectively ($n = 26$). The difference pre- and postoperatively at 12 months was statistically significant ($p < 0.001$). Patients who underwent biceps tenotomy at the time of surgery had a less significant improvement in their VAS and OSS.

Conclusions: Suprascapular neurotomy can afford medium-term benefit in over two-thirds of the patients who would otherwise have undergone reverse polarity shoulder replacements. We consider that this is a reproducible technique.

Keywords

Arthroscopy, rotator cuff, rotator cuff arthropathy, suprascapular nerve

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Introduction

Massive irreparable rotator cuff tears are an increasing burden on society and are difficult to manage.^{1,2} The outcome of repairing massive cuff tears has been analyzed and its success is considered to be multifactorial in nature. Fatty infiltration of the infraspinatus in particular may play a significant role.²

The options of treatment for the clinician have been limited and rely on a thorough assessment of the patients suitability for intervention.¹ In an attempt to prevent rotator cuff arthropathy, tendon repair, tendon transfer, matrix allografting, platelet rich plasma and biodegradable subacromial spacers have been tried. The end result of these techniques may be an arthroplasty procedure.^{1–5}

Nizlan et al. used a nonvalidated scoring system to review the outcomes of 20 patients who had an

arthroscopic suprascapular neurectomy, 17 of whom had rotator cuff arthropathy.⁶ At a mean of 29 months, they noted a 75% good to excellent pain relief and most impressively 90% less rest pain.⁶

Patients who are not suited to major surgical intervention are frequently seen by pain specialists who have been able to perform pulsed radiofrequency of the suprascapular nerve under landmark or ultrasound techniques with varying success (Table 1).^{7–12} The

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Table 1. Published data for comparing techniques of suprascapular nerve ablation.

Reference	Number of patients	Scoring system	Landmark/USS-guided	Complications	Results	Duration of results
Bashir et al. ⁷	62	VAS	X-ray	Nil	85% patients >50% pain relief	6 months
Kane et al. ⁸	12	OSS/VAS	X-ray	Nil	All scores improved	6 months
Keskinbora et al. ⁹	32	OSS		nil	OSS improved	6 months
Liliang et al. ¹⁰	11 (13 joints)	VAS	X-ray	Nil	VAS reduced by 5	6 months
Gurbet et al. ¹¹	8	Pain scores			'pain control'	12 weeks
Bone et al. ¹²	62	VAS	Landmark	Nil	>50% pain relief	6 months

USS, ultrasound scan; OSS, Oxford Shoulder Score; VAS, visual analogue score.

results of these series, however, are limited by medium-term follow-up.

The potential advantages to the arthroscopic technique include the ability to define the extent of the cuff tear, to classify the severity of glenohumeral arthritis and to divide the suprascapular nerve under direct vision without injuring the suprascapular artery.

The present study aimed to analyze the available data relating to our experience of arthroscopic suprascapular neurotomy in patients who have irreparable rotator cuff tears.

Materials and methods

Patients were identified retrospectively using electronic patient records and theatre listing records.

All patients were under the care of a single surgeon (MJR) from February 2010 to October 2013. All had irreparable rotator cuff tears with or without rotator cuff arthropathy. Patients were considered for the procedure if they had a painful shoulder in the presence of a compensated cuff tear (i.e. they were able to abduct or forward flex to shoulder height). Those with a painful shoulder and pseudoparalysis who wanted an increased range of movement were offered a reverse polarity replacement. Patients were specifically examined for a lag sign when testing external rotation; an intact infraspinatus is a contraindication for suprascapular neurotomy.

Rotator cuff tears were deemed irreparable by the senior author either pre-operatively on magnetic resonance imaging scanning or during arthroscopic examination, the criteria of which are presented in Figure 1. Oxford shoulder scores (OSS) and visual analogue scores (VAS) were recorded pre-operatively, within the first 3 months to 6 months, and at 12 months post-operatively where possible. This was performed in the clinic or by a telephone call from one of the

- Fatty degeneration of the supraspinatus > 50% muscle bulk on sagittal T1 MRI
- Cuff retraction to the level of the glenoid or medial to the glenoid
- Acetabularisation of the acromion + superior migration of the humeral head
- Severe arthritic change in the glenohumeral joint in combination with the above
- Immobile rotator cuff on arthroscopic examination

Figure 1. Components contributing to the diagnosis of an irreparable rotator cuff.

authors (PK). The OSS is a subjective measure with 12 questions relating to pain and function. A score of 48/48 was considered normal with a score of 0/48 indicating severe disease. The scores were obtained and analyzed in a retrospective manner using Student's *t*-test and calculating the confidence intervals (CI) at an significance level of 95%.

All patients were consented for suprascapular neurotomy prior to the procedure under general anaesthesia in a beach chair position.

Surgical technique

A posterior viewing portal is made to inspect the glenohumeral and subacromial spaces. A standard lateral portal is made under direct vision. The lateral port is utilized for viewing and an additional anterior portal was made. The position of the anterior port is made using a needle so that an instrument can pass along the line of the supraspinous fossa. Using an arthroscopic wand, the coraco-acromial ligaments are identified and followed under direct vision to the base of the coracoid. The fibres of the coracoclavicular (CC) ligaments are then identified running vertically from the base of the coracoid. The CC ligament is followed inferiorly and becomes confluent with the suprascapular notch

ligament, which runs in a horizontal direction. Using a Nevaiser portal, the suprascapular notch ligament is divided from the coracoid using an arthroscopic wand. At the same time as protecting the suprascapular artery, the nerve is divided under direct vision, leaving an empty suprascapular notch (Figures 2 and 3). No other tissues within the glenohumeral joint or subacromial space are debrided except the biceps, which is tenotomized if present. A subacromial decompression is not performed. Patients are given a collar and cuff for temporary pain relief, which is discarded at the earliest opportunity when the patient is comfortable. Patients are initially reviewed within 1 week by a physiotherapist who made sure that there were no immediate complications and commence deltoid strengthening exercises.

Results

Patient data were collected retrospectively using a trust secure database. Forty patients were included in the time frame mentioned. There were 15 males and 25 females with a mean age of 74 years (range 59 years to 88 years) who underwent suprascapular neurotomy

under general anaesthesia. Two patients have since died beyond 6 months following the procedure as a result of unrelated illnesses.

Pre-operatively, all patients underwent clinical and X-ray examination. Twenty-one patients underwent magnetic resonance imaging to confirm the presence of arthropathy or an irreparable cuff tear. Five patients underwent formal ultrasound examination.

Eighteen patients were diagnosed with cuff tear arthropathy following investigation, whereas three patients had undergone a previous cuff repair that had failed.

The mean pre-operative OSS in all patients was 17.7 (15.26–20.14 = CI 95%) with a mean pre-operative VAS of 8.0 (7.49–8.51 = CI 95%) indicating severe shoulder pain and dysfunction.

Pre-operative mean VAS and OSS scores in patients with Cuff arthropathy were 8.3 and 19.8, respectively. Comparatively, the mean VAS and OSS scores in all other patients were 7.9 and 16.0.

The mean postoperative OSS in all patients was 30.8 (27.42–34.18 = CI 95%) with a mean VAS of 3.6 (2.64–4.56 = CI 95%) at the 3-month (short-term) period. Using a two-tailed paired *t*-test, there were statistically

Figure 2. Arthroscopic identification of the right suprascapular notch ligament and nerve as seen from a lateral viewing portal.

Figure 3. Schematic diagram of a posterior coracoid.

significant reductions in the VAS and the OSS at 3 months ($P < 0.001$). A total of 32 patients were available for follow-up at the 3-month period.

The medium-term (1-year) VAS and OSS had improved to 3.7 (2.37–5.03 = CI 95%) and 33.6 (28.91–38.29 = CI 95%), respectively. The difference pre- and postoperatively at 12 months was also statistically significant ($P < 0.001$). A total of 26 patients were available for follow-up at the 1-year period.

After the 1-year review, 16 of the 26 medium-term follow-up patients had avoided a reverse polarity shoulder replacement as a result of control of their symptoms. Reverse polarity shoulder replacements were offered to patients with unremitting pain where OSS and VAS did not improve or may have deteriorated. This decision was made by the senior author.

When analysing the OSS breakdown, there is a steady improvement regarding both pain and function (Figure 4).

Eleven patients underwent biceps tenotomy. Eleven of the patients had documented autotenotomy. At 6 months, there was no statistically significant difference in OSS ($P = 0.08$) between those who underwent surgical tenotomy and those who had autotenotomized. The change in VAS at 6 months, however, was found to be significant ($P = 0.01$) using a Student's *t*-test. At 1 year, the change in pre-operative VAS or OSS was not statistically different between those who had undergone surgical tenotomy and those who had already auto-tenotomized ($P \geq 0.05$). At 1 year, the difference

in the improvement in both VAS and OSS in the auto-tenotomized group was statistically significant ($P \leq 0.05$). This was also true for patients who underwent tenotomy at 3 months, although no such change was observed in the OSS at 1 year (Table 2).

Discussion

The suprascapular nerve is said to account for up to 70% of pain fibres in the glenohumeral joint.¹³ Massive, irreparable cuff tears are a problem in an increasingly elderly society. Various treatment options exist from simple analgesia and physiotherapy to reverse polarity joint replacement.

Our patient cohort reflects an elderly group who are trying to maintain an acceptable quality of life. A mean OSS of 17.7 within this group reflects an unacceptable standard of living regarding pain and function.

Our results demonstrate the ability for the orthopaedic surgeon to radically improve the quality of life by creating a statistically significant reduction in pain and an increase in function in those who have irreparable cuff tears. Both short- and medium-term outcomes amongst our patients are favourable.

The clear advantage of this arthroscopic day case procedure is the ability to accurately define and document the disease process within the glenohumeral joint, repair the cuff if possible, or perform a suprascapular neurotomy. When comparing it with the landmark radiofrequency ablation technique, the nerve is found

Figure 4. Oxford Shoulder Score breakdown following suprascapular nerve ablation.

Table 2. Mean outcomes between patients where the long head of biceps was absent and those who underwent surgical tenotomy.

	Pre-operative VAS	1 year postoperative VAS	Pre-operative OSS	1 year postoperative OSS
Biceps absent	7.6	3.4	15.1	41
Surgical tenotomy	9	5.3	19.2	24.6

OSS, Oxford Shoulder Score; VAS, visual analogue score.

and resected under direct vision without damaging other structures. At arthroscopy, if the infraspinatus is intact, then a suprascapular nerve ablation cannot be undertaken because the patients function may deteriorate. With non-arthroscopic radiofrequency ablation, the infraspinatus cannot be directly visualized, potentially causing iatrogenic reduction in function.

It is important to note that none of our patients underwent a decompression, microfracture or general debridement. The reasons for this are two-fold: to retain structures that would prevent anterosuperior escape and to eliminate a source of potential error in the present study.

Patients who had an absent long head of the biceps at the time of surgery appeared to have significantly greater improvement in both VAS and OSS. We expected to see more improvement in patient symptoms

in those who had a surgical tenotomy of the long head of biceps (innervated by the musculocutaneous nerve) and a suprascapular neurotomy; however, this was not the case.

Although we have demonstrated a significant reduction in the number of reverse polarity shoulder replacements required for this group, we acknowledge that a SSN ablation is not without its drawbacks. Specifically, patients do not become entirely pain free: their pain levels are reduced such that they can be managed without further surgery and with simple oral analgesia. Of the seven patients who underwent a SSN ablation followed by a reverse polarity shoulder replacement, two underwent the conversion within a 6-month period as a result of unremitting pain. The decision was made by the senior author. We counselled patients carefully in the pre-operative period to ensure that they have realistic goals regarding the suprascapular neurotomy.

We are unable to explain the loss to follow-up of the remaining patients after 1 year at this stage and are not aware of any further intervention that they have undergone.

Conclusions

Arthroscopic suprascapular neurectomy under direct vision is an effective procedure at reducing short- and medium-term pain and increasing function.

It has the clear advantage of accurately defining the relevant pathology and permits the surgeon the opportunity to act accordingly.

Suprascapular neurectomy has afforded medium-term benefit in 61% of patients who would otherwise have undergone reverse polarity shoulder replacements.

We consider this to be a reproducible technique that can be performed in similar units as a day-case procedure, provided that the patients meet the specific criteria.

Declaration of Conflicting Interests

None declared.

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