Continuing acromioclavicular joint pain after excision arthroplasty: is further surgery effective?

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ABSTRACT

BACKGROUND Little published evidence exists on the incidence of continuing acromioclavicular joint pain with no published outcomes for revision surgery. This study aimed to establish the incidence and outcomes of revision acromioclavicular joint excision surgery.

MATERIALS AND METHODS A consecutive retrospective cohort of patients undergoing revision arthroscopic or open acromioclavicular joint excision was identified. Patients were identified from a prospectively collected database. Inclusion criteria were revision acromioclavicular joint excisions over a 14-year period between 2001 and 2015. Exclusion criteria were previous surgery for acromioclavicular joint instability or shoulder arthroplasty. Outcome measures were Oxford Shoulder scores and a satisfaction survey.

RESULTS Forty-three consecutive cases of revision acromioclavicular joint excision over 14 years (37 after arthroscopic excision with subacromial decompression, 5 after arthroscopic excision with rotator cuff repair, 1 after open excision). Continuing acromioclavicular joint pain was associated with incomplete resection from arthroscopic surgery, which was the primary indication for revision surgery. Revision occurred a mean 14.2 months after primary surgery (standard deviation 7.6 months). Mean Oxford Shoulder score was preoperatively 18 (standard deviation 8.1) and 23.4 (standard deviation 11.1) after primary surgery, which did not reach significance until after revision surgery with a mean 31.7 (standard deviation 13.6; $P = 0.021$). Median follow up was 15 months (interquartile range 4–31 months). A survey at a mean of 6 years (standard deviation 2.3) post-revision surgery found that 65% of patients felt improved, 77% would have their surgery again and 69% of patients felt satisfied. The incidence of postoperative frozen shoulder was 14.3%.

CONCLUSION Functional outcomes after revision surgery showed improvement from scores taken before primary surgery; however, long-term satisfaction rates were relatively low.

KEYWORDS

Acromioclavicular joint – Osteoarthritis

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Introduction

Acromioclavicular joint (ACJ) osteoarthritis is a common cause of anterior shoulder pain. When non-operative treatment in the form of simple analgesia, activity modification, physiotherapy and steroid injection have been exhausted, surgical treatment is considered. Recent evidence has found that arthroscopic treatment has similar outcomes to open treatment and may in fact result in less long-term postoperative pain.¹ Open resection of the distal clavicle, as described by Mumford,² has become less popular due to concerns about the morbidity of detachment of the deltoid and trapezius and risk of infection and instability,³ despite good success rates.⁴ Arthroscopic surgery is technically challenging due to difficulties in visualisation of the lateral end of the clavicle,⁵ with an increased risk of incomplete

resection of the posterior superior cortex resulting in a residual ridge of bone which can cause continuing pain.

The authors have observed patients suffering from continuing ACJ pain following surgical resection, which is challenging to manage. A search of the literature revealed little published evidence on the incidence of continuing ACJ pain and no published outcomes for revision surgery. Two recent retrospective series comparing open to arthroscopic ACJ excision reported an incidence of revision surgery from arthroscopic cases between 3.7% and 6.2% and between 2.4% and 4.2% from open cases.^{6,7} However, no patient recorded outcome measures were reported (Table 1).

The purpose of this study was to establish the incidence of revision ACJ excision from a large consecutive group of patients undergoing primary surgery and to review their

Table 1 Literature search for revision acromioclavicular joint surgery comparing the main outcome variables of this study.

Study	Type	Follow-up (months)	Shoulders (n)	Revision (%)	Mean postoperative OSS (SD)	Postoperative frozen shoulder (%)	Postoperative instability (%)	Postoperative infection (%)	Follow-up (months)
Elhassan (2009) ⁷	Arthroscopic	49	82	6.2	–	–	0	–	49
	Open	53	24	4.2	–	–	0	–	53
Duindam (2014) ⁶	Arthroscopic	34	108	3.7	–	8.3	0	0.9	34
	Open	43	41	2.4	–	2.4	0	4.9	43
Dekker (this study)	Arthroscopic	–	1223	3.4	–	3.4	–	–	–
	Open	–	60	1.7	–	3.2	–	–	–
	Revision arthroscopic	15	42	11.9	29.9 (13.6)	7	0	2.3	15
	Revision open	15	1	0	20 (0)	0	0	0	15

OSS, Oxford Shoulder score; SD, standard deviation.

functional outcomes to determine if revision surgery was effective.

Materials and methods

Study design and study population

A retrospective cohort study of all patients undergoing either open or arthroscopic ACJ excision surgery under the care of four consultant shoulder surgeons between January 2001 and December 2015 was performed. The exclusion criteria were open procedures carried out as part of a shoulder hemiarthroplasty and patients who have had previous surgery for ACJ instability.

Patients were identified using a prospectively collected database containing diagnosis and procedural information both from clinic and the operating theatre from 2001 onwards. Historical cases before the introduction of electronic notes in 2011 had this information entered on the database on a case-by-case basis by a data entry team using case notes and theatre logs. The database was searched for all records of arthroscopic and open ACJ excision from January 2001 to December 2015. Patient case notes were requested for retrospective analysis and outcome data was extracted. Patients having revision surgery either had been referred back to the shoulder unit or had never been discharged due to continuing pain. Patients were informed about the study via letter and invited to return a survey questionnaire. If no reply was received then patients were contacted by telephone.

All patients had completed a minimum of six months of non-surgical treatment comprising a watch and wait strategy, which in some cases included physiotherapy and oral anti-inflammatory analgesia. Those receiving an intra-articular steroid injection underwent the procedure

without image guidance in the outpatient clinic using 40 mg in 1 ml of triamcinolone combined with 1 ml 0.5% bupivacaine. The decision to reoperate was based on failure to improve given six months of non-surgical management with pain and tenderness over the ACJ and positive cross-body adduction test. Plain-film radiographs were performed using standard anteroposterior shoulder views plus a 30-degree oblique (Zanca) view.⁸

Arthroscopic surgical procedure

Regional or general anaesthesia was used, patients were placed in a beach chair position with extremity draping and the arm left free. A standard arthroscopic posterior portal was used to perform a glenohumeral joint arthroscopy and to visualise the subacromial space. Lateral and anterior portals were used for instrumentation. First, a bursectomy was performed for visualisation with subacromial decompression using a burr if necessary. The location of the midpoint of the ACJ was located using a 20-gauge needle before creating the incision for the anterior portal. Any remaining fibrocartilaginous disk was removed and the lateral end of the clavicle was resected using both anterior and lateral portals.

Open surgical procedure

A longitudinal incision was made directly over the distal clavicle with dissection through the deltoid fascia. The capsule of the ACJ was incised at 90 degrees to the skin incision with periosteal elevation to create flaps of tissue for closure. The lateral end of the clavicle was resected to allow a clearance from the acromion of at least 1 cm using an oscillating saw to permit the surgeon's digit without impingement on shoulder elevation and adduction.

Patients had routine clinical follow-up with the treating surgeon at a minimum of 6 weeks, 12 weeks and 6 months. Shoulder function was assessed using the Oxford Shoulder score (OSS).^{9,10} Scores range from 0 to 48, with 48 being the best outcome. OSS was assessed at each clinic attendance. For the purposes of this study, the OSS at the first clinic attendance was taken as the pre-primary ACJ excision, the OSS before revision ACJ excision as the post-primary ACJ excision and the OSS at the most recent follow-up appointment the post-revision OSS. The incidence of revision and incidence of a diagnosis of postoperative frozen shoulder was obtained from clinic letters. The duration of follow-up was recorded. Complications identified including infection requiring surgical washout or hospital admission, postoperative ACJ instability and revision surgery. The reason for revision was correlated to preoperative and postoperative plain film radiographs by the senior author.

A survey questionnaire was sent by mail, which included an OSS and four dichotomous questions asking if the patient felt improved, if they felt satisfied and if they would have the surgery again. They were also offered a further clinic appointment.

Statistical analysis

Statistical analysis was performed using SPSS version 25.0. Paired t-test was used to compare preoperative with

postoperative OSS as Shapiro Wilk test of normality confirmed normally distributed data. Subgroup analysis was performed using Chi square test to compare survey questions for the group of patients with a clear radiographic indication for revision surgery versus those without.

Results

A total of 1361 ACJ excision surgeries were performed by four consultant shoulder surgeons between 2001 and 2015 (Figure 1). Seventy-eight cases were excluded as they were performed in patients having shoulder arthroplasty. Of the remaining 1283 cases, 988 were performed arthroscopically with subacromial decompression, 235 were performed arthroscopically in conjunction with an arthroscopic rotator cuff repair and 60 were open cases.

Some 43 revision cases were identified (18 male and 25 female) with a mean age of 55 years (range 29–76 years, standard deviation, SD, 10.9). There were six diabetic patients. Before their revision surgery, 84% received an intra-articular steroids and local anaesthetic injection. Revision surgery occurred a mean 14.2 months since primary surgery (SD 7.6 months). Of the arthroscopic cases 29 were revised arthroscopically and 13 revised open. There was one open revision, which was revised open.

The reasons for revision were nonspecific pain (13 shoulders), inadequate excision (16 shoulders), ACJ pain with transient response to injection (8 shoulders), heterotrophic new bone formation (6 shoulders). A review of the preoperative radiographs showed good clearance in five cases, inadequate excision in 35 cases, heterotrophic new bone formation in two cases; for one case, radiographs were not available.

Preoperative OSS was mean 18.0 (SD 8.1), post-primary surgery OSS was mean 23.4 (SD 11.1) and post-revision surgery OSS was mean 31.7 (SD 13.6; Figure 2). The difference was significant comparing preoperative OSS and post-revision OSS ($P = 0.021$) but not significant comparing preoperative OSS and post primary OSS ($P = 0.061$) or post-primary OSS and post-revision OSS ($P = 0.145$). Clinical follow-up with OSS assessment occurred at a median 15 months (interquartile range, IQR, 4–31) and was a minimum of six months for all cases.

There was one case of deep infection, which was successfully treated with a surgical washout and intravenous antibiotics in a patient treated with arthroscopic surgery. There were three cases of frozen shoulder (7%) in patients treated with arthroscopic surgery and none in the group treated with open surgery. Two cases were treated with manipulation under general anaesthesia and one case required arthroscopic arthrolysis. There were five re-revisions, all for continuing ACJ pain despite good clearance. Two re-revision cases (4.7%) went on to cause ACJ instability and both of these cases required a surgical stabilisation procedure.

Some 27 of the 45 revisions (60%) were contactable by letter or telephone; one patient died, one had emigrated, and eight were not contactable. The mean time since revision surgery was six years (SD 2.3). Of the total, 65% felt improved by their revision surgery, 69% felt satisfied and 77% would have it again. No patients requested a further clinic appointment.

A further analysis was performed comparing outcomes with reason for revision. Thirty-eight cases had a clear radiographic indication with either inadequate excision or new heterotrophic bone formation visible on plain film radiographs with a transient response to intra-articular ACJ steroid injection. Five cases had no clear radiographic indication for revision with no response to intra-articular steroid injection and were revised at the time of repeat arthroscopic surgery for symptoms of ACJ pain with positive cross-body adduction test. There was no difference in post-revision OSS comparing these groups ($P = 0.196$). There was no difference in satisfaction ($P = 0.437$), if the patient would have the surgery again ($P = 0.487$) and if they felt improved ($P = 0.634$).

Discussion

Most patients were revised due to residual bone left after inadequate debridement at primary surgery and were listed for revision surgery within six months and one year. An example radiograph of inadequate excision with a residual superior ridge of bone is given in Figure 3. Those without a residual bony spur were revised due to new

Figure 3 Postoperative radiograph demonstrating inadequate excision of the lateral end of the clavicle.

heterotrophic bone formation within the ACJ, typically several years after primary surgery, and who responded with transient pain relief following an intra-articular steroid and local anaesthetic injection. In identifying the group of revision cases to be studied a revision rate was found for primary ACJ resection of 3.4% for arthroscopic surgery and 1.7% for open surgery. This was lower than the only two studies reporting revision rates (3.7–6.2% for arthroscopic and 2.4–4.2% for open cases).^{6,7} There are no studies in the literature reporting the outcomes of revision surgery.

The OSS did not significantly improve after primary surgery, nor was a significant difference observed after revision surgery when compared with the pre-revision OSS. A significant improvement was seen, however, when comparing OSS before primary surgery and after revision surgery ($P = 0.021$). The authors suggest this may represent that this group did not have adequate treatment from the primary surgery and only improved once adequate clearance was performed in the revision surgery. The survey at a mean of six years (SD 2.3) following revision showed relatively low scores of satisfaction (69%) and feeling of improvement (65%) suggesting despite showing an improved functional outcome these patients did not necessarily feel overall improved after surgical treatment in the long term.

A subgroup analysis of those patients with a clear radiographical indication for revision surgery with residual bony spur versus those with positive clinical examination and transient response to local anaesthetic an injection alone did not reveal a significant difference in any outcome measures. The number of patients in the group without a clear indication (5) was very small, however, and 10 of the 43 patients did not respond.

The postoperative frozen shoulder rate was relatively high in this study (7%), which may be because a higher complication rate is to be expected in revision surgery. In addition, the size of the group was small. Recent series of primary ACJ excision found frozen shoulder rates of 3.4–8.3% for arthroscopic and 2.4–4.2% for open surgery.^{6,7} The incidence of frozen shoulder in revision surgery has not been published.

Routine postoperative radiographs were not always taken for primary surgery. This made it difficult to assess whether heterotrophic new bone had formed or if an inadequate resection had been performed. Careful visualisation of the posterior superior ridge of the distal clavicle be performed via an anterior viewing portal and, if necessary, an additional posterior working portal to ensure adequate resection may help avoid incomplete resection. Intraoperative radiographs could also be taken using a mini c-arm and image intensifier to confirm adequate debridement and provide a comparative radiograph to aid future assessment of the ACJ. These steps would help reduce the risk of a residual bony prominence and lower the incidence of revision surgery within one year.

Given the higher risk of postoperative frozen shoulder and relatively poor long-term satisfaction rates, careful patient selection is essential when considering revision surgery and educating patients of the risks involved.

Only two cases of postoperative instability were found subsequent to re-revision resection of the lateral end of the clavicle. This is a recognised complication with significant morbidity, but no cases were identified following first-time revision surgery.

Strengths of this study were that this is a large multi-surgeon consecutive patient series over a 14-year time period with clinical follow-up and patient recorded outcome measures at a median 15-month follow-up and questionnaire survey at six years.

Limitations of this study include the retrospective nature with no control group for comparison. Only patients requiring surgery for continuing ACJ pain were identified and thus the incidence of low-grade pain not requiring surgical treatment cannot be identified. This is a single-centre study and patients may have been lost to other hospitals had revision surgery elsewhere. This study may therefore have underreported the revision rate. Intra-articular steroid injection was performed without image guidance, which risks inaccuracy.^{11,12}

Conclusion

The main cause for continuing ACJ pain was incomplete resection following previous arthroscopic surgery. Revision ACJ excision surgery only resulted in a significantly improved OSS when compared with the OSS before failed primary excision, but satisfaction scores were low.

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