

Journal Club: 16th July 2009

Organiser: Mr Alistair Ross, FRCS

Bursectomy compared with acromioplasty in the management of subacromial impingement syndrome: a prospective randomised study

Jenkins HE, de Witte BB, Nelissen RGH, Brand R, van Arkel ERA

J Bone Joint Surg [Br] 2009;91-B:504-10.

Reviewers: Scott Parker, Will Thomas

Introduction:

The aetiology of subacromial impingement remains the subject of much debate. Neer's traditional extrinsic impingement theory is the basis for acromioplasty. The alternative intrinsic theory of degenerate tendinopathy leading to a subacromial inflammation should respond to bursectomy alone. Budhjoft et al reported 79% good to excellent results in arthroscopic debridement without acromioplasty for partial thickness rotator cuff tears. This original study compares bursectomy against acromioplasty in an attempt to further elucidate the aetiology and best treatment for primary subacromial impingement.

Methods:

The study obtained local ethical approval for a prospective randomised trial. The aim was to compare bursectomy to acromioplasty in the management of primary subacromial impingement. No hypothesis is given but the presumed hypothesis is that bursectomy provides equivalent results to acromioplasty in the treatment of primary subacromial impingement syndrome. A total of 80 consecutive patients were studied with 14 excluded due to clinical or radiological evidence of concurrent gleno-humeral pathology, cuff tears, trauma or rheumatoid arthritis.

A further 9 patients were excluded at arthroscopy due to glenohumeral pathology leaving 57 patients, of whom 26 received a bursectomy and 30 an acromioplasty. Surgery was carried out by the senior author.

Of note is that all patients had a course of conservative treatment with subacromial injections, NSAID's and physiotherapy prior to surgery. Surprisingly, no patients improved with conservative treatment.

Outcome measures

Constant shoulder score; objective score of pain, function, range of movement and strength.

Simple shoulder test: subjective pain and function score.
Visual analogue scale; subjective pain and function.

Outcome measures were valid, reproducible and sensitive. Outcome was double-blinded assessment by an independent examiner at 3-month intervals. Limitations were again due to the small numbers as the Constant shoulder score was corrected for age and gender.

Statistics

The Student's t-test, with significance at 95%, is a suitable test of this data. A null hypothesis has not been explicitly stated and we therefore assume that the authors are attempting to disprove a hypothesis of no difference. In fact, they only need to prove no difference for the bursectomy alone technique, the lesser procedure, to be better. No power analysis was done to verify the numbers required to show a statistical difference.

To analyse how acromion type, as classified by Bigliani, affected outcome between groups, univariate analysis was proposed. However, multivariate analysis was subsequently required to deal with the unequal distribution of age, gender, baseline scores and acromion type between groups. This is a product of the randomisation of too few subjects.

Results:

One patient was lost to follow up and excluded from the study. Mean follow-up was 2.5 years (1-5 years). All patient scores improved with no statistical difference between the groups. An increasing Bigliani or worse pre-operative score inferred a worse final outcome irrespective of the treatment group.

Five patients required a further procedure after one year due to deteriorating symptoms. Two patients from the bursectomy group had an acromioplasty. From the acromioplasty group one patient required a revision and two had an A-C joint excision. No further details of these patients are given in the paper but on subsequent enquiry neither bursectomy patient improved significantly with the acromioplasty.

Conclusions:

The study shows no statistical difference between acromioplasty and bursectomy, concluding that both are effective treatments. Sub analysis suggested an increasing Bigliani score infers a worse outcome whatever the treatment.

The authors are aware the study is underpowered and are careful to limit their conclusions. They highlight the weakening effect of correcting for age and gender on both the Constant score and in the need to do a multivariate analysis.

The fact that there is a trend to better results for acromioplasty in this underpowered study is somewhat glossed over as the authors concentrate on the improvements with bursectomy alone and the possible reasons for this.

Level of evidence

Level 2 - no relevant statistically significant findings with wide confidence intervals.

Discussion:

Pros

This original study idea, which uses findings from preclinical studies suggesting a degenerate aetiology to subacromial impingement, tests the accepted Neer's hypothesis of extrinsic mechanisms and the alternative intrinsic theory.

Overall, this is a well-designed study. It is prospective and randomised by an automatically generated randomisation code. The patients and assessors are both blinded to the treatment arm. The experimental group A was controlled by group B undergoing the established method of treatment.

Although limited by small numbers and without clinically relevant statistical significance, the authors have produced 95% confidence intervals that have been carefully interpreted. It is on the basis of these that the author believes the study is not underpowered and a type 2 error has not been made.

The paper draws the conclusion that both treatments provide good results and that the pathogenesis of subacromial impingement can still be attributed to several mechanisms.

With a power calculation and sufficient numbers, this type of work may well change future practice. This paper paves the way for further work and will add value to any future meta-analysis.

Cons

This paper asks a great question but fails to provide an answer of relevance to the clinician. The study is underpowered from the start by its own admission due to the lack of a power

calculation. Power is further reduced by unequal distribution within groups requiring statistical correction. The trend to better results with acromioplasty is then glossed over and the most likely reason of a type 2 error discounted.

Operative technique is inadequately described with no mention of the coraco-acromial ligament division of which would decompress the sub-acromial space. A subsequent letter informs us the ligament was not divided.

The results are at best inconclusive and require further investigation before clinical practice is changed. Neer's extrinsic theory of subacromial impingement may be incomplete but is not disproved by the study. Bursectomy as a treatment for primary subacromial impingement should remain within the confines of research and trials for the time being and we await the results from the Fowler Kennedy Sport Medicine Clinic trial with interest.

Fracture of the carpal scaphoid: a prospective randomised 12 year follow-up comparing operative and conservative treatment

Saeden B, Tornkvist H, Ponzer S, Hoglund M
J Bone Joint Surg [Br] 2001;83-B:230-4.

Reviewers: Tristan Barton and Hideki Nagata

Methods:

Study design

The authors set out to analyse the long-term results of scaphoid fractures with respect to treatment and with a 12 year follow-up. This paper represented the longest review at that time in the literature. This was a prospective randomised controlled trial (level of evidence 1) and ethical approval was obtained.

Subject recruitment and criteria

A power calculation was not performed. A total of 62 patients with acute scaphoid fractures were enrolled into the study with inclusion criteria stated as acute scaphoid fractures visible on initial radiographs. The pattern of scaphoid fracture was not mentioned. Exclusion criteria were tuberosity fractures, and fractures showing signs of delayed union or pseudoarthrosis. It was stated that there were no demographic differences between the two groups.

Hypothesis

This is not stated, with the study described as comparing 'the long-term results in patients with fracture of the scaphoid treated by immobilisation in a short plaster cast with those treated acutely by fixation by a Herbert screw'.

Interventions

The 62 patients were randomised to either operative or non-operative management. A total of 30 patients were randomised to treatment in a short arm plaster cast until radiological evidence of fracture union and 32 patients to operative treatment by fracture stabilisation using the Herbert screw. This was by an open volar approach. Patients managed operatively were immobilised for a mean of two weeks.

Results:

Outcome measures

Clinical and radiological outcome measures were clearly stated both during the initial fracture period and at 12 years follow-up. At this later review, patients were examined, completed a

questionnaire, and reviewed radiologically by plain radiographs and CT scans. CT scans were used to assess fracture union and radiocarpal and scaphotrapezial osteoarthritis.

Completeness of data

There were 51 of 62 fractures (82%) available for 12 year review equally distributed between the two groups (25 operated, 26 conservatively managed). 3 patients had died and 8 were unavailable. Of these 51 patients, 47 were available for physical examination, and 42 for CT scanning. Of the 32 patients managed operatively, 24 were CT scanned at 12 years, and of the conservatively managed patients only 19 of the original 30 were available for further imaging.

Analysis

The results are clearly displayed in table format. Patients who underwent operative treatment had a significantly shorter time in plaster (2 versus 12 weeks) and returned to work significantly sooner (6 versus 15 weeks). Two of the conservatively managed group went on to nonunion and required operative intervention and subsequently united. One patient who was operated upon went on to have an asymptomatic nonunion. At twelve years, there was no significant difference in symptoms between the groups. Radiological evidence of scaphotrapezial osteoarthritis was more common in the operated group ($P < 0.05$) but this did not correlate with symptoms.

Conclusion and Discussion:

Conclusion

The authors state in the discussion that immobilisation of the wrist in a plaster cast is a safe and reliable method of treating acute scaphoid fractures, since 90% to 95% will heal. In the final paragraph they go on to say that internal fixation of the scaphoid allows early return to normal function and should be regarded as an alternative in certain patients.

Limitations

Studying the long term consequences of scaphoid fractures is difficult due to the patients being young, active and geographically mobile. For this reason, the number of patients reviewed was reasonable but with a 20% drop-out rate, analysis would likely show the study to be under-powered. For this reason, commenting upon the severity of scaphotrapezial osteoarthritis between the two groups is probably not possible. This limitation has been recognised by the authors. The demographics of the two groups were similar, but there was a higher number of displaced and angulated scaphoid fractures in the operated upon group. If such fractures had been randomised to the conservatively managed group, the non-union rate may have been significantly different.

Conclusions justified and relevance

From the results stated, we feel that the authors are justified in reaching the conclusions stated above. The subject of how to manage the acute scaphoid fracture is of continuing relevance in today's practice, and this paper helps add to the body of evidence in this field.

Observations on the natural history of massive lumbar disc herniation

Cribb GL, Jaffray DC, Cassar-Pullicino VN
J Bone Joint Surg [Br] 2007;89-B:782-4.

Reviewers: Irfan Khan, Adekoyejo Odutola

Summary:

To observe the outcome of massive lumbar disc herniation treated non-operatively

Methods:**Originality and design**

The authors refer to previous work by Weber in 1983, which concluded that the natural history of radicular pain from lumbar disc herniation was spontaneous clinical resolution. However, they point out that this study pre-dates MRI scanning, meaning that radiological evaluation of subsequent resolution was not assessed. Other studies quoted looked at the relationship of disc morphology (Jensen et al) or the relationship of canal size to outcome (Porter et al) but did not relate these factors in combination to outcome. The authors therefore infer originality as their study looks at the relationship between disc morphology, size in relationship to canal size and outcome.

This was an observational study of outcomes in a small series of patients with allocation of patients to conservative treatment based on patient choice. Its conclusions therefore represent level IV evidence.

Aims and hypotheses

The aim of the study was to observe the outcome of patients with massive disc extrusions treated conservatively.

Although the authors did not define a clear hypothesis, they did mention the fact that massive disc extrusions and sequestrations are treated surgically for fear of cauda equina compression. The implied hypothesis is therefore that a significant proportion of conservatively treated massive disc extrusions would progress to cauda equina syndrome.

Subject recruitment and criteria

The authors selected patients with “massive” disc herniations and a painful radiculopathy who presented to a general spinal clinic within a 5-year period. Clear definitions with objective radiographic criteria were given for massive extrusions (>50% of the canal occupied by disc material on MRI scans), thus reducing the effect of interpreter bias.

There were 15 patients who presented in this period who met the specified criteria. Patient allocation to the conservative treatment method was based on patient choice, either due to concerns about surgery and/or resolving symptoms. This has the potential to introduce selection bias into the study, as patients who are clinically “better” are more likely to opt for the conservative route.

The group consisted only of lower lumbar disc herniations with 10 being at the L4/L5 level and 5 at the L5/S1 level.

Results:

Follow-up and completeness of data

All 15 patients in the study group (10 women and 5 men) were followed up. The mean follow up was 24 months although this ranged from 5 to 56 months. The authors state clearly that all but one of the disc herniations had resolved “dramatically” by the second MRI scan. The wide variation in duration of radiological follow-up suggests this was not standardized across the cohort and the authors do not define what criteria were used to determine the follow-up time point (for example, clinical resolution).

Outcome measures

Both clinical and radiological outcome measures were utilised. The clinical outcome measures used were either progression to surgery or development of cauda equina syndrome. The radiological outcome measure used was the reduction in size of the herniation, as measured on MRI.

None of the patients in their series developed cauda equina syndrome although one patient required discectomy because of persistent pain, despite substantial resolution of the disc prolapse on MRI. Another patient whose disc had not resolved radiologically had substantially diminished symptoms. The authors did not describe exactly how much radiological resolution had occurred in either of these patients and it does raise the issue of the validity of correlations between clinical and radiological outcomes.

Discussion and Conclusions:

Theory

The authors provide a theoretical basis for their observations, stating the loss of the immune privilege afforded by the annulus fibrosus as a mechanism for spontaneous disc resorption. This was corroborated by other studies that showed that larger disc herniations decrease in size to a greater extent than smaller protrusions. All disc herniations in their series were uncontained (absent annulus fibrosus).

Limitations and further work

Whilst admitting that the study is limited, there are no clear statements as to the specific limitations. Some of these are implied within the text. The size of the sample is perhaps the most obvious. The authors however mention the usefulness of further work comparing the canal size in their cohort with a matched group of patients with massive disc herniations requiring surgery.

Conclusions justified?

The authors conclude by suggesting that massive disc herniations are more benign than previously thought and conservative treatment does not necessarily result in complications. They further justify non-operative management by stating the complications associated with surgery, including recurrence (7.9%), CSF leak (3.5%) and infection (3%). It would be interesting to observe the recurrence rate in their cohort.

This study certainly challenges current thinking on the treatment of massive disc extrusions. It does not propose that all massive extrusions be treated conservatively but simply exposes a more “benign” side to the pathology, which is a useful consideration in clinical decision-making.

Imageless computer navigation for placement of the femoral component in resurfacing arthroplasty of the hip

Olsen M, Davis ET, Waddell JP, Schemitsch EH
J Bone Joint Surg [Br] 2009;91-B:310-15.

Reviewers: Navraj Atwal and JJ Gillooly

Methods:

Originality

A number of previous studies have all indicated that computer navigation can improve the accuracy of component placement and reduce the incidence of femoral notching. The authors acknowledge this and present their own findings with a larger cohort of patients. Two of the studies were case control studies comparing navigation with the use of standard jigs but involved smaller numbers. A previous study by Romanowski and Swank published in the American JBJS the previous year was essentially identical but enrolled 77 patients rather than 100.

Ethics

There was no mention of ethical approval, however both hip resurfacing and computer navigation are widely-accepted procedures.

Aims and hypotheses

The aim was to investigate the accuracy of imageless computer navigation for placement of the femoral component in resurfacing arthroplasty of the hip. The hypothesis was that imageless computer navigation resulted in precise placement of the femoral stem and reduced the incidence of complications such as femoral notching. The study set out to establish this by comparing the planned stem-shaft angle with the post operative stem-shaft angle. There was no control group, so the previously published results of non-navigated hip resurfacing were used for comparison.

Study type/level of evidence

This was a case series. Level 4 evidence.

Preliminary statistics

Appropriate statistical tests were utilised. One way analysis of variance with Tukey post hoc analysis was used to compare differences in navigation time and accuracy of alignment. The remaining descriptive statistics were performed on Microsoft Excel.

Subject recruitment

A consecutive series of 100 patients undergoing Birmingham hip resurfacing in the practice of a single surgeon.

Intervention

The routine Birmingham technique was used through a standard posterolateral approach. For navigation a 5mm Schanz pin with reflective spheres was drilled into the lesser trochanter and a reflective pointer was used to determine the relevant femoral landmarks. All information was collected by a 2 camera optical array and presented visually on a computer display in real time.

Results:**Outcome measures**

The overall mean difference between the planned neck-shaft angle and the postoperative stem-shaft angle was 2.8° (0-8). All stems were placed in valgus as planned with a mean relative valgus of 11.7° (1-22). Overall position was deemed acceptable in all cases with 86% of cases within 5° of the planned angle and with no cases demonstrating either intraoperative or X-ray evidence of notching. However, the precise criteria for acceptability are not fully explained. The navigation time improved from a mean of 26.8 minutes for the first 20 cases to a mean of 15.8 minutes (11 to 50) for the last 20 cases. No explanation was given for the outliers in either stem position or navigation time.

Accuracy and clarity of presentation

Graphs and figures are clear and easy to interpret.

Valid/reliable

The study is based on the operative technique of a single surgeon which would allow for biasing of results if he was particularly accomplished at hip resurfacing. All radiographs were reviewed by a single observer. A prior study was carried out which confirmed the reproducibility of the X-ray measurements. A standardised X-ray technique was used to acquire the post operative AP hip radiograph: it is not clearly stated that this was followed for the preoperative radiograph.

Missing data

Three patients did not attend follow-up: their immediate post-operative X-rays were used for analysis.

Completeness/length of follow up

All patients were included and 97% were seen for review at three months.

Complications

There were three superficial wound infections. All were successfully treated with antibiotics.

Conclusions:**Study aims fulfilled**

Yes.

Conclusions justified?

The authors demonstrate that imageless computer navigation facilitates accurate femoral stem placement, but without a control group their statement that it is more accurate than conventional mechanical jigs is not justified.

Relevance

Notching and femoral fracture are significant risk factors in hip resurfacing and accurate stem placement has been shown to reduce this so this paper is relevant.

Insight into shortcomings

The authors recognise the limitations of their study especially the sole observer assessing all radiographs which introduces bias. Other limitations include the fact that measurements were taken in the coronal plane only with no assessment in the lateral plane. Errors during registration of anatomic landmarks intraoperatively and patient positioning during X-ray may also be responsible for aberrant results.

Relationship with existing knowledge

This paper supports the existing literature.

References complete?

The references are comprehensive and include basic scientific, historic and also up to date papers on hip resurfacing and navigated hip resurfacing.

Future work

Future work should be aimed at reducing the error in stem-shaft angle measurement pre- and postoperatively and also at reducing the error in anatomical landmark registration intraoperatively. The paper highlights the need for a repeatable method of assessment to measure version on the lateral radiograph.