Outcome of Arthroscopic Débridement is Worse for Patients With Glenohumeral Arthritis of Both Sides of the Joint

Brian J. Kerr MD, Eric C. McCarty MD

© The Association of Bone and Joint Surgeons 2008

Abstract Glenohumeral arthritis in the young patient presents a difficult problem with potentially devastating sequelae. Reports in the literature suggest a role for arthroscopic treatment in patients with symptomatic degenerative joint disease of the shoulder. However, no published study directly compares patients with unipolar versus bipolar cartilage lesions. We retrospectively reviewed 19 patients (20 shoulders) younger than 55 years with Outerbridge Grade 2–4 articular cartilage changes who underwent arthroscopic glenohumeral débridements. We obtained WOOS, SF-12, SANE and the American Shoulder and Elbow Society scores at last followup. The minimum follow up time was 12 months (average, 20 months; range, 12–33 months). Three patients progressed to shoulder arthroplasty. All but three patients reported their shoulder function at 60% or better based on the SANE score. The grade of the lesion did not influence outcome scores, but patients with unipolar lesions had higher outcome scores than patients with bipolar lesions.

Each author certifies that he or she has no commercial associations (e.g., consultancies, stock ownership, equity interest, patent/licensing arrangements, etc.) that might pose a conflict of interest in connection with the submitted article.

Each author certifies that his institution has approved the human protocol for this investigation and that all investigations were conducted in conformity with ethical principles of research, and that informed consent for participation in the study was obtained.

B. J. Kerr, E. C. McCarty
University of Colorado Health Science Center, Boulder, CO,
USA

B. J. Kerr (✉)
Great Lakes Orthopaedic Center, 4045 West Royal Drive,
Traverse City, MI 49684, USA
e-mail: kerr.bri@gmail.com

We believe arthroscopic glenohumeral débridement in young patients with shoulder arthritis can be an effective tool in managing symptoms and delaying the need for invasive resurfacing or prosthetic replacement.

Level of Evidence: Level IV, case series. See the Guidelines for Authors for a complete description of the levels of evidence.

Introduction

Management of glenohumeral arthritis in the young patient is a difficult challenge. Numerous etiologies exist, including idiopathic, inflammatory, autoimmune disorders, postinfectious, shoulder instability, and even iatrogenic causes. Early stage, minor joint changes can be treated nonoperatively. More advanced disease that causes pain or leads to limitation or loss of function needs to be evaluated carefully. Any treatment plan requires consideration for the long and seemingly productive remaining life of the affected joint and patient. Traditional total joint arthroplasty has historically relieved pain, but results in younger patients are not as favorable, with higher incidence of component failure and worse outcome scores [9, 16]. Younger patients particularly interested in maintaining an active lifestyle may wish to delay total joint arthroplasty. In younger patients more conservative measures need to be exhausted prior to proceeding with arthroplasty.

The role of arthroscopy is expanding in the management of glenohumeral arthritis. Early degenerative joint disease can mimic or coexist with other pathologic diagnoses, such as impingement [2, 6, 8]. For early stage arthritis, particularly small focal lesions not easily elucidated by plain radiographs or MR imaging, arthroscopy can be an important diagnostic tool [2]. Arthroscopic débridement of

the glenohumeral joint is an expanding option in the treatment of shoulder arthritis. It improves pain and function, with the best results in those shoulders with mild to moderate arthritic changes [19, 27]. However, the literature is not clear on whether the grade of the lesion influences outcome or whether the presence of a lesion on one versus both sides of the joint influences outcome.

We therefore compared patients with high grade lesions (Grade 4) to those with low grade lesions (Grades 2 and 3). Additionally, we compared patients with unipolar glenohumeral cartilage lesions with patients with bipolar lesions after undergoing arthroscopic débridement to determine if better outcomes can be expected in those patients with less severe disease.

Materials and Methods

We retrospectively reviewed 19 patients (20 shoulders) who underwent arthroscopic shoulder surgery during which débridement of the glenohumeral joint was performed for Outerbridge Grade 2–4 lesions [20] between May 2004 and October 2006. We compared outcome measures for patients with Grades 2–3 to those in patients with Grade 4 lesions and the outcomes for patients with monopolar versus bipolar lesions. The primary complaint in most patients was pain rather than loss of motion. We included all patients aged 18 to 55 years for whom nonoperative treatment failed. Patients with concomitant rotator cuff repairs were not included. There were 12 men and seven women in the study group. Three of the 19 patients (three shoulders) underwent prosthetic replacement during the study period. We did not include their outcome measurements, as we considered these patients to have failed treatment. The average age was 38 years (range, 20–54 years). The minimum follow up time was 12 months (average, 20 months; range, 12–33 months).

Preoperative plain film imaging was obtained in all patients. OA was not apparent in 12 of 19 patients. Some showed no evidence of degenerative changes.

All patients underwent shoulder arthroscopy in the beach-chair position. Standard posterior viewing and anterior working portals were used for the diagnostic arthroscopy.

The grade, location, size, and number of each cartilage defect were noted using a clock face arrangement for location and calibrated probe for size. We used the Outerbridge grading scale [20]; in Grade 1 there is softening and swelling of the cartilage; in +Grade 2 there is fissuring and fragmentation in an area less than one-half inch in diameter; Grade 3 has the same findings as Grade 2 but greater than one-half inch diameter; Grade 4 has erosion to bone. Four patients had Grade 2 or 3 lesions and 15 had

Grade 4 articular cartilage changes. We arthroscopically débrided the lesions to remove any loose cartilaginous fragments, leaving a stable edge.

Sixteen of the 19 patients underwent concomitant procedures as determined by preoperative evaluations and diagnoses. A biceps tenotomy was performed in five patients. This decision was made intraoperatively after probing the biceps insertion for tearing; however, each patient was alerted preoperatively to the possibility of tenotomy if significant biceps insertion pathology was identified. One patient underwent repair of a Type II SLAP lesion. A distal clavicle resection was performed in two patients. In nine patients an acromioplasty was performed. Four patients underwent subacromial bursectomy without acromioplasty. Two patients required a manipulation under anesthesia at the time of surgery. A microfracture was performed in two patients who had focal Grade 4 lesions with stable surrounding edges, without any other degenerative findings.

Postoperatively, patients were placed in a sling for comfort. Passive shoulder range of motion began on the first postoperative day. The sling was discontinued when tolerated by the patient, and active range of motion began when pain allowed (except for patients undergoing SLAP repair, for which no active biceps motion was allowed for 6 weeks).

Potential study participants were mailed questionnaires approved by our institutional review board. The Western Ontario Osteoarthritis Score (WOOS) [12], Marx Activity Level Score [4], American Shoulder and Elbow Society (ASES) Score [11], SANE Score [28] and SF-12 forms [26] were completed by the patients. They were instructed to complete and return the questionnaires but provide no other instructions.

We compared WOOS scores, ASES scores, Marx Activity Level scores, and SANE scores for patients with Grade 2–3 lesions and those with Grade 4 lesions and patients with monopolar and bipolar lesions using a *t* test. We chose this test because the variance between the two groups showed no evidence that they were not normally distributed.

Results

The mean WOOS score for the 16 included patients was 0.64 (range, 0.12–0.98). The mean ASES score was 75.3 (range, 24–100). The Marx Activity Level Score was 12.6 (range 9.0 to 18.0). The SANE (Single Assessment Numeric Evaluation) score (for which patients were asked “On a scale of 0 to 100, how would you rate your shoulder function with 100 being normal?”) was 71%. When one patient who rated his function as 0% was excluded, the

SANE score rose to 77% (Table 1). Overall, nine patients rated their shoulder function at 80% or better by SANE score. Five of these patients had Grade 4 changes. At final followup, all nine of these patients had forward flexion to at least 170° and external rotation to at least 70°. Two patients rated their shoulder function at 30% or worse; both had bipolar lesions.

Patients with Grade 4 lesions had similar outcome scores in all measures as those with Grade 2 or 3 cartilage changes (Table 2). WOOS scores averaged 0.66 for those with Grade 2 or 3 changes, compared to 0.64 for patients with Grade 4 disease. ASES scores were similar for both groups (Grade 2/3, 75.9; Grade 4, 75.4). Marx Activity Level scores averaged 14.7 for the low grade group and 11.9 for the high grade patients. None of these values were significant ($p = 0.91$, $p = 0.97$, $p = 0.15$, respectively). SANE scores were not markedly higher in the Grade 2/3 shoulders (68.8 versus 60.6, $p = 0.69$). The group with Grade 2 or 3 changes (mean age, 27.8 years) was noticeably younger than the group with Grade 4 changes (mean age, 47.5 years, $p = 0.017$).

Patients with unipolar lesions of either the glenoid or humeral head fared considerably better compared to those with bipolar lesions in WOOS and SANE scores (Table 3). There were seven patients (eight shoulders) with unipolar lesions and nine patients with bipolar cartilage lesions.

Table 1. All scores

Scoring classification	All patients	Range
WOOS	0.64	0.12–0.98
ASES	75.3	24–100
Marx	12.6	9.0 to 18.0
SANE	63%	0–100

Table 2. Comparing Grade 2/3 lesions versus Grade 4 lesions

Scoring classification	Grade 2/3	Grade 4	p Value
WOOS	0.66	0.64	0.91
ASES	75.9	75.4	0.97
Marx	14.7	11.9	0.15
SANE	68.8	60.6	0.69

Table 3. Comparing unipolar versus bipolar lesions

Scoring classification	Unipolar	Bipolar	p Value
WOOS	0.89	0.52	0.014
ASES	93.3	66.3	0.033
Marx	14.4	11.3	0.053
SANE	89.6	49.3	0.022

WOOS scores averaged 0.89 for patients with unipolar lesions and 0.52 for those with bipolar lesions ($p = 0.014$). ASES scores were 93.3 and 66.3 for unipolar and bipolar groups, respectively ($p = 0.033$). SANE ratings were also better in the unipolar group (89.6 versus 49.3; $p = 0.022$). Marx score comparisons, although lacking a significant p value difference, showed a definite trend toward higher scores in the unipolar group (14.4 versus 11.3 for the bipolar group, $p = 0.053$).

Discussion

We sought to identify prognostic factors in determining outcomes in patients treated surgically for glenohumeral cartilage lesions. This study has several limitations. First, it is a retrospective review. As such, it was difficult to control for specifically separating diagnoses and their different treatments when these separate diagnoses are often treated with concomitant procedures during the same surgery. Second, the small sample sizes limited the power of the study. Comparing patients undergoing different concomitant procedures in addition to the arthroscopic débridements may impair the comparisons somewhat.

Various etiologies lead to premature degenerative glenohumeral joint disease. Glenohumeral arthrosis following instability episodes has often been described in the literature. “Dislocation arthropathy” occurs in patients treated nonoperatively and operatively. Intraarticular changes may occur following a single dislocation, and can worsen with subsequent instability episodes [8, 10, 15, 18, 24].

Glenohumeral arthritis is a well-described complication of stabilization procedures for glenohumeral instability. Neer et al. [17] noted 10% of their patients undergoing total shoulder arthroplasty for degenerative arthritis had prior surgery for shoulder instability. Green and Norris [9] reviewed a series of 39 patients with advanced glenohumeral arthritis and a history of instability. Nineteen of these patients had previously undergone stabilization procedures.

Managing young patients with glenohumeral arthritis is a difficult problem. The treatment needs to be tailored to the stage of the patient’s disease process. Patients with relatively little pain and good function can be followed nonoperatively, with focus on maintenance of strength and capsular mobility. Additionally, nonsteroidal anti-inflammatory drugs, COX-2 specific drugs, and corticosteroid injections can be utilized for temporary relief of symptomatic flare-ups. To date, the use of viscosupplementation is considered off-label for the glenohumeral joint, but has been described as an option with successful results [25].

When glenohumeral arthritis in the young patient becomes refractory to nonoperative management, conservative surgical intervention is indicated. With worsening

mechanical symptoms or stiffness, arthroscopic glenohumeral débridement can be considered [5]. Most experience reported in the literature supports arthroscopic débridement for early-stage arthritic changes in the shoulder. Ogilvie-Harris and Wiley [19] first reported on a series of 54 patients undergoing arthroscopic shoulder débridement with 3-year followup. Two-thirds of their patients with mild degenerative disease achieved a successful result, while only one-third of those with moderate to severe disease had a good result.

Weinstein et al. [27] noted good outcomes in a study of 25 patients undergoing arthroscopic glenohumeral débridement. The average age of the study group was 46 years (range, 27–72 years). All patients reported at least some improvement in pain. At final followup, only two patients had reported return of pain to preoperative levels. They also noted a trend between severity of articular cartilage damage and worse unfavorable results. They recommended arthroscopic débridement as a reasonable approach to treating mild glenohumeral arthritis, and recommended against it in patients with severe joint incongruity or radiographic loss of joint space.

Cameron et al. [7] reported on arthroscopic débridement of Grade 4 glenohumeral articular lesions. They noted relief of pain for a mean of 28 months or greater in their series. They also reported lesions greater than 2 cm² correlated with lesser duration of pain relief and were predictive for ultimate failure of the procedure.

If stiffness, particularly in external rotation, is a major issue, arthroscopic or open release can be performed. MacDonald et al. [14] reported good results after performing subscapularis release in 10 patients who developed mild to severe arthritic changes in the shoulder following anterior stabilization. These patients had increased external rotation and pain relief at an average of 3.5 years postoperatively. Lusardi et al. [13] also recommended an anterior release for patients with a major loss of external rotation to prevent late osteoarthritis in patients who previously underwent shoulder stabilization procedures. Additionally, Cameron et al. [7] recommended adding capsular release to arthroscopic débridement if there was loss of motion greater than 15° in any plane of motion.

When less diffuse, focal cartilage lesions are found in isolation, marrow stimulation or restorative cartilage transplantation can be considered. Microfracture [23] and autologous chondrocyte transplantation (ACI) [22] have been described as effective surgical options in the shoulder. Interposition allografts, performed either arthroscopically or with an open approach, have been effectively utilized in the glenohumeral joint [1, 3, 6, 21].

Our results mirrored those of previous studies, suggesting arthroscopic débridement of lower-grade glenohumeral cartilage lesions resulted in symptomatic pain

relief and improved function. However, contrary to prior reports, many of our patients with higher-grade lesions did have outcomes comparable to those with lower-grade lesions, with SANE scores of 80% or higher. Those patients with unipolar lesions demonstrated much higher outcome scores compared to those with bipolar cartilage lesions. Nevertheless, three patients to date have progressed to shoulder resurfacing or arthroplasty. We counsel our patients that arthroscopic glenohumeral débridement can offer improvement in pain and function, but the extent and duration of that relief is related to the degree of joint degeneration. Regardless, this relatively conservative surgical option, combined with associated procedures pertinent to each individual patient's needs (acromioplasty, microfracture, etc.) can provide temporary relief and delay the need for more involved reconstructive arthroplasty.

Acknowledgments We thank Paula Langer for assistance in preparing the manuscript.

References

1. Ball CM, Galatz LM, Yamaguchi K. Meniscal allograft interposition arthroplasty for the arthritic shoulder: description of a new technique. *Tech Shoulder Elbow Surg.* 2001;2:247–254.
2. Bishop JY, Flatow EL. Management of glenohumeral arthritis: a role for arthroscopy? *Orthop Clin North Am.* 2003;34:559–566.
3. Brislin KJ, Savoie FH, Field LD, Ramsey JR. Surgical treatment for glenohumeral arthritis in the young patient. *Tech Shoulder Elbow Surg.* 2004;5:165–169.
4. Brophy RH, Beauvais RL, Jones EC, Cordasco FA, Marx RG. Measurement of shoulder activity level. *Clin Orthop Relat Res.* 2005;439:101–108.
5. Brophy RH, Marx RG. Osteoarthritis following shoulder instability. *Clin Sports Med.* 2005;24:47–56.
6. Burkhead WZ Jr, Hutton KS. Biologic resurfacing of the glenoid with hemiarthroplasty of the shoulder. *J Shoulder Elbow Surg.* 1995;4:263–270.
7. Cameron BD, Galatz LM, Ramsey ML, Williams GR, Iannotti JP. Non-prosthetic management of grade IV osteochondral lesions of the glenohumeral joint. *J Shoulder Elbow Surg.* 2002;11:25–32.
8. Cameron ML, Kocher MS, Briggs KK, Horan MP, Hawkins RJ. The prevalence of glenohumeral osteoarthritis in unstable shoulders. *Am J Sports Med.* 2003;31:53–55.
9. Green A, Norris TR. Shoulder arthroplasty for advanced glenohumeral arthritis after anterior instability repair. *J Shoulder Elbow Surg.* 2001;10:539–545.
10. Hovelius L, Augustini BG, Fredin H, Johansson O, Norlin R, Thorling J. Primary anterior dislocation of the shoulder in young patients. A ten-year prospective study. *J Bone Joint Surg Am.* 1996;78:1677–1684.
11. King GJ, Richards RR, Zuckerman JD, Blasier R, Dillman C, Friedman RJ, Gartsman GM, Iannotti JP, Murnahan JP, Mow VC, Woo SL. A standardized method for assessment of elbow function. Research Committee, American Shoulder and Elbow Surgeons. *J Shoulder Elbow Surg.* 1999;8:351–354.
12. Lo IK, Griffin S, Kirkley A. The development of a disease-specific quality of life measurement tool for osteoarthritis of the shoulder: The Western Ontario Osteoarthritis of the Shoulder (WOOS) index. *Osteoarthritis Cartilage.* 2001;9:771–778.

13. Lusardi DA, Wirth MA, Wurtz D, Rockwood CA Jr. Loss of external rotation following anterior capsulorrhaphy of the shoulder. *J Bone Joint Surg Am.* 1993;75:1185–1192.
14. MacDonald PB, Hawkins RJ, Fowler PJ, Miniaci A. Release of the subscapularis for internal rotation contracture and pain after anterior repair for recurrent anterior dislocation of the shoulder. *J Bone Joint Surg Am.* 1992;74:734–737.
15. Marx RG, McCarty EC, Montemurno TD, Altchek DW, Craig EV, Warren RF. Development of arthrosis following dislocation of the shoulder: a case-control study. *J Shoulder Elbow Surg.* 2002;11:1–5.
16. Matsoukis J, Tabib W, Guiffault P, Mandelbaum A, Walch G, Nemoz C, Edwards TB. Shoulder arthroplasty in patients with a prior anterior shoulder dislocation. Results of a multicenter study. *J Bone Joint Surg Am.* 2003;85:1417–1424.
17. Neer CS 2nd, Watson KC, Stanton FJ. Recent experience in total shoulder replacement. *J Bone Joint Surg Am.* 1982;64:319–337.
18. Norlin R. Intraarticular pathology in acute, first-time anterior shoulder dislocation: an arthroscopic study. *Arthroscopy.* 1993;9:546–549.
19. Ogilvie-Harris DJ, Wiley AM. Arthroscopic surgery of the shoulder. A general appraisal. *J Bone Joint Surg Br.* 1986;68:201–207.
20. Outerbridge RE. The etiology of chondromalacia patellae. *J Bone Joint Surg Br.* 1961;43:752–757.
21. Pennington WT, Bartz BA. Arthroscopic glenoid resurfacing with meniscal allograft: a minimally invasive alternative for treating glenohumeral arthritis. *Arthroscopy.* 2005;21:1517–1520.
22. Scheibel M, Bartl C, Magosch P, Lichtenberg S, Habermeyer P. Osteochondral autologous transplantation for the treatment of full-thickness articular cartilage defects of the shoulder. *J Bone Joint Surg Br.* 2004;86:991–997.
23. Siebold R, Lichtenberg S, Habermeyer P. Combination of microfracture and periosteal-flap for the treatment of focal full thickness articular cartilage lesions of the shoulder: a prospective study. *Knee Surg Sports Traumatol Arthrosc.* 2003; 11: 183–189.
24. Taylor DC, Arciero RA. Pathologic changes associated with shoulder dislocations. Arthroscopic and physical examination findings in first-time, traumatic anterior dislocations. *Am J Sports Med.* 1997;25:306–311.
25. Valiveti M, Reginato AJ, Falasca GF. Viscosupplementation for degenerative joint disease of shoulder and ankle. *J Clin Rheumatol.* 2006;12:162–163.
26. Ware J Jr., Kosinski M, Keller SD. A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. *Med Care.* 1996;34:220–233.
27. Weinstein DM, Bucchieri JS, Pollock RG, Flatow EL, Bigliani LU. Arthroscopic debridement of the shoulder for osteoarthritis. *Arthroscopy.* 2000;16:471–476.
28. Williams GN, Gangel TJ, Arciero RA, Uhorchak JM, Taylor DC. Comparison of the Single Assessment Numeric Evaluation method and two shoulder rating scales. Outcomes measures after shoulder surgery. *Am J Sports Med.* 1999;27:214–221.