



Outcome of ulnohumeral arthroplasty in osteoarthritis of the elbow

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Ulnohumeral arthroplasty is commonly used to treat mild or moderate osteoarthritis (OA) of the elbow. Previous studies have reported good to excellent results, but have not focused on the continuing degenerative process which can alter the outcome. The authors retrospectively evaluated 10 patients with elbow OA who were treated with the Outerbridge-Kashiwagi procedure from 2004 to 2006. The mean increase in the overall Andrews and Carson scores was 91 points (range : 70 to 100) at 3 months follow-up. The overall gain in range of motion, patient satisfaction rate and VAS and Andrews and Carson scores was found to be significantly diminished at the last follow-up, as compared with early postoperative values. Although ulnohumeral arthroplasty is an accepted procedure for elbow osteoarthritis, the deterioration of the overall gain in pronation/supination and progression of the disease can affect the final scores and patient satisfaction.

Keywords : elbow ; osteoarthritis ; ulnohumeral arthroplasty.

INTRODUCTION

The most common symptoms in elbow osteoarthritis (OA) are end-arc pain, loss of terminal flexion and extension, limitation of supination and pronation, painful catching or ulnar neuropathy. Beside the degenerative joint cartilage, impingement of periarticular soft tissues or the inflamed synovium may be the pain generators in the arthritic elbow (8).

Gramstad and Galatz (7) have recommended capsular release, debridement and removal of osteophytes in cases with end-arc pain and preserved joint space, in mild or moderate osteoarthritis (OA) of the elbow. Many authors have reported good or excellent results with this procedure (2,5,10,13). Most surgeons try to excise the anterior and posterior osteophytes through fenestration of the olecranon fossa. An additional deep lateral approach can allow for anterior capsular release and exposure of the radiocapitellar joint (5). Antuna *et al* (2) also recommended anterior capsulectomy in a stiff elbow with more than 20° flexion contracture.

Progression of the disease can result in the development of osteophytes, loose bodies and synovitis

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following ulnohumeral arthroplasty. Although a majority of studies have demonstrated satisfactory mid-term or long-term results, there is controversy with respect to the deterioration of the initial post-operative results due to progression of the disease (11). The purpose of the present study was to review the mid-term results of ulnohumeral arthroplasty and to test the hypothesis that the good results of ulnohumeral arthroplasty can deteriorate over time because of progression of the disease involving especially the radiocapitellar joint.

MATERIAL AND METHODS

Between October 2004 and November 2006, 11 consecutive patients with mild or moderate osteoarthritis of the elbow underwent ulnohumeral debridement arthroplasty (Outerbridge-Kashiwagi procedure) performed by two of the senior authors (MU, AS). There were 8 men and 3 women (mean age : 47 years, range : 43 to 52). Nine patients had primary osteoarthritis and 2 had post-traumatic osteoarthritis. There were 2 housewives and 9 manual labourers. The dominant extremity was treated in 10 patients. The indication for elbow arthroplasty was based on the clinical and radiological severity of the arthrosis.

All medical records were reviewed to determine the patients' age, gender, occupation, medical history, signs, symptoms and indications for surgery. All radiographic materials were reviewed to determine preoperative diagnosis, postoperative radiological outcome and possible postoperative complications. Postoperative course and outcomes were analysed.

The average follow-up was 32 months (range : 25 to 46). Follow-up assessments were documented and included residual pain, range of motion (ROM), signs of infection, presence of paraesthesia, use of analgesics, work status and activities of daily living.

Preoperatively, all patients underwent thorough imaging workup, including anterior-posterior and lateral plain radiographs and computed tomography (CT) scanning. A goniometer was used to evaluate the preoperative and postoperative ROM of the elbows. The mean preoperative flexion-extension arc of the elbows was 63.4° (range : 53 to 70) and the mean loss of pronation-supination was 18.4° (range : 17 to 21). To assess pain, motion, stability and function, all patients were evaluated with the subjective/objective scoring system of Andrews and Carson (A-C) (1). Patients were also asked to rate how well they were doing compared with before surgery

(better, worse or unchanged). A visual analog scale was used to rate pain from 0 to 10 (0 = no pain, 10 = severe pain).

The surgical procedure used was similar to that described by Outerbridge-Kashiwagi. Olecranon osteophytes were resected through a triceps splitting approach. After fenestrating the olecranon fossa, the coronoid osteophytes were also removed. After one week of immobilisation in a sling, passive and active assisted ROM exercises were begun. Patients were prescribed a 6-week course of 25 mg indomethacin 3 times daily for heterotopic ossification prophylaxis.

Statistical analysis

Due to the size of our sample (n = 10) we used Friedman's Test to compare the preoperative and post-operative values of ROM, VAS and the Andrews and Carson scores. Significance was set at $p < 0.05$.

RESULTS

At the time of initial follow-up evaluation, one patient could not be located. Ten patients (91%) were available for complete evaluation, including the 3-, 6-, and 18-month follow-up examinations. All underwent the O-K procedure. Two patients had decompression and anterior transposition of the ulnar nerve through the same incision because of signs of ulnar tunnel syndrome.

Of 10 patients evaluated, 9 rated their condition as better and one patient as unchanged at the 3-month follow-up. Especially the pain at the end of extension and flexion arc was improved. The mean VAS score showed statistically significant improvement from a mean of 8/10 (SD \pm 0.667) to 2.1/10 (SD \pm 0.876) ($p < 0.001$). The mean increase in the overall subjective/objective components of the Andrews and Carson scores was 91 points (range : 70 to 100) at 3 months follow-up. The mean cumulative flexion-extension arc improved from 63.4° (range : 53 to 70) to 120° (range : 110 to 130). The mean extension loss decreased from 40.9° (range : 33 to 46) to 11.3° (range : 6 to 21). The mean loss in cumulative pronation-supination was reduced to 9.5° (range : 5 to 14) (table I).

The overall gain in ROM values and VAS and Andrews and Carson scores at the last follow-up are

Table I. — Evaluation of patients 3 months after operation with patient satisfaction, VAS and A-C scores and Range of Motion

| | Preoperative | Postoperative 3 months | <i>p</i> value |
|----------------------------|---------------------------------------|--|------------------|
| Patient satisfaction | | | |
| Better | | 9 | |
| Unchanged | | 1 | |
| VAS score | 8/10 (SD ± 0.667) | 2.1/10 (SD ± 0.876) | <i>p</i> < 0.001 |
| A-C score | 88.5 (range : 85-95) (SD ± 3.375) | 179.5 (range, 160-190) (SD ± 8.644) | <i>p</i> < 0.001 |
| ROM | | | |
| Flexion-extension | 63.4° (range : 53-70) (SD ± 5.095) | 120° (range, 110-130) (SD ± 7.109) | <i>p</i> < 0.001 |
| Extension loss | 40.9° (range, 33-46) (SD ± 3.9) | 11.3° (range, 6-21) (SD ± 4.99) | <i>p</i> < 0.001 |
| Pron-supin (mean decrease) | 18.4° (range : 17-21) (SD ± 1.506) | 9.5° (range, 5-14) (SD ± 2.635) | <i>p</i> < 0.001 |

Table II. — ROM values, VAS and Andrews and Carson scores at the last follow-up
(*p* values refer to comparison with 3-month follow-up evaluation)

| | 18 months postoperative | <i>p</i> value |
|--------------------------------|--|------------------|
| Patient satisfaction | | |
| Better | 6 | |
| Unchanged | 4 | |
| VAS score (mean) | 3.1/10 (SD ± 0.876) | <i>p</i> < 0.001 |
| A-C score (mean) | 168.5 (range, 140-185) (SD ± 17.167) | <i>p</i> < 0.001 |
| ROM | | |
| Flexion-extension arc | 112.7° (range, 100-125) (SD ± 10.177) | <i>p</i> < 0.001 |
| Extension loss | 12.9° (range, 8-26) (SD ± 5.363) | <i>p</i> < 0.001 |
| Pron. - supin. (mean decrease) | 14.6° (range, 12-18) (SD ± 1.713) | <i>p</i> < 0.001 |

shown in table II. Although 9 patients (90%) had shown good to excellent results at the initial follow-up, evaluation of the elbows at the last follow-up revealed a satisfaction rate of 54.5% (6 improved, 4 unchanged). The mean VAS score was increased from 2.1/10, (SD ± 0.876) to 3.1/10, (SD ± 0.876).

There was no major perioperative complication. One patient developed deep wound infection which did not respond to antibiotics. He was treated by open debridement and wound irrigation with selective antibiotic therapy. After the procedure, one patient developed ulnar neuropathy which was

successfully treated conservatively with a night splint and oral medication.

DISCUSSION

Since several studies have reported acceptable results with the O-K procedure, many surgeons have adopted this procedure to treat mild or moderate elbow osteoarthritis (2,5,10,13). Conservative treatment modalities such as activity modification, ROM exercises, nonsteroidal anti-inflammatory drugs and intraarticular injections of corticosteroids

or sodium hyaluronate may be effective in the early stages of the disease (3,12).

Currently arthroscopic debridement, open debridement with ulnohumeral arthroplasty, distraction interposition arthroplasty and total elbow arthroplasty are the surgical options for the treatment of elbow osteoarthritis (3,5,8,14). Surgery is indicated in case of impingement pain at extremes of motion or mid-arc of motion, pain at rest and failure of conservative treatment. The Outerbridge-Kashiwagi procedure is an accepted and effective ulnohumeral arthroplasty in the management of the osteoarthritic elbow.

Vingerhoeds *et al* (13), Antuna *et al* (2), Tsuge and Misuzeki (11) have reported good or excellent results with the O-K procedure with more than 11° (11° to 34°) of overall gain in motion, primarily in the flexion/extension arc, without any major complication. The most common complication of this procedure is ulnar nerve compression. Antuna *et al* (2) reported postoperative ulnar nerve symptoms in 29% of their patients. They decompressed and translocated the nerve in 13% of their cases to overcome this problem. Our clinical observations also suggest that in cases with preoperative ulnar neuropathy, decompression of the nerve should be done simultaneously. Cheung *et al* (3) recommend ulnar nerve decompression in case of limited elbow extension (> 60°) and flexion (< 100°) as well as preoperative ulnar neuropathy, to prevent this complication. Although 5 patients in our study had a limited flexion-extension range beyond the indication of Cheung, only one developed ulnar neuropathy.

However, the O-K procedure does not address forearm rotation. The radiocapitellar degeneration persists. According to a cadaveric study by Goodfellow and Bullough (6), elbow osteoarthritis appears to start at the lateral aspect of the joint, especially at the radiocapitellar joint. The combination of rotation and hinge movements occurring at the radiocapitellar joint produces cartilage degeneration, in contrast to the ulnohumeral joint which only features hinge movement. Tashjian *et al* (10) reported a mean of 35° improvement in the supination-pronation arc with a wide range from a loss of 20° to a gain of 90°. They believe that improvement

was related with the overall pain relief. Tashjian *et al* (10) also concluded that the outcome tools previously used in literature may poorly reflect the functional outcomes after ulnohumeral arthroplasty.

Some authors have focused on the deterioration of functional results. Philips *et al* (9) had found no correlation between deterioration of functional outcome and closure of the fenestrated fossa. Forster *et al* (4) analysed predictors of good outcome after the O-K procedure : they did not find any correlation between the outcome and the type of osteoarthritis, limitation of movement or severity of radiological arthrosis. They pointed out a decreased incidence of good outcomes in conjunction with presence of anterior loose bodies. Forster *et al* noted that a good outcome could be anticipated in case of arthrosis with ulnar tunnel syndrome (4).

Although our study group included a relatively small number of cases, we believe that we noted more deterioration in results than previously reported studies because those studies poorly took into account the range of supination/pronation. Following ulnohumeral arthroplasty, we indeed noted continuing lateral elbow pain, arising mainly from the radiocapitellar joint. Although the O-K procedure has satisfactory results, there should be more focus on the radiocapitellar joint which can be the source of new anterior loose bodies (4). Further studies should be carried out to assess and overcome the problem.

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