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*ORIGINAL STUDY*

# Evaluation of functional outcome and patient satisfaction after arthroscopic elbow arthrolysis

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**Arthroscopic arthrolysis is indicated for stiffness and pain caused by intrinsic stiffness and early arthritis of the elbow joint. Previous studies have demonstrated the benefits in relieving pain and improving motion, but none have reported the specific functional recovery. To understand the functional outcome and patient satisfaction, 26 patients were reviewed at a mean follow-up of 25 months. All were manual workers or strength athletes. Pre- and post-operative evaluation included the Elbow Functional Assessment score, patient satisfaction and return to work and sports. Function improved significantly in 87% and the overall Elbow Functional Assessment score raised from a preoperative 48 to a postoperative 84. Arthroscopic arthrolysis not only improved pain and the range of motion, but also restored the elbow function and returned patients to their desired level of activity.**

**Keywords** : elbow ; arthroscopy ; arthrolysis.

## INTRODUCTION

Primary degenerative and post traumatic arthritic conditions of the elbow significantly affect the function of the arm. Loss of extension, pain at the end points of the arc of motion, mechanical locking with osteophytosis and loose bodies are the usual causes for stiffness and disability.

When non-operative measures fail, treatment of primary or post traumatic arthritis is possible, by removal of osteophytes and loose bodies (joint debridement) with or without capsular releases. Arthroscopy has an important role in the surgical management of these conditions, not only by minimising further morbidity of additional soft tissue trauma due to open debridement procedures, but also by allowing complete visual assessment and treatment of associated pathology.

Several methods of surgical treatment have been described in the literature, varying from minimally invasive (including arthroscopy) to extensive surgical debridement (*2,7,24*) for primary arthritic (*3,4,5, 10,12,14,16,19,20*) and post traumatic stiff conditions (*1,3,9,13,22*) of the elbow, and the advantages of these procedures were compared (*5*). Few studies report the functional outcomes of arthroscopic debridement (*9,20,22*) and none have reported specific functional recovery.

Using specific functional outcome tools and return to activities, we retrospectively reviewed the functional outcome and subjective satisfaction of 22 consecutive patients who underwent arthroscopic debridement and describe the operative technique.

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## MATERIALS AND METHODS

Of 26 patients who underwent arthroscopic debridement of the elbow joint from 2002 to 2004, three were lost to follow-up, and one died one year after operation due to an unrelated cause. Twenty two patients were available for analysis. The indication for operation was a painful or stiff elbow with or without locking episodes after a period of failed non-operative treatment including physiotherapy and bracing.

The demographics of these patients, their pre and post operative pain at rest and movement, range of motion, functional ability and stability of the elbow were noted. Intra-operative details were recorded. All operations were performed by a single surgeon using the same technique. Of the 22 patients, 17 were male and 5 were female, with a mean age of 53 years (range, 28-68 years). All patients had a history of pain in the elbow, 14 (63%) had symptoms of clicking and locking and 18 (82%) complained of stiffness in their elbow. None of them had preoperative ulnar nerve entrapment symptoms.

The indication was post traumatic stiffness and arthritis in 6 patients : two sustained a radial head fracture, two had a non-defined rugby elbow injury, one had an elbow dislocation and one had a history of a significant soft tissue injury at the elbow. The patient with elbow dislocation had previous surgery. Fifteen of the remaining 16 patients were diagnosed with primary degenerative osteoarthritis using Kellgren and Lawrence's radiological grading system. The average radiological osteoarthritis score was 3. One patient was diagnosed to have osteochondritis dissecans (table I).

Four portals (anteromedial, anterolateral, posterior and posterolateral) were used in 18 patients (82%) and three portals (without posterior portal) were used in four patients. The capsule was tight in 15 patients (68%). The capsule was released both anteriorly and posteriorly in eight, anteriorly in five and posteriorly in three patients. Synovectomy was performed in 14 patients. Loose bodies were found in 14 patients (63%), in six patients they were in the posterior compartment, in four in the anterior compartment and in three in both anterior and posterior compartments. Coronoid osteophytes were found in 17 patients, olecranon osteophytes in 15, and trochlear osteophytes in 10 patients. Six elbows showed a variable degree of arthritic changes in all compartments. In 16 elbows the articular surface of some compartments was normal : the capitellum in four, the radial head in three, the trochlea in eight, and the coronoid in one case. Osteophytes and fossae were debrided as described in table II.

The mean follow-up period was 25 months (9-37 months) after surgery. Seven patients with a flexion contracture of more than 30° were provided with a postoperative extension splint. The remaining 15 patients (68%) started early mobilisation and supervised physiotherapy.

Using the Mayo Elbow Performance index and Elbow Functional Assessment score *(6)* (table III), the overall outcome of the operation was analysed with SPSS-PC. One sample t-test was used for comparing the variables such as pain, arc of movement, functional and cumulative elbow scores.

Table I. — Patient demographics

| | |
|---|---|
| Total number of patients | 22 |
| Age (in years) | 28 – 68 ( mean 52.9) |
| Sex (Male : Female) | 17:5 |
| Affected side (Right : Left) | 12:10 |
| Occupation | Heavy manual workers - 7<br>Rugby players - 3<br>Retired<br>(previous manual workers) -12 |
| Diagnosis | Primary osteoarthritis - 2<br>Primary osteoarthritis with loose bodies - 13<br>Post traumatic arthritis - 3<br>Post traumatic arthritis with loose bodies - 3<br>Osteochondritis dissecans - 1 |

Table II. — Arthroscopical data

| | | |
|---|---|---|
| Number of portals | Four | 18 |
| | Three | 4 |
| Capsular tightness | Tight | 15 |
| | Normal | 7 |
| Location of loose bodies | Anterior | 4 |
| | Posterior | 6 |
| | Anterior + Posterior | 3 |
| | Lateral | 1 |
| | None | 8 |
| Capitellar osteophytes | Present | 6 |
| | Absent | 16 |
| Olecranon osteophytes | Present | 15 |
| | Absent | 7 |
| Coronoid osteophytes | Present | 17 |
| | Absent | 5 |
| Trochlear osteophytes | Present | 10 |
| | Absent | 12 |
| Capsular release | Anterior | 5 |
| | Posterior | 3 |
| | Anterior + Posterior | 8 |
| | None | 6 |

## RESULTS

There were no postoperative wound complications. Two patients who gained significant additional flexion post-operatively developed mild ulnar nerve symptoms. A traction neuropathy was diagnosed clinically and neurophysiologically. One resolved spontaneously. The other underwent ulnar nerve decompression and made a full recovery. One patient underwent a second arthroscopic debridement for pain and stiffness at 20 months postoperatively and at final assessment had a satisfactory outcome.

The mean pre- operative pain score (VAS) improved significantly post-operatively ($p < 0.001$) from 5.0 to 8.7 at rest and from 3.9 to 7.4 on movement (table IV).The pre- operative mean functional score of 18 (maximum 35 points) improved to a postoperative mean score of 29 ($p < 0.05$).

The mean sagittal arc movement improved significantly from 106° pre-operatively to 124° postoperatively ($p < 0.05$). The mean flexion contracture of 26.6° reduced to 14° postoperatively. The mean elbow flexion of 132° preoperatively improved to 138° postoperatively ($p < 0.05$). The mean pre operative pronation and supination were 80° each and improved only marginally post operatively.

The overall EFA score significantly improved from a preoperative mean score of 48 to a postoperative score of 83.6 ($p < 0.001$). The preoperative Mayo Elbow Performance Index was poor in 14, fair in 6 and good in 2. Postoperatively 10 were excellent, 6 good and 4 fair, with only two poor results. Both these patients were diagnosed to have primary osteoarthritis with loose bodies. Though there was improvement in the range of movement in their affected elbow, functional ability was reduced due to persistent post operative pain. One of them continued to progress to have severe arthritis of elbow and was offered joint replacement.

Table III. — Elbow Function Assessment (EFA) scale *(6)*

| | | |
|---|---|---|
| I. | Pain (max = 30 points) | |
| | Pain sensation at rest (10 cm VAS, no pain is 10 points) | |
| | Pain sensation on motion (10 cm VAS × 2, no pain is 20 points) | |
| II. | ADL* (max = 35 points) | |
| | Cup to mouth | |
| | Eating with a spoon | |
| | Lifting a kettle filled with one liter | |
| | Pouring water from a kettle to a glass | |
| | Telephone receiver to ipsilateral ear | |
| | Cutting with a knife | |
| | Pulling an object over the table | |
| III. | Motion (max = 35 points) | |
| | Active ROM (max = 25 points) | |
| | Active flexion | ≥ 125° = 15 |
| | | 100-125° = 10 |
| | | 75-100° = 5 |
| | | < 75° = 0 |
| | Flexion contracture | ≤ 20° = 10 |
| | | 20-40° = 5 |
| | | ≥ 40° = 0 |
| | Combined movement (max = 10 points) | |
| | Grasping ear lobe of contralateral side with arm in front of the body | without difficulty = 10 |
| | | with difficulty = 5 |
| | | impossible = 0 |

*On a self-reported questionnaire for the ipsilateral arm. Without difficulty = 5 ; with little difficulty = 3 ; with much difficulty = 2 ; with aid = 1 ; impossible = 0.

Table IV. — Comparison of pre- and post-operative data

| | Preoperative mean (C.I) | Post operative mean (C.I) |
|---|---|---|
| Pain at rest (VAS) | 5.0 (3.6-6.4) | 8.7 (7.7-9.7) |
| Pain on movement (VAS) | 3.9 (2.6-5.2) | 7.4 (6.3-8.4) |
| Functional (ADL) score | 18 (15.8-20) | 29 (26.2-32) |
| Elbow range of movements | | |
| Elbow arc of movement (in degrees) | 106 (92-119) | 124 (114-133) |
| Elbow extension (in degrees) | 26.5 (18-35) | 14 (7.8-20) |
| Elbow flexion (in degrees) | 132.5 (125-140) | 138.5 (133-144) |
| Elbow Functional assessment (EFA) score | 48 (41-55) | 84 (77-90) |
| Mayo Elbow Performance grade | Excellent 0<br>Good 2<br>Fair 6<br>Poor 14 | Excellent 10<br>Good 6<br>Fair 4<br>Poor 2 |

Nineteen patients (87%) expressed that they were very satisfied with the procedure. Of the three patients who were not satisfied (< 30% satisfaction rate), all were diagnosed to have primary degenerative osteoarthritis, with persistent pain in two and stiffness in one patient. Further arthrolysis was offered to the patient with persistent stiffness.

## DISCUSSION

Debridement procedures to remove osteophytes and loose bodies have been traditionally performed by open approaches. The Outerbridge-Kashiwagi (O-K) procedure consists of open decompression of the ulno-humeral joint with resection of the ole-

cranon and coronoid osteophytes and fenestration of the distal part of the humerus through a posterior splitting approach (*2*). The Tsuge procedure is a more extensive debridement in which the ligaments are released and the elbow subluxated in order to assess and approach the articular surface (*23*). Morrey designed the ulno-humeral arthroplasty which is a modification of the original O-K procedure (*11*). These procedures are technically demanding, require extensive dissection and consequently have the potential for complications (*9*).

Conversely, elbow arthroscopy provides the benefits of less surgical morbidity and a quicker rehabilitation with earlier return to work and sports (*3,9,10,20*). This procedure is not only less invasive, but also allows for improved visualisation of the intra articular structures and more appropriate debridement of all compartments of the elbow. Cohen *et al* compared the results of the O-K procedure performed by open and arthroscopic approaches in osteoarthritis of the elbow and found no difference in the overall outcome with either of these approaches. They concluded that arthroscopy would be indicated when the predominant symptom is pain, whereas open release is preferable in cases whose main symptom is stiffness (*5*).

Savoie *et al* performed arthroscopic debridement in 24 patients for post traumatic arthritis, rheumatoid arthritis and primary degenerative arthritis and reported a significant improvement in pain and range of movement (*20*). Ogilvie-Harris *et al* reported improvement in the overall elbow performance index in 21 patients with degenerative arthritis of the elbow (*16*). Ball *et al* performed arthroscopic release of post traumatic elbow contractures in 14 cases ; they found significant improvement in the mean arc of elbow movement and concluded that their results are comparable with open release procedures (*3*).

Our study supports these conclusions as we found a significant improvement in pain, range of movement and overall performance of the elbow after arthroscopic debridement. All our patients obtained significant relief of pain both at rest and on movement. The mean score for pain at rest improved more than the pain score on movement. No correlation was identified between postoperative pain improvement and age, sex, preoperative functional status and pre operative elbow range of movements.

In 12 of 14 patients complaining of locking and clicking preoperatively loose bodies were isolated, and 11 reported a significant relief of their symptoms post operatively. Ogilvie-Harris *et al* reported that removal of loose bodies has improved locking symptoms in 92% of their patients (*17*). O' Driscoll and Morrey reported that arthroscopic loose body excision was beneficial in 75% of their patients. The majority of the loose bodies were found in the posterior compartment (*15*). In our series, loose bodies were located in the posterior compartment in 6 elbows, in the anterior compartment in 4 elbows and in both compartments in 3 patients.

In 18 patients complaining of stiffness, capsule tightness was identified in 14 patients, 11 had a preoperative elbow arc of movement of less than 100°, which improved postoperatively in 8 patients, and only three ended with an arc of less than 100°. In our series, the mean postoperative improvement in extension was more than that of flexion. This finding is comparable to other studies.

The overall improvement in the range of movement in our series is comparable to other studies (*5,9,22*). Duration of symptoms, diagnosis, age and sex did not seem to have influenced the postoperative gain in the range of movements in our series, which seems to have correlated with the findings reported by Ball *et al* (*3*). Out of 22 patients, 15 had improvement in the arc of movement and 6 had no difference in their elbow movement, though all 6 have a functional arc (30°-130°). Only one patient continued to experience more stiffness than preoperatively.

One of the important aspects of our study was the evaluation of the functional outcome as this would be the final goal of any treatment. In some studies (*5,8,10*), emphasis was given more on the evaluation of pain, range of movements and final patient satisfaction whereas in other studies (*9,20,22*) functional outcome questionnaires were so broad that precision of functional evaluation was blurred. We used a seven item questionnaire following the Elbow Functional Assessment scoring system (*6*). As mentioned before, we found significant

improvement postoperatively in the mean functional score from 18 to 29. Ball *et al* reported a functional score of 28.3 in their patients who were treated for post traumatic elbow contracture (*3*). Antuna *et al* reported that 83% (46) patients recovered a full ability to perform all normal daily activities (*2*). In our series, 7 manual workers, 3 rugby players and 9 retired manual workers achieved a satisfactory functional recovery with return to their desired level of activity in an average time of three months postoperatively.

Arthroscopy is a technically demanding procedure. A sound knowledge of the anatomy around the elbow is essential, which allows safe portal placement. Neurovascular injuries remain a constant risk because of the proximity of neurovascular structures to the standard portal sites (*10*). Over distension, aggressive intra articular manipulation and extravasation of local anaesthetic have been implicated in the transient post operative nerve palsies. Wrong portals and aggressive use of motorised shavers can cause permanent nerve injuries (*18*). In a stiff elbow there is additional risk as the capsular distension is inadequate (*10*).

Schneider *et al* reported temporary nerve palsy in 7 out of 67 cases (*21*). Antuna *et al* reported one case of ulnar and one of complete radial nerve palsy. Thirteen out of 45 patients in their series complained of some degree of ulnar nerve symptoms, of which 6 required another operation to decompress the nerve postoperativey (*2*). In our series, only two patients developed transient ulnar nerve symptoms and only one required ulnar nerve decompression after which the symptoms resolved with a satisfactory outcome. The final Mayo performance index in our series is comparable to that of the reports from other series (*2*). Nineteen (87%) patients expressed their satisfaction postoperatively which is again comparable to other studies (*3,5, 10,20,22*).

## CONCLUSIONS

Our study emphasises and supports the important role of arthroscopic arthrolysis in degenerative and post traumatic arthritis and stiffness of the elbow joint with favourable functional outcome. Arthroscopic arthrolysis has improved elbow function and returned patients to their desired level of activity, as well as improving range of motion and pain in patients with intrinsic elbow stiffness and pain.

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