Original article

Arthroscopic elbow joint release with radial head resection arthroplasty: 12 cases

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ABSTRACT

Background: Elbow arthritis typically affects manual labourers aged 40 to 50 years and usually starts in the lateral compartment. The objective of this study was to evaluate the medium-term clinical, functional, and radiological outcomes in 12 patients after arthroscopic elbow joint release and radial head resection arthroplasty.

Hypothesis: Our main hypothesis was that pre-operative damage to the radio-capitellar joint was associated with poorer clinical outcomes after elbow joint release.

Material and method: Consecutive patients treated by a single surgeon at a single centre between July 2006 and May 2014 were studied retrospectively. The 12 patients – 10 males and 2 females with a mean age of 54.5 ± 9.3 years (33–69 years) – had osteoarthritis confined to the radio-capitellar compartment with elbow stiffness and pain and underwent arthroscopic elbow joint release with radial head resection arthroplasty. Among them, 9 had a history of trauma or micro-trauma and 3 had rheumatoid arthritis. The Broberg and Morrey osteoarthritis grade on the pre-operative radiographs was 1 in 4 patients, 2 in 6 patients, and 3 in 2 patients.

Results: Mean follow-up was 38.1 ± 33.7 months (5–97). One patient required total elbow arthroplasty. Mean arc of motion was 79.6 ± 20.5° (30–110) pre-operatively, 123.6 ± 18° (90–140) immediately after surgery, and 109 ± 11.7° (90–120) at last follow-up. At last follow-up, mean values were 81.4 ± 12.5° (65–100) for the Mayo Elbow Score, 11.1 ± 11.1 (2.3–31.8) for the Quick DASH score, and 1.1 ± 1.6 (0–4) for the visual analogue scale pain score. The radiological assessment at last follow-up showed no evidence of osteoarthritis progression.

Conclusion: In our case-series, arthroscopic elbow joint release with radial head resection arthroplasty produced good outcomes with a motion arc greater than 100° and little or no pain after a mean follow-up of 3.1 years.

Level of evidence: IV, retrospective study.

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1. Introduction

Elbow osteoarthritis is uncommon (2%–3% of the general population) [1]. The symptoms consist of pain and progressive loss of motion range in all planes that rapidly induce functional impairment. The main causes of elbow osteoarthritis are trauma and repetitive micro-trauma. The typical patient is therefore a manual labourer aged 40 to 50 years [1]. The degenerative process usually starts in the lateral compartment before extending to the remainder of the joint. Thus, the cartilage damage occurs earlier and is more severe at the radio-capitellar than at the ulno-trochlear joint [2–4]. Patients in whom non-operative treatment fails can be offered a surgical procedure such as arthroscopic release [5]. This procedure is currently under evaluation. The role for radial head excision in addition to joint release is a major issue.

Our main hypothesis was that pre-operative damage to the radio-capitellar joint is associated with poorer clinical outcomes after elbow joint release. The objective of this study was to evaluate the medium-term clinical, functional, and radiological outcomes of arthroscopic elbow joint release with radial head resection arthroplasty.

2. Material and method

2.1. Ethical considerations

This non-interventional clinical research study was approved by the appropriate ethics committee. The establishment of an
2.2. Patients

Consecutive patients who underwent surgery between July 2006 and May 2014 at a single centre and by a single surgeon were evaluated retrospectively. Patients were eligible if they underwent arthroscopic elbow joint release to treat stiffness related to osteoarthritis affecting only the radio-capitellar joint. During the study period, these eligibility criteria were met by 12 patients, 10 males and 2 females with a mean age of 54.5 ± 9.3 years (33–69). Among them, 10 were manual workers. The left elbow was affected in 7 patients and the right elbow in 5 patients; 10 patients were right-handed and 2 left-handed and, in 6 (50%) patients, the operated elbow was on the dominant side. A history of trauma or repetitive micro-trauma was noted in 9 (75%) patients, including 5 with trauma due to a work-related accident or occupational disease. The remaining 3 patients had rheumatoid arthritis. The main presenting symptoms were pain and stiffness. Locking of the joint or hydraulithesis were present also in some patients.

The pre-operative radiological evaluation according to Broberg and Morrey [6] showed osteoarthritis grade 1 in 4 patients, grade 2 in 6 patients, and grade 3 in 2 patients.

2.3. Operative technique

The patient was positioned on the side with the upper limb hanging down on an arm board and the elbow free. A tourniquet was inflated and the skin landmarks delineated using a dermatographic pen. The first step of the arthroscopic elbow release procedure consisted in injecting 30 mL of normal saline to distend the joint cavity. An antero-lateral portal was created to allow assessment of the joint. The medial portal was established using the outside-in technique under visual guidance. The anterior compartment was debrided and the anterior capsule excised. Then, the two portals were inverted to allow gradual radial head excision using a power burr. The head was resected until a uniform space of about 8 mm was obtained. The remaining steps consisted in debroiding the posterior compartment, resecting the osteophytes, removing foreign bodies, and releasing the coronoid and olecranon fossae, depending on the lesions. An intensive rehabilitation program was started immediately to preserve the motion-range gains achieved during surgery.

2.4. Outcomes assessment

Outcomes data were obtained for 11 patients, of whom 10 were examined in person by an independent observer and 1 completed a questionnaire and sent new radiographs. At last follow-up, the clinical outcome was evaluated by measuring the motion ranges and looking for instability in the coronal plane. The functional outcome measures were the Mayo Elbow Performance Score (MEPS) [7] and the Quick DASH Score [8]. Also recorded were patient satisfaction (on a 4-grade scale: very dissatisfied, dissatisfied, satisfied, very satisfied) and pain intensity (on a 0–10 point visual analogue scale [VAS]). Antero-posterior and lateral radiographs of the elbow were obtained, with valgus/varus stress views.

3. Results

After a mean follow-up of 38.1 ± 33.7 months (5–97), 10 patients were examined in person and 1 was interviewed by telephone. The remaining patient was lost to follow-up. Total elbow replacement surgery was required in 1 patient, who had rheumatoid arthritis.

Wrist pain during pronation-supination was reported by 1 patient, in the absence of distal radio-carpal or radio-ulnar osteoarthritis. This patient had no evidence of infection or injury to nerves or blood vessels.

At the pre-operative physical examination, extension lag was 26.3° ± 18° (10–60), flexion was 105.8° ± 15.6° (90–140), pronation was 68.8° ± 24.3° (0–80), and supination was 60.8° ± 34.4° (0–85). Thus, the motion arc was 75.6° ± 20.5° (30–110) (Fig. 1).

Immediately after surgery, the physical examination showed the following: extension lag, 6.4° ± 9.2° (0–30); flexion, 130° ± 14.1° (100–140); pronation, 80° (in all patients); and supination, 81.4° ± 10.5° (50–85). Motion arc was 123.6° ± 18° (90–140) (Fig. 1). Surgery was performed on a day-hospital basis in 2 patients, and mean hospital stay length was 2.4 ± 1.4 days (1–5).

At last follow-up, the results of the physical examination were as follows: extension lag, 13° ± 9.2° (0–30); flexion, 122° ± 15.5° (90–140); pronation, 75.6° ± 10.1° (5085); and supination, 80° ± 11.5° (50–85). The motion arc was 109° ± 11.7° (90–120) (Fig. 1).

At last follow-up, the MEPS was 81.4 ± 12.5 (65–100) and the Quick DASH converted to a score on 100 points was 11.1 ± 11.1 (2.3–31.8). The VAS pain score was 1.1 ± 1.6 (0–4). Of the 11 patients, 10 were satisfied or very satisfied with the outcome and 1 was dissatisfied. Furthermore, 6 patients were able to return to their previous job, 1 was retrained to a non-manual job, 3 were retired, and 1 was on disability.

The radiological evaluation at last follow-up (Fig. 2) showed no valgus or varus deformity of the forearm, even on stress views. Neither was there any evidence of further damage to the capitellar cartilage or of secondary degeneration of the ulno-trochlear joint.

4. Discussion

The treatment goal in middle-aged (50 years) manual workers is to achieve an appropriate and sustained improvement consistent with the social and occupational needs that characterise this population. The typical patient presents with elbow pain and stiffness related to major cartilage damage, usually in the radio-capitellar compartment. The therapeutic challenge consists in offering an alternative to joint replacement in patients with advanced radio-capitellar osteoarthritis. Joint replacement is not indicated as it cannot simultaneously ensure recovery of the functional motion arc (>100°), absence of pain, and sufficient strength. The role for arthroscopy has increased in this situation. Thus, in patients with radio-capitellar or global elbow osteoarthritis, radial head resection combined with joint release holds considerable promise [9].

Arthroscopic radial head excision was first reported by Lo and King in 1984 [10]. In a case-series study of 12 patients, Mentch-Chiari et al. [11] showed that resection of the radial head did not necessarily have to be complete to improve elbow function while significantly alleviating the pain. Similar findings were obtained by McLaughlin et al. in a case-series study of 36 patients reported in 2006 [12].

Radial head excision concomitantly with arthroscopic release is currently an alternative to joint replacement, since radio-capitellar osteoarthritis predicts poorer clinical outcomes after joint release [5]. Cha et al. [9] demonstrated that radio-capitellar osteoarthritis was also of adverse prognostic significance in joint release using the Outerbridge-Kashiwagi procedure.

A comparison of the outcomes reported by McLaughlin et al. [12] to those obtained by Morrey [13] and Kashiwagi [14] suggests better motion range recovery after arthroscopic release than after open release. The mean increase in flexion/extension range after open radial head excision was only 20° in a study by Taylor et al. [15]. In contrast, McLaughlin et al. [12] reported a mean 62° increase, a significant improvement compared to the result of open surgery.

In keeping with these findings, a case-series study [5] reported at a French Society for Arthroscopy (SFA) symposium showed better...
range of motion after arthroscopic elbow joint release than after open surgery. This motion range difference between arthroscopic and open procedures may be ascribable to the smaller degree of tissue damage with arthroscopy. Furthermore, arthroscopy is associated with less morbidity (pain, fibrosis adhesions) and therefore allows earlier and more prolonged mobilisation.

Well-documented complications of radial head resection include radial nerve and blood vessel injuries, ulna valgus, loss of strength, and heterotopic ossification [11,12,16]. McLaughlin et al. [12] reported a case of forearm scaffold destabilisation in a patient with rheumatoid arthritis: degenerative disease of the distal radio-ulnar joint, together with radial head resection, resulted in proximal migration of the radial shaft and ulna valgus deformity. The risk of forearm scaffold destabilisation and elbow instability is lower with arthroscopic compared to open radial head resection [17].

At last follow-up, the motion arc had increased from 79.6° pre-operatively to 109°, which compares favourably with previously published data. In addition, the functional outcomes were satisfactory, with a mean Quick DASH score (on 100) of 11.1 ± 11.1 (2.3–31.8).

Of the 12 patients, 1 required total joint replacement. This patient had rheumatoid arthritis with involvement of the hand first then of the elbow. Arthroscopic or open synovectomy is an
**Fig. 2.** Radiographs obtained pre-operatively (a), in the immediate post-operative period (b) and at last follow-up 52 months later (c) in the same patient: a: grade 1 radiocapitellar osteoarthritis in the Broberg and Morrey classification; b: post-operative radiographs; c: radiographs at last follow-up: no adverse changes or evidence of coronal instability on the stress views.
option for the initial surgical treatment of the rheumatoid elbow, most notably in patients with Broberg and Morrey grade I or II disease. This procedure provides moderate improvements in pain and motion range in the short term (<5 years) that do not seem sustained after longer follow-ups [11,18,19]. Simple synovectomy seems inadequate in patients with elbow stiffness. In a study of patients with rheumatoid arthritis, Woods et al. [20] compared clinical outcomes after combined release, radial head excision, and synovectomy and after total elbow replacement. Motion range gains were similar but joint replacement provided greater medium-term pain relief. However, complications were both more common and more severe after joint replacement. Another important consideration is that patients with elbow replacement cannot perform manual jobs. Consequently, in younger patients with rheumatoid arthritis or symptoms chiefly ascribable to the radio-capitellar joint, we recommend arthroscopic release with concomitant radial head resection. This procedure allows the deferment of joint replacement in patients with rheumatoid arthritis.

5. Conclusion

The role for arthroscopy in the management of elbow disorders has increased in recent years. The indications for arthroscopic procedures have evolved. Foreign body removal remains the main indication, but joint release is now in second place [5]. As the elbow is a non-weight-bearing joint, it is rarely affected by osteoarthritis. Nevertheless, the functional impairment induced by elbow osteoarthritis has a major adverse impact on social and occupational activities. As always, optimal initial non-operative treatment is indispensable. Important concomitant measures include wearing a brace, adapting the workstation and, if needed, job retraining. If this strategy fails, the patient can be offered arthroscopic joint debridement combined with joint release and radial head resection. In our case-series study, this procedure produced good functional outcomes with a greater than 100° motion arc and little or no pain after a mean follow-up of 3.1 years. The risk of long-term progression to global elbow osteoarthritis remains to be evaluated.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

References