Arthroscopic release of resistant stiff elbow

Mohamed G. Morsy

Department of Orthopedic Surgery, El-Hadara Orthopaedic and Traumatology University Hospital, University of Alexandria, Alexandria, Egypt

Correspondence to Mohamed G. Morsy, MD, Department of Orthopedic Surgery, El-Hadara Orthopaedic and Traumatology University Hospital, University of Alexandria, Alexandria, Egypt
Tel: 00201001701563; Fax: +20 342 95792; e-mail: morsimoh@gmail.com

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Introduction
Elbow stiffness represents a difficult therapeutic challenge. The complaints are classically characterized by pain and loss of motion. Treatment options include nonoperative and operative techniques, all attempting to provide pain relief and restoration of function. If nonsurgical treatment fails, operative intervention is indicated. Treatment of the stiff elbow by means of arthroscopic capsular release is a relatively new and effective procedure; however, the surgery is technically demanding. The aim of this study was to evaluate the clinical outcomes of arthroscopic release of resistant stiff elbow.

Patients and methods
Twenty patients with elbow stiffness were treated by means of arthroscopic capsular release through anterolateral and anteromedial elbow portals, using arthroscopic ablation device and shaver. Posterior and posterolateral portals were used to remove loose bodies, debris, or scar tissue in the olecranon fossa. The patients were prospectively followed up clinically for a mean of 24 months (range = 16–30 months). The clinical assessment was performed with the Mayo Elbow Performance score.

Results
Eighteen patients were satisfied with the outcome. There was a significant improvement in the range of motion and reduction of pain. The mean Mayo Elbow Performance score was significantly improved from a mean of 45.3 preoperatively to 95.3 postoperatively.

Conclusion
The early results of arthroscopic release of resistant stiff elbow are encouraging and provide symptomatic improvement in most patients. It shortens the time to achieve a good function.

Keywords:
arthroscopic arthrolysis, capsular release, stiff elbow

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Introduction

Elbow stiffness is a challenging orthopedic problem [1]. It commonly results from both intrinsic and extrinsic factors [2]. Many different causes, including trauma, burns, arthritis, and spasticity, can lead to acquired elbow stiffness. Trauma to the elbow is considered to be the most common cause that leads to various degrees of pain and restricted range of motion. It usually results in hemarthrosis with subsequent scarring and contracture. The early surgical intervention, immobilization, and postoperative rehabilitation, although important, may complicate the initial soft tissue injuries [3].

An essential goal following elbow trauma is the prevention of contracture. Most activities of daily living need an arc of elbow flexion of 100° (from 30 to 130°) and an arc of forearm rotation of 100°. Therefore, when restriction encroaches upon this functional arc of motion, significant limitations may develop in the daily activities [4].

The early nonoperative treatment of post-traumatic elbow stiffness involves the use of anti-inflammatory and pain medication, standard physical therapy regimens, and static or dynamic splinting [5,6]. However, failure of the nonoperative management in relieving the pain and regaining the range of motion required for the patient's functional demands results in a painful stiff elbow that requires further intervention.

Various surgical interventions have been described to treat elbow stiffness; most of them used an open approach [7–10]. However, open release of contractures may lead to additional soft-tissue injury to the elbow with subsequent increase in the risk for recurrence and pain that limits physical therapy.

Less-invasive procedures for the release of elbow stiffness have been introduced aiming at avoidance of excessive scarring and soft tissue injury that may contribute to recurrence of contracture. Recently, arthroscopic release of post-traumatic resistant stiff

elbow has gained popularity with encouraging clinical results and patient satisfaction [11–13]. The earliest application of elbow arthroscopy for stiff elbow was reported by Jones and Savoie [14], Nowicki and Shall [15], and Byrd [16] in the early 1990s. Although good results were reported, they were undermined by concerns for peripheral nerve injuries [17].

The arthroscopic release has the same indications as the open release. The specific technique may depend more on the surgeon's experience than on other factors; there is no specific contraindication to either approach other than the need to release and/or explore the ulnar or radial nerve when necessary [18]. However, the arthroscopic release has the advantages of improved joint visualization, less postoperative morbidity, and a more rapid functional recovery [19,20].

Aim of the work

The purpose of this study was to evaluate the clinical outcomes of arthroscopic release of resistant stiff elbow.

Patients and methods

Between March 2009 and September 2010, arthroscopic surgical procedures were carried out on 20 patients (14 male and six female). The ages of the patients ranged from 28 to 58 years (mean = 42.5 years). The right elbow was affected in 13 patients (65%). The dominant hand was involved in 11 patients (55%).

The study included patients with post-traumatic elbow stiffness that had a symptomatic pain and limitation of range of motion. In all patients presented for surgery, a course of conservative management for at least 6 months had failed to relieve the symptoms, leaving the patients with inability to work or perform daily activities. This nonoperative treatment consisted of medical treatment, physical therapy, elbow supports, and/or local steroid injections.

Patients with active infection around their elbow or those who were unwilling to cope with the postoperative rehabilitation program were excluded from the study. For all patients, plain film radiographies were performed to evaluate the osseous abnormalities; however, those with significant bone architecture disruption were excluded. Moreover, patients with primary degenerative or inflammatory arthritis of the elbow were not included in the study.

The mean duration of symptoms before surgery was 11 months (range = 6–18 months).

All patients were clinically assessed preoperatively as regards the level of pain, activities of daily living, and the range of motion to obtain the Mayo Elbow Performance score. This is a 100-point score with parameters of pain (45 points), function (25 points), range of motion (20 points), and stability (10 points) [21].

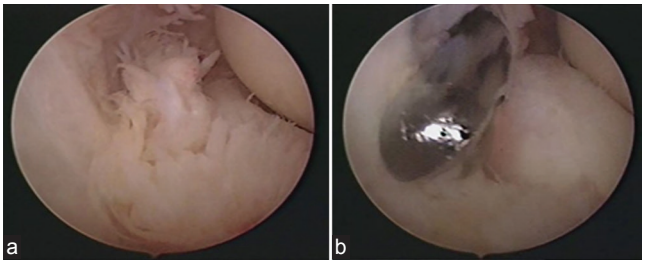
The patients were operated on under general anesthetic and tourniquet control. They were made to lie in the lateral decubitus position. Physical examination under anesthesia was routine. Following disinfection and sterile draping, 15 ml of saline was injected to distend the elbow through the soft spot, which is located between the olecranon, lateral epicondyle, and radial head. Following careful identification and palpation of the ulnar nerve, a standard 4.5 mm, 30° arthroscope was inserted into the elbow through the proximal anteromedial portal (1 cm proximal and anterior to the medial epicondyle). An arthroscopic pump of low pressure was used to improve visualization and to avoid joint overdistension. An initial diagnostic arthroscopy with visualization of the entire anterior aspect of the elbow was performed. Under direct arthroscopic visualization, a spinal needle was then inserted from the lateral side at the level of the capitellum to establish the anterolateral portal (1 cm proximal and anterior to the radial head) (Fig. 1). After establishing the anterolateral portal, synovectomy and debridement of adhesions were undertaken with a 4.5 mm oscillating shaver (Fig. 2a and b). Osteophytes were excised from the anterior joint, and any loose bodies were removed (Fig. 3). The anterior capsule was then released proximally and distally under direct arthroscopic vision from medial to lateral using an arthroscopic ablation device and a motorized shaver (Fig. 4).

Once the anterior surgery was completed, a posterior central portal of 4 cm proximal to the tip of the

Figure 1

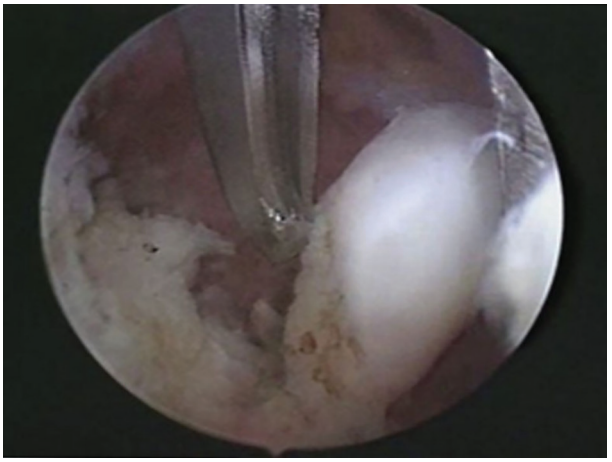
Anterior (medial and lateral) portals.

Figure 2



(a) Intra-articular synovitis. (b) Synovitis debridement with the oscillating shaver.

Figure 3



Arthroscopic loose body removal.

Figure 4

Capsular release with the arthroscopic ablation device.

Figure 5

Posterior arthroscopic portals.

olecranon through the triceps tendon and a posterior-lateral portal of 2 cm proximal to the olecranon tip and lateral to the triceps tendon were used to perform the posterior joint debridement (Fig. 5). All osteophytes, loose bodies, and fibrotic tissue in the posterior compartment were removed using the motorized shaver. The debridement did not extend beyond the medial aspect of the olecranon fossa to avoid injury of the ulnar nerve (Fig. 6).

Range of motion of the elbow was then assessed, and gentle manipulation was performed if necessary to release any remaining capsular contracture. Postoperatively, active and active-assisted range-of-motion exercises were encouraged.

All patients were reviewed postoperatively, and the Mayo Elbow Performance score was determined.

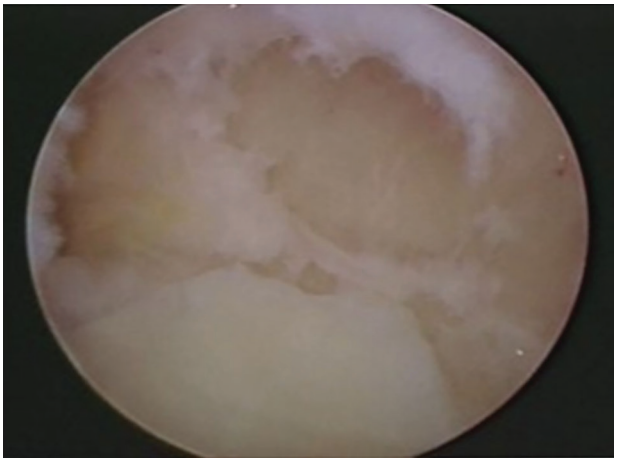
Results

The mean follow-up period was 24 months (range = 16–30 months). The Mayo Elbow Performance score was significantly improved from a mean of 45.3 points (range = 30–50 points) preoperatively to a mean of 95.3 points (range = 82–98 points) postoperatively ($P = 0.0001$).

The mean score of pain improved from 16 points (range = 0–25 points) preoperatively to 43 points (range = 34–45 points) postoperatively. The mean score of function improved from 7 points (range = 4–16 points) preoperatively to 23 points (range = 19–25 points) postoperatively.

The range of motion was significantly improved from a mean of 6 points (range = 3–10 points) preoperatively to a mean of 18 points (range = 15–20 points) postoperatively ($P<0.0001$). A functional arc of motion of 100° or more between 30 and 130° was obtained in 18 of 20 patients postoperatively. Figure 7 shows one of the patients with preoperative stiffness and postoperative satisfactory improvement.

Figure 6



The olecranon fossa after debridement.

Figure 7

Preoperative and postoperative results.

There was no significant difference between dominant and nondominant elbow surgery. There was also no loss of grip strength in the operated limb. None of the patients developed reflex sympathetic dystrophy, elbow instability, or required revision surgery. One patient had a superficial portal track infection that was completely resolved with dressing and antibiotic therapy. Two patients suffered from transient anterior interosseous nerve palsy that recovered spontaneously at 6 weeks postoperatively.

At the final follow-up, 18 (90%) of 20 elbows were considered by the patients to be much better as a result of the operation. The other two patients had a residual intermittent pain with 70° arc of motion.

Discussion

Elbow trauma can result in a significant loss of motion that interferes with the ability to perform daily activities. The post-traumatic stiff elbow is a common complication encountered by most orthopedic surgeons. Elbow contractures are usually caused by intrinsic and extrinsic factors, resulting in pain and functional limitation of motion [2].

Nonsurgical treatment including physical therapy, splinting, and/or local injections can help in restoration of a functional range of motion; however, many patients will continue to have residual elbow stiffness. In such resistant cases, operative interventions may be indicated [22].

Traditionally, open surgical release of post-traumatic elbow stiffness showed good clinical results. Mansat and Morrey [9] reported improved range of motion and satisfactory results in 82% of patients who underwent open surgical intervention. Wada *et al*. [23] evaluated the results of open release using a single medial approach; they reported improvement in the arc of the range of motion from 46 to 110°. However, open release results in large scars and increased soft tissue injury, which may lead to recurrence of contracture and can thus delay the postoperative rehabilitation program [24].

Recent advances in elbow arthroscopy have led to the development of less-invasive procedures for the treatment of resistant elbow contractures. The arthroscopic intervention offers an alternative strategy with the advantages of improved joint visualization, decreased postoperative morbidity, and a more rapid functional recovery [2]. Several authors have reported good results following arthroscopic arthrolysis in the treatment of elbow stiffness [12,13,25]. However, most of the published reports have focused on debridement rather than capsular release [11,14,20].

Arthroscopic capsular release is challenging because of the proximity of the neurovascular structures to the arthroscopic portals and the limited joint space. Jones and Savoie [14] showed improvement in motion and decreased pain in 12 patients with stiff elbow treated with arthroscopic debridement; however, one patient suffered from a permanent posterior interosseous nerve palsy.

In this study, the primary indication for surgery was post-traumatic stiffness with persistent pain and limitation of functional range of motion. All patients had capsular contracture as a main pathology. Satisfactory results were recorded in 90% of patients, and the Mayo Elbow Performance score was significantly improved from a mean of 45.3 points preoperatively to a mean of 95.3 points postoperatively. A significant decrease in

pain and improvement in range of motion were found in 18 of 20 patients at the final follow-up.

The results in this study compare favorably with the published reports of open or arthroscopic operative release of recalcitrant stiff elbow [8,9,18,22,24]. Singh *et al*. [1] showed improvement in the Mayo Elbow Performance score from a mean of 64.5 points preoperatively to a mean of 83.17 postoperatively. Ball *et al*. [11], similarly, reported an improvement in the range of motion arc greater than 100° in 13 of 14 patients. In their study, all patients were satisfied, although six had reported some pain.

With regard to the postoperative complications, two patients in this study had transient anterior interosseous nerve palsy with spontaneous recovery after 6 weeks. Two transient median nerve palsies in 25 patients were also reported by Kim *et al*. [25] following arthroscopic debridement and capsular release of stiff elbow. In 1999, Haapaniemi *et al*. [17] reported a case of complete median and radial nerve palsy during arthroscopic release of elbow contracture that required further intervention. A superficial portal tract infection was encountered in one patient in this study that was completely resolved with dressing and antibiotic treatment. Similar complication was reported by Ball *et al*. [11], and Van Zeeland and Yamaguchi [22].

The limitations of this study were the relatively low patient numbers and the short duration follow-up.

Conclusion

The preliminary results of arthroscopic release of resistant stiff elbow are encouraging and provide symptomatic improvement in most patients. Moreover, it shortens the time to achieve a good function, with minimal soft tissue trauma and improved joint visualization. However, the procedure is technically demanding and requires an adequate knowledge on the anatomy of the elbow and a quite long learning curve.

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Conflicts of interest
There are no conflicts of interest.

References

1 Singh H, Nam KY, Moon YL. Arthroscopic management of stiff elbow. Orthopedics 2011; 34:167–171.
2 Keener JD, Galatz LM. Arthroscopic management of the stiff elbow. J Am Acad Orthop Surg 2011; 19:265–274.
3 Tucker K. Some aspects of post-traumatic elbow stiffness. Injury 1977; 9:216–221.
4 Morrey BF, Askew LJ, Chao EY. A biomechanical study of normal functional elbow motion. J Bone Joint Surg Am 1981; 63:872–877.
5 Dickson RA. Reverse dynamic slings. A new concept in the treatment of post-traumatic elbow flexion contractures. Injury 1976; 8:35–38.
6 Green DP, McCoy H. Turn buckle orthotic correction of elbow flexion contractures after acute injuries. J Bone Joint Surg Am 1979; 61:1092–1095.
7 Gates HS III, Sullivan FL, Urbaniak JR. Anterior capsulotomy and continuous passive motion in the treatment of post-traumatic flexion contracture of the elbow. A prospective study. J Bone Joint Surg Am 1992; 74:1229–1234.
8 Husband JB, Hastings H II. The lateral approach for operative release of post-traumatic contracture of the elbow. J Bone Joint Surg Am 1990; 72:1353–1358.
9 Mansat P, Morrey BF. The column procedure: a limited lateral approach for extrinsic contracture of the elbow. J Bone Joint Surg Am 1998; 80:1603–1615.
10 Morrey BF. Post-traumatic contracture of the elbow. Operative treatment, including distraction arthroplasty. J Bone Joint Surg Am 1990; 72:601–618.
11 Ball CM, Meunier M, Galatz LM, Calfee R, Yamaguchi K. Arthroscopic treatment of post-traumatic elbow contracture. J Shoulder Elbow Surg 2002; 11:624–629.
12 Kim SJ, Shin SJ Arthroscopic treatment for limitation of motion of the elbow. Clin Orthop Relat Res 2000; 375:140–148.
13 Nguyen D, Proper SI, MacDermid JC, King GJ, Faber KJ. Functional outcomes of arthroscopic capsular release of the elbow. Arthroscopy 2006; 22:842–849.
14 Jones GS, Savoie FH III. Arthroscopic capsular release of flexion contractures (arthrofibrosis) of the elbow. Arthroscopy 1993; 9:277–283
15 Nowicki KD, Shall LM. Arthroscopic release of a posttraumatic flexion contracture in the elbow: a case report and review of the literature. Arthroscopy 1992; 8:544–547
16 Byrd JW. Elbow arthroscopy for arthrofibrosis after type 1 radial head fractures. Arthroscopy 1994; 10:162–165.
17 Haapaniemi T, Berggren M, Adolfsson L. Complete transection of the median and radial nerves during arthroscopic release of post-traumatic elbow contracture. Arthroscopy 1999; 15:784–787.
18 Tucker SA, Savoie FH III, O'Brien MJ. Arthroscopic management of the post-traumatic stiff elbow. J Shoulder Elbow Surg 2011; 20(Suppl): 83–89.
19 Phillips BB, Strasburger S. Arthroscopic treatment of arthrofibrosis of the elbow joint. Arthroscopy 1998; 14:38–44.
20 Timmerman LA, Andrews JR. Arthroscopic treatment of posttraumatic elbow pain and stiffness. Am J Sports Med 1994; 22:230–235.
21 Morrey BF, An KN, Chao EYS. Functional evaluation of the elbow. In: Morrey BF, editor. *The elbow and its disorders*. Philadelphia: W. B. Saunders; 1993. 86–89.
22 Van Zeeland NL, Yamaguchi K. Arthroscopic capsular release of the elbow. J Shoulder Elbow Surg 2010; 19(Suppl): 13–19.
23 Wada T, Ishii S, Usui M, Miyano S. The medial approach for operative release of post-traumatic contracture of the elbow. J Bone Joint Surg Br 2000; 82:68–73.
24 Cefo I, Eygendaal D. Arthroscopic arthrolysis for posttraumatic elbow stiffness. J Shoulder Elbow Surg 2011; 20:434–439.
25 Kim SJ, Kim HK, Lee JW. Arthroscopy for limitation of motion of the elbow. Arthroscopy 1995; 11:680–683.