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ORIGINAL ARTICLE

Prospective outcome assessment of arthroscopic arthrolysis for traumatic and degenerative elbow contracture

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Background: The purpose of this study was to evaluate the efficacy of arthroscopic elbow release for both traumatic and degenerative contractures from intraoperative recording through the recovery time until final follow-up.

Methods: The study is based on 54 consecutive patients with extrinsic elbow contracture (traumatic in 31 and degenerative in 23) treated with arthroscopic arthrolysis by a single surgeon in 2011-2015. Range of motion (ROM) and the Mayo Elbow Performance Score (MEPS) were recorded preoperatively; intraoperatively; following release; and in the 1st, 3rd, 8th, 12th, and 26th weeks and at 2 years postoperatively.

Results: Significant improvements were noted in extension, flexion, and range of motion, measured both intraoperatively and at all follow-up visits. The greatest improvement in the range of motion was achieved at the time of surgery (from 89° ± 28° to 131° ± 14°, $P < .001$); it then decreased at 1 week to 103° ± 22° ($P < .001$) and slowly recovered to reach 124° ± 22° after 2 years. This was better than the preoperative value ($P < .001$) but worse than the intraoperative value ($P = .002$). A similar pattern was observed in both traumatic and degenerative contractures. The MEPS improved from 73 ± 12 preoperatively to 93 ± 14 at the final evaluation ($P < .001$). The ROM and MEPS results at every follow-up were comparable for both traumatic and degenerative contractures. ROM improved regardless of the severity of contracture.

Conclusions: Arthroscopic elbow arthrolysis was similarly efficient in ROM restoration in both traumatic and degenerative contractures and regardless of the severity of contracture. After early deterioration, the achieved gain slowly recovers over a period of 6 months but may not recover to the ranges achieved during arthroscopy.

Level of evidence: Level IV; Case Series; Treatment Study

Keywords: Arthroscopy; elbow; stiffness; elbow arthroscopy; arthroscopic release; elbow injury; elbow degeneration

Elbow function—specifically range of motion (ROM)—is essential to basic life functions such as reaching the hand out and then bringing the hand close to the face. It also becomes important for more advanced activities, such as manual jobs

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and sports. Most human elbow activities occur in the so-called functional ROM, which has been discovered to be in the range of 30°-120°.[24] Any pathology limiting that range significantly affects patients' everyday life. Small contractures have so far been accepted as well tolerated by individuals. However, with rising demands and society becoming more and more active, even a minor limitation may not be well accepted by some patients.[6,7] Addressing the minor limitation with open release might not solve the problem. We have observed that open release did not improve the ROM in minor contractures (<30°) and in some cases made it even worse.[9] Therefore, our conclusion was that minor contractures should not be addressed by open arthrolysis but rather by a much less invasive arthroscopic approach. This has also been suggested in a systematic review by Kodde et al.[20] Arthroscopic release was applied in elbow contractures of lower limitations than in those once treated by the open approach. The technique has also shown a lower rate of complications.[20] This, however, was analyzed only for post-traumatic cases and in almost exclusively retrospective studies. Patients with a limited range of movement who come to see the surgeon are affected by either traumatic or degenerative contracture. Despite the advances in care (both surgical and rehabilitation), post-traumatic stiffness is a common consequence of elbow trauma. There are a variety of pathologic factors contributing to elbow stiffness: capsular fibrosis, adhesions, intra-articular fibrosis, articular surface deformity, and heterotopic ossification (HO). Most of them can be addressed by an arthroscopic procedure. Major limitations of the arthroscopic approach are the interfering hardware and the necessity for its removal, large HOs, and severe articular surface deformity. Degenerative arthritis of the elbow is a relatively rare pathology, mostly accompanied by osteophyte formation, loose bodies, and capsular contracture. It slowly and progressively limits elbow motion, affecting mostly the population of men in their fifties.[22,23,36] Both open and arthroscopic procedures have been described to decrease pain and improve function. A positive result may be achieved by débridement of osteophytes, removal of loose bodies, and capsular release.

In general, arthroscopic elbow arthrolysis is a difficult procedure; however, when properly performed, it can be beneficial for the patient. Both the portals and the technique, which allow for safe handling of instruments to address almost all coexisting pathologies, have been well presented before.[32]

Our hypothesis was that the application of the arthroscopic technique to address elbow stiffness would result in a significant increase in the ROM of the elbow, with special attention to cases of minimal contractures. We also hypothesized that a similar increase in the ROM could be achieved regardless of the etiology—whether trauma or degeneration. The purpose of the study was to evaluate the efficacy of arthroscopic elbow release for both traumatic origin and degenerative origin. A secondary aim was to perform a prospective assessment of the ROM changes from intraoperative recording through the recovery time until final follow-up.

Materials and methods

This is a prospective clinical study of a patient cohort operated on by a single surgeon (P.L.). The study presents a series of consecutive cases of patients who underwent arthroscopic release of elbow contracture and were evaluated prospectively over a period of 24 months. The inclusion criteria comprised symptomatic elbow flexion contracture of at least 10° and/or extension contracture of at least 120° interfering with patient activity, failed rehabilitation program of at least 6 months' duration, preserved joint space, and arthroscopic elbow release. The exclusion criteria were as follows: elbow contractures related to inflammatory disorders, skin contractures or muscle spasticity, open hardware removal, active infection, and intrinsic contractures with articular surface deformity.

A total of 57 patients were operated on in 2011-2015 by a single surgeon (P.L.). Three patients were lost to follow-up; they either did not show up or refused to attend the control visit. Thus, 54 patients underwent the assessment, including 13 female and 41 male patients. All the data of the study participants were available for analysis. All patients had elbow contracture resulting from a traumatic cause (n = 31) or degenerative process (n = 23). The average age of the patients was 37 years (SD, 13 years; minimum, 13 years; maximum, 68 years). The patients were scheduled to undergo the arthroscopic procedure only when an adequate rehabilitation program for a minimum of 6 months had failed to restore elbow functionality. The diagnosis was made by clinical assessment and supported by radiologic evaluation (radiography, computed tomography, and magnetic resonance imaging).

The cohort was divided according to the etiology of the contracture: traumatic versus degenerative. The patients were assigned to the traumatic group if there was a history of trauma that resulted in elbow contracture. The history included elbow dislocation (9), distal humeral fracture (7), radial head fracture (6), olecranon fracture (4), fracture-dislocation (4), and humeral and olecranon fracture (1). The average age in the traumatic group was 34 years (SD, 14 years; minimum, 13 years; maximum, 68 years), with 11 female and 20 male patients. The patients without a history of trauma were assigned to the degenerative group when degenerative changes (osteophytes or loose bodies) were identified on imaging. All except 1 had a long history of heavy lifting. One patient had a contracture that resulted from osteochondritis dissecans of the capitellum. The average age in the degenerative group was 41 years (SD, 13 years; minimum, 15 years; maximum, 61 years), with 2 female and 21 male patients. The traumatic group was significantly younger than the degenerative group ($P = .03$). There were significantly more male patients in the degenerative group. The participants were informed and consented to participate in this study.

Arthroscopic technique and postoperative regimen

All patients were operated on under brachial plexus block anesthesia. The same approach was used in all cases. The patient was placed supine with a tourniquet on the arm. The arm was placed on a narrow support to allow for easy access to the elbow. Saline solution, 10-20 mL, was injected into the elbow joint. The anterior compartment was approached first, followed by the posterior one. Arthrolysis in the traumatic group included release of the capsule with partial capsular excision. Parts of the capsule in the proximity of the nerves were not completely removed and were treated with caution. These included the medial gutter around the ulnar nerve, the anterolateral