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(CASE REPORT)

Elbow arthrolysis for post-traumatic stiffness: Predictive factors of outcome

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Abstract

Introduction: The purpose of this study was to evaluate the outcomes of open elbow arthrolysis in post-traumatic elbow stiffness and to identify prognostic factors influencing functional results and range of motion (ROM).

Patients and Methods: Between 2016 and 2021, 21 elbow arthrolysis procedures were performed at our institution. Sixteen patients were available for retrospective evaluation, while five were lost to follow-up. The mean age was 42.3 years (range, 14–70). Etiologies included elbow dislocation, radial head fractures, olecranon fractures, distal humeral fractures, and post-traumatic soft-tissue contractures. According to Morrey's classification, stiffness was intrinsic in 10 cases and extrinsic in 6 cases.

Surgical approaches were posterior (n = 2), lateral (n = 7), and combined posterior–lateral (n = 7). All patients underwent open arthrolysis followed by immediate postoperative mobilization and standardized rehabilitation. ROM was measured preoperatively, immediately postoperatively, and at final follow-up. Functional outcomes were assessed using the Disabilities of the Arm, Shoulder and Hand (DASH) score and Visual Analog Scale (VAS). Mean follow-up was 57 months (range, 13–71).

Results: The mean flexion-extension arc improved from 47° preoperatively to 114° immediately postoperatively. At final follow-up, a mild loss of motion was observed, with a mean arc of 87°, corresponding to a decrease of approximately 5°–10° compared with the immediate postoperative result.

The mean functional gain in flexion-extension arc was approximately 40°. Most patients achieved a functional pronation–supination arc greater than 100°.

At final follow-up, the mean DASH score was 53.4 and the mean VAS pain score was 5. Eight patients were highly satisfied, five were satisfied, and three were dissatisfied.

Final ROM was significantly correlated with preoperative stiffness severity ($p = 0.001$) and immediate postoperative mobility. Patients treated within one year of injury achieved significantly better outcomes ($p < 0.05$). No significant association was found between outcomes and age, sex, etiology, or surgical approach.

Conclusion: Open elbow arthrolysis is an effective procedure for post-traumatic elbow stiffness. Final ROM is mainly determined by preoperative stiffness severity and time to surgery. A slight postoperative loss of motion (5°–10°) may occur, but functional improvement remains significant and durable.

Keywords: Post-Traumatic Elbow Stiffness; Elbow Arthrolysis; Open Elbow Release; Range of Motion

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1. Introduction

Elbow stiffness, a common condition associated with significant morbidity, is generally defined as an elbow range of motion (ROM) of less than 30°–130° [10]. It results in substantial functional limitations and disability affecting hand function in daily activities and work-related tasks. Its etiology includes both atraumatic and traumatic factors [11], with trauma being recognized as the primary cause. Factors associated with post-traumatic elbow stiffness include prolonged immobilization, soft tissue contracture, intra-articular obstruction, and heterotopic bone formation.

Morrey classified post-traumatic elbow stiffness into three categories: intrinsic, extrinsic, and mixed [12]. Intrinsic causes, such as joint incongruity, osteophyte formation, and intra-articular adhesions, originate within the elbow joint itself, whereas extrinsic causes include capsular contracture, heterotopic ossification, and impinging hardware. In clinical practice, the causes of post-traumatic elbow stiffness are frequently mixed. Although our understanding of the pathogenesis of post-traumatic elbow stiffness continues to expand, it remains incomplete. The incidence of elbow stiffness following trauma has not been clearly established; however, more severe stiffness has been correlated with high-energy trauma and prolonged immobilization [12,13].

Both nonoperative and operative treatment modalities are used to manage elbow stiffness. In general, surgical release should be considered when nonoperative treatment fails to improve motion after six months [14]. Open arthrolysis remains the gold standard for the treatment of post-traumatic elbow stiffness. First reported in 1944, surgical techniques have evolved considerably over the past 70 years. Numerous studies have described this procedure, reporting varying functional outcomes and complication rates [11,15]. The literature indicates a chronological trend toward improved outcomes, particularly in recent years; however, complication rates have not decreased over time and continue to represent a major challenge, even for experienced specialists.

In this retrospective study of 18 patients who underwent surgery solely to improve restricted ROM, the relative influence of patient characteristics, surgical approach, and postoperative management on surgical outcomes was evaluated.

2. Materials and Methods

Between January 2016 and February 2021, 21 elbow arthrolysis procedures were performed. Eighteen patients were available for long-term follow-up and were retrospectively evaluated by an independent examiner, while three patients were lost to follow-up. The study population consisted of 12 women and 4 men. The mean age at surgery was 38 years (range: 14–70 years). Twelve injuries involved the dominant arm and four the non-dominant arm; 13 were right-sided and 3 left-sided. No bilateral injuries were observed.

Elbow contracture resulted from degenerative arthritis in one patient and myositis ossificans secondary to neurotrauma in two patients; in the remaining 13 patients, contracture was post-traumatic. Contractures were classified as predominantly intrinsic in 10 patients and extrinsic in 6 patients.

Preoperatively, the total arc of motion ranged from 10° to 100° (mean: 49°). The mean extension deficit was 57° (range: 20°–90°), while the mean flexion was 104° (range: 85°–130°). Moderate restrictions in pronation (mean: 65°) and supination (mean: 75°) were also observed.

All patients underwent open elbow arthrolysis. The surgical approach was posterior in 2 cases, lateral in 7 cases, and combined posterior-lateral in 9 cases.

The indication for arthrolysis was loss of range of motion resulting from fractures (58 cases), dislocations (15 cases), fracture-dislocations (15 cases), and osteoarthritis (12 cases).

Postoperatively, a bulky dressing was applied. All patients received adequate pain control through intravenous patient-controlled analgesia. Neither casts nor splints were used immediately after surgery. Continuous passive motion was initiated immediately postoperatively according to patient tolerance. All patients underwent an intensive rehabilitation program beginning immediately after surgery, including passive, active-assisted, and active range-of-motion exercises. Physical therapy was continued for a minimum of three months following hospital discharge.

Data were collected during at least three separate evaluations (preoperative, intraoperative, and a minimum of six months postoperatively). At each visit, function and range of motion (flexion, extension, pronation, and supination)

were measured using a handheld goniometer. At final follow-up (mean: 47 months; range: 6–120 months), patients completed the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire. Pain relief and patient satisfaction were also assessed using a Visual Analog Scale (VAS; 0–10 points). Statistical analyses were performed using SAS software, with significance set at $p < 0.05$.

3. Results

Mean elbow extension, flexion, and overall arc of motion increased significantly by 33°, 18°, and 51°, respectively, immediately following surgery.

However, a substantial proportion of the motion gained intraoperatively was lost over time. Mean flexion decreased from 132° intraoperatively to 122° at follow-up beyond six months. Similarly, extension deficit worsened from −17° intraoperatively to −36° postoperatively, while the overall arc of motion decreased from 114° to 87°. Nevertheless, improvements remained significant at final follow-up, with mean gains of 20°, 16°, and 36° in extension, flexion, and total arc of motion, respectively.

The number of patients achieving a functional ROM (flexion ≥130°, extension deficit ≤30°) increased from two to fourteen. Likewise, the number of patients achieving a near-functional ROM (flexion ≥120°, extension deficit ≤40°) increased from nine to thirty-eight.

Figure 1 Pre operative images demonstrating the lateral approach

Figure 2 Immediate post op images demonstrating ROM

Figure 3 Demonstrating ROM at follow up

At follow-up (mean: 57 months; range: 13–71 months), the mean DASH score was 53.4 points (range: 14–86). The mean VAS pain score was 5 points (range: 1–8). Six patients reported minimal or no pain, seven reported moderate pain, and three experienced severe pain.

Mean patient satisfaction was 6.5 points (range: 2–9). Three patients were dissatisfied, five were satisfied, and eight were highly satisfied.

Patient sex, age, and duration of follow-up had no significant influence on final outcomes.

The greatest improvements in all motion parameters were observed in patients with very severe contractures. No improvement was observed in cases of minimal contracture. Functional ROM (arc of motion ≥100°) was achieved in 14% of patients with very severe contractures, 21% with severe contractures, 48% with moderate contractures, and 50% with minimal contractures.

Most postoperative motion loss occurred within the first six months after surgery. Similarly, the majority of gains achieved through postoperative rehabilitation occurred during this period.

When arthrolysis was performed within one year of symptom onset, significantly better postoperative outcomes were achieved ($p < 0.05$). The mean improvement in arc of motion was 52° when treated within one year, compared with only 22° when treatment was delayed beyond one year.

Treatment of extrinsic contractures resulted in better postoperative elbow motion than treatment of intrinsic contractures. The arc of motion improved by an average of 44° and 35°, respectively.

No significant differences were observed in extension, flexion, or overall arc of motion among patients treated using different surgical approaches.

A significant correlation ($p < 0.01$) was found between improvement in arc of motion and both DASH scores and patient satisfaction scores. Overall postoperative arc of motion was also significantly correlated ($p < 0.05$) with DASH and satisfaction scores. However, no significant correlation was found between improvement in elbow motion and pain scores ($p = 0.14$), suggesting that improved elbow mobility enhances function and patient satisfaction but does not necessarily reduce pain.

4. Discussion

Despite advances in knowledge and experience regarding the treatment of elbow stiffness, this condition remains challenging to manage, and its prognosis is sometimes unpredictable. Various treatment protocols and surgical approaches have been proposed, generally yielding favorable outcomes.

Elbow arthrolysis is recommended when flexion is less than 120° and extension deficit exceeds 30°, and when conservative treatment has failed after six months [1,2]. Contraindications include active inflammation, infection, and active periarticular ossification [3–7]. Reflex sympathetic dystrophy, lack of patient cooperation, and poor motivation have also been considered contraindications [8,9].

The aim of this study was to evaluate the outcomes of elbow arthrolysis for post-traumatic stiffness and identify factors influencing surgical success. The mean gains in flexion-extension and complication rates were comparable to those reported in previous studies [16,18].

No correlation was found between outcome improvement and patient sex or age at the time of surgery, consistent with previous reports [18].

Similar to the findings of Cikes et al. [19], our results did not demonstrate a statistically significant relationship between the type of elbow contracture and arthrolysis outcomes. However, other authors have reported superior results for extrinsic contractures compared with intrinsic contractures [18].

Consistent with previous literature, we observed a decline between immediate postoperative ROM and ROM measured at final follow-up [17,18].

The influence of the interval between injury and arthrolysis remains controversial. Chantelot et al. [16] found no association between trauma-to-arthrolysis interval and outcomes. However, in agreement with Lahoda et al. [20], Heirweg et al. [18], and Cikes et al. [19], our study demonstrated significantly better clinical improvement when arthrolysis was performed within the first year after injury.

The choice of surgical approach should consider several factors, including the underlying pathology, severity of contracture, presence and location of heterotopic ossification, previous surgical scars, and potential ulnar nerve involvement. In general, all surgical approaches appear similarly effective when appropriately selected and applied [21].

Ziyang Sun et al. [22] reported smoking as a negative prognostic factor affecting recovery of elbow mobility. Similarly, Wei Zheng et al. [23] demonstrated that overweight patients achieved poorer postoperative functional outcomes than patients with normal body weight.

5. Conclusion

Open elbow arthrolysis is an effective and reproducible procedure that can be successfully performed by different surgeons. Achieving the greatest possible ROM during surgery is essential, as it correlates strongly with final outcomes. Although the results are durable, some deterioration in extension can be expected over time. Surgical approach selection should be tailored to the underlying elbow pathology.

Patients with the most severe contractures achieved the greatest improvements; however, their likelihood of regaining a normal or near-normal ROM remained lower. Preoperative mobility and the interval between trauma and arthrolysis significantly influenced outcomes: the more severe the preoperative ROM limitation and the shorter the delay before arthrolysis, the greater the postoperative mobility gain.

The best outcomes, in terms of elbow motion and patient satisfaction, were observed in patients with severe stiffness who underwent surgery within the first year after the initial trauma. Conversely, factors such as age, sex, etiology, and surgical approach did not significantly influence mobility improvement.

Compliance with ethical standards

Disclosure of conflict of interest

We declare that no author has any conflict of interest in relation to this manuscript.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

[1] Husband JB, Hastings H, II (1990) The lateral approach for operative release of posttraumatic contracture of the elbow. J Bone Joint Surg [Am] 72: 1353-1358.

[2] Money BF, Askew LJ, An KN, Chao EY (1981) A biomechanical study of normal functional elbow motion. J Bone Joint Surg [Am] 63:872-877

[3] Ecke H (1986). Arthrolysis of the Elbow Joint. Trauma Surgery (Unfallchirurgie), Vol. 12, pp. 253–257.

[4] Jiger M, Wirth CJ (1981). Arthrolysis and Arthroplasty of the Elbow and Knee Joints. Current Problems in Surgery and Orthopedics (Aktuelle Probleme der Chirurgie und Orthopädie), Vol. 17, pp. 1–81.Morrey BF (1990) Post-traumatic contracture of the elbow. Operative treatment, including distraction arthroplasty. J Bone Joint Surg [Am] 72:601-618

[5] Wentzensen A (1987). Arthrolysis in the Treatment of Post-Traumatic Joint Stiffness of the Knee and Elbow Joints. Current Traumatology (Aktuelle Traumatologie), Vol. 17, pp. 237–241.

[6] Zilch H, Steuer G (1982). The Stiff Elbow Joint. Trauma Surgery (Unfallchirurgie), Vol. 8, pp. 307–314.

[7] Amillo S (1992) Arthrolysis in the relief of post-traumatic stiffness of the elbow. Int Orthop 16: 188-190

[8] Weizenbluth M, Eichenblat M, Lipskeir E, Kessler I (1989) Arthrolysis of the elbow: 13 cases of posttraumatic stiffness. Acta Orthop Scand 60 (6): 642-645

[9] Keschner MT, Paksima N (2007) The stiff elbow. Bulletin: Hospital for Joint Diseases 65: 24–28

[10] Lindenhovius ALC, Jupiter JB (2007) The Posttraumatic Stiff Elbow: A Review of the Literature. Journal of Hand Surgery 32: 1605–1623. PMID: 18070653

[11] Morrey BF, Askew LJ, Chao EY. A biomechanical study of normal functional elbow motion. J Bone Joint Surg Am 1981; 63: 872–877

[12] Zheng W, Liu J, Song J, et al. Risk factors for development of severe post-traumatic elbow stiffness. Int Orthop 2018; 42: 595–600.

[13] Higgs ZCJ, Danks BA, Sibinski M, Rymaszewski LA (2012) Outcomes of open arthrolysis of the elbow without post-operative passive stretching. Journal of Bone and Joint Surgery—Series B 94 B: 348– 352.

[14] Olsen BS (2012) Treatment of the stiff elbow joint. Orthopaedics and Trauma 26: 397–404

[15] Chantelot C, Fontaine C, Migaud H, et al. (1999). Retrospective Study of 23 Elbow Arthrolyses for Post-Traumatic Stiffness: Predictive Factors of Outcome. Review of Orthopaedic Surgery (Revue de Chirurgie Orthopédique), Vol. 85, pp. 823–827.Tosun B, Gundes H, Buluc L, Sarlak AY (2007) The use of combined lateral and medial releases in the treatment of post-traumatic contracture of the elbow. Int Orthop 31(5):635–638. doi:10.1007/s00264-006-0252

[16] S. HEIRWEG, L. DE SMET OPERATIVE TREATMENT OF ELBOW STIFFNESS : EVALUATION AND OUTCOME Acta Orthopædica Belgica, Vol. 69 - 1 – 2003

[17] Alec Cikes, MD, Brigitte M. Jolles, MD, MSc, and Alain Farron, MD Open Elbow Arthrolysis for Posttraumatic Elbow Stiffness J Orthop Trauma Volume 20, Number 6, July 2006

[18] Lahoda LU, Klapperich T, Hahn MP, et al. Results of posttraumatic elbow arthrolysis: a prospective study. Chirurg. 1999;70: 1302–1306

[19] Maciej Bręborowicz & Przemysław Lubiatowski et al, The outcome of open elbow arthrolysis: comparison of four different approaches based on one hundred cases

[20] Ziyang Sun MD, Haomin Cui MD, Jihao Ruan MD, Juehong Li MD, Wei Wang MD, Cunyi Fan MD, PhD What Range of Motion and Functional Results Can Be Expected After Open Arthrolysis with Hinged External Fixation For Severe Posttraumatic Elbow Stiffness?

[21] Wei Zheng, MD, Shuai Chen, MD, Jialin Song, MD, Jiazhi Liu, MD, Cunyi Fan The influence of body mass index on outcome of open arthrolysis for post-traumatic elbow stiffness