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The relation between elbow range of motion and patient satisfaction after open release of stiff elbow

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ABSTRACT

Objective: The aim of this retrospective study was to find out whether a cut off value existed for elbow flexion and extension after open surgical release of elbow contracture that would correlate with subjective patient satisfaction.

Methods: The study enrolled 77 patients (53 males and 24 females with a mean age of 35.1 (18–77) years at the time of operation) with elbow contracture who attended regular follow-up appointments for more than 12 months. The mean follow up period was 44.2 months (12–186). The preoperative and postoperative modified MAYO elbow scores, objective parameters of increase in both flexion and extension end point measurements and improvement in total ROM were compared in order to determine the cut off degree of ROM in both flexion and extension that significantly correlated with patient satisfaction.

Results: Of the 77 participating patients, 26 patients had an extrinsic (33.8%) and 51 patients had an intrinsic elbow contracture (66.2%). Surgeries performed involved 40 cases of lateral release and 37 cases of both lateral and medial (progressive) release. The median preoperative total flexion-extension arch (ROM) was 45° (20°–65°). The median postoperative total flexion-extension arch (ROM) was 110° (97.5°–125°). The modified MAYO elbow score improved from 60 to 85 points postoperatively. The postoperative flexion cut off value was 115° for an excellent or good postoperative modified MAYO elbow score.

Conclusion: Post-operative flexion cut off value was 115° and had a positive effect on the postoperative patient satisfaction. The cut off value for postoperative extension was 20° but it was not a significant variable on patient satisfaction as was the total increase in ROM.

Level of significance: Level IV Therapeutic Study.

Elbow joint is prone to stiffness after trauma and surgery. It has a small intracapsular volume, predisposing the joint to stiffness with effusion, hemarthrosis, scarring, and thickening of the capsule. Results of conservative treatment of significant elbow contractures are generally unsatisfactory.[1–6] Surgical treatment is technically demanding, as a thorough understanding of the pathoanatomy and formation of an appropriate surgical plan are necessary.[6–12] The goal of open surgical treatment is to completely resect all pathological tissues and protect the collateral ligaments, if possible. Several articles have reported steady improvement in range of motion (ROM) of the elbow joint after operative treatment.[5,8,13–24] Yet correlation between objective parameters of increase in flexion and extension arch and improvement in total ROM and subjective patient appreciation has not been well established.[25–33]

The aim of this retrospective study was to determine whether there was a cut-off point of ROM in both flexion and extension that produced significant correlation with subjective patient satisfaction. Other variables that might have an effect on the clinical results of the procedure were also analyzed.

Patients and methods

Over the 16-year period between 1997 and 2013, 2 surgeons performed open surgical release in adult patients with an established stiff elbow at this hospital. The following criteria were used to define established stiff elbow:

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1 Loss of extension of greater than 30° or flexion of less than 120°,
2 No skeletal injury other than to elbow joint in the same extremity,
3 A minimum interval of 3 months between the trauma or most recent surgery and the proposed surgery, and
4 Failure of a rehabilitation program or inability to participate in program within 3 months after the trauma or most recent surgery.

Patients with an established stiff elbow were excluded from the study on the basis of the following criteria:

1 Active infection,
2 Associated nonunion of the humerus, ulna, or radius that necessitated surgical treatment,
3 Patients with an associated central nervous system injury that interfered with the rehabilitation of the involved extremity,
4 Patients with open physis, or
5 Advanced cartilage injury that required some form of interposition arthroplasty in addition to elbow release.

Peripheral nerve dysfunction and presence of an internal fixation device were not considered exclusion criteria. Kocaeli University ethics committee approval was granted for retrospective review of medical documents and follow-up visits of patients, including physical examination and obtaining radiographs. Total of 92 patients who met the enrollment criteria of the study were listed, and 77 of the 92 patients who had regular follow-up period of more than 12 months and who agreed to participate were included in the study. The following data were obtained from medical charts at most recent follow-up:

1 Preoperative modified Mayo Elbow Performance Scores,
2 Postoperative modified Mayo elbow scores at latest follow-up visit,
3 Preoperative and postoperative flexion and extension measurements,
4 Postoperative total increase in joint ROM.

ROM was measured with hand-held goniometer. Subjective parameter of patient satisfaction was evaluated on the basis of postoperative modified Mayo elbow score. Objective parameters, such as increase in flexion and extension arch and improvement in total ROM, were compared in order to determine cut-off value of ROM in both flexion and extension that correlated significantly with patient satisfaction.

Other factors that might have had an effect on postoperative patient satisfaction, such as type of contracture (intrinsic or extrinsic), time interval between trauma and proposed surgery, type of surgical plan (lateral exposure, medial exposure, or combined surgery) were also assessed.

Surgical technique

Of the 77 patients, 40 had lateral release and 37 had lateral and medial (progressive) release. This surgical concept is one of the subjective criteria of the study, since progressing to medial release depended on the surgeon's dissatisfaction with peroperative result after lateral release.

All patients were operated on in supine position. Under general anesthesia, the involved upper extremity was prepared and tourniquet was inflated to 250 mmHg after exsanguination. Incision was made over the lateral epicondyle and central portion of the radial head. Anterior and posterior skin flaps were raised to protect the lateral antebrachial cutaneous nerve. Next, incision was made beginning 3–4 cm proximally to the epicondyle and extending distally to just beyond the radial head. The fibers of the extensor carpi radialis longus muscle were identified and were dissected off the anterior capsule with an elevator to identify the plane of the capsule. The tendinous origin of the common extensor tendon was then sharply elevated to complete the exposure of the anterior capsule when the radiocapitellar joint and the anterior aspect of the elbow joint could be seen. The interval between the anterior capsule and the brachialis muscle was then identified and developed with blunt dissection. Deep retractor was then positioned to protect the brachialis muscle while the anterior capsule was excised.

If access to the posterior elbow joint was required, care was taken to protect the origin of the lateral collateral ligament (LCL) from the epicondyle (Fig. 1). Posterior capsulectomy could then be performed and the olecranon and olecranon fossa inspected.

When full ROM was restored with lateral approach, tourniquet was deflated and bleeding was controlled. After inserting suction drain, the anterior and posterior extensor origins were reattached.

Failure to restore nearly full motion with resection from the lateral approach was an indication for additional medial incision. This was also designed over the epicondyle. Care had to be taken to protect the medial ante brachial cutaneous nerve. Ulnar nerve was dissected distally, through the cubital tunnel, and then mobilized with its blood supply. Next, the area anterior to the medial inter muscular septum was exposed. The fascial confluence over the interval between the brachialis and flexor-pronator muscle masses was incised and blunt dissection was performed to expose the median nerve and brachial vessels. These did not need to be dissected, but merely visualized, so that safe resection could be performed. The anterior portion of the flexor–pronator muscle mass was then released, exposing the anterior capsule for resection. Care was taken to protect the anterior bundle of the medial collateral ligament (MCL). Posteriorly, the floor of the cubital tunnel was the posterior MCL and capsule and could now be resected, along with the posteromedial capsule (Fig. 2). Capsulectomy could at this stage be completed and motion assessed. If full motion had been restored, closure was performed. If not, the remaining possible impediments were either the muscles or the anterior MCL. Inspection and palpation of the muscles during motion permitted this distinction to be made. If the restriction was due to the MCL, careful dissection of the remaining portion of the flexor-pronator muscles overlying the MCL was performed. If the ligament was intact and simply adherent to the medial trochlea, lysis could be performed. We tried not to sacrifice the collateral ligaments of any patient in order to obtain more ROM. Peroperative result was

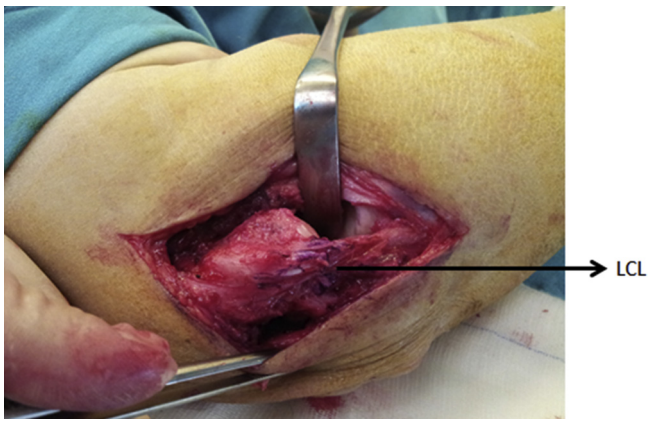

Fig. 1. Lateral surgical exposure. LCL: Lateral collateral ligament.

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