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SHOULDER AND ELBOW

Functional outcomes following surgical treatment of chronically unreduced simple elbow dislocations: a retrospective review

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Abstract

Background: Chronic elbow dislocations are rare injuries that present late for orthopaedic management. The delay in presentation is frequently due to patients not seeking treatment after the initial injury, poor access to health care, inadequate initial treatment of acute dislocation or initial missed diagnosis. Chronic simple elbow dislocations refer to dislocations that remain unreduced for more than two weeks and are not associated with fractures. This study aims to evaluate the outcome of surgically treated chronic elbow dislocations.

Methods: A retrospective review of all patients who were treated for chronic simple elbow dislocations between September 2009 and August 2014 was undertaken. Further information regarding return to function was obtained from the records or telephonic consultation with the patients. Nine patients were included for final analysis.

Results: Nine patients were eligible for the study. Three patients were employed, three were scholars and three were unemployed. All patients were able to return to premorbid function with minor limitations due to occasional pain. According to the Mayo Elbow Performance Index (MEPI) score, two patients had excellent outcomes, three good and three fair. One could not be scored as there was no recorded scoring on the file and telephonic contact was unsuccessful. The range of motion varied from 20° of extension to 140° of flexion. One patient developed a stiff elbow but was able to adapt to activities of daily living.

Conclusion: Surgical treatment of chronically unreduced simple elbow dislocations offers satisfactory outcome with minimal complications and should be considered for all patients presenting with this condition.

Level of evidence: Level 4

Key words: chronic elbow dislocation, functional outcomes, MEPI

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Background

Acute elbow dislocations are frequently encountered in emergency units. These injuries are as a result of high energy trauma which may be due to falls, sports injuries, assault or motor vehicle accidents, and account for approximately 20% of all articular dislocations. Despite the frequency of acute elbow dislocations, chronic elbow dislocations are rare.[1,2] Patients with chronic elbow dislocations are frequently the result of their not seeking treatment after the initial injury, poor access to health care, inadequate initial treatment of acute dislocation or initial missed diagnosis.[1-3]

Neglected (chronic) elbow dislocations are defined as dislocations left unreduced for more than two weeks.[1-4] These injuries are uncommon in developed countries,[5] but more frequently encountered in developing countries.[3,6] Dislocations without concomitant fractures are termed 'simple dislocations' while dislocations that are associated with fractures of the coronoid process, radial head or neck, distal humerus or olecranon are termed 'complex dislocations'.[2]

Patients with chronic elbow dislocations present with disability as a result of a fixed position or decreased range of motion (ROM). Many of these individuals are of an economically active age group and in many instances are the only breadwinners in the family. Available literature has reported favourable to excellent results for surgical management of these injuries using outcome measures which include DASH (disabilities of the arm, shoulder and hand), MEPI (Mayo Elbow Performance Index) and Krishnamoorthy scores. These scoring systems provide an idea of the patient's function, pain and ROM but do not provide information regarding patient's activities of daily living (ADLs), satisfaction with surgery, return to premorbid function, or if they would recommend surgery to other patients with similar injuries.

This study aims to report patient satisfaction following surgical treatment of chronic simple elbow dislocations, evaluate return to premorbid function and gather information that may help in pre-operative counselling of patients in terms of the expected outcomes of surgery and rehabilitation.

Materials and methods

A retrospective review of all patients with chronic simple elbow dislocations that were surgically treated between September 2009 and August 2014 was performed. Ethical approval was obtained from the institutional ethics committee before commencement of the study. Eligible patients were identified from a prospectively collected database. Patients were contacted telephonically to ascertain functional recovery and satisfaction with surgery. Patients were excluded if dislocations were acute, associated with fractures, lost to follow-up, refused surgery or refused to participate.

Simple elbow dislocations were defined as dislocations with no associated fractures. Chronic dislocations were defined as dislocations that remained unreduced for more than two weeks following the injury.

Surgery was performed with patients in either a lateral or prone position. A tourniquet was used in all cases. A long posterior incision was followed by identification and anterior transposition of the ulnar nerve in all patients. The medial and lateral paratricipital approach provided access to the distal humerus and elbow joint. A muscle slide procedure was performed for the common flexor and extensor origins. All fibrous tissue in the olecranon fossa was debrided and followed by circumferential capsular release (*Figures 1 and 2*). The elbow was then reduced. The elbow was flexed maximally to stretch the triceps. We planned to proceed with triceps lengthening if intra-operative elbow flexion was less than 130°. No patient required triceps lengthening. One patient had

Figure 1. Circumfential release done; figure shows fibrous tissue in the olecranon fossa

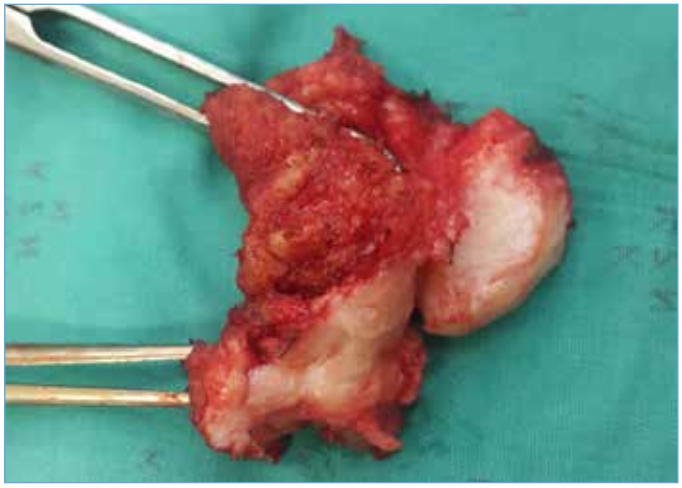

Figure 2. Fibrous tissue excised from the olecranon fossa

Figure 3. Post-operative radiographs of the patient who had a divergent dislocation with humero-radial wire

medial and lateral collateral ligament repair with suture anchors as reduction was unstable intra-operatively. A 2 mm K-wire was then inserted through the olecranon to the distal humerus (*Figure 3*). One patient with a divergent dislocation had a radio-capitellar wire insertion to prevent lateral subluxation of the radial head. Haemostasis was ensured following release of the tourniquet. Wounds were closed in layers over a 3 mm drain. An above-elbow plaster of Paris backslab was applied for a period of two to three weeks after which rehabilitation under the supervision of the occupational therapist was commenced. Patients were considered for indomethacin prophylaxis against heterotopic ossification as per the operating surgeon's discretion. One patient was initially treated with a hinged external fixator for joint distraction followed by open reduction one week later.

Rehabilitation was goal-directed and commenced between two and eight weeks post-operatively. The focus was on scar and pain management and initiation of active assisted ROM, taking care not to overstretch healing tissues. Progressive serial dynamic splinting was used for patients who were not showing improvement in ROM without splintage. Scars were massaged with aqueous cream at least twice per day and patients were taught how to do this at home. Patients were also encouraged to do active assisted exercises at home.

At two months following the surgery, rehabilitation focused on improvement of ROM, muscle strengthening and functional use. Both active assisted and active ROM was encouraged and patients were taught how to do this at home. Aggressive passive mobilisations were avoided in order to minimise the risk of developing heterotopic ossification. Cold packs were used for flare up of inflammation. Serial splinting was continued for patients who did not show improvement of ROM.

Results

Twenty patients with chronic elbow dislocations were treated during the study period. Eleven patients were excluded from the study. These included five patients whose files could not be found, four who had associated fractures, one who refused surgery and one who was lost to follow-up immediately following surgery.

Nine patients with a mean follow-up of 8.1 months ranging from one to 24 months were included for analysis. The study population consisted of three women and six men. The median age was 27 years, ranging from six to 47 years. The median time duration from injury to surgical treatment was 5 months, ranging from 1 to 7 months (*Table I*). Eight patients (88.9%) presented with a history of falling while the remaining patient had been assaulted. One was an active smoker and one patient was HIV positive and on antiretroviral treatment.

Seven patients (77.8%) sought medical treatment immediately post injury while two did not seek any treatment because they thought the injury was not significant. Of the seven patients who sought immediate treatment, two were immobilised in a plaster of Paris backslab without reduction, three were reduced and placed in a collar and cuff, one had no reduction nor splinting and one patient was reduced, immobilised in a plaster of Paris backslab and reduction confirmed on radiographs. This patient was then lost to follow-up and presented seven months after the initial injury with the history that she had fallen again three weeks earlier.

Four patients (44.4%) had posterior dislocations, four (44.4%) had posterior–lateral dislocations and one patient (11.1%) had a divergent-type elbow dislocation. The patient with the divergent dislocation was initially treated with external fixator for joint distraction. This was followed by open reduction with posterior approach and K-wire one week later. All other patients were treated with open reduction and K-wire as a single stage procedure.

Concentric reduction of the ulno-humeral and radio-capitellar joints was obtained in all patients following surgery. ROM varied from patient to patient with extension to flexion ranging between 20° to 140° (*Table I*). The ROM and MEPI scores obtained were independent of duration from time of dislocation to surgery. Eight patients had full forearm supination and pronation while one developed a stiff elbow with forearm in 30° pronation.

Complications included heterotopic ossification in one patient, superficial wound sepsis which resolved with oral antibiotics in one patient and early elbow osteo-arthritis in one patient. No neurological injury as a result of the initial injury or surgery was encountered.

During telephonic follow-up, only five patients could be reached. All five of the patients reported being satisfied with the outcome of surgery and would recommend surgery to other patients with similar injuries. The sixth patient was satisfied with surgery according to last follow-up notes on the patient's records but there is no record on whether he would recommend surgery or not. The other three patients could not be reached telephonically and no records could be found on satisfaction or whether they would recommend surgery.

Of the five patients who could be reached telephonically, one was self-employed and fully functional with no pain or limitation other than not regaining full extension. One patient was a bricklayer and had returned to work eight weeks following the surgery. Another patient was a car guard who had returned to work on last follow up but reported struggling with ADLs despite regaining a ROM of 40° to 140°.

Three patients were unemployed and three were scholars. One unemployed housewife reported struggling with ADLs due to pain at times despite ROM of 20° to 130° (*Table I*). In addition, on her last follow-up she was found to have developed early post-traumatic elbow osteoarthritis (*Table I*). Of the three scholars, two reported no complaints of pain or ability to perform ADLs. The third scholar developed heterotopic ossification and a stiff elbow as a result. The remaining two patients could not be reached telephonically and no records could be found indicating occupation or ADLs. According to MEPI scores, two patients had excellent outcomes (scoring 100 and 95), three good (two scoring 85 and one scoring 80), and three fair (two scoring 60 and one with a score of 65. One could not be scored as there was no recorded scoring on the file and telephonic contact was unsuccessful.

Discussion

This study aims to report on patient satisfaction following surgical treatment of chronic simple unreduced elbow dislocations. In addition we wanted to evaluate return to premorbid function and to gather information that may help in pre-operative counselling of patients in terms of the expected outcomes of surgery and rehabilitation.

The majority of acute elbow dislocations (80–90%) are posterior or postero-lateral and result from a fall on outstretched hand with the forearm pronated.[2,4,7,8] Other mechanisms of injury include high velocity motor vehicle accidents, assaults and sports-related injuries. Lateral, posterior medial, medial, anterior and divergent (characterised by displacement of the radius from the ulna) are much less common.[4,8] Our results concur with the reported literature on the mechanism of injury and the direction of dislocation. Our cohort consisted of four posterior, four postero-lateral and one divergent dislocation, most of which were sustained following a simple fall.

Chronic elbow dislocations usually result from inadequate treatment of the acute injury. These injuries are common in developing countries and are usually treated initially by local bone setters and present late for orthopaedic opinion.[1-3,6,7] Seven

Table I: Summary of age distribution, clinical presentation, duration from injury to surgery, post-operative assessment, patient satisfaction and MEPI scores

Patient	Age (years)	Injury mechanism	Time to presentation	Deformity flex/extension/ radiographs	ROM at presentation	Time to surgery	ROM at final follow-up	Patient satisfaction	Return to pre-injury function	MEPI score	Complications
1	47	FOOSH in June Represented in November	Backslab and discharged immediately post initial injury	Elbow extended Posterior lateral dislocation	FFD 30° Full pronation and supination	5 months	30–140°	Satisfied	Self-employed; able to carry all activities at 8 months post-op	85	Pain on cold weather only
2	40	FOOSH September, represented in January 2 weeks after re-injury	Immediately, reduced and treated on collar and cuff; then lost to follow-up	Extension Posterior dislocation	0–80°	7 months from initial injury	20–130°	Not contactable	Unemployed housewife. Struggles with ADLs (washing, brushing teeth, dressing)	60	OA changes noted on last follow-up at 26 months
3	27	FOOSH while playing soccer in February	Immediately treated with backslab for 2 months. No history of reduction of post reduction radiographs	Flexion Posterior lateral dislocation	FFD 90°	5 months	40–140°	Contact numbers off on multiple attempts	Car guard. Struggles with ADLs (washing, brushing teeth, dressing)	65	HTO which never progressed nor required surgery
4	6	FOOSH in December	Immediately reduced, put on collar and cuff. No follow-up given	Flexion Divergent dislocation	FFD 90° Supination 90°, pronation 40°	5 months	Stiff elbow	Not contactable	Scholar; no record of function on file and not contactable		Required repeat surgery for manipulation under anesthesia and later developed HTO. Family refused further surgery and reported the child had adapted to using the limb
5	30	Fell off the ladder in February	Presented 16 days post injury	Extension Posterior dislocation	FFD 30°	6 months	20–115°	Very satisfied	Bricklayer/ builder. Bread winner. Returned to full function ±10 weeks post-surgery	95	None reported/ documented
6	12	Fell while playing in June	Immediately treated with backslab, no information on reduction or post reduction radiographs	Extension Posterior dislocation	FFD 30°	6 months	40–90°	Satisfied	Scholar. Able to carry out all activities of age, playing well with other children and never complains of pain	60	Superficial wound sepsis HTO on CT scan which was done due to poor elbow movement
7	24	Assaulted and fell in September	Presented 15 days post injury. Closed reduction attempted but failed	Extension Posterior lateral dislocation	Jog of ROM	1 month	40–120	Satisfied	Unemployed. No limitations	80	None reported/ documented
8	12	FOOSH in June	Immediately treated with backslab. No information on reduction and post reduction radiographs	Extension Posterior dislocation	FFD 30°, jog of pronation and supination	5 months	30–130°	Satisfied	Scholar. Full function and plays without limitations	100	None reported/ documented
9	28	Assault/ FOOSH in January. Re-injured in June (3 weeks prior to 2nd presentation	Immediately reduced, backslab No closed reduction attempted on 2nd injury	Extension Posterior lateral dislocation	FFD 35°	1 month after re-injury	20°–full flexion	Satisfied	Unemployed. Able to carry out all daily activities with minimal pain	85	Joint crepitations at final follow-up Pain in cold weather

FOOSH: fall on an outstretched hand; FFD: fixed flexion deformity; OA: osteoarthritis; HTO: heterotopic ossification

(77.7%) of our patients were treated at emergency units, some of which had no record of reduction nor confirmation of reduction on radiographs. In addition, some patients received inadequate treatment as they were placed in a collar and cuff followed by discharge without an adequate rehabilitation plan. Two patients did not seek any treatment as they did not initially recognise the severity of the injury.

Treatment of old unreduced posterior dislocations of the elbow is one of the challenges that face orthopaedic surgeons in developing countries.[1,9,10] Clinical findings include an extended or flexed elbow with wasting of the triceps and a palpable bony deformity (*Figures 4 and 5*). Common findings at surgery include shortening of the triceps, firm adhesions and contracture of the capsule and collateral ligaments, dense osteo-fibrous tissue in the olecranon fossa (*Figures 1 and 6*), coronoid fossa and trochlea notch and the presence of heterotopic ossification.[10] These usually prevent closed reduction in chronic elbow dislocations and hence surgical treatment is advocated by most surgeons. Our intra-operative findings were consistent with that described by other authors.

Successful treatment is a challenge and depends on obtaining and maintaining concentric reduction of the ulno-humeral and radio-capitellar joints as well as a functional arc of motion in order to complete ADLs.[8,9] We achieved concentric reduction on all patients. ROM in terms of flexion and extension varied between patients (*Table I*). Eight patients had full pronation and supination post-surgery while one patient developed a stiff elbow.

Bansal *et al.* reported on three patients treated with open reduction, V–Y plasty and intra-articular cortisone injection.[1] Two of their patients had chronically unreduced simple elbow dislocation while one had chronically complex unreduced elbow dislocation. They reported two excellent results on simple dislocations and one good result on complex dislocation according to the MEPI. Although chronic complex elbow dislocation was included in their report, their results are comparable to available literature as well as our results. None of our patients required triceps lengthening. A similar observation was made by Islam *et al.* who treated 13 patients, three with associated fractures and ten without.[2] Twelve of their patients did not require V–Y plasty of the triceps. They also report satisfactory outcomes in 11 patients with six excellent, five good, one fair and one poor outcome. We are of the opinion that triceps lengthening should be individualised to patients in whom reduction cannot not be obtained without lengthening.

The MEPI is a useful score system for these injuries are it assesses pain intensity, motion of the joint, stability and function. A score of more than 90 is considered excellent, 75–89 good, 60–74 fair and less than 60 is considered poor. Our results are consistent with results obtained by Mehta *et al.* in their series of ten patients. They reported five excellent, three good and two poor outcomes in a series of ten cases.[6]

Chowdhury *et al.* managed 15 cases of simple unreduced elbow dislocations.[3] They reported four cases with good results, seven fair and four poor according to the Krishnamoorthy score. They attributed less satisfactory results to lack of post-operative exercise facilities.[3,6] We agree that it is essential to have a facility that can facilitate planned, goal-directed therapy. We faced similar challenges as most of our patients were referred from remote areas and therefore could not fully participate in the rehabilitation programme.

Jupiter *et al.* treated five patients with open reduction and the use of hinged external fixator. They reported two excellent and three good results with an average MEPI of 89.[11] We treated one patient with an external fixator for joint distraction. Our patient developed heterotpic ossification and subsequently joint stiffness. He was, however, able to carry out some activies using shoulder joint positioning.

Figure 4. Elbow flexion is limited and a lateral bony mass is shown signifying posterior lateral dislocation.

Figure 5. Showing a semi-flexed position of the elbow, wasting of the triceps and prominent olecranon

Figure 6. Triceps is shortened and there is presence of fibrous tissue.

A more recent study by Anderson *et al.* included 22 patients treated with medial and lateral approaches to the elbow without triceps lengthening.[12] The authors demonstrated 97% of good or excellent results with low complication rate.[12] Their study also supports preservation of extensor mechanism and allowed for early

ROM as there was no risk of rupturing recently repaired soft tissues. We do not have experience with early ROM at our institution.

There were several limitations to this study. Due to the low incidence of these injuries, only a small number of patients were treated. Our series does however have similar patient numbers as other published studies in international literature. Hospital records at our facility are only kept for five years and not stored on microfilm or electronic records. This unavailability of some patient records impacted our study results. We did not perform formal assessment of DASH or patient-rated elbow evaluation (PREE) scores for comparison with other studies. MEPI scores were obtained from the files as well as after contacting the patients telephonically. Most patients were referred from peripheral hospitals far from our institution and were often from poor backgrounds; this resulted in poor follow-up and poor adherence to rehabilitation protocols.

Conclusion

Patients with chronic simple elbow dislocation experience improved function following surgical treatment. Extensive counselling about surgical treatment and prolonged rehabilitation should be discussed with the patient prior to surgery. Emergency practitioners need to be able to diagnose, reduce, check elbow stability post reduction and properly splint patients who present with acute elbow dislocations. Furthermore a planned follow-up and rehabilitation should be standardised for each institution and be given to patients after treatment of acute dislocations. We recommend social worker referral and financial support for all patients who require it in order to facilitate adherence to the prolonged rehabilitation programme. Where possible, patients should be seen by occupational therapists pre- and post-operatively. This helps build rapport between the patient and the therapist and ensures adherence to a post-operative rehabilitation programme.

Ethics statement

Ethical approval was obtained from the institutional ethics committee before commencement of the study.

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