Case Report

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Rehabilitation of Post Traumatic Intra-Articular Elbow Fracture in Osteoporotic Patient: A Case Report

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Abstract

Isolated fractures of capitellum are often more complex and involve lateral epicondyle, trochlea and posteriorly distal part of humerus. The intra-articular complexity of these fractures requires optimal surgical exposure and implants for successful outcomes. When the fracture is displaced, unfavourable outcomes can occur and lead to early arthritis. Additionally, elbow pain and stiffness due to immobilization or surgical reduction and stabilization can limit one's overall upper extremity function. Superior results are attributed to anatomic reduction and stable fixation with early ROM exercises. Rehabilitation following such a fracture is complex and can be challenging. Therefore, the aim ofthis case report is to present the evaluation and rehabilitation of a 51-year-old female following acomplicated comminuted capitellum and trochlea of humerus fracture post reduction and instrumentation. The rehabilitationover a 6 months course was done and the benefits of joint specific manual therapy in the rehabilitation were emphasized.

Keywords: Humerus fractures; Osteoporosis; Intra-articular.

Introduction

In adults, most distal humerus fractures are intra-articular and involve both medial and lateral columns.[1] These fractures are more evident among women because of higher rate of osteoporosis and difference in carrying angle between men and women.[1] There have been variable reports as regards to functional outcome of open reduction and internal fixation of these fracture.[1]

Achieving a good functional range of motion at the elbow with stability are the primary objectives in managing a comminuted distal humerus fracture. Hence, it is very necessary to determine if fracture fixation is successful in achieving a stable mobile joint.[2,3,4]

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Elbow is the intermediate joint of the upper limb constituting the mechanical link between upper arm and hand. Elbow joint forms an important link of kinematic chain to carryout activities of daily living such as eating, combing, bathing dressing etc.

Loss of ROM at elbow post trauma results in difficulty and loss of upper limb functions and makes the person dependent on other person for his ADLs. Residual post-traumatic joint incongruity may lead to elbow osteoarthritis.[5] Additionally, it is well documented that elbow stiffness ensues following elbow fracture.[2,6,7] Outcome research on rehabilitation following elbow fracture treated conservatively or surgically is limited although most protocolsrecommend both active and passive range of motion (ROM). This case report presents the examination findings of a comminuted capitellum and trochlea of humerus fracture with subsequent open reduction internal fixation (ORIF), the interpretation of the examination findings, interventions used during the rehabilitation process, and the outcomes of treatment. More

specifically, this case report highlights the addition of joint specific manual interventionto the patient management to restore mobility and full elbow function.

Case Report

A right handed 51-year-old medical doctor was referred to physical therapy for evaluation and treatment of a comminuted capitellum and trochlea fracture post ORIF secondary to a fall while descending a staircase two weeks prior. Upon injury, she landed with direct impact to right elbow by hitting against a wall. She was been taken to emergency care. Elbow Radiographs and CTscans were taken at that time, however a comminuted fracture of right capitellum and trochlea of humerus was diagnosed with computerised tomography. A day later, she was operated for open reduction internal fixation. One-week Post surgery she was referred for Physical Therapy with a cast extending above elbow to the hand, for mobilization of uninvolved shoulder & wrist joints of right upper extremity, which included active and active assisted movements. Six weeks post operation ensuring visible bony union on radiographs Intensive Physiotherapy was started. Following cast removal, the patient had begun to use her arm for simple activities but reported significant stiffness and moderate pain in her right elbow, forearm, wrist, and hand. The patient reported increased symptomsin the morning with mild increase in flexibility as the day progressed; however, the stiffness and sorenesswere present throughout the day. She reported difficulties while bathing and self-care tasks due to her limited ROM and weakness also she had to rely on others for same. She was unable to use her right upper extremity for most activities of daily living (ADL's) and lifestyle tasks such as cooking, cleaning and laundry. Her primary complaints at the time of the initial evaluation were: significant restrictionin ROM, weakness in the upper extremity, and increased pain, tingling sensation along ulnar border of forearm and little finger. She rated her pain on a VAS as 7/10 at the time of the initial evaluation. This patient's goal was to regain normal use of herright arm for her work and lifestyle activities.

She was been diagnosed with osteoporosis and was accordingly given medication for the same. She did not have any contraindications to begin physical therapy, and was referred for physical therapy. Instructions for Physical Therapy included for full AROM and gentle PROM, so a modified elbow examination was completed.

Clinical Examination

The patient was evaluated for the initial examination.

Fig. 1: Preoperative CT showing fracture of capitellum and trochlea.

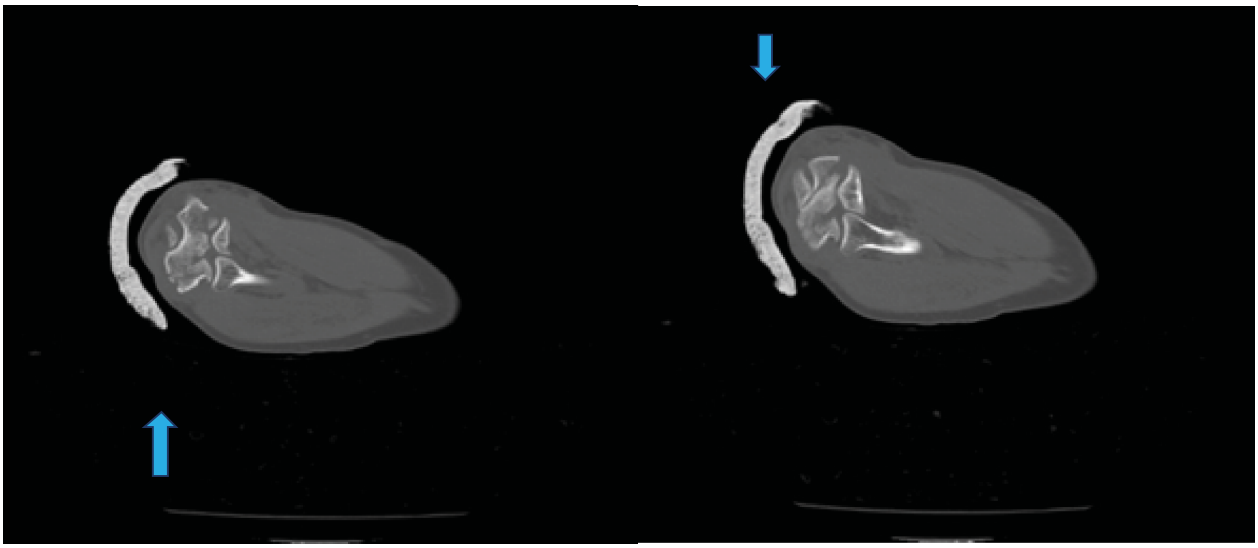

Fig. 2: Post-operative radiographs of comminuted fracture of capitellum and trochlea of humerus post instrumentation.

Lateral view AP view

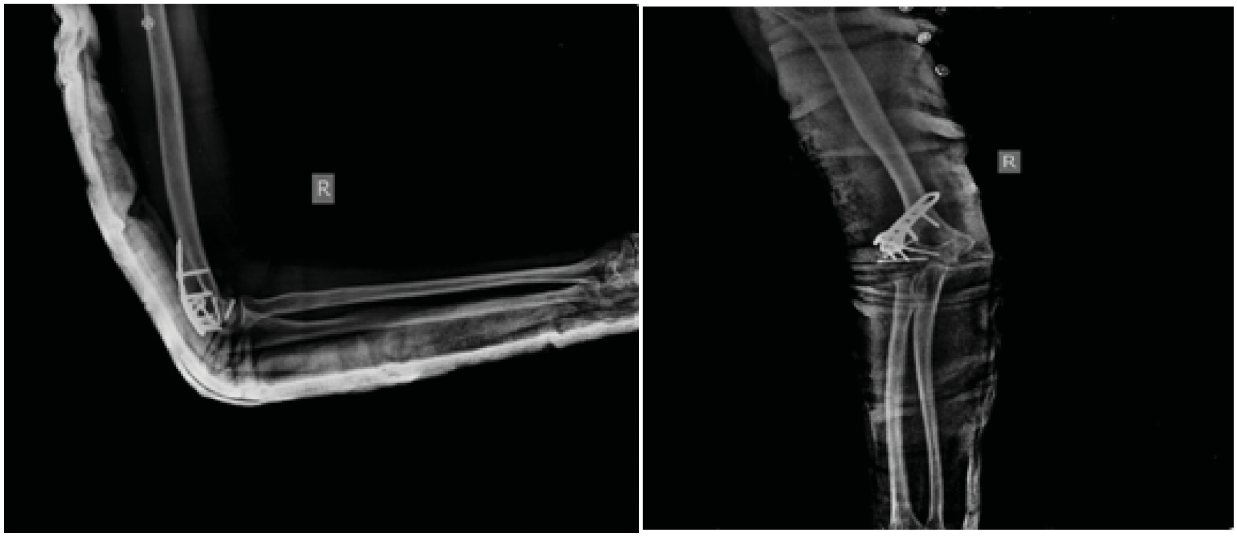

Fig. 3: Post-operative radiographs ofcomminuted fracture of capitellum and trochlea of humerus 3 months post instrumentation.

AP view Lateral view

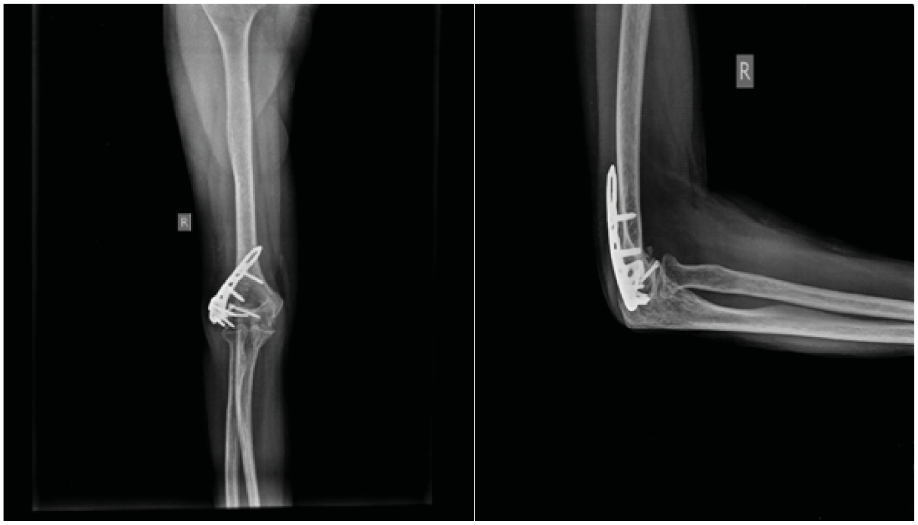

Fig. 4: .

Initial Physical Examination.

Inspection

Girth Measurement: above elbow, 9 cm from olecranon

Right 24.5cm Left 23 cm

Below elbow, 5 cm from olecranon.

Right 21.cm Left 20 cm

Range of Motion

Initial evaluation	Rt arm		Lt arm		Endfeel
	AROM	PROM	AROM	PROM	
Elbow					
Flex/extension	60º–75º	65º – 80	0 –145	0 – 150	Firm
Forearm					
Pronation	0 –20	0 – 25	0 – 85	0 – 90	Firm
Supination	0 –35	0 – 45	0 – 90	0 – 90	Firm
Wrist					
Flexion	0 – 70	0 – 80	0 – 85	0 – 90	Firm
Extension	0 – 70	0 – 85	0 – 90	0 – 90	Firm
Ulnar deviation	0 – 20	0 – 30	0 – 35	0 – 40	Firm
Radial deviation	0 – 5	0 – 10	0 – 20	0 – 20	Firm

Palpation: Palpable tenderness and increased muscular tone noted. Skin was warm to touch. Muscle testing was not performed during the initial evaluation due to surgical precautions, and due to the post-surgical nature of her injury.

Increased warmth and tenderness to palpation were noted around the entire elbow joint.

Scar examination

Location: lateral aspect of right elbow joint.

Extends from above capitellum to radial head.

Well healed measures 10 cms.

Tenderness over scar with minimal adherence to underlying tissue.

The Mayo Elbow Performance score (MEPS) was found to be 45/100 before the rehabilitation.

Muscle testing was not performedduring the initial evaluation due to surgical precautions.

Interpretation of Clinical Examination Findings and Diagnosis

The capsular pattern of limitation for the elbow is flexion limited much more than extension.[8] On examination, it was found that there was limitation of motion into elbow flexion, extension, supination, and pronation. Based on the examination findings, the patient presented with a non-capsular pattern of limitation status post immobilization. This patient had significant limitations of motion in both flexion and extension during active and passive ROM. End-feel at the end-range of both flexion and extension was firm. A non-capsular pattern of limitation at elbow joint due to the immobilization was considered as the primary physical therapy diagnosis.

Prognosis and Treatment Plan

The prognosis for this patient was good. She was highly motivated to return toher active lifestyle. Due to the elbow tendency for stiffness[6,9,10] following a traumatic injury,and due to immobilization post operatively, there was a significant probability she would not regain full elbow range of motion and function. However, the physical therapy expectation was that shewould gain functional mobility of the elbow and be able to return to her prior level of activity without limitation. The primary goal was to allow her to return to her full work duties as Medical Professional.

Treatment strategy: Multi-treatment approach was incorporated to treat the patient time to time regularly over 6 months duration. Patient was given Paraffin wax bath therapy to relieve pain and increase extensibility of the tissues surrounding joint. During the first six to eight weeks, the physician's prescription consisted of AROM within limits of pain and mobility and strength training exercises for shoulder and wrist. Consequently, ranges at elbow improved, however tingling sensation along the ulnar nerve distribution along little finger intensified with extreme ROM at elbow. As a result, we were not able to progress PROM and were able to continuewith gentle active hold relax techniques and soft tissue mobilization. After one-week following above, manual interventions including soft tissue management andjoint mobilizations were used to achieve her ROM goals. Passive ROM included elbow flexion, extension, supination andpronation of forearm. Joint specific mobilization to improve elbow ROM were added to the treatment plan. However utmost caution was exercised in terms of pressure exerted during mobilization as patient was osteoporotic.

Joint specific manual techniques included:

Humeroradial joint dorsal & volar glide.

Humeroradial joint: compression mobilization, quick thrust with simultaneous supination and compression of radius.

Distal radioulnar joint: dorsal (supination)

Humeroulnar joint: distraction volar glide (pronation)

Humeroulnar joint: distraction with glide (scoop motion)

Mobilization with movement (MWM): lateral glide applied to proximal ulna while patient actively flexes, followed by passive end-range stretch.

Task oriented multiple angle isometrics.

Active hold relax technique.: (a) elbow extensors (b)elbow flexors

Theraband exercises for strengthening elbow flexors

Joint specific mobilizations were performed for 4 – 5 bouts of 40 seconds per mobilization. Exercises included general strengthening for the shoulder complex, biceps, triceps, and forearm supination and pronation.

Outcomes: Outcomes of the Final Examination.

Inspection: Healthy appearing female in no apparent distress.

Girth Measurement: above elbow, 9 cm from olecranon.

Right- 23.cm Left- 23 cm

Below elbow, 5 cm from olecranon.

Right- 20.cm Left - 20 cm

Range of Motion

	Rt arm		Lt arm		End-feel
	AROM	PROM	AROM	PROM	
Elbow					
Flex/extension	35º–130º	30º – 135	0 –145	0 – 150	Firm
Forearm					
Pronation	0 –85	0 –90	0 – 85	0 – 90	Firm
Supination	0 –75	0 – 85	0 – 90	0 – 90	Firm
Wrist					
Flexion	0 – 85	0 – 90	0 – 85	0 – 90	Firm
Extension	0 – 85	0 – 90	0 – 90	0 – 90	Firm
Ulnar deviation	0 – 30	0 – 35	0 – 35	0 – 40	Firm
Radial deviation	0 – 15	0 – 20	0 – 20	0 – 20	Firm

Palpation: No palpable tenderness or increased muscular tone noted at extremityNo pain and swelling at elbow joint.

Muscle power:

Shoulder	Right	Left
Flexors	5/5	5/5
Extensors	5/5	5/5
Abductors	5/5	5/5
Adductors	5/5	5/5
Internal rotators	5/5	5/5
External rotators	4+/5	5/5
Elbow		
Flexors	4+/5	5/5
Extensors	4/5	5/5
Forearm		
Pronators	4+/5	5/5
Supinators	4+/5	5/5

Scar examination: well healed without any adherence to underlying tissue.

The Mayo elbow performance score(MEPS) was found to be 85/100post rehabilitation.

Discussion

Intra–articular capitellar fractures are often more complex and involve the lateral epicondyle, trochlea, and posterior aspect of the distalhumerus.The complexity of these fractures is better appreciated by computed tomographic (CT) scans.[4,11,12] Closed reduction, immobilisation and fragment excision are known to cause poor outcomes.[13] Fractures of the capitellum and trochlea are prone to non-union when they create multiple articular fragments and there is posterior comminution.[10] The intra-articular and complex nature of these fractures require optimal surgical exposure and implants for successful outcome measures.

Patient education[14,15] is an important factor which is essential in the rehabilitation of elbow fractures.[14] However, there are limited references in the literature to any fixed protocol in postoperative management, and thesources do not show a unanimous consensus on the implementation of a rehabilitation program[14,16] because there is still a controversy on whether early or delayed rehabilitation is anoptimum approach for greater functional recovery.

There are no established protocols regarding beginning of rehabilitation.[14,16,17] However,a rehabilitation program after an operation for comminuted fracture of capitellum and trochlea may represent the difference between a functional and a non-functional extremity.[14] Also, good communication is essential between the surgeon and the team responsible for the rehabilitation[4] for the implementation of a systematic rehabilitation protocol.[16] Moreover, the treatment must be individualized and adapted to each of the stages of recovery in patients. With regard to the onset of treatment, although some authors prefer immediate mobilization[17] (after the surgical intervention), most of them recommend mobilization within 10 to 20 days after the operation.[7,15,18] The delay in mobilization allows the soft tissue to scar during that period. Somesurgeons prefer an active movement of the elbow after surgery as it promotes the stability of the elbow through the recruitment of motor units which help to achieve a dynamic stabilization of the elbow.[14] The active motion of the joint stimulates arterial flow and venous and lymphatic fluid return.[20] The immobilization period and the onset of the rehabilitation treatment is still subject under debate, although it is a known fact that long immobilization may contribute to higher rigidity and functional loss, and to poorer results [14,15,16] caused by a higher adherence of joint capsule and the surrounding soft tissue.[19] In our case, the average immobilization time was 6 weeks.

There is no established consensus either with regard to the different modalities of rehabilitation treatment or treatment techniques.[14,15,17] The findings may be summarized as follows:

The initial objective of the treatment is the control of pain and oedema, as well as joint release.[14] In our caseshe had approximately 1.5 cm of swelling about the elbow joint. Once the oedema and the pain have subsided, the activemobility program can be started at an early stage.[16] Active ROM and active-assisted ROM is more commonly used and preferred than passive ROM for joint improvement and release, with better functional outcomes.[14,15,16,18] The muscles which surround the elbow become weak as they lose the ability to generate enough tension after the trauma, and the treatment strategy directs exercises for muscle strengthening to strengthen the joint.[20] These exercises may be implemented in the fibroblastic stage of scarring, approximately at week 6 after the surgical intervention.[20] Task oriented multiple angle isometric exercises played a key role in achieving the functional range at elbow joint. The use of superficial thermotherapy is beneficial[14,15,20] to add elasticity to the capsule and soft tissue, also to improve tissue extensibility.[14] In our case we had used Paraffin wax bath Therapy to serve the purpose. Cryotherapy is used after the treatmentsession to provide analgesic effect

and relieve soreness post exercises.[14] Ultrasounds, magnetotherapy, acupuncture, laser are not indicated in this fracture with implants in situ.[14] Scar mobilization should only be used in the treatment of wounds and scars, around 3–4 weeks after surgery, in order to desensitize the area, and to reduce scar hypertrophy and assist in the remodelling of the scar tissue.[16] It is essential to educate the patients and to teach them a program of home exercises, both in the immobilization stage, in order to prevent the rigidity of the associated joints (wrist and shoulder) and during the rehabilitation treatment.[7,16] With regard to the duration of the treatment, the optimum time of rehabilitation and the number of sessions required is an unknown factor which varies according to the type of patient.[15] In our series the average time was six months, though it may take up to 6–12 months to recover the strength and function.[14]

Functional Results

With regard to the recovery of range of motion, the final ROM was flexion /extension around 135 – 30 degrees and with pronation of 0 – 90 degrees and a supination of 0 – 85 degrees. This is considered to be good mobility in comparison with similar studies.[19] A flexion and extension arc close to 120/–30 degrees with approximately 50/50 degrees of pronation and supination was considered acceptable for most daily living activities [DLAs].[7,15] For their part, some authors claim that a range of 120/–60 degrees would be enough to carry out most DLAs with minimum difficulty.[7] With regard to the results assessed through theMayo index, a good result was obtained in most cases, like studies of Pugh and McKee and Mullati.[19,21,22] However, the combination of a surgical treatment protocol and an individualized rehabilitation protocol may account for the good results.

Conclusion

Isolated fractures of the capitellum are often more complex and, when the fracture is displaced, can result in unfavourable outcomes leading to early arthritis and limited ROM. This reported case presented thesuccessful management of a 51-year-old female following a complicated capitellum and trochlea of humerus fracture. The rehabilitation was conducted over asix-month period with the inclusion of joint specific manual therapy to restore elbowrange of motion, and gain independence in functional activities.

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