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Novel Physiotherapy Management and its Effects on Ulnar Styloid Process Fracture Recovery- A Case Report

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Abstract

A 60-year-old male sustained a compound fracture of left ulnar styloid process with flexor carpi ulnaris following and accident involving fodder cutting machine, this case report highlights the effect of integrated treatment for betterment of patient. Patient reported to emergency out patient department where patient was advised to undergo open reduction external fixation. After the surgery the individual was referred to physiotherapy. Upon examination the individual presented with reduced range of motion of wrist and significant pain 8/10 on movement and 5/10 at rest on numerical pain rating scale. The range of motion is reduced of the affected side. And strength assessment revealed MMT 2/5. The physiotherapy treatment consists of cryotherapy and isometric contraction in acute phase, in subacute phase active assisted ROM, tendon gliding exercises, followed by progressive strengthening and weight bearing exercises, and resisted exercises. The aim of the rehabilitation was to restore range of motion improve strength and reduce pain. As a follow up X – ray confirmed successful union. This case report highlights the importance of gradual progressive rehabilitation protocol for recovery of individual with ulnar styloid fracture.

Keywords*: Ulnar styloid process fracture, flexor carpi ulnaris injury, physiotherapy management, open reduction and external fixation,*

1. Introduction:

Fracture of upper limb are common in individuals with advancing age, younger age group individuals sustain injury followed by high impact traumas such as after road traffic accidents. In older individual even low impact activities like fall can cause fracture due to underlying degeneration caused by osteoporosis, after upper limb fracture the mobility is hampered for 12 months, reducing the individuals functional independence, limitation in professional, toileting and athletic activities. Upper limb complication arrives Manier times with complications like shoulder hand syndrome, complex regional pain syndrome etc. [1].

Ulnar styloid fracture is the most common fracture associated with upper limb fracture. The ulnar styloid is the ulnar ancho of triangular fibrocartilage complex (TFCC). The congruency of the proximal carpal row, ulnar head, and distal radius is maintained by the TFCC [2].
The secondary complication of the fracture includes muscle weakness, muscle shortening, compartment syndrome, as well as injuries to nerves and vascular structures, other lesions like malunion, non – union, delayed union, and reflex sympathetic dystrophy with clinical features like paresthesia, hyperesthesia, hypersensitivity are the common reported issues in distal radius fracture (DRF), some of the study have proved the correction of poor wrist function associate with distal radioulnar joint instability [3][4]. The treatment for symptomatic nonunion of the ulnar styloid typically involves the straightforward removal of the ulnar styloid fragment. Although this condition is rare, two anatomical types of ulnar styloid nonunion are presented, each requiring a different therapeutic approach. Type 1 nonunion is associated with a stable distal radioulnar joint, while Type 2 nonunion involves subluxation of the distal radioulnar joint [5]. It is debatable if ulnar styloid fractures are significant. DRUJ instability may result from ulnar styloid base fractures that encompass the fovea, even if fractures of the distal section of the ulnar styloid are not very serious. Primary stabilization of the DRUJ is provided by the deep segment of the DRUL, which enters the ulnar fovea close to the base of the ulnar styloid. DRUJ instability would, therefore, be predicted to result from ulnar styloid base fractures that include this foveal insertion, as they would eliminate the deep DRUL's stabilizing influence [6]. Determining whether ulnar styloid fixation is required in individuals with a stable DRUJ is crucial, as there is a chance of further problems following styloid fixation [7].
Compromised local vasculature is a common feature of complex traumatic upper extremity injuries. It might be challenging or perhaps impossible to fix some severe flaws properly. However, there has been much discussion throughout the years over when to transplant tissue. Godina originally proposed that microsurgical reconstructions of wounds completed in three days would reduce the infection rate, minimize hospital stays, and accelerate the recovery of wounded bone [8]. Rebuilding function and covering should not be the exclusive objectives of upper extremity soft tissue regeneration. Free cutaneous flaps (FCFs) are becoming more widely used as reconstructive microsurgery has developed. The benefits of FCF include better cosmetic outcomes, increased design adaptability, and a reduction in donor-site morbidity by maintaining muscle and fascia [9]. Achieving full and quick recovery of strength, function, and range of motion is the aim of rehabilitative therapy for fractures. The departmentalization of the physician-patient-therapist connection at the beginning of the century resulted in frequently subpar outcomes for hand therapy patients. This has now changed to a collaboration between the patient, therapist, and physician. This change in practice collaboration has been facilitated by improved knowledge of fracture reduction and bone and soft tissue restoration. In order to reach the result, each partner has a distinct duty. The therapist's duties include reducing edema, restoring range of motion in the forearm, wrist, and digital regions, and gradually strengthening the fracture once the doctor has stabilized it and taken care of the acute care [10].

2. Patient Information:

The 60-year-old male patient was brought to the hospital with an alleged history of their left hand getting stuck in a cutting machine, causing injury to the left wrist and forearm. Immediately after reaching the hospital, the patient underwent emergency medical management along with investigations, which revealed a compound-grade left ulnar styloid process fracture with injury to the flexor carpi ulnaris muscle. Reduction of compound fracture and external fixator application was done after diagnosing the condition. The patient shared no history of loss of consciousness, vomiting, and fever. Now, the patient is referred for physiotherapy management with complaints of pain, reduced wrist mobility as well as finger movements, and decreased muscle strength of the left upper extremity. The pain was sudden in onset and severe in intensity, continuous throughout.

3. Clinical Findings:

Prior to the examination, informed consent was obtained. The patient was conscious and aware of place, time, and person. He was hemodynamically stable. A thorough musculoskeletal examination was

performed, which revealed reduced finger, wrist, and forearm mobility. Outcome measures used during the examination were the Numerical pain rating scale (NPRS), Range of motion (ROM), Manual muscle testing(MMT) of the wrist, and finding out the Disability of the arm, shoulder, and hand (DASH) score.

Motion	**Left**	**Right**
Hip Flexion	0-135°	0-125°
Knee Flexion	0-55°	0-120°
Ankle DF	0-24°	0-30°

Table no. 1: Demonstrate pain intensity and disability interpretation according to NPRS and DASH, respectively.
NPRS scale-(0- No pain; 1-3- Mild pain; 4-6- Moderate pain; 7-10- Severe pain)
DASH scale- (1- No difficulty; 2- Mild difficulty; 3-Moderate difficulty; 4- Severe difficulty; 5- Unable to perform activities)

Sr no.	Joints	Right (Unaffected hand)	Left (Affected hand)
1.	Wrist flexion	0-60º	0-30º
2.	Wrist extension	0-50º	0-20º
3.	Ulnar deviation	0-25º	0-10º
4.	Radial deviation	0-25º	0-10º

Table No. 2: Demonstrate pre-interventions in wrist range of motion (ROM)

Sr no.	Muscles	Right (unaffected hand)	Left (affected hand)
1.	Wrist flexors	5/5	2/5
2.	Wrist extensors	5/5	2/5
3.	Elbow flexors	5/5	4/5
4.	Elbow extensors	5/5	4/5

Table no. 3: Demonstrate pre-interventions for wrist and elbow muscle strength using Manual muscle testing (MMT)
(Grade 0- no contraction; 1- flickering of contraction; 2- full ROM in gravity eliminated position; 3- full ROM against gravity with no resistance; 4- full ROM against gravity with minimum resistance; 5- full ROM against gravity with maximum resistance.

4. Diagnostic Assessment:

Fig no.1 X-ray depicts post-operative management of left-handed ulnar styloid process fracture by open reduction and external fixator. Fig no.2 X-ray depicts the removal of the external fixator and union of fracture of the ulnar styloid process.

Figure no. 1 Demonstrate open reduction with external fixator application.

Figure no. 2 demonstrates the post-operative removal of the external fixator.

Surgical procedure- Open reduction and External fixator were made to manage the ulnar styloid process fracture.

5. Therapeutic Intervention:

Sr no.	Phase	Goals	Interventions and dosage	Dosage and duration
1	Acute phase (0-2 weeks)	To reduce pain and to promote fracture healing	Cryotherapy- to reduce pain and swelling	15 mins
		Promote fracture healing and prevent further injury	Immobilization-splinting	25 days
		Maintain mobility of the unaffected joint	Pain-free shoulder and elbow mobility exercises	10 reps; 1 set for 5 mins

		Prevent muscle atrophy and maintain grip and wrist strength	Isometrics exercises of wrist and grip (like ball squeezes, resistance bands) (10 reps; 1 set)	10 reps; 1 set for 10 mins
NPRS- 7/10 DASH- 80/100				
2	Subacute phase (2-6 weeks)	Begin to restore wrist mobility while protecting the fracture site	Gentle active assisted ROM exercises for wrist (10 reps; 1 set)	
		Improve tendon mobility and prevent adhesions.	Tendon mobility exercise- fingers and wrist movements (10 reps; 1 set)	
		Shoulder strengthening to prevent compensation injuries.	Scapular and elbow strengthening exercises (without weight bearing) (10 reps; 1 set)	
		Alleviate pain and promote healing.	Ultrasound and Transcutaneous electrical nerve stimulation (TENs)	
NPRS- 5/10 DASH- 68/100				
3	Rehabilitation phase (6-12 weeks)	Restore full ROM of wrist	Progressive wrist ROM exercises- Active wrist flexion, extension, ulnar and radial deviations (10 reps;1 set)	
		Improve strength by gradually introducing loading on the wrist	Light weight bearing like table push-offs (10 reps; 1 set)	
		Prevent stiffness and deformity.	Joint mobilizations	
NPRS- 3/10 DASH- 40/100				
4	Strengthening phase (12 weeks and above)	To improve grip and wrist strength	Progressive resisted strengthening- resistance bands and wrist ROM exercises using dumbbells as resistance (10 reps; 1 set)	
NPRS-1/10 DASH-10/100				

Table no. 4 Demonstrate physiotherapy interventions in different phases of bone healing.
(Reps- repetition; mins- minutes)

Post-intervention progress in patient condition

Sr no.	Joints	Right (Unaffected hand)	Left (Affected hand)
1.	Wrist flexion	0-60º	0-40º
2.	Wrist extension	0-50º	0-40º
3.	Ulnar deviation	0-25º	0-20º
4.	Radial deviation	0-25º	0-20º

Table no. 5 Demonstrate post-intervention wrist joint ROM.

Sr no.	Muscles	Right (unaffected hand)	Left (affected hand)
1.	Wrist flexors	5/5	4/5
2.	Wrist extensors	5/5	4/5
3.	Elbow flexors	5/5	5/5
4.	Elbow extensors	5/5	5/5

Table no. 6: Demonstrate interventions for wrist and elbow muscle strength using Manual muscle testing (MMT)

6. Discussion:

One of the biggest health issues facing elderly folks is fractures. Because of the related morbidity, death, and expenses, fractures often occur prior to a significant loss of mobility and place a heavy burden on society [11]. Because of the intricate structure of the numerous open fractures and severe tissue abnormalities, upper extremity crush injuries provide a significant challenge to surgeons. In upper extremity crush injuries, the main goals are to minimize donor site morbidity, prevent potentially fatal infections, and provide sufficient soft tissue protection for vital structures such as blood vessels and nerves, all while achieving the best possible functional and cosmetic results [12].
A distal radius fracture (DRF) affects one in six individuals who arrive at the emergency room with a fracture. A fracture of the ulnar styloid process (USP) is seen in 44–65% of those individuals. Displacement of DRFs can disrupt the distal radioulnar ligaments. This can happen by direct ligamentous tearing or by avulsion of the ligaments' origin, which is a fracture at the ulnar fovea or ulnar styloid. Distal radioulnar joint (DRUJ) instability can arise from an ulnar styloid avulsion because it disrupts the triangular fibrocartilage complex (TFCC), which is the main stabilizer of the DRUJ [13]. The fovea, ulnar styloid, and ulnar head are where the triangular fibrocartilage complex (TFCC) enters. The DRUJ's main stabilizing mechanism is the deep segment of the distal radioulnar ligaments (DRUL). A fracture of the ulnar styloid may compromise the DRUL's implantation, changing the biomechanical characteristics of the DRUJ[14].
Following an ulnar styloid process fracture, the goals of physical therapy are to regain the joint range of motion and functional capacity fully. Physiotherapists employ either aggressive or passive therapies to accomplish these goals. Active intervention are treatment methods are methods which require active participation of the patient which will reduce the recovery time. And techniques like such as passive joint mobilization falls under passive intervention technique where the patient is passive during the treatment [15].
It is essential to understand the effect of movement on structures like ligament, muscles, capsule, bones, ligaments, tendons, articular cartilage for optimal restoration of the function after surgey/injury. However some there exists a debate on early mobilization and healing Nicholas Andry (1659–1742) and Estee Lucas-Championniere (1843–1913), two of the most renowned medical professionals and experts on the musculoskeletal system, imparted the knowledge that early, regulated movement speeds up healing and function restoration.[16].

7. Conclusion:

A well-planned rehabilitation program is needed for the recovery of patient suffering from ulnar styloid process fracture associated with distal radius fracture (DRF). Functional and vocational independence of the patient is dependent on the integrated approach from physical therapist and surgeon in regaining functional range of motion, strength and mobility to perform activities of daily living independently. Along with the exercises which help in functional recovery ultrasound and TNS played an important role in healing and recovery of the patients. Physical therapy management regiment not only helps in functional recovery but also minimizes long term complication and prevent secondary complication of immobilization.

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