A Case Study of Radial Head Replacement Rehabilitation

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Abstract

Purpose: Radial head fractures (RHF) constitute one-third of the fractures around the elbow joint and 1.5-4% of all fractures. Commonly, Open Reduction Internal Fixation (ORIF), resection or radial head replacement procedures are performed to manage radial head and neck fracture along with dislocation. Physical therapy has been found to be beneficial after surgically managed radial head fractures; however, documented rehabilitation protocol using active, passive exercises, manual therapy techniques (i.e. mobilization, muscle energy technique (MET), and soft tissue mobilization) along with strengthening exercises in cases managed with radial head replacement is limited. The purpose of this case report is to provide the rehabilitation protocol during maximum, moderate and minimum protection phase after radial head replacement surgery.

Case Description: A 28-year-old female completed 8 weeks of physical therapy following a radial head replacement due to radial head fracture and posterior dislocation of the elbow joint. The patient reported pain, decreased right elbow mobility and function at initial evaluation. Outcomes: Subjective pain levels improved from 8/10 to 2/10. Elbow mobility increased by 30°-50° in all the ranges and strength of elbow muscles improved to 4+/5. 65% reduction in the Quick Disabilities of the Arm Shoulder and Hand at the end of 8 weeks was noted. The patient was able to return to work with minimal limitation.

Conclusion: Patient returned to functional level with minimal limitation after 8 weeks of customized physical therapy protocol after radial head replacement surgery.

Key Words: radial head fracture with elbow dislocation, radial head replacement, soft tissue mobilization, muscle energy technique

Introduction

Radial head fractures (RHF) constitute one-third of the fractures around the elbow joint and 1.5-4% of all fractures [1]. Almost 75% cases of radial head fractures are associated with posterior dislocation of the elbow joint [2]. The radial head adds stability to the elbow joint when the medial collateral ligament and lateral ulnar collateral ligament have been compromised after injury or surgical procedure [3]. Commonly, ORIF, resection or radial head replacement procedures are performed to manage radial head and neck fracture along with dislocation [1-4]. Physical therapy assists the patient in regaining mobility, strength, and function. The use of therapeutic intervention postoperatively has been shown to be beneficial [1, 3]. However, documented use of manual therapy techniques (i.e. mobilization, muscle energy technique (MET), and soft tissue mobilization) in these cases is limited. The objective of this study is to present a protocol in maximum, moderate and minimum protection phase after radial head replacement surgery, since we found limited literature on physical rehabilitation post radial head replacement.

Case Presentation

Patient history:

A right handed 28 years old housewife had a fall from the stool directly on her right elbow, visited the orthopedic department with complaint of severe pain around the right elbow, marked swelling and inability to move the elbow. This patient was diagnosed by the orthopedician as right radial head fracture with posterior dislocation of the elbow on x-ray (figure 1 and 2) and MRI investigations, and was posted for radial head replacement surgery.

Following the surgery, patient was referred to outpatient physical therapy department to regain mobility, strength, and function after removal of the above elbow cast which was applied for 3 weeks. Medications for pain relief and anti inflammatory were taken infrequently and only as needed. Postoperatively patient had chief complaints of pain, stiffness, mild swelling and limited ROM at right elbow joint. She was unable to use the right upper extremity for most activities of daily living (ADL's) and lifestyle tasks such as cooking, cleaning, grooming and laundry. The goals at the time of evaluation were

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Table 1: Initial examination and reassessment data

Physical examination	Initial evaluation			Post 8 weeks		
Pain	8/10			2/10		
Swelling-Girth	32cm			29cm		
ROM	Active	Passive	End feel	Active	Passive	End feel
Elbow available ROM	70°F-105°F	60°F-110°F	Firm	20°F-140°F	15°F-155°F	Soft
Supination	0°-10°	0°-15°	Empty	0°-85°	0°-90°	Firm
Pronation	0°-15°	0°-20°	Firm	0°-75°	0°-90°	Firm
Wrist flexion	0-50°	0-70°	Stretch	0°-80°	0°-80°	Firm
Wrist extension	0°-65°	0°-75°	Firm	0°-75°	0°-75°	Firm
Wrist radial deviation	0°-20°	0°-20°	Hard	0°-20°	0°-20°	Hard
Wrist ulnar deviation	0°-30°	0°-30°	Firm	0°-30°	0°-30°	Firm
MMT Grip strength	4kg			9kg		
Elbow flexors	Not tested due to surgical procedure			4+		
Elbow extensors				4		
Supinators				4+		
Pronators				4+		
Quick DASH	90%			25%		

to decrease pain, increase mobility and increase function. The clinical impression of this patient was consistent with symptoms following a surgical procedure of this type. Her outlook and youthful age, lack of co-morbidities, and willingness to participate in a rehabilitative program also contributed positively to her favorable prognosis.

Clinical Examination:

On her 1st visit to physiotherapy department, the patient presented with forward head and neck position, anterior elevation of right shoulder girdle and elbow in 90° of flexion and forearm in midprone position. She experienced pain ranging from 8/10 with exacerbation of symptoms to 4/10 in a non-exacerbated state. Exacerbation of pain was most associated during elbow flexion-extension, forearm pronation-supination, with full pain relief, once a neutral position was reassumed.

It was, therefore, determined that the patient's irritability level was severe.

She presented with a 2cm increase in swelling about the right elbow crease as compared to the left elbow crease. Atrophy of the right arm and forearm muscles were noted as compared to the left.

Active range of shoulder, elbow, forearm; and wrist motion was measured using a standard goniometer. All measurements were performed in a seated position. Limitations were noted in elbow, forearm and wrist ranges in all planes while shoulder joint measured within normal limits. Strength of elbow muscles using Manual muscle testing (MMT) was not performed during the initial evaluation due to surgical precautions. Grip strength was assessed using Jamar hand held dynamometer. Increased skin temperature and tenderness to palpation were noted about the radial head and incision. Minimal scar tissue thickening was noted. Soft tissue and myofascial hypomobility were observed with direct palpation of the scar and the right brachialis, brachioradialis and supinator. Grade II hypomobility was observed at the distal radioulnar and radiocarpal joint. Sensory testing was performed and revealed diminished sensation to both soft touch and sharp along the patient's right cubital fossa, posterior, medial and lateral elbow region. The functional outcome measure used for the patient was the Quick DASH: is a shortened version of the DASH scoring system. It consists of 11 items to measure physical function and symptoms in people with any or multiple musculoskeletal disorders of the upper limb. Similar to the DASH, each item has five response options (1= no difficulty; 2 = mild difficulty; 3 = moderate difficulty; 4 = severe difficulty; 5 = unable). From the item scores, a summative score is calculated. The final score ranges between 0 (no disability) and 100 (the greatest possible disability). This measurement tool has been shown to be reliable, valid, and responsive in populations

Table 1: Initial examination and reassessment data

Week 1(maximum)	Week 2-4(moderate)	Week 4-8(minimum)
· Active and active assisted ROM exercises	**· Scar tissue mobilization**	**· Myofascial release**
· Maitland mobilization to wrist and distal radioulnar joint	· Myofascial release	· Muscle energy technique
· Scapular strengthening	**· Static stretching the elbow flexors, extensors, supinators and pronators**	**· Resistive strengthening for the elbow flexors, extensors, supinators and pronators**
	· Muscle energy technique to elbow flexors, extensors, supinators and pronators	
	· Isometric strengthening to elbow flexors, extensors, supinators and pronators	
	· Resistive strengthening to the shoulder and wrist muscles	

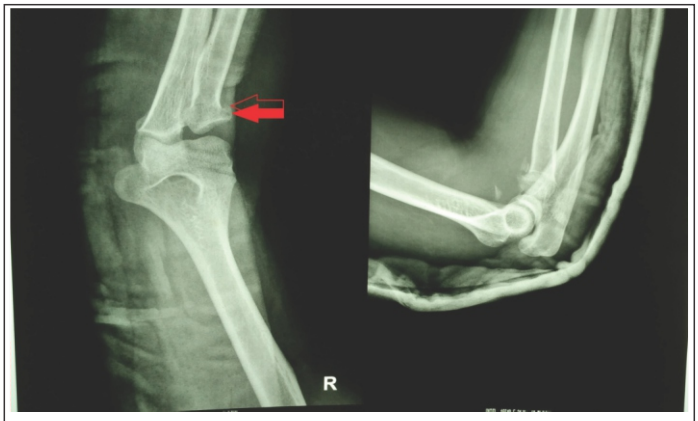

Fig 1: xray AP and lateral view of elbow joint showing fracture of radial head

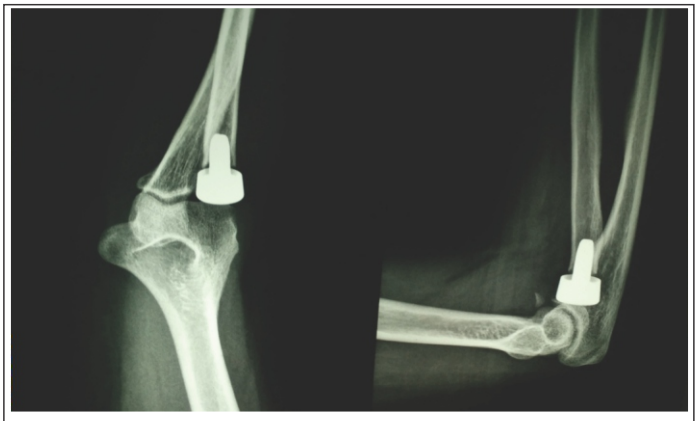

Fig 2: xray AP and lateral view showing radial head replacement

with shoulder, elbow and hand dysfunction [5].

Intervention:

The patient was seen for over 8 week period, 6 days a week for physical therapy intervention including: scar tissue mobilization, soft tissue mobilization, Maitland graded joint mobilization, muscle energy technique, progressive resistive exercise training, and patient education for postural alignment. The ultimate goal was to allow the patient to return to her full work without any impairment.

Description of the physiotherapy intervention:

Week 1(maximum protection phase): active assisted shoulder flexion, extension, abduction and rotations; elbow flexion-extension, forearm pronation, wrist flexion extension and; radial and ulna deviation ROM of motion exercises in available range of motion 15 reps of one set was done. Grade III and IV mobilizations was used in combination with stretching, to assist in the restoration of mobility where limited. Each technique was performed while the patient was sitting comfortably. Distal radioulnar joint was mobilized with dorsal glide to radius to increase supination and volar glide to increase pronation. Radiocarpal joint was mobilized with distal radius ulna stabilized and dorsal glide to improve wrist flexion and volar glide to improve wrist extension. The wrist flexor and extensor were stretched passively with forearm in midprone position. The choice to use graded mobilizations of III and IV, as described by Maitland, was determined based on the low irritability and stiff dominance of the patient. Initial mobilizations were dosed at 3 bouts of 30 second intervals and progressed according to patient response [6]. Scapular retractor strengthening was done with 10 seconds hold for 10 repetitions. Supination was not started in week 1 since it was very painful. Temporary slab was removed before physiotherapy treatment and reapplied after physiotherapy.

Week 2-4(moderate protection phase): Scar tissue mobilization and myofascial release. A transverse friction technique was applied to the area of greatest soft tissue restriction. Muscle energy technique, was used toward the end range of newly acquired motion after soft tissue mobilization. This was accomplished by instructing the patient to perform flexion, extension, pronation and supination accordingly for approximately 10 seconds against an unyielding resistance imparted by the therapist. After the isometric contraction was completed, and relaxation of the muscle tissues had occurred, the patient was taken further into her range of limitation and hold for 10 seconds. Continuous feedback was ascertained from the patient with each technique's application to ensure localization and appropriateness of force. Initial METs were dosed at 3 to 5 repetitions of reciprocal inhibition and progressed to post isometric relaxation according to patient response [7].

Static stretching was given to the elbow flexors, extensors, pronators and supinator for 3 repetitions hold for 30 seconds [8].

Fig 3: at initial evaluation

Fig 4: at 8 weeks of rehab

Isometric strengthening to the elbow flexor, extensor and; forearm supinator and pronator was given for 10 sec hold 10 repetitions. Shoulder and wrist muscles were strengthened with ½ liter bottle for 10 repetitions each.
Icing was done for 10 minutes 3-4 times daily. Sling was used for rest of the time for a period of one month.
Week 4-8(minimum protection phase): Along with the above treatment the patient performed resistance exercise in the clinic under the therapist's direct supervision, and as part of her home program. The primary goal was to restore strength and function to her biceps and triceps muscles. The initial strength training consisted of resisted exercises (flexion, scaption, abduction) for the shoulders, elbow flexion extension; and forearm supination and pronation.
.Appropriate resistance for each exercise was determined based on the patient's ability to fully perform 10 repetitions with mild fatigue. Each exercise was performed at a dosage of 2 sets of 10 repetitions with one minute rest period between sets. All exercises were progressed in both resistance and repetitions as tolerated by the patient.

Home Exercise Program:
A home exercise program was provided from the 2nd week of the intervention. The patient was asked to perform active range of motion exercises for the right elbow flexors, extensors; forearm supinators and pronators. She was instructed to manually depress and retract her right shoulder while extending the elbow. Self stretching was taught to the patient for the elbow flexors, extensors, forearm supinators and pronators.
After 4 weeks- strengthening for the shoulder, elbow and wrist muscles with ½ liter bottle was taught along with scar tissue mobilization. She was to perform this at least 3 times daily. Postural re-education was also provided to assist in decreasing her forward head and elevated shoulder girdle. It was suggested to her to practice her exercises in front of a mirror for visual feedback and apply ice after the exercises for 10-15 minutes.
The physiotherapy treatment is still continuing with the aim of achieving full range and functional mobility including task specific training, muscle endurance training and propioceptive training etc.

Outcome
Table 1 shows the results of tests and measures administered at initial evaluation and at the end of 8 weeks. Throughout intervention the patient experienced decreased levels of pain from 8/10 to 2/10. The patient regained full capacity for lifting, eating, grooming, dressing, cooking, washing and recreation where, at initial evaluation, her scores implicated moderate to severe limitation. Measurable improvement in active elbow mobility was also observed during her care. All ranges initially associated with painful end ranges, were able to be performed with minimal or no pain. Total gain in arc of motion at elbow joint was from 35° (pre treatment) to 120° (post 8 weeks of treatment)(figure 3 and 4). Supination and pronation range of motion was improved by almost 70°. Grip strength improved by 5kg compared to baseline evaluation using Jamar hand held dynamometer. Strength of the elbow flexors, extensors and; supinator and pronator also showed improvement after manual muscle testing to 4+/5. The DASH measurement and calculation revealed scores reflecting diminished levels in pain and functional limitation from 90% to 25%. The patient was able to perform all household tasks and recreational activities without complication.

Discussion
In this case report, a patient was referred to physical therapy presenting with pain, limited mobility, strength, and function after radial head replacement due to radial head fracture and posterior dislocation of the elbow. After careful evaluation, a plan of care was developed using manual therapy techniques to decrease pain and increase mobility, strength, and function. Joint mobilization, MET, and soft tissue mobilization were applied using sound clinical reasoning. Traditional physical therapy interventions including the use of both active and passive range of motion exercises with resistive training have been shown to provide good outcomes for patients with radial head fractures. (3) The manual therapy techniques used to manage this patient were chosen based on clinical findings in supportive literature.(6) both superficial and deep soft tissue mobilization techniques were chosen due to its ability to reduce pain and increase tissue extensibility. Suggested physiologic benefits include aiding in the removal of pain mediators, tissue revascularization, and easing of muscle guarding. Cyriax-deep transverse friction massage was applied to the scar and the interrosei. It has been shown to minimize the approximation and cross-linking of collagen tissue throughout the proliferative and remodeling phases of tissue repair. (7) Grade III and IV Maitland mobilizations were implemented to assist in reducing stiffness and arthrokinematic mobility restoration at wrist in the maximum phase. (6) Muscle energy technique was incorporated in the moderate protection phase for biceps, triceps, supinators and pronators to improve their flexibility and mobility at the elbow joint. (7, 9)
In minimum protection phase with the aim of returning functional activities we included task specific training, muscle endurance training and propioceptive training etc.
This case report illustrated the importance of integrated manual therapy techniques in adjunct to traditional physical therapy intervention when treating a unique patient as the one described. This physiotherapy protocol can be recommended for patients with radial head replacement. New research is needed in a larger, controlled design to further determine the effectiveness of this intervention protocol after radial head replacement.

Conclusion
This case report presented the customized physiotherapy intervention of 8 weeks protocol of a 28 year old female who underwent radial head replacement which included specific manual therapy, soft tissue mobilization and strengthening exercises which were then found to be effective in improving pain, her functional mobility and strength.

References

1. Kaur M, MacDermid J, Grewalz R, Stratford P and Woodhouse L. Functional outcomes post-radial head arthroplasty: a systematic review of literature. Shoulder and Elbow. 2014; 6(2): 108–18. DOI: 10.1177/1758573214524934.
2. Zwingmann J, Bode G, Hammer T, Südkamp N and Strohmr P. Radial Head Prosthesis after Radial Head and Neck Fractures – Current Literature and Quality of Evidence. Acta Chirurgiae Orthopaedicae Et Traumatologiae Čechosl. 2015; 82(3): 177–85.
3. Chien H, Chen A, Huang J, Cheng C and Hsu K. Short- to Medium term Outcomes of Radial Head Replacement Arthroplasty in Posttraumatic Unstable Elbows: 20 to 70 Months Follow-up. Chang Gung Med J. 2010; 33(6): 668-78.
4. Neumann M, Nyffeler R and Beck M. Comminuted fractures of the radial head and neck: is fixation to the shaft necessary? J Bone Joint Surg [Br]. 2011; 93(2): 223-8. doi:10.1302/0301-620X.93B2. 24760.
5. Gummesson C, Ward M and Atroshi I. The shortened disabilities of the arm, shoulder and hand questionnaire (Quick DASH): validity and reliability based on responses within the full-length DASH. BMC Musculoskeletal Disorders. 2006; 7:44: doi: 10.1186/1471-2474-7-44.
6. Draper D. Ultrasound and Joint Mobilizations for Achieving Normal Wrist Range of Motion after Injury or Surgery: A Case Series. Journal of Athletic Training. 2010; 45(5):486–91.
7. Gugliotti M. The Use of Mobilization, Muscle Energy Technique, and Soft Tissue Mobilization Following a Modified Radical Neck Dissection of a Patient with Head and Neck Cancer. Rehabilitation Oncology. 2011; 29(1): 3-8.
8. Page P. Clinical Commentary Current Concepts In Muscle Stretching For Exercise And Rehabilitation. The International Journal of Sports Physical Therapy. 2012; 7(1): 109-19.
9. Hariharasudhan R, Balamurugan J. Effectiveness of muscle energy technique and Mulligan's movement with mobilization in the management of lateral epicondylalgia. Arch Med Health Sci 2015; 3(2):198-202. DOI:10.4103/2321-4848.171904

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