Case Report

Post-Surgery Elbow Rehab:

A Functional Approach

By George K. Petruska, DC, DACRB

A low-tech rehab program improved a patient's muscle balance, endurance, and joint stability

History

A 41-year-old right-handed male presented for post-surgery elbow rehabilitation. The patient fell from a roof, landing on concrete and shattering his left elbow at impact. After diagnostic testing at a hospital emergency department, he was sent to an orthopedic surgeon, who reconstructed his elbow using surgical screws and hardware. The muscles of his forearm, bicep, and tricep were reattached. The surgery was successful and the patient was given medical clearance to begin rehabilitation.

Clinical Presentation

The patient presented with his left elbow in a brace bent at 90°. He had swelling, inflammation, "tightness and weakness," and managed only a few degrees of motion in all directions.

Clinical impression: He had muscle imbalances with severely limited ranges of motion and flexibility, decreased stability, and a compensatory upper cross syndrome. Areas of deficit included tight, overactive muscles on the involved side, inhibited or weak muscles on the opposite side, round shoulders, anterior head translation, winged scapula on the involved side, and less than 5° of motion in flexion, extension, pronation, and supination, with markedly decreased proprioception.

Functional testing included postural analysis, proprioception testing, muscle testing, and range-of-motion testing

Findings

The patient initially presented with round shoulders, winging of scapulae, and elevation of shoulders. He demonstrated weak lower and middle trapezius, neck flexors, serratus anterior, triceps, anconeus, pronator, and supinator. There was diminished proprioception on the left side, which became worse when the patient closed his eyes. He also demonstrated tight biceps, brachialis, brachioradialis, upper trapezius and levator scapulae, sub occipitals, pectoralis major and sternocleidomastoidious (SCM). Myofascial trigger points were noted in the SCM and levator scapulae. There were inhibited spinal stabilizers, specifically the multifidus. Strength differences were greater than expected values. Shallow breathing was present.

Diagnosis

The patient's diagnoses at the initial presentation were joint stiffness, upper cross syndrome, abnormal posture, muscle imbalances, muscle incoordination, and muscle weakness.

Treatment

Rehabilitation concepts: The specific rehabilitation program design was based on the specific adaptation to imposed demands (SAID) principle, Sherrington's law of reciprocal inhibition, neurologic crossover effect, and neuromuscular overflow (physiologic).

Primary focus, clinical goals: The rehabilitation program was designed to increase strength of the lower and middle trapezius, neck flexors, serratus anterior, triceps, anconeus, pronator and supinator; stretch the biceps, brachialis, brachioradialis, upper trapezius, levator scapulae, sub occipitals,

pectoralis major and SCM; activate spinal stabilizers such as multifidus; increase proprioception; and correct the spinal and extremity biomechanics.

Stage 1, passive care protocols (short-term goals): Initially, the primary focus of treatment was to address the acute nature of the injury postsurgery so that more aggressive rehabilitation could be performed with minimal upset to the patient. The patient showed favorable outcome, through increased flexibility and reduction in the onset and duration of pain and inflammation. Manipulation was performed as needed to address joint dysfunction. Sequential electrical muscle stimulation (EMS) using variable muscle stimulation (VMS) burst and interferential was utilized for 30 minutes to reduce the symptoms, improve circulation, and diminish spasms. Ultrasound was performed for 10 minutes using Medic Ice as a conduction medium to decrease inflammation, improve flexibility, and break up adhesions. Mechanical traction was performed, focusing on full extension of the elbow. The traction was performed to patient comfort, increasing the amount of force each week. A combination of post-isometric relaxation (PIR), proprioceptive neuro-muscular facilitation (PNF) and flex building muscle energy techniques were utilized to stretch the short, tight muscles, activate the inhibited muscles, and strengthen the weak muscles (Sherrington's law of reciprocal inhibition).

Zinovieff Protocol

Timing for the exercise is 3 seconds contraction /6 seconds relaxation. Initial 10 repetitions maximum (RM) = IRM/2

Set 1: The exercise is performed at the initial 10 RM value (if this is the first session following the evaluation), or at the 10 RM value calculated from the previous exercise session. The patient will perform up to 11 repetitions at this weight. Number of repetitions completed is entered. Patient will rest for 1 minute.

Set 2: Patient will perform 10 repetitions at 3/4 of the 10 RM. Patient will rest for 1 minute.

Set 3: Patient will perform 10 repetitions at 1/2 of the 10 RM. If the patient was able to achieve more than 10 repetitions for the first set, the computer will add one weight unit for the next exercise session. If the patient achieved fewer than 10 repetitions, the computer will decrease the resistance by one weight unit for the next session. Otherwise the weight will remain the same.

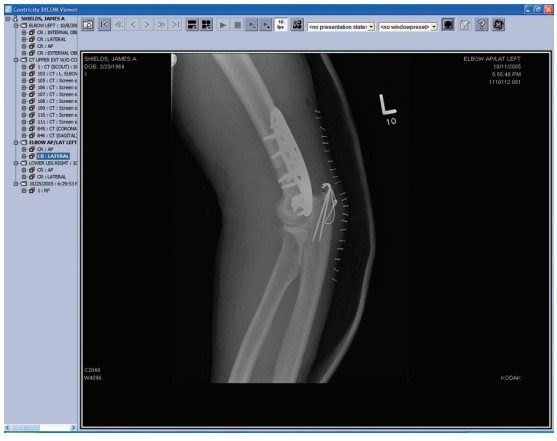
The patient was taught correct breathing patterns, beginning from the lower abdomen and ending in the upper chest. Correct breathing patterns activate spinal stabilizers. The patient was shown how to use a Dynasplint to flex and extend his elbow (neuromuscular overflow). This was performed three times per day, to patient comfort, for 20 minutes, increasing the force of traction on a weekly basis. The patient was instructed to perform upper extremity exercise protocols using the Wristiciser at home primarily on the uninjured side (neurologic cross-over effect). Office treatment was administered five times per week, while home care was performed daily. After office treatment and home care, Medic Ice was used daily to control symptoms.

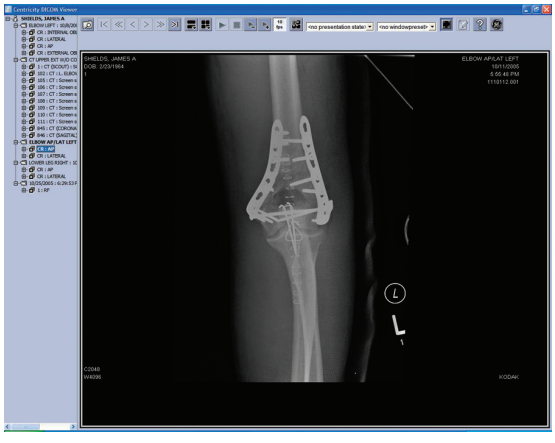
Stage 2, intermediate goals: During this period of treatment, focus was on core and postural stabilization of the upper kinetic chain to develop proper cervical and upper-extremity movement patterns. Focus was also on resolving noted tightness/weakness syndromes so that patient tolerance for sedentary and light activities was possible without upset.

To address joint dysfunction, manipulation was performed as needed. Sequential EMS using VMS burst and interferential was again utilized for 30 minutes to reduce the symptoms, improve circulation, and diminish spasms. Ultrasound was performed again using Medic Ice, and mechanical traction was again performed. The traction was performed to patient comfort, increasing the amount of force each week. A combination of PIR, PNF and flex-building muscle energy techniques were again used.

The patient began performing strengthening exercises utilizing low weight and high repetitions protocol on a universal gym. The patient also began performing exercise on an elliptical walker for 15 minutes, followed by 15 minutes on a Cardioglide. These two devices put the arm through a full range of motion with resistence (Sherrington's law of reciprocal inhibition). Gym Ball, upper extremity, core, and postural stability exercises were performed to complete the routine. Office treatment protocols were performed three times per week. Home protocols are still performed daily. The patient is now performing the Wristiciser exercises on both the injured and uninjured upper extremities.

Stage 3, long-term goals: During this phase of treatment, the focus continued with core stabilization of the





Pictured are the lateral (above) and A-P view of the patient's surgically repaired elbow.

upper-kinetic chain, with the progression of more challenging exercises. The goal is to improve the functional stability of the upper kinetic chain such that patient tolerance for more aggressive and stressful activities were possible without upset (SAID principle). Patient progress was continuously monitored through periodic functional re-evaluation and was discharged when progress reached a plateau. Biomechanical manipulation should be performed as needed to address joint dysfunction. The patient continued to perform endurance cross-training using an elliptical walker and a Cardioglide for 30 minutes.

The patient also continued performing strengthening exercises using Zinovieff protocols progressing to McQueen on a universal gym. Gym ball protocols continued to be performed with a whole body focus. In addition to the above exercises, Otis Ring work training was added in the transverse and horizontal planes, for two minutes using all three ring sizes. Otis Ring is a hollow ring with two metal balls, and the patient spins the ring.

The patient then transitioned to both clockwise and counter-clockwise training, with all three sizes of the Otis Rings in the transverse and horizontal planes for two minutes each. The next transition was to perform one-handed protocols in both planes, using all three ring sizes. The patient progressed to Body Blade exercises in the X, Y & Z planes using both hands, for two minutes each. The patient was then transitioned to one-handed Body Blade protocols, in all three planes, for two minutes. The final progression was to perform the Otis Ring and Body Blade protocols while standing on balance boards.

Discharge to Home Care

Patient capacity for occupational, recreational, and social activities was restored. Following discharge, the patient was advised of the benefits of a home care program. The patient was provided with specific self-care stretches and exercises, as well as the Wristiciser and a Gym Ball that are safe to perform without direct supervision. The patient was to return for additional care, if function decreased or symptoms reoccurred. CP

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Jodelle Lapinski and Heather Petruska edited this article.