Charles University

Faculty of Physical Education and Sport UK, Prague

Department of Physiotherapy

Wrist fracture

Bachelor thesis

(figure 1)

Author: lichterman inessa

Supervisor: Mgr. A. Kaczmarska

April 2008, Prague

Supervising physiotherapist: Alena Rihova

Abstract

Title: Wrist fracture

Author: Lichterman Inessa

Thesis Aim: In this thesis I will discuss about the wrist fractures also I will show results after six therapeutic sessions with one patient that had wrist fracture.

Methods: The therapy included six sessions with the patient during two weeks. PIR techniques were performed at every session for the relaxation of hypertonic muscles, and increase ROM, stretching techniques to elongate the shortened muscles, strengthening exercises of the week muscles. Also mobilization of restricted joints, soft tissue technique for restriction of fascia and skin and proprioreceptive stimulation. Because of weakness and hyper tonus of muscles and restricted ROM I recommended to the patient for the autotherapy PIR techniques and strengthening of muscles.

Results: After the six sessions improvements were detected in the final kinesiologic examination. Hypertonic muscles were relaxed, restricted ROM of wrist joint an hand were increased, there was elongate the shortened muscles, increase strength of the week muscles. blockages of joint were mobilized, restriction of fascia and skin was released. Results of my treatment approach, discussions of the wrist fracture and literature approaches for the examination and treatment of the wrist fracture are discussed.

Key words: wrist fracture, muscles hyper tonus and weakness, restricted ROM, pain physiotherapy +case study

Declaration-

I declare that my Bachelor thesis based on my individual work.

All the information used for the development of this Bachelor thesis has been taken from the list of literature that exists in the end of this Thesis.

In Prague Lichterman Inessa

Author: Lichterman Inesse **Date:** April 2008

Acknowledgement

First of all, I would like to thank to my mother, she is the most important person and she is responsible for my knowledge and the formation of my personality.

Also, I would like to thank my family and friends for the wise guiding during my childhood and the important advises in every serious decision that effect my life.

They were always supported me and my decisions, same times it was really hard for them, my parents always trusted and believe in me in every situation, it was very difficult for my parents to let me study so far from home, but they did it for my future because in Israel Charles University in Prague known as a very good one.

It is important to say thanks also to my commander in the army they give me good school for life, if every thing is new and an known and it is really hard not to give up every thing will came with the time and it is exactly like this.

I want also to thank the professors of Charles University in Prague. Their passion and the believe in physiotherapy, their great knowledge that they shared with the students made me love even more this profession. I really appreciate it.

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Finally, I want to thanks the physiotherapist Mgr A.Kaczmarska, my supervisor in my bachelor thesis. I feel really lucky that i had her as my supervisor. She is an amazing person and a great physiotherapist it is really easy to communicate with her and i like her a lot. Her special way of teaching and thinking made the students to think deeper about the physiotherapy problems and not looking only the surface of a problem.

Author: Lichterman Inesse **Date:** April 2008

Contents:

1. Preface

In the age of 12 i had an operation on my left forearm and after the operation i had fixation for my forearm, for about 3 month. After the doctors take of the fixation i couldn't extend my elbow and wrist joint, the maximum extension that i could rich in the elbow joint was still 40 degrees of flexion proximally the same situation was in my wrist joint, i couldn't even rich the neutral position of the wrist. The doctors doesn't give me any chance for improvement, they told me to tanks god that I still have my arm. But may mother didn't give up she find a very good physiotherapist and in one month i achieved a full ROM in the wrist and elbow. Since this time i wanted to have the knowledge and the skills to do the same "magic". After my studies in Charles University in Prague i have the knowledge to help the people.

In my bachelor thesis I will try to show how i practically use all the knowledge that I have for a really common fracture in nowadays.

I will show you a complete session of therapy units including evaluation, examination, conclusions that connect them to the therapeutic plan, and the execution of a therapy proposal with its effect on the patient's rehabilitation program.

2. General part-

2.1 Anatomy of the wrist-

Intraduction-

The anatomy of the wrist joint is extremely complex, probably on of the most complex of all the joints in the body. The wrist is actually a collection of many bones and joints. These bones and joints let us use our hands in lots of different ways. The wrist must be extremely mobile to give our hands a full range of motion. At the same time, the wrist must provide the strength for heavy gripping. A joint capsule is a watertight sac that surrounds a joint and contains lubricating fluid called synovial fluid. In the wrist, the eight carpal bones are surrounded and supported by a joint capsule. (3) (21)

Important structures-

The important structures of the wrist can be divided into several categories. These include

- bones
- ligaments and tendons
- muscles
- nerves
- blood vessels
- cartilage, fascias and membranes

2.1.1 Anatomy of the wrist bones

Ulna it is the bone that located in the medial side of the forearm the ulna articulates proximally with the trochlea of the humerus and the head of the radius and distaly articulates with the ulnar notch of the radius. The long shaft of the ulna divided into a body and two extremities. Its upper part, of great thickness and strength, forms a large part of the elbow-joint; the bone diminishes in size from above downward, its lower part being very small, and excluded from the wrist-joint by the interposition of an articular disk. In the upper part are presents two curved processes, the olecranon and the coronoid process; and two concave, articular cavities, the semilunar and radial notches. The lower part of the ulna is small, and presents two eminences; the lateral and larger is a rounded, articular eminence, termed the head of the ulna; the medial, narrower and more projecting, non-articular eminence, the styloid process. The head presents an articular surface, is directed downward, is narrow, convex, and received into the ulnar notch of the radius. The

styloid process projects from the medial and back part of the bone; it descends a little lower than the head, and it is attachment for the ulnar collateral ligament of the wrist-joint. (5) (10)

Radius it is the bone that located in the lateral side of the forearm the radius pivots on its long axis and crosses the ulna during pronation. The long shaft of the radius is situated on the lateral side of the ulna, which exceeds it in length and size. Its upper end is small, and forms only a small part of the elbow-joint; but its lower end is large, and forms the chief part of the wrist-joint. It is a long bone in form and slightly curved longitudinally. It has a body and two extremities. The upper end presents a head, neck, and tuberosity. On the upper surface of the head is a fovea for articulation with the head of the humerus. The head is supported on a round, smooth, and constricted portion called the neck, on the back of which is a slight ridge for the insertion of part of the Supinator.m. On the medial side, is an eminence, the radial tuberosity; its surface is divided into a posterior portion, for the insertion of the tendon of the Biceps brachii, and an anterior, smooth portion, on which a bursa is interposed between the tendon and the bone. The lower end is large and provided with two articular surfaces one below, for the carpus, and another at the medial side, for the ulna. The carpal articular surface divided into two parts, the lateral, articulates with the Scaphoid bone, the medial with the lunate bone. The articular surface for the ulna is called the ulnar notch of the radius, it is articulates with the head of the ulna. This end of the bone has three non-articular surfaces—volar, dorsal, and lateral. The volar surface attachment to the volar radiocarpal ligament. The dorsal surface attachment to the dorsal radiocarpal ligament The lateral surface is prolonged obliquely downward into a strong, conical projection, the styloid process, which gives attachment by its base to the tendon of the Brachioradialis, and by its apex to the radial collateral ligament of the wrist-joint. (5) (10)

Carpal bones

are the bones of the wrist eight bones arranged in two rows, from lateral to medial, proximal row first: scaphoid, lunate, triquetrum, pisiform distal row: trapezium, trapezoid, capitate, hamate. The scaphoid and lunate bones of the proximal row articulate with the distal end of the radius. And the distal row of carpal bones articulates with the metacarpal bones of the hand. (5) (10)

Scaphoid it is the most lateral carpal bone of the proximal row the scaphoid bone is located in the proximal row, it is the largest bone in the proximal row. It is situated at the radial side of the carpus and articulates with the lower end of the radius. On the dorsal surface serves for the

attachment of ligaments. The volar surface is giving attachment to the transverse carpal ligament.The lateral surface gives attachment to the radial collateral ligament of the wrist. The medial surface presents two articular facets form articulation with the lunate bone, the inferior or larger forming with the lunate a concavity for the head of the capitate bone. The Scaphoid bone frequently fractured by hyperextension and abduction of the wrist.(5) (10)

Lunate it is carpal bone that located between the scaphoid and triquetrum in the proximal row the lunate is so named because it is "moon-shaped" in longitudinal section; the head of the capitate sits within the crescent of the lunate. (5) (10)

Triquetrum the most medial bone in the proximal row of carpal bones it articulates with the pisiform which sits anterior to it. (5)

Pisiform a sesamoid bone in the tendon of the flexor carpi ulnaris m. it articulates with the triquetrum, the pisiform bone provides a protective function for the flexor carpi ulnaris tendon by bearing the forces generated by the tendon riding across the triquetrum, especially during wrist extension.(5) (10)

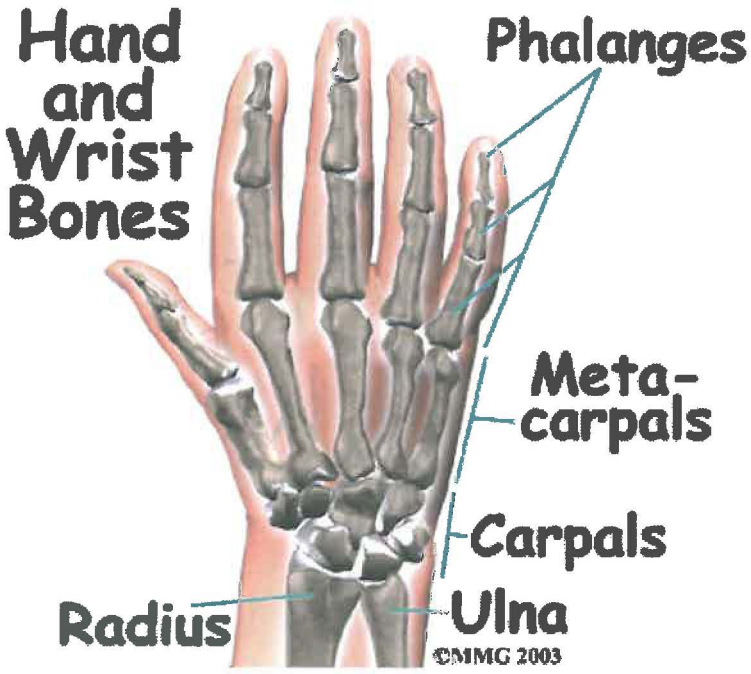
Trapezium the most lateral carpal bone of the distal row it forms a saddle joint with the metacarpal bone of the thumb.(5)

Trapezoid the carpal bone located between the trapezium and the capitate in the distal row, it is the smallest bone in the distal row., trapezoid bone having four articular facets touching each other, and separated by sharp edges. The superior surface, quadrilateral, smooth, and slightly concave, articulates with the Scaphoid. The inferior surface articulates with the proximal end of the second metacarpal bone. The dorsal and volar surfaces are rough for the attachment of ligaments. The medial surface is articulates with the capitate, for attachment of an interosseous ligament. (5) (10)

Capitate the carpal bone located between the trapezoid and the hamate in the distal carpal row, the capitate is the largest carpal bone, forces generated in the hand (as during a punching blow with the fist) are transmitted through the third metacarpal bone to the capitate and proximally through the lunate to the radius.(5) (10)

Hamate the most medial carpal bone in the distal row the hamulus (hook) of the hamate is its distinguishing characteristic, it is an attachment point of the flexor retinaculum.(5)

Metacarpal bones. The metacarpal bones located between the carpal bones and the phalanges of the hand there are a total of five metacarpal bones in the hand, the metacarpals of the four fingers are bound together by ligaments to form a firm foundation for finger movements; the metacarpal of the thumb is more independent in its range of motion, the proximal end of the metacarpal articulates with the distal row of carpal bones and the distal end of the metacarpal articulates with the proximal phalanx of the corresponding digit. The metacarpal bones consist of body, base and head. The body have three surfaces: medial, lateral, and dorsal. The medial and lateral surfaces attach to the Interossei, the dorsal surface presents in its distal two-thirds of the area which is covered by the tendons of the Extensor muscles. To the tubercles on the digital extremities are attached the collateral ligaments of the metacarpophalangeal joints. The Base articulates with the carpus, and with the metacarpal bones; its dorsal and volar surfaces are rough, for the attachment of ligaments. The Head articulates with the proximal phalanx on one side and on either side of the head is a tubercle for the attachment of the collateral ligament of the metacarpophalangeal joint. (5) (10)



(figure 2) hand and wrist bones (21)

2.1.1 Cartilage

Articular cartilage is the material that covers the ends of the bones of any joint. The articular cartilage thinner in joints such as the wrist that don't support a lot of weight. articular cartilage is white, shiny, and has a rubbery consistency. It is slippery, which allows the joint surfaces to slide against one another without causing any damage. The function of articular cartilage is to absorb shock and provide an extremely smooth surface to make motion easier. We have articular cartilage essentially everywhere that two bony surfaces move against one another, In the wrist, articular cartilage covers the sides of all the carpals and the ends of the bones that connect from the forearm to the carpal bone. The end of the ulna bone of the forearm articulates with two carpal bones, the lunate and the triquetrum., the triangular fibrocartilage complex (TFCC) it is a unique structure sits between the ulna and these two carpal bones. It is a small cartilage pad that cushions this part of the wrist joint, it also improves the range of motion and gliding action within the wrist joint. (21)

2.1.3 Ligaments-

Ligaments are soft tissue structures that connect bones to bones. The ligaments around a joint usually reinforce and stabilize a joint capsule.

Ulnar collateral ligament (UCL) is on the ulnar side of the wrist. It crosses the ulnar edge of the wrist. It starts at the ulnar styloid, the small bump on the edge of the wrist where the ulna meets the wrist joint. There are two parts to the cord-shaped UCL. One part connects to the pisiform and to the transverse carpal ligament, a thick band of tissue that crosses in front of the wrist. The other goes to the triquetrum. The UCL adds support to a small disc of cartilage the TFCC where the ulna meets the wrist. The UCL stabilizes the TFCC and keeps the wrist from bending too far to the side.(3)

Radial collateral ligament (RCL), is on the latteral side of the wrist. It starts on the outer edge of the radius on a small bump called the radial styloid prosses, it connects to the side of the scaphoid bone. The RCL prevents the wrist from bending too far to the side. (3)

Palmar carpal ligament it is thick ligament over the palmar surface of the wrist. palmaris longus and ulnar neurovascular bundle pass deep to the palmar carpal ligament, and the flexor retinaculum lies deeper and more distal to palmar carpal ligament. (5)

Dorsal radiocarpal ligament less thick and strong than the palmar carpal ligament, is attached, above, to the posterior border of the lower end of the radius; its fibers are directed obliquely downward and medialward, and are fixed, below, to the dorsal surfaces of the scaphoid and lunate bone.(10)

Transverse metacarpal ligament it is thick bands of connective tissue that connect the palmar ligament of the metacarpophalangeal joint to each other it is important because by linking the metacarpal bones together they restrict the movement of this bones and by this helps to form unified skeletal for the palm of the hand. As many bones that form the wrist, there are many ligaments that connect and support these bones. Injury or problems that cause these ligaments to stretch or tear can eventually lead to arthritis in the wrist. (5) (3) (10)

2.1.4 Fascias and Membranes of the forearm and hand-

Antebrachial fascia continuous above with the brachial fascia, is a membrane which forms a general sheath for the muscles, it is attached to the olecranon and dorsal border of the ulna, and gives off from its deep surface numerous intermuscular septa, which enclose each muscle separately. Over the Flexor tendons as they approach the wrist it is especially thickened, and forms the volar carpal ligament. This is continuous with the transverse carpal ligament, and forms a sheath for the tendon of the Palmaris longus. (5) (10)

Interosseous membrane is a fibrous membrane that connects the interosseous borders located on the shafts of the radius and the ulna, its fibers are oriented obliquely downward from the radius toward the ulna, the, vessels pass between the anterior and posterior space superior to the upper margin, the interosseous membrane connects the ulna and the radius without restricting pronation and supination, proximally directed forces from the hand pass through the radius and are transferred to the ulna through the interosseous membrane, marked proximally by the oblique cord. (3) (5)

Palmar Aponeurosis The palmar aponeurosis invests the muscles of the palm, and consists of central, lateral, and medial portions. The central part cover the middle of the palm, is triangular in shape, and of great strength and thickness. Its apex is continuous with the lower margin of the

transverse carpal ligament, and receives the expanded tendon of the Palmaris longus. The lateral and the medial part of the palmar aponeurosis are thin, fibrous layers, which cover, on the radial side, the muscles of the ball of the thumb, and, on the ulnar side, the muscles of the little finger; they are continuous with the central portion and with the fascia on the dorsum of the hand. (5) (10)

2.1.5 Tendons –

Tendons connect muscles to bones, the tendons that cross the wrist begin as muscles that start in the forearm. Those that cross the palm side of the wrist are the flexor tendons, they bend the fingers, thumb and the wrist joint. There are several important tendons, flexor tendons run beneath the transverse carpal ligament. This structure lies on the palm side of the wrist. This band of tissue keeps the flexor tendons from bowing outward when there is bending of fingers, thumb, or wrist. The tendons that travel over the back of the wrist, the extensor tendons, run through a series of tunnels, called compartments. These compartments are lined with a slick substance called tenosynovium, which prevents friction as the extensor tendons glide inside their compartment. (21)

2.1.6 Muscles-

These muscles act on the elbow and wrist joints and on those of the digits. The tendons of these muscles pass through the distal part of the forearm and continue into the hand. These muscles can be divided into flexor-pronator and extensor-supinator groups. The flexor-pronator group arises by a common flexor tendon from the medial epicondyle of the humerus. The extensor supinator group arises by a common extensor tendon from the lateral epicondyle of the humerus. The forearm muscles are divided into 3 muscular layers; a deep layer, intermediate layer and superficial layer. A septum of deep fascia separates the deep layer of flexor muscles from the superficial and intermediate layers. Most of the flexor tendons are held in place by the flexor retinaculum, a thickening of the deep fascia of the forearm. This retinaculum prevents bow stringing of the tendons when the flexor muscles contract and also help improve the effective of the muscles by changing the direction of force of the tendons.(5) (10)

Muscle	Action
abductor pollicis longus	abducts the thumb at carpometacarpal joint
brachioradialis	flexes the elbow, assists in pronation & supination
extensor carpi radialis longus	extends the wrist; abducts the hand
extensor carpi radialis brevis	extends the wrist; abducts the hand
extensor carpi ulnaris	extends the wrist; adducts the hand
extensor digiti minimi	extends the metacarpophalangeal, proximal interphalangeal and distal interphalangeal joints of the 5th digit
extensor digitorum	extends the metacarpophalangeal, proximal interphalangeal and distal interphalangeal joints of the 2nd-5th digits; extends wrist
extensor indicis	extends the index finger at the metacarpophalangeal, proximal interphalangeal and distal interphalangeal joints
extensor pollicis brevis	extends the thumb at the metacarpophalangeal joint
extensor pollicis longus	extends the thumb at the interphalangeal joint
flexor carpi radialis	flexes the wrist, abducts the hand
flexor carpi ulnaris	flexes wrist, adducts hand
flexor digitorum profundus	flexes the metacarpophalangeal, proximal interphalangeal and distal interphalangeal joints
flexor digitorum superficialis	flexes the metacarpophalangeal and proximal interphalangeal joints
flexor pollicis longus	flexes the metacarpophalangeal and interphalangeal joints of the thumb
pronator quadratus	pronates the forearm
palmaris longus	flexes hand (at wrist) and tightens palmar aponeurosis
pronator teres	pronates the forearm
supinator	supinates the forearm

interosseous, dorsal (hand)	flex the metacarpophalangeal joint, extend the proximal and distal interphalangeal joints of digits 2-4, abduct digits 2-4 (abduction of digits in the hand is defined as movement away from the midline of the 3rd digit)
interosseous, palmar	flexes the metacarpophalangeal, extends proximal and distal interphalangeal joints and adducts digits 1, 2, 4, & 5 (adduction of the digits of the hand is in reference to the midline of the 3rd digit)
lumbrical (hand)	flex the metacarpophalangeal joints, extend the proximal and distal interphalangeal joints of digits 2-5

Table 1 (5)

2.1.7 Nerves

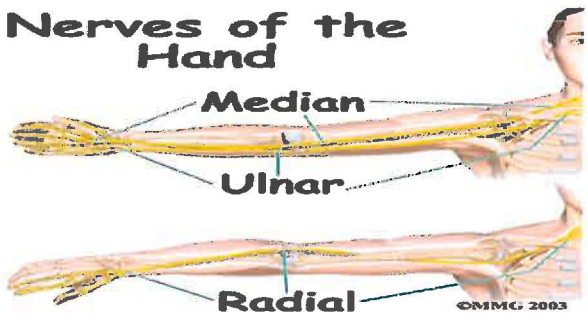
All of the nerves that travel to the hand cross the wrist and forearm. There is three main nerves begin in the brachial plexsus and go doun to the forearm: the radial nerve, the median nerve, and the ulnar nerve but also there is interosseous anterior that is the source of the median nerve, interosseous posterior that is the source of the deep radial nerve and radial deep that is the source of the deep radial nerve . These nerves carry signals from the brain to the muscles that move the arm, hand, fingers, and thumb. The nerves also carry signals back to the brain about sensations such as touch, pain, and temperature.

The radial nerve runs along the thumb-side edge of the forearm. It wraps around the end of the radius bone toward the back of the hand. It gives sensation to the back of the hand from the thumb to the third finger. It also goes to the back of the thumb and just beyond the main knuckle of the back surface of the ring and middle fingers.

The median nerve travels through a tunnel within the wrist called the carpal tunnel. The median nerve gives sensation to the palm sides of the thumb, index finger, long finger, and half of the ring finger. It also sends a nerve branch to control the thenar muscles of the thumb. The thenar muscles help move the thumb and let you touch the pad of the thumb to the tips each of each finger on the same hand, a motion called opposition.

The ulnar nerve travels through a separate tunnel, called Guyon's canal. This tunnel is formed by two carpal bones (the pisiform and hamate), and the ligament that connects them. After passing through the canal, the ulnar nerve branches out to supply feeling to the little finger and

half the ring finger. Branches of this nerve also supply the small muscles in the palm and the muscle that pulls the thumb toward the palm (21) (5)



(figure 3) (21) lateral and anterior viwe

2.1.8 Blood Vessels

Traveling along with the nerves are the large vessels that supply the hand with blood this process occurs through the branches of posterior interosseous and anterior interosseous arteries the posterior interosseous artery originates from the branch of the ulnar artery and its supply the posterior part of the forearm the supinator and abdactor pollicis longus .m The anterior interosseous artery also originates from the branch of the ulnar artery and is located in the anterior part of the forearm on the interosseous membrane and supply deep muscles of the posterior part of the hand.The largest artery is the radial artery that travels across the front of the wrist, closest to the thumb. The radial artery is where the pulse is taken in the wrist and its supply the blood to the extensor muscles on the radial side of the forearm. The ulnar artery runs next to the ulnar nerve through Guyon's canal The ulnar and radial arteries arch together within the palm of the hand, supplying the front of the hand and fingers. Other arteries travel across the back of the wrist to supply the back of the hand and fingers. (5) (3)

2.2 Movements at the wrist

The movements permitted in this wrist joint are flexion, extension, abduction, adduction, and circumduction, this movements combined with movement of the shoulder, arm and forearm and enable the hand to have wide range of positions. The ROM can be different from person to person and even from left to right hand , because of the position of the forearm. The metacarpophalangeal joint is condylar joint and it allow flexion, extension, abduction, adduction, and circumduction. The interphalangeal joint are hinge joints that allow only flexion and

extension. The thumb are flexion, extension, abduction, adduction and opposition. The opposition is essential for normal function of the hand. The movement of carpal row gliding on the radius and triangular ligament, this movement produced with the wrist movment. When the hand is going to palmar flextion the carpal row glides dorsally, in the radial abduction the proximal carpal row glides in ulnar direction with help of elastic capsula and ligaments. The proximal row of carpal bones are more mobile than the distal row. The function and the movements that can be present in the wrist depends on the muscles that control the movement, also the motions depends on the shape of the articulation surfaces. For example: there is bigger ROM of flexion in the wrist compare to extension and ulnar abduction compare to radial because of the shape of the articulation surfaces of the radius, and also the fact that dorsal wrist ligaments are more slack than the palmar ligaments. Proximal carpal row is moving in opposite direction to the movement of the hand, for exampele in wrist flexion the carpus slide dorsally on the radius.the grip is also influenced by the position of the wrist, when the wrist is in extension the grip is three times more powerful than if the wrist in flextion. (Hamil and Knutten 1995 cited a study by Nording and Frankel) (3) (15)

2.2.1 Flextion and extension of the wrist-

The axis of flexion and extension of the wrist go through the frontal plane distally to styloid process of radius and ulna through the capitate bone, the axis move distally when there is movement from extension to flexion, it is caused by rotational movement of lunate and scaphoid bones. This movement change the height of the wrist bones and cause to tension of ligaments and muscles.

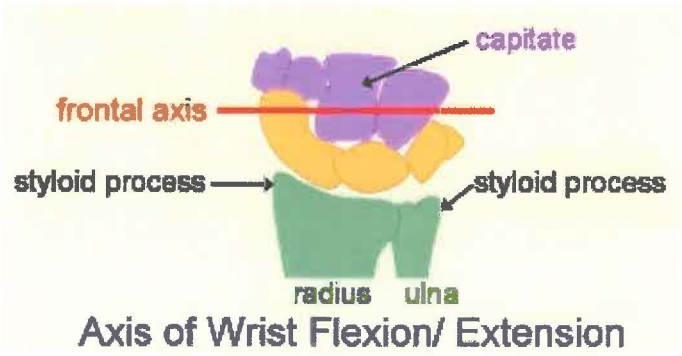


figure 4 (8)

In the different joints there is different amount of movement, the distal carpal row glides on the proximal to produce flexion and extension. In flextion there is big movement at the radiocarpal

joint, at the intercarpal joint there is less movement, and the smallest movement is at the mid carpal joint. In extension the big movement is at the midcarpal joint and secondary is radiocarpal joint. The movement of flexion is often combine with slight ulnar deviation and supination. In extension ligaments row the capitulum and scaphoid bones together, it is increases the extension force. Full extension of the wrist is possible only with slight spreading of distal radius and ulna if this bones will be grasped together full extension would not be possible. Wrist extension often combained with slight radial deviation, extension without deviation of the radius depend on the ulnar and radial extensors muscles that are working together for a balance. Range of motion of wrist flexion is 0 ~ 85 /90ș and wrist extension 0 ~ 75/ 80ș . (15)

2.2.2 Radial and ulnar deviation-

Radial and ulnar deviation occurs in sagittal axis, with the axis of motions through the capitate bone at the right angel to the palm. Motions that occurs lateral to this axis is radial deviation and motions that occurs medial to this axis is ulnar deviation. There is more movement in ulnar deviation than in radial because the radial styloid process comes into contact with the scaphoid bone during radial deviation and prevent the further movement. The radial and ulnar deviation is bigger when the wrist is in neutral position without flexion or extension. In radial deviation the proximal carpal row moves ulnary on the radius, while the distal row of carpal bones is moves radially. In the frontal plan the distal row would move radially during radial deviation to push the scaphoid in to the radial styloid process but instead of it there is shifting of the scaphoid bone, the distal part of scaphoid bone rotates toward the palm and the proximal row provide some flexion due to the scapholunate ligament, and the capitate bone glides ulnary toward the proximal row and causing close packed. In ulnar deviation happened the same like in radial deviation, the triquetrum moves the same like the scaphoid in radial deviation. The triquetrum glides distally on the hamate bone and it is bring the lunate bone into extension rotation position toward the palm. The capitate bone rotates and slightly glides around the lateral and medial part of the joint, and this produce movement toward the radial side and release the capitate from the proximal row. The scaphoid bone also moves in to extension and the distal carpal bones moves towards ulna. Most of the motion that occurs in ulnar deviation occurs at the radiocarpal joint. Ulnar abduction it is the end of the movement due to tension of radial collateral ligament and the joint capsule. The range of movement in radial deviation of the wrist 0 ~ 15/ 25ș and in ulnar deviation 0 ~ 35/ 45ș (15) (8)

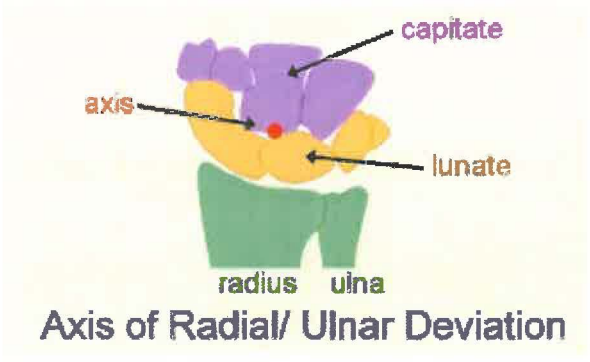


figure 5 (8)

2.2.3 Forearm pronation and supination

The distal radioulnar joint (concave on convex) when there is anterior gliding of the radius on the ulna it is forearm pronation, when there is a posterior gliding of the radius on the ulna it is forearm supination

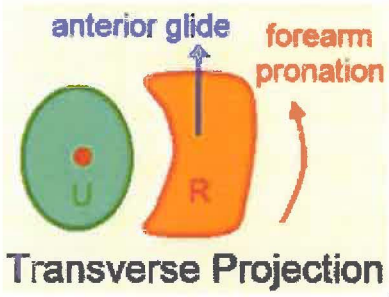


figure 6 (8)

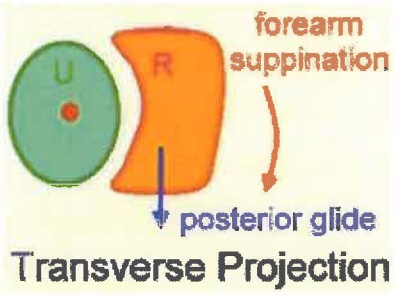


figure 7 (8)

Forearm pronation and supination in distal Radioulnar Joint (8)

2.2.4 Internal kinetics of muscles-

It is internal movement and cooperation between the muscles.

Many of the wrist muscles work together to produce one action and than to produce a complex motion with another muscles. This can be seen in the radial and ulnar wrist extension, the muscles work together to produce deviation, as in flexor carpi radialis and extensor carpi radialis longus muscles, they work together to produce radial deviation. Similarly the muscles flexor carpi ulnaris and extensor carpi ulnaris have antagonist function in flexion and extension but they work together when they provide ulnar deviation. Other example of synergic action is when the muscles flexor carpi radialis and flexor carpi ulnaris work together to hold the wrist in neutral position or when the muscles extensor carpi radialis longus and brevis and extensor carpi ulnaris work together to produce a powerful grip and maintain wrist extension even when the fingers tightly grasp the object. This is only few muscular combination that occurs in the wrist for

providing sufficient wrist position for optimal hand function and the transmission of the forces from the forearm to the hand. (15)

2.3 Wrist fractures-

The wrist is made up of eight carpal bones and the two forearm bones, the radius and ulna. Wrist fracture is a broken bone at the wrist involving one or both bones of the forearm. This may be a complete or incomplete break. The break may involve the joint between the radius and ulna or involve the joint between the radius or ulna and the carpal bones of the hand. A fracture may occur in any of these bones when enough force is applied, such as when falling down onto a stretch and dorsally flex hand. The most commonly broken bone of the wrist is the radius, often the wrist appears crooked and deformed. Fractures of the small wrist bones, such as the scaphoid, are unlikely to appear. Approximately 60 percent of distal radius fractures are associated with ulnar styloid fracture. Fractures may be simple with the bone pieces aligned and stable. Other fractures are unstable and the bone fragments tend to displace or shift, in which case the wrist is more likely to appear crooked. A fracture that extends into the joint, it is called an intra-articular fracture. A fracture that does not extend into the joint is called an extra-articular fracture. Sometimes the bone is shattered into many pieces, which usually makes it unstable. When a fractured bone breaks the skin, it is called an open fracture. When a bone is broken into more than two pieces, it is called a comminuted fracture A open (compound) fracture occurs when a bone fragment breaks through the skin. There is some risk of infection with compound fractures. The most common fractures of the wrist joint is scaphoid and distal radius fractures so I will focus on this fractures. (23) (19) (22)

2.3.1 Signs and Symptoms

Severe wrist pain at the time of injury, tenderness, swelling, and later bruising of the wrist, there can also be visible deformity if it is a complete fracture and bone fragments displaced, numbness, coldness or paralysis in the wrist or hand also can be present. (23)

2.3.2 Diagnosis

Examination of the hand and forearm are needed and also x-rays examination, sometimes a CT scan or MRI or Arthroscopy may be used to get better detail of the fracture fragments and

associated injuries. In addition to the bone, ligaments, tendons, muscles, and nerves may be injured as well when the wrist is broken. These injuries may need to be treated in addition to the fracture. (23) (4) (7)

2.3.3 Treatment

The pattern of the fracture, whether it is unstable or stable, and it the fracture is stable or unstable, or if it is open fracture or not. this factors in determining the treatment. Other important considerations include patient age, health , dominant hand , work and leisure activities, the presence of any injury in the past or arthritis. A splint or gypsum may be used for 6 or more weeks to treat a fracture that is stable, not displaced and not open. The gypsum protect a fracture that has been set. Other fractures may need surgery to properly set the bone and stabilize it. Fractures may be stabilized with pins, screws, plates, rods, or external fixation. External fixation is a method in which a frame outside the body is attached to pins which have been placed in the bone above and below the fracture site, in effect keeping it in traction until the bone heals (figure 8). Sometimes part of the bone may be missing or may be so severely crushed. In such cases, a bone graft may be necessary. In this procedure, bone is taken from another part of the body to help fill in the defect. Bone from a bone bank or synthetic bone graft substitutes may also be used. (23)

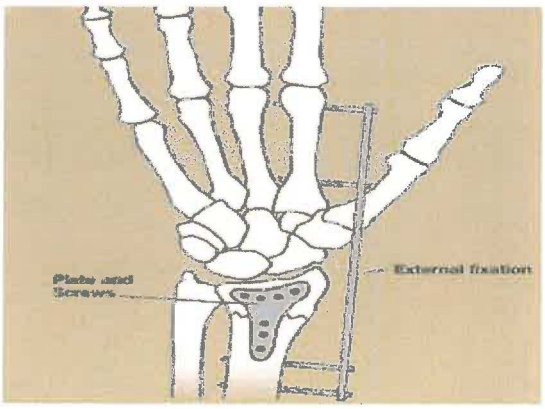


Figure 8: Radius fracture stabilized with external fixation and plate and screws. (23)

2.3.4 Prognosis

Recovery time depending on the severity of the injury, associated injuries, age, health, dominant hand, work and leisure activities. It is not unusual for maximal recovery from a wrist fracture to take several months. Some patients may have residual stiffness or aching. If the surface of the

joint was badly injured, arthritis may develop. If it was complicated fracture additional treatment or reconstructive surgery may be needed. (23)

2.4 Scaphoid fracture

Scaphoid bone it is the most common fractured carpal bone. Fractures of the scaphoid happened in people of all ages. The injury often happens during sports activities. The scaphoid can be identified easily, when the thumb is in a abduction and extension position. (18)

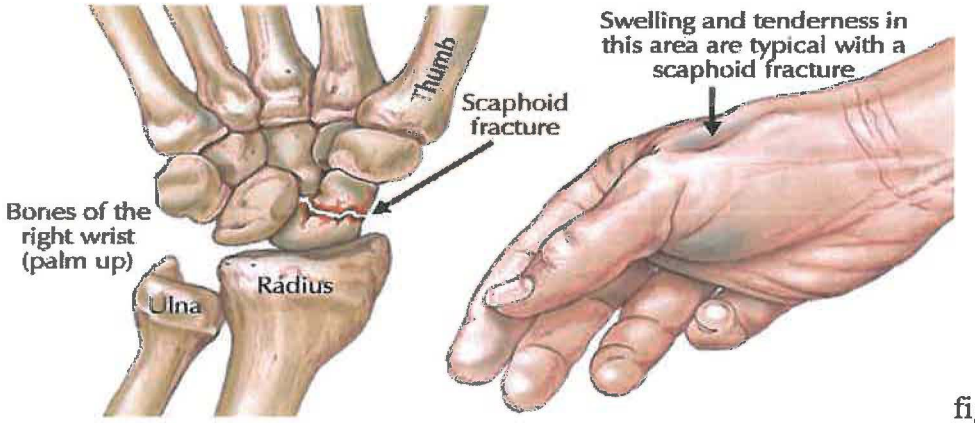


figure 9 scaphoid fracture (14)

2.4.1 Causes

A fracture of the scaphoid usually happens from a fall on a stretched arm and hyper extended wrist, with the weight landing on the palm. The end of the radius may also break in this type of fall and cause to Colles or Smith's fracture it is depending on the position of the wrist on landing. But patients often assume that the injury is just a sprain, and they wait for it to heal on its own. In some cases, the wrist gets better. In many cases the bone fails to heal. The scaphoid fracture then develops into a nonunion .A nonunion can occur in two ways. In a simple nonunion, the two pieces of bone fail to heal together. The second type of nonunion is much more serious. The lower half of the fractured bone loses its blood supply and actually dies. (18)

2.4.2 Symptoms

The symptoms of a scaphoid bone fracture usually include pain in the wrist and tenderness in the area just below the thumb. It may be seen also swelling around the wrist. The swelling occurs because blood from the fractured bone fills the wrist joint. Symptoms of a nonunion of the

scaphoid bone may appear, pain is present when there is using of the wrist, but the pain may be very minimal. These people probably suffered a wrist injury years ago that they thought it was just a simple sprain. Still, the most common symptom of a nonunion is a gradual increase in pain. Over several years the nonunion can lead to degenerative arthritis in the wrist joint. (17)

2.4.3 Diagnosis

X-rays will be used to assess the bone. Sometimes, a broken scaphoid does not show up on an X-ray immediately. If this is the case, the wrist might be put in a splint for a week or two. A new X-ray will be taken to see if the fracture will become visible. An MRI may be taken to visualize the bones and soft tissues. This sometimes shows a fracture of the scaphoid before it can be seen on an X-ray. Sometimes the scaphoid fracture is unstable or displaced, displacement between the fracture fragments in different views it is indication for unstable fracture. Fracture with dislocation is usually comes with dorsal displacement of the distal fragment and carpal bones. (19)

2.4.4 Associated injuries

when there is fracture of scaphoid sometimes there is associated injuries of proximal and distal carpal row dislocation, lunate fracture, radiocarpal joint dislocation or distal radius fracture. (19)

2.4.5 Non surgical Treatment

Treatment of scaphoid fractures depends on the location of the break in the bone. The treatment of scaphoid bone usually with complications. In general distal fracture and in transverse fractures heal with little complications because in these part of the bone there is good supply of blood. This fractures heal well when they are placed in a gypsum. The gypsum will usually be below the elbow. It may or may not include the thumb. But the proximal and oblique fractures cause usually to complications, because this areas of the scaphoid do not have very good blood supply. This makes it more difficult to heal but still possible to treat only conservatively with gypsum. In this kind of fracture the gypsum probably include the thumb and extend above the elbow It is recommended for proximal and oblique fractures immobilization and gypsum for 12 weeks, for distal and transverse fractures it is recommended immobilization and gypsum for 8 weeks . The time for healing is best determined by X-rays or (CT) scan. (19)

2.4.6 Surgical Treatment

When the scaphoid is broken at the middle or proximally, surgery may be recommended. A screw or wire may be used to stabilize the scaphoid while the bone heals. Where the incision is placed and how large it is depends on what part of the scaphoid is broken. The incision will be on the front or the back of the wrist. Sometimes the screw or wire can be placed in bone fragments with a small incision. In other cases, a larger incision is needed to ensure that the fragments of the scaphoid are aligned properly. After surgery, the wrist is usually placed in a gypsum. Even with surgery, fractures in this area can take a long time to heal. It is also possible that the bone will not heal properly or portions of the bone will die from a lack of blood supply If the scaphoid does not heal, maybe consider using bone grafts to help the bone heal. (17)

2.4.7 Nonunions and vascular Necrosis

Nonunions are more common after scaphoid fractures because blood supply to the scaphoid bone is poor. Blood supply to the bone is very important in its healing. Bones need blood to carry oxygen and nutrients to the site of the fracture. When the scaphoid is broken, especially when the fragments also displaced, the blood supply to those fragments may be disrupted. Sometimes, the blood supply to one of the fragments is so poor that the piece does not get enough nutrients and oxygen, than the cells in that fragment die. This is called avascular necrosis. Over time, nonunion and avascular necrosis of the scaphoid can lead to arthritis of the wrist. (17)

2.5 Distal radius fracture- Colles and Smith's fracture

Distal radius fracture it is a fracture of the distal end of radius. A fracture of the distal radius occurs when the area of the radius near the wrist breaks. (figure10) It can be classified into two group: when patient fall down of extended wrist it is Colles fracture, if the wrist in flexion it is smith's fracture. Colles fracture was first described by an Irish surgeon and anatomist, Abraham Colles, it is the most common fracture of the distal radius. In 1814, and Smith's fracture named after the orthopedic surgeon, Robert William Smith (1807-1873). Smith's fracture often described as a oposite fron Colles fracture, Smith's fracture is less common fracture. (4) (19) (20)

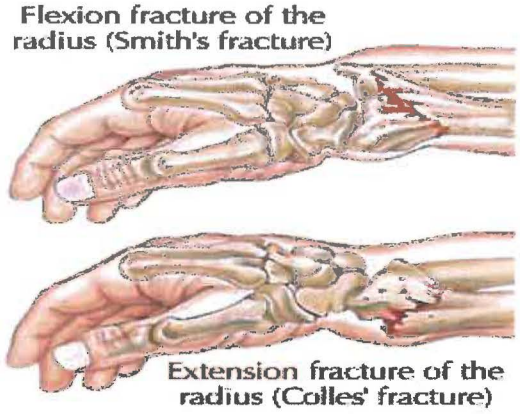


figure 10 (14)

2.5.1 Causes

In Colles fracture the break usually happens when a fall causes someone to land on a stretched arm and palmary flex hand. Smith's fracture result from a fall on the supinated forearm with hand in dorsal flexion. The fracture is also depend on the force of the fall and the age of the bone.(4) (19)

2.5.2 Symptoms

Colles fracture usually causes immediate and acute pain, tenderness, bruising, and swelling. In Smith's fracture also apper pain and swelling of the ventral aspect of the wrist. Frequently there is immediate deformities of the area. It is important to examine the function and the present of injury of the radial artery, median and ulnar nerve.(4) (19) (20)

2.5.3 Diagnosis

The X-ray of the wrist will be used to assess the bone fracture. The fracture almost always occurs about 1 inch from the end of the bone. The fracture can occur in many different ways, however.It is important to classify the type of fracture, because some fractures are more difficult to treat than others. Intra-articular fractures it is fractures that include the joints, open fractures it is fractures that break through the skin, and comminuted fractures it is fracture that shatter the bone into a lot of small pieces are more difficult to treat. (4) (19) (20)

2.5.4 Associated injuries

In Colles fracture sometimes there is associated injuries of ulnar styloid fracture or fracture of the ulnar neck, fracture of carpal bones, injuries of the flexor tendon, median or ulnar nerve, and examining the involvement of the radioulnar or radiocarpal joint. The CT or MRI can be helpful for identifying the involvement of radioulnar or radiocarpal joint. In Smith's fracture the involvement of the radioulnar joint is really rarely, but sometimes Smith's fracture cause to fracture or dislocation of carpal bone. (19)

2.5.5 Non surgical Treatment

The choice depends on many factors: nature of the fracture, age and activity. If the broken bone is in a good position, a gypsum may be applied until the bone heals. If the alignment of the bone is not good and likely to limit the future use of the arm, it may be necessary to correct the deformity be traction followed by manipulation of the bone, without incision, this is called a closed reduction. After the bone is properly aligned, a gypsum may be placed on the arm. A splint is usually used for the first few days, to allowing normal swelling. A gypsum is added a few days to a week, after the swelling goes down. The gypsum is changed two or three weeks after the swelling almost completely. Non displaced fracture should remain immobilized in the gyps for 4-6 weeks. A displaced fracture should remain immobilized in the gyps for 6-12. (4) (19)

2.5.6 Surgical Treatment

Sometimes, the position of the bone displace, an stabile or fractured in many parts, this kind of fracture cannot be corrected in a gyps. In this case, surgery may be required. There are many ways of performing surgery. Sometimes it may be possible to make closed reduction of the fracture. In other cases, it will be necessary to make an open reduction to directly access the broken bones to improve alignment, fixate the bone and make reposition. The treatment depending on the fracture, there are a number of options for holding the bone in the correct position, including a gyps, metal, a plate and screws, or an external fixator, or any combination of these techniques. (4)

2.6 Complication Algodystrophy and Malunion

Complications of distal radius fractures range from 20 to 30% and are consequence of injury or of treatment. Management of these complications must be individual. Complications may involve soft tissue (tendon, nerve, arterial or fascial complication, algodystrophy) or bone and joint (malunion, nonunion, osteoarthritis).

Algodystrophy is described with many terms recently the term complex regional pain syndrome was proposed. Despite many theories, the pathogeny of this disease is uncertain. The diagnosis is mainly clinical, based on presence of pain, trophic changes (atrophy, stiffness, edema) and functional impairment but plain x-ray demonstrating osteopenia and bone scintigraphy showing abnormal bone turnover may be helpful. Since the pathogeny is unclear, the treatment is targeting the symptoms rather then the disease. Treatment must be individualized and may consist of: physical therapy of the hand, pain control with general or local drugs, corticosteroids. Prevention of algodistrophy in the first days of a distal radial fracture is very important and include: prevention of the edema (elevation of the hand, early mobilization of fingers), decrease of pain, cast removal to relieve pression, and non-traumatic surgery.

Malunion is a faulty union of the fragments of a fractured bone. malunion is the most common complication of distal radius fracture and it usually occurs after close treatment. The malalignament may be extraarticular or it may involve the joint (radiocarpal or distal radioulnar joint). Axial shortening and dorsal or radial malalignament are the most common. Clinical signs are wrist pain, loss of grip strength, limitation of wrist mobility Osteoarthritis is likely to develop in both types of malunions. For extraarticular nonunions osteotomy is usually the treatment of choice. Many types of osteotomies have been proposed but the most commonly used are opening wedge osteotomy and Watson osteotomy. Intraarticular malunion is more difficult to treat and many surgical solutions have been proposed: intraarticular osteotomy, bone resections (styloid, anterior or posterior rim, radiolunate or radioscapholunate limited arthrodesis, proximal row carpectomy, wrist denervation, wrist arthroplasty, total wrist arthrodesis). (1)

2.7 Rehabilitation after wrist fracture

Often started as soon as possible in order to improve the motion and function of the wrist and hand. After the patient take the gypsum out the patient refers to rehabilitation, Generally rehabilitation programs begin 7-8 weeks after the injury. Also physical therapy can be combine with occupational therapy together. in wrist and motions provides functional improvement in wrist and hand functions.

Physical therapy

Hydrotherapy- exercise in the direction of flexion and extension for 15 min, in cold and hot water in order to augment venous return, decrease muscular stiffness and joint capsule contraction. (2)

Magnetotheraphy application for 15-20 min on the wrist, for stimulation of cell metabolism, speeding of blood and lymphatic drift, increase cell multiplyfication and inducing of collagen production of bone tissue.(2)

Whirlpool application for 15 min, tem 37ș degrees, after traumatic state, for tissue hyperemia and increase metabolism.(2)

Paraffin application are also necessary for increasing the metabolism in the tissue, wrapped up with paraffin for 15 min of treatment, tem 52ș-62ș degrees.(2)

Manual therapy application mobilization of the carpal bones between each other, radioulnar joint, and radiocarpal joint, for releasing possible blockages in the area. (13)

Soft tissue techniques on the hand and fore arm, for releasing the restricted fascia and skin. Soft tissue techniques also good for Scar therapy- deep transverse friction massage have very good result in improvement mobility of the scare tissue and increase ROM . Exercise program consist of passive ROM and transverse friction massage.

Post Isometric Relaxation-(PIR) for decrease hyper tonus in hyper tonic muscles and release trigger points. (13)

Exercise of flexion, extension, ulnar adduction, radial adduction, supination and pronation. The physical therapy program consists of muscles strengthening, recovery of the ROM, elevation of the hand and active ROM exercise will facilitate the pumping action of the muscles of the hand and decrease swelling, the reduction of the edema and swelling is very important for evaluation

of hand function. Treatment also may include graded active motion, clinics and home activities include the 'Wall walking' with the fingers, bilateral paper ripping, circular 'dusting', simple 'blackboard writing' and drawing tasks, various opposition and pinching exercises. These activities are graded according to resistance, type of motion and grasp strength. Exercise combining shoulder-elbow and thumb range of motion should also be included in the program. (16) (6)

3. Special part

3.1 Methodology-

I did my practice in the Military hospital (vojenska nemocnice) in Prague. During 2 weeks, from the 04.02.08 to the 15.02.08.

I provided initial kinesiological examination, conclusions of the examination that help me to set up plans for therapy, for this I used the followed references (13) (9) (11) (12) (2) from the literature list.

I worked with my patient 6 times every therapy was a proximally for one hour. After the therapy I provided final kinesiological examination, and evaluation of therapy effect by comparing the initial kinesiological examination and final kinesiological examination. And according to I did the prognosis for the patient problem.

In this hospital the patient also get hydro therapy and magneto therapy for better therapeutic effect. All the information used for the development of this Bachelor Thesis has been taken from the list of literature that exists in the end of this Thesis.

The patient has signed an agreement and was informed that his case and the results will be presented in the bachelor thesis.

Patient- H.M female 55 years old

3.2 Diagnosis-

Fracture of distal radius and abruption of styloid process of ulna on the left hand.

3.3 Anamnesis- history

3.3.1 History of the present problem-

In 18.12.07 the patient fall from the stairs in her work, the doctors provide reposition of the styloid process of ulna and conservation treatment for the fracture of distal radius.

The patient had a gypsum for 6 weeks.

02.02.08 the doctors take out the gypsum.

04.02.08 the patient refer to rehabilitation.

The patient feels pain , stiffness, restricted range of motion and weakness of muscles of the left hand.

3.3.2 Family history:

Father- 82 year old normal aging problem

Mother- died when she was 70 because of brain stroke.

Brother-56 years old he is healthy.

Daughter-24 years old he is healthy.

Son-22 years old he is healthy.

3.3.3 Personal anamnesis-

Common childhood disease

Operation-no operation

Allergies-no allergies

Diet-no spatial diet

Abuse-doesn't smoke and drinking alcohol

Pharmacological anamnesis-no

Gynecology-before the first child had 2 spontaneous abortion.

Had two normal pregnancies and deliveries.

Beginning of menopause 5 years ago.

Dominant hand: right

3.3.4 Social anamnesis-

The patient is married with two children, the children study in the university and living with her and her husband.

The husband work as a lawyer.

anamnesis of free time activities- tourism and rafting.

Vocational anamnesis- working as a librarian in the library.

3.4 Previous rehabilitation-

No previous rehabilitation this is the first time that the patient attend physiotherapeutic treatment.

3.5 Statement from the patients medical documentation-

(Figure11) 25.12.2007 x-ray picture of the left hand , posterior/anterior view and latero/lateral view.

Fracture of the distal part of radius with slight dorsal dislocation, abruption of styloid process of ulna.

The patient fell down from stress during her work, objectively the left wrist of the patient is swelling and painful during palpation in distal part of radius and styloid process of ulna, ROM is limited because of pain.

3.6 Indication of rehabilitation-

The doctors refer the patient to rehabilitation because of pain, swelling, stiffness, restricted range of motion and weakness of muscles of the left arm.

3.7 Differential consideration-

-The patient have menopause before 5 years, the level of female hormones is lower because of this. This fact can effect the regeneration and healing of the bone.

-Another risk factor is appearance of Algodystrophic syndrome after injures and fractures that more frequently seen in women between the age 40-60.

- May be there is higher position of left shoulder because of the fixed position of the arm in the gypsum, for 6 weeks, its can lead to changing in posture and changing of movement stereotypes of the patient

-The patient had complicated fracture of the wrist, there is possibility of nerves lesion

-The restriction of the movement could be because of swelling of the area, hyper tonic muscles, shorted muscles and pain during the movement.

3.8 Initial kinesiologic examination-

3.8.1 Present state-

Weight-65 kg,

Height-160 cm

BMI-25.4

The patient suffer from pain during the movements in the wrist and fingers of the left hand, stiffness and restricted range of motion specially in the morning

3.8.2 Postural evaluation in standing-

Table 2-Dorsal view: plumb line-between the spinoss process and the heels

Symmetry of the heels	symmetry
Symmetry of Achilles tendon	symmetry
Symmetry of calf:	symmetry
Symmetry of popliteal line	symmetry
Symmetry of thigh:	symmetry
Symmetry of subgluteal line:	symmetry
Symmetry of gluteal muscle tone	symmetry
Symmetry of posterior superior iliac	Symmetry
Symmetry of iliac crest:	Symmetry
Symmetry of trunk	Symmetry

Symmetry of spinosus processes	Symmetry
Symmetry of lower angel of scapula	slight higher
Symmetry of scapulas medial margin	symmetry
Symmetry of shoulder position	slight higher
Symmetry of auricles	symmetry

Table 3-Frontal view: plumb line- between the nose, sternum, foots.

Symmetry of sole and weight bearing	symmetry
Symmetry of sole arch	symmetry
Symmetry of calf:	symmetry
Symmetry of popliteal line	symmetry
Symmetry of thigh:	symmetry
Symmetry of anterior superior iliac	symmetry
Symmetry of umbilicus deviation	symmetry
Symmetry of abdominal muscle tone	Symmetry
Symmetry of sternum	Symmetry
Symmetry of nipples	Symmetry
Symmetry of pectoral muscle tone	Symmetry
Symmetry of clavicle	Symmetry
Symmetry of shoulder position	slight higher
Symmetry of face	symmetry

Table 4-Side view: plumb line – go from external meatus, shoulder joint, posterior to the hip joint, anterior to the knee anterior to lateral malleus,

Knee joint position	Straight line
Position of pelvis	Slight anterior tilt
Lumbar part of spine	Slight hyperlordosis
Thoracic part of spine	optimal
Shoulder position	optimal
Cervical part of spine	optimal
Head position	optimal

Balance test (2 scales): left side-32kg right side-33kg

Conclusion of postural evaluation-

According to the postural evaluation of the dorsal and frontal view the left lower angel of scapula and the left shoulder is slight elevated.

Because of this factors I will examined the muscles tone and the length of trapezius and levator scapulae.

According to the postural evaluation of the side view the Position of pelvis in slight anterior tilt and there is slight hyper lordosis of the lumbar spine.

Because of this factors I will examine the muscles strength of rectus abdomimis.m and oblique externus and internus and m.gluteus maximus and also I will examine the shortness of m.iliopsoas and m.erector spinae specially lumbar spine.

The higher position of left lower angel of scapula and elevation of left shoulder may be cause of the fixed position of the arm for 6 weeks by the gypsum

3.8.3 Basic neurological examination-

Table 5- for Objective examination

General symptoms	normal
Appearance	normal
Positions of patient posture	normal
Body type	melancholic
Nutrition-	Normal diet and water intake
Skin complexion	normal
Speech	normal
Cognition	normal
Body scheme	normal
Psychoneurotic behavior	normal
Involuntary movement	negative
ataxia	negative

Upper extremity

Table 6- for deep tendon reflexes- (left and right side)

triceps brachi	normal
biceps brachi	normal
Styloradialis	normal
palmar	normal

Table 7- of superficial sensation- tested in dorsal and palmar surface of the left and right hands and forearm.

Touch	normal, same sensation in both sides
Tactile	normal, same sensation in both sides
Dermatography	normal, same sensation in both sides

Table 8-of deep sensation- (left and right side)

Vibration	normal, bilaterally same sensation
2 point discrimination	normal
Position sense	normal
steriognosia	normal

Conclusion of Basic neurological examination-

All the neurological examination was negative, the deep reflexes and the deep and superficial sensation was normal, which shows that there is no neurological deficiency, it is mean that there is no neurological lesion of the nerves, so the decreased of muscle strength will be because of weakness of the muscles and not lesion of the nerve.

3.8.4 Examination of ROM: Table 9 (all examinations provided by active movement)

	LEFT	**RIGHT**
Shoulder joint		
Flexion	180ș	180ș
Extension	40ș	40ș
Abduction	180ș	180ș
Internal rotation	40ș	40ș
External rotation	90ș	90ș

Elbow joint		
Flexion	150ș	150ș
Extension	0ș	0ș
Pronation	90ș	90ș
Supination	90ș	90ș
Wrist		
Dorsal flexion	30ș	70ș
Palmar flexion	40ș	60ș
Radial adduction	15ș	30ș
Ulnar adduction	30ș	50ș
1st MCP joint		
flexion	40ș	70ș
Extension	0ș	0ș
MCP joint 2-5		
Flexion	60ș	80ș
Extension	10ș	10ș
PIP joint 2-5		
Flexion	80ș	95ș
Extension	10ș	15ș
DIP joint 2-5		
Flexion	60ș	75ș
Extension	0ș	0ș

-abduction and adduction in fingers is normal.

Table 10 of -ROM of Head:

Right	Head	Left
40°	Latero flexion	40°
80°	Rotation	80^0

Head flexion	45°
Head extension	45ș

Conclusion of examination of ROM-

According the examination of ROM there is no restriction in the shoulder joint, elbow joint and in the head movement in any direction.

According the examination of ROM in the wrist joint, MCP joint and interphalangeal joint there is restriction of movement in wrist joint in all the direction, in MCP joint retraction in the direction of flexion in interphalangeal joint there is retraction in the direction of flexion.

The restriction could be because of swelling of the area, hyper tonic muscles, shorted muscles and pain during the movement also we should examined the muscles strength in the upper extremities.

3.8.5 Examination of Muscle strength - (12)

Table 11-of Muscle strength- according grades from 0 to 5, 0-no contraction felt or seen in the muscles, 5- ability to hold tested position against strong pressure.

The muscles	Left	right
m.trapezius upper part	5	5
m.levator scapulae	5	5
m.Rhomboidei	5	5
m.scalenes	5	5
m.SCM	5	5
m.pectoralis minor	4+	4+
m.pectoralis major	5	5
m.serratus anterior	4+	4+
m. biceps brachii	5	5
m.triceps brachii	5	5
m.deltoid anterior/middle part	5	5
m.Flexor digitorum Profandus/superficialis	5	5
m.palmar interossei	3+	5
m.lumbricals	3+	5
m.flexor pollicis lomgus/brevis	3+	5
m.flexor carpi radialis	3	5
m.exstensor digitorum	3	5
m.dorsalinterosei	3+	5
m.extensor carpi ulnaris	3	5
m.extensor carpi radialis longus/brevis	3	5
m.flexor carpi ulnaris	3	5
m.extensor pollicis lomgus/brevis	3	5
m.flexor pollicis lomgus/brevis	3+	5
m.abductor pollicis longus/brevis	3+	5
m.adductor pollicis	3+	5
m.opponens pollicis	3+	5
m.flexor digiti minimi	3+	5

m.abductor digiti minimi	3+	5
m.Opponens digiti minimi	3+	5
m.supinator	5	5
m.pronator quadratus	3	5
m.pronator teres	5	5
m.brachioradialis	5	5
m. rectus abdomimis	4	4
oblique externus and internus	4	4
m.gluteus maximus	5	5

Conclusion of muscles strength examination-

According the muscles strength examination the patient generally have good muscles strength.

There is good muscles strength in the scapular muscles, shoulder muscles, elbow, arm and gluteus muscles of left and right side.

There is slight weakness of abdominal muscles of left and right side.

There is a problem in the strength of the muscles on the wrist hand and fingers of the left hand there is general weakness of the all muscle groups, the weakness caused by pain, swelling and edema of the area and it is cause to spasm ,hyper tonus and shortness of muscles all of this can lead to restriction of ROM in the effected area.

3.8.6 Functional tests of the hand –

the patient able to grasping and holding small objects, like pen or small ball but not able to hold more heavy staff like her shoes or a cap because of pain in the left hand and wrist.

3.8.7 Circumferential measurements-

Circumferential measurements- the left wrist is swelling, because of the swelling there is bigger circumference of the left wrist joint than the right one.

3.8.8 Examination by palpation-

Skin - During the examination of skin on the area from the fingers to the cervical spine and scapula, there was swelling and edema of the area around the left hand and wrist joint.

Connective tissue- during the examination of the connective tissue of the area, there was restriction in movement around the left hand and wrist joint.

Fascia- During the examination of the fascia, on the left forearm was restriction of movement to the directions of flexion, which needs stretching.

Palpation examination of muscles: the muscles of the hand and arm was palpation in supine position, the muscles of the scapula and cervical spine was palpated in prone position, the palpation was uncomfortable and little painful to the patient when we palpated the flexor's and the extensors of the wrist joint.

Table 12- of muscles palpation

The muscles	**Left**	**Right**
m.trapezius upper part	Normal tonus	Normal tonus
m.levator scapulae	Normal tonus	Normal tonus
m.Rhomboidei	Normal tonus	Normal tonus
m.scalenes	Normal tonus	Normal tonus
m.SCM	Normal tonus	Normal tonus
m.pectoralis minor	Normal tonus	Normal tonus
m.pectoralis major	Normal tonus	Normal tonus
m.serratus anterior	Normal tonus	Normal tonus
m. biceps brachii	Normal tonus	Normal tonus
m.triceps brachii	Normal tonus	Normal tonus
m.deltoid anterior and middle part	Normal tonus	Normal tonus
m.flexor pollicis longus/brevis	hyper tonus	Normal tonus
m.flexor carpi radialis/ ulnaris	Spasm, hyper tonus,	Normal tonus
m.exstensor digitorum	hyper tonus	Normal tonus
m.extensor pollicis	Swelling	Normal tonus

lomgus/brevis		
m.extensor carpi ulnaris/radialis	Spasm, hyper tonus	Normal tonus

Conclusion of Examination by palpation-

According the examination by palpation of skin, connective tissue, fascia and muscles there is swelling and edema of the skin, restricted movement of the fascia and connective tissue in the area of the forearm and hand.

There is also spasm ,hyper tonus and uncomfortabl filing with little pain in the area of the left hand, fingers, wrist and fore arm.

The examination by palpation of the right arm is normal.

3.8.9 Examination of Movement stereotypes-(11)

Neck flexion:

Not detected jaw juts forwards at the beginning of the movement.

Shoulder abduction:

Abduction in shoulder joint was performed in proper way

Conclusion-of Examination of Movement stereotypes-

According the examination I didn't detect bad movement stereotypes

3.8.10 Examination of Muscle length-(11)

Table 13- of Muscle length examination

The muscles	Left	right
m.trapezius upper part	1	0
m.levator scapulae	0	0
m.SCM	0	0
m.pectoralis minor	0	0
m.pectoralis major	0	0
m.iliopsoas	0	0
m.erector spinae lumbar part	0	0

Conclusion of muscle length examination-

According to this examination shortening exists in m. trapezius upper part in left side.

3.8.11 Examination of joint play- (13)

Table 14-of joint play examination of the right and left side

Co-C1 joint play	No restriction to anterior, posterior and lateral direction
C-Th crossing joint play	No restriction to ventral/dorsal and latero/lateral direction
Acromio-clavicular joint play	No restriction to any direction-bilaterally
Sterno-clavicular joint play	No restriction to any direction- bilaterally
Shoulder joint play	No restriction to any direction- bilaterally
Scapulo-thoracic joint play	No restriction to any direction-bilaterally
Elbow joint play	No restriction to any direction-bilaterally
Distal radio ulnar joint play	No restriction to any direction- bilaterally
Radiocarpal joint play	Restriction in dorsal direction in the left hand side
Intercarpal joint play	No restriction to any direction- bilaterally
Carpometacarpal joint play of the thumb	No restriction to any direction- bilaterally
Metacarpo phalangeal joint play 2-5	Restriction in second Metacarpo phalangeal joint in dorso/palmar direction in the left hand
Interphalangeal joint play	No restriction to any direction- bilaterally

Conclusion of joint play examination-

according the joint play examination there are blockages in Radiocarpal joint in dorsal direction in the left hand, and blockages in 2 Metacarpo phalangeal joint in dorso/palmar direction in the left hand.

3.9 Conclusion of initial kinesiologic examination

--- according the history of the present problem the main complain of the patient is stiffness, restricted range of motion and weakness of muscles of the left hand

-in this case it is not necessary to put to mach attention to the family anamnesis because the problem is not genetic and can not be influence by it. The social status of the patient is very good,

she get fool support from her family, the patient work as a librarian in the library so she need the ROM and the muscles strength of the hand to be able to do her job.

--- The general health of the patient is good there is not other disease like diabetes mellitus or arthritis that can influence the healing process of the soft tissue and bone, no operation, medication or allergy the patient also doesn't consume alcohol and doesn't smoke.

---the patient didn't have any previous rehabilitation

--- according the patient initial kinesiologic examination-

postural examination the left lower angel of scapula and the left shoulder is slight elevated also there is slight hyper lordosis of the lumbar spine.

Examination by palpation of skin, connective tissue, fascia and muscles there is swelling and edema of the skin, restricted movement of the fascia and connective tissue in the area of the left forearm and hand, also spasm and hyper tonus of muscles and uncomfortable filing with little pain in the area of the left hand, fingers, around the wrist joint and fore arm.

Examination of Movement stereotypes no detection of bad movement stereotypes.

In examination of muscles length, shortening exists in m. trapezius upper part in left side

In examination of ROM we detect restriction in the wrist joint, MCP joint and interphalangeal joint

Wrist joint restriction in all the direction, MCP joint retraction in the direction of flexion and in interphalangeal joint there is retraction in the direction of flexion.

There is restriction in the ROM because of swelling of the area, restricted movement of the fascia and connective tissue, spasm and hyper tonus and shorted muscles and pain during the movement.

All of this cause to restricted ROM and also to weakness of muscles around the area.

There is no restriction in the shoulder joint, elbow joint and in the head movement in any direction.

In muscles strength examination the patient generally have good muscles strength.

There is good muscles strength in the scapular muscles, shoulder muscles, arm and elbow muscles of left and right side.

There is a problem in the strength of the muscles around the forearm, hand and fingers of the left hand there is general weakness of the muscles in all the directions, the weakness caused by pain, swelling, edema, restricted movement of the fascia and connective tissue, of the area all of this

cause to spasm ,hyper tonus and shortness of muscles all of this lead to restriction of ROM in the effected area.

In neurological examination no detection of any neurological deficiency, it is mean that the weakness of the muscles no cause by lesion of nerves.

In joint play examination we detect blockages in Radiocarpal joint in dorsal direction in the left hand and also blockages in 2 Metacarpo phalangeal joint in dorso/palmar direction in the left hand.

--- according the kinesiologic examination we detect that the main problem is in the left wrist and hand, we found that there is-

1) swelling, edema and restricted movement of the fascia and connective tissue of the area
2) hyper tonus of muscles, shortness of muscles and weakness of muscles
3) restricted ROM of the area and same blockages in the area.

3.10 Short-term and long-term rehabilitation plan

According to the founding i will provide the therapy.

Short-term:

- Decrease of pain and stiffness around wrist by hydrotherapy and magneto therapy
- Decrease swelling and edema around the hand and wrist by hydrotherapy and magneto therapy
- Relaxation of hyper tonus in flexors and extensors muscles of the hand and forearm and stretch the shortened flexors muscles of the forearm.
- Mobilize joint blockages of Radiocarpal joint in dorsal direction and 2 Metacarpo phalangeal joint in dorso/palmar direction in the left hand.
- Increase the restricted range of motion in the wrist joint
- Strengthening of week muscles.
- Instruction of patient how to provide correct the auto-therapy exercises
- Decrease hyper tonus and shortness of m.trapezius upper part left side for decrease elevation of the left shoulder and scapula.

Long-term:

- Maintain the muscle power
- Maintain the range of motion
- Improving the activities of daily living
- Improving of posture decrease lordosis in lumbar spine and strengthening the abdominal muscles.

3.11 Rehabilitation

First session (04/02/08)

- Anamnesis and kinesiological examination of the patient
- hydro therapy whirlpool application for the hands, 15 min in temperature 37ș-38ș
- magneto therapy application for 15 min on the area of the wrist
- Soft tissue techniques for release of dorsal and palmar fascia, connective tissue and decrease swelling and edema on the hand and fore arm
- PIR on m.flexor pollicis longus/brevis, m.extensor pollicis longus/brevis, m.palmar/dorsal interosy , m.lumbrecalis, m.flexor digitorum profandus/superficialic, m.flexor carpi radialis/ulnaris, m.extensor digitorum, m.extensor carpi radialis/ulnaris
- PIS on m. trapezius upper part.
- Instruction for the patient the auto-therapy program:
  - Self PIR for m.flexor pollicis longus/brevis, m.extensor pollicis longus/brevis, m.flexor digitorum profandus/superficialic, m.flexor carpi radialis/ulnaris,
  m. extensor digitorum, m.extensor carpi radialis/ulnaris.

Second session (06/02/08)

- hydro therapy whirlpool application for the hands, 15 min in temperature 37ș-38ș
- magneto therapy application for 15 min on the area of the wrist
- checking the auto therapy of the patient
- Soft tissue techniques for release of dorsal palmar fascia, connective tissue and decrease swelling and edema on the hand and fore arm

- PIR on m.flexor pollicis longus/brevis, m.extensor pollicis longus/brevis, m.palmar/dorsal interosy , m.lumbrecalis, m.flexor digitorum profandus/superficialic, m.flexor carpi radialis/ulnaris, m.extensor digitorum, m.extensor carpi radialis/ulnaris
- PIS on m. trapezius upper part.
- Mobilization of blockages of Radiocarpal joint in dorsal direction and 2 Metacarpo phalangeal joint in dorso/palmar direction in the left hand
- Instruction for the patient the auto-therapy program:
  - Self PIR for m.flexor carpi radialis/ulnaris, m.extensor carpi radialis/ulnaris.

Third session (08/02/08)

- hydro therapy whirlpool application for the hands, 15 min in temperature 37ș-38ș
- magneto therapy application for 15 min on the area of the wrist
- checking the auto therapy of the patient
- Soft tissue techniques for release of dorsal and palmar fascia, connective tissue and decrease swelling and edema on the hand and fore arm
- Exteroceptive receptive stimulation on the hand and fore arm with rubber ball and soft stroking.
- PIR on m.flexor pollicis longus/brevis, m.extensor pollicis longus/brevis, m.palmar/dorsal interosy , m.lumbrecalis, m.flexor digitorum profandus/superficialic, m.flexor carpi radialis/ulnaris, m.extensor digitorum, m.extensor carpi radialis/ulnaris
- PIS on m. trapezius upper part.
- Instruction for the patient the auto-therapy program:
  - Self PIR for m.flexor pollicis longus/brevis, m.extensor pollicis longus/brevis, m.flexor digitorum profandus/superficialic, m.flexor carpi radialis/ulnaris,
  m. extensor digitorum, m.extensor carpi radialis/ulnaris.
  - Extero receptive stimulation on the hand and fore arm by soft stroking.

Fourth session (11/02/08)

- hydro therapy whirlpool application for the hands, 15 min in temperature 37ș-38ș
- magneto therapy application for 15 min on the area of the wrist.
- checking the auto therapy of the patient

- Soft tissue techniques for release of dorsal and palmar fascia, connective tissue and decrease swelling and edema on the hand and fore arm
- Exteroceptive receptive stimulation on the hand and fore arm with rubber ball and soft stroking.
- PIR on m.flexor pollicis longus/brevis, m.extensor pollicis longus/brevis, m.palmar/dorsal interosy , m.lumbrecalis, m.flexor digitorum profandus/superficialic, m.flexor carpi radialis/ulnaris, m.extensor digitorum, m.extensor carpi radialis/ulnaris
- PIS on m. trapezius upper part.
- PNF first and second diagonal flexion and extension for upper extremities, relaxation of m.flexor digitorum profandus/superficialic, m.flexor carpi radialis/ulnaris, m. extensor digitorum, m.extensor carpi radialis/ulnaris by slow reversal hold relax.
- Instruction for the patient the auto-therapy program:

  - Self PIR for m.flexor pollicis longus/brevis, m.extensor pollicis longus/brevis, m.flexor digitorum profandus/superficialic, m.flexor carpi radialis/ulnaris,
  m. extensor digitorum, m.extensor carpi radialis/ulnaris.
  - Extero receptive stimulation on the hand and fore arm by soft stroking.

Fifth session (13/02/08)

- hydro therapy whirlpool application for the hands, 15 min in temperature 37ş-38ş
- magneto therapy application for 15 min on the area of the wrist.
- checking the auto therapy of the patient
- Soft tissue techniques for release of dorsal and palmar fascia, connective tissue and decrease swelling and edema on the hand and fore arm
- Exteroceptive receptive stimulation on the hand and fore arm with rubber ball and soft stroking.
- PIR on m.flexor pollicis longus/brevis, m.extensor pollicis longus/brevis, m.palmar/dorsal interosy , m.lumbrecalis, m.flexor digitorum profandus/superficialic, m.flexor carpi radialis/ulnaris, m.extensor digitorum, m.extensor carpi radialis/ulnaris
- PIS on m. trapezius upper part.
- PNF first and second diagonal flexion and extension for upper extremities, relaxation of m.flexor digitorum profandus/superficialic, m.flexor carpi radialis/ulnaris, m. extensor digitorum, m.extensor carpi radialis/ulnaris by slow reversal hold relax.

- Exercise with thera-band for strengthening of m.flexor digitorum profandus/superficialic, m.flexor carpi radialis/ulnaris, m. extensor digitorum, m.extensor carpi radialis/ulnaris and
- Instruction for the patient the auto-therapy program:

  - Self PIR for m.flexor pollicis longus/brevis, m.extensor pollicis longus/brevis, m.flexor digitorum profandus/superficialic, m.flexor carpi radialis/ulnaris,
  m. extensor digitorum, m.extensor carpi radialis/ulnaris.
  - Extero receptive stimulation on the hand and fore arm by soft stroking.

Sixth session (15/02/08)

- hydro therapy whirlpool application for the hands, 15 min in temperature 37ș-38ș
- magneto therapy application for 15 min on the area of the wrist.
- kinesiological examination of the patient.
- checking the auto therapy of the patient.
- Soft tissue techniques for release of dorsal and palmar fascia, connective tissue and decrease swelling and edema on the hand and fore arm.
- Exteroceptive receptive stimulation on the hand and fore arm with rubber ball and soft stroking.
- PIR on m.flexor pollicis longus/brevis, m.extensor pollicis longus/brevis, m.palmar/dorsal interosy , m.lumbrecalis, m.flexor digitorum profandus/superficialic, m.flexor carpi radialis/ulnaris, m.extensor digitorum, m.extensor carpi radialis/ulnaris
- PIS on m. trapezius upper part.
- PNF first and second diagonal flexion and extension for upper extremities, relaxation of m.flexor digitorum profandus/superficialic, m.flexor carpi radialis/ulnaris, m. extensor digitorum, m.extensor carpi radialis/ulnaris by slow reversal hold relax.
- Exercise with thera-band for strengthening of m.flexor digitorum profandus/superficialic, m.flexor carpi radialis/ulnaris, m.extensor digitorum, m.extensor carpi radialis/ulnaris.
- Mobilization of blockages of Radiocarpal joint in dorsal direction and 2 Metacarpo phalangeal joint in dorso/palmar direction in the left hand
- Education of correct using of hand and fore arm in ADL activity.
- Instruction for the patient the auto-therapy program:

  - Self PIR for m.flexor pollicis longus/brevis, m.extensor pollicis longus/brevis, m.flexor digitorum profandus/superficialic, m.flexor carpi radialis/ulnaris,

m. extensor digitorum, m.extensor carpi radialis/ulnaris.

- Extero receptive stimulation on the hand and fore arm by soft stroking.

-strengthening the muscles of the hand and wrist with the help of thera-band.

3.12 Final kinesiologic examination-

3.12.1 Postural evaluation in standing-

Table 15-Dorsal view: plumb line-between the spinoss process and the heels.

	After the therapy	Before the therapy
Symmetry of lower angel of scapula	**symmetry**	slight higher
Symmetry of shoulder position	**symmetry**	slight higher

Table 16-Frontal view: plumb line- between the nose, sternum, and foots.

	After the therapy	Before the therapy
Symmetry of shoulder position	**symmetry**	slight higher

Table 17-Side view: plumb line – go from external meatus, shoulder joint, posterior to the hip joint, anterior to the knee anterior to lateral malleus.

	After the therapy	Before the therapy
Lumbar part of spine	Slight hyperlordosis	Slight hyperlordosis

Conclusion of postural evaluation:

According to the final postural examination of the dorsal and frontal view the left lower angle of scapula and the left shoulder was slight elevated, but after the therapy there is symmetry of the lower angel of scapula and symmetry of shoulder position.

According to the final postural examination of the side view, there is still Slight anterior tilt of the pelvis and Slight hyperlordosis of the lum spine because the main goal of the therapy was on the wrist, I will recommend to the patient to have therapy for this problem in long term rehabilitation plan.

3.12.2 Examination of ROM: Table 18 (all examinations provided by active movement).

	Initial LEFT	**Final LEFT**	**Initial RIGHT**	**Final RIGHT**
Shoulder joint				
Flexion	180ș	180ș	180ș	180ș
Extension	40ș	40ș	40ș	40ș
Abduction	180ș	180ș	180ș	180ș
Internal rotation	40ș	40ș	40ș	40ș
External rotation	90ș	90ș	90ș	90ș
Elbow joint				
Flexion	150ș	150ș	150ș	150ș
Extension	0ș	0ș	0ș	0ș
Pronation	90ș	90ș	90ș	90ș
Supination	90ș	90ș	90ș	90ș
Wrist joint				
Dorsal flexion	30ș	**50°**	70ș	70ș
Palmar flexion	40ș	**50°**	60ș	60ș
Radial adduction	15ș	**20°**	30ș	30ș
Ulnar adduction	30ș	**40°**	50ș	50ș
1st MCP joint				
flexion	40ș	**70°**	70ș	70ș
Extension	0ș	0ș	0ș	0ș
MCP joint 2-5				
Flexion	60ș	**70°**	80ș	80ș
Extension	10ș	10ș	10ș	10ș
PIP joint 2-5				
Flexion	80ș	**95°**	95ș	95ș
Extension	10ș	10ș	15ș	15ș
DIP joint 2-5				
Flexion	60ș	**75°**	75ș	75ș
Extension	0ș	0ș	0ș	0ș

-abduction and adduction in fingers joint is normal.

Table 19-ROM of Head:

Right	Head	Left
40°	Latero flexion	40°
80°	Rotation	80^0

Head flexion	45°
Head extension	45ș

Conclusion of examination of ROM-

According the examination of ROM there is no restriction in the shoulder joint, elbow joint and in the head movement in any direction, like it was in the initial kinesiologic examination.

Before the therapy, according the examination of ROM in the wrist joint, MCP joint and interphalangeal joint there was restriction of movement in wrist joint in all the direction, in MCP joint retraction in the direction of flexion in PIP and in DIP joint there was retraction in the direction of flexion. After the therapy, increase ROM in the wrist joint in all the direction, but there is still slight restriction of movement in all the direction, spatially in the direction of dorsal flexion. ROM of MCP 2-5 also increase but there is still slight restriction in the direction of flexion.

In PIP and in DIP joint no restriction of ROM

3.12.3 Examination of Muscle strength -(12)

Table 20-of Muscle strength- according grades from 0 to 5, 0- no contraction felt or seen in the muscles, 5- ability to hold tested position against strong pressure.

The muscles	**RIGHT**	**LEFT BEFOR THERAPY**	**LEFT AFTER THERAPY**
m.trapezius upper part	5	5	5
m. biceps brachii	5	5	5
m.triceps brachii	5	5	5
m.Flexor digitorum Profandus/superficialis	5	5	**5**
m.palmar interossei	5	3+	**5**
m.lumbricals	5	3+	**5**
m.flexor pollicis lomgus/brevis	5	3+	**5**
m.flexor carpi radialis	5	3	**-4**
m.exstensor digitorum	5	3	**5**
m.dorsalinterosei	5	3+	**4**
m.extensor carpi ulnaris	5	3	**4**
m.extensor carpi radialis	5	3	**4**

longus/brevis			
m.flexor carpi ulnaris	5	3	-4
m.extensor pollicis lomgus/brevis	5	3	5
m.flexor pollicis lomgus/brevis	5	3+	5
m.abductor pollicis longus/brevis	5	3+	5
m.adductor pollicis	5	3+	5
m.opponens pollicis	5	3+	5
m.flexor digiti minimi	5	3+	5
m.abductor digiti minimi	5	3+	5
m.Opponens digiti minimi	5	3+	5
m.supinator	5	5	5
m.pronator quadratus	5	3	4
m.brachioradialis	5	5	5

Conclusion of muscles strength examination-

According to the initial muscles strength examination, there was a problem in the strength of the muscles on the forearm, hand and fingers of the left hand there was general weakness of the all muscle groups. After the therapy there is improvement of muscles strength in the left fingers, hand, and fore arm of the left side. but there is still slight weakness of the muscles.

3.12.4 Examination by palpation-

Skin - During the examination of skin on the area from the fingers to the cervical spine and scapula, there was swelling of the area.

After the therapy- there is slight swelling of the area around the left hand and wrist joint.

Connective tissue and Fascia - during the examination of the connective tissue and fascia, in examination of the fascia the left forearm was restriction of movement to the directions of flexion. In connective tissue examination of the area, there was restriction in movement around the left hand and wrist. After the therapy- there is no restriction in movement of connective tissue and fascia around the left forearm and hand.

Palpation examination of muscles: the muscles of the hand and arm was palpation in supine position, the muscles of the scapula and cervical spine was palpated in prone position,

Table 21-of muscles palpation

The muscles	**RIGHT**	**LEFT BEFORE THERAPY**	**LEFT AFTER THERAPY**
m.trapezius upper part	Normal tonus	Normal tonus	Normal tonus
m.levator scapulae	Normal tonus	Normal tonus	Normal tonus
m.Rhomboidei	Normal tonus	Normal tonus	Normal tonus
m.scalenes	Normal tonus	Normal tonus	Normal tonus
m.SCM	Normal tonus	Normal tonus	Normal tonus
m.pectoralis minor	Normal tonus	Normal tonus	Normal tonus
m.pectoralis major	Normal tonus	Normal tonus	Normal tonus
m.serratus anterior	Normal tonus	Normal tonus	Normal tonus
m. biceps brachii	Normal tonus	Normal tonus	Normal tonus
m.triceps brachii	Normal tonus	Normal tonus	Normal tonus
m.deltoid anterior and middle part	Normal tonus	Normal tonus	Normal tonus
Flexor digitorum Profandus/superficialis	Normal tonus	Spasm, hyper tonus	**Slight hyper tonus**
m.palmar interossei	Normal tonus	Spasm, hyper tonus	**Slight hyper tonus**
m.lumbricals	Normal tonus	Spasm, hyper tonus	**Normal tone**
m.flexor pollicis longus/brevis	Normal tonus	Swelling, hyper tonus	**Normal tone**
m.flexor carpi radialis/ ulnaris	Normal tonus	Spasm, hyper tonus,	**Slight hyper tonus**
m.exstensor digitorum	Normal tonus	hyper tonus	**Normal tone**
m.dorsalinterosei	Normal tonus	hyper tonus	**Normal tone**
m.extensor pollicis	Normal tonus	hyper tonus	**Normal tone**

lomgus/brevis			
m.extensor carpi ulnaris/radialis	Normal tonus	Spasm, hyper tonus,	**Slight hyper tonus**

Conclusion of Examination by palpation-

According the examination by palpation of skin before the therapy there was swelling, restriction of connective tissue and fascia and hyper tonus and spasm of the muscles. After the therapy there is slight swelling of skin of the area around the left hand and wrist joint.

According the examination by palpation of connective tissue and fascia after the therapy there is no restriction in movement around the left hand and wrist joint.

According the examination by palpation of fascia before the therapy , after the therapy there is no restriction of movement in the left hand, fingers and fore arm to all the directions.

According the examination by palpation of muscles-there is slight hyper tonus of m. flexor digitorum profandus/superficialis, Slight Hyper tonus, of m.flexor carpi radialis/ulnaris, m.palmar interossei, and m.extensor carpi radialis/ulnaris.

3.12.5 Examination of Muscle length- (11)

Table 22-of Muscle length examination

The muscles	**RIGHT**	**LEFT BEFORE THERAPY**	**LEFT AFTER THERAPY**
m.trapezius upper part	0	1	**0**
m.levator scapulae	0	0	0
m.SCM	0	0	0
m.pectoralis minor	0	0	0
m.pectoralis major	0	0	0
m.iliopsoas	0	0	0
m.erector spinae lumbar part	0	0	0

Conclusion of muscle length examination

According to this examination shortening before the therapy there was shortening in m. trapezius upper part in left side. After the therapy there is no shortness of m. trapezius upper part in left side.

3.12.6 Circumferential measurements-

Before the therapy there was bigger circumference of the left wrist joint than the right one, Because of swelling of the left wrist joint, after the therapy there is almost same circumference of the left wrist joint than the right one, in the left wrist joint there is slight bigger circumference because there is still slight swelling of the left wrist joint.

3.12.7 Functional tests of the hand –

Before the therapy the patient able to grasping and holding small objects, like pen or small ball but not able to hold more heavy staff like her shoes or a cap because of weakness of muscles and pain in the left hand . After the therapy the patient able to hold and grasp more heavy things like her shoes, her beg and a cap full of water, without pain in the area. But there is still not full power of grasping and holding in the left hand.

3.12.8 Examination of joint play- (13)

Table 23-of joint play examination

	BEFOR THERAPY	**AFTER THERAPY**
Radiocarpal joint play	restriction in dorsal direction	**no restriction in dorsal direction**
Metacarpo phalangeal joint play 2-5	restriction in Metacarpo phalangeal joint in dorso/palmar direction	**No restriction in Metacarpo phalangeal joint in dorso/palmar directio**

Conclusion of joint play examination-

Before the therapy there was restriction in dorsal direction of the Radiocarpal joint and restriction in Metacarpo phalangeal joint in dorso/palmar direction

After the therapy according the joint play examination there is no blockages and restriction of movement. Before the therapy there was no blockages of elbow, shoulder joint, scapula, C-TH crossing, acromioclavicular, sternoclavicular and distal radioulnar joint.

3.13 Therapy effect-

After the 6 rehabilitation sessions with the patient, there is improvement in- postural examination

According to the final postural examination of the dorsal and frontal view the left lower angel of scapula and the left shoulder was slight elevated, but after the PIR for m. trapezius upper part there is symmetry of the lower angel of scapula and symmetry of shoulder position.

According to the final postural examination of the side view there was Slight anterior tilt of the pelvis and Slight hyperlordosis of the lumbar spine, i didn't focus in this problem because the main goal of the therapy was to give therapy to left wrist and hand , I will recommend to the patient to have therapy for this problem in long term rehabilitation plan.

Examination by palpation- according the examination by palpation of skin-after the hydro therapy and Soft tissue techniques there is less swelling of the area around the left hand and wrist joint.

In palpation of connective tissue after the therapy of Soft tissue techniques there is no restriction in movement of connective tissue around the left hand and wrist joint like it was before the therapy.

In palpation of fascia- there is also no restriction after Soft tissue techniques therapy, in the left hand, fingers and fore arm to all the directions like it was before the therapy.

In palpation of muscles- after the therapy of PIR and PIS there is no spasm and hyper tonus of muscles like it was before the therapy, but there is still slight hyper tonus of m. flexor digitorum profandus/superficialis, slight hyper tonus of m.flexor carpi radialis/ulnaris, m.palmar interossei, and m.extensor carpi radialis/ulnaris.

In muscle length examination-after the therapy of PIS there is no shortness in almost all examining muscles.

In examination of ROM-after the hydro therapy, soft tissue techniques, PIR and PIS, there is no restriction of ROM of MCP, PIP and DIP joint like it was before the therapy, also there is improvement of ROM in the wrist joint but there is still slight restriction of movement in all the direction, in the wrist spatially in the direction of dorsal flexion.

The restriction could be because of slight swelling of the skin, hyper tonus, and shortens of muscles m.flexor carpi radialis/ulnaris, on the left side.

In muscles strength examination- after the therapy of exercise with thare-band there is improvement of muscles strength in the left fingers, hand, and fore arm, but there is still slight

weakness because of slight swelling of skin, hyper tonus and shortness of muscles and restriction of ROM in the wrist of the left side.

Circumferential measurements- after the hydro therapy and Soft tissue techniques there is less swelling of the area around the left hand and wrist joint, and this is cause to smaller circumference. There is almost same circumference of the left wrist joint than the right one, in the left wrist joint there is slight bigger circumference because there is still slight swelling of the left wrist joint.

Functional tests of the hand – after the therapy of exercise with thare-band there is improvement of muscles strength in the left fingers, hand, and fore arm the patient able to hold and grasp more heavy things like her shoes, her beg and a cap full of water, without pain in the area. But there is still not full power of grasping and holding in the left hand.

In joint play examination-after the therapy of mobilization there is no blockages and restriction of movement.

3.14 Prognosis-

the prognosis is very good for the patient, after the therapy of 6 sessions there was big improvement in ROM, muscles strength, there was no blockages, less hyper tonus, swelling and shortness of muscles in the left hand side according the final kinesiologic examination.

I think that if the patient will keep doing the auto therapy proximally after one month probably she will not have any restriction in the ROM, no weakness, hyper tonus, swelling and shortness of muscles the left hand will be the same like the right

4. Conclusion –

I did my practice in the Military hospital (vojenska nemocnice) in Prague.

I really enjoyed my practice, first time that all the responsibility was on me, these filing of responsibility encourage me to try really hard, the patient wanted to see improvement.

When my patient came to another therapy she was always happy to show me how big the improvement , she was really nice women she listen to me, cooperate with me and did all the auto therapy.

I still can not believe that in such a short time can be so big improvement, of course if the patient wouldn't be so cooperative and wouldn't do the auto therapy, the improvement will not be so big, so thank a lot to my patient.

Also i wanted to say Thank you to my supervising physiotherapist in the hospital Alena Rihova for helping me a lot and give me good advise for my practice.

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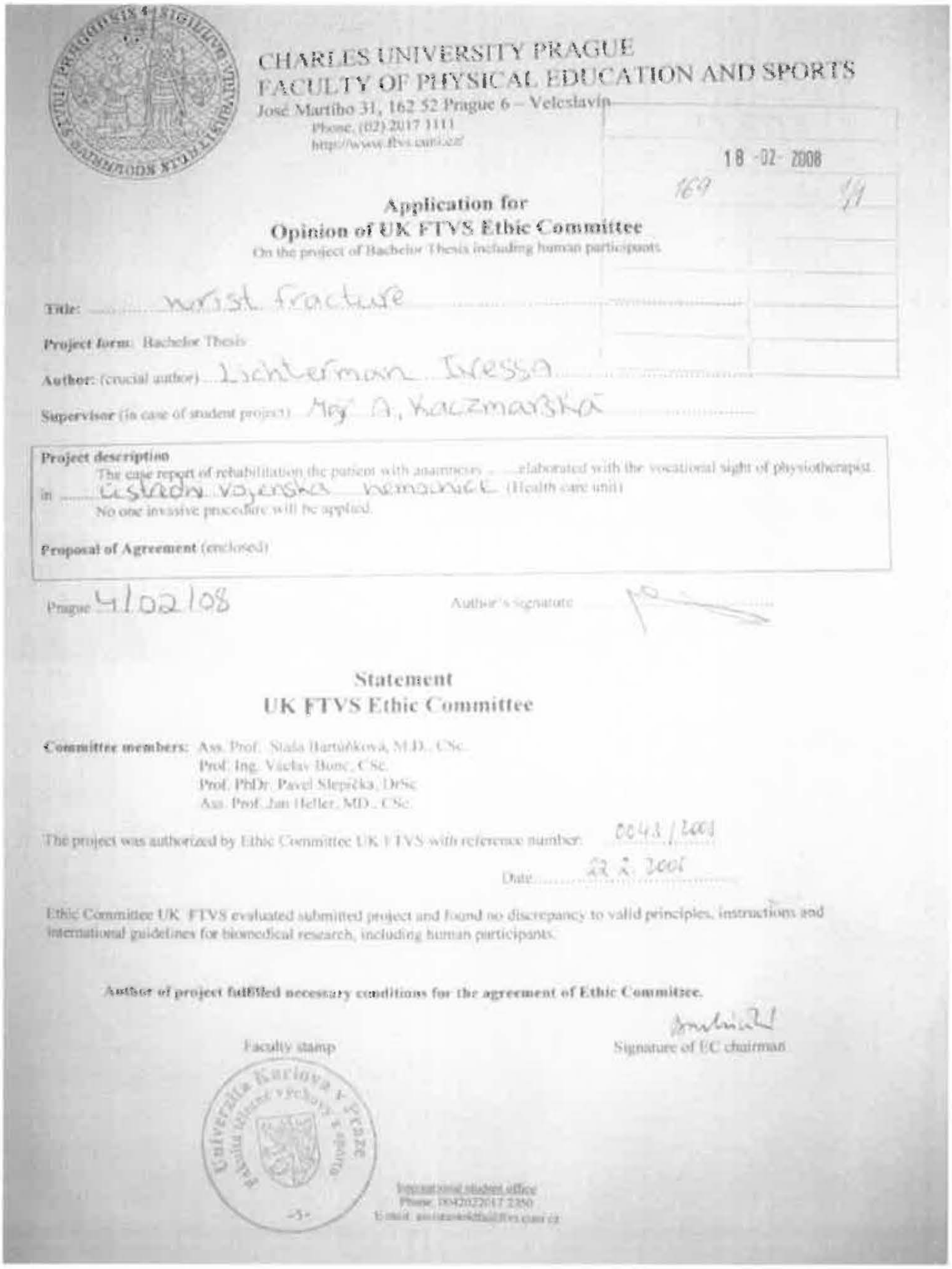
6. List of Abbreviations

1) UCL: ulnar collateral ligament
2) RCL: radial collateral ligament
3) TFCC: Triangular fibrocartilage complex
4) SCM: Sternocleidomastoid muscle
5) ROM: Range of motion
6) BMI: Body Mass Index
7) PIR: Post Isometric Relaxation
8) PIS: Post isometric Stretching
9) m: muscle
10) PNF: proprioceptive neuromuscular facilitation
11) MRI :magnetic resonance image
12) CT-computed tomography
13) Tem-temperature
14) MCP-metacarpal phalangeal
15) PIP- proximal inter phalangeal
16) DIP- distal inter phalangeal
17) C-TH crossing- cervico thoracic crossing
18) Min- minutes

7. Supplements

The project was authorized by ethic committee UK FTVS with reference number 0043/ 2008

Date: 22.02.2008



CHARLES UNIVERSITY PRAGUE
FACULTY OF PHYSICAL EDUCATION AND SPORTS
José Martiho 31, 162 52 Prague 6 – Veleslavín
Phone: (02) 2017 1111
http://www.ftvs.cuni.cz/

18 -02- 2008

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Application for
Opinion of UK FTVS Ethic Committee
On the project of Bachelor Thesis including human participants

Title: wrist fracture

Project form: Bachelor Thesis

Author: (crucial author) Lichterman Inessa

Supervisor (in case of student project) Mgr. A. Kaczmarská

Project description
The case report of rehabilitation the patient with anamnesis ......elaborated with the vocational sight of physiotherapist in Ústřední vojenská nemocnice (Health care unit)
No one invasive procedure will be applied.

Proposal of Agreement (enclosed)

Prague 4/02/08 Author's signature

Statement
UK FTVS Ethic Committee

Committee members: Ass. Prof. Staša Bartůňková, M.D., CSc.
Prof. Ing. Václav Bunc, CSc.
Prof. PhDr. Pavel Slepička, DrSc.
Ass. Prof. Jan Heller, MD., CSc.

The project was authorized by Ethic Committee UK FTVS with reference number: 0043/2008

Date: 22. 2. 2008

Ethic Committee UK FTVS evaluated submitted project and found no discrepancy to valid principles, instructions and international guidelines for biomedical research, including human participants.

Author of project fulfilled necessary conditions for the agreement of Ethic Commitee.

Faculty stamp

Signature of EC chairman

International student office
Phone: 0042022017 2350
E-mail: [illegible]