

TOPIC OUTLINE 9- THE WRIST AND HAND.

Introduction.

The wrist and hand are constructed of a series of complex, delicately balanced joints whose function is essential to almost every act of daily living.

While the hand is the most active part of the upper extremity, it is, at the same time, the least protected, and therefore extremely vulnerable and the incidence of injury is high.

Injuries of the hands range from trauma/ repetitive strain injuries to pathological/ degenerative processes.

Unlike the rest of the body the hand is an area where deformities are quite common, these range from :-

Finger Deformities

- Mallet finger, Boutonniere, Swan Neck deformities. These are usually caused by tendon rupture secondary to R.A./O.A.
- Ulna deviation of the wrist . Due to R.A.
- Radial deviation of the fingers. Due to O.A.
- Benediction hand – ulna nerve palsy
- Dropped wrist –radial nerve palsy
- Dupuytren's Contracture – nodular thickening of the palmar fascia
- Heberden Nodes – Distal interphalangeal joint thickening due to O.A.
- Dislocations

Examination of the wrist and hand should be accurate and should include a methodical search for both intrinsic and extrinsic pathology.

Initial Regional Inspection.

Observation of the wrist and hand should include the deformities noted above, as well as:-

- oedema
- synovitis
- lacerations

It is also important to compare the symmetry of both hands.

Ref. Passor, Musculoskeletal Physical Examination Competencies List (2000-2001).

Palpation of Bony Landmarks

- Radial styloid process
- Anatomical snuffbox
- Scaphoid
- Trapezium
- Lister's tubercle
- Capitate
- Lunate
- Trapezoid
- Ulna styloid
- Triquetrium
- Pisiform
- Hook of Hamate
- Metacarpals
- Metacarpophalangeal joints
- Phalanges

Radial styloid process

The palpation begins at this landmark noting for any enlargements or tenderness. Assess the obvious groove on the lateral edge, which is occupied with the EPB and APL tendons. The palpation extends up the radius as far as possible, then returning to the radial styloid process.

Anatomical Snuff Box

This is a small depression located immediately distal and dorsal to the radial styloid process. It becomes more prominent when the thumb is extended and abducted from the fingers. The floor of the snuff box is the scaphoid bone, which is the most common bone to be fractured in the upper extremity.

Scaphoid

The scaphoid is located distal to the radial styloid process in the floor of the snuff box. The palpation is made easier by ulna deviating the wrist. The blood supply to the scaphoid arrives distally and is commonly interrupted by a fracture, causing necrosis of the proximal part of the bone.

Trapezium

Distal to the scaphoid and articulating with the 1st metacarpal is the trapezium. The trapezium is palpated distal to the snuffbox where the 1st CMC joint is palpated.

Lister's tubercle/ Tubercle of the radius

This landmark is located on the dorsum of the radius and separates tunnel 2 and 3. (See soft tissue palpation of the wrist).

Capitate

Palpate distally from Lister's tubercle to locate the base of the 3rd metacarpal. Located between these two landmarks is a depression in which lies in the capitate bone. Flexion of the wrist aids palpation.

Lunate

The lunate is proximal to the capitate and is the most common bone to be dislocated, and the 2nd most common bone to be fractured. With the wrist flexed, the lunate becomes more prominent and lies in a direct line with Lister's tubercle, the capitate and the base of the 3rd metacarpal, all being covered by the ECRB tendon as it passes to attach at the base of the 3rd metacarpal.

Trapezoid

The trapezoid bone is palpated medial to the trapezium and lateral to the capitate bone.

Ulnar Styloid Process

The ulnar styloid process does not extend as distally as the radial styloid, allowing the wrist more ulnar than radial deviation. The ulnar styloid process is also more prominent. Palpate from the ulnar styloid, up the ulna to the olecranon process.

Triquetrium

Distal to the ulna styloid process is the triquetrium, which is best palpated in ulnar deviation. Anteriorly it is covered by the pisiform making palpation more difficult.

Pisiform

The sesimoid carpal bone exists within the tendon of FCU.

Hook of Hamate

Locate the pisiform and palpate diagonally towards the patients index finger until the hook of hamate is palpated. The hook of hamate forms the lateral border of the tunnel of Guyon, which transports the ulna nerve and artery. The pisiform forms the medial border.

Metacarpals

The entire length of the metacarpals are palpated from first to fifth. Assess for tenderness, lack of continuity and swelling which may indicate a possible fracture, which most commonly occurs in the shaft of the 5th metacarpal.

Metacarpophalangeal joint

Palpate distally from the metacarpals. Flexion exposes the condyles, the groove between the condyles transports the extensor tendons of the fingers.

Phalanges

There are 14 in total on each hand. Palpate them in their entirety paying special attention to the interphalangeal joints of each digit. Swelling or enlargement of the interphalangeal joints may be indicative of degenerative change or inflammatory arthritis.

Soft Tissue Palpation.

- Anatomical snuff box
- Tunnels 1-6
- Flexor Carpi Ulnaris
- Tunnel of Guyon
- Ulna artery
- Palmaris Longus
- Carpal Tunnel
- Flexor Carpi Radialis
- Radial artery

The wrist is comprised of 6 dorsal tunnels, which transport the extensor tendons, and 2 palmer tunnels, which transports the flexor tendons as well as nerves and blood vessels for the hand.

Anatomical Snuff Box.

This is located distal to the radial styloid process. The tendons bordering it become more prominent with the thumb extended. Palpate the tendons along the course, checking for any tenderness or swelling.

Radial border – Abductor Pollicis Longus (APL)
- Extensor Pollicis Brevis (EPB)

Ulnar border - Extensor pollicis Longus (EPL)

Floor – Scaphoid bone.

Tunnel 1

This tunnel is located over the radial styloid process. This tunnel is a common site of stenosis.

Tunnel 2

This tunnel is located lateral to the Lister's tubercle and transports the tendons of Extensor Carpi Radialis Longus & Brevis. (ECRL & ECRB). Palpation is made easier by the patient clenching their fist.

Tunnel 3

The tunnel is located immediately medial to Lister's tubercle and transports the tendon of EPL which forms the ulnar border of the anatomical snuff box.

Tunnel 4

This tunnel lies along the medial border of tunnel 3 and cannot be distinctly differentiated from it. It transports the tendons of Extensor Digitorum Communis (EDC) and Extensor Indicis (EI).

Tunnel 5

This tunnel overlies the radioulnar joint, lateral to the ulna styloid process. It transports Extensor Digiti Minimi (EDM). To facilitate palpation, the patient is asked to place their hand on the examination table, palm down and raise/lower their 5th finger. The tendon becomes palpable at the wrist.

Tunnel 6

This tunnel lies in the groove between the apex of the ulna styloid process and the distal head of the ulna. It transports the tendon of Extensor Carpi Ulnaris (ECU) which is distinctly palpable as it crosses over the ulna styloid process to its insertion on the base of the 5th metacarpal. Palpation is made easier with wrist extension and ulnar deviation.

Flexor Carpi Ulnaris (FCU)

This tendon is located over the anterior aspect of the triquetrum bone and contains the pisiform within it. To palpate the tendon, resist wrist flexion and ulnar deviation palpating the palmar surface of the wrist around the pisiform.

Tunnel of Guyon

This small palmer tunnel is bounded by the pisiform and hook of hamate and is covered by the pisohamate ligament. It transports the ulna nerve and artery. Palpation of the nerve and artery is not possible as these structures are deep to soft tissue structures.

Palmaris Longus (PL)

This muscle bisects the anterior aspect of the wrist, marking the anterior surface of the carpal tunnel. Approximation of the thumb and little finger makes the muscle more prominent. This approximation makes two tendons appear on the anterior aspect of the wrist. FCU is most prominent, lateral to the midline. Palmaris longus is found medial to this.

Carpal Tunnel.

The margins of the carpal tunnel are defined by four bony prominences:-

- Pisiform (proximally)
- Tubercle of Scaphoid (proximally)
- Hook of Hamate (distally)
- Tubercle of Trapezium (distally)

The transverse carpal ligament runs between these four landmarks to form a fibrous roof. The carpal bones form the floor of the tunnel. The tunnel transports the flexor tendons of the fingers as well as the median nerve.

Flexor Carpi Radialis (FCR)

This muscle is lateral to palmaris longus and passes across the scaphoid to insert into the base of the 2nd metacarpal.

Radial Artery

Palpate the radial artery as it passes into the wrist between the radial styloid process and the FCR tendon. The artery is assessed for rate, rhythm and amplitude.

Thenar Eminence

The thenar eminence is made up of 3 muscles, which move the thumb.

- Abductor Pollicis Brevis (superficial)
- Opponens Pollicis (intermediate)
- Flexor Pollicis Brevis (deep).

Hypothenar Eminence

This is also made up of 3 muscles:-

- Abductor Digiti Minimi
- Opponens Digiti Minimi
- Flexor Digiti Minimi Brevis

Both the thenar and hypothenar eminence are palpated to assess for tenderness or wasting due nerve damage.

Palmer Aponeurosis

This is made up of four bands which extend to the base of the fingers. The fascia is palpated for thickening, nodules and tenderness – possibly indicative of Dupuytren's contracture.

Finger Flexor Tendons

These run in a common sheath, which is not palpable. They are assessed for tenderness, usually due to direct trauma.

Extensor Tendons

Palpate the dorsum of the patient's hand asking them to flex and extend their fingers. Assess each tendon individually looking for tenderness.

Finger Tufts

Finger tufts are located at the distal end of the fingers and contain the majority of nerve ending. Continuous use makes this area pain sensitive and prone to infection.

Orthopaedic Examination.

As with the elbow and shoulder, bilateral comparison is an accurate way of assessing ease, quality and range of movement.

Normal Range of Movement.

Wrist

- Flexion – 85°
- Extension – 85°
- Ulna deviation – 45°
- Radial deviation – 15°

Fingers- flexion/extension- Metacarpophalangeal joints

- Flexion – 90°
- Extension – 30 – 40°
- Adduction – 20°
- Abduction – 15°

Thumb

- Abduction – 70°
- Adduction – 5°
- Flexion – 85°

- Extension – 2-5°

Range of motion is a guide line based on patients with no underlying pathologies.
Ref. The Physiology of the Joints, I.A.Kapandji- Volume 1 Upper Limb.

Active Movements.

The quickest and most accurate way to assess the active movements is to ask the patient to mimic the practitioner's movements.

Wrist.

- Flexion/Extension
- Radial/Ulna Deviation
- Pronation/Supination and Circumduction

Fingers.

- Adduction
- Abduction
- Flexion/Extension – both MCP and IP joints

Thumb.

- Flexion/Extension
- Abduction/Adduction
- Opposition – thumb and little finger.

N.B. all active movements are carried out with the elbows flexed to 90 degrees, to minimise shoulder and elbow movements.

Passive Movements.

As with the active movements, the patient is sitting.

Wrist.

- Flexion/Extension – Straight fingers
- Pronation/Supination – Fist
- Radial/Ulnar deviation – Fist, tested in three planes of movement – neutral, pronation and supination
- Circumduction – Fist.

Fingers

- Flexion/Extension
- Adduction/Abduction

N.B. the fingers are tested individually, and all joints are assessed.

Thumb

- Flexion/Extension
- Abduction/Adduction
- Circumduction.

Special Tests.

N.B. individual carpal bone articulation is carried out (as described in the bony palpation routine) to assess specific movements.

MEDIAN NERVE COMPRESSION. – CARPAL TUNNEL SYNDROME.

Carpal tunnel syndrome is defined as compression of the median nerve underneath the transverse carpal ligament.

The median nerve arises from the brachial plexus (C5-T1) passing between the anterior and middle scalene muscles, between the first rib and clavicle and underneath the pectoralis minor muscle. It then passes deep to the bicipital aponeurosis, between the Pronator teres muscle and through the fibrous arch of the superficial flexor digitorum muscle, to finally enter the wrist underneath the transverse carpal ligament.

Women are more predisposed than men and CTS most commonly affects 30 -50 year olds. The causes can range from ;-

- Extreme wrist positions
- RSI
- Fluid accumulation due to cardiac, respiratory problems, pregnancy.
- Fibrous tissue deposition
- Post. Fracture
- O.A./R.A.

The symptoms of CTS include, **Parasthesia** in the median nerve distribution – thumb, index and middle finger as well as the radial half of the ring finger. There may also be pain in the median nerve distribution. Classically the patient will be woken up in the early hours of the morning with pins and needles in their hand, which would be relieved by shaking their hand. A late clinical finding of CTS is thenar atrophy.

TINNEL'S TEST.

The patient's hand is in the anatomical position. The wrist is slightly extended and a compression (with the practitioner's fingers) is applied over the "Carpal tunnel" to irritate the median nerve. To further stress the nerve a continuous percussion (with the practitioner's fingers) is applied for approximately 10 – 15 seconds over the "carpal tunnel". A positive test would cause reproduction of symptoms in the median nerve distribution.

The test results are recorded to what symptoms the patient reports.

PHALEN'S TEST.

This test is to assess for carpal tunnel syndrome. The patient is seated with their arms flexed at the elbow to 90 degrees. The patient's wrists are flexed to a maximum degree and compressed together. This position is held for one minute. A positive test is reproduction of symptoms into the median nerve distribution. The results are recorded to what the patient reports.

The theory of this test is to apply an anatomical compression to the median nerve, therefore reproducing the symptoms.

REVERSE PHALEN'S TEST.

This is a variation of the Phalen's test assessing for median nerve irritation. The test is carried out in the same position as the Phalen's test BUT, the patients wrists are extended presenting in the "prayer position". This position is also held for one minute and any reproduction of symptoms are noted. The test results are noted to what the patient reports.

The theory of this test is to apply an anatomical stretch to the median nerve, therefore enhancing any nerve irritation.

FINKELSTEIN TEST.

Finkelstein's test is to assess for stenosing tenosynovitis (De Quervain's disease) of the tendons in tunnel 1. The tendons of abductor pollicis longus and extensor pollicis brevis can become inflamed due overuse. Inflammation of the synovial lining of the tunnel narrows the tunnel opening and results in pain when the tendons move.

To test specifically for stenosing tenosynovitis of the tendons of tunnel 1, the patient makes a fist, with their thumb tucked inside their other fingers. The practitioner then stabilizes the patients forearm and introduces ulna deviation of the wrist with the other hand. If the patient reports sharp pain in the area of tunnel 1, there is strong evidence of stenosing tenosynovitis.

The test is recorded as to what symptoms the patient reports.