



The Hand and Wrist: Enhancing Your Approach to Assessment and Treatment Mini Series

**Session Two: Objective Markers /
Orthopaedic Examination**

Ian Gatt MSC OMPT MCSP BSc (HONS)



- When assessing the Hand & Wrist it is important to consider the whole kinetic chain. Studies indicate that around 50% of the force comes from the trunk and hip region, with only about 10% of the force developed around the wrist (Kiber, 1995). This indicates that if there is a disruption in the kinetic chain, in order to maintain the required level of performance, the wrist will be required to create more velocity or strength. This in turn will lead to injuries in the area.
- Observation is an important part of the assessment of the hand & wrist region. It is important to note for any asymmetries between sides related to either injury or specific conditions, like arthritis. Guttering of the interossei could indicate a lesion of the Ulnar nerve. This can also be indicated by atrophy of the Hypothenar muscle group. Atrophy of the Thenar eminence is more likely due to a median nerve lesion, although if an ulnar lesion is present atrophy of the Adductor Pollicis, which is innervated by this nerve, at the Thenar aspect could be present.
- During the observation process it is important to look out for any bumps or lumps. Tumors of the hand and upper extremity are surprisingly common. They can occur in people of all ages. The majority of these are benign. Nevertheless, every tumor or mass should be carefully evaluated. Benign hand and wrist masses which do not cause pain, dysfunction, or problems do not require specific interventions like surgery. A ganglion cyst is a very common bump or mass that usually appears near joints or tendons in the hand or wrist. Since ganglion cysts are fluid-filled, a light shined directly on the mass will trans-illuminate the cyst. A lipoma is a non-cancerous or benign fatty lump that usually causes no symptoms or problems. Most lipomas are small and are best left alone. Surgical intervention is usually only done for cosmetic reasons. There are other forms of tumors or masses that can develop in the Hand/wrist region and it is important to rule out any malignancy. Examples of these are; Giant Cell Tumors (GCT), Nerve Tumors, Vascular Tumors, Glomus Tumors, Pyogenic Granuloma, and Skin Tumors.
- Observing the knuckles: Murphy's sign indicates a collapsed knuckle due to a subluxation of the lunate bone. Normally the 2nd Knuckle should appear more distal than the other knuckles. With a subluxation, all knuckles will appear at the same level. When making a fist a knuckle might also appear collapsed when viewing it from the front of the fist (looking directly at the knuckles). This can occur due to carpometacarpal joint instability (associated with ligament and/or joint loss of integrity). This might be an old injury currently asymptomatic.
- Carpal bossing tends to describe a small, immovable mass of bone typically occurring at the CMC joint. Bosses are typically idiopathic in the general population appearing at the 3-4th decade. This condition is uncommon. In combat sports, like boxing, this can occur due to impact in the area which creates this bossing at the base of the hand. It is usually linked to CMC joint injury, which in turn can cause instability at the joint and associated symptoms.
- During the observation process the passive position of the wrist should be determined. This should be mid-way in between pronation/supination, flexion/extension, and ulnar/radial deviation. If measured using an inclinometer on the 3rd Metacarpal bone the hand should be in a slight extended position (around 15 degrees). Posture of the wrist should be assessed in sitting with the arm rested on a table, as well as standing. This allows identification of any contributing structures at the elbow and shoulder.
- During observation the passive 'cascade' of the hand should also be noted. With the hand resting on a table in a supinated position it is expected that the index finger lies more distal than the little finger, with the middle and ring finger in between. Any alteration of this order could indicate tightness of the flexor group.

- Dynamically the fingers should abduct during MCP extension and adduct during MCP flexion due to the action of the Lumbrical muscles acting at the collateral ligaments and transverse ligaments. When closing the hand the fingers should all point towards the scaphoid tubercle.
- When objectively measuring ROM 2 devices are particularly recommended; 1) a finger goniometer which can be used to measure MCP, PIP and DIP Flexion/Extension, and 2) an inclinometer to measure wrist as well as forearm motion. When measuring Flexion/Extension the inclinometer should rest on the 3rd metacarpal bone, just proximal to the knuckle. For Radial/Ulnar deviation the arm should be in the mid-prone position and inclinometer should rest on the radial aspect of the 2nd metacarpal bone. For Supination/Pronation the inclinometer the arm should also be in the mid-prone position with the inclinometer resting on the radial side of the proximal phalanx bone. Wrist and Forearm measurements should be performed with the forearm resting on a table, with the elbow at about 60 degrees of flexion, and with the hand hanging off the table.
- When testing strength at the hand it is important to consider that there are 3 main grips; Power, Key and Pinch. All of them provide a different component of hand strength and can equally be independently assessed. Power Grip is the action of making a fist. Pinch Grip involves the thumb being parallel to the fingers with the pulp of the 1st DIP making contact against the 2-3rd DIP pulps. Key Grip involves the thumb in an adducted position with the pulp of the 1st DIP making contact over the radial aspect of the 2nd phalanx.
- Power Grip can be measured using different dynamometers with the Jamar considered as the gold standard. The position recommended is with the elbow in 90 degrees of flexion and with 1 minute break between readings to eliminate the effects of fatigue. Pinch Grip can be measured using a pinch dynamometer, which can also be used for Key Grip measurement. Both grips can also be measured using weighted plates. Additionally, Pinch Grip can also be measured using a hand held dynamometer (HHD).
- Isokinetic testing can also be useful, especially in athletes, as it provides additional information including the ratio between Flexor and Extensor muscle groups, as well as concentric versus eccentric strength. Different speeds can also be explored dependant on the sport.
- Special orthopaedic tests are important as part of the overall assessment of the hand and wrist. These aim at assessing the integrity of the neuro-musculoskeletal structures. Neural tests at the hand and wrist should include predominately the ulnar and median nerves. The radial nerve should be considered if sensory or motor distribution appears to be affecting its distribution. It is however important to remember that at the hand this nerve has only a sensory role.
- Median nerve tests (sensory) include the Pronator Teres syndrome test (which assesses the nerve as it passes in between the 2 heads of the Pronator Teres muscle), Phalen and/or Reverse Phalen Test (which assess compression or stretching of the carpal tunnel in order to replicate symptoms, Tinel and Compression tests (which also assess the integrity of the median nerve as it passes through the carpal tunnel. For the median nerve (motor) muscle resistance of individual muscles or specific actions should be considered, as well as observation of the Thenar muscle bulk.
- Ulnar nerve: Similar to the median nerve, the ulnar nerve passes through the Guyon canal at the hand and it is particularly vulnerable at the elbow (passing between the olecranon and medial condyle). Although not as documented as the median nerve, similar tests used for the carpal tunnel can be used for the Guyon canal. Tinel sign at the elbow, which is more common than at the hand for this nerve, should also be performed.

Motor deficits include special tests like; Froment Sign (which identifies weakness of the Adductor Pollicis muscle by compensating through recruitment of Flexor Pollicis Longus when attempting to adduct the thumb, flexing the DIP of the thumb) and Wartenburg's Sign (which identifies weakness of the interossei muscles by compensating by recruiting Extensor Digiti Minimi when attempting to adduct the 5th finger, extending and abducting the proximal phalanx). Individual muscle testing of other muscles supplied by this nerve should also be considered.

- There are a lot of tests used for joint and bone integrity. For the TFCC (Triangular Fibrocartilage complex which is made up of the; Discus, Ulnocollateral ligaments, and distal radioulnar ligaments) and the Scaphoid bone a group of tests can be used.
- For the TFCC the following tests are indicative; Piano Key test on Ulnar styloid (this provides an overall feel of the stability between the ulna and adjacent radius and carpal bones), TFC shear test (this assess the structures between the ulnar and carpal bones), DRUJ shear test (this assess the structures between the ulna and radius), fovea sign (palpation of the discus just distal to the ulna styloid in between the tendons of FCU and ECU), Sharpey's Test and Grind Test (both tests providing a compressive and grinding effect to test the integrity of the area), weight bearing tests which include the lift off test (pushing up from the edge of a table/couch with the wrists in UD and pronated forearms) and the scale test (which uses a measuring scale to provide an objective measure for symptom provocation/alleviation). ADLs should also provide an indication towards the pathology (e.g. pain with holding a frying pan and/or pushing up from a chair)
- For a scaphoid fracture the following tests are indicative; Pain on active/passive RD of the wrist, Pain with axial compression, Tenderness at the snuff box (yielding 90% Sensitivity & 40% Specificity) and Tenderness on the scaphoid tubercle (yielding 87% Sensitivity & 57% Specificity).
- Other useful tests for assessing the hand and wrist are Watson's test (which assess the integrity of the scapholunate ligament), Lunate-Triquetrium Shear test (which assess the integrity of the named ligament stabilising these two bones), Collateral stress tests (which assess the UCL and LCL ligaments of the wrist, MCPs, PIPs and DIPs) with a special mention of the Valgus stress test of the thumb to assess the integrity of the UCL ligament of the 1st MCP. A special consideration for the integrity of the mid-carpal joint is also required. This is performed by compressing the hand, and over pronating whilst ulnar deviating the wrist in order to replicate symptoms, which include pain and an audible clunk.
- Other structures that can be injured, either through trauma or overuse are tendons. Trauma on the dorsal aspect of the finger can either affect the central tendon (which can be assessed by either Ellsen's test or the Boutonniere deformity test) or the more distal terminal tendon (causing a Mallet finger deformity and assessed through extension resistance of the DIP joint). On the palmar side of the finger avulsion of the FDP can occur through a forced extension of the distal phalanx when the finger is held in a flexed position. This mechanism occurs commonly in team sports when trying to hold on to the opponents jersey and they suddenly pull away (hence the name Jersey Finger). Another common injury, in climbers, is disruption of the A2 pulley specifically at the 3rd and 4th fingers due to the fact they take the highest amount of load being centrally placed. Partial or full ruptures can occur. The ECU tendon can also be injured, specifically at the sub-sheath which maintains the tendon within its groove at the distal ulna. This can cause subluxation of the tendon particularly with UD and forearm supination, which are the original mechanism of injury when occurring repetitively and with high forces.

- Tendon can also occur as a result of overuse injuries. Repetitive Strain Injury (RSI) is an umbrella term commonly used to refer to several discrete conditions that can be associated with repetitive tasks, vibrations, and mechanical compression. Conditions include; tendonopathy, carpal tunnel syndrome, cubital tunnel syndrome, trigger finger (a.k.a. stenosing tenosynovitis), radial tunnel syndrome and focal dystonia (a.k.a. Yips in Sports), De Quervain syndrome and intersection syndrome. The latter two can be tested clinically using Finkelstein's test which depending on the anatomical location of symptoms can assist in distinguishing between the two conditions.