

TOPIC OUTLINE 8 – THE ELBOW AND FOREARM.

Introduction.

The elbow, a ginglymus (hinge) joint is relatively stable with a firm osseous support.

The elbow is comprised of three articulations:-

1. The humeroulnar joint
2. The humeroradial joint
3. The radioulnar joint.

As the joint is relatively stable and protection from dislocation is provided by the interosseous membrane, common injuries to the elbow often tend to be soft tissue due to trauma and repetitive strain injuries.

When the arm is extended in the anatomical position, the longitudinal axes of the upper arm and forearm form a lateral (valgus) angle at the elbow joint known as the “ carrying angle”.

A normal carrying angle measures approximately 5° in males and between 10 – 15° in females. The carrying angle allows the elbow to fit closely into the depression at the waist, immediately superior to the iliac crests, as females have “wider” iliac crests the carrying angle is bigger.

Initial Regional Inspection

Factors to consider on performing an initial regional inspection of the elbow joint include:-

- Carrying angle
- Cubitus Valgus (greater than 15° or asymmetry)
- Cubitus Varus (less than 5° or asymmetry)
- Swelling
- Atrophy
- Skin lesions

Ref – (Passor Musculoskeletal Physical Examination Competencies Lists 2000-2001)

Once an initial regional inspection has been carried out, the bony and soft tissue pain sensitive structures are palpated.

Palpable Structures – Bony Structures

1. Medial epicondyle of the humerus
2. Medial supracondylar line
3. Olecranon Process
4. Ulnar Border
5. Olecranon Fossa
6. Lateral Epicondyle
7. Lateral Supracondylar Line
8. Radial Head

The patient is seated, and the practitioner positioned either behind or in front of the patient depending on comfort.

Medial Epicondyle

The practitioner palpates the medial aspect of the elbow, identifying the prominent epicondyle of the humerus. This landmark is the attachment of the common flexor tendon and protects the ulnar nerve. It is a common site of fracture. The margins of the epicondyle are palpated and assessed for tenderness and enlargement.

Medial Supracondylar Line

The palpation is extended superiorly, from the medial epicondyle. The medial supracondylar line is palpated as it ascends the medial aspect of the humerus. This region of the elbow is an important site for muscle attachment and may be interrupted by callus formation from a previous supracondylar fracture.

Olecranon Process

Palpating inferiorly down the supracondylar line the posterior aspect of the elbow is contacted, where the prominent olecranon process is located. The size, orientation and fluidity of movement is assessed.

Ulnar Border

Palpating distally from the olecranon process along the posterior border of the ulna the ulna styloid process is located at the wrist. The ulna border is assessed for callus formation, lack of continuity and muscular attachments.

Olecranon Fossa

The olecranon process is re-located. From this structure palpate proximally into a depression – the olecranon fossa. The fossa is filled with a fat pad, and the triceps tendon travels above it, therefore the palpation may be difficult.

The fossa is assessed for consistency of depth, tenderness and swelling resulting from an inflamed fat pad.

Lateral Epicondyle

The lateral aspect of the elbow is palpated and the lateral epicondyle is assessed. The lateral epicondyle is the attachment point of the common extensor tendon and the lateral collateral ligament which supports the annular ligament and so the radial head, making it prone to injury and therefore tenderness and swelling.

Lateral Supracondylar Line

This is palpated as described for the medial supracondylar line and extends as far as the deltoid tuberosity.

Radial Head

The lateral epicondyle is re-located. Palpate into the soft tissue approximately 1cm distal to the epicondyle locating the radial head and the joint line between it and the humeral condyle. The forearm is taken into passive pronation and supination assessing for tenderness, inflammation and quality of movement.

Palpable Structures – Soft Tissue Structures

Medial Aspect

1. Ulnar Nerve
2. Wrist Flexor Pronator Group
3. Medial Collateral Ligament
4. Supracondylar Lymph Nodes

Posterior Aspect

1. Olecranon Bursae
2. Triceps Muscle

Lateral Aspect

1. Lateral Forearm Muscles
2. Lateral Collateral Ligament
3. Annular Ligament

Anterior Aspect

1. Cubital Fossa

Palpation of Landmarks.

The practitioner is positioned behind the patient, whose elbow is flexed to 90°.

Ulnar Nerve

The ulnar nerve is situated in a groove between the medial epicondyle and the olecranon process. The nerve is susceptible to injury as it passes under the medial collateral ligament of the elbow.

The nerve is gently palpated and is assessed for displacement and tenderness.

The ulnar nerve passes distally to cross the posterior aspect of the elbow joint and pierces the flexor carpi ulnaris muscle to enter the forearm.

Wrist Flexor Pronator Group

This is composed of four muscles.

- Pronator Teres
- Flexor Carpi Radialis
- Palmaris Longus
- Flexor Carpi Ulnaris

These four muscles share their origin at the medial epicondyle, commencing as a common tendon before dividing into the individual muscles.

The common tendon is palpated as well as the individual muscles to their approximate insertions. The muscles are assessed for pain, tenderness or signs of inflammation, which may result from repetitive or traumatic injury.

Pronator Teres

This muscle is deep to the other flexors and is not distinctly palpable but is clinically significant as the median nerve pierces it- distal to the elbow.

Flexor Carpi Radialis (FCR)

Palpation of this muscle is aided by the patient making a fist and radially deviating their wrist. FCR becomes apparent lateral to palmaris longus and is palpable to its origin.

Palmaris Longus

This muscle bisects the anterior aspect of the wrist, and marks the anterior surface of the carpal tunnel. To aid in the palpation of this muscle the patient is asked oppose their thumb and little finger making the tendon apparent at the wrist. The muscle and tendon is palpated to its origin at the medial epicondyle. (in approximately 7% of the population this muscle is absent).

Flexor Carpi Ulnaris

This muscle is difficult to palpate as it is not a prominent muscle. The muscle is palpated proximal to the pisiform bone to its origin at the medial epicondyle of the humerus.

Medial Collateral Ligament

This is a fan shaped ligament that covers the ulnar nerve and stabilises the humeroulnar joint medially. The medial collateral ligament arises from the medial epicondyle of the humerus and extends to the medial margin of the trochlear notch of the ulna. This ligament is not directly palpable but tenderness due to a sprain may be reproducible by palpating over the site of its passage.

Supracondylar Lymph Nodes

The medial supracondylar line is palpated for the presence of enlarged lymph nodes. If present, they may be indicative of an infection of the hand or forearm.

Olecranon Bursae

They are three olecranon bursae present in this region, the most common bursae to be inflamed is the subcutaneous olecranon bursa. Normally, this bursa is not palpable, but if inflamed tenderness will be reported.

Triceps Muscle

The triceps muscle has three heads :

- Long head
- Lateral head
- Medial head

The long head crosses both the glenohumeral and elbow joints. To facilitate the palpation, the patient is asked to lean on the examination table with their wrist, and the hand oriented anteriorly. This makes the muscle more visible and palpable.

The long head of triceps is subcutaneous and can be palpated on the posteromedial portion of the arm. The muscle is palpated from origin to insertion where it becomes continuous with that of the lateral head.

The lateral head is also subcutaneous and lies on the posterolateral aspect of the arm and is palpated in a similar manner as the long head.

The medial head is deeper and lies under the long head. As the medial head lies deep, only a small portion of this head is palpable.

The three heads of the triceps combine at the distal humerus at the triceps aponeurosis. This area is palpated and assessed for tenderness and signs of an inflammatory process.

Lateral Forearm Muscles

This group of three muscles arise from the lateral aspect of the elbow.

The muscles are:

- Brachioradialis
- Extensor Carpi Radialis Longus (ECRL)
- Extensor Carpi Radialis Brevis (ECRB)

Brachioradialis

To aid in the palpation of this muscle, the patient is asked to form a fist and place it in a neutral supination/pronation position while attempting to “lift” the examination table. The muscle is palpated from origin to insertion on the radial styloid process, assessing for tenderness.

ECRL and ECRB

To aid in the palpation of these muscles, the patient is asked to form a fist, radially deviate and extend their wrist against resistance. The muscles become palpably apparent at the wrist on the dorsal aspect just proximal to the second and third metacarpal. The muscles are palpated along their entire length to the lateral epicondyle of the humerus.

Lateral Collateral Ligament

The ligament is palpated from the origin on the lateral epicondyle of the humerus to its insertion on the radial head where it becomes continuous with the annular ligament, assessing for inflammation, tenderness or defect. The cordlike ligament is similar to the lateral collateral ligament of the knee.

Annular Ligament

This ligament encircles the radial head and has its origin and insertion on the radial notch of the ulna. The ligament is not palpable but may be tender if inflamed.

Cubital Fossa

This is a triangular space on the anterior aspect of the elbow with the following borders:

- lateral border – Brachioradialis
- Medial border – Pronator teres
- Superior border – imaginary line between the two epicondyles

From its lateral to medial borders the structures passing through the cubital fossa are:

- Musculocutaneous Nerve
- Biceps Tendon
- Brachial Artery
- Median Nerve

Musculocutaneous Nerve

This nerve lies lateral to the biceps tendon and provides muscular innervation and cutaneous sensation in the forearm. This nerve is not palpable but lies deep to the brachioradialis muscle.

Biceps Tendon

To aid in palpation of this structure, the patient is asked to resist flexion of the forearm. In the cubital fossa the biceps tendon lies medial to the brachioradialis muscle.

The muscle is palpated from origin to insertion.

Brachial Artery

The pulse of the brachial artery is palpated immediately medial to the biceps tendon. The pulse is assessed for rate, rhythm and amplitude and is compared with other pulses.

Median Nerve

This is a difficult structure to palpate, lying directly medial to the brachial artery.

Once both bony and soft tissue structures have been palpated active and passive range of motion is carried out to assess range and quality of movement.

Orthopaedic Examination.

As with the shoulder the active examination of the elbow can be carried out bilaterally, allowing for a more accurate assessment of ease, quality and range of movement.

Normal Range of Movement.*

- Flexion – 135 +°
- Extension – 0°/-5°
- Supination – 90°
- Pronation – 90°

Ref (Passor Musculoskeletal Physical Examination Competencies Lists 2000-2001)

* As with all range of motion, range of motion can vary with age, sex and occupation. The degrees of motion shown above are a guide.

Active Movements.

This examination can be carried out either standing or sitting.

- Flexion
- Extension
- Supination
- Pronation

N.B. Pronation and Supination is carried out with the forearm flexed to 90° for a pure elbow movement.

Passive Movements.

This aspect of the examination is carried out with the patient sitting.

- Flexion
- Extension
- Supination
- Pronation.

Again as with the active movements pronation and supination is carried out with the forearm flexed to 90°.

Special Tests.

The special tests for the elbow assesses for medial and lateral epicondylitis as well as ulna nerve compression.

Lateral Epicondylitis. Tennis Elbow.

This test assesses for tendonitis affecting the common extensor tendons of the forearm inserting onto the lateral epicondyle of the humerus.

This test is a progressive stress test, therefore once the patient “feels” pain the test must stop, even if the full test has not been completed. The findings of your test will be determined on how much of the test your patient is able to complete.

The elbow is in full flexion and in the anatomical position. The practitioner then brings the hand into pronation, flexes the wrist. The pressure is kept onto the flexed wrist and the elbow is taken into extension. If, during this combined movement pain is reported over the lateral epicondyle, the test is stopped.

To further stress the tendon, the patient makes a fist and the wrist is extended. In this position pressure is applied by the practitioner on the wrist pushing the wrist back to a neutral position, while the patient resists. Again if pain is reported, the test is stopped.

The wrist is then returned to a neutral position and radially deviated. The patient is asked to hold this position resisting the practitioner’s pressure. (the practitioner is pushing the wrist from the radial deviation to ulna deviation).

Again if pain is reported over the lateral epicondyle, the test is stopped.

The final aspect of this test, puts the maximum stress on the tendon. The wrist is in a neutral position and flexed. The practitioner then applies extension of the wrist while the patient resists. This is the weakest position of the extensor muscles, therefore the last stage of the progressive stress test.

The results of this test are recorded to what the patient reports. i.e. pain reported on extension of the elbow and radial deviation of the wrist.

Medial Epicondylitis. Golfers Elbow.

This test assesses for tendonitis affecting the common flexor tendons of the forearm, attaching onto the medial epicondyle of the humerus.

As with the “ tennis elbow” tests, this is a progressive stress test, and if pain is reported at any stage of the test it must be stopped.

The arm is in the anatomical position with the elbow flexed. The hand is supinated, and the elbow is extended. This combination of movement assesses the first level of stress on the tendon.

The patient then forms a fist and flexes the wrist. The practitioner then applies a pressure in taking the wrist into extension while the patient resists. This is the second level of stress onto the tendon.

The final stage of the stress test is to extend the patient's wrist. The practitioner applies a pressure to move the wrist into a flexed position while the patient resists.

As with the lateral epicondyle tests, results are recorded to what the patient reports.

Tinnel's Sign.

The tinnel's sign in the elbow tests for ULNA NERVE dysfunction. The nerve can be compressed in the ulna groove on the medial aspect of the humerus. Compression of the nerve can cause diffuse pain, pins and needles or radiations in the ulna nerve distribution. (medial aspect of the forearm to the 4th and 5th digit). The nerve can be damaged due to trauma or degenerative changes to the elbow. (affecting the carrying angle).

Initially palpation over the ulna nerve may reproduce symptoms. If by palpation symptoms are reproduced, the test is not continued. To further aggravate symptoms percussion over the ulna groove is carried out. Initially with the practitioner's fingers. If the symptoms are not reproduced, percussion with a patella hammer is indicated.

The findings are recorded to what the patient reports, and to what method the symptoms were reproduced.