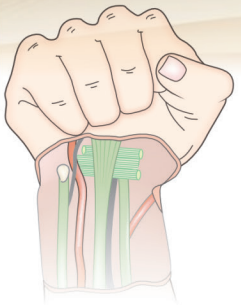
Chapter 1



Superior Extremity

Competencies:

AN13.6 Identify and demonstrate important bony landmarks of upper limb: Jugular notch, sternal angle, acromial angle, spine of the scapula, vertebral level of the medial end and inferior angle of the scapula.

AN13.7 Identify and demonstrate surface projection of: Cephalic and basilic veins, palpation of brachial artery, radial artery, testing of muscles: Trapezius, pectoralis major, serratus anterior, latissimus dorsi, deltoid, biceps brachii, brachioradialis.

SHOULDER, AXILLA, ARM AND ELBOW REGIONS

SURFACE LANDMARKS (ANTERIOR ASPECT) (Fig. 1.1)

- **Clavicle** lies horizontally at the root of the neck. As it is subcutaneous, it can be felt (palpated) throughout its length.
- **Anterior axillary fold** is formed by the rounded lower border of pectoralis major. It becomes prominent when the abducted arm is adducted against resistance.
- **Clavicular head of pectoralis major** can be recognised as it contracts when the arm is flexed to a right angle.
- **Coracoid process** points almost straightforward, 2–3 cm vertically below the junction of the lateral fourth and medial three-fourths of the clavicle. Anterior fibres of deltoid cover it.
- **Tip of acromion** is situated lateral to the acromioclavicular joint and can be easily felt.
- **Deltoid** insertion can be identified when the arm is maintained in the abducted position. It is half a way down the lateral aspect of humerus. Its anterior border can also be easily seen.
- **Greater tubercle of humerus** is the most lateral bony point in the shoulder region. It can be felt deep to the deltoid muscle, just below the acromion.
- **Lesser tubercle of humerus** lies 3 cm below the tip of the acromion on the anterior aspect of the shoulder.
- **Medial epicondyle of humerus** is a conspicuous landmark felt easily on the medial side in a flexed elbow.

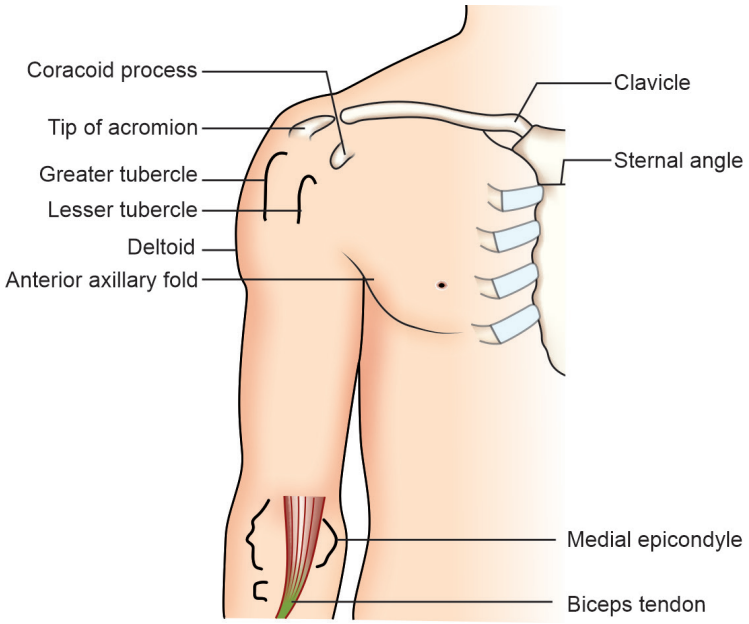


Fig. 1.1: Surface landmarks—shoulder, axilla, arm and elbow regions (anterior aspect)

- **Sternal angle (angle of Louis)** can be easily felt as a ridge by running the finger downwards on the sternum from the suprasternal notch. Traced laterally, it leads to second costal cartilage. The ribs can be counted downwards after the second rib has been located.
- **Tendon of biceps** becomes prominent when the elbow is flexed, it can be grasped in the cubital fossa.

SURFACE LANDMARKS (POSTERIOR ASPECT) (Fig. 1.2)

- **Acromial angle:** Lower border of the crest of the spine continues with the lateral border of the acromion at this angle.
- **Olecranon process** can be felt well to the inner side of the midpoint of the interepicondylar line in an extended elbow. The tip of the olecranon and the two epicondyles form an isosceles triangle when the elbow is flexed.
- **Crest of the scapular spine** is subcutaneous throughout its length. It runs downwards and medially to reach the medial border of the bone opposite to the third thoracic spine.
- **Head of the radius** is situated below the lateral epicondyle of humerus in the hollow below the elbow on the extensor surface of the forearm. It can be left rotating in pronation and supination movements.
- **Inferior angle of scapula** can be felt at the level of the seventh thoracic spine when the medial border of scapula is traced downwards.
- **Nipple and areola** (Fig. 1.3)**:** Nipples are located in the 4th intercostal space about 10 cm from midsagittal plane. Nipple is surrounded by a pigmented circular area called areola. Position of nipple is variable even in males; hence it is not useful to correlate with other structures or rib counting.

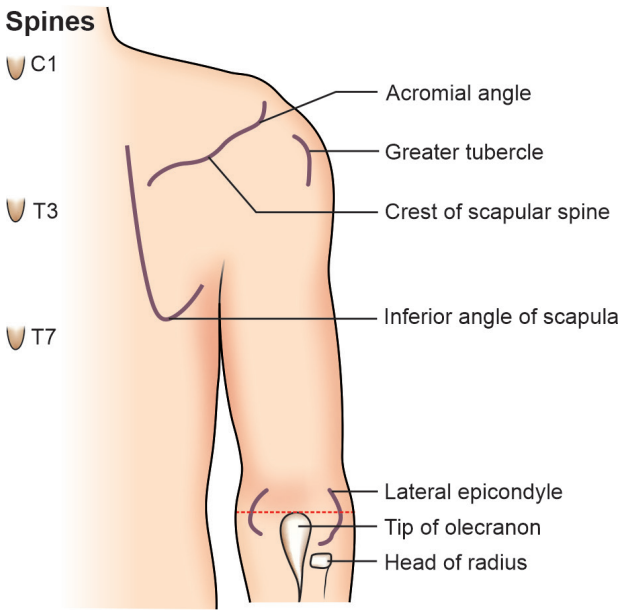


Fig. 1.2: Surface landmarks—shoulder, axilla, arm and elbow regions (posterior aspect)

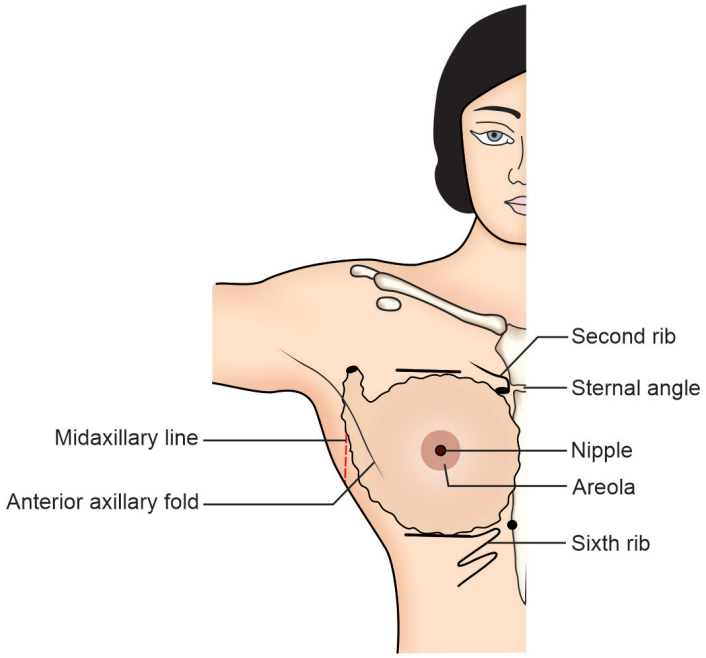


Fig. 1.3: Surface landmarks—nipple, areola (anterior aspect, female)

SURFACE MARKINGS

Joints

Elbow Joint

On the front, the plane of the joint can be represented as follows (Fig. 1.4a):

- Put a point 2 cm below the medial epicondyle.
- Mark a point 2 cm below the lateral epicondyle.

Join these points by a line directed downwards and medially. The line is oblique because of the carrying angle and also represents the distal limit of the cavity of the joint.

The proximal limit of the joint cavity can be represented on the front of the arm by the following line (Fig. 1.4b).

- Put a point just above the tubercle on the coronoid process.
- Mark a point over the most lateral part of the front of the medial epicondyle.
- Put a point on the front of the lateral epicondyle.
- Mark the level of the head of the radius.
- Draw a curved line from the first point arching across to the last point.

On the back, the *plane of the elbow joint* can be represented as follows (Fig. 1.5a):

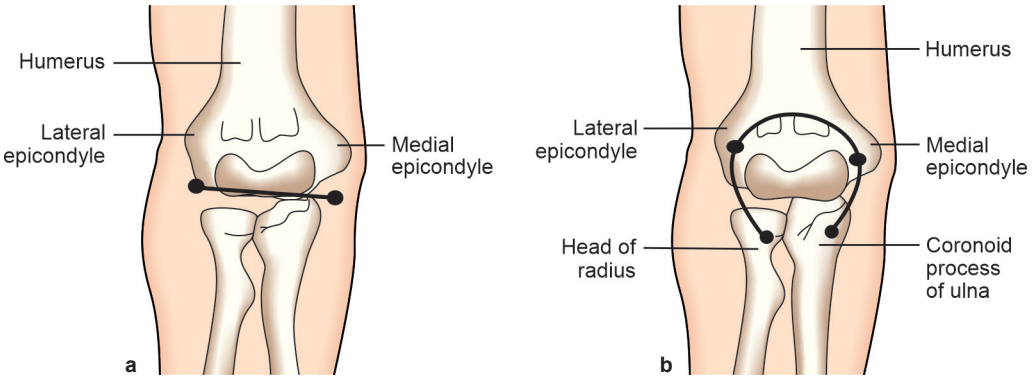
- Put a point in the depression between the head of the radius and the lateral epicondyle.
- Mark the tubercle on the medial border of the coronoid process.

Join these points by a line which also represents the distal limit of the joint cavity.

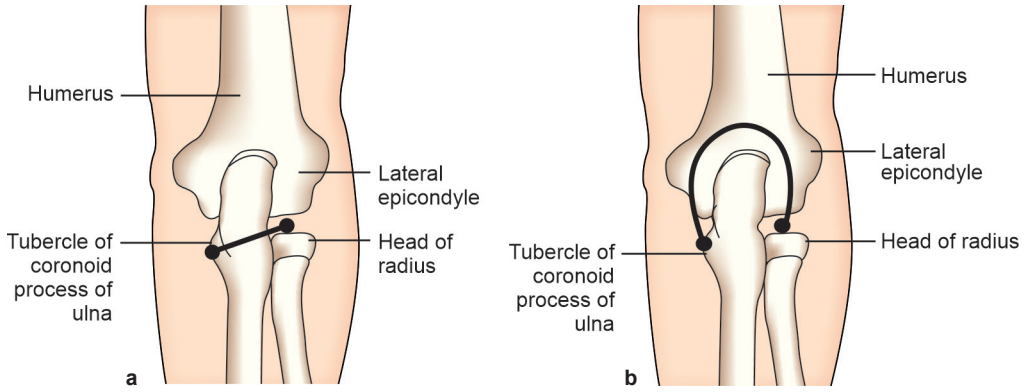
The proximal limit of the joint cavity can be represented on the back of the elbow as follows (Fig. 1.5b):

- Mark a point in the depression between the head of the radius and the lateral epicondyle.
- Put a point on the tubercle, on the medial border of the coronoid process.

Draw a line from the first to the second point by an arch a little wide of the outline of the olecranon process.



Figs 1.4a and b: Elbow joint (front)



Figs 1.5a and b: Elbow joint (back)

Clinical Anatomy

- Surface marking of elbow joint is useful for detection of dislocation of the elbow, pulled elbow and for aspiration of elbow effusion.
- Normal carrying angle is 11–17°. It is 3° more in females than in males. In cubitus valgus deformity, the carrying angle is greater than normal, whereas in cubitus varus (gunstock deformity), it is less than the normal.

Shoulder Joint

The joint line can be represented *on the front* as follows (Fig. 1.9):

- Put a point on the coracoid process.
  Draw a line downwards from the above point.

The joint line can be represented *on the back* as follows (Fig. 1.7):

- Put a point on the acromial angle.
  Draw a line downwards from the above located point.

Clinical Anatomy

Surface marking of shoulder joint is useful for detection of dislocation of the shoulder and for aspiration of effusion of shoulder joint.

NERVES

Axillary Nerve (Fig. 1.7)

- Mark the midpoint of the line joining the tip of acromion to the deltoid insertion.
- Put a point 2 cm above the midpoint of the above line. Draw a transverse line from the second point across the deltoid muscle.

Clinical Anatomy

Intramuscular injection should be given in lower part of the deltoid muscle to avoid injury to the axillary nerve.

Median Nerve in the Arm (Fig. 1.6)

- Put a point in the medial bicipital groove behind coracobrachialis to mark the commencement of the brachial artery.
- Mark a point in the cubital fossa medial to palpable brachial artery.
- Join these points by a line to represent the brachial artery.

To represent the median nerve, draw a line which should lie lateral to the brachial artery in upper half and medial to its lower half.

Musculocutaneous Nerve (Fig. 1.6)

- Put a point 5 cm below the coracoid process.
- Mark the midpoint of the elevation caused by the biceps.
- Put a point lateral to the tendon of biceps.

Join these points to get its surface marking.

Radial Nerve in the Arm (Figs 1.6 and 1.7)

- Put a point where the posterior wall of axilla and arm meet.
- Join the insertion of the deltoid to the lateral epicondyle by a line. Put a mark on the junction of the upper and middle-third of this line.
- Put a mark at the level of lateral epicondyle 1 cm lateral to the tendon of biceps.

These points should be joined by a line crossing the elevation produced by long and lateral heads of triceps.

Clinical Anatomy

Saturday night palsy is a result of an injury to the radial nerve in the radial groove.

Ulnar Nerve in the Arm (Fig. 1.6)

- Put a point at the commencement of the brachial artery at the medial bicipital groove behind coracobrachialis by feeling its pulsation.

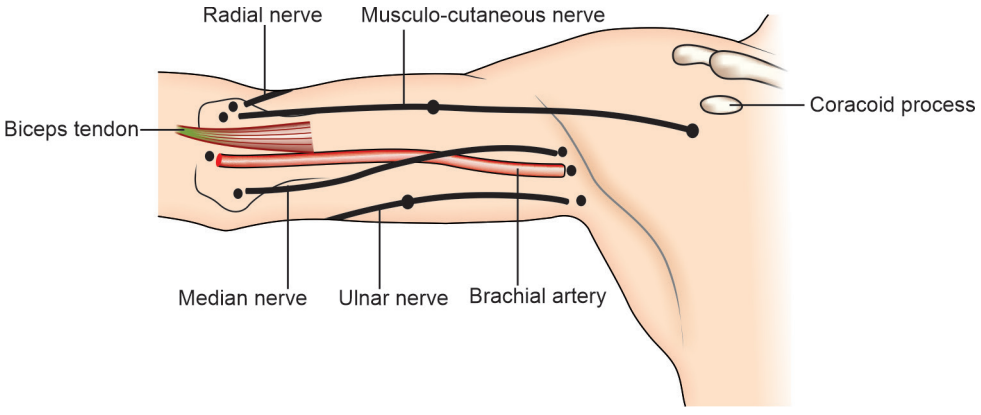


Fig. 1.6: Nerves in the front of arm

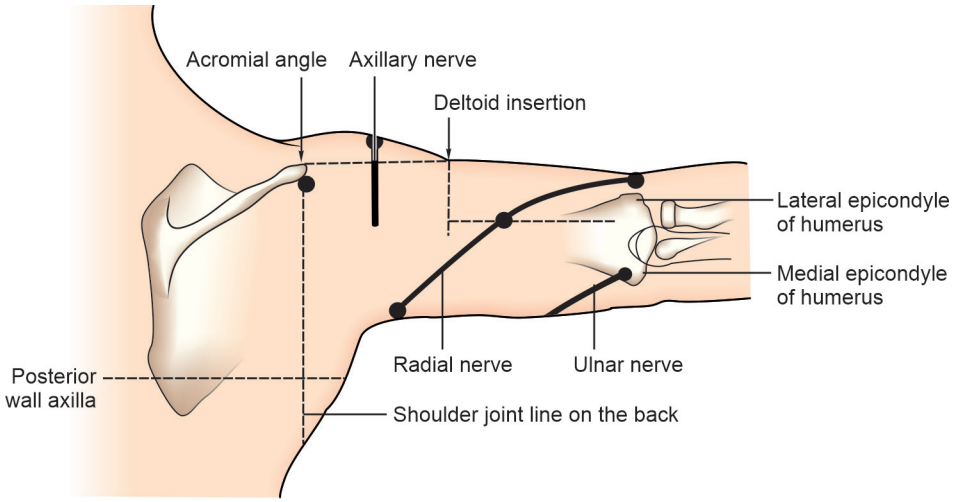


Fig. 1.7: Nerves in the back of arm

- Mark the midpoint of the brachial artery.
- Put a mark on the back of the medial epicondyle where ulnar nerve can be rolled.

Draw a line following the medial side of the brachial artery half-way down its course. The line should then diverge to join the point on the back of medial epicondyle.

VESSELS

Axillary Artery (Fig. 1.3)

Axillary artery is a continuation of subclavian artery at the outer border of 1st rib. Axillary artery continues as brachial artery at the lower border of teres major muscle. Abduct the arm to a right angle.

- Mark the midpoint of clavicle.
- Put a point below the coracoid process.
- Put a point on the pulsation of the lower part of the axillary artery in the groove behind the coracobrachialis muscle in front of the posterior axillary fold.

Join these points by a broad curved line.

Brachial Artery (Fig. 1.8)

Brachial artery begins as a continuation of axillary artery at the lower border of teres major muscle. It terminates at the level of neck of radius (in the cubital fossa) by dividing into radial and ulnar arteries.

- Put a point on the pulsation of the lower part of axillary artery on the medial side of the arm, just in front of the posterior axillary fold.
- Mark a point at the level of the neck of the radius in the middle line of the cubital fossa.

Join these points to get the surface marking.

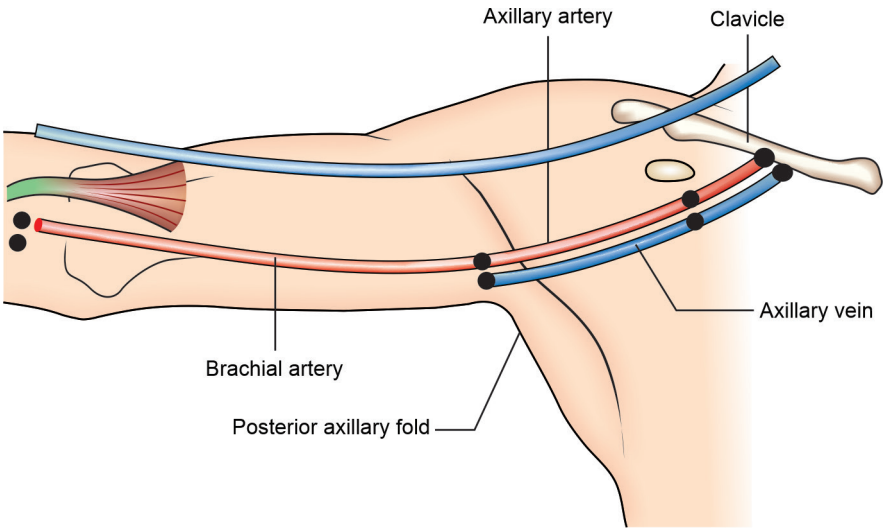


Fig. 1.8: Brachial artery

Clinical Anatomy

The pulsation of brachial artery can be felt in the cubital fossa, medial to the tendon of biceps brachii. During the measurement of blood pressure, the brachial artery is auscultated in the cubital fossa.

Axillary Vein (Fig. 1.8)

- Mark the midpoint of the clavicle.
- Put a point below the coracoid process.
- Mark a point above the lower border of the posterior wall of axilla.

Join these points by a line.

Basilic Vein (Fig. 1.9)

- Put a point on the inner side of the arm half a way between the axilla and the medial condyle.
- Mark a point on the anterior surface of the forearm below the elbow towards the medial side.

Join the above two points by a line.

Cephalic Vein (Fig. 1.9)

- Put a point in the deltopectoral groove below the coracoid process.
- Mark a point in front of the elbow in the groove between the brachioradialis and the biceps.

Join these points by a line which first ascends up and then arches towards the first point.

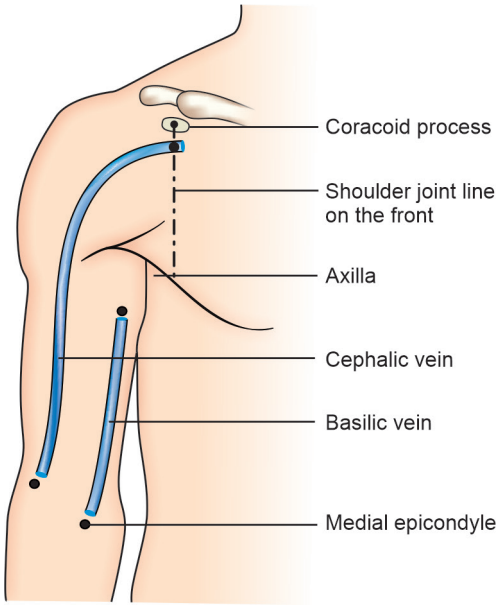


Fig. 1.9: Veins of arm

FOREARM

SURFACE LANDMARKS (Figs 1.10 and 1.11)

- **Hamate hook** can be felt distal to pisiform and nearer the centre of palm by deep pressure.
- **Pisiform bone** forms an elevation on the medial part of the base of the hypothenar eminence, and can be distinguished by tracing downwards the tendon of flexor carpi ulnaris.
- **Radius, dorsal tubercle** is situated near the middle of the posterior aspect of the lower end of the radius in line with the cleft between the index and middle fingers.
- **Radius, lower end** causes a little elevation on the lateral side of the wrist, about 1 cm above the base of the thenar eminence.
- **Radius, styloid process** can be found by tracing the lateral aspect of the lower end of radius downwards. It lies 1.75 cm below and slightly on a more anterior plane than the styloid process of ulna.
- **Dorsal tubercle of lister** is small, pointed tubercle on the posterior surface of radius.
- **Ulna, head** forms a round elevation on the medial side of the posterior aspect of the wrist in a pronated hand.
- **Ulna, posterior border** lies in the furrow on the back of a fully flexed forearm. It extends from the subcutaneous surface of the olecranon to the styloid process of ulna below.

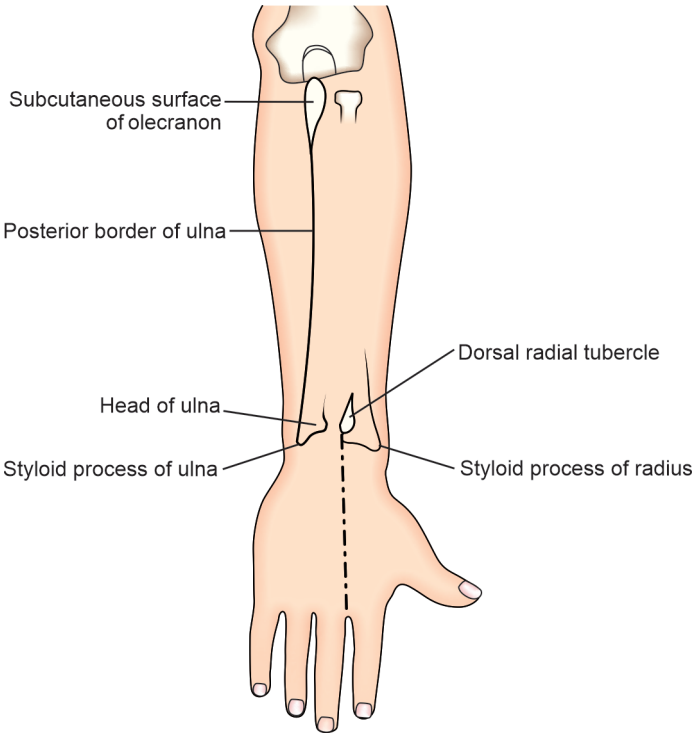


Fig. 1.10: Surface landmarks—back of forearm

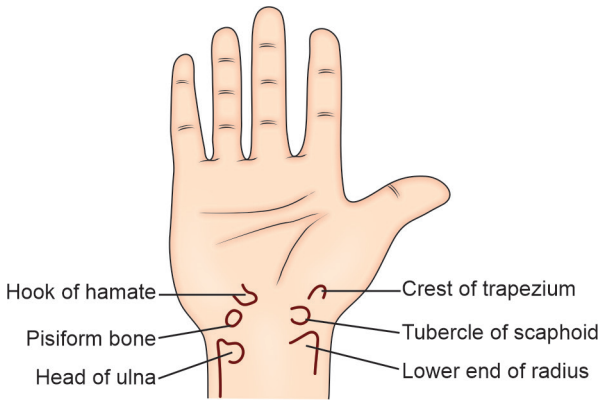


Fig. 1.11: Surface landmarks—wrist and palm

- **Ulna, styloid process** can be determined by following the posterior border of ulna downwards. It will be found projecting downwards from the ulnar head.
- **Scaphoid, tubercle** is situated in the base of the thenar eminence and is partly hidden by the tendon of the flexor carpi radialis muscle. It is felt below the lower end of radius.
- **Trapezium, crest** can only be recognised by applying deep pressure over the thenar muscles below and external to the tubercle of scaphoid.