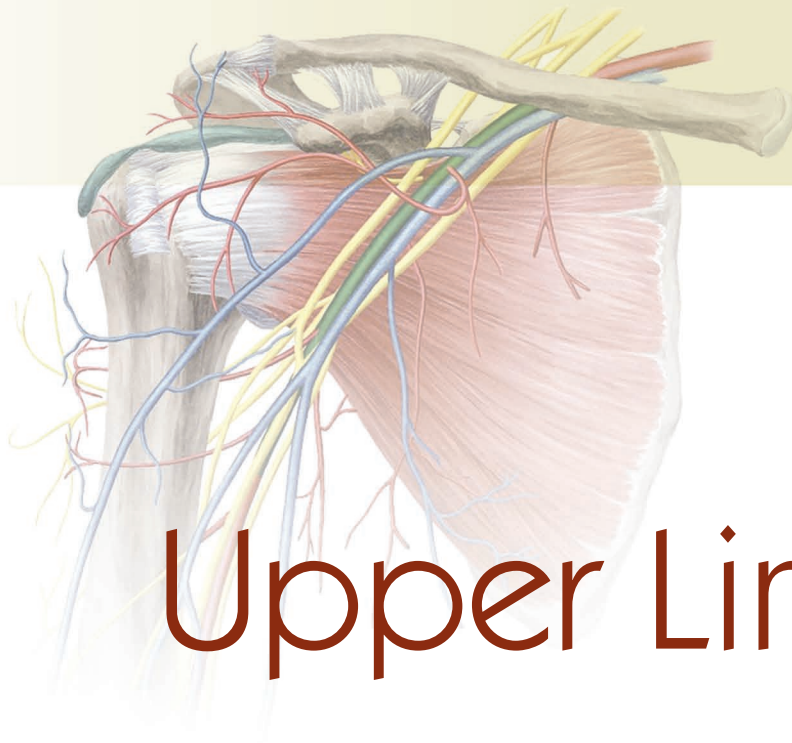




Section

1

Upper Limb

- Bones
- Pectoral Region and Axilla
- Artery
- Back and Scapular Region and Veins of Upper Limb
- Anterior Arm and Cubital Fossa
- Posterior Arm
- Forearm
- Hand
- Joints

Case

A 40 years old drunk male was admitted to the hospital after he fell from his balcony on outstretched hand. He came with left arm resting on side of thorax with elbow supported by the other hand. X-ray revealed that he has fracture of the left clavicle.

Q. Which is the most common site of fracture of clavicle?

A. Fracture of the clavicle most commonly occurs at the junction of medial 2/3 and lateral 1/3 which is the weakest point of the bone (Fig. 1.1)

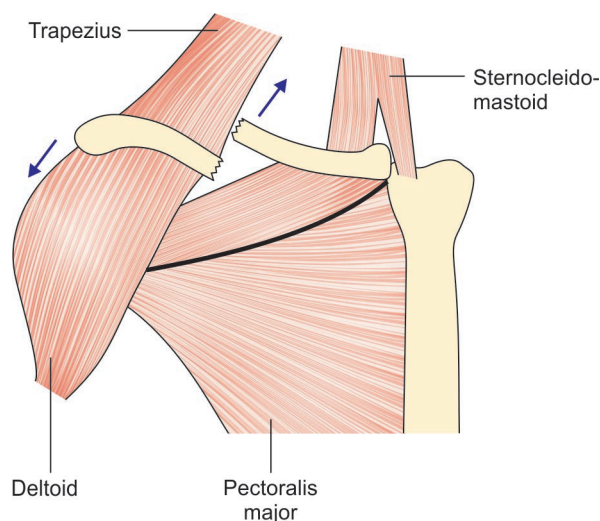


Fig. 1.1: Fracture of clavicle

Q. Why lateral segment of the fracture bone displaced downwards?

A. Due to weight of upper limb as trapezius alone is unable to support the weight of upper limb.

Q. What is greenstick fracture?

A. Here, there is fracture of the cortex of the bone but the periosteum is intact. It is treated conservatively by immobilization with application of brace in the figure of eight. This type of fracture is more common in children.

Q. Which is the most common fracture that occurs in children?

A. Fracture of clavicle is the most common fracture that occurs in children.

Q. Why clavicle is considered long bone?

A. Like a long bone clavicle has two ends and one shaft. It also takes part in transmission of weight of upper limb to axial skeleton. But clavicle is horizontally placed, is devoid of medullary cavity and is occasionally pierced by middle supraclavicular nerve. This is the reason why clavicle is called modified long bone.

Q. What is cleidocranial dysostosis?

A. Cleidocranial dysostosis (Fig. 2.5; *BD Chaurasia's Human Anatomy*, Vol 1) is the condition in which development of teeth and bones is primarily affected. The shoulders can be approximated anteriorly in front of chest due to absence of clavicle. Other symptoms include delayed maturation of skull bone, delayed or nonclosure of fontanelles, peg-like teeth, misalignment of teeth and jaws, etc.

Case

A scuffle broke out between two persons. One of them attacked the other with iron rod. The rod struck the victim on his deltoid region which caused the fracture of the surgical neck of the humerus and injury to a nerve along the surgical neck of the humerus. He has associated sensory loss over the shoulder area.

Q. Which nerve is injured in this case?

A. Axillary nerve as it winds round the surgical neck of the humerus (Fig. 1.2).

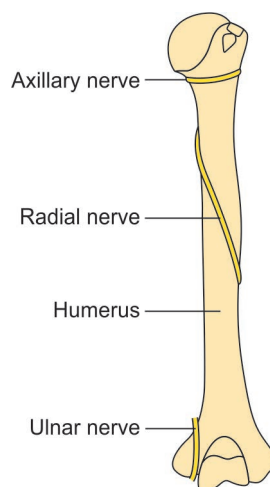


Fig. 1.2: Nerves related to humerus

Q. Which muscles are affected in this case?

A. Deltoid and teres minor

Q. Which movements are lost in such injury?

A. Abduction from 15° to 90° is lost due to paralysis of deltoid. There is weakness in lateral rotation of arm due to paralysis of deltoid and teres minor.

Q. What is regiment badge anesthesia?

A. Sensory loss on the skin over the lower half of the deltoid muscle is called regiment badge anesthesia as badge of the army regiment on the sleeve is located over this region.

Q. Why there is loss of rounded contour of the shoulder after some time in such injury?

A. Paralysis of the deltoid muscle causes disuse atrophy of the muscle resulting in flattening of the rounded contour of the shoulder. The greater tubercle of humerus becomes prominent.

Q. What are the other causes for the injury to the axillary nerve?

A. Axillary nerve may also be injured in inferior dislocation of the head of humerus or during intramuscular injection in the deltoid.

Q. What is position of shoulder in fracture of anatomical neck of the humerus?

A. There is drooping of the shoulder in fracture of anatomical neck of the humerus.

Q. What are the common sites of fracture of humerus in a case of a fall in each following condition? Which important structure can be damaged depending on the site of the fracture?

- A fall in an elderly person with osteoporosis: Surgical neck of humerus—axillary nerve.
- A fall on the elbow with forearm flexed: Intercondylar fracture—median nerve.
- Falling on shoulder: Avulsion fracture of greater tubercle—muscles attached to greater tubercle.
- Falling on hand with shoulder abducted: Spiral fracture of shaft of humerus—radial nerve.

Case

A 10 years old boy was involved in a road accident. His right forearm and hand were badly crushed with uncontrolled bleeding. So, amputation of his affected arm was performed. 2 years after the surgery the boy was brought again to the doctor for painful conical stump at the site of the amputation.

Q. Why the boy came back with painful conical stump at the site of amputation?

A. Upper end of the humerus is growing end. Enough soft tissue should be left at the site of amputation for future growth of the bone, otherwise it causes formation of painful conical stump.

Q. How the growing end of the bone can be decided by examining a bone of limb?

A. The nutrient foramina is directed away from the growing end of a long bone. So, by examining the direction of nutrient foramina, growing end of the bone can be decided.

Q. How to remember the growing ends of upper and lower limbs with respect of elbow and knee?

A. The direction of nutrient foramina in bones of upper and lower limbs can be remembered as follows 'to the elbow I go, from the knee I flee'. So opposite end to the direction of the nutrient foramina is the growing end of the bone.

Case

A 22 years male was involved in an accident while riding his motor bike. On examination, pronation and supination of forearm was found deficient. X-ray examination revealed fracture of upper 1/3 of ulna with dislocation of head of radius from superior radio-ulnar joint.

Q. What is this fracture called?

A. Monteggia fracture (Fig. 1.3)

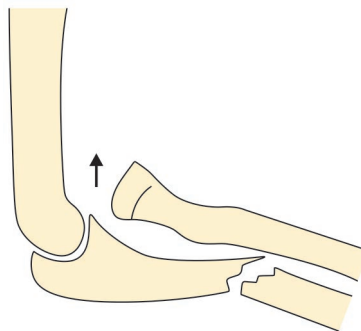


Fig. 1.3: Monteggia fracture

Q. What are the types of this condition?

A. Two types:

1. **Extension type:** Ulna angulates anteriorly and radius also dislocates anteriorly.
2. **Flexion type:** Ulna angulates posteriorly and radius also dislocates posteriorly.

Q. What is Galeazzi fracture?

A. It is fracture of distal 1/3 of radius with dislocation of head of ulna from inferior radio-ulnar joint (Fig. 1.4).

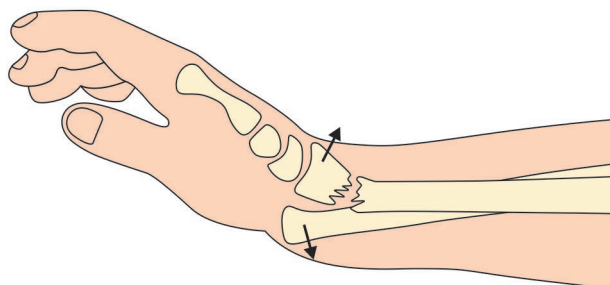


Fig. 1.4: Galeazzi fracture

Q. What is night-stick fracture?

A. It is a fracture of ulna which occurs when a night watchman reflexly raises his forearm to protect against a blow of a stick and so the stick hits the ulna.

Case

A 66 years old woman comes to the hospital after she fell on the wet bathroom floor. Examination revealed a bulging on posterior aspect of distal forearm. X-ray reveals fracture of the radius about 2 cm above its lower end. The broken distal segment is displaced backwards and upwards.

Q. What is this fracture called?

A. Colles' fracture

Q. What is the position of radial styloid process in this kind of fracture?

A. The radial styloid process comes to lie proximal to ulnar styloid process. Normally it is distal to ulnar styloid process.

Q. What is the deformity in this case?

A. Due to posterior displacement of the distal part of radius there is bulging in the lower part of posterior aspect of forearm. This kind of deformity is called dinner fork deformity (Fig. 1.5).

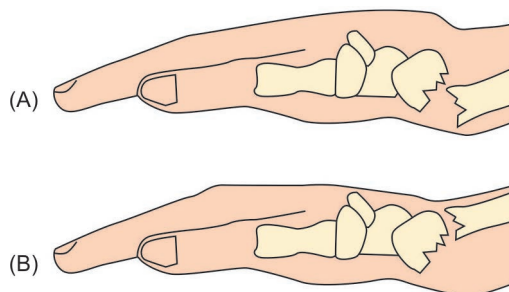


Fig. 1.5: A.Colles' fracture, B.Smith's fracture

Q. Which carpal bones are often fractured or dislocated with Colles' fracture?

A. Scaphoid and lunate as they are in direct articulation with the radius.

Q. What is Smith's fracture?

A. When the distal detached part of the radius is displaced anteriorly, it is called Smith's fracture. It is produced due to fall on the back of hand.

Case

A 25 years old athlete is brought to the emergency department after he fell while running and landed on the tips of his left-hand finger. The doctor noticed tenderness and swelling in the anatomical snuff box. X-ray of hand showed fracture of a carpal bone in the floor of the anatomical snuff box.

Q. Which bone is most likely affected in this case?

A. Scaphoid

Q. What are the boundaries of the anatomical snuff box?

A. Anatomical snuff box is bounded laterally by tendons of abductor pollicis longus and extensor pollicis brevis and medially by the tendon of extensor pollicis longus. The floor is formed scaphoid, trapezium and base of first metacarpal (Fig. 1.6).

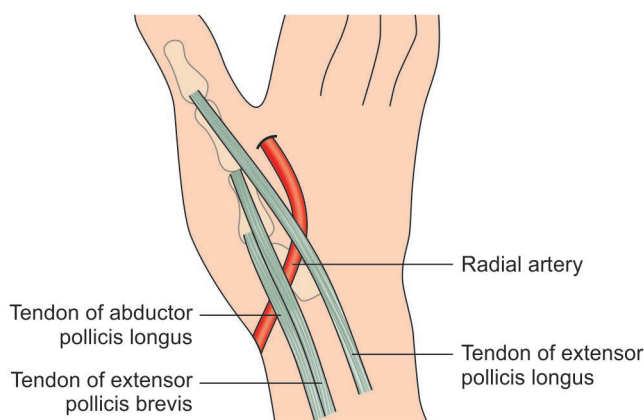


Fig. 1.6: Boundaries and content of anatomical snuff box

Q. Mention the content of the anatomical snuff box.

A. Radial artery

Q. Why avascular necrosis of the affected bone is common?

A. Normally the scaphoid is supplied by two nutrient arteries. One enters the palmar surface of the tubercle and the other the dorsal surface of the body. Occasionally, both the vessels enter through the distal half of the bone. In such cases, fracture of scaphoid will cause loss of blood supply to proximal half of the bone leading to avascular necrosis (Fig. 1.7).

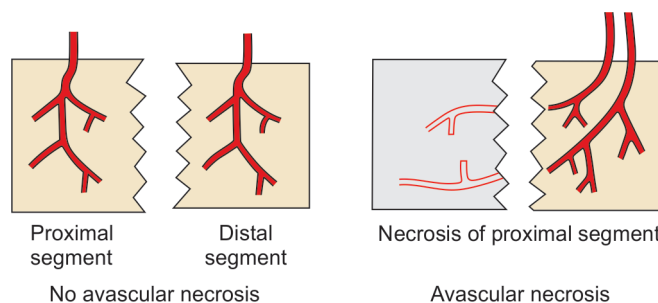


Fig. 1.7: Avascular necrosis of scaphoid

Case

A 23 years old male runner came to doctor with complaint of pain in his right wrist after he fell on the track on outstretched hand. X-ray examination reveals dislocation of a carpal bone.

Q. Which carpal bone is most likely dislocated?

A. Lunate

Q. Why lunate is most commonly dislocated?

A. The palmar surface of the lunate is broader than its dorsal surface which is opposite to other carpal bones. So, it easily slips when struck on outstretched hand (Fig. 1.8).

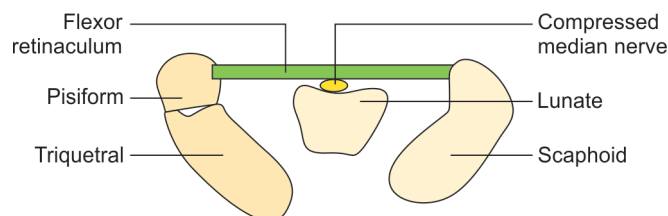


Fig. 1.8: Dislocation of lunate compressing median nerve

Q. What is the direction of dislocation of this bone?

A. Lunate usually dislocates anteriorly.

Q. Which nerve can be compressed in dislocation of this bone?

A. Median nerve in carpal tunnel can be compressed which leads to carpal tunnel syndrome like features.

Case

A 25 years old professional boxer came to the emergency department with complaint of pain in his right hand. He confessed that he had practice vigorously for getting ready for a tournament. Examination of his hand revealed that medial side of hand was quite swollen and medial knuckle was not seen when he made a fist. The doctor made diagnosis of fracture of metacarpal.

Q. What is this condition called?

A. Boxer's fracture (Fig. 1.9).

Q. Which bone is fractured in this condition?

A. Neck of fifth metacarpal.

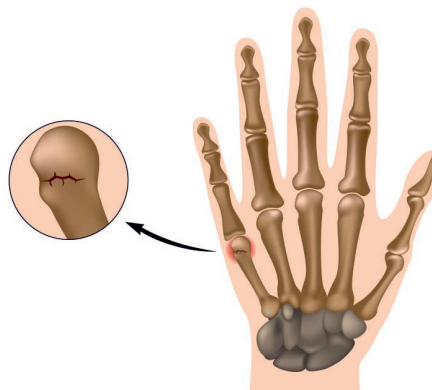


Fig. 1.9: Boxer's fracture

Q. What is Bennett's fracture?

A. It is an oblique intra-articular fracture of base of first metacarpal with subluxation of metacarpal (Fig. 1.10).



Fig. 1.10: Bennett's fracture

Q. Which muscle is called boxer's muscle?

A. Serratus anterior is called boxer's muscle as its action is required to make punches during boxing. Paralysis of serratus anterior causes loss of pushing and punching movements.

PECTORAL REGION AND AXILLA

Case

A 26 years old nursing mother who gave birth to a baby two months back visited the doctor with complaint of pain in her right breast. On examination the doctor found that the right breast was swollen and tender on palpation. USG of breast revealed collection of pus in the affected breast.

Q. What is probable diagnosis?

A. Breast abscess.

Q. What are the types of breast abscess according to its location in the breast region?

A. These are intramammary (in the breast) and retromammary (in the retromammary space).

Q. What is the probable reason of breast abscess in this case?

A. Intramammary abscess in a nursing mother usually occurs due to retrograde infection from the nipple. (Retromammary abscess usually occurs due to spread of infection from tuberculosis of ribs, empyema, etc.)

Q. How the intramammary breast abscess is drained?

A. Intramammary abscess is drained by giving a radial incision at the affected area under USG guidance. Radial incision is given in order to avoid injury to the lactiferous ducts (Fig. 1.11).

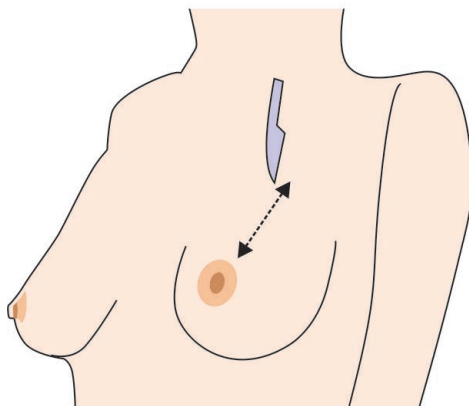


Fig. 1.11: Radial incision for drainage of breast abscess

Q. How is retromammary abscess drained?

A. Retromammary abscess is drained by submammary incision (Fig. 1.12).

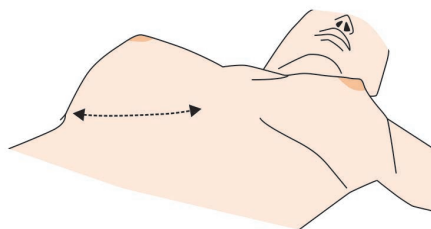


Fig. 1.12: Submammary incision for retromammary abscess

Case

A 22 years old female visited the doctor with complaint of a lump in the upper and inner quadrant of her right breast. On inspection, both the breasts were symmetrical and nipple areola complex was normal. On palpation, the doctor found that there was a solitary, smooth, well defined and mobile nodule in her right breast. The axillary lymph nodes were nonpalpable. Mammograph confirmed the same findings.

Q. What is probable diagnosis?

A. Fibroadenoma of breast.

Q. What is the cause of this condition?

A. Aberration of normal development and involution (ANDI).

Q. From which type of ducts fibroadenoma and carcinoma arise?

A. Fibroadenoma usually arises from distal smaller ducts, whereas carcinoma usually arises from larger ducts (Fig. 1.13).

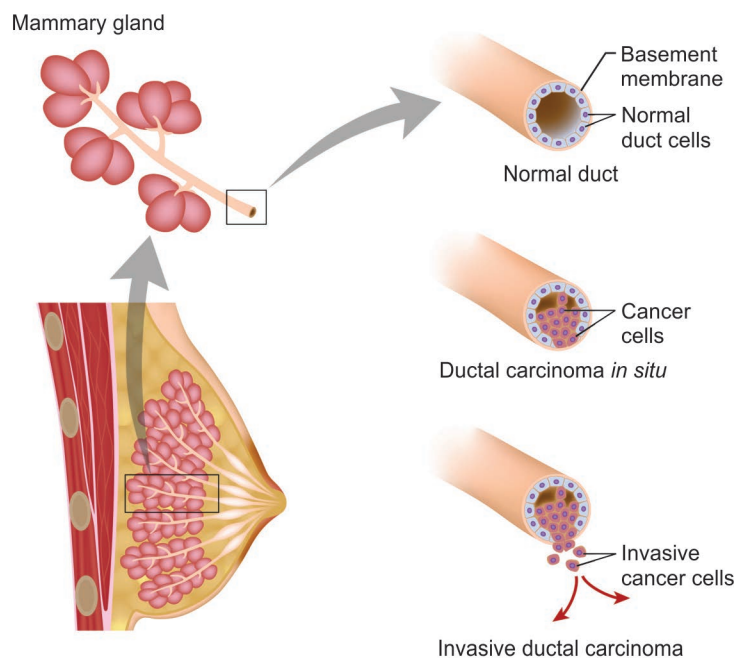


Fig. 1.13: Ductal carcinoma

Q. What are the types of this condition?

A. Intracanalicular and intercanalicular.

Q. How is this condition treated?

A. Enucleation, i.e. removal of nodule

Case

55 years old female visited the doctor with complain of a lump in upper and outer quadrant of her left breast. On examination the doctor found that skin of left breast was puckered and gave appearance of skin of an orange and the nipple was retracted. On palpation he found that the breast was fixed and axillary lymph nodes were enlarged.

Q. What is probable diagnosis?

A. Carcinoma of breast.

Q. Which quadrant of the breast is most commonly involved in carcinoma of breast?

A. Upper outer (superolateral) quadrant. Carcinoma usually arises from the larger duct system (Fig. 1.14).

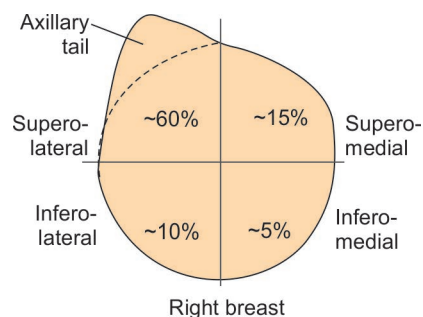


Fig. 1.14: Breast quadrants showing incidence of carcinoma

Q. Give anatomical basis for the puckering of the skin.

A. Infiltration of carcinoma into the suspensory ligament of Cooper and their subsequent contraction can cause retraction or puckering of the skin (Fig. 1.15).

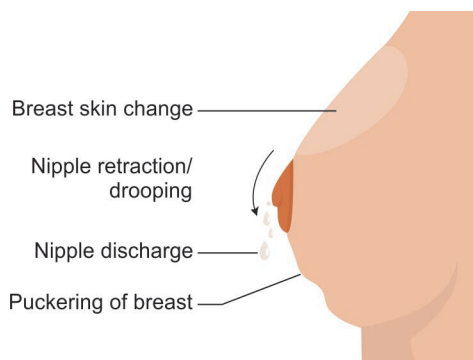


Fig. 1.15: Puckering of skin

Q. Give anatomical basis for the orange like appearance of the skin.

A. Infiltration and subsequent obstruction of the superficial lymphatics may produce oedema of the skin and fixation of hair follicle to subcutaneous tissue, thereby giving appearance like that of skin of an orange. This condition is known as Peau d'orange or oedema with pitting (Fig. 1.16).

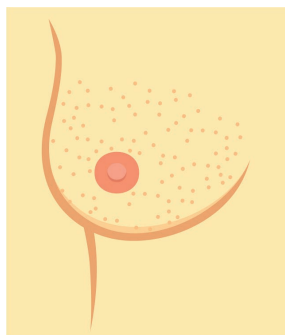


Fig. 1.16: Peau d'orange appearance

Q. Give anatomical basis for retraction of the nipple.

A. Infiltration by carcinoma into lactiferous duct and their subsequent fibrosis can cause retraction of the nipple (Fig. 1.17).

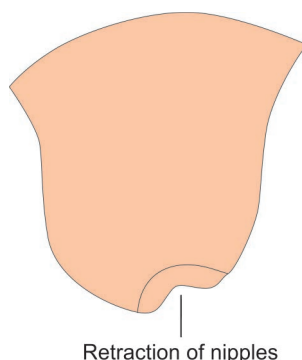


Fig. 1.17: Retraction of nipple

Q. Why was the breast fixed?

A. Due to spread of carcinoma into suspensory ligament of Cooper and underlying pectoral fascia (including retromammary space), the breast becomes fixed.

Q. How the fixity of the breast is tested?

A. It is tested by asking the patient to press her hands on her hips to make pectoralis major contract and then the doctor moves the breast on the pectoral fascia. Loss of mobility of breast indicates spread to deeper structures.

Q. How carcinoma of one breast can spread to the opposite breast?

A. Superficial lymphatics of breast communicate with opposite side across the midline. Any carcinoma infiltrating superficial lymphatics of one breast can spread to opposite side through this communication (Fig. 3.17; *BD Chaurasia's Human Anatomy, Vol 1*).

Q. Give anatomical basis for the carcinoma of breast to spread to the vertebrae and brain.

A. Carcinoma of the breast can spread through segmental veins. Veins draining the breast communicate with internal vertebral venous plexus through Batson's veins. By this route the carcinoma can spread to vertebrae and brain.

Cancer cells from breast → Posterior intercostal veins → Vertebral venous plexus of vein → Intracranial dural venous sinuses → Brain

Q. Give anatomical basis for the carcinoma to spread to abdomen.

A. Lymphatics from inferomedial quadrant of the breast may communicate with subdiaphragmatic and subperitoneal lymph plexuses. Through this route, carcinoma may spread to liver or cancer cells may undergo transcoelomic migration to form secondaries in abdomen. Such kind of secondary forming in ovary is called Krukenberg's tumour (Fig. 3.17; *BD Chaurasia's Human Anatomy, Vol 1*).

Q. Which radiological procedure is recommended for early detection of breast carcinoma?

A. Mammography (Fig. 1.18)

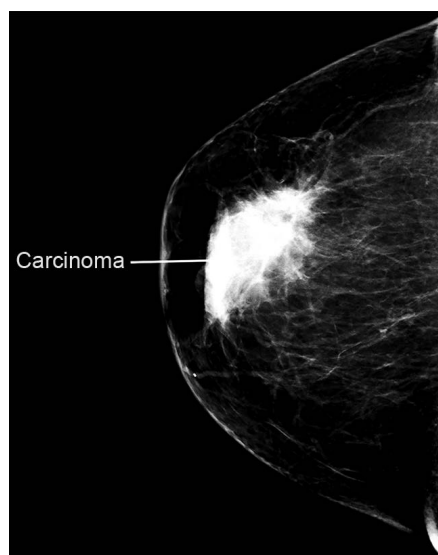


Fig. 1.18: Mammogram

Q. Which test is employed for confirmation of diagnosis of breast carcinoma?

A. Fine needle aspiration cytology (FNAC) is the most accurate and rapid method for diagnosis of carcinoma of breast.

Q. What is the surgical treatment of breast carcinoma?

A. Lump up to 4 cm in diameter is treated by removal of lump (by radial incision) and axillary lymph nodes followed by radiotherapy. Lump larger than 4 cm in diameter is treated by radical mastectomy (removal of breast, axillary lymph nodes and pectoralis minor) or modified radical mastectomy (removal of breast and axillary lymph nodes in a facial tent).

Q. What are the signs that can indicate presence of carcinoma of breast?

A. Lump, puckering of skin, change in colour or texture of skin, retraction of nipple, discharge from nipple and asymmetry of breast are a few signs which can indicate probable carcinoma of breast.

Q. What are the other causes of lump in breast?

A. Breast cyst, fibroadenoma, fibroadenosis, papilloma, etc. are other causes of lump in breast.

Case

A patient of breast carcinoma underwent radical mastectomy where the affected breast along with axillary lymph nodes were removed. On follow-up visit patient complained of difficulty in overhead abduction along with excessive prominence of the medial border of the scapula. Or

A 44 years old male firefighter is admitted to the hospital after blunt trauma to his left axilla. Physical examination reveals undue prominence of medial border of the scapula with difficulty in overhead abduction on ipsilateral side.

Q. Which nerve is affected in this case?

A. Long thoracic nerve or nerve of Bell (C 5, 6, 7). As the nerve passes through the axilla, it may be accidentally cut during removal of axillary lymph nodes in radical mastectomy or may be injured by a blunt trauma in axilla as seen in second case scenario.

Q. What are the other causes for injury to the long thoracic nerve?

A. Carrying heavy loads on shoulder, sudden pressure on the shoulder from above or stab injury can cause injury to the long thoracic nerve.

Q. Which muscle is paralysed in this case?

A. Serratus anterior (boxer's muscle or swimmer's muscle)

Q. What is the deformity in this case?

A. Winging of scapula—excessive prominence of medial border of the scapula particularly while pushing and punching (Fig. 1.19).

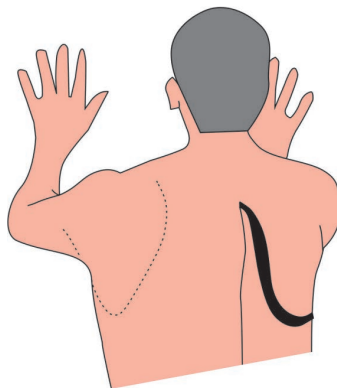


Fig. 1.19: Winging of scapula

Q. Give anatomical basis of winging of scapula.

A. During pushing and punching movements, pull of the normal serratus anterior keeps the medial border of scapula firmly applied to the thoracic wall. In paralysis of serratus anterior, there loss of such action of serratus anterior along with unopposed action of retractors of the scapula (rhomboids and middle fibres of trapezius) causing retraction of the medial border of the scapula and thereby producing winging of scapula.

Q. What is disability in this case?

A. Loss of pushing and punching movements. During attempts at doing these movements, there occurs winging of scapula. Overhead abduction of shoulder is also affected.

Q. How serratus anterior muscle is tested?

A. Forward pressure with the hands against a wall makes the medial border and inferior angle of scapula prominent if the muscle is paralysed.

Case

30 years old male visited the doctor with complain of loss of abduction of arm and flexion of forearm. On examination the doctor noticed following: Patient's right arm was adducted and medially rotated, whereas his right forearm was extended and pronated. There was also sensory loss on lateral aspect of the right upper limb. When asked further, the patient told the doctor that he had an accident about a week ago when he fell from the scooter on his shoulder with jerky lateral flexion of his head to the left side and so stretching his right side of neck. Or

During a difficult child birth a baby's head was delivered but his rest of the body was stuck in the birth canal. The baby had to be pulled by his head which was done with great difficulty. Next day the doctor noticed that the infant's right arm was adducted and internally rotated, whereas his right forearm was extended and pronated. On further examination it was found that there was sensory loss on the lateral aspect of the right upper limb. Or

A male patient undergoing the surgery of the right hand was given interscalene brachial plexus block. The next day the doctor noticed that his right arm was adducted and internally rotated, whereas his right forearm was extended and pronated. On further examination it was found that there was sensory loss on the lateral aspect of the right upper limb.

Q. What is the name of the deformity?

A. The deformity is called Policeman's tip hand or Porter's tip hand or Waiter's tip hand deformity (Fig. 4.16; *BD Chaurasia's Human Anatomy*, Vol 1).

Q. Which is the probable site of the injury?

A. This kind of deformity is produced by injury to the upper trunk of the brachial plexus. The site of injury is called Erb's point where six nerves meet. These six nerves are C5 and amp; C6 roots, suprascapular nerve, nerve to subclavius, ventral and dorsal divisions of upper trunk (Fig. 4.15; *BD Chaurasia's Human Anatomy*, Vol 1).

Q. Which fibers of brachial plexus are affected?

A. Fibers of C5 and C6 roots are affected—mainly C5 and partly C6.

Q. What are the causes of injury to the upper trunk of the brachial plexus?

A. These are as follows:

1. Fall on shoulder.
2. Difficult child birth where baby is pulled by the head and neck.
3. Injury by needle while administering anaesthetic solution by interscalanae approach for surgery of upper limb.

Q. Which dermatomes are involved in this case?

A. Area of skin along the lateral border of arm and forearm supplied by C5 and C6 dermatomes are involved in this case (Fig. 7.6; *BD Chaurasia's Human Anatomy, Vol 1*).

Q. Which muscles are affected in this condition?

A. Mainly biceps, deltoid, brachialis and brachioradialis and partly supinator, supraspinatus, infraspinatus and teres minor. Broadly these muscles are abductors and lateral rotators of arm and flexors and supinators of forearm.

Q. Describe the deformities in this condition.

A. Arm is adducted and medially rotated. Forearm is extended and pronated.

Q. Describe the disabilities in this condition.

A. There is loss of abduction and lateral rotation of arm and flexion and supination of forearm.

Q. Give anatomical basis for arm to be adducted and medially rotated.

A. Due to paralysis of supraspinatus and deltoid, there is loss of abduction of arm at shoulder joint. This leads to unopposed action of adductors of arm causing arm to remain adducted. Further, due to paralysis of infraspinatus and teres minor there is loss of lateral rotation of arm. Consequently, this leads to unopposed action of the medial rotators causing arm to remain medially rotated.

Q. Give anatomical basis for forearm to be extended and pronated.

A. Due to paralysis of biceps, brachialis and brachioradialis there is loss of flexion of the forearm at elbow joint. This leads to unopposed action of extensors of forearm causing forearm to remain in extended position. Further, due to paralysis of biceps and supinator there is loss of supination of forearm. Consequently, this leads to unopposed action of pronators of forearm causing the forearm to remain pronated.

Q. Which reflexes are lost in this condition?

A. Biceps and supinator jerks are lost as these reflexes are governed by C5 and C6 spinal roots.

Case

During a difficult child birth a baby's right hand was delivered first and the baby was then pulled by the hand. After a month, the baby was brought to the doctor by his parents with complaint of deformity of right hand and inability to straighten the fingers. They also

complained of baby was not opening the right eye properly. On examination the doctor noticed hyperextension of metacarpophalangeal joint and flexion of interphalangeal joints of right hand and loss of sensation on medial border of forearm and hand. The skin was warm and dry over the area of cutaneous loss. There was drooping of right upper eyelid and the right eye pupil was constricted.Or

A 23-year-old male climbed the mango tree and while he was picking the mangoes, he lost balance and fell. As he was falling, he reached out and grabbed a branch of tree by his right hand. A few days later, he reported to a doctor with complaint of deformity of right hand. On examination the doctor noticed hyperextension of metacarpophalangeal joint and flexion of interphalangeal joints of right hand and loss of sensation on medial border of forearm and amp; hand. The skin was warm and dry over the area of cutaneous loss. There was drooping of right upper eyelid and the right eye pupil was constricted.

Q. Which deformity of the hand is observed by doctor on examination?

A. The deformity of the hand observed in this case is claw hand (Fig. 1.20).



Fig. 1.20: Claw hand

Q. What is the position of joints in this deformity?

A. There is hyperextension of metacarpophalangeal joints and flexion of interphalangeal joints of affected hand.

Q. Which are the disabilities found in this condition?

A. Disabilities—there is loss of flexion of metacarpophalangeal joints and extension of interphalangeal joints of medial four digits.

Q. What is the anatomical basis for this deformity?

A. Due to paralysis of lumbricals and interossei of hand there is loss of flexion at metacarpophalangeal joints and extension at interphalangeal joints. This leads to unopposed action of long flexors and extensors of hand producing claw hand deformity.

Q. Which other movements of the fingers are affected? Mention the clinical tests for the muscles involved.

A. There is loss of adduction and abduction of fingers due to paralysis of palmar and dorsal interossei respectively.

Clinical test for palmar interossei: The patient is asked to hold a piece of paper tightly between two fingers while the doctor tries to pull it. If the paper is held firmly between the fingers, it means that palmar interossei are normal (Fig. 9.29; *BD Chaurasia's Human Anatomy*, Vol 1).

Clinical test for dorsal interossei: The patient is asked to abduct the fingers against resistance given by the doctor. If the patient is able to abduct the fingers, it means that dorsal interossei are normal (Fig. 9.28; *BD Chaurasia's Human Anatomy*, Vol 1).

Q. Which is the probable site of the injury?

A. The probable site of the injury is lower trunk of the brachial plexus.

Q. What is the name of the clinical condition?

A. Klumpke's palsy

Q. Which fibers of brachial plexus are involved?

A. Mainly T1 and partly C8

Q. What are the other causes of such deformity?

A. These are as follows:

1. Pancoast tumour of lung (tumour of apical part of the lung)
2. Cervical rib.

Q. Which dermatomes are involved in sensory loss?

A. Area of skin along the forearm and hand supplied by C8 and T1 dermatomes are involved in this case (Fig. 7.6; *BD Chaurasia's Human Anatomy*, Vol 1).

Q. Why was the skin warmer and dry over the area of cutaneous loss?

A. There is loss of sympathetic supply in the area of cutaneous loss, thereby the skin feels warmer due to arteriolar dilatation and is dry due to loss of sweating.

Q. What are the other changes seen in the skin of the affected area?

A. Trophic changes are seen in the skin of affected area in long standing cases. The skin becomes dry and scaly, nails become brittle and there is atrophy of pulp of fingers.

Q. Why the baby is not able to open the right eye properly?

A. Due to paralysis of involuntary part of levator palpebrae superioris, there is partial drooping of the upper eyelid of right eye. This condition is known as ptosis.

Q. Why the right eye pupil is constricted?

A. Due to paralysis of the dilator pupillae muscle, constrictor component becomes dominant which is responsible for constriction of the pupil on the affected side. This condition is known as miosis.

Q. Ptosis and miosis is part of which syndrome?

A. Horner's syndrome. When the injury to lower trunk of brachial plexus also involves thoracic sympathetic chain at the level of T1 ganglion, it will cut the sympathetic supply to the head and neck of the same side. This will produce variety of symptoms collectively known as Horner's syndrome.

Q. Which are the other symptoms of Horner's syndrome?

A. Anhydrosis (loss of sweating), enophthalmos (sunken eyeball), loss of ciliospinal reflex and heterochromia iridis (lighter coloured iris in congenital Horner's syndrome) (Fig. 4.18; *BD Chaurasia's Human Anatomy*, Vol 1).

Q. Give anatomical basis for the symptoms of Horner's syndrome.

A. It is due to interruption of sympathetic fibres to head and neck region producing various conditions as shown in Table 1.1.

Table 1.1: Anatomical basis of different conditions found in Horner's syndrome	
Condition	Anatomical basis
Ptosis	Due to paralysis of involuntary part of levator palpebrae superioris muscle
Miosis	Due to paralysis of dilator pupillae muscle
Anhydrosis	Due to loss of sweating
Enophthalmos	Due to loss of orbital fat cushion of the eyeball
Loss of cilio-spinal reflex	Due to disfunction of sympathetic pathway and paralysis of dilator pupillae muscle
Heterochromia iridis (congenital Horner's syndrome)	Due to interference in melanin production

Q. Mention cilio-spinal reflex.

A. Pinching the nap of the neck reflexly produces the dilatation of pupil of the same side. This is called the cilio-spinal reflex.

Case

A professional body builder came to the doctor with complain of pain and tingling and numbness in right upper limb. He told the doctor that he had visited a construction site to see progress of work of his flat where a solid concrete block from 2nd floor had fallen over lower part of side of right neck. On examination, the doctor found feeble radial pulse and rhythmic movement of scapula. Doppler study showed formation of thrombus in 1st part of axillary artery.

Q. Why the patient complained of pain and paresthesia?

A. Decrease in blood supply to the upper limb causes ischemia of muscles and nerves of upper limb causing pain and paresthesia.

Q. What is the reason for feeble pulse?

A. Feeble pulsation of radial artery occurs due to low pressure in radial artery because of obstruction of axillary artery by the thrombus.

Q. What is pulsatile scapula?

A. Due to opening of collateral circulation between first part of subclavian artery and third part of axillary artery through anastomosis around scapula, increased amount of blood now passes through it. This causes scapula to move rhythmically with each pulse. This is called pulsatile scapula.

Q. Where does the anastomosis between subclavian artery and axillary artery take place?

A. Anastomosis between subclavian artery and axillary artery takes place in two places: (Fig. 6.12; *BD Chaurasia's Human Anatomy*, Vol 1)

1. Around the body of scapula in subscapular, supraspinous and infraspinous fossae.
2. Around the acromion process of scapula

Q. Name the arteries that take part in anastomosis around body of scapula.

A. This is the anastomosis between 1st part of subclavian artery and 3rd part of axillary artery.

It is formed by following arteries: (Fig. 6.12; *BD Chaurasia's Human Anatomy*, Vol 1)

1. Suprascapular artery—branch of thyrocervical trunk of first part of subclavian artery
2. Deep branch of transverse cervical artery—branch of thyrocervical trunk
3. Circumflex scapular artery—branch of subscapular artery of third part of axillary artery.

Q. Name the arteries that take part in anastomosis around acromion process of scapula.

A. This is the anastomosis between 1st part of subclavian artery and 2nd and 3rd parts of axillary artery. It is formed by following arteries: (Fig. 6.12; *BD Chaurasia's Human Anatomy*, Vol 1)

1. Acromial branch of thoracoacromial artery—branch of 2nd part of axillary artery
2. Acromial branch of suprascapular artery—branch of 1st part of subclavian artery
3. Acromial branch of posterior circumflex humeral artery—branch of 3rd part of axillary.

ARTERY

 Case

A 35 years old male went to the doctor with complaints of painless swelling in right axilla, loss of appetite and weight loss. On examination the doctor found that there was bulging in the right axilla which was soft and non-tender. USG of axilla showed collection of pus in axilla and then aspiration of pus was done. Microbiological study of the pus showed presence of the tuberculous bacilli. MRI of cervical spine showed wedging of C5, C6 and C7 vertebrae, reduction of intervertebral disc space and presence of paraspinal abscess.

Q. What is probable diagnosis?

A. Tuberculosis of cervical vertebrae

Q. What are the other causes for swelling in axilla?

A. Lipoma, enlargement of axillary tail of Spence, enlargement of axillary lymph nodes, aneurysm of axillary artery, etc.

Q. What is the reason for collection of pus in axilla in this case?

A. The axillary sheath is the prolongation of the prevertebral fascia that covers the trunks and cords of brachial plexus and axillary artery up to axilla. Pus from cervical vertebrae behind the prevertebral fascia can track along the axillary sheath and collect in the axilla.

Q. How the abscess in axilla is drained?

A. Axillary abscess is incised through the floor of the axilla, midway between the anterior and posterior axillary folds and nearer to the medial wall in order to avoid injury to the main vessels running along anterior, posterior and lateral walls of the axilla.

Q. How the swelling in this case can be differentiated from enlarged axillary lymph nodes?

A. In this case, the pus arises in the cervical region tracking down to the axilla. So, the swelling is soft and painless. Enlargement of axillary lymph nodes may occur due to infection or carcinoma in the territory of their drainage. In case of bacterial infection, the lymph nodes are soft, tender and mobile, whereas in carcinoma they are fixed and stony hard.

Q. How the axillary lymph nodes are palpated?

A. Axillary lymph nodes are palpated using both the hands. Left axillary lymph nodes should be palpated by right hand and right axillary lymph nodes should be palpated by left hand.

Case

A 24 years old male is diagnosed with metastatic squamous cell carcinoma of the skin over the lower part of the sternum. On examination, the doctor found a few enlarged lymph nodes over the pectoral region.

Q. Which lymph nodes receive most lymph from the affected area?

A. Anterior axillary lymph nodes (Fig. 4.11; *BD Chaurasia's Human Anatomy*, Vol 1).

Q. Mention the areas from which lymph is drained by the affected lymph nodes.

A. Anterior axillary lymph nodes drain lymph from the anterior and lateral thoracic walls up to umbilicus and also the skin and parenchyma of the mammary gland.

Q. Where do efferents from affected lymph nodes drain?

A. Efferent from anterior axillary lymph nodes drains into central and apical groups of axillary lymph nodes.

Q. Pain along the medial side of upper part of the arm occurs due to compression of which nerve?

A. Intercostobrachial nerve passes through the central part of the axilla and supplies the skin of the medial side of upper part of the arm. Compression of this nerve due to enlargement of central group of axillary lymph nodes can cause pain along the area supplied by it.

Q. What are Rotter's nodes?

A. These are a few nodes intervening between pectoralis major and minor muscles. They form alternate channel of lymph drainage from deep surface of mammary gland when normal channels are obstructed by spread of cancer cells.

Q. Which lymph nodes drain the upper limb?

A. Lymphatics from entire upper limb except those accompanying cephalic vein drain into lateral axillary lymph nodes. Lymphatics accompanying cephalic vein drain into deltopectoral (cephalic) lymph nodes.

Case

A 25 years old male lost his right leg in traumatic car accident. He was discharged from the hospital and was given an axillary crutch to walk. Six months after the incident he came to doctor with complaint of deformity of right hand. On examination, the doctor noticed thumb drop, finger drop, wrist drop and loss of extension at elbow. There is also sensory loss along the posterior aspect of arm, forearm and lateral side of dorsum of hand.

Q. Which structure is involved in this case?

A. Trunk of radial nerve in axilla is compressed by the crutch in right axilla.

Q. Give anatomical basis for thumb drop, finger drop and wrist drop.

A. Due to paralysis of extensor pollicis longus and brevis, there is loss of extension of thumb causing thumb drop. Due to paralysis of extensor indices, extensor digitorum and extensor digiti minimi there is loss of extension at metacarpophalangeal joints of all fingers causing finger drop. Due to paralysis of extensor carpi radialis longus and brevis, there is wrist drop.

Q. Give anatomical basis of wrist drop in this case.

A. Due to paralysis of extensor carpi radialis longus, extensor carpi radialis brevis and extensor carpi ulnaris along with unopposed action of wrist flexors, there occurs wrist drop.

Q. Why there is loss of elbow extension in this case?

A. Due to paralysis of triceps brachii and to lesser extent anconeus, there is loss of extension at elbow.

Q. Enumerate the sensory branches of the radial nerve.

A. In axilla—posterior cutaneous nerve of arm.

In spiral groove—lower lateral cutaneous nerve of arm and posterior cutaneous nerve of forearm.

In cubital fossa—superficial terminal branch.

BACK AND SCAPULAR REGION AND VEINS OF UPPER LIMB

Case

The right shoulder abduction of a 58 years old woman had become increasingly painful over the past year. Examination by an orthopaedic doctor revealed following: There is no pain during abduction up to initial 60°. The pain starts on further abduction and lasts during abduction up to 120° and then the pain disappears during abduction from 120° to 180°.

Q. What is probable diagnosis?

A. Supraspinatus tendinitis

Q. What is the name of syndrome with respect to pain occurring in the arc of 60° to 120° abduction?

A. Painful arc syndrome or rotator cuff syndrome (Fig. 1.21).

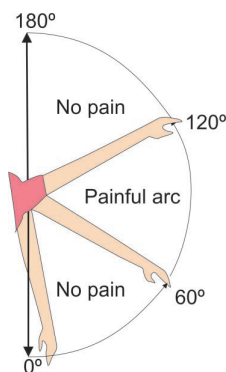


Fig. 1.21: Painful arc syndrome

Q. Give anatomical basis for the pain to occur during abduction from 60 to 120 degree.

A. Pain starts at about 60 degree and lasts till 120 degree of abduction as inflamed supraspinatus muscle starts getting impinged between great tubercle of humerus and coracoacromial arch in that range. Further abduction of shoulder can take place only after lateral rotation of humerus. This rotation takes the greater tubercle of humerus away from the coracoacromial arch and thus releasing the pressure on the supraspinatus tendon causing disappearance of pain too.

Q. How the pain of subacromial bursitis differs from that of supraspinatus tendinitis?

A. In subacromial bursitis, pressure over the deltoid below the acromion with arm by the side causes pain. However, pressure over the same point with arm abducted to right angle causes no pain (Dawbarn's sign). This is due to the fact that during abduction to right angle, the subacromial bursa passes beneath the coracoacromial arch causing disappearance of pain too.

Q. What is suprascapular nerve entrapment?

A. The suprascapular nerve is occasionally compressed in suprascapular notch usually in schoolchildren by bag strap. This causes paralysis of supraspinatus and infraspinatus leading to disuse atrophy of affected muscles and difficulty in initiation of the shoulder abduction.

Case

During a road accident, a person fell from the scooter on the right shoulder. This resulted in inferior dislocation of the right humerus causing injury to a nerve along the surgical neck of the humerus. He has associated sensory loss over the shoulder area. Or

A 25 years old male patient came with loss of abduction of shoulder more than 15°. When asked, he told that he had taken a folic acid injection on the right shoulder 2 days back. He has associated sensory loss over the shoulder area.

Q. Why the head of humerus is most commonly displaced inferiorly?

A. The head of humerus is most commonly displaced inferiorly because it is not supported inferiorly by musculotendinous cuff (rotator cuff) or coracoacromial arch. The shoulder joint is more prone to dislocation than any other joint in body (Fig. 1.22).



Fig. 1.22: Dislocation of head of humerus

Q. Which nerve is injured in this case?

A. Axillary nerve

Q. Which muscles are paralysed in such nerve injury?

A. Deltoid and teres minor

Q. Which movements are lost in such injury?

A. Abduction from 15° to 90° is lost due to paralysis of deltoid. There is weakness in lateral rotation of arm due to paralysis of deltoid and teres minor.

Q. What is regiment badge anaesthesia?

A. Sensory loss along the lower half of the deltoid muscle is called regiment badge anaesthesia as badge of the army regiment on the sleeve is located over this region (Fig. 6.10b; *BD Chaurasia's Human Anatomy*, Vol 1).

Q. Why there is loss of rounded contour of the shoulder after some time in such injury?

A. Paralysis of the deltoid muscle causes disuse atrophy of the muscle resulting in flattening of the rounded contour of the shoulder. The greater tubercle of humerus becomes prominent.

Q. What are the other causes for the injury to the axillary nerve?

A. Axillary nerve may also be injured in fracture of surgical neck of the humerus or during intramuscular injection in the deltoid.

Q. How the function of axillary nerve is tested?

A. Axillary nerve is tested by testing the action of deltoid. A person is laid down in supine position and he is asked to do abduction starting from 15° against resistance. Supine position is given to nullify the effect of gravity.

Q. What is the peculiarity of nerve to teres minor?

A. Nerve to teres minor bears a pseudoganglion (pseudoganglion gives appearance of a ganglion but is made of connective tissue. Pseudoganglion is also found in the terminal part of posterior interosseous nerve and deep peroneal nerve) (Fig. 6.6; *BD Chaurasia's Human Anatomy*, Vol 1).

Case

A 25 years old male professional body builder worked hard on his shoulder muscles. His shoulder muscles were enlarged to such an extent that the size of quadrangular space was greatly reduced.

Q. Which nerve is likely to be compressed in this case?

A. Axillary nerve as it passes through the quadrangular space.

Q. Which muscles are likely to be paralysed in this case?

A. Deltoid and teres minor

Q. Which vessels are likely to be compressed in this case?

A. Posterior circumflex humeral vessels as they along with axillary nerve pass through the quadrangular space.

Q. What are the boundaries of quadrangular space?

A. These are as follows: (Fig. 6.11; *BD Chaurasia's Human Anatomy*, Vol 1).

1. Above by subscapularis, capsule of shoulder joint and teres minor
2. Below by teres major
3. Medially by triceps brachii
4. Laterally by surgical neck of humerus

Q. What are the contents of upper triangular space?

A. Circumflex scapular artery.

Q. What are the contents of lower triangular space?

A. Radial nerve and profunda brachii vessels.

Case

A 53 years old female visited the doctor with complaint of neck pain with tingling and numbness in right upper limb. MRI examination revealed herniation of an intervertebral disc in the cervical region. Physical examination revealed weakness in wrist extension and paresthesia on dorsum of hand in the region adjoining middle three digits.

Q. Which intervertebral disc is herniated in this case?

A. Disc between 7th and 8th cervical vertebrae (Fig. 1.23).

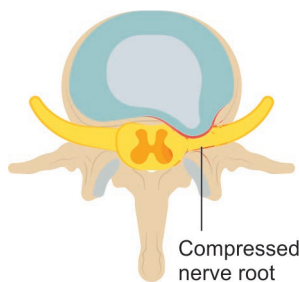


Fig. 1.23: Herniation of disc

Q. Which spinal nerve is most probably affected in this case?

A. C7 spinal nerve

Q. Which spinal nerves control wrist flexion and extension?

A. C6 and C7

Q. Why there is weakness in wrist extension?

A. Due to compression of C7 spinal nerve by herniated disc, there is weakness in wrist extension.

Q. Why there is paresthesia on the dorsum of the hand?

A. Area of skin on the dorsum of the hand adjoining middle three digits is supplied by C7 spinal nerve. Due to compression of C7 spinal nerve by herniated disc, there is tingling and numbness.

Q. What is dermatome?

A. Area of skin supplied by one spinal nerve is called dermatome.

Case

A 77 years old male was admitted in the hospital for kidney failure and was advised dialysis. The doctor selected a vein in lateral part of the distal forearm that runs superficially in both forearm and arm.

Q. Which vein is selected in this case?

A. Cephalic vein (Fig. 1.24).

Q. Where does this vein terminate?

A. The cephalic vein pierces clavipectoral fascia and makes a right-angled bend in delto-pectoral triangle to terminate into the axillary vein.

Q. Why this vein is selected for dialysis?

A. Due to its proximity with the radial artery and so arteriovenous fistula can be made easily for dialysis.

Q. Why this vein is not selected for cardiac catheterisation?

A. As the vein makes a right-angled bend before opening into axillary vein, it might cause obstruction at the communication between cephalic and axillary vein.

Q. Why this vein is not considered an efficient channel for transport of blood?

A. The earlier a vein becomes deep the better, because the venous return is then assisted by muscular compression (muscle pump). The cephalic vein runs in superficial fascia for majority of its course and load of cephalic vein is greatly transferred to basilic vein through median cubital vein.

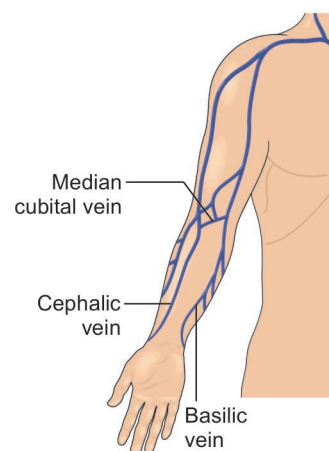


Fig. 1.24: Superficial veins of upper limb

Case

A 20 years old female was admitted to the hospital for high grade fever. A vein was punctured for collection of blood for laboratory investigations. The selected vein lies in front of cubital fossa and is obliquely placed connecting the preaxial vein to the postaxial vein.

Q. Which vein is selected in this case?

A. Median cubital vein (Fig. 7.7; *BD Chaurasia's Human Anatomy*, Vol 1).

Q. What is extent of the selected vein?

A. It extends from the cephalic vein 2.5 cm below the bend of elbow to basilic vein 2.5 cm above the bend of the elbow.

Q. What is the function of this vein?

A. The median cubital vein shunts the blood from the cephalic vein to the basilic vein as later is a more efficient channel for transport of blood to the heart.

Q. Why median cubital vein is the choice of vein for intravenous injection or withdrawal of blood?

A. The median cubital vein is fixed to deep vein by a perforator vein and so it does not slip away during piercing.

Q. Which structure lies deep to the median cubital vein?

A. Bicipital aponeurosis.

ANTERIOR ARM AND CUBITAL FOSSA

Case

A 25 years old male is admitted in the emergency department after a road accident. X-ray examination revealed multiple fractures of the upper part of the humerus. On examination, it was found that there is weakness in flexion and supination of forearm. There is also loss of cutaneous sensations on the lateral aspect of the forearm.

Q. Which nerve is most probably affected?

A. Musculocutaneous nerve (Fig. 1.25).

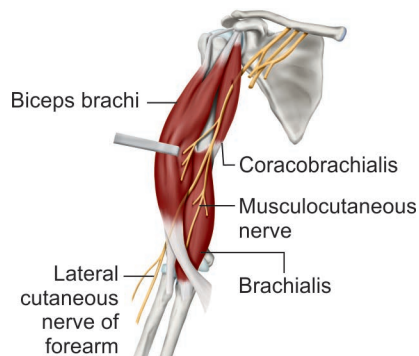


Fig. 1.25: Musculocutaneous nerve distribution

Q. Why there is loss of cutaneous sensations on the lateral aspect of the forearm?

A. Lateral cutaneous nerve of forearm is continuation of the musculocutaneous nerve and supplies the skin of the lateral side of the forearm. This is the reason for the loss of cutaneous sensations along the lateral aspect of the forearm.

Q. What is the root value of the affected nerve?

A. C 5, 6, 7—branch of lateral cord of the brachial plexus

Q. Which muscles are supplied by the affected nerve?

A. Biceps brachii, brachialis and brachioradialis

Case

A 26 years old female visited the doctor with complaint of severe pain in right upper limb. On examination, the pulses of radial artery were feeble, forearm skin was colder and hand was in fixed flexion position. USG examination revealed a fibrous band extending from medial epicondyle to supratrochlear spine beneath which the brachial artery is passing. Or

A 26 years old female motorcyclist is propelled over the handlebar of her bike due to a bump in the road and falls on her one arm. She is taken to the hospital. Examination reveals swelling of her affected arm with fixed flexion position of hand. Radiographic investigation reveals supracondylar fracture of the humerus with a large hematoma. Or

During a road accident, a 25 years old male suffered from midshaft fracture of humerus on right side. He was treated conservatively by giving a plaster cast of the arm. The plaster cast was very tight and that caused compression of the brachial artery. When he came for removal of cast after 2 months, he complained of pain in right upper limb with flexed position of the hand.

Q. What is this condition called?

A. Volkmann's ischaemic contracture.

Q. What is the fibrous band extending from medial epicondyle to supratrochlear spine is called?

A. Struthers' ligament (Fig. 1.26).

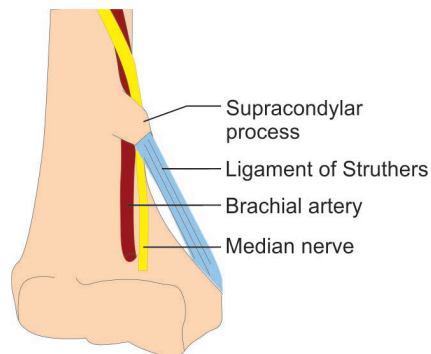


Fig. 1.26: Struthers' ligament

Q. Which structure is morphologically represented by the fibrous band?

A. Morphologically, Struthers' ligament represents third head of coracobrachialis which is usually suppressed in humans.

Q. What is the reason for Volkmann's ischaemic contracture in this case?

A. It is caused by compression of brachial by the Struthers' ligament underneath which the artery is passing. In second case scenarios, it is caused by rupture of the brachial artery. In third case scenario, it is caused by compression of brachial artery by plaster cast.

Q. What is the deformity in this condition?

A. Flexor muscles of forearm are affected more than extensor muscles as they are bulkier. Due to loss of blood supply, the flexor muscles of forearm undergo ischaemic necrosis, fibrosis and consequent contracture. This causes shortening of muscles and subsequent flexion of digits and wrist. This is called fixed flexion deformity (Fig. 1.27).



Fig. 1.27: Deformity in Volkmann's ischaemic contracture

Q. What are the symptoms of Volkmann's ischaemic contracture?

A. Pain, pulselessness, pallor, puffiness and loss of function.

Case

During a road accident, a 25 years old male suffered from fracture of right humerus about 2 cm above medial epicondyle of the humerus (supracondylar fracture). A nerve running along the medial side of brachial artery was damaged. On examination it was found that thumb was adducted and lateral two fingers lag behind while making a fist.

Q. Which nerve is damaged in this case?

A. Median nerve

Q. Which muscles are affected in this case?

A. Muscles affected of front of forearm—all except medial $\frac{1}{2}$ of flexor digitorum profundus and flexor carpi ulnaris. Muscle affected on hand—abductor pollicis brevis, flexor pollicis brevis, opponens pollicis and lateral two lumbricals.

Q. What is the position of forearm in this case?

A. Forearm remains in supination due to paralysis of pronators and hand is adducted due to action of flexor carpi ulnaris.

Q. Which type of deformity of thumb is seen in this case?

A. Ape thumb deformity due to paralysis of above mentioned thenar muscles and unopposed action of adductor pollicis (supplied by ulnar nerve), where the thumb remains in adducted position (Fig. 9.40; *BD Chaurasia's Human Anatomy*, Vol 1).

Q. Give reason for hand of benediction deformity in this case.

A. Due to paralysis of flexor digitorum superficialis and lateral ½ of flexor digitorum profundus, flexion at interphalangeal joints of index finger and middle finger is lost. So, both these fingers remain slightly straight while making a fist. This kind of deformity of hand is called hand of benediction deformity (Fig. 1.28).



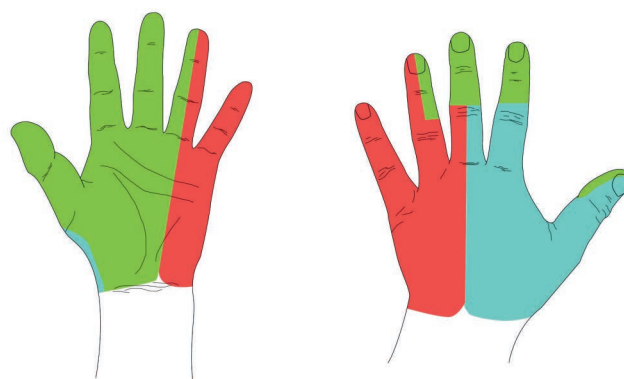
Fig. 1.28: Hand of benediction deformity

Q. What is the sensory loss in this case?

A. Loss of sensation on lateral aspect of palm and palmar aspect of lateral 3 ½ digits.

Case

A 50 years old man received a gunshot wound where the bullet entered the anterior aspect of lower arm and exited from posterior aspect. Two weeks after the incident, the man came to the doctor with deformity of hand where his right hand showed complete clawing. There was also sensory loss over the palm, ventral aspect of all digits and medial side of dorsum of hand along with medial 2½ digits (Fig. 1.29).



- Median nerve
- Ulnar nerve
- Radial nerve

Fig. 1.29: Sensory loss in hand in median, radial and ulnar nerve palsy

Q. Which nerves are affected in this case?

A. Median nerve and ulnar nerve as the bullet passed through the lower arm damaging both the nerves as they are almost in one line from before backwards in the medial side of lower arm.

Q. Why there is complete clawing of hand?

A. Due to paralysis of all lumbrical and interossei muscle, flexion at metacarpophalangeal joints and extension at interphalangeal joints are lost. Claw hand—hyperextension of metacarpophalangeal joints (due to unopposed action of long extensors) and flexion of interphalangeal joints (due to unopposed action of long flexors).

Q. Give anatomical basis for the sensory loss in this case.

A. Skin on lateral side of palm and palmar aspect of lateral 3½ fingers is supplied by the median nerve. Skin of medial side of palm and palmar aspect of medial 1½ fingers is supplied by the ulnar nerve. Skin of the medial side of dorsum of hand and dorsal surface of medial 2½ digits is supplied by the ulnar nerve. As both the nerves are damaged well above the hand, there is loss of sensation from palm and palmar aspect of all the digits (Fig. 9.41; *BD Chaurasia's Human Anatomy*, Vol 1).

Q. What are the other effects in this case?

A. Due to damage to the median nerve, there is loss of movements of the thumb. Due to damage to the ulnar nerve, there is loss of adduction and abduction of fingers.

POSTERIOR ARM

Case

A 40 years old male, who was drunk, slept in the living room on a wooden chair with his right arm hanging from the backrest of the chair. Next day morning he noticed that his wrist and fingers were dropping and he was not able to extend his right wrist. He also noted sensory loss along the lateral side of dorsum of the hand.

Q. What is this condition called?

A. Saturday night palsy

Q. Which nerve is involved in this case?

A. Radial nerve is compressed in the spiral groove by the backrest of the chair.

Q. Which muscles are affected in this case?

A. All the muscles of posterior compartment of forearm are paralysed. Triceps is partially affected as branches to its long and medial head are given by radial nerve in axilla which are not affected in this case (Fig. 8.23; *BD Chaurasia's Human Anatomy*, Vol 1).

Q. What is the reason for wrist drop?

A. Due to injury to the radial nerve, extensor carpi radialis longus, extensor carpi radialis brevis and extensor carpi ulnaris are paralysed. So, the wrist remains in flexed position (wrist drop) due to unopposed action of the long flexors of the wrist (Fig. 1.30).

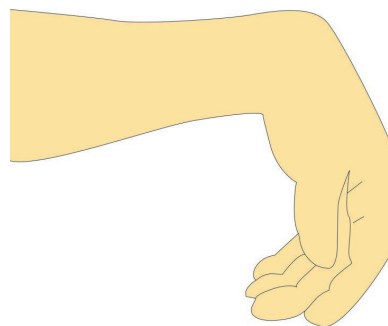


Fig. 1.30: Wrist drop

Q. What is the reason for finger drop?

A. Due to paralysis of extensor muscles of thumb and fingers.

Q. Why there is sensory loss on the dorsum of the hand?

A. Superficial branch of the radial nerve supplies lateral side of dorsum of hand along with lateral 2½ digits. So, injury to radial causes loss of sensations on the lateral side of dorsum of hand and lateral 2½ digits (Fig. 1.27).

Case

A 52 years old male was hit in the back of his right arm during a police lathi charge. Physical examination revealed an inability to extend the right wrist and weakness in extension of forearm. There is also loss of sensation on lateral side of the dorsum of the hand.

Q. Which nerve is affected here?

A. Radial nerve in the spiral groove

Q. Why the patient is not able to extend his wrist?

A. Due to paralysis of extensors of the wrist, namely extensor carpi radialis longus, extensor carpi radialis brevis and extensor carpi ulnaris. This leads to wrist drop (Fig. 1.28).

Q. Give anatomical basis for weakness in extension of forearm.

A. The radial supplies the triceps from axilla and spiral groove. In axilla it gives branches to long and medial head of triceps. In spiral groove it supplies medial and lateral head of triceps and anconeus. Due to partial loss of nerve supply to triceps, there is weakness in extension of forearm.

Q. Why there is sensory loss on the dorsum of the hand?

A. Superficial branch of the radial nerve supplies lateral side of dorsum of hand along with lateral 2½ digits. So, injury to radial causes loss of sensations on the lateral side of dorsum of hand and lateral 2½ digits (Fig. 9.41; *BD Chaurasia's Human Anatomy, Vol 1*).

Q. What are the other causes of injury to radial nerve in the spiral groove?

A. These are as follows:

1. Fracture of shaft of humerus in the region of spiral groove.
2. Intramuscular injection in the triceps

FOREARM

Case

A badminton player comes to the doctor complaining that he is not able to grip his racquet during practice and there is pain in anterior part of right forearm. On examination, the doctor noticed that the player has atrophy of thenar eminence, inability to oppose the thumb and difficulty in flexing the distal interphalangeal joints of second and third digits. There is also sensory loss of sensation from lateral part of palm and palmar aspect of lateral 3½ digits.

Q. What is the most likely diagnosis of this condition?

A. Pronator syndrome

Q. What causes this condition?

A. Due to hypertrophy of pronator teres, median is compressed between the two heads of the pronator teres.

Q. Give reason for atrophy of thenar muscles.

A. Thenar muscles are paralysed in this condition and so disuse atrophy of thenar muscles occur.

Q. Give reason for difficulty in flexing the distal interphalangeal joints of second and third digits.

A. Due to paralysis of flexor digitorum profundus (supplied by anterior interosseous branch of median nerve), there is loss of flexion at distal interphalangeal joints of second and third digits. Due to paralysis of flexor pollicis longus (supplied by anterior interosseous nerve), there is loss of flexion at interphalangeal joint of the thumb.

Q. Give reason for sensory loss in this case.

A. All cutaneous branches of median nerve arise in forearm and hand supplying skin lateral part of palm and palmar aspect of lateral 3½ digits. As the nerve is compressed in the forearm, sensory loss occurs in the above mentioned area.

Case

A 65 years old male stumbled and fell on outstretched hand while walking on a footpath. Radiographic investigation reveals fracture of medial epicondyle of the humerus. On examination, weakness of wrist adduction and clawing of medial two digits was found. There was also sensory loss along the medial side of hand and palmar aspect of medial 1½ digits. Or

A 65 years old female came to doctor with complain of weakness of wrist abduction and hand deformity. On examination, the metacarpophalangeal joints and flexion of interphalangeal joints of medial two fingers were noticed. There was also sensory loss along the medial side of hand and palmar aspect of medial 1½ digits. Radiographic investigation revealed compression of a nerve between the two heads of flexor carpi ulnaris. Or

A 16 years old girl was brought to the doctor with complaint of hand deformity. On examination it was found that there was clawing of medial two fingers, weakness of wrist adduction and sensory loss along medial side of hand and palmar aspect of medial 1½ digits. The doctor also observed that there was excessive angulation of ipsilateral forearm from the body.

Q. Which nerve is affected in this case?

A. Ulnar nerve

Q. How the ulnar is affected in the above mentioned three case scenarios?

A. In the first case, the ulnar is damaged by the raw edge of broken medial epicondyle. In the second case, the nerve is compressed between the two heads of flexor carpi ulnaris

(cubital tunnel syndrome—Fig. 1.31). In the third case, the ulnar nerve is stretched behind the medial epicondyle due to cubitus valgus giving rise to gradual progress of the symptoms (tardy ulnar nerve palsy).

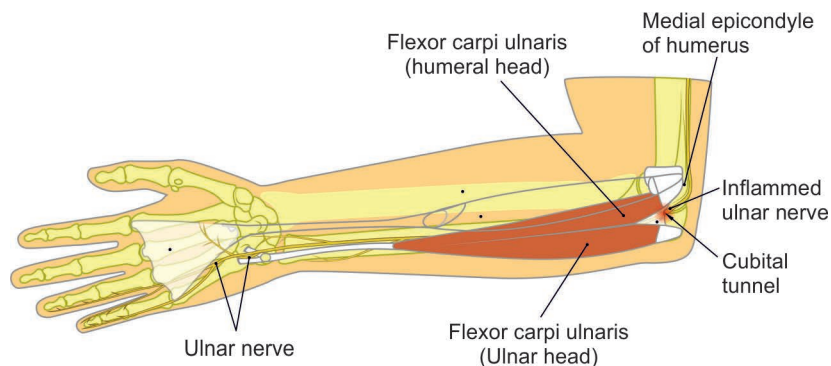


Fig. 1.31: Cubital tunnel syndrome

Q. What is the reason for weakness of wrist adduction?

A. Due to paralysis of flexor carpi ulnaris, adduction of wrist becomes weak.

Q. Give anatomical basis for claw hand in this case.

A. Due to paralysis of medial two lumbricals and all interossei, there is claw hand affecting the medial two fingers.

Q. Give anatomical basis for sensory loss in this case?

A. Palmar and dorsal cutaneous branches of ulnar supply medial side of palmar and dorsal aspects of the hand and so the sensory loss in above mentioned area. Superficial branch of ulnar nerve supplies the palmar aspect of medial $1\frac{1}{2}$ digits and so the sensory loss in this area.

Q. What is Froment's test?

A. Froment's test or book test is done to test the adductor pollicis muscle. The person is asked to firmly hold the book between his thumb and other fingers of both hands. When the doctor tries to pull the book, the terminal phalanx of the thumb on the paralysed side becomes flexed at the interphalangeal joint (by the flexor pollicis longus which is supplied by the median nerve) suggesting paralysis of adductor pollicis muscle. The muscle can also be tested by asking the patient to hold a piece of paper tightly between the thumb and palm. Due to paralysis of adductor pollicis, the patient cannot hold the piece of paper tightly as asked (Fig. 1.32).



Fig. 1.32: Froment's test

Q. What is ulnar paradox?

A. Usually in nerve injury, more proximal the injury greater the manifestations. In case of ulnar

nerve, clawing of hand is greater in injury at the wrist than injury at the elbow. This is due to the fact that in injury at elbow, the flexor digitorum profundus is paralysed with unopposed action of extensors of digits leading to lesser degree of finger flexion and so lesser degree of claw hand. Whereas, in injury to the nerve at the wrist, flexor digitorum profundus escapes paralysis and thereby produce active flexion at distal interphalangeal joints of affected digits and thus producing greater degree of claw hand.

Case

A 37 years old construction worker is admitted to the hospital after he suffers a penetrating injury to his right forearm by a nail gun. On examination, it was found that the person was not able to oppose the tip of thumb to tip of index finger as in making OK sign. On the other hand, he is able to touch the tips of little and ring finger to the pad of his thumb.

Q. Which nerve is affected here?

A. Anterior interosseous nerve.

Q. Which muscles are supplied by the affected nerve?

A. Flexor pollicis longus, pronator quadratus and lateral ½ of flexor digitorum profundus.

Q. Why the person is not able to make OK sign with his right hand?

A. Due to paralysis of flexor pollicis longus, flexion of terminal phalanx of the thumb is affected. Also due to paralysis of lateral ½ of flexor digitorum profundus flexion of terminal phalanx of the index and middle fingers is affected. Due to loss of flexion of terminal phalanges of both thumb and index finger, the person is not able to make OK sign.

Q. Why the person is able to touch the tips of ring and little fingers to pad of his thumb?

A. Medial ½ of flexor digitorum profundus is supplied by ulnar nerve and so flexion of terminal phalanges of ring and little fingers is not affected. The effect of short thenar muscles on carpometacarpal joint and metacarpophlangeal joint of thumb is also not affected. Due to this reason, the person is able to touch the tips of ring and little fingers to pad of his thumb.

Case

A 16 years old gymnast fell on outstretched arm while practicing for the tournament. He was brought to the emergency department with pain and swelling in the upper part of forearm. On examination, the doctor noticed thumb drop and finger drop but no wrist drop. Extension of forearm was normal with no sensory loss in the affected limb. Radiograph showed fracture of neck of radius.

Q. Which structure is involved in this condition?

A. Posterior interosseous nerve or deep branch of radial nerve. The nerve is injured while it passes behind the neck of radius (Figs 9.55 and 9.56; *BD Chaurasia's Human Anatomy*, Vol 1).

Q. Give anatomical basis for thumb drop and finger drop.

A. Due to paralysis of extensor pollicis longus and brevis, there is loss of extension of thumb causing thumb drop. Due to paralysis of extensor indices, extensor digitorum and extensor digiti minimi, there is loss of extension at metacarpophalangeal joints of all fingers causing finger drop.

Q. Why there is no wrist drop in this case?

A. Extensor carpi ulnaris is supplied by the posterior interosseous nerve. On the other hand, extensor carpi radialis longus and extensor carpi radialis brevis are supplied by the radial nerve in lower arm. So, these two muscles escape paralysis and wrist extension is not much affected.

Q. Why extension of forearm is not affected in this case?

A. Extension of forearm is mainly produced by triceps brachii muscle. Triceps is supplied by the radial nerve by branches given in axilla and spiral groove and so it escapes paralysis.

Q. Why there is no sensory loss in this case?

A. Radial nerve gives posterior cutaneous nerve in axilla. It gives lower lateral cutaneous nerve of arm and posterior cutaneous nerve of forearm in spiral groove. Lastly, it gives superficial branch in the cubital fossa. All these nerves arise well above the area of injury to posterior interosseous nerve. Also, posterior interosseous nerve does not provide any sensory branches. These are the reasons for no sensory loss in this case.

Case

A 65-year-old retired carpenter came to the doctor with complaint of tingling and numbness affecting the first 3½ digits of his right hand. On examination, the doctor also noticed atrophy of thenar eminence. The pain aggravated on flexing the wrist. Or

A 50-year-old female computer operator came to the doctor with complaints of sensation of 'pins and needle' affecting the first 3½ digits of her right hand. Initially, the symptoms occurred at night but then they were present throughout the day. On examination, the doctor noticed flattening of thenar eminence. Pain was aggravated on flexing the wrist.

Q. What is this condition called?

A. Carpal tunnel syndrome

Q. Compression of which structure is responsible for the above mentioned condition?

A. Compression of median nerve in carpal tunnel (Fig. 1.33). Nerve conduction study shows delayed or absent conduction of impulses in median nerve across the wrist.

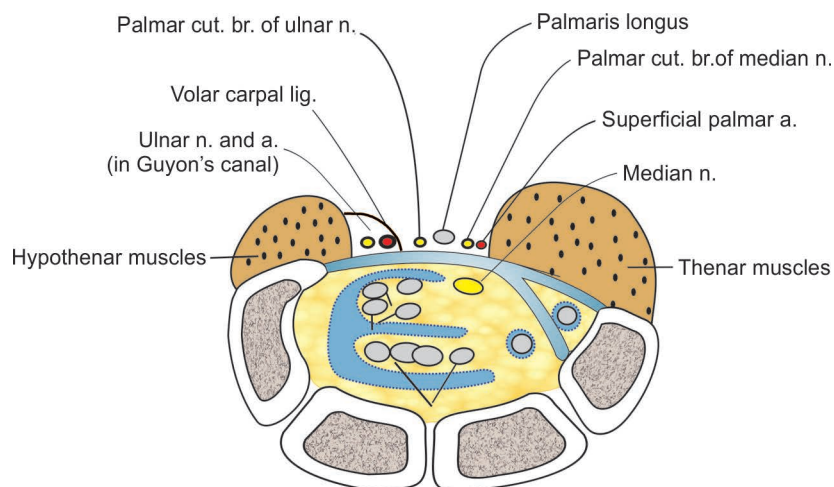


Fig. 1.33: Median nerve in carpal tunnel

Q. Give anatomical basis for tingling and numbness over first three digits.

A. This is due to the reason because cutaneous branches of median nerve in palm supply the palmar aspect of lateral 3½ digits.

Q. Why there is flattening of the thenar eminence?

A. Due to compression of the median nerve, the thenar muscles undergo atrophy causing flattening of the thenar eminence.

Q. What are the few causes leading to this condition?

A. Excessive manual work (computer operator, carpenter, etc.), myxedema, acromegaly, dislocation of lunate, wrist fracture, tenosynovitis, rheumatoid arthritis, obesity, pregnancy, etc.

Q. What is Tinel's sign?

A. Symptoms of carpal tunnel syndrome are reproduced with percussion over the flexor retinaculum. This is called Tinel's sign (Fig. 1.34).



Fig. 1.34: Tinel's sign

Q. What is Phalen's sign?

A. symptoms of carpal tunnel are reproduced when the patient is asked to flex both the wrists against each other (Fig. 1.35).

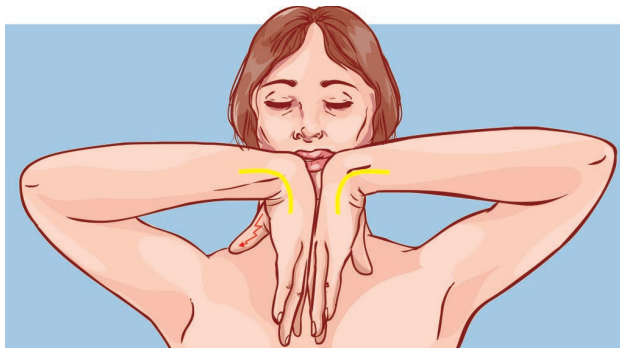


Fig. 1.35: Phalen's sign

Q. Which structure is surgically cut to relieve the symptoms?

A. Flexor retinaculum is cut longitudinally to relieve the pressure over the median in order to relieve the symptoms.

Case

A 63-year-old farmer received an injury to his middle of the anterior aspect of forearm by a sharp object. This caused injury to the median nerve in the middle of the forearm.

Q. Which muscles are paralysed in this case?

A. Tendon for index finger of flexor digitorum superficialis, three thenar muscles (abductor pollicis brevis, flexor pollicis brevis and opponens pollicis) and lateral two lumbricals are paralysed in this case.

Q. Why the entire flexor digitorum superficialis is not affected?

A. The flexor digitorum superficialis is supplied by the median nerve. The part flexor digitorum superficialis for middle, ring and little fingers receive nerve supply in cubital fossa.

Only the part for the index finger receives its nerve supply below the middle of the forearm.

Q. What type of deformity is seen in this case?

A. Ape thumb deformity due to paralysis of thenar muscles and unopposed action of adductor pollicis (supplied by ulnar nerve). There would be median claw hand affecting 2nd and 3rd digits. On asking to make a fist, the index finger lags behind (because of paralysis of part of flexor digitorum superficialis and unopposed action of extensor muscle) causing a deformity known as pointing index finger (Fig. 1.36).



Fig. 1.36: Pointing index finger

Case

A 16 years old boy lacerated his palmar surface of distal forearm as he stumbled and fall on a broken bottle. The wound was exposed for examination. On examination, cut ends of a tendon could be seen exactly in the middle of the distal forearm.

Q. Which tendon lies in this position?

A. Palmaris longus

Q. What is the nerve supply of affected muscle?

A. Median nerve

Q. What is insertion of this muscle?

A. The tendon of palmaris longus passes superficial to the flexor retinaculum and is continuous with palmar aponeurosis (Fig. 1.37). Morphologically palmar aponeurosis is considered degenerated distal part of palmaris longus.

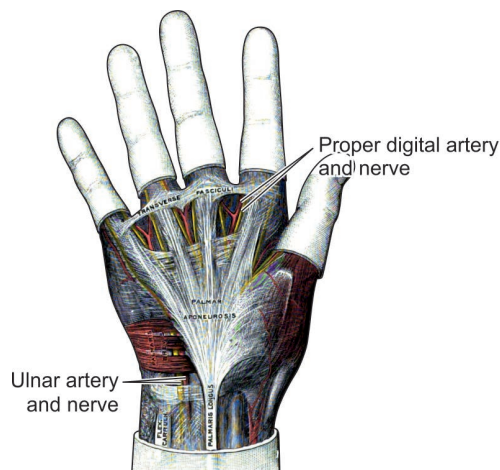


Fig. 1.37: Palmaris longus tendon with palmar aponeurosis

Q. Why this muscle is called vestigial muscle?

A. Palmaris longus is called vestigial muscle due its long tendon and short belly. Its distal part is already degenerated in form of palmar aponeurosis.

Case

A 20 years old man is brought to the doctor because of a deep knife wound on the medial side of his distal forearm of right hand. The medial two fingers of the right-hand show clawing and he is unable to hold a piece of paper between his fingers. There is also sensory loss on the palmar aspect of the medial 1½ fingers.

Q. Which nerve is most likely affected?

A. Ulnar nerve (because it is quite superficial in the medial side of distal forearm as it passes superficial to the flexor retinaculum to enter the palm).

Q. Why there is clawing of medial two fingers?

A. The ulnar nerve through its deep branch supplies medial two lumbricals as well as all the interossei. Due to paralysis of these muscles, there is clawing—hyperextension of metacarpophalangeal joints and flexion of interphalangeal joints of medial two fingers.

Q. Why the person is not able to hold the paper between his fingers?

A. Adduction of the fingers is done by palmar interossei which are supplied by the ulnar nerve. Due to paralysis of palmar interossei, the person is not able to adduct the fingers and so he is unable to hold a piece of paper between his fingers.

Q. Why there is sensory deficit on the palmar aspect of the medial 1½ fingers?

A. The skin of the palmar aspect of medial 1½ fingers is supplied by superficial branch of the ulnar nerve arising in the palm and so there is loss of sensations in medial 1½ fingers. There is no sensory loss on the medial side of the palm as this area is supplied by palmar cutaneous branch of the ulnar nerve arising about 5 cm above the wrist and has escaped injury in this case.

Q. What is Froment's test?

A. Froment's test or book test is done to test the adductor pollicis muscle. The person is asked to firmly hold the book between his thumb and other fingers of both hands. When the doctor tries to pull the book, the terminal phalanx of the thumb on the paralysed side becomes flexed at the interphalangeal joint (by the flexor pollicis longus which is supplied by the median nerve) suggesting paralysis of adductor pollicis muscle. The muscle can also be tested by asking the patient to hold a piece of paper between the thumb and palm. Due to paralysis of adductor pollicis, the patient cannot hold the piece of paper tightly as asked (Fig. 1.32).

Q. What is the other reason for such condition?

A. Compression of ulnar nerve in Guyon's canal (Fig. 1.33) is also known as Guyon canal syndrome.

 Case

A 49 years old patient was admitted to the hospital after a road accident in a state of shock. There were multiple injuries to her right forearm and her radial pulse was absent in the ipsilateral side.

Q. Against which bone radial pulse is felt?

A. Against lower end of radius

Q. Radial pulse is located between which two tendons?

A. Between tendons of palmaris longus and flexor carpi radialis

Q. Which the other site where radial pulse can be felt?

A. In the anatomical snuff box.

Q. What is Allen's test?

A. Allen's test is done to check the patency of radial or ulnar artery. To test the radial artery, patient is asked make a fist and doctor puts pressure over the ulnar at the wrist

artery to stop the blood flow. After a while the patient is asked to open the fist and filling of blood in the palm is checked. If the radial artery is patent, then the palm will immediately become pink. Same test can be done to check the patency of the ulnar artery (Fig. 1.38).

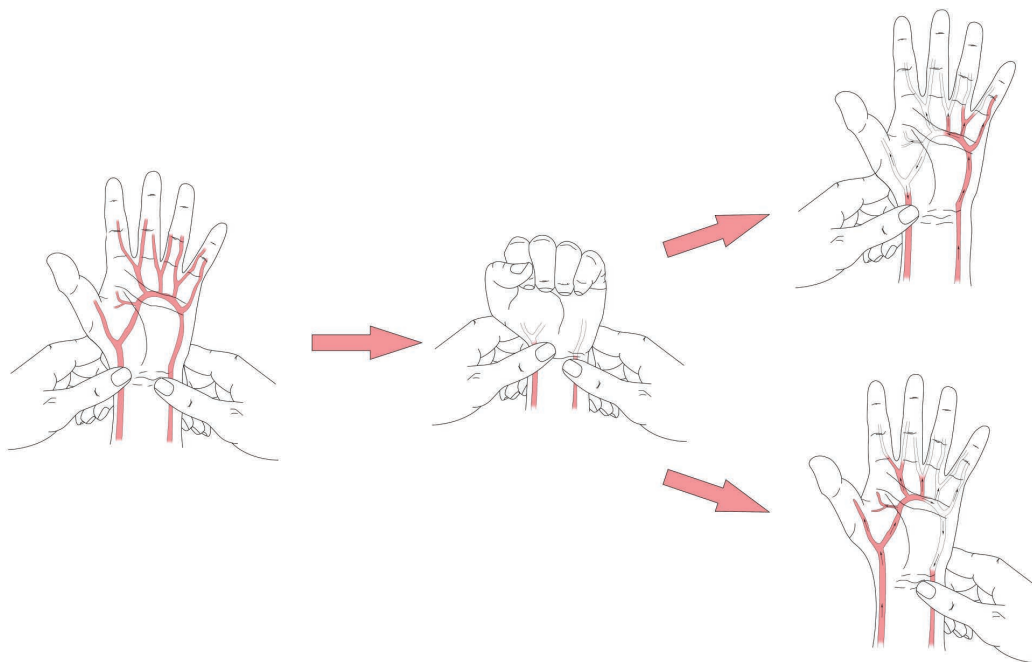


Fig. 1.38: Allen's test

Q. In which other procedure radial artery is used?

A. These are as follows:

1. Radial artery is used in coronary angiography and angioplasty for passing the catheter towards the heart.
2. It is used in coronary bypass surgery where a segment of radial artery is stitched to aorta and affected coronary artery distal to the blockage.
3. Blood for arterial blood gas analysis is taken from radial artery.

Q. Mention the sites where arterial pulsations can be felt in upper limb.

A. These are as follows:

1. Axillary artery pulsations in the lower part of axilla in front of teres major muscle.
2. Brachial artery pulsations on medial side of middle of arm against insertion of coracobrachialis muscle.
3. Brachial artery pulsations in cubital fossa just medial to the tendon of biceps brachii.
4. Ulnar artery pulsations just lateral to the tendon of flexor carpi ulnaris at the wrist.

HAND

Case

A 70 years old man visited a doctor for thickening of the skin from middle of the palm to bases of his right ring and little fingers. On examination, the doctor found that proximal and middle phalanges of affected digits are flexed but the terminal phalanx is unaffected.

Q. Which structure is affected here?

A. Palmar aponeurosis

Q. What is this condition called?

A. Dupuytren's contracture (Fig. 9.18; *BD Chaurasia's Human Anatomy*, Vol 1).

Q. What leads to this condition?

A. There is inflammation of medial side of palmar aponeurosis followed by thickening and contracture of the aponeurosis. The exact cause of this condition is not known.

Q. Which movements of the affected digits are lost?

A. Extension of proximal and middle phalanges of affected digits is lost.

Case

A 45-year-old man visited the doctor with complaint of not being able to play sitar. On examination, the doctor found that his index finger is locked in flexion at metacarpophalangeal joint. As he passively extended the index finger, an audible snap was heard.

Q. What is the name of given condition?

A. Trigger finger or snapping finger or tenovaginitis stenosis (Fig. 1.39).

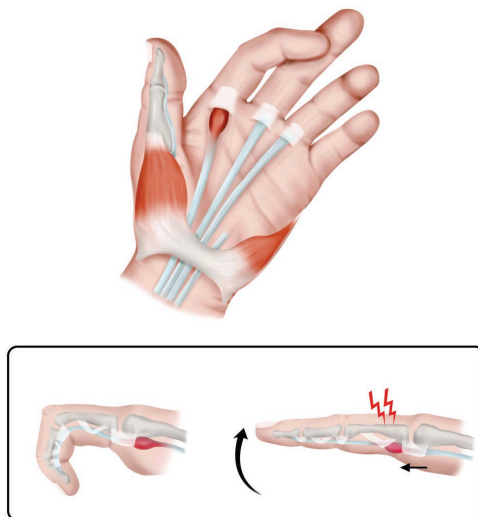


Fig. 1.39: Trigger finger

Q. What is the reason for this condition?

A. Due to thickening of the fibrous flexor sheath, there is narrowing or stenosis of the canal.

This causes swelling in the tendons of flexor digitorum superficialis and flexor digitorum profundus proximal to the tunnel.

Q. Why there snapping sound occurs during extension?

A. As the proximal part of the tendon is swollen, there is difficulty in extending the digit.

Either by excessive effort or by other hand the extension of the digit occurs like a trigger of the gun. So, due to sudden movement of the swollen tendon in and out of the tunnel, the snapping sound occurs.

Q. How this condition is treated?

A. Either by giving steroid injection in the affected part to resolve inflammation or by surgically cutting the narrowed part of fibrous flexor sheath and releasing the pressure over the tendons.

Case

A 24 years old male came to the emergency department after he suffered a deep cut to his left palm when he stumbled and struck his hand on kitchen knife. On examination, it was found that he was not able to extend the interphalangeal joints of 4th and 5th digits. There was no sensory deficit in the hand.

Q. Which nerve is affected in this case?

A. Deep branch of ulnar nerve.

Q. Which muscles are paralysed in this case?

A. All the muscles supplied by the deep branch of the ulnar nerve, viz. three hypothenar muscles, medial two lumbricals, all interossei and adductor pollicis (Fig. 1.40).

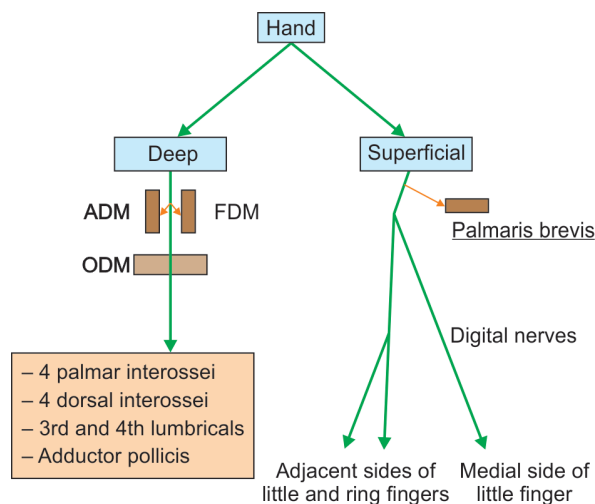


Fig. 1.40: Ulnar nerve distribution in hand

Q. Why the patient is not able to extend interphalangeal joints of 4th and 5th digits?

A. Deep branch of ulnar supplies medial two lumbricals and all interossei. Due to paralysis of these muscles and unopposed action of long flexors (flexor digitorum superficialis and flexor digitorum profundus), the patient is not able to extend interphalangeal joints of 4th and 5th digits.

Q. Which deformity is seen in this case?

A. Ulnar claw hand, i.e. loss of flexion at metacarpophalangeal joint and extension at interphalangeal joint of 4th and 5th digits (Fig. 1.41).



Fig. 1.41: Ulnar claw hand

Q. Why there is no sensory deficit in this case?

A. Deep branch of ulnar nerve gives no sensory branches and hence there is no sensory deficit in this case.

Case

A 35 years old professional cyclist came to doctor with deformity of his right hand. On examination the doctor noticed hyperextension of metacarpophalangeal joints and flexion of interphalangeal joints of medial two digits. There is no sensory loss in the affected digits.

Q. Which nerve is most likely affected?

A. Deep branch of ulnar nerve (Fig. 9.34; *BD Chaurasia's Human Anatomy*, Vol 1).

Q. What is the cause of injury to the affected nerve?

A. It occurs due to compression of deep branch of ulnar against the hook of hamate by handle bar of the cycle. That is why this condition is also known as handle bar palsy or cyclist's palsy.

Q. Which muscles are affected in this condition?

A. Medial two lumbricals, all interossei and adductor pollicis. The three hypothenar muscles are not affected as they are supplied by the deep branch proximal to the hook of hamate.

Q. What is the name of deformity of hyperextension of metacarpophalangeal joints and flexion of interphalangeal joints of medial two digits?

A. Ulnar claw hand (Fig. 1.41).

Q. What is the reason for claw hand?

A. Paralysis of medial two lumbricals and all interossei supplied by deep branch ulnar nerve causes ulnar claw hand.

Q. Which other movements of the hand is lost?

A. Adduction and abduction of fingers is lost due to paralysis of palmar interossei and dorsal interossei respectively. There is also loss of adduction of thumb and so the thumb remains in abducted position.

Q. Why there is no sensory loss in this case?

A. Deep branch of ulnar nerve provides no sensory branches and hence, there is no sensory loss in this case.

Case

A 20 years old man comes to the doctor with a wound on lateral aspect of his left palm. When asked, he was not able to touch the bases of his fingers with his thumb and the thumb was in adducted position. There is also no loss of cutaneous sensation on the skin of the palm or fingers.

Q. Which nerve is most likely injured in this case?

A. Recurrent branch of the lateral division of the median nerve in palm.

Q. Which muscles are supplied by the affected nerve?

A. Three thenar muscles, namely abductor pollicis brevis, flexor pollicis brevis and opponens pollicis.

Q. Why the person is not able to touch the pads of the fingers with his thumb?

A. Due to paralysis of the opponens pollicis, one cannot touch the pads of fingers with the thumb, i.e. loss of opposition.

Q. Why the thumb was adducted in position?

A. Due to unopposed action of adductor pollicis which is supplied by deep branch of ulnar nerve.

Q. Why there is no sensory loss on the skin of the palm?

A. The recurrent branch does not provide any cutaneous branch and so there is no cutaneous loss on the skin of the palm (the skin of the palm is supplied by palmar cutaneous branch of the median nerve and palmar cutaneous branch of the ulnar nerve. Both the palmar cutaneous branches arise in the lower part of the forearm from respective nerves and so there is no sensory loss on the skin of the palm.

Case

An 18 years old first year MBBS student drew blood with a needle from his left middle finger. A few days later, there was swelling of distal part of terminal phalanx of his left middle finger. He came to the doctor with swelling and severe throbbing pain in the terminal phalanx of affected finger.

Q. What is probable diagnosis?

A. Whitlow or felon affecting the pulp space of middle phalanx (Fig. 9.47; *BD Chaurasia's Human Anatomy*, Vol 1).

Q. Why there is severe throbbing pain in the affected finger?

A. Fibrous septa connect the skin to periosteum distal 4/5th of terminal phalanx into 15–20 tight compartments. The collected pus cannot spread due to tight compartments. This will cause rise in pressure in affected compartments leading to severe throbbing pain.

Q. How the pus is drained from pulp space?

A. Pus in pulp space is drained by giving a lateral incision. This kind of incision opens all the compartments and saves the tactile tissue of tips of fingers from damage.

Q. What can happen if one neglects this condition and does not take any treatment?

A. If whitlow is neglected, it will cause compression of blood vessels traversing the compartments. This will lead to necrosis of distal 4/5th of the terminal phalanx. The infection can also spread to digital synovial sheath leading to tenosynovitis.

Case

A 40 years old male injured his right little finger by a sharp iron nail. After about 3 days, he developed fever and his right little finger was swollen and painful.

Q. Name the structure that is likely to be inflamed.

A. Digital synovial sheath of little finger (Fig. 9.7; *BD Chaurasia's Human Anatomy*, Vol 1).

Q. Which tendons are enclosed by the inflamed structure?

A. Digital synovial sheath of fingers encloses the tendons of flexor digitorum superficialis and flexor digitorum profundus for little finger (digital synovial sheath of thumb encloses the tendon of flexor pollicis longus).

Q. What is the extent of the inflamed structure?

A. The digital synovial sheath extends from head of metacarpal to the base of the terminal phalanx. The digital synovial sheaths of index, middle and ring fingers are independent. The digital synovial sheath of little finger is continuous with ulnar bursa and that of thumb is continuous with the radial bursa.

Q. What is this clinical condition called?

A. Tenosynovitis

Q. Where can the infection spread from the affected structure?

A. The infection from digital synovial sheath of little finger can spread to ulnar bursa. This can further spread into the radial bursa (radial and ulnar bursae communicate with each other beneath the flexor retinaculum in 50% of people). Rarely, ulnar bursa may burst and the infection may spread to midpalmar space.

Case

A 35 years old male had suffered a dog bite on his distal forearm. The bite was deep enough to break into the ulnar bursa. The wound was cleaned and stitched. Two days later, the patient developed fever and his little finger was swollen.

Q. Which tendons are enclosed by the ulnar bursa?

A. Ulnar bursa encloses tendons of flexor digitorum superficialis and flexor digitorum profundus (Fig. 9.7; *BD Chaurasia's Human Anatomy*, Vol 1).

Q. What are the layers of ulnar bursa?

A. 2 layers

1. Parietal or outer layer which lines the walls of the carpal tunnel.
2. Visceral or inner layer which lines the tendons of flexor digitorum superficialis and flexor digitorum profundus.

Q. What is the distal communication of ulnar bursa?

A. Ulnar bursa is continuous distally with digital synovial sheath of little finger. So, infection of ulnar bursa can spread into the digital synovial sheath of little finger and vice versa. This is the reason for swelling of little finger in this case (Fig. 9.7; *BD Chaurasia's Human Anatomy*, Vol 1).

Q. Where the incision is put to drain pus from ulnar bursa?

A. Incision is put at the lateral border of hypothenar eminence (Fig. 1.42).

Q. Which tendon is enclosed by radial bursa?

A. Tendon of flexor pollicis longus is enclosed by radial bursa.

Q. What is the distal communication of radial bursa?

A. Radial bursa is continuous distally with digital synovial sheath of the thumb. So, infection of radial bursa can spread to digital synovial sheath of thumb (Fig. 9.7; *BD Chaurasia's Human Anatomy*, Vol 1).

Q. What is compound palmar ganglion?

A. Occasionally the infection from ulnar bursa may spread to forearm space of Parona. So, both ulnar bursa and forearm space are swollen due to collection of pus. But in the region of carpal tunnel, there is constriction due to unyielding walls of carpal tunnel. This kind of hour-glass swelling is known as compound palmar ganglion.

Case

A 14 years old boy was bitten by the dog that entered the radial bursa. The wound was cleaned and dressed. A few days later he was brought to doctor with complaint of fever and swelling in the first web space. Radiography suggested collection of pus in thenar space.

Q. Which facial space acts as inlet for infection to thenar space?

A. Radial bursa usually acts as inlet of infection to thenar space. It occurs when an infected radial bursa with pus bursts open, spreading the infection into the thenar space (Fig. 9.7; *BD Chaurasia's Human Anatomy*, Vol 1).

Q. Which facial space acts as inlet for infection to midpalmar space?

A. Ulnar bursa usually acts as inlet of infection to midpalmar space. It occurs when an infected ulnar bursa with pus bursts open, spreading the infection into the midpalmar space.

Q. Why lumbrical canals are considered distal extension of thenar and midpalmar spaces?

A. Lumbrical canal is formed by delicate connective tissue sheath around lumbrical muscles.

Infection of thenar or midpalmar space easily breaks into the lumbrical canal. So, for practical purpose, the lumbrical canals are considered diverticuli of thenar or midpalmar space into the webs of digits.

Q. How pus in thenar space is drained?

A. The pus in thenar space is drained by putting an incision into the first web space and opening the first lumbrical canal. The lumbrical canal acts as outlet for infection (Fig. 1.42).

Q. How the pus in midpalmar space is drained?

A. The pus in midpalmar space is drained by putting an incision in third or fourth webspace and opening the third or fourth lumbrical canal respectively. The lumbrical canal acts as outlet for infection (Fig. 1.42).

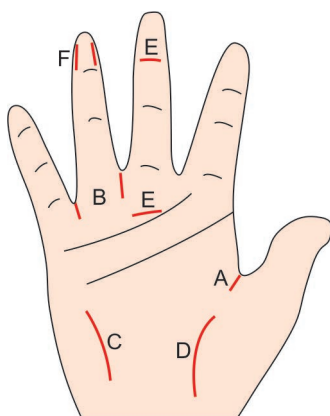


Fig. 1.42: Incisions in hand—A: Thenar space; B: Midpalmar space; C: Ulnar bursa; D: Radial bursa; E: Digital synovial sheath; F: Pulp space

Case

A 25 years old male baseball player came to doctor with pain and swelling of right index finger. He told the doctor that when he dived to reach the base pad, his index finger struck the base pad with force. On examination, it was found that terminal phalanx of the right index finger was in flexed position and the player was unable to extend it.

Q. What is name of deformity?

A. Mallet finger (Fig. 1.43).

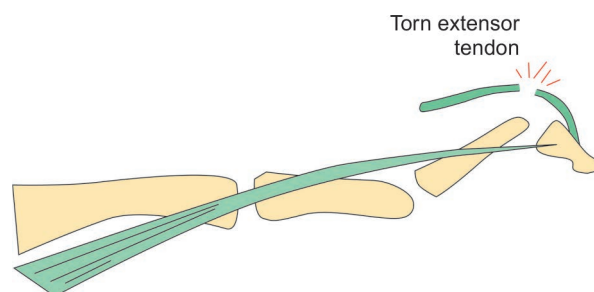


Fig. 1.43: Mallet finger

Q. Which structure is involved in this deformity?

A. Slip of extensor expansion attached to posterior aspect of base of the terminal phalanx.

Q. Why the terminal phalanx was in flexed position?

A. By the action of flexor digitorum profundus attached to anterior aspect of base of the terminal phalanx

Q. What is Boutonnière's deformity (buttonhole deformity)?

A. Avulsion of central slip of extensor expansion attached to the middle phalanx produces characteristic deformity in form of flexion at proximal interphalangeal joint (due to unopposed action of flexor digitorum superficialis) and extension at distal interphalangeal joint (due to constant traction caused by flexion at proximal interphalangeal joint) (Fig. 1.44).

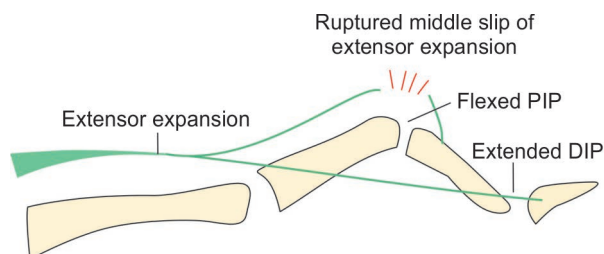


Fig. 1.44: Boutonnière's deformity

JOINTS

Case

A 50 years of old female came with the complaints of progressively increase in pain in the shoulder, stiffness of the shoulder joint and restriction of movements particularly abduction and rotation.

Q. What is probable diagnosis?

A. Frozen shoulder (Fig. 1.45).

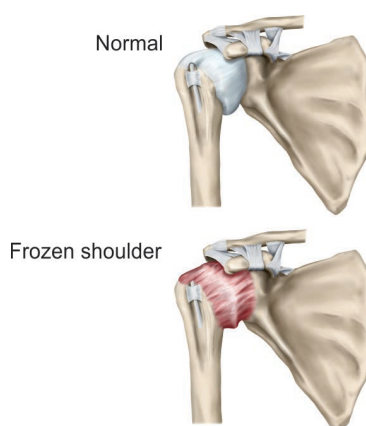


Fig. 1.45: Frozen shoulder

Q. Mention the pathology for this condition.

A. Frozen shoulder or adhesive capsulitis occurs because two layers of the synovial membrane become adherent to each other. It is self-limiting disease and the patient recovers with 1–3 years.

Q. Describe the change in mechanism of scapula-humeral rhythm.

A. Due to restriction of movements at gleno-humeral, there is altered scapula-humeral rhythm because of excessive use of scapular motion while performing overhead flexion and abduction.

Case

A 36 years old female came to doctor with pain in the anterior region of her right shoulder. When asked, she said that she is professional tennis player and she is right handed. Arthroscopic examination of the right shoulder joint revealed erosion of a tendon within the right shoulder joint.

Q. Which tendon is affected in this case?

A. Tendon of long head of biceps brachii.

Q. From where does this tendon arise?

A. From supraglenoid tubercle of scapula. The origin of long head of biceps is intracapsular.

Q. From where does the other head of this tendon arise?

A. From tip of coracoid process in common with coracobrachialis.

Q. What is the nerve supply of this muscle?

A. Musculocutaneous nerve (C 5, 6, 7).

Case

A 78 years old male patient came to doctor with a bulging in his right arm. He told that the bulging had appeared after lifting a heavy box of books. On physical examination the doctor concluded the bulging to be 'Popeye's deformity'.

Q. Which structure is affected in this case?

A. Spontaneous rupture of long head of biceps.

Q. Which is the most common site of injury in this case?

A. Movements of long head of biceps at intertubercular sulcus leads to wear and tear of the tendon. So, it is the common site for rupture of the tendon.

Q. What is Popeye's deformity?

A. Spontaneous rupture of long head of biceps, causes sudden appearance of a bulging in lower arm because the detached belly takes the shape of a ball. The deformity is called Popeye's deformity due to its resemblance with cartoon character Popeye (Fig. 1.46).

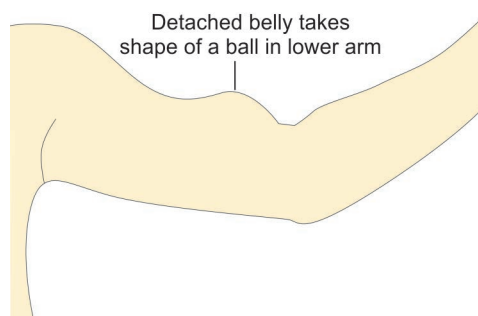


Fig. 1.46: Popeye's deformity

Case

A 45 years old female came to the doctor with complaints of fever for the last five days and right shoulder tip pain. On examination, the shoulder region was found to be normal. On further investigation, it was found that the woman is suffering from subphrenic abscess.

Q. Which structure is irritated by subphrenic abscess in this case?

A. Right dome of thoraco-abdominal diaphragm

Q. What is the reason for shoulder tip pain?

A. Irritation of peritoneum underneath diaphragm causes referred pain on the shoulder.

This is because both, the phrenic nerve (root value C 3, 4, 5) carrying the sensation from peritoneum and supraclavicular nerves (root value C 3, 4) supplying the skin over the shoulder arise from spinal nerves C3, C4.

Q. Give reason for left shoulder tip pain.

A. Irritation of peritoneum underneath left dome of diaphragm produces left shoulder tip pain. This is mostly seen in splenic rupture (Kehr's sign—elevation of leg end of bed brings blood collected in peritoneal cavity towards diaphragm. The peritoneum underneath the diaphragm is irritated by the blood leading to left shoulder tip pain).

Case

A 37 years old male tennis player complained of severe pain over lateral part of right elbow. On examination it was found that there is tenderness over lateral epicondyle and the pain is aggravated on extension of wrist against resistance.

Q. What is this condition called?

A. Lateral epicondylitis

Q. What is the other name of this condition?

A. Tennis elbow (Fig. 1.47).

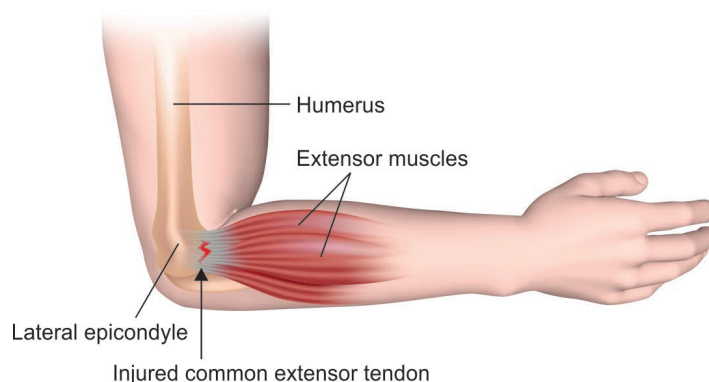


Fig. 1.47: Tennis elbow

Q. What is the location of pain in this condition?

A. Over the lateral epicondyle of the humerus.

Q. What causes such a condition?

A. Repeated forceful extension of the wrist and abrupt pronation of forearm may cause such condition.

Q. what are the causes for this condition?

A. Swimming, basketball, table tennis or any other sports in which there is strenuous use of extensors of forearm.

Case

A 38 years female golfer complained of severe pain over medial part of her right elbow. On examination, it was found that there is tenderness over medial epicondyle and pain aggravates on flexion of forearm.

Q. What is this condition called?

A. Medial epicondylitis.

Q. What is the other name of this condition?

A. Golfer's elbow (Fig. 1.48).

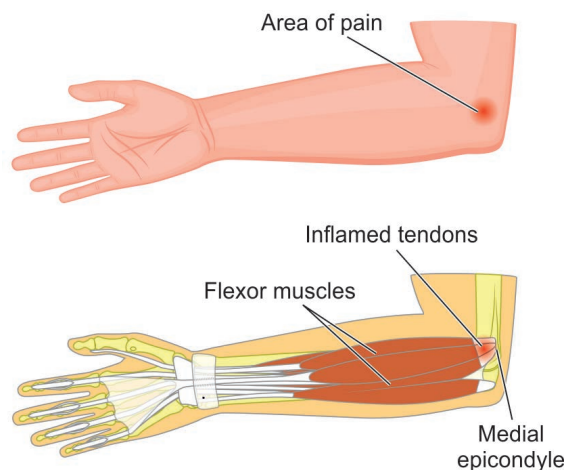


Fig. 1.48: Golfer's elbow

Q. What is the location of pain in this condition?

A. Over medial epicondyle of humerus.

Q. What is the cause of such condition?

A. It occurs due to inflammation of common flexor tendons, caused by repeated flexion and pronation of forearm at elbow.

Case

A 40 years old male fell on outstretched hand after losing his balance while skating on the ice. He came to the emergency department with bulging on the posterior aspect of his elbow. Examination showed loss of movements at the elbow joint. Radiograph showed posterior dislocation of ulna.

Q. Which part ulna can get fractured along with dislocation of ulna?

A. Coronoid process of ulna.

Q. How this condition can be diagnosed without using radiographic examination?

A. In dislocation of ulna, triangular relationship between two epicondyles of humerus and the olecranon is lost. During extension of elbow, these three bony points lie in

the same line. During flexion, these three bony points make isosceles triangle. Any disturbance in relationship of these three bony points indicate dislocation.

Q. What is student's (minor's) elbow?

A. Inflammation of superficial bursa over the olecranon process is called student's elbow.

The students while attending the class, support their head with their flexed elbow resting on the bench. This causes compression of bursa and subsequent inflammation (Fig. 1.49).



Fig. 1.49: Student's elbow

Case

A nursemaid was playing with a 4 years boy in the park. She pulled the boy's hand to put him on the swing. As she tugs the boy, the boy screams with pain. The boy is admitted to the emergency department. Here, the doctor noticed that the boy is not able to straighten his forearm. Radiographic examination reveals a dislocated head of radius slipping out of a ligament.

Q. Write the name of this condition?

A. Pulled elbow or Nursemaid's elbow (Fig. 1.50).

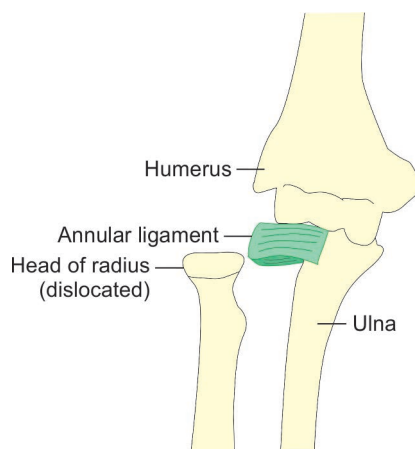


Fig. 1.50: Dislocation of head of humerus

Q. Which ligament is involved in this case?

A. Annular ligament

Q. Which joint is involved in this case?

A. Superior radioulnar joint

Q. What is the type and subtype of involved joint?

A. Pivot variety of synovial joint.

Q. Write anatomical basis for this clinical condition.

A. In the children below six years of age, the diameters of head and neck of radius are same. When the child is pulled with hand in semi-proned position, the head of radius slips out of the annular ligament (subluxation). Forcible supination screws the dislocated head into place.