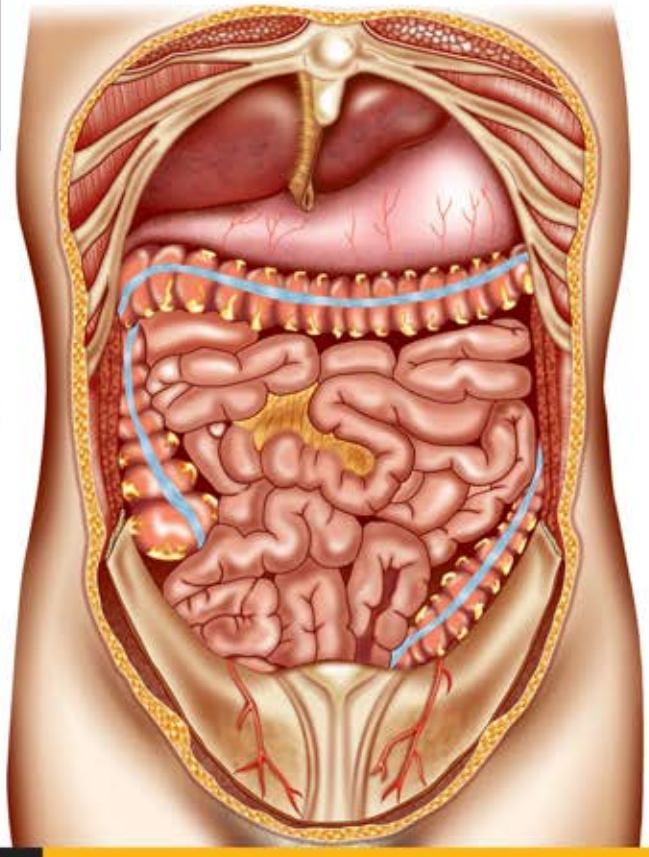
Dissection *of* the HUMAN BODY

Designed for Restructured Medical Curriculum

A Krishnamurti
JP Gunasegaran



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DISSECTION SCHEDULE 4

Back of Forearm, Hand and Joints of Shoulder Girdle

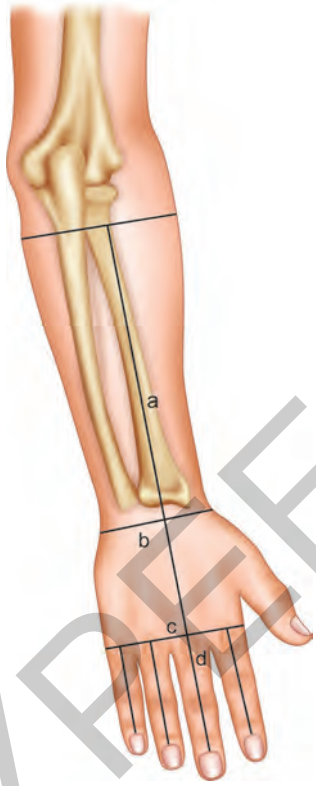

Fig. 4.1 • Skin incisions

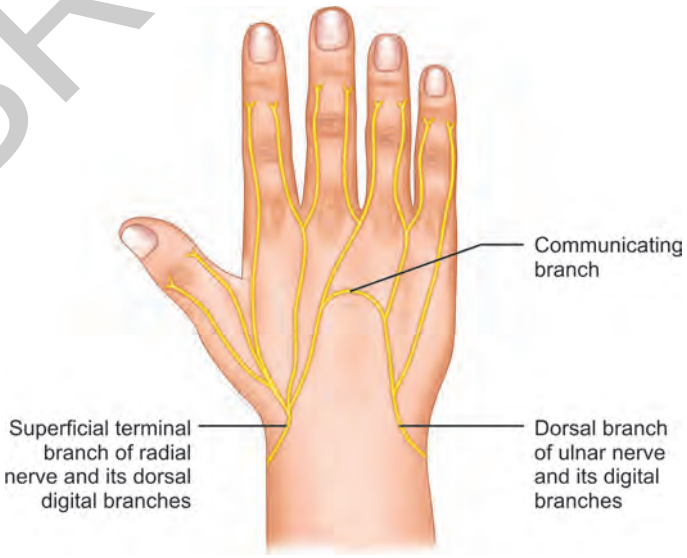

Fig. 4.2A • Cutaneous nerves on the dorsum of hand

BACK OF FOREARM AND HAND

Incisions (Fig. 4.1)

- Make the following incisions:
  a. A median incision from the middle of the forearm down to the root of the middle finger.
  b. A transverse incision across the wrist.
  c. A curved incision at the level of the heads of the metacarpal bones.
  d. A longitudinal incision along the middle of each digit to the nail bed.
- Reflect the skin flaps.

Dorsum of Hand (Figs 4.2A and B)

- Clean the dorsal venous arch which lies over the metacarpal region and note the commencement of the basilic and cephalic veins from the ulnar and radial sides of the arch.

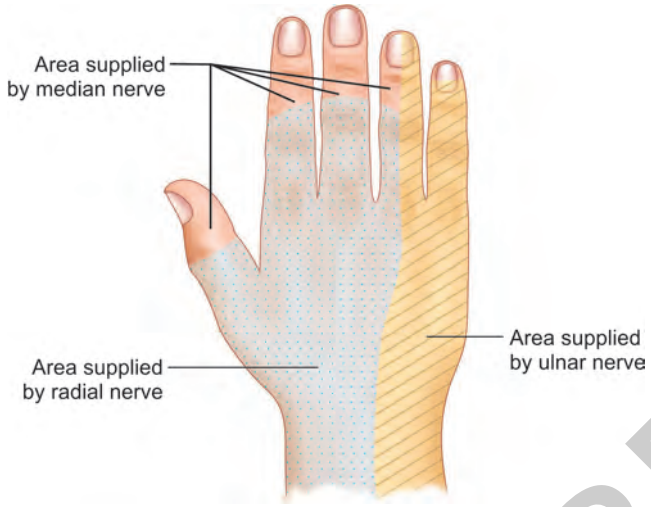

Fig. 4.2B • Area of distribution of cutaneous nerves on the dorsum of hand

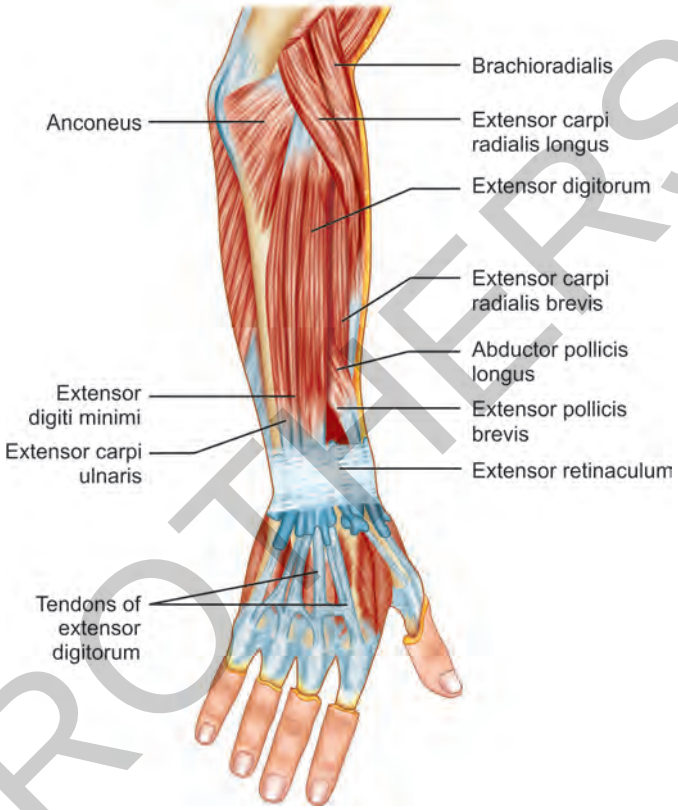

Fig. 4.3 • Superficial muscles of the back of forearm

- Identify the *dorsal branch of the ulnar nerve* piercing the deep fascia about 5 cm above the wrist on the medial side of the forearm. Trace this nerve and clean its digital branches supplying the medial one and a half or quite often the medial two and a half digits.
- Similarly clean the branches of the *superficial radial nerve* supplying the remaining digits. This nerve can be seen in the lower part of the lateral side of the forearm before it breaks up into digital nerves.
- Define the *extensor retinaculum* which is attached to the lower end of the radius laterally and the triquetral and pisiform medially. Remove the rest of the deep fascia.

BACK OF FOREARM (SUPERFICIAL) (FIG. 4.3)

- Define the *marginal set* of three muscles of forearm, i.e. (a) *brachioradialis* arising from the upper part of the lateral supracondylar ridge of the humerus and gaining insertion into the lower end of the radius; (b) *extensor carpi radialis longus* passing from the lower part of the lateral supracondylar ridge to the base of the second metacarpal bone; (c) *extensor carpi radialis brevis* extending from the lateral epicondyle of the humerus to the styloid process of third metacarpal bone. Note, once again, the nerve supply from the trunk of the *radial nerve* to the first two muscles and secure the nerve supply to the extensor carpi radialis brevis from the deep branch of the radial nerve.
- Note that the *superficial* extensors comprising the extensor digitorum, the extensor digiti minimi and the extensor carpi ulnaris have a common origin from the lateral epicondyle of the humerus. Trace the *extensor digitorum* into the hand where it splits into four tendons for the medial four digits. Define the insertion of the extensor *carpi ulnaris* into the base of the fifth metacarpal bone.

BACK OF FOREARM (DEEP) (FIGS 4.4A AND B)

- Divide the extensor digitorum, extensor digiti minimi and extensor carpi ulnaris midway between their origin and insertion to bring into view the *deep group* of muscles. Study their attachments. From above downwards these are:

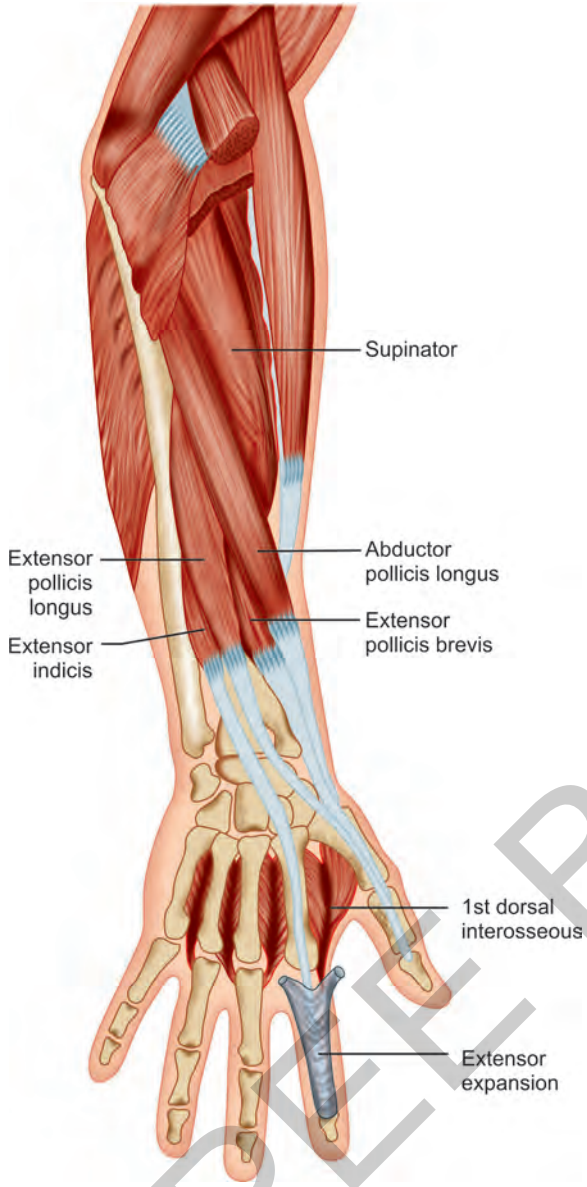

Fig. 4.4A • Deep muscles of the back of forearm and hand

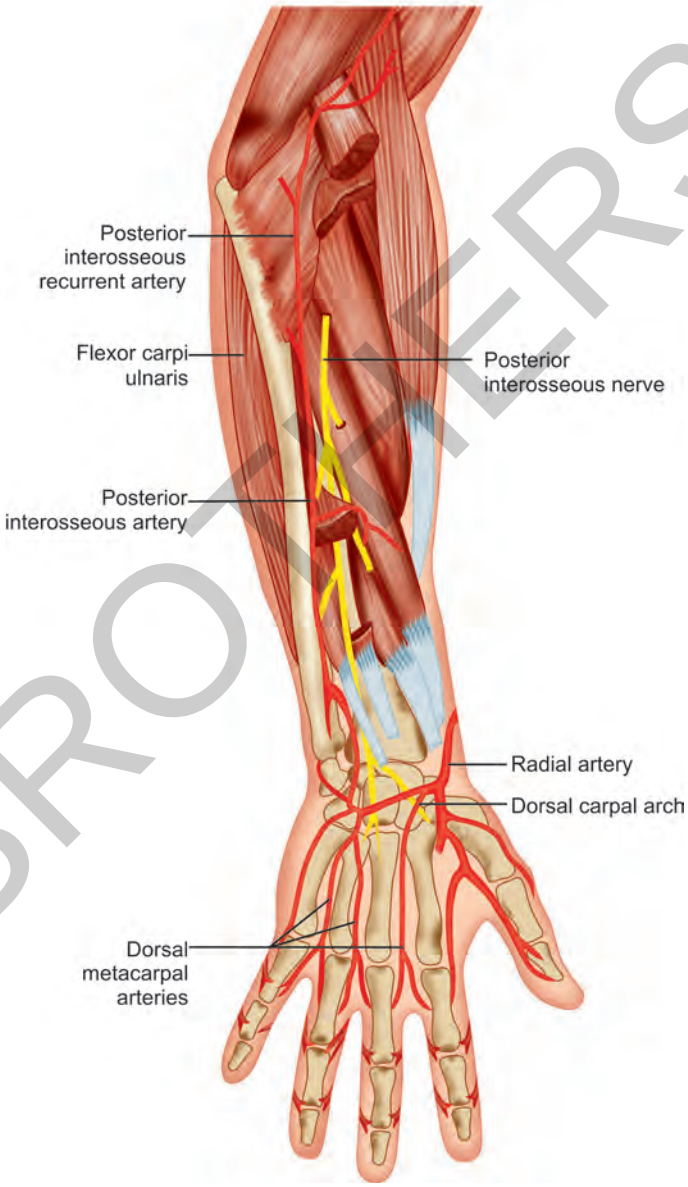

Fig. 4.4B • Neurovascular structures on the back of forearm and hand

a. The *supinator,* passing from the lateral epicondyle of the humerus and supinator crest of the ulna to the upper third of radius. Note how the muscle winds round the posterior surface of the radius.
b. *Abductor pollicis longus* taking origin from the posterior surfaces of both radius and ulna and gaining insertion into the base of the first metacarpal.
c. *Extensor pollicis brevis* arising from the posterior surface of the middle of the shaft of the radius and getting inserted into the proximal phalanx of the thumb. Observe that the tendons of the last two muscles run side by side on the lateral aspect of the wrist.
d. *Extensor pollicis longus* taking origin from the posterior surface of the ulna just proximal to the origin of the extensor indicis and getting inserted into the terminal phalanx of the thumb; note that the tendon passes medial to the tubercle on the dorsal aspect of the distal end of the radius.

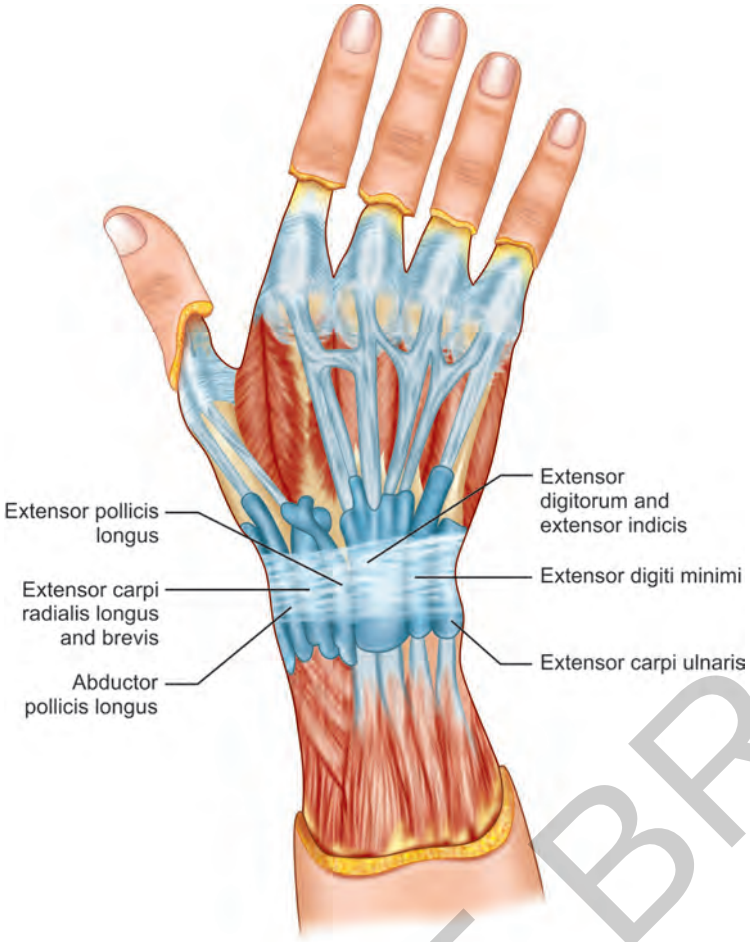

Fig. 4.5A • Extensor retinaculum with underlying structures

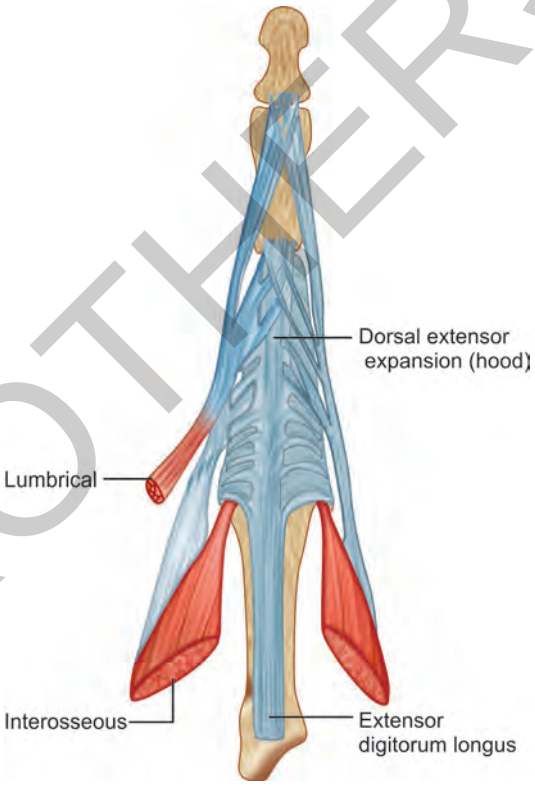

Fig. 4.5B • Extensor expansion (extensor hood)

e. *Extensor indicis* originating from the lower part of the posterior surface of the ulna and fusing with the extensor digitorum tendon for the index finger.

Trace the *deep branch of the radial nerve* through the supinator and note that it continues as the posterior interosseous nerve. Secure the branches of the posterior interosseous nerve to the superficial and deep extensors. Identify the accompanying posterior interosseous artery arising from the common interosseous branch of the ulnar artery.

EXTENSOR RETINACULUM (FIG. 4.5A)

- Review the attachments of extensor retinaculum
- Trace the extensor tendons as they *pass under the extensor retinaculum* in six different osteofascial compartments. As they lie in these compartments, they are covered by synovial sheaths.
- Identify once again the tendons of the extensor digitorum. Note that the tendons to the index and little fingers are joined by the tendons of the extensor indicis and extensor digiti minimi respectively. Observe that the tendons begin to expand towards the digitis where they form the extensor expansions (extensor hood) (Fig. 4.5B). Trace the slips from these expansions to their insertions into the bases of the intermediate and distal phalanges.
- Near the wrist (anatomical snuff box) find the radial artery passing beneath the tendons of the abductor pollicis longus, extensor pollicis brevis and extensor pollicis longus to enter the palm between the two heads of the first dorsal interosseous muscle. Note that its dorsal carpal branch anastomoses with the corresponding branch of the ulnar artery to form the *dorsal carpal* arch. Trace the branches from the arch supplying the dorsum of the hand.

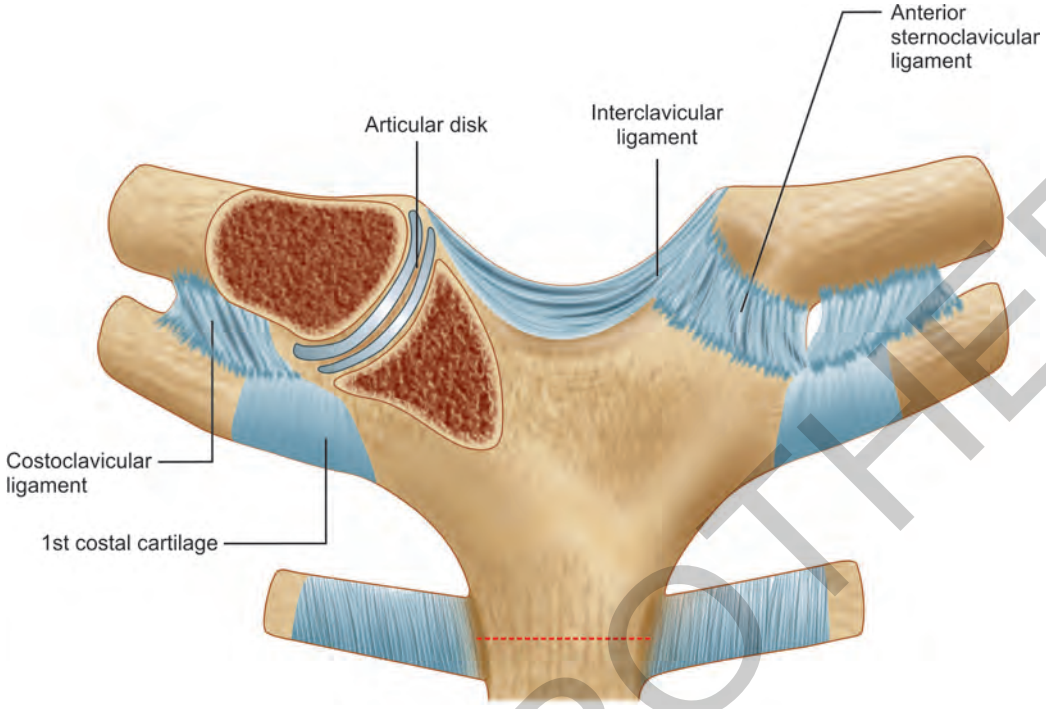

Fig. 4.6 • Sternoclavicular joint

JOINTS OF SHOULDER GIRDLE

Sternoclavicular Joint (Fig. 4.6)

- Dissect this joint *only* on the right side. Detach the tendinous *sternal head* of the sternomastoid muscle. Define the *anterior* and *posterior* sternoclavicular and *interclavicular* ligaments.
- Detach the subclavius from its origin. Look for the important *costoclavicular (rhomboid) ligament* that extends from the inferior surface of the medial end of the clavicle to the first rib and costal cartilage. This is an accessory ligament of the joint.
- Cut through the upper part of the capsule close to the sternum and displace the clavicle laterally to see the *articular disc.* Note the attachments of the disc to the upper part of the medial end of the clavicle above and to the first costal cartilage below. Remove the disc and examine the opposing articular surfaces.

Acromioclavicular Joint

- Clean the superior and inferior ligaments. Open the joint and see if there is an articular disc. Examine the articular surfaces. Look for the *coracoclavicular ligament* stretching between the inferior surface of the clavicle and the superior surface of the coracoid process (Fig. 4.7). This ligament is composed of a medial *conoid* and a lateral *trapezoid* portion with a bursa in between the two. Note the direction of fibers of these two portions.
- Observe the *coracoacromial ligament* extending from the apex of the acromion process to the coracoid. This ligament lies behind the coracoclavicular ligament. The coracoclavicular ligament is an accessory ligament.

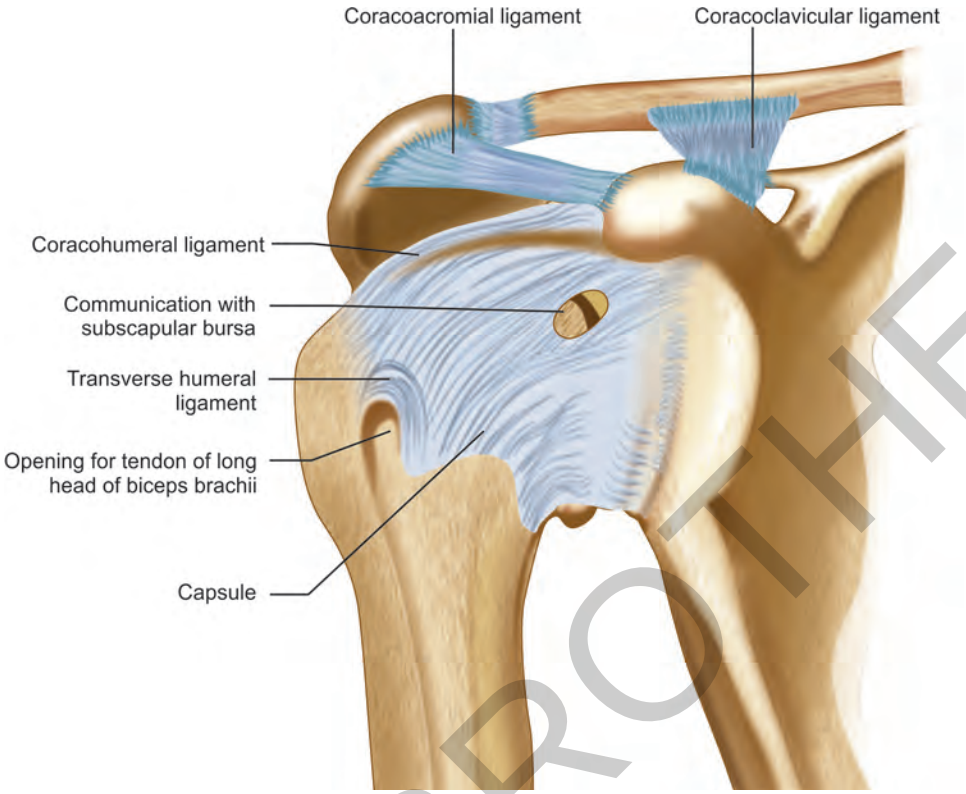

Fig. 4.7 • Shoulder joint (anterior view)

Shoulder Joint (Fig. 4.7)

- Define the capsule and note the tendons of the rotator cuff which are fused to it. Identify the subscapular bursa underneath the subscapularis tendon and note that it communicates with the shoulder joint.
- Detach the short head of biceps and coracobrachialis from their origin. Identify the tendon of the long head of the biceps lying beneath the *transverse humeral ligament* which stretches across the upper part of the intertubercular groove. Note that the *coracohumeral ligament* extends from the root of the coracoid process (above the supraglenoid tubercle) towards the greater tubercle of the humerus. This strengthens the upper part of the capsule. Observe the laxity in the lower part of the *capsule* of the joint and note its attachment to the *surgical neck* of the humerus. This is the weakest and least protected part of the capsule.
- Open the posterior part of the capsule by a vertical incision and rotate the head of the humerus medially to view the superior, middle and inferior glenohumeral ligaments passing from the anterior margin of glenoid cavity towards the anatomical neck of humerus in relation to the lesser tubercle. Now cut through the anterior part of the capsule and identify the origin of the long head of the biceps from the supraglenoid tubercle of the scapula.
- Remove the humerus by cutting through the remains of the capsule and long head of biceps. Note the difference in the size of the humeral and scapular articular surfaces,
- Identify the labrum glenoidale attached to the margins of the glenoid cavity. Make a cross section of the labrum and observe its shape.

TAKE HOME MESSAGE

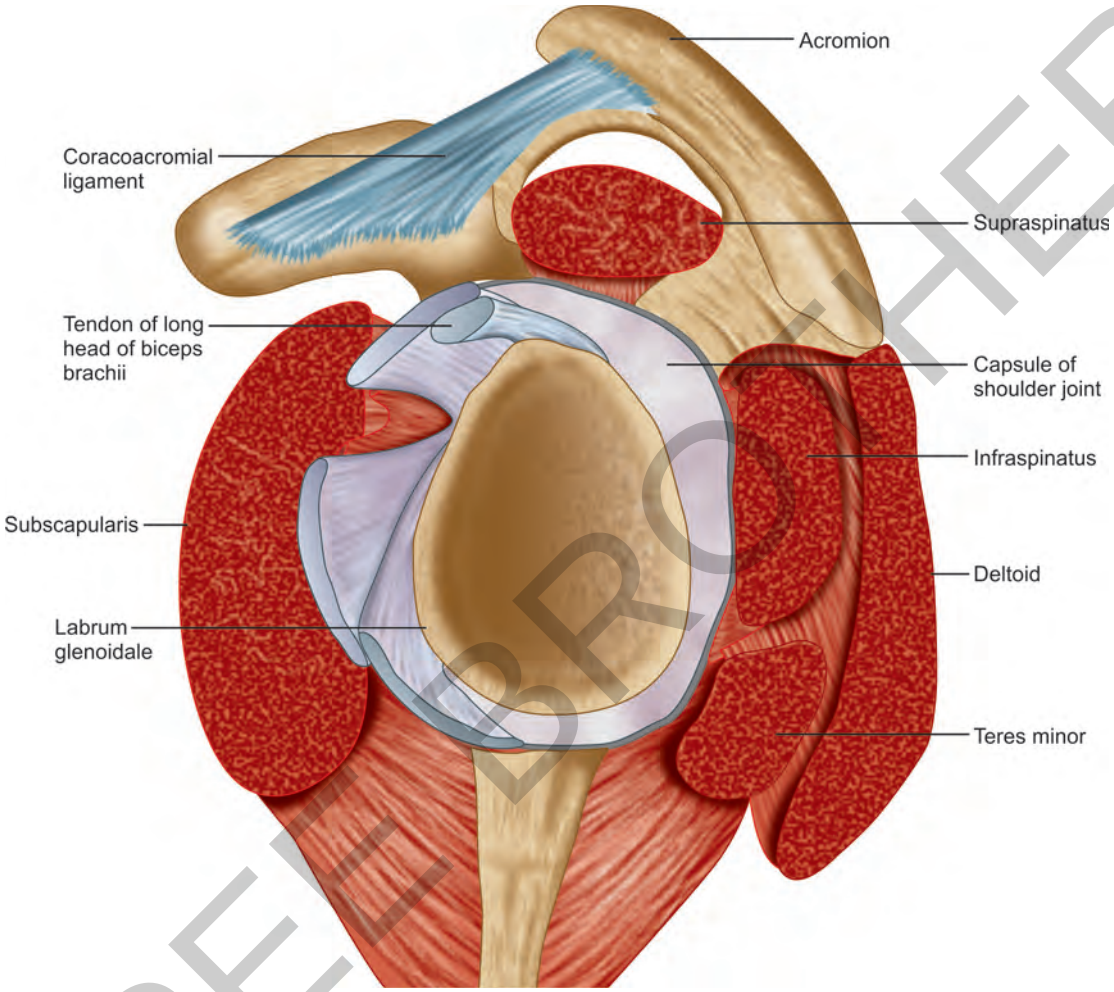

Fig. 4.8 • Rotator cuff muscles of shoulder joint

The ***sternoclavicular joint*** though classified as a saddle joint, permits varying types of movements of the clavicle such as elevation, depression, forward and backward movements as well as rotation. The strength of this joint depends largely on the strength of the ligaments. In particular, the costoclavicular ligament and the interarticular disc (which may be regarded as an intracapsular ligament) check the upward displacement of the medial end of the clavicle. Consequently, dislocation of the medial end of the clavicle does not usually occur.

The ***shoulder joint*** is a ball and socket joint in which mobility is greatly increased at the expense of stability. The strength of the joint depends chiefly on the rotator cuff muscles which are fused to the capsule of the joint (Fig. 4.8). The joint is least protected inferiorly and consequently dislocations commonly occur here.

The 'plane of the joint' is set obliquely so that the arm is carried forwards and medially during flexion and backwards and laterally during extension. Abduction is initiated by the supraspinatus and further carried out by the deltoid. As abduction proceeds towards a vertical position, the humerus is rotated laterally.

It must also be borne in mind that during movements of the shoulder joint, simultaneous movements occur at the sternoclavicular and acromioclavicular joints. Consequently, any restriction of movements of these joints will indirectly

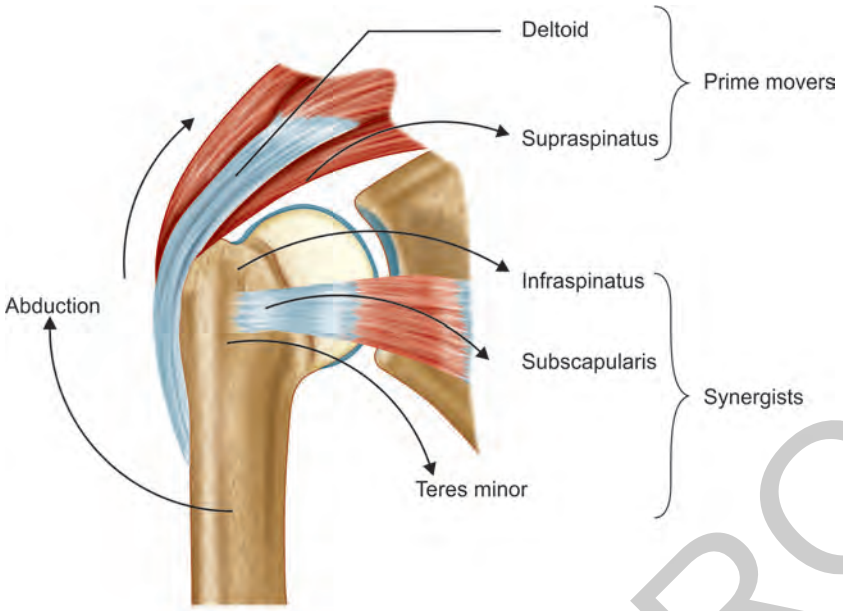

Fig. 4.9A • Initiation of abduction at shoulder joint

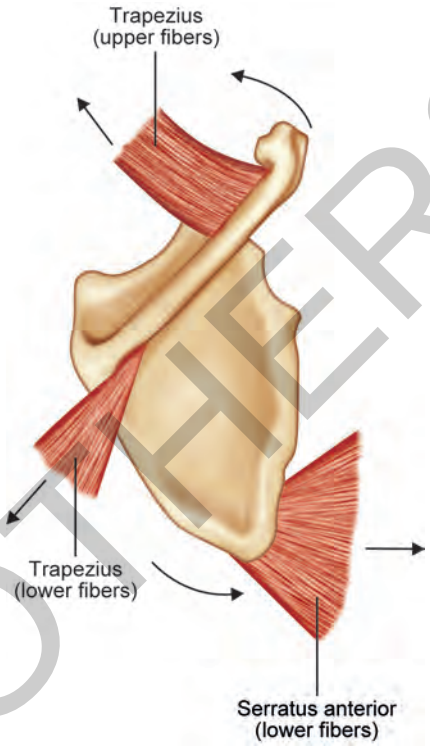

Fig. 4.9B • Overhead abduction (180º) by rotation of scapula

affect the movements of the shoulder joint. Moreover, movements of the shoulder joint are assisted by an excursion of the scapula on the thoracic wall. Therefore any paralysis of muscles which move the scapula will restrict the range of movement at the shoulder joint. Indeed in abduction of the arm through a possible 180°, scapular rotation by itself contributes to about a third of the total movement (Figs 4.9A and B).

The muscles of the back of the forearm can be classified into superficial and deep groups. The superficial set comprises the brachioradialis, extensor carpi radialis longus and brevis which are situated laterally (marginal group) and the extensor digitorum, extensor digiti minimi and extensor carpi ulnaris which occupy the dorsal aspect of the forearm. The deep group is formed by the supinator, abductor pollicis longus, extensor pollicis brevis, extensor pollicis longus and the extensor indicis. All these muscles are supplied by the radial nerve or its branches. Consequently, in cases of injury to the radial nerve, the extensor muscles will be paralysed leading to a condition known as 'wrist drop'.

OBJECTIVES FOR BACK OF FOREARM, HAND AND JOINTS OF SHOULDER GIRDLE

BACK OF FOREARM AND HAND

General Objective - 1

Understands the disposition of muscles in the region.

Specific Objectives

1. Enumerates muscles of superficial and deep extensor groups.
2. Defines osteofascial compartments in the back of the wrist and enumerates tendons passing through each compartment.
3. Defines the boundaries and contents of the anatomical snuffbox.
4. Defines formation and termination of extensor expansions to each digit.
5. Comments on tendons to thumb, index finger and little finger.

General Objective - 2

Comprehends arrangement of nerves and blood vessels of the region.

Specific Objectives

1. Defines muscles supplied by radial nerve and its branches.
2. Indicates segmental innervation of wrist joint and the joints of fingers.
3. Explains 'wrist drop' in anatomical terms.
4. Analyses cutaneous innervation and dermatomic pattern of the region.
5. Traces origin, course and termination of basilic and cephalic veins.
6. Comprehends fracture of lower end of radius and ulna (Colles' fracture).

JOINTS OF SHOULDER GIRDLE

General Objective - 1

Comprehends arrangement of osteoligamentous structures of the joints of the shoulder girdle.

Specific Objectives

1. Orientates sternum, clavicle, scapula and humerus.
2. Articulates clavicle with sternum and first costal cartilage and compares the clavicular and sternal articular surfaces.
3. Describes the ligaments of the sternoclavicular joint.
4. Assigns functional role to the articular disc of sternoclavicular joint.
5. Articulates clavicle with acromion.
6. Describes the ligaments of acromioclavicular joint.
7. Assigns functional role to the coracoclavicular ligament.
8. Articulates humerus with scapula.
9. Compares articular surfaces of shoulder joint.
10. Describes attachments of capsular, transverse humeral and coracohumeral ligaments of the shoulder joint.
11. Identifies anatomical and surgical necks of humerus.
12. Defines axes and movements of shoulder joint.
13. Discusses stability of the shoulder joint.
14. Analyses innervation of the shoulder joint based on Hilton's law.
15. Explains how movements of the shoulder joint are associated with movements of the shoulder girdle, i.e. movements at the acromioclavicular and sternoclavicular joints.
16. Interprets X-rays of these joints.

General Objective - 2

Comprehends the anatomy of the shoulder joint.

Specific Objectives

1. Classifies muscles acting on shoulder joint into flexors, extensors, abductors, adductors and rotators.
2. Outlines role of the 'rotator cuff'.
3. Explains effects of paralysis of deltoid, supraspinatus and serratus anterior.
4. Reviews spinal cord segment (spinal centers) controlling movements at the shoulder joint.
5. Understands the subluxation of shoulder joint.

General Objective - 3

Comprehends movements of the shoulder girdle.

Specific Objectives

1. Differentiates movements of the shoulder girdle, i.e. movements of scapula and clavicle only, from movements of the shoulder joint.
2. Defines muscles concerned in elevation, depression, protraction and retraction of the scapula in everyday activities.
3. Explains role of serratus anterior, trapezius, rhomboids and levator scapulae in scapular rotation.
4. Discusses movements of elevation, depression, protraction, retraction, and rotation of the clavicle, and roles of the coracoclavicular and rhomboid ligaments.
5. Explains how movements of the shoulder girdle are limited following diseases of the shoulder joint.

Dissection *of the* Human Body

Designed for Restructured Medical Curriculum

Salient Features

- This book is designed in such a way that the dissection of the human body can be completed regionwise within 8 months
- The objective of the design is to equip the medical student with clear anatomical concepts rather than getting lost in the intricacies of details; and to gain the fundamental level of competence required for the practice of medical profession
- Each anatomical region has an introduction, which explains the disposition of structures on the basis of development and evolution followed by weekly dissection schedule
- In each schedule, instructions are given serially and in step-by-step format for easy comprehension. Especially for areas related to special senses, where dissection can be avoided, provision is made for the study on prosected specimens
- A *Take Home Message* highlighting the salient features of the regions dissected, is given at the end of each schedule
- A list of *Objectives* to encourage the students to form discussion groups to ensure that they learn those aspects that will be required by them in their clinical years.

A Krishnamurti BSc MBBS FAZ PhD FZS MIBiol FAMS FABMS is one of the distinguished Anatomists of the country, with 55 years of teaching and research experience in Anatomy gained from three different universities, viz. University of Singapore, University of Madras, Chennai, and Annamalai University, Chidambaram, Tamil Nadu, India. He has made significant contributions to both teaching and research in anatomy. He has published five books and has to his credit 85 research publications in both national and international journals. His brilliant academic records enabled him to get recognition from many peer groups, such as the International Brain Research Organization (IBRO) and the National Academy of Medical Sciences (NAMS), New Delhi, India. The Anatomical Society of India appointed him as the Chairman of Anatomy Curriculum Committee to revise the MBBS curriculum to suit the present-day needs. Notable among the several distinctions and awards received by him, is the prestigious Hari Om Ashram Alembic Research Award from the Medical Council of India for his contribution to Medical Sciences.

JP Gunasegaran MSc PhD is the Professor of Anatomy at Rajah Muthiah Medical College (RMMC), Annamalai University, Chidambaram, Tamil Nadu, India. He has been teaching anatomy to undergraduate and postgraduate students both in India and abroad at premier institutes, such as CMC, JIPMER, RMMC, India and Al-Fateh University of Medical Sciences, Tripoli, Libya, for more than 35 years. His *Textbook of Histology and a Practical Guide* (2nd Edition, 2010) is very popular among students of many institutions. He has reviewed renowned textbooks, such as *Gray's Anatomy: The Anatomical Basis of Clinical Practice* (40th Edition, 2008) and *Wheater's Functional Histology: A Text and Colour Atlas* (5th Edition, 2006). He has received several distinctions and notable among them are Dr TK Narashimha Reddy Award, for the best Teacher in Anatomy and Dr Liza Chacko Endowment Prize, for the best research work in anatomy.

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