

**Prof. Dr. Talib Jawad**  
**Anatomy introduction**

**Clinical Anatomy by Regions -**  
**Richard S. Snell**

بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ



Core Knowledge for Optimal Performance . . .  
On the USMLE Step 1 And In Practice!

**RICHARD S. SNELL**

# CLINICAL ANATOMY

for *Medical Students*

SIXTH EDITION

The new edition of *Clinical Anatomy for Medical Students* is created with today's curriculum and medical practice in mind.

Taking into account the vast expansion of technology in recent years, the new Sixth Edition delivers high-yield content in a concise format with everything you need for your future in practice—without extraneous detail.

Like its predecessors, the Sixth Edition features a user-friendly organization by body region, from surface to deep structure. That way, the presentation is in sync with your curriculum, and also makes it easier to find material on specific structures.

Plus, the book is generously illustrated, with clear depictions augmented with extensive use of color. You'll find artwork summarizing the nerve and blood supplies of regions, as well as overviews of the distribution of cranial nerves—an advantage for study and review.

#### NEW to the Sixth Edition:

- More tables within the chapters and in the appendix to streamline the text and make it easier to learn and remember more material, including important dimensions and capacities of various structures.
- Expanded coverage of the anatomy of common medical procedures, with new sections on complications caused by an ignorance of normal anatomy.
- More illustrations of CT scans, MRIs, and sonograms to increase your understanding of cross-sectional anatomy, and to reflect the increased use of these modalities in the clinical setting.
- Clinical problem solving questions at the end of each chapter, revised to follow National Board format.
- More clinically relevant focus on the anatomy of areas commonly involved in trauma such as auto accidents and gunshot and knife wounds.
- More emphasis on pediatric anatomy, including embryological dynamics that are clinically significant in congenital defects.

Make this text part of your library. You'll see why the Sixth Edition of *Clinical Anatomy for Medical Students* is your best choice—for class now, and for practice in the future.



# Step 1

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[Overview](#) [Content Outline and Specifications](#) [Content Description](#) [Test Question Formats](#)

## Overview

Step 1 assesses whether you understand and can apply important concepts of the sciences basic to the practice of medicine, with special emphasis on principles and mechanisms underlying health, disease, and modes of therapy. Step 1 ensures mastery of not only the sciences that provide a foundation for the safe and competent practice of medicine in the present, but also the scientific principles required for maintenance of competence through lifelong learning. Step 1 is constructed according to an integrated content outline that organizes basic science material along two dimensions: **system and process**.

 [Content Description and Practice Materials](#)

[Information about the Step 1 exam including downloadable practice materials](#)

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# P R E F A C E

**A**s we enter the second millennium, faculty and students should pause and seriously consider the type of factual information that is necessary for the successful diagnosis and treatment of patients. During the last 2 decades alone there has been an explosion in technological advances in all the medical disciplines. The detailed anatomic knowledge once taught to generations of physicians is no longer desirable or necessary. However, future physicians (you) should be able to recall the basic anatomic information necessary to examine patients successfully and to interpret the findings of modern technological procedures.

Although this sixth edition continues with the successful and popular format of providing students with the core knowledge of anatomy to carry out clinical practice, great efforts have been made to weed out unnecessary material and generally streamline the text. The following changes have been introduced:

1. Tables have been used wherever possible to reduce the size of the text. This includes reference tables at the end of the text that give important dimensions and capacities of various anatomic structures.
2. More emphasis is given to pediatric anatomy, and embryologic explanations to some important congenital defects have been added.
3. The anatomy of common medical procedures section has been expanded and includes sections on complications caused by an ignorance of normal anatomy.
4. The advent of a more violent society has necessitated that greater attention be paid to areas commonly traumatized by gunshot and knife wounds and automobile accidents.
5. The more extensive use of computed tomographic (CT) scans, magnetic resonance images (MRIs), sonograms, and echocardiograms has resulted in the need for increased knowledge of cross-sectional anatomy so that the findings can be interpreted.

6. The clinical problems section at the end of each chapter has been reconstructed so that the problem solving can be answered in a manner similar to that found in the National Boards, with multiple-choice features.

Each chapter of *Clinical Anatomy for Medical Students* is constructed in a similar manner. This will give students ready access to material and will facilitate moving from one part of the book to another. Each chapter is divided into the following categories.

1. *Clinical Example*: A short case report that dramatizes the relevance of anatomy in medicine introduces each chapter.
2. *Chapter Outline*: A list of selected headings with page numbers is provided so that immediate access is possible. This information is supplied in addition to the detailed index at the end of the book.
3. *Chapter Objectives*: This section focuses the student on the material that is most important to learn and understand in each chapter. It emphasizes the basic structures in the area being studied so that once mastered, the student will be able to easily build up his or her knowledge base. This section also points out structures on which examiners have repeatedly asked questions on national examinations.
4. *Basic Anatomy*: This section provides basic information on gross anatomic structures that are of clinical importance. Numerous examples of normal radiographs, CT scans, MRIs, and sonograms are also provided. Labeled photographs of cross-sectional anatomy of the head, neck, and trunk are included to stimulate students to think in terms of three-dimensional anatomy, which is so important in the interpretation of CT scans, MRIs, and sonograms.
5. *Surface Anatomy*: This section provides surface landmarks of important anatomic structures, many of which are located some distance beneath the skin. This section is important because most practicing physicians seldom

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**Basic anatomical information for  
Successful diagnosis  
what are the new in this edition**

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**Tables , pediatric anatomy , abnormality, concentrate on more parts exposed to accidents , CT, Mri,**

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**Clinical problems, clinical anatomy ,: clinical example ,**



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**Outline , Objectives,**

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5. *Surface Anatomy:* This section provides surface landmarks of important anatomic structures, many of which are located some distance beneath the skin. This section is important because most practicing physicians seldom

explore tissues to any depth beneath the skin. Photographs of living subjects have been used extensively.

6. *Clinical Notes:* This section provides the practical application of anatomic facts that are essential in clinical practice. It emphasizes the structures that the physician will encounter when making a diagnosis and treating a patient. It also provides the anatomic knowledge necessary to understand many procedures and techniques and notes the anatomic "pitfalls" commonly encountered.

7. *Clinical Problem Solving*: Examples of clinical cases are given at the end of each chapter. Each is followed by multiple-choice questions. Answers to the problems are given at the end of the chapter.
8. *National Board Type Questions*: Examples of National Board Type Questions are found at the end of each chapter. Solutions to the problems are provided at the end of the chapter.

To assist in the quick understanding of anatomic facts, the book is heavily illustrated, and most figures have been kept simple; color has been used extensively. Illustrations summarizing the nerve and blood supply of regions have been retained, as have overviews of the distribution of cranial nerves.

I am greatly indebted to many faculty members of the Department of Radiology at the George Washington University School of Medicine and Health Sciences for the loan of radiographs, CT scans, and MRIs that have been reproduced in different sections of this book. I am also grateful to Dr. Carol Lee, Dr. Gordon Sze, and Dr. Robert Smith of the Department of Radiology at Yale University Medical Center for supplying examples of mammograms, CT scans of the vertebral column, and MRIs of the limbs. My special thanks are due to Dr. Michael Remetz of the Department of Cardiology at Yale for providing examples of coronary arteriograms.

As in the past, I wish to express my sincere thanks to Terry Dolan, Virginia Childs, and Myra Feldman for the earlier preparation of the artwork and to Ira Alan Grunther, AML, for the very fine new art in this edition.

To the librarians of the George Washington University School of Medicine and Health Sciences, thanks are due for the continued help in procuring much needed reference material.

Finally, I wish to express my deep gratitude to the staff of Lippincott Williams & Wilkins for their enthusiasm and support throughout the preparation of this book.





1985



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# INTRODUCTION

A 65-year-old man was admitted to the emergency department complaining of the sudden onset of a severe crushing pain over the front of the chest spreading down the left arm and up into the neck and jaw. On questioning, he said that he had had several attacks of pain before and that they had always occurred when he was climbing stairs or digging in the garden. Previously, he found that the discomfort disappeared with rest after about 5 minutes. On this occasion, the pain was more severe and had occurred spontaneously while he was sitting in a chair; the pain had not disappeared.

The initial episodes of pain were angina, a form of cardiac pain that occurs on exertion and disappears on rest; it is caused by narrowing of the coronary arteries so that the cardiac muscle has insufficient blood. The patient has now experienced myocardial infarction, in which the coronary blood flow is suddenly reduced or stopped and the cardiac muscle degenerates or dies. Myocardial infarction is the major cause of death in industrialized nations. Clearly, knowledge of the blood supply to the heart and the arrangement of the coronary arteries is of paramount importance in making the diagnosis and treating this patient.

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# CHAPTER OBJECTIVE

It is essential that students understand the terms used in describing the structure and function of different regions of gross anatomy. Without these terms it is impossible to describe in a meaningful way the composition of the body. Moreover, the physician needs these terms so that anatomic abnormalities found on clinical examination of a patient can be accurately recorded.

Included in this chapter are brief descriptions of

some of the basic structures that compose the body, such as skin, muscles, and bones. It is important that a student understands the functional organization of these structures and how they control the various activities of the body.

Knowledge of the arrangement of the end arteries in the blood supply to the cardiac muscle, as seen in the clinical example at the beginning of the chapter, is a case in point.

**Structure  
and  
function**

**How  
structures  
are  
arranged**

A

65-year-old man was admitted to the emergency department complaining of the sudden onset of a severe crushing pain over the front of the chest spreading down the left arm and up into the neck and jaw. On questioning he said that he had had several attacks of pain before and that they had always occurred when he was climbing stairs or digging in the garden. Previously, he found that the discomfort disappeared with rest after about 5 minutes. On this occasion the pain was more severe and had occurred spontaneously while he was sitting in a chair; the pain had not disappeared.

climbing stairs  
digging

الدرجات المتسلقة  
الحفر

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episode  
paramount



الحادثة  
أساسي



*Again I say to the Medical Students:*

*“The first day that you look at or place your hand on a patient, you require a basic knowledge of anatomy to interpret your observations. It is in the Anatomy Department that you learn the basic medical vocabulary that you will carry with you throughout your professional career and that will enable you to converse with your colleagues. Anatomy can be a boring subject; clinical anatomy is fascinating.”*

*“In an era of unprecedented technological advances and automation, remember that your patient is a human being like yourself and should always receive the personal attention, respect, and care that you would wish to receive in similar circumstances. Your knowledge of their anatomy may save their life.”*

**career,** المهنة  
**automation,** الية  
**unprecedented,**  
غير مسبق

**Circumstances**  
ظروف  
**Carry** يحمل  
**Converse** مناقشة

# Basic Anatomy

## Definition Anatomy

***Anatomy is the study of structure and functions of the body parts (its one of the oldest basic medical science , firstly studied in Egypt 500B.C.)***

***Term Anatomy refer to cutting up or taking a part.***

***Modern anatomy = functional anatomy , so anatomy is the structure in which the function of life occur .***

# Approaches of studying anatomy

I-Regional Anatomy ( Topographical anatomy) •

\*\*\* Regional Anatomy (it's the method of studying the body's structure by focusing attention on a specific parts . e.g., the head – region the face ), Conceders the organization of human body as segments or major parts based on **form & mass**.

**main body parts consisting of Head – neck, trunk** (subdivided into thorax , abdomen , back) &(pelvis\perineum ) & **paired upper limbs & lower limbs .**

All the major parts may be further subdivided into regions & zones

***Regional anatomy also recognizes the body's organization by layers : skin , subcutaneous tissue & deep fascia covering the deeper structures of muscles , skeleton & cavities which contain viscera (internal organs)***

**\*\*\*Surface anatomy : is an essential part of the study of regional anatomy , we can learn much by observing the external form & surface of the body & observing or feeling the superficial aspects of structures beneath its surface**

## 2-Systemic anatomy

**\*\*\* recognizes the organization of the body's organs into system or collective apparatuses that work together to carry out complex functions so it's a study of the functional systems of the body**

**The body system include**

**Integumentary system**

(dermatology ) consist of the skin & its appendages ( hair, nails , sweat glands )

**Skeletal system ( Osteology )** consist of bones and cartilage , its provides our basic shape & support for the body & its what the muscular system acts on to produce movement , also it protect vital organs .

## Articular system (arthrology )

consist of joints & their associated ligaments , connecting the bony parts of the skeletal system & providing the sites at which movement occur.

## Muscular system ( Myology) ,

consist of muscles that act (contract) to move or position parts of the body.



# Nervous system ( Neurology)

,consist of CNS (brain &spinal cord) and PNS (nerves& ganglia ,together with their motor & sensory ending ) the nervous system controls & coordinates the functions of the organ system enabling the body's responses to activities within its environments .

**Digestive system or alimentary system (gastroenterology )** consist of the organs & glands associated with ingestion , mastication (chewing) , deglutition (swallowing) , digestion & absorption of food & the elimination of feces remaining after nutrients have been absorbed.

# Circulatory system ( angiology )

consist of cardiovascular & lymphatic system , which functional in parallel to transport body fluid .

A- cardiovascular system (Cardiology ) , consist of heart & blood vessels that propel & conduct blood through the body ,delivering oxygen , nutrient , & hormones to cells & remove waste product.

**B- lymphatic systems** , it's a network of lymphatic vessels that withdraw excess tissue fluid (lymph) from the body's interstitial (intercellular) fluid compartment , filters it through lymph nodes & returns it to the body stream .

# Respiratory system ( pulmonology )

consist of the air passages & lungs that supply oxygen to the blood for cellular respiration & eliminate carbon dioxides from it. Diaphragm & larynx control the flow of air through the system ,which may also produce tone in the larynx that is further modified by tongue , teeth , &lips into speech

**Urinary system (urology)** consist of the kidneys ,ureters, urinary bladder & urethra ,which filter blood & subsequently produce , transport , store & intermittently excrete urine

**Reproductive or genital system** ( •  
gynecology for female & andrology for male) •  
consist of gonads that produce oocytes &  
sperms , & the duct that transport them .

**Endocrine system ( endocrinology)** consist •  
of discrete ductless glands as well as isolated •  
& clustered cells of the gut & blood vessel  
walls & specialized nerve ending that secret  
hormones

3- **Clinical Anatomy (applied anatomy)** •



# **DESCRIPTIVE ANATOMIC TERMS**



## Anatomical planes

**The median plane** : the vertical plane passing longitudinally through the body ,divides the body into right & left halves .The plane intersects the midlines of the anterior & posterior surface of the body .its often erroneously used as a synonym for the median plane.

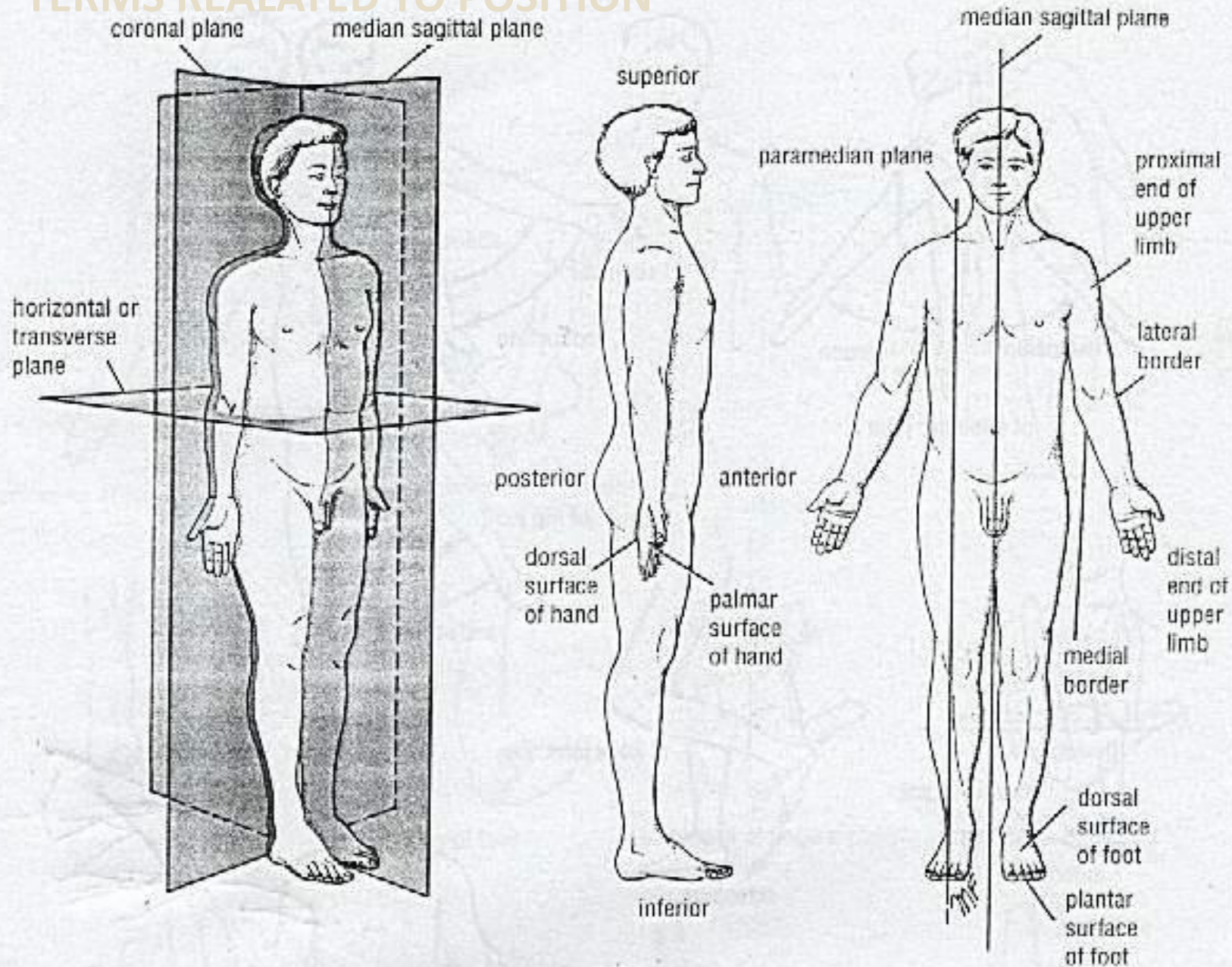
**Sagittal plane:** are vertical plans passing through the body parallel to the median plane. Its helpful to give a point of reference by naming a structure intersected by the plane you are referring to.

The **term midsagittal** plane is superfluous term for the median plane. Parasagittal ,commonly used by neuroanatomists & neurologists ,is also unnecessary because any plane parallel & to either side of the median plane is sagittal by definition ( however a plane parallel & near to the median plane may be referred to as a Para median plane

**Frontal (coronal) plane: are vertical planes passing through the body at right angles to the median plain ,dividing the body into anterior (front) and posterior (back) parts. Again a point of reference is necessary to indicate the position of the plane (e.g. a frontal plane through the heads of mandible**

***Transverse plane*** : are plane passing through the body at right angles to the median & frontal planes divided the body into superior (upper) & inferior (lower) parts . Its helpful to give a reference point to identify the level of the plane such as (transverse plane through the umbilicus).

# TERMS RELATED TO POSITION



**Figure 1-1** Anatomic terms used in relation to position. Note that the subjects are standing in the anatomic position.

## Type of sectioning

**Longitudinal section** : run lengthwise or parallel to the long axis of the body or any of its parts & the term applies regardless of the position of the body .

**Transverse section (cross section )** : are slices of the body or its parts that are cut at right angles to the longitudinal axis of the body or any of its parts .

**Oblique sections** : are slice of the body or any of its parts that are not cut along one of the previously mentioned anatomical planes .

## TERMS REALATED TO POSITION

**Anatomic position** :that position in which the person standing erect ,with the upper limbs by the sides and the face and palms of the hands directed forward .



Superficial

Internal

Anterior

Palmer

Ipsi lateral

Supine

Lateral flexion of trunk

Abduction

Protraction

Deep

external

posterior

dorsal

contra lateral

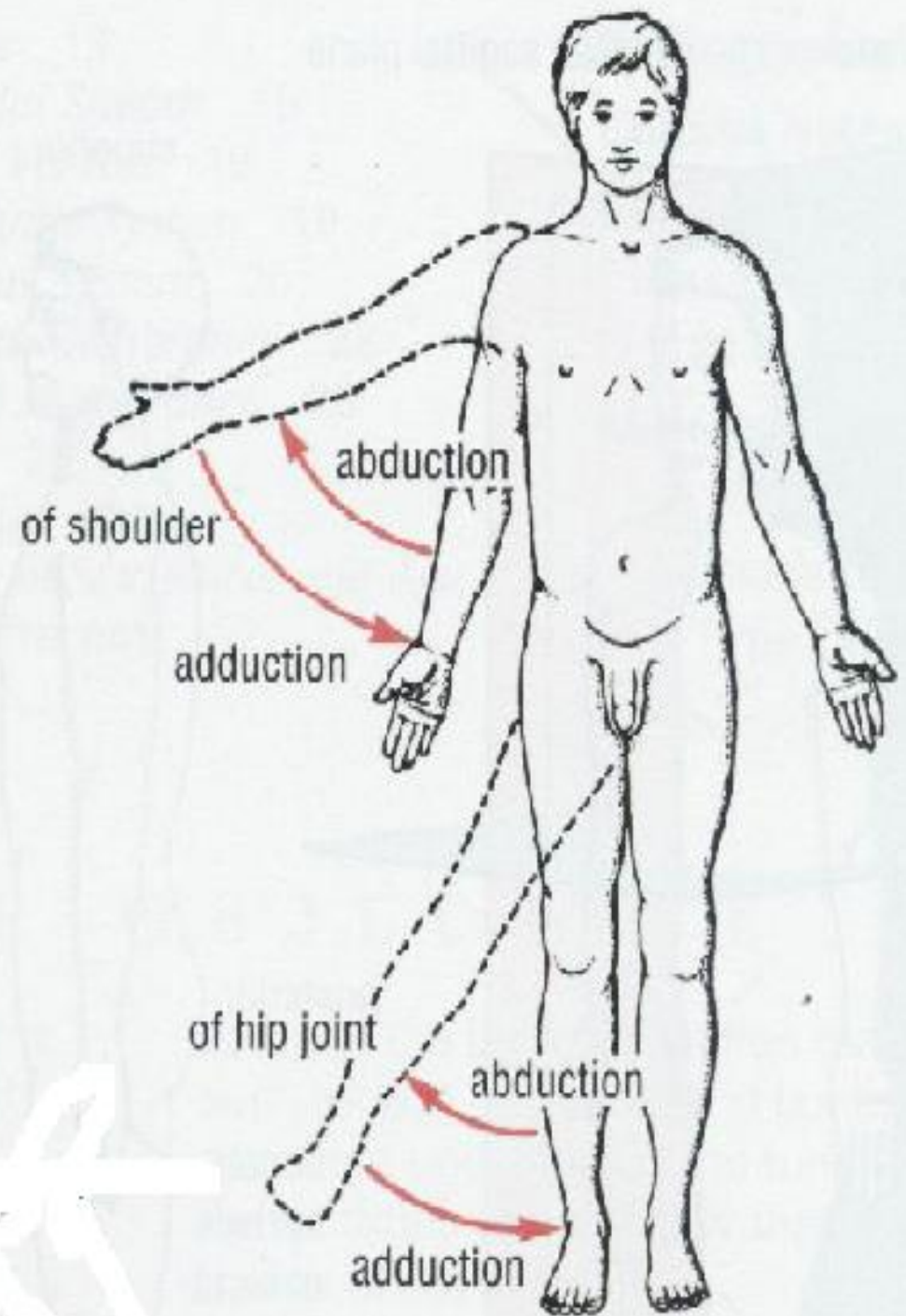
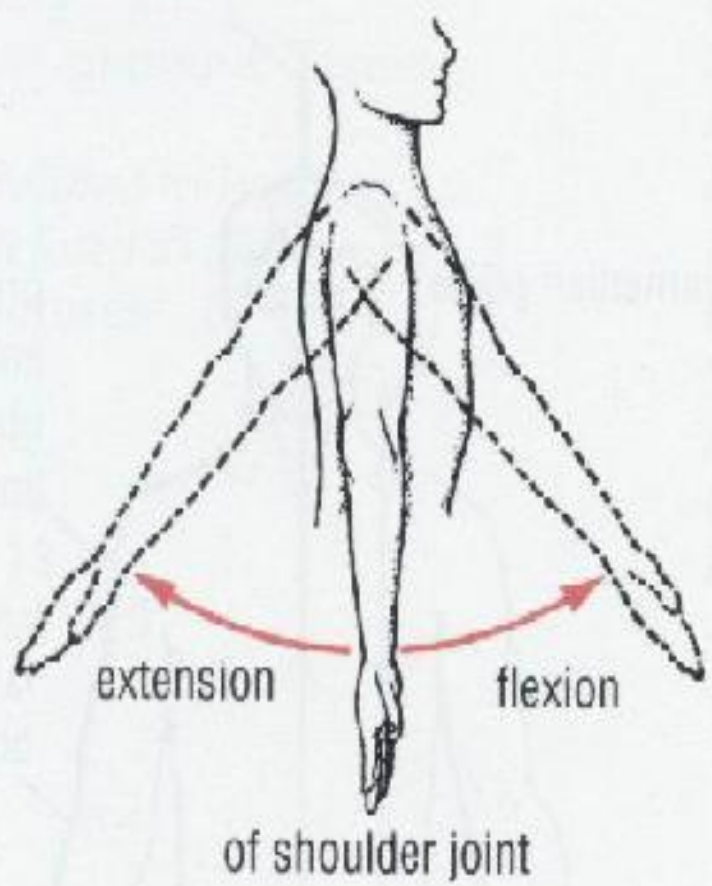
prone

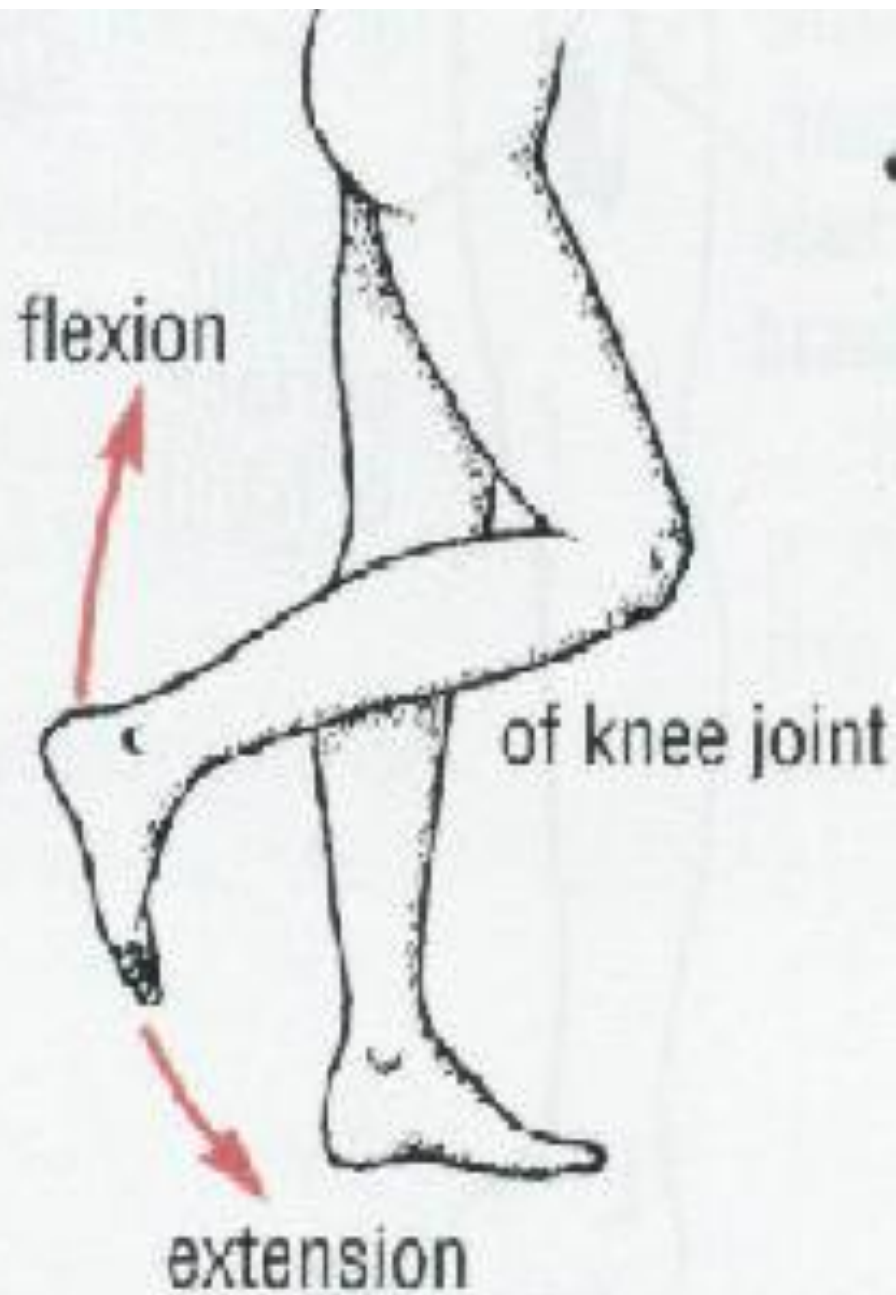
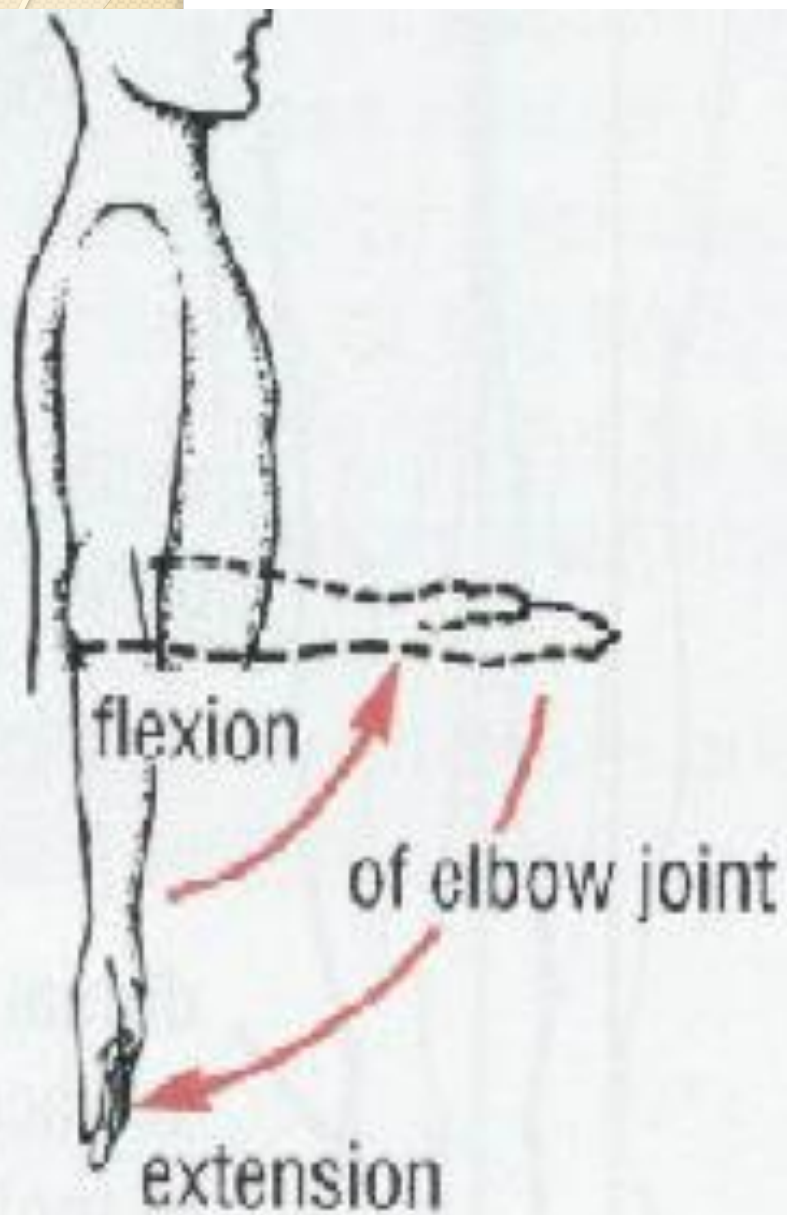
adduction

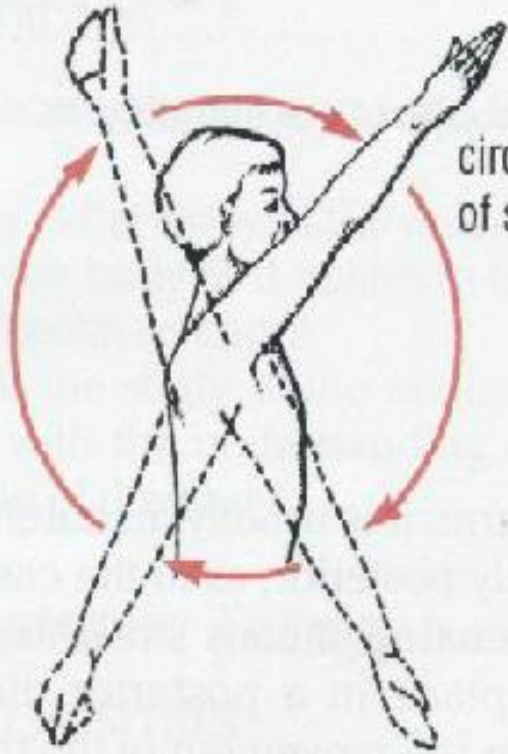
retraction



# **TERMS REALATED TO MOVENENT**



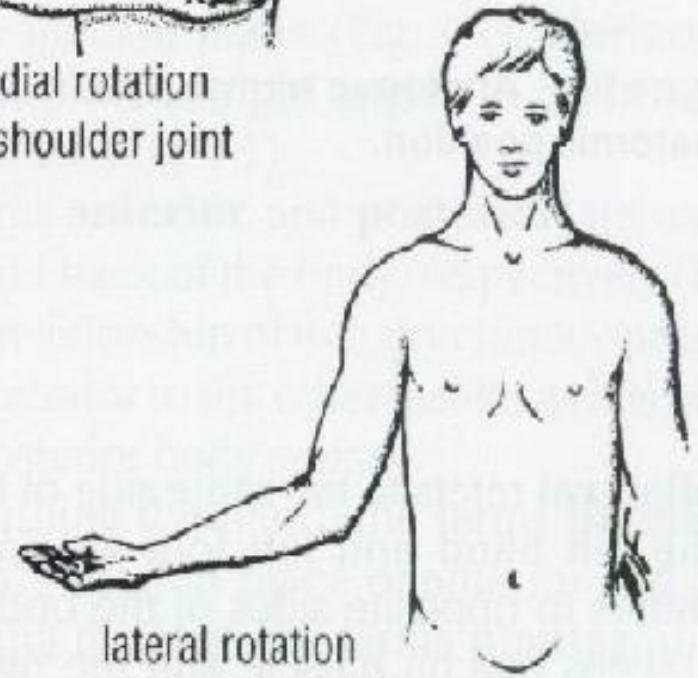




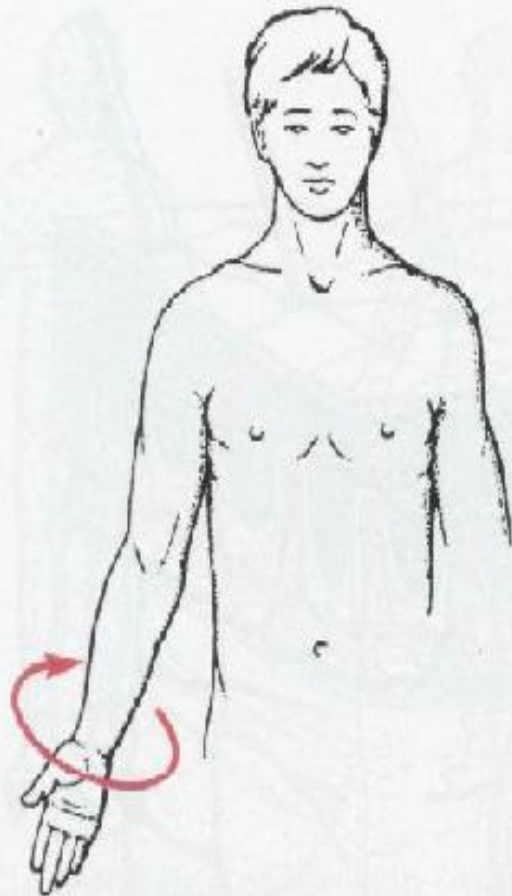
circumduction  
of shoulder joint



medial rotation  
of shoulder joint



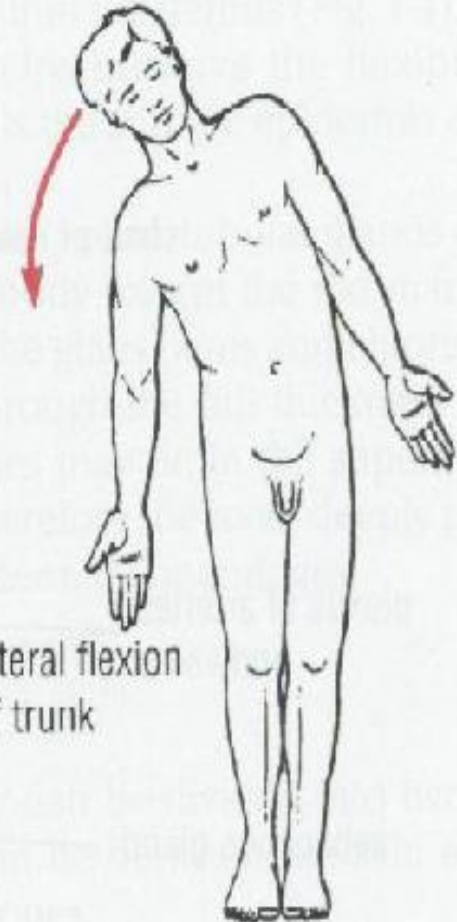
lateral rotation  
of shoulder joint



supination of forearm



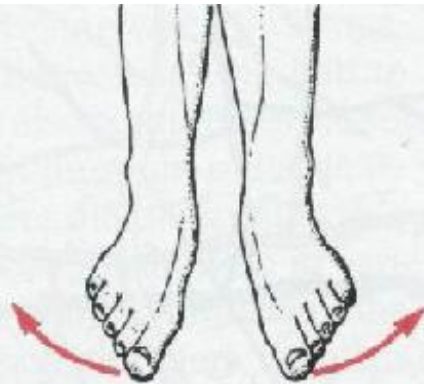
pronation of forearm



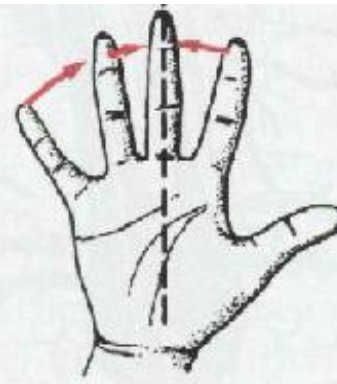
lateral flexion  
of trunk



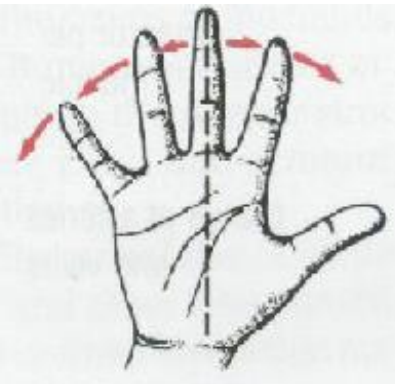
inversion of foot



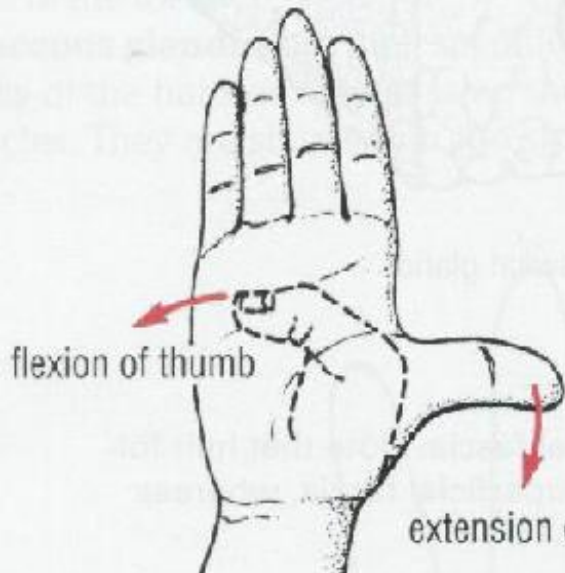
eversion of foot



adduction of fingers



abduction of fingers

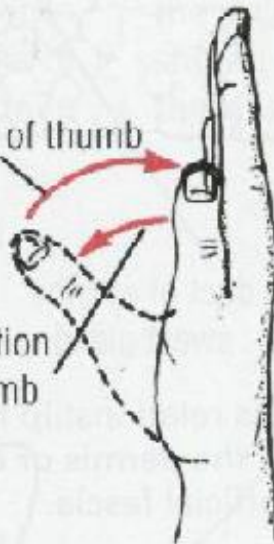


flexion of thumb

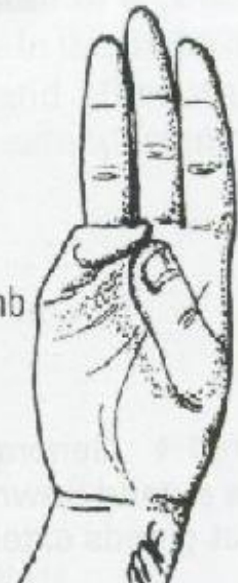
extension of thumb

adduction of thumb

abduction of thumb



opposition of thumb and little finger





# **BASIC STRUCTURES**



# SKIN

## Epidermis

## Dermis

**Superficial fasciae** :is mixture of loose areolas and adipose tissue that unites the dermis of the skin to the underlining deep fasciae

**deep fasciae** is membranous layer of connective tissue that invest the muscles and other deep structures

# Lines of cleavage

# Skin creases

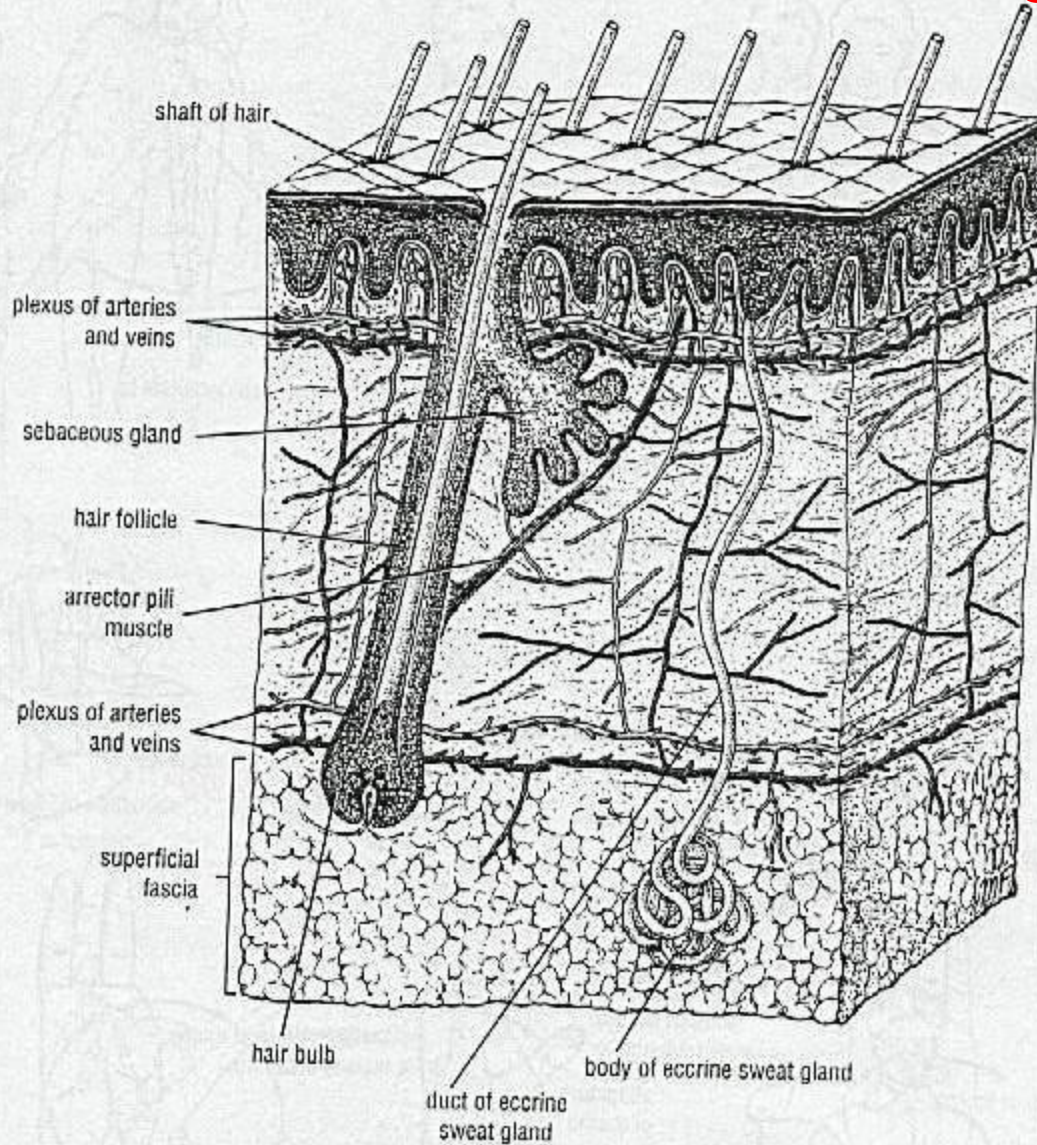


Figure 1-4 General structure of the skin and its relationship to the superficial fascia. Note that hair follicles extend down into the deeper part of the dermis or even into the superficial fascia, whereas sweat glands extend deeply into the superficial fascia.

- Appendages are
- Nails
- Hair follicles
- Sebaceous glands
- Sweat glands

Line of cleavage

Skin creases

Sebaceous gland, sweat gland

Nails :- fold, bed, root,

Hair pulp, shaft, papilla, goose flesh  
(dimpling of the skin by the erector pili)

Superficial fascia, deep fascia.

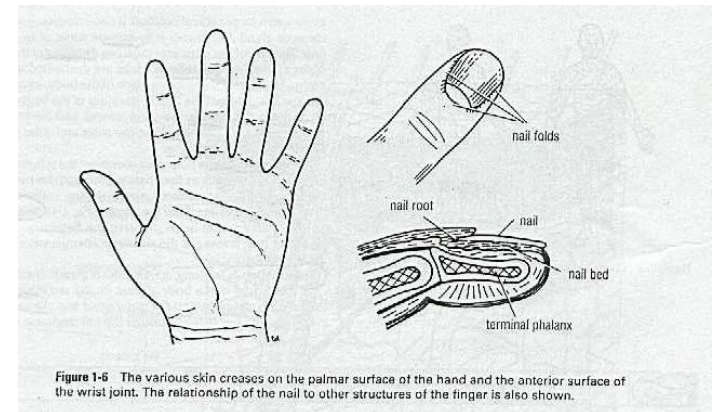
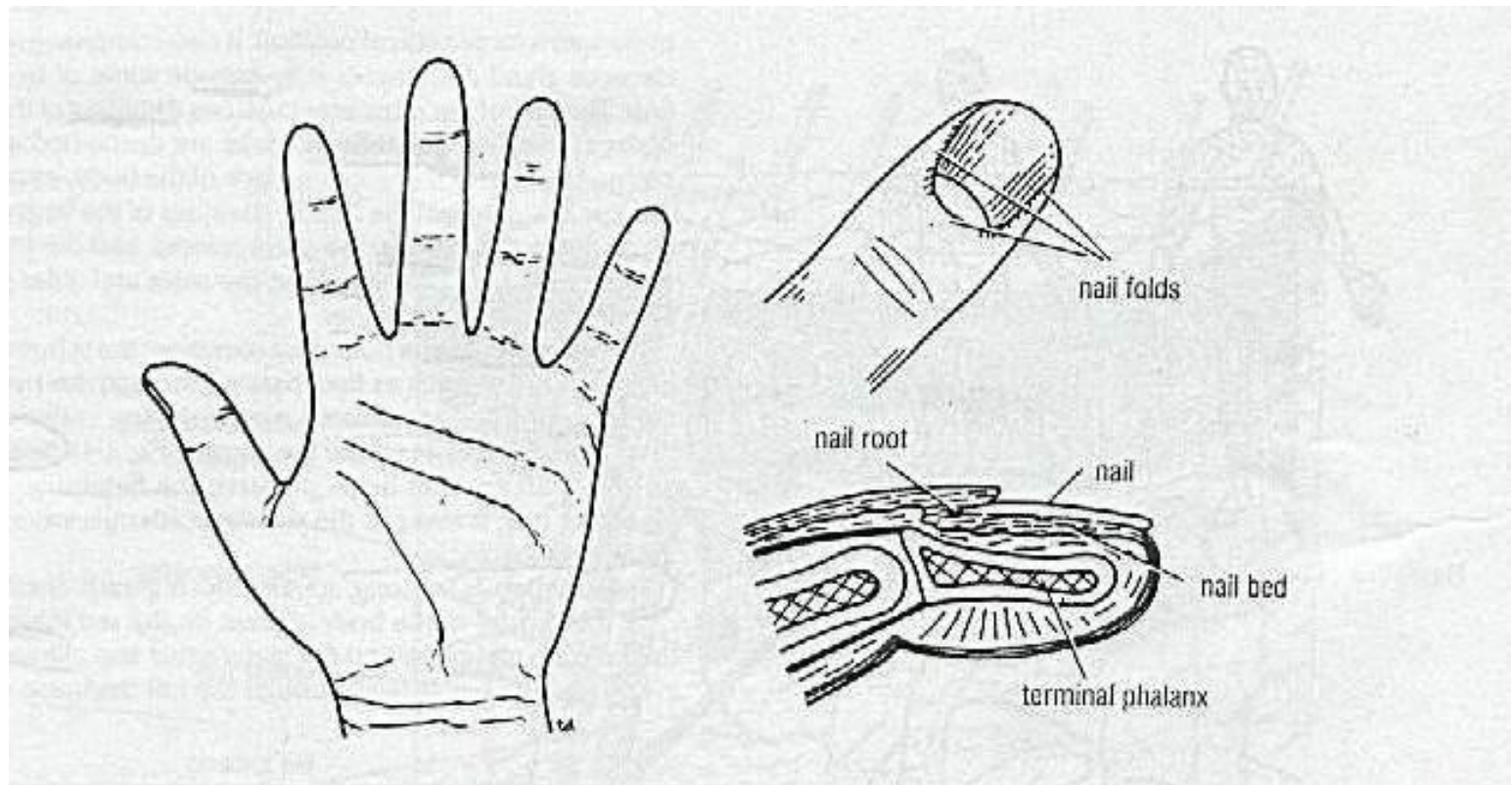


Figure 1-6 The various skin creases on the palmar surface of the hand and the anterior surface of the wrist joint. The relationship of the nail to other structures of the finger is also shown.

# NAIL



**Figure 1-6** The various skin creases on the palmar surface of the hand and the anterior surface of the wrist joint. The relationship of the nail to other structures of the finger is also shown.

# **Hair**

**Follicle; invagination of epidermis to the dermis**

**Bulb: expanded extremities of follicles**

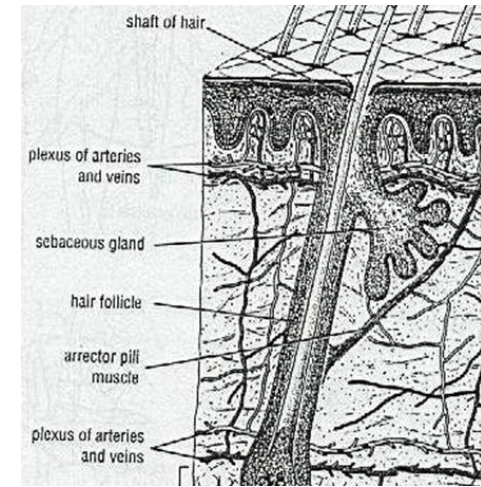
**Shaft; cornfield end**

**arrector pili muscle; from bulb to superficial part of the dermis;**

**arrector to hair.**

**compress the gl. (secretion)**

**Gooseflesh (dimpling of skin)**



***Sebaceous gland; sebum for flexibility of hair.***

***Sweat glands; long spiral tubular, extend to hypodermis.***

***Fascia ; (superficial & deep)  
retinacula ; hold tendon in position***



## Clinical notes

**Line of cleavage: direction of collagen fibers**

**Skin infection:**

**a- paronychia; nail bed infection (streptococcus)**

**b- common boil ; hair follicle & sebaceous glands**

**c- carbuncle; inflammation begins with hair follicle then to superficial fascia (staphylococcal)**

**Sebaceous cyst ;**  
**abstraction mouth of ducts**  
**Shock; pale skin and**  
**gooseflesh, sympathetic**  
**stimulation that cause**  
**contraction of dermal**  
**arterioles and erector pili**  
**muscles.**



# Muscles

**SKELETAL M.**

**CARDIAC M.**

**SMOOTH M.**

Muscles;

**SKELETAL;**

**Origin;**

**Insertion**

**Belly ; fleshy part**

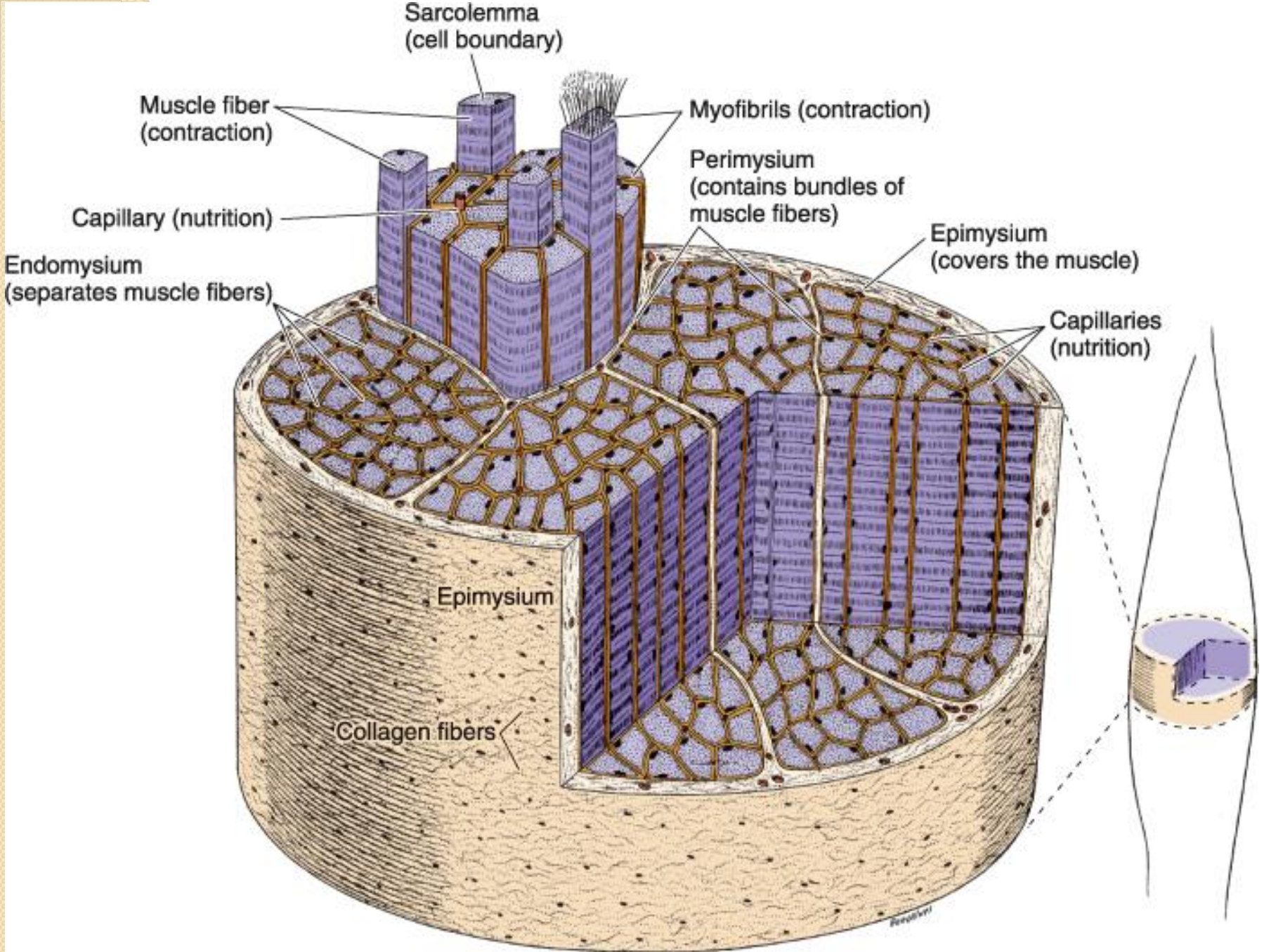
**Tendon; connect the muscle with bone**

**Aponeurosis; fibrous tissue to which flattened muscle attached**

**Raphe; inter-digitations of the tendinous ends of fibers of flat muscles**

**SMOOTH .**

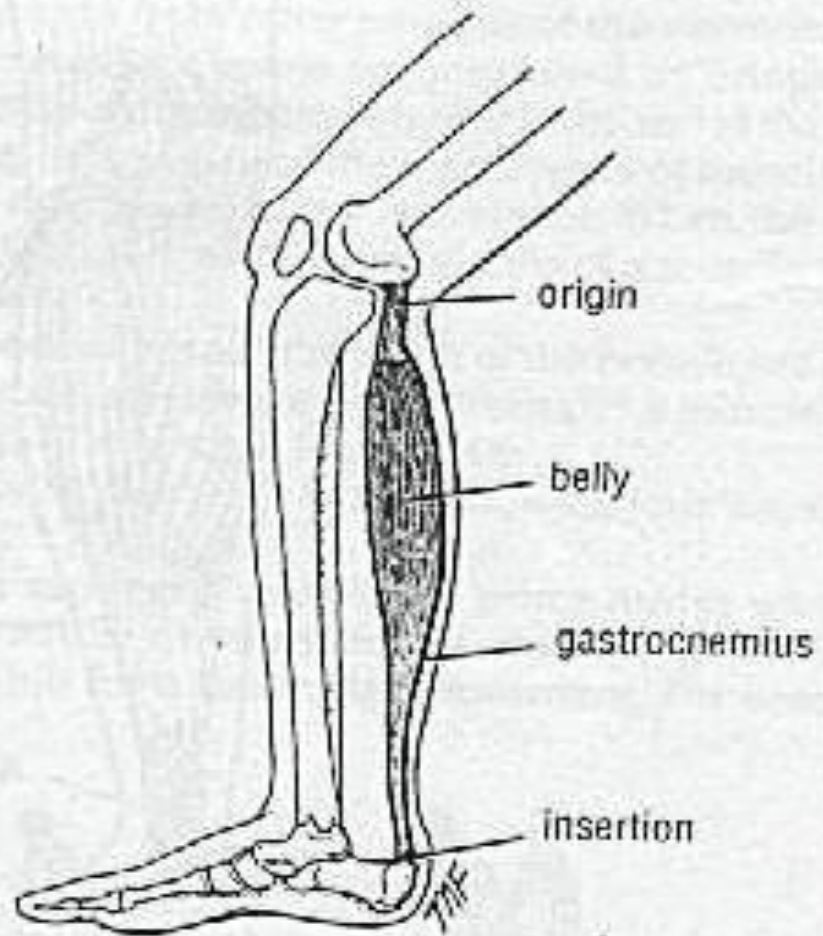
**CARDIAC.**





# **SKELETAL MUSCLE**

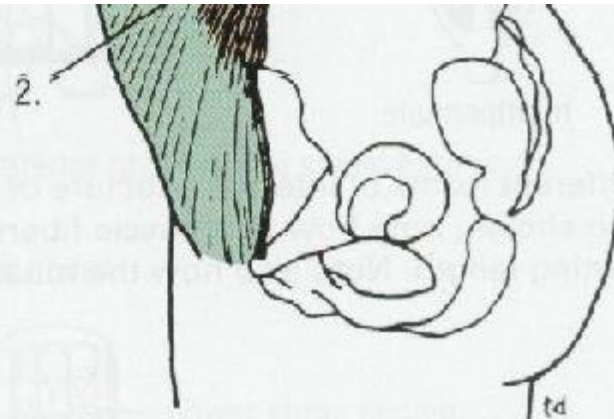
**Voluntary muscles**



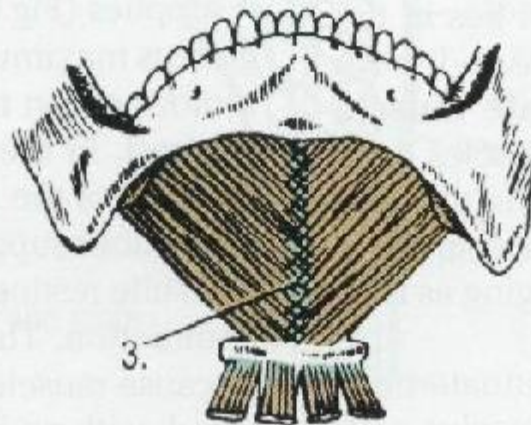
**Figure 1-9** Origin, insertion, and belly of the gastrocnemius muscle.



common tendon for the insertion  
of the gastrocnemius and  
soleus muscles

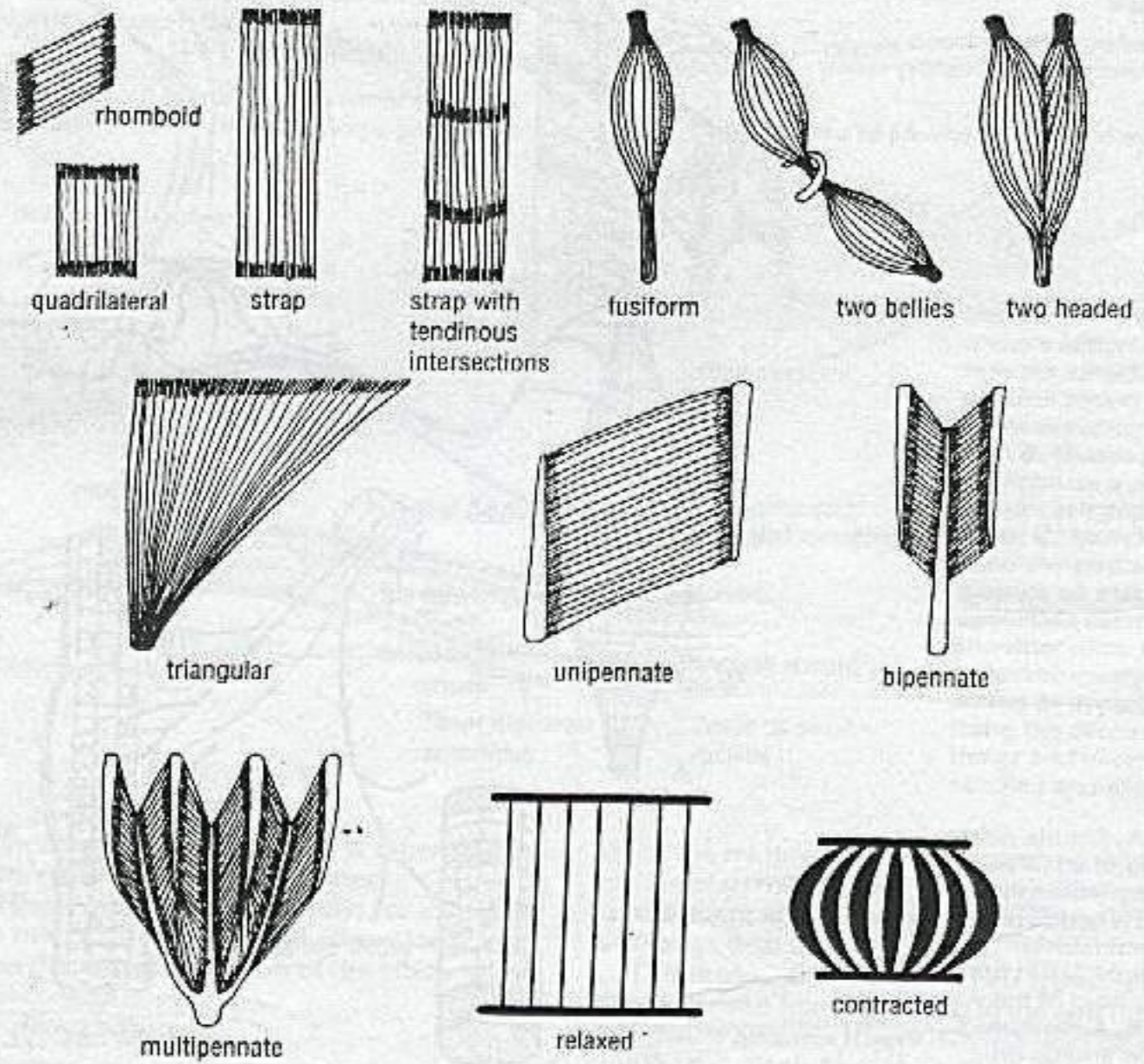


external oblique aponeurosis



raphe of mylohyoid muscles

# SKELETAL MUSCLE



**Figure 1-11** Different forms of the internal structure of skeletal muscle. A relaxed and a contracted muscle are also shown; note how the muscle fibers, on contraction, shorten by one third to one half of their resting length. Note also how the muscle swells.

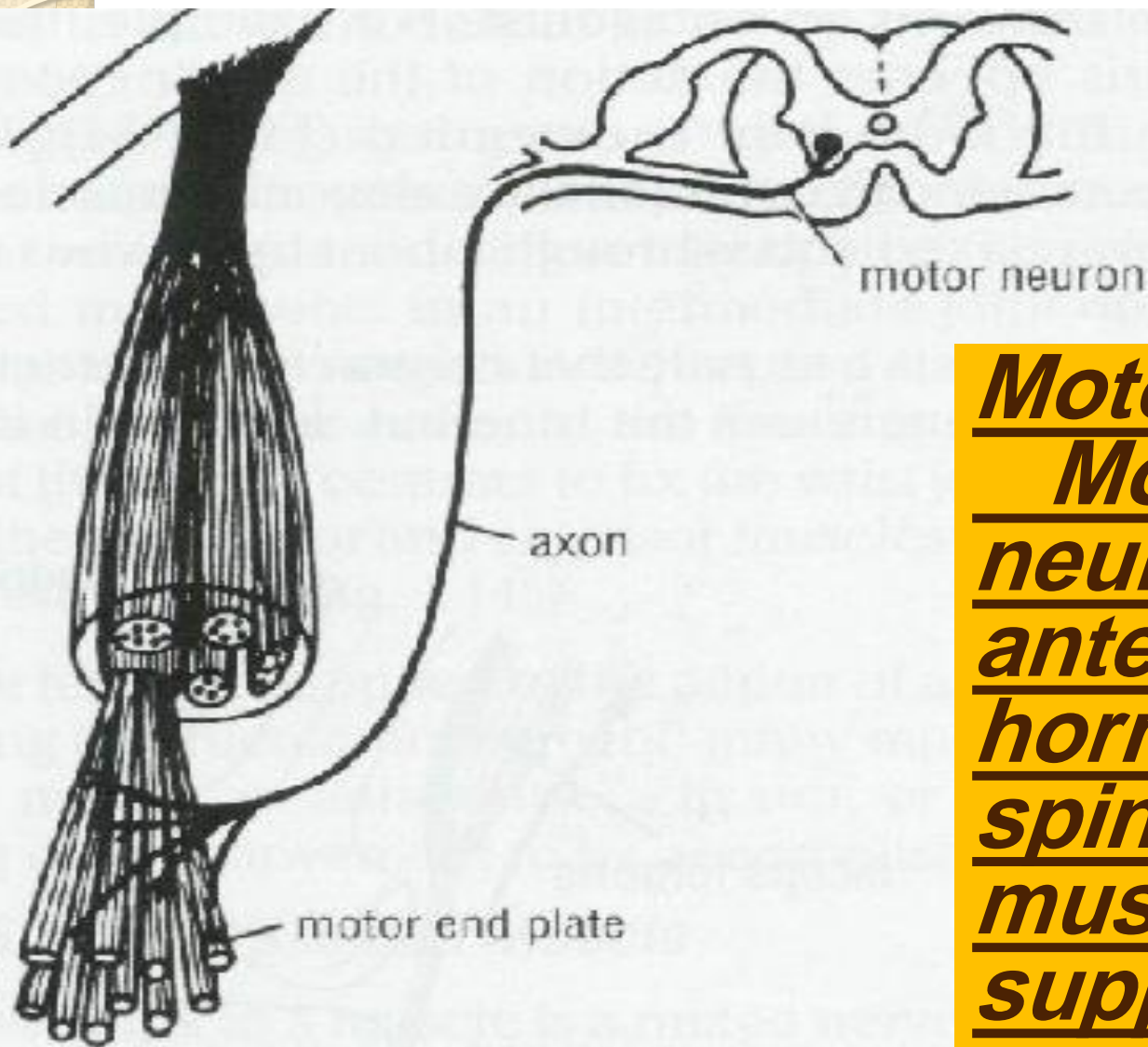
## *Skeletal Muscle Tone and Action*

A **motor unit** consists of a motor neuron in the anterior gray horn or column of the spinal cord and all the muscle fibers it supplies (Fig. 1-12). In a large buttock muscle, such as the gluteus maximus, where fine control is unnecessary, a given motor neuron may supply as many as 200 muscle fibers. In contrast, in the small muscles of the hand or the extrinsic muscles of the eyeball, where fine control is required, one nerve fiber supplies only a few muscle fibers.

While resting, every skeletal muscle is in a partial state of contraction. This condition is referred to as **muscle tone**. Because muscle fibers are either fully contracted or fully relaxed, with no intermediate stage, it follows that a few muscle fibers within a muscle are fully contracted all the time. To bring about this state and to avoid fatigue, different groups of motor units, and thus different groups of muscle



# **Muscle tone; partial contraction**



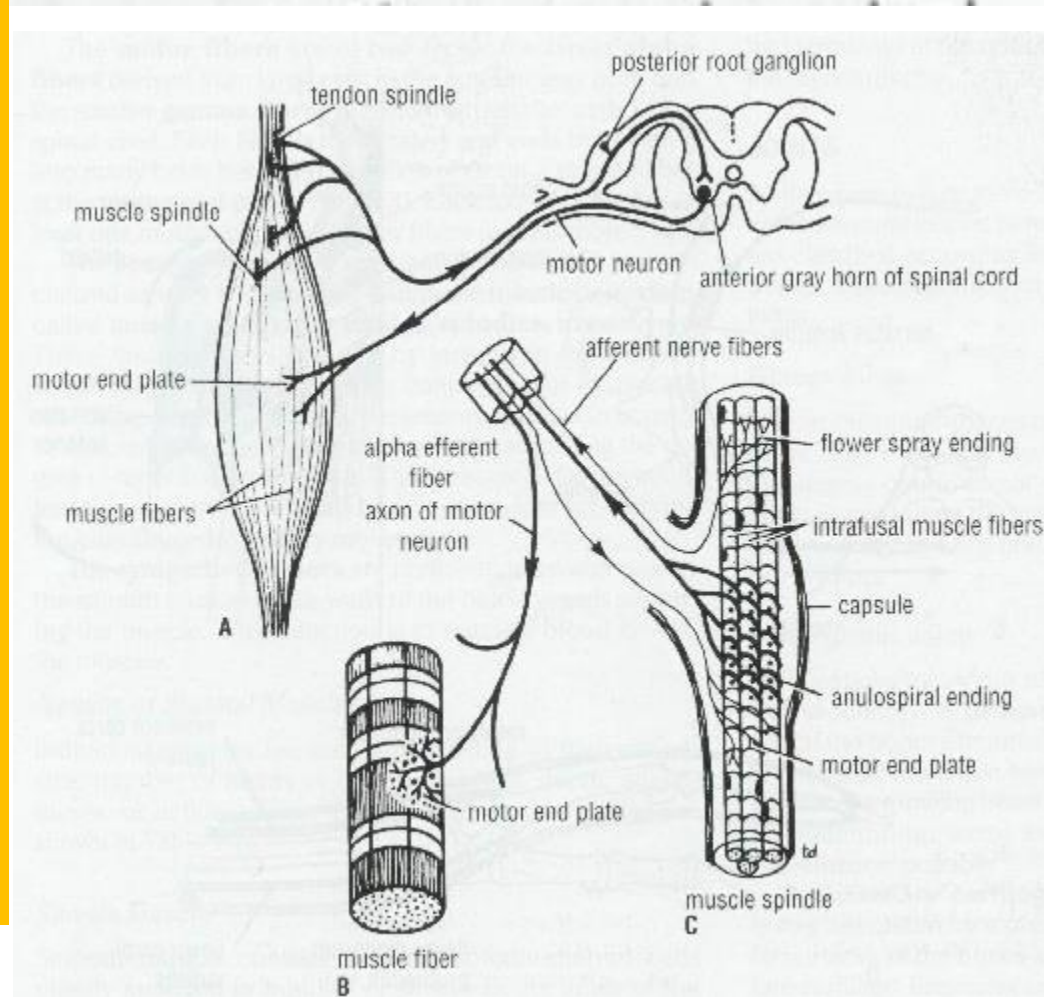
**Motor unite;**  
**Motor**  
**neurons in the**  
**anterior gray**  
**horn of the**  
**spinal cord + all**  
**muscle fibers it**  
**supplies**

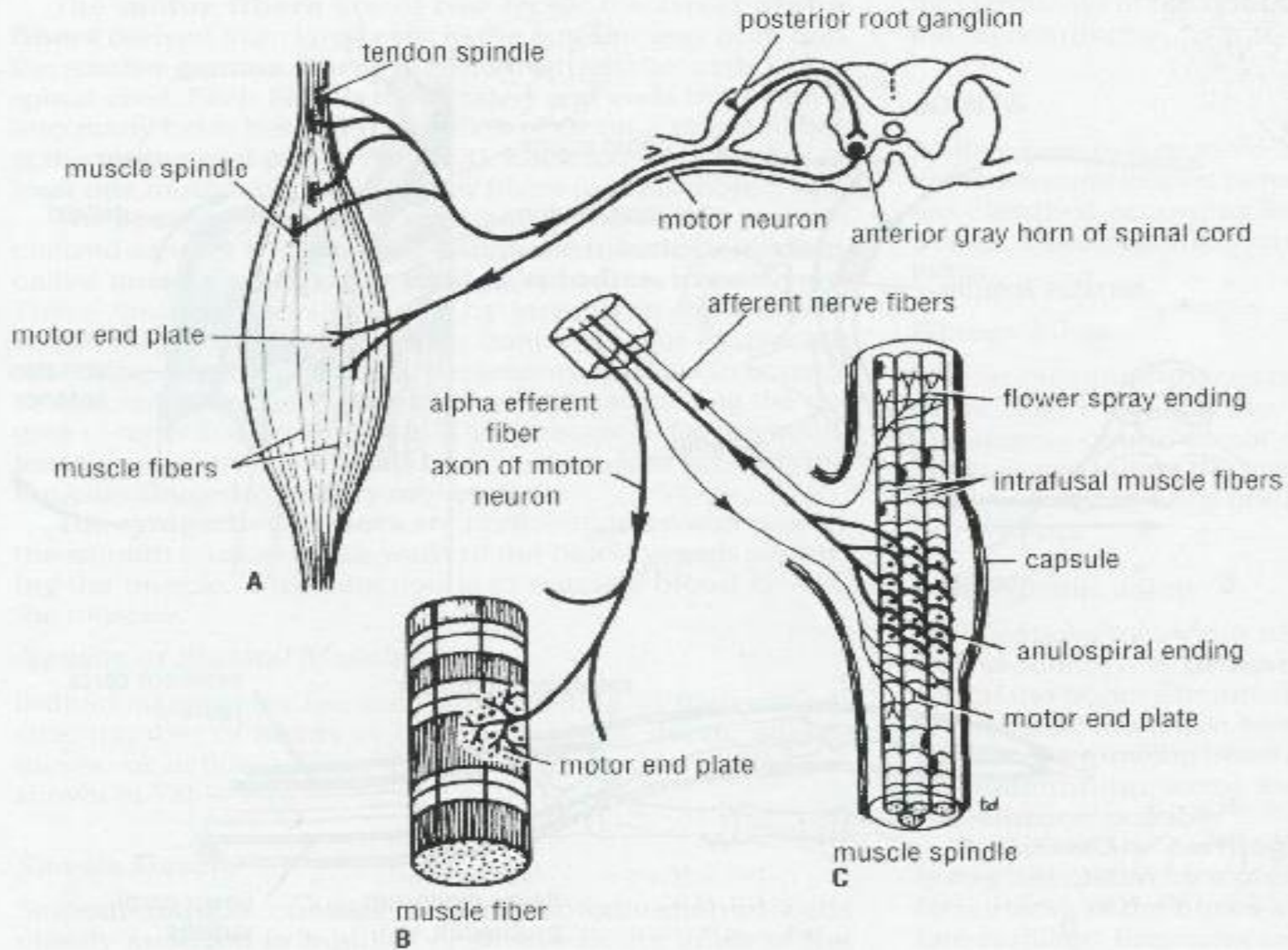
bundle of muscle fibers and  
nerve endings in voluntary muscle

**Figure 1-12** Components of a motor unit.

Basically, muscle tone depends on the integrity of a simple monosynaptic reflex arc composed of two neurons in the nervous system (Fig. 1-13). The degree of tension in a muscle is detected by sensitive sensory endings called **muscle spindles** and **tendon spindles** (Fig. 1-13). The nervous

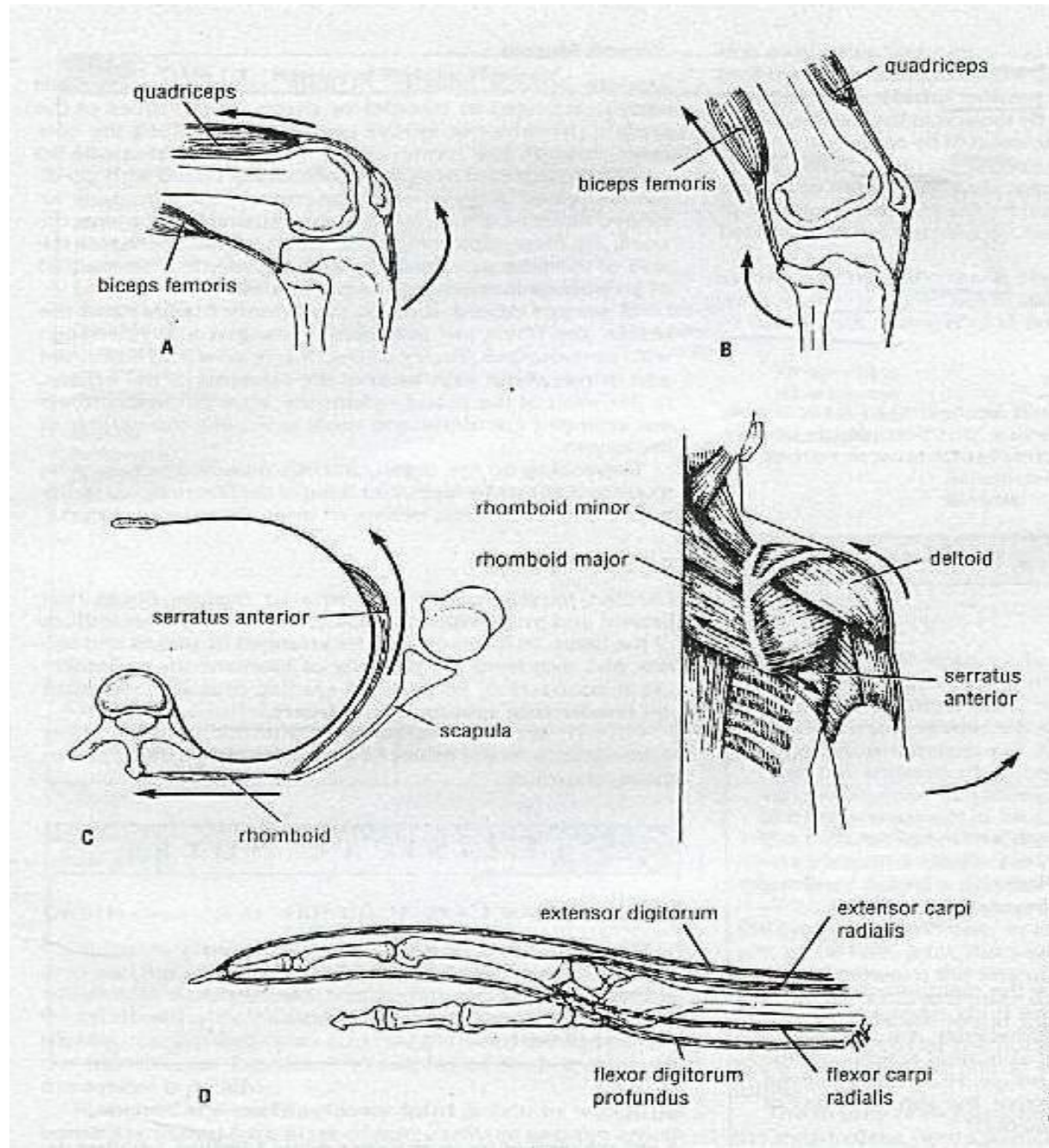
**Reflex arch;**  
**a- tendon spindle or muscle spindle**  
**b- afferent fibers**  
**c- motor neuron (anterior gray horn)**  
**c- efferent fibers**  
**d- motor end plate, flower spray ending & anulospiral ending.**





# The muscles work as

prime mover  
Antagonist  
Fixator  
Synergist



# **Nerve supply of skeletal muscles ;**

Trunk; inner muscle midpoint on deep surface  
(motor point)

peripheral nerves

60 % motor

40 % sensory

some autonomic

**Alfa fibers : from large neurons**

**Gamma fibers; smaller neurons**

## Cardiac Muscle

Cardiac muscle consists of striated muscle fibers that branch and unite with each other. It forms the myocardium of the heart. Its fibers tend to be arranged in whorls and spirals, and they have the property of spontaneous and rhythmic contraction. Specialized cardiac muscle fibers form the **conducting system of the heart**.

Cardiac muscle is supplied by autonomic nerve fibers that terminate in the nodes of the conducting system and in the myocardium.

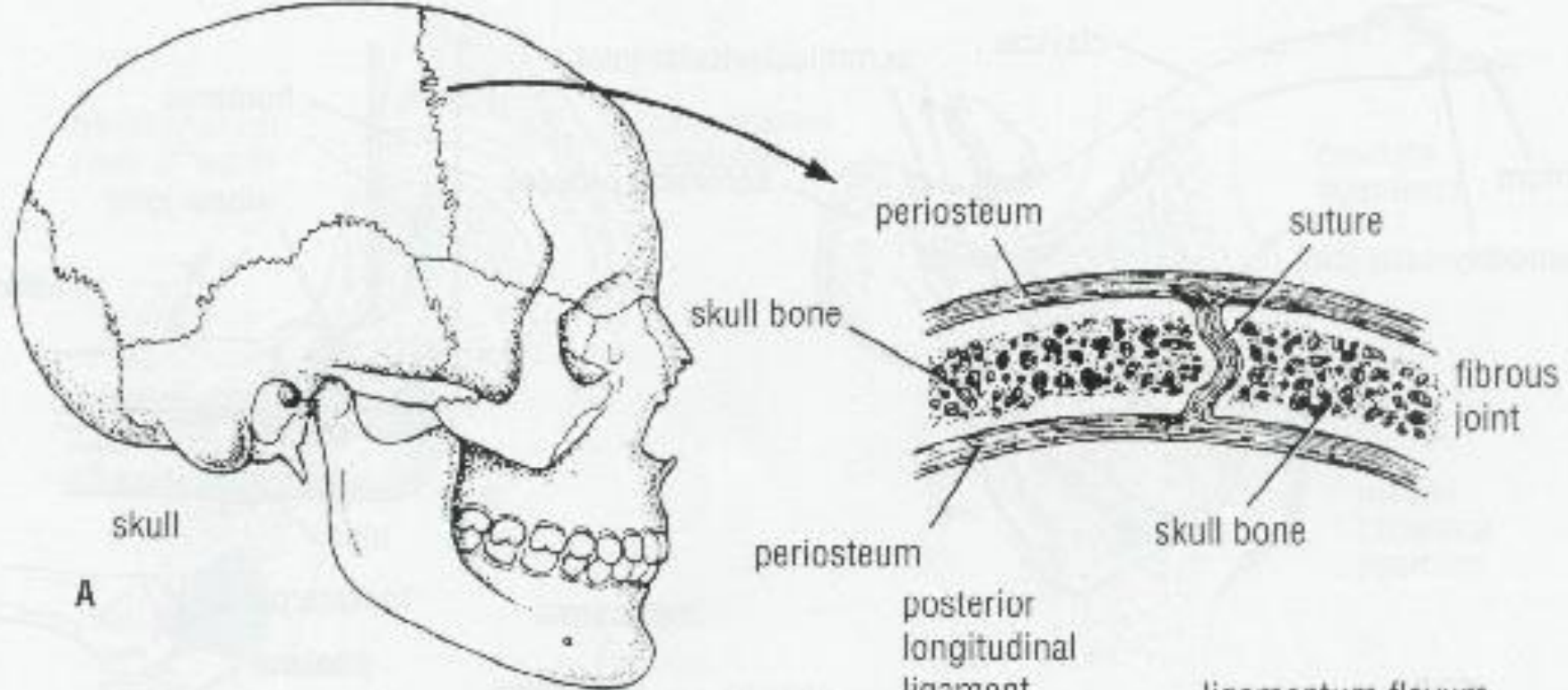
# Joints

- Fibrous
- Cartilagenous :primary (between epiphysis and diaphysis, Secondary : between vertebrae

Synovial joints can be classified according to the arrangement of the articular surfaces and the types of movement that are possible.

- **Plane joints:** In these joints, the apposed articular surfaces are flat or almost flat, and this permits the bones to slide on one another. Examples of plane joints are the sternoclavicular and acromioclavicular joints (Fig. 1-16).
- **Hinge joints:** These joints resemble the hinge on a door, so that flexion and extension movements are possible. Examples of hinge joints are the elbow, knee, and ankle joints (Fig. 1-16).
- **Pivot joints:** In these joints, a central bony pivot is surrounded by a bony-ligamentous ring (Fig. 1-16), and rotation is the only movement possible. The atlantoaxial and superior radioulnar joints are good examples.
- **Condylloid joints:** These joints have two distinct convex

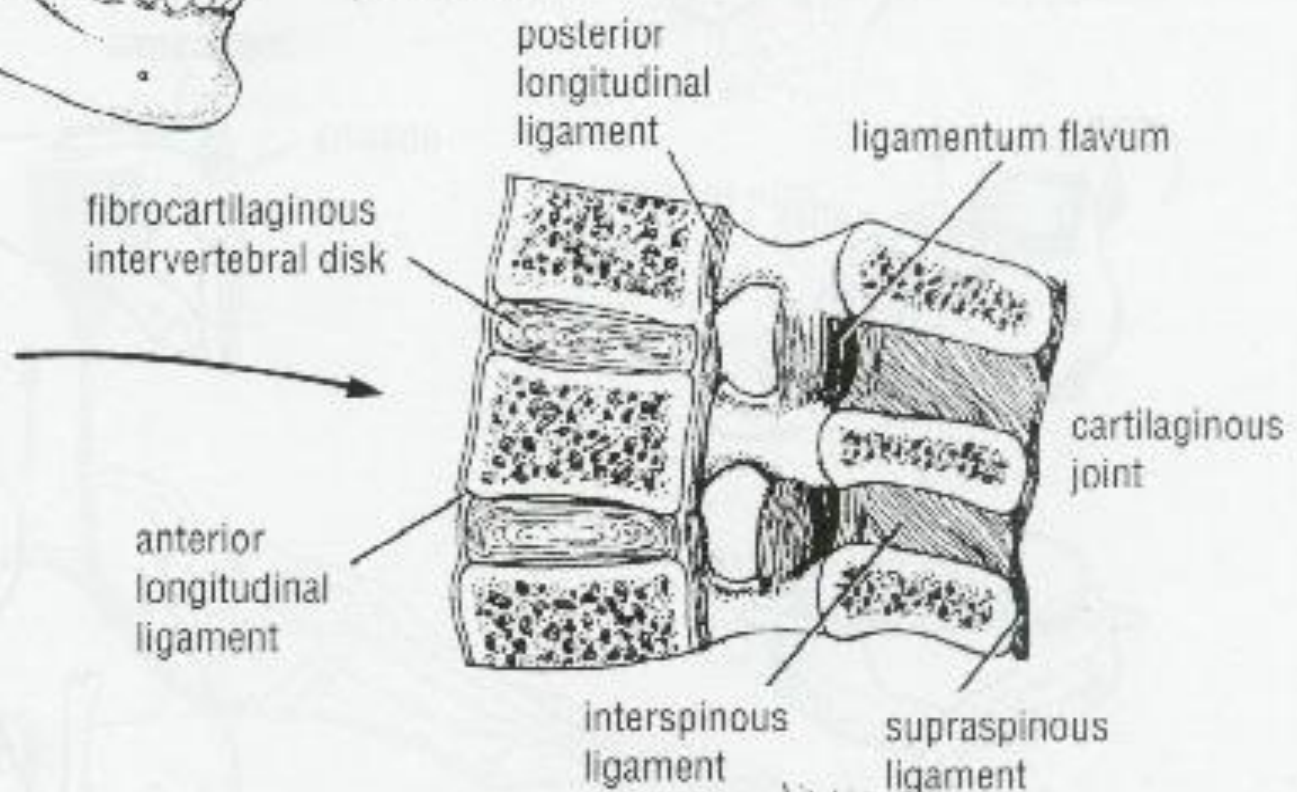


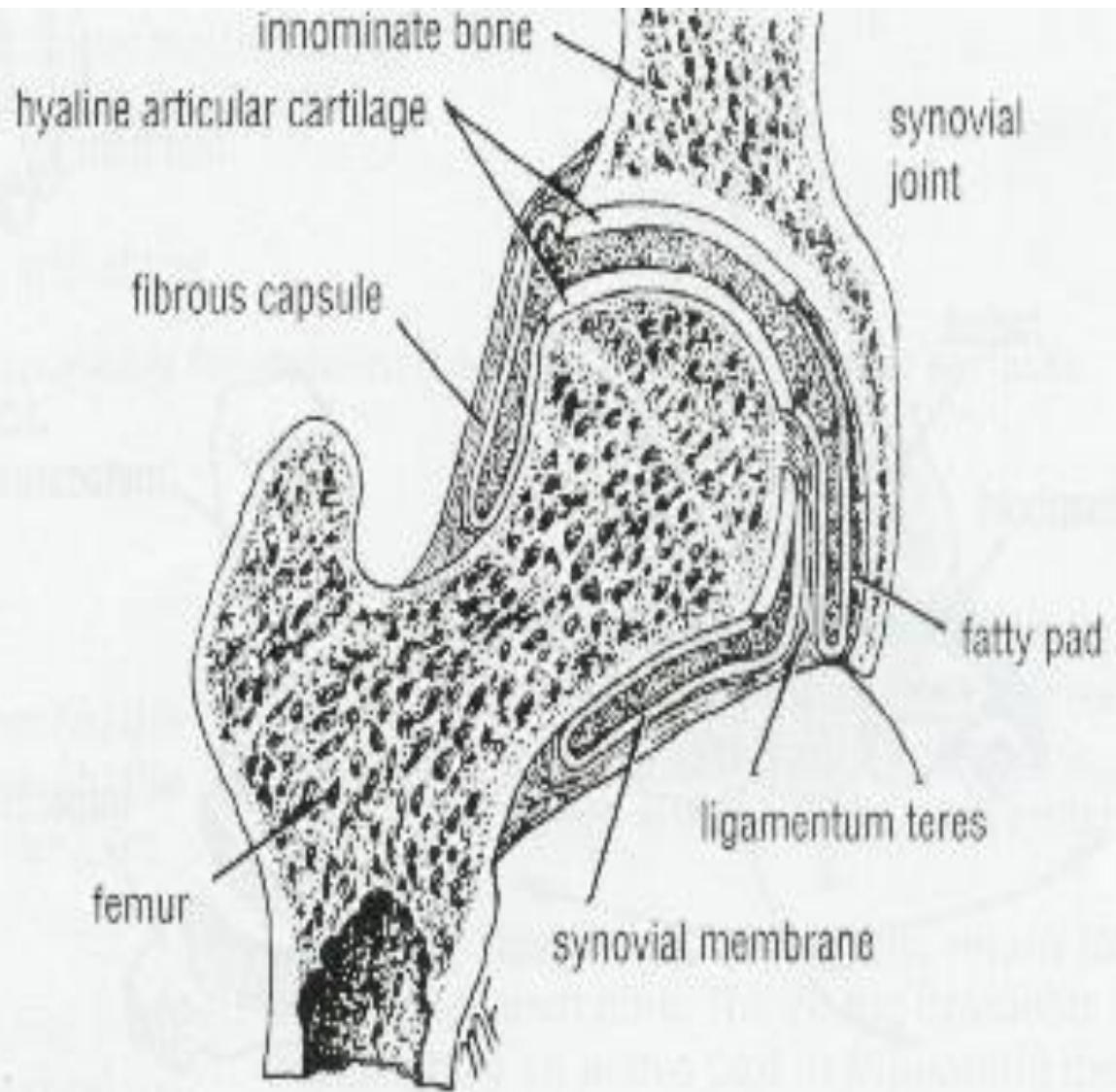


**A**

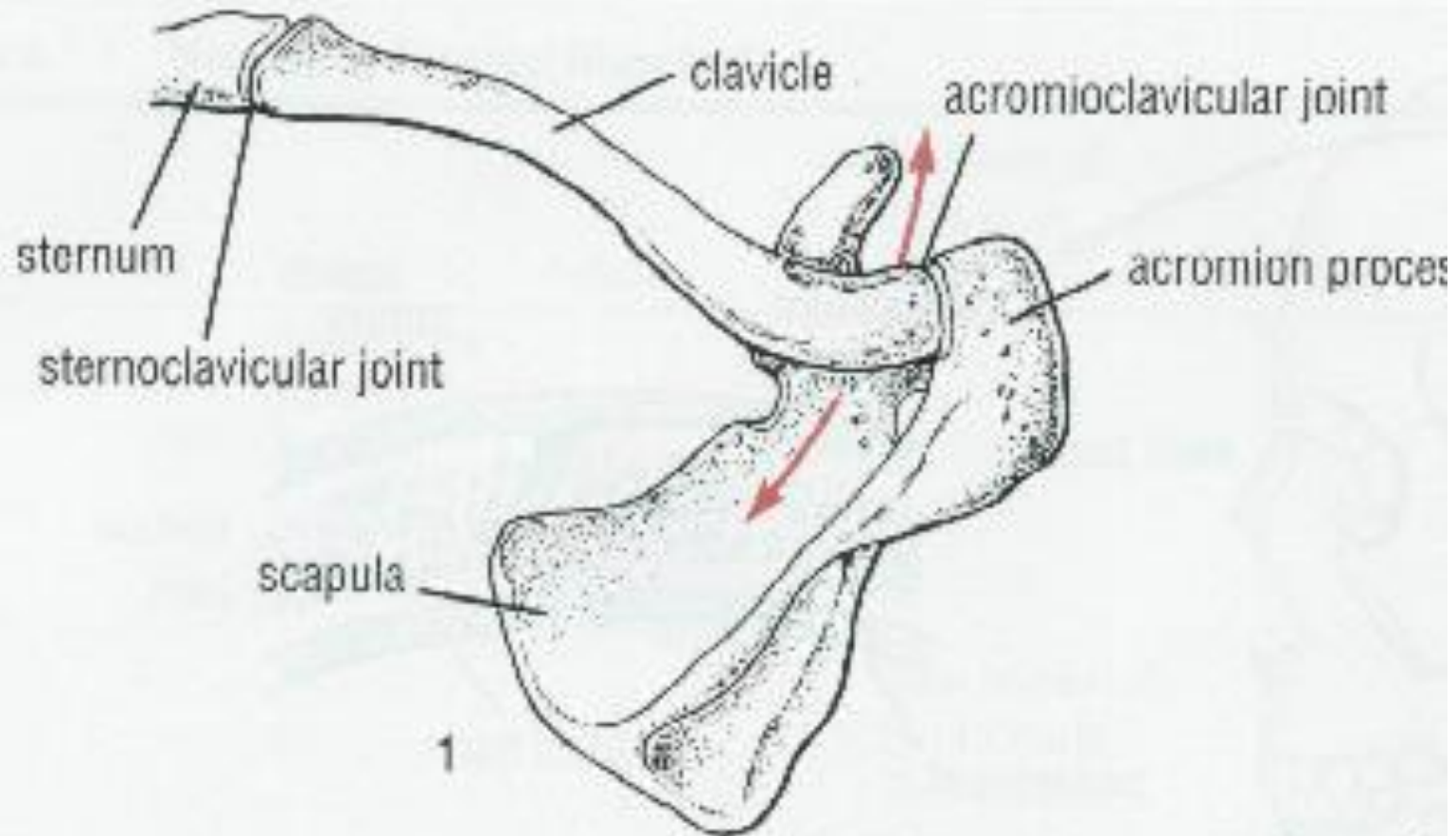


**B**

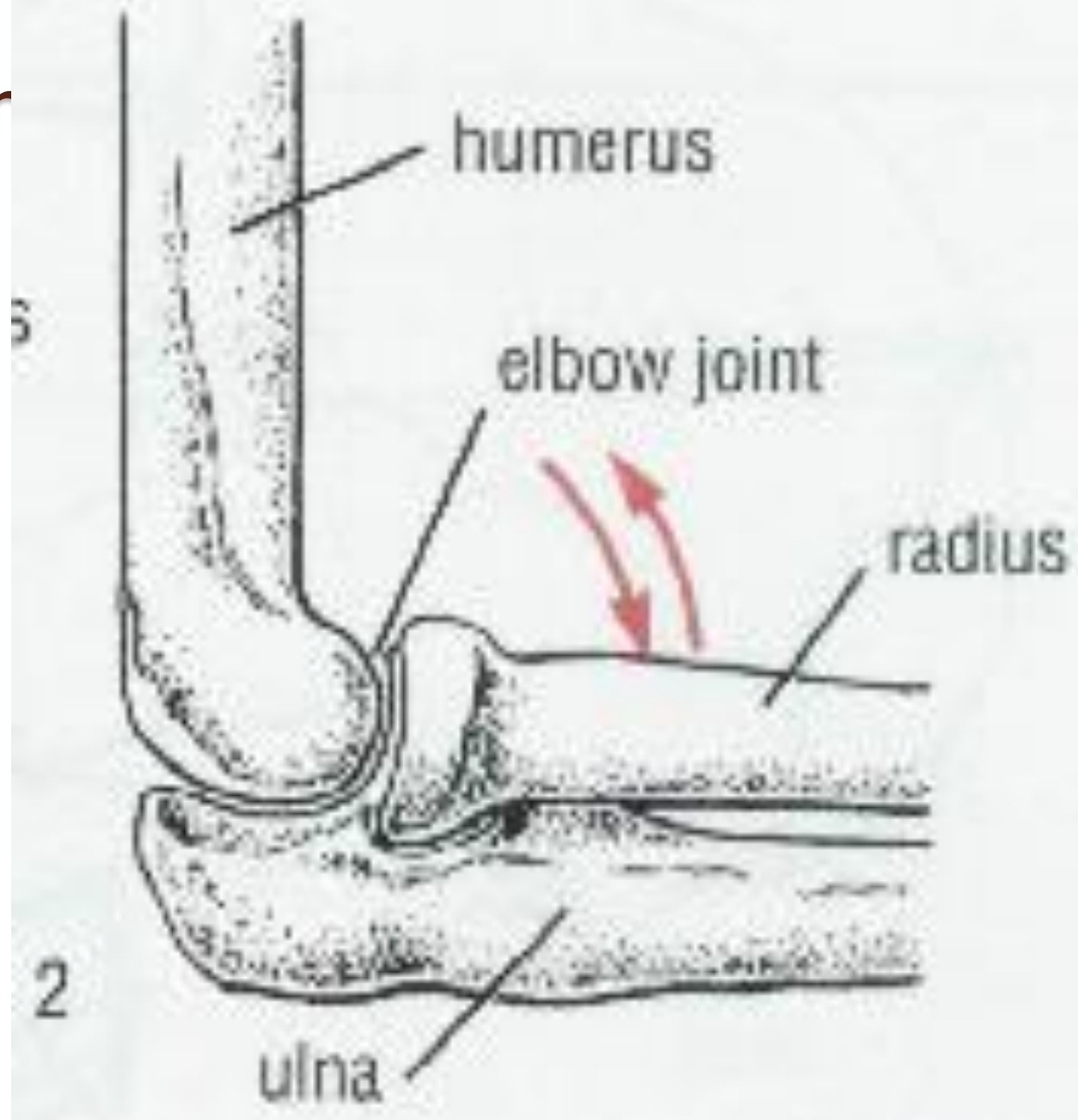




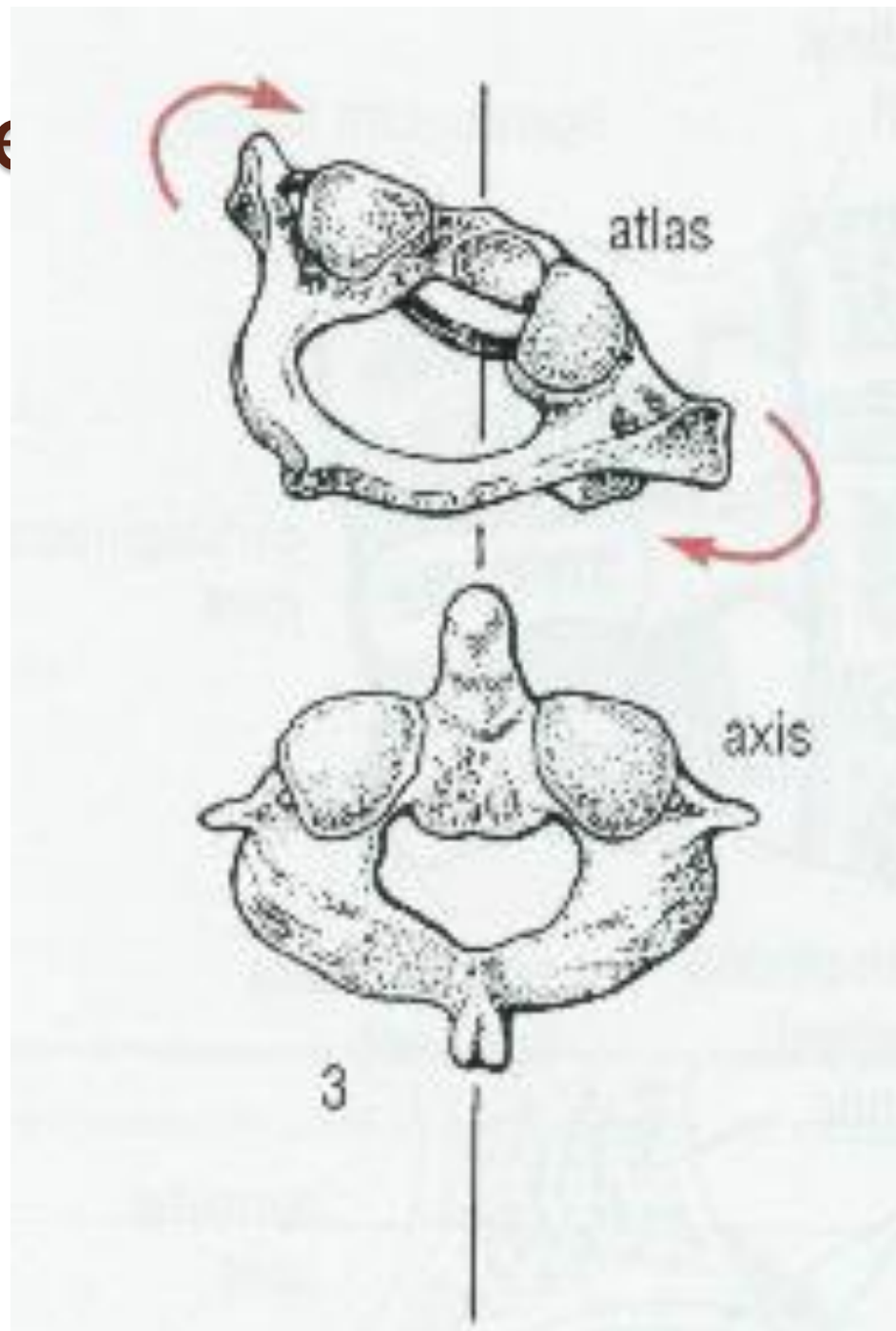
# Plain joint: gliding



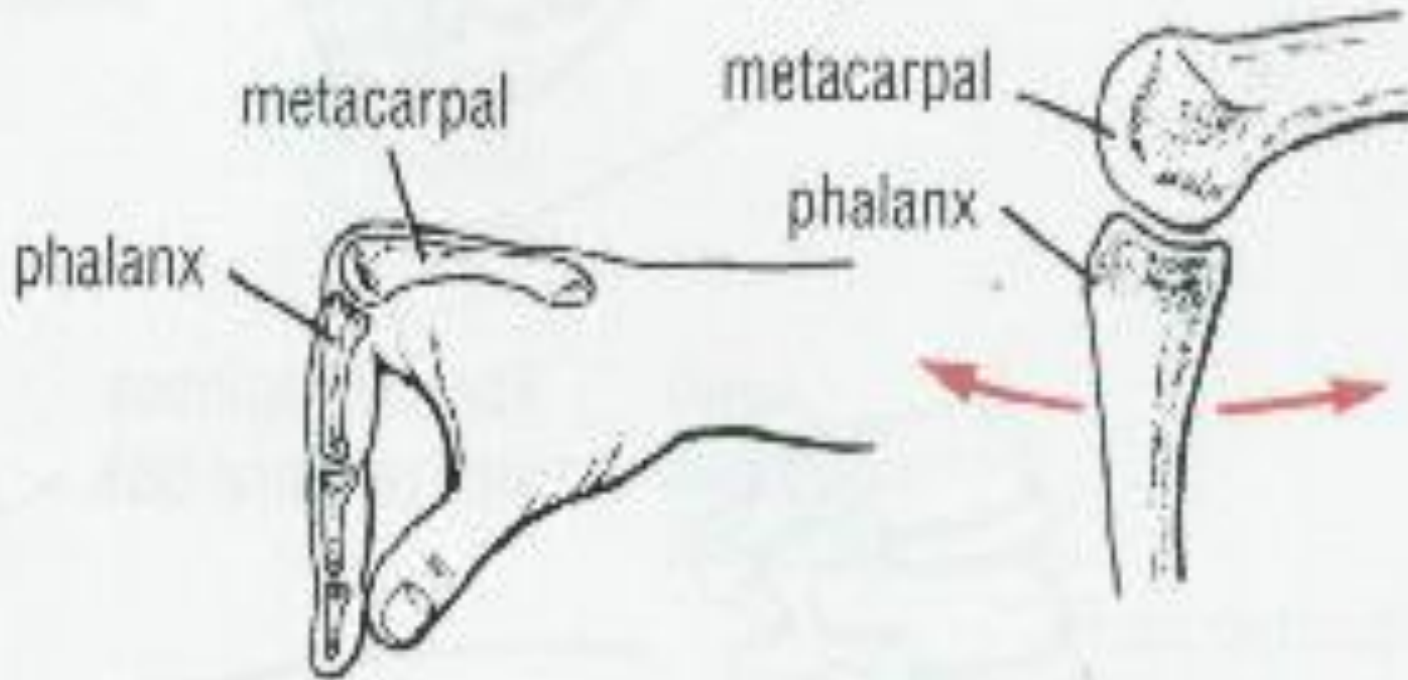
Hir



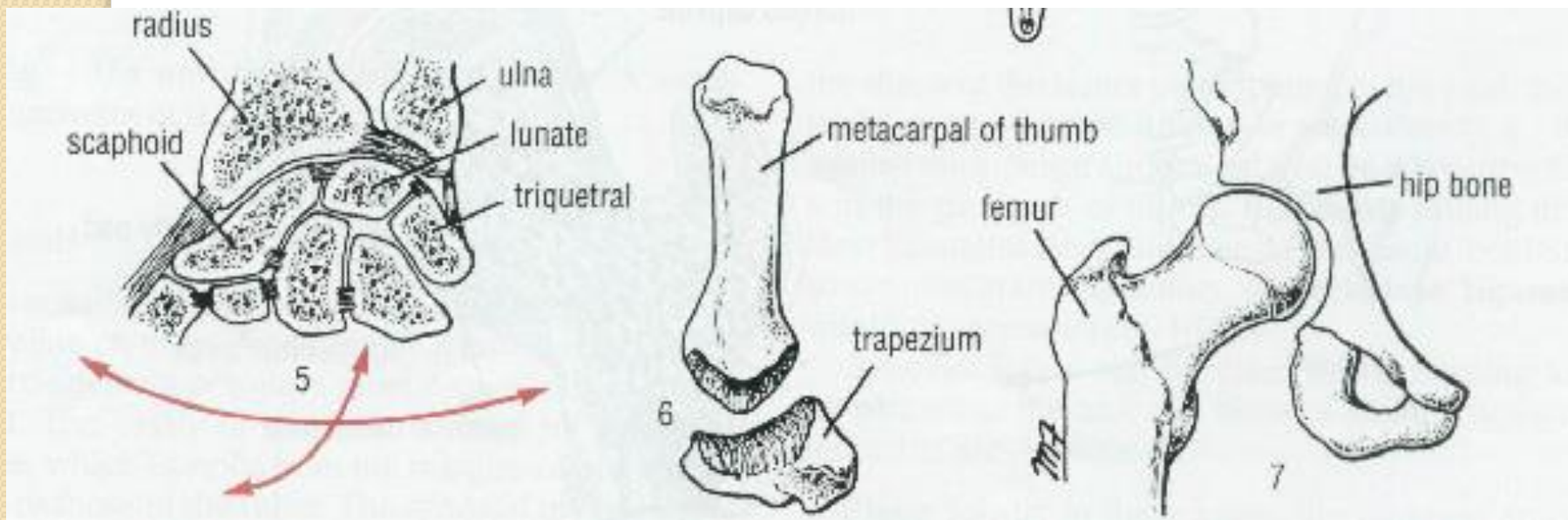
# Pivot



# Codyloid

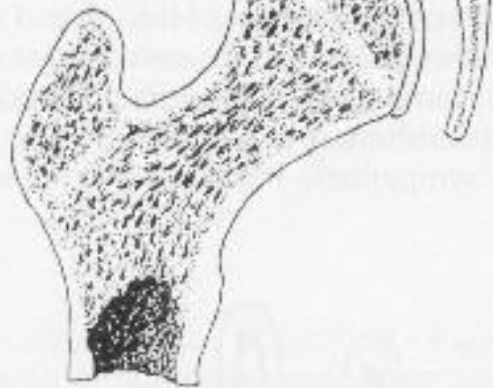


# Saddle, ball and socket



hemispherical head of femur

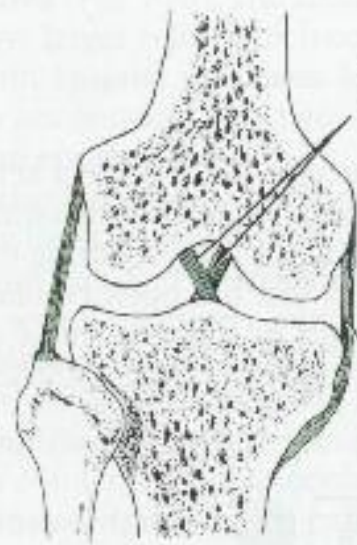
cup-shaped acetabulum



hip joint

A

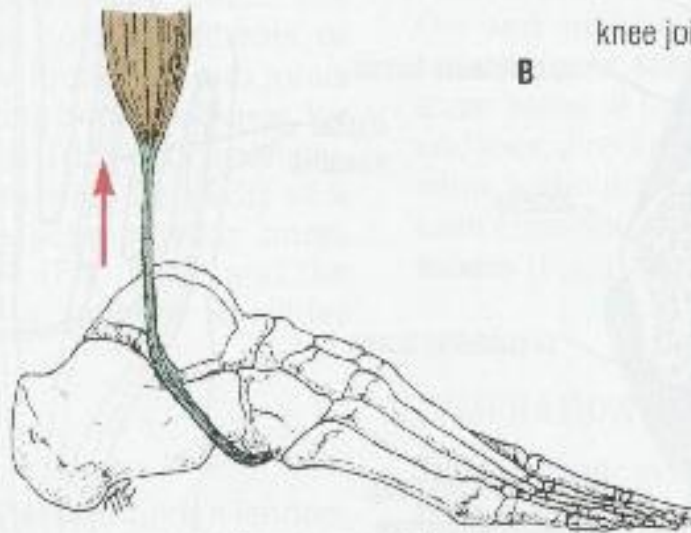
cruciate ligaments



medial collateral ligament

knee joint

B



peroneus longus muscle holding up lateral longitudinal arch of right foot

C

arch of foot

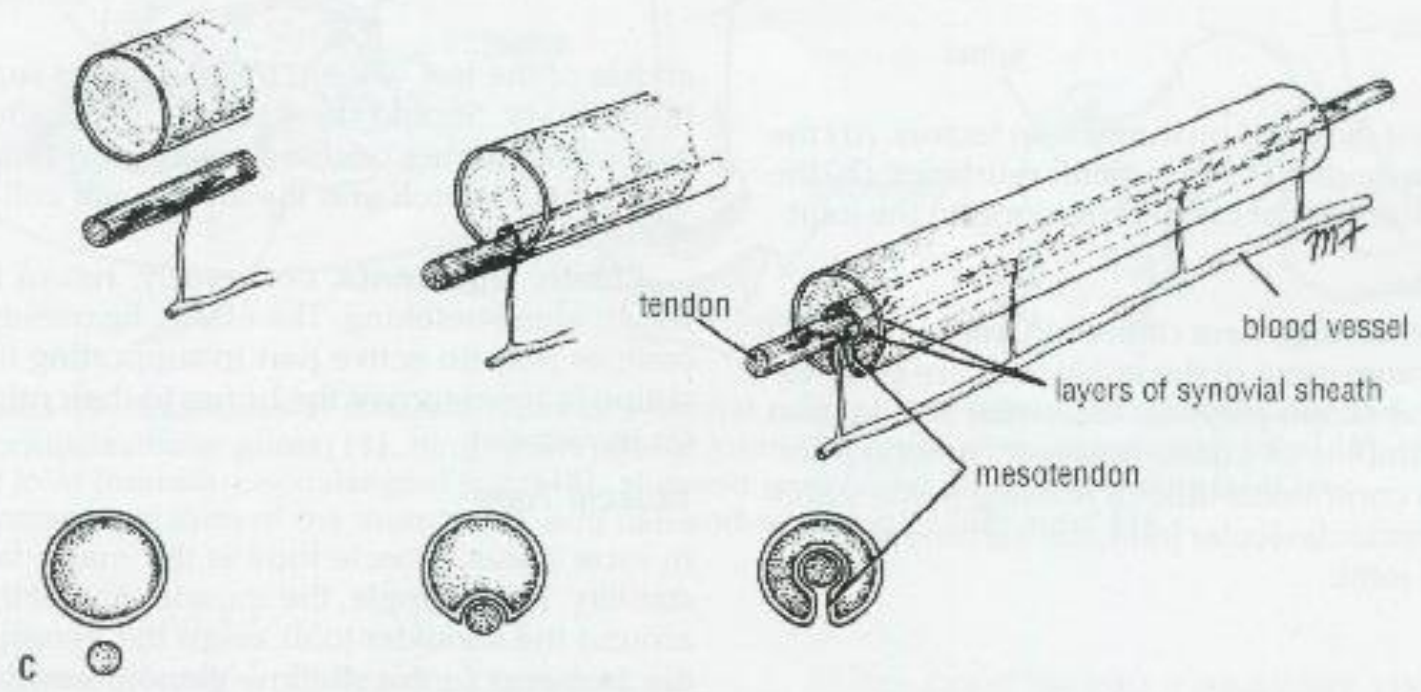
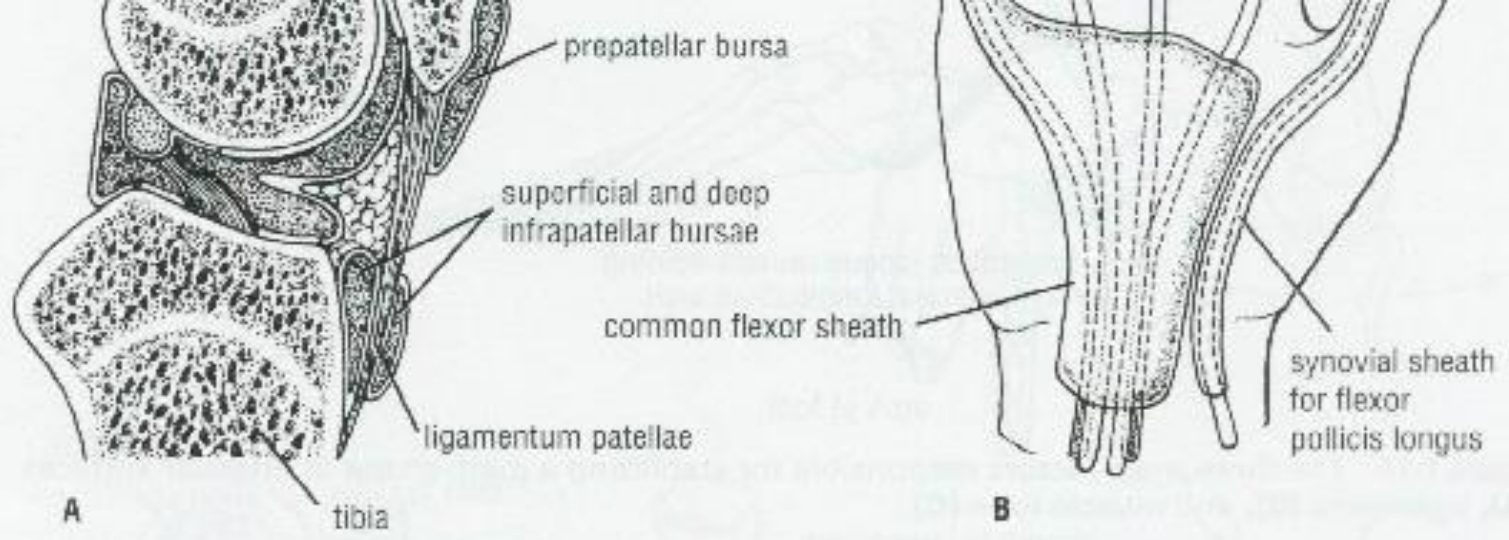
**Figure 1-17** The three main factors responsible for stabilizing a joint: shape of articular surfaces (A), ligaments (B), and muscle tone (C).



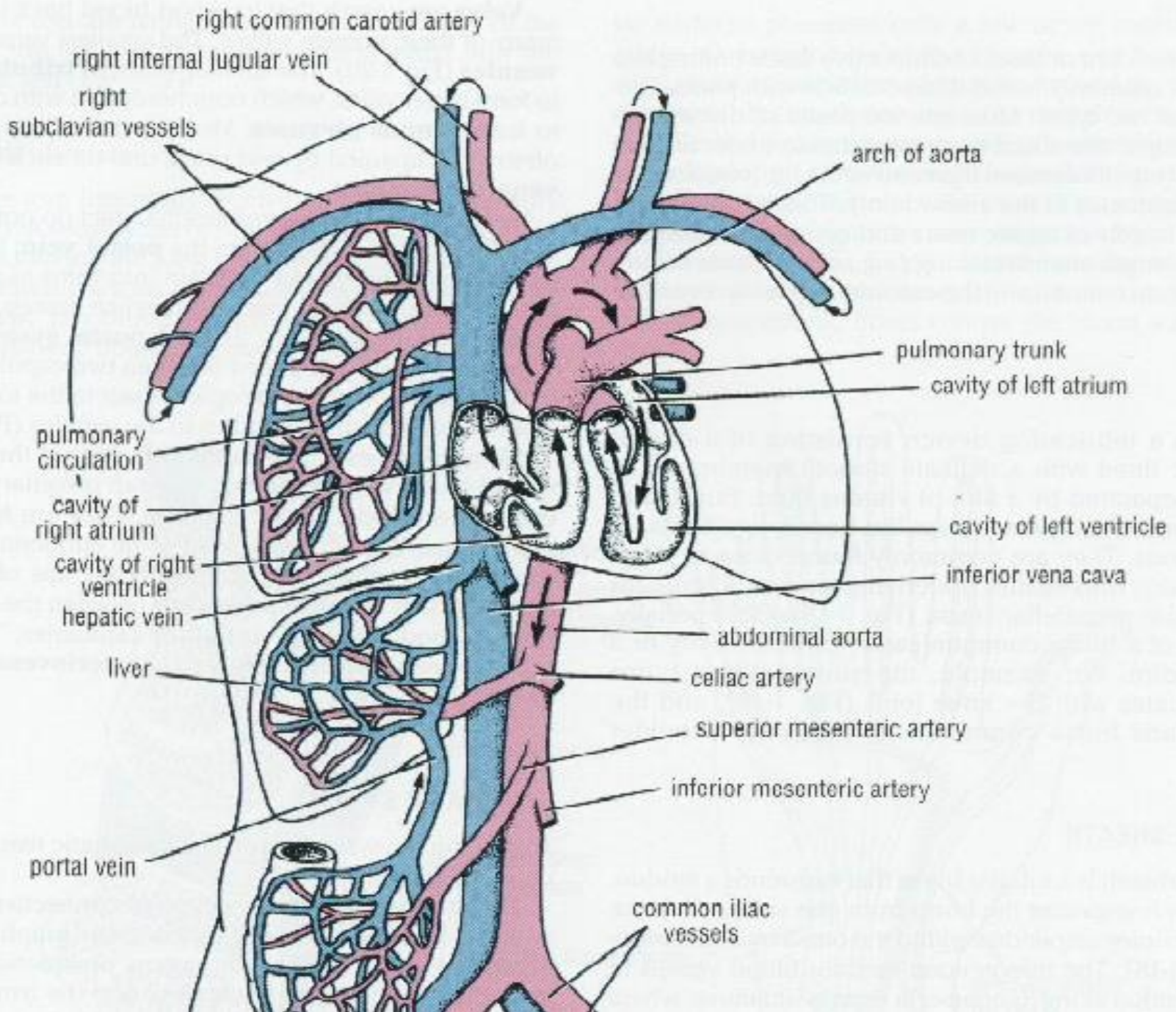
# Ligaments

Elastic : support the ossicles •

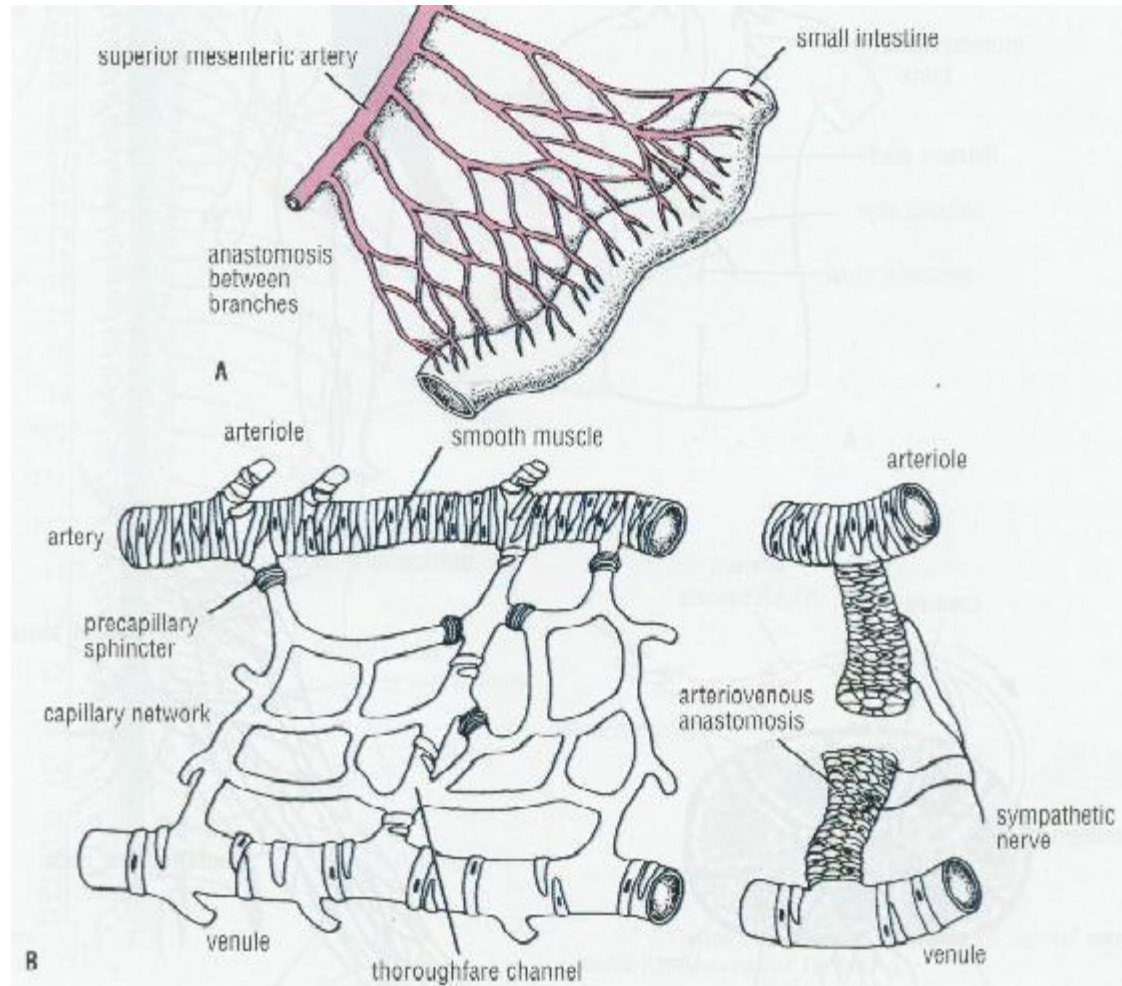
Fibrous : feet •

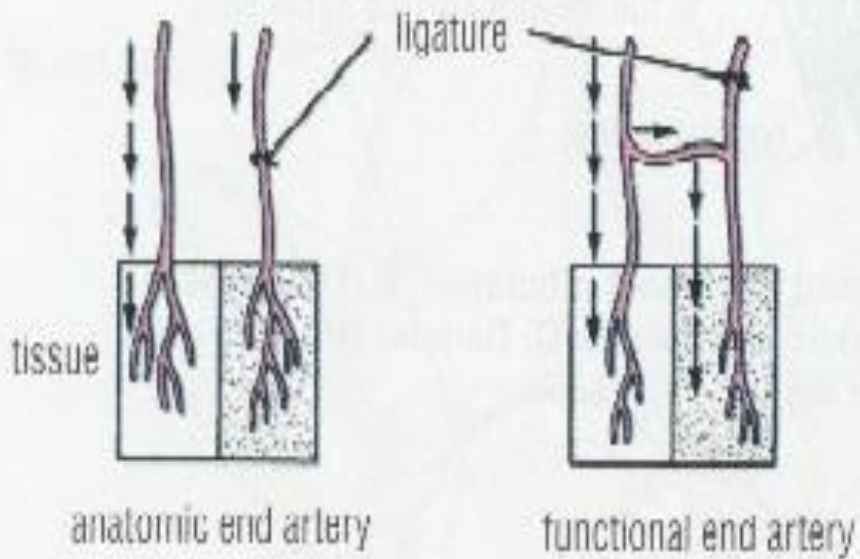


**Figure 1-18** **A.** Four bursae related to the front of the knee joint. Note that the suprapatellar bursa communicates with the cavity of the joint. **B.** Synovial sheaths around the long tendons of the fingers. **C.** How tendon indents synovial sheath during development, and how blood vessels reach the tendon through the mesotendon.

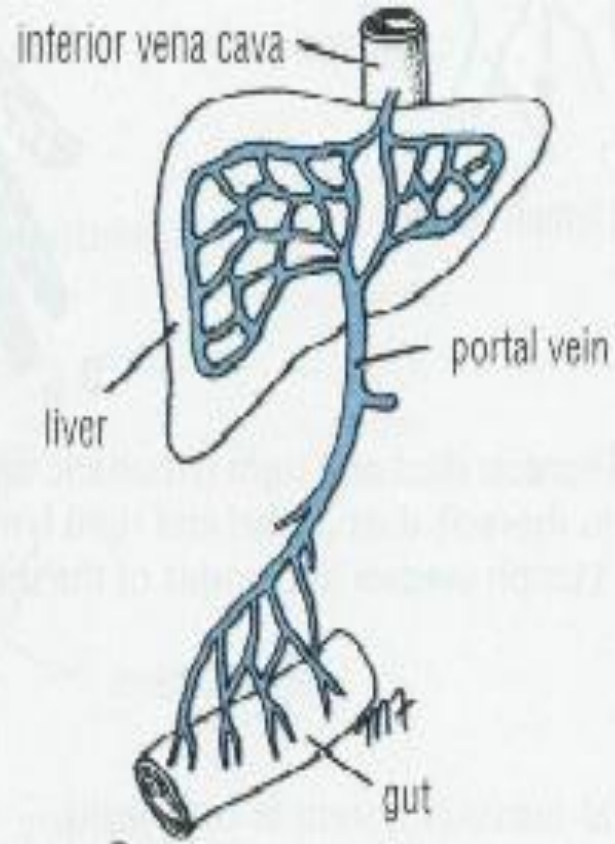


# Arteriovenous anastomosis





C



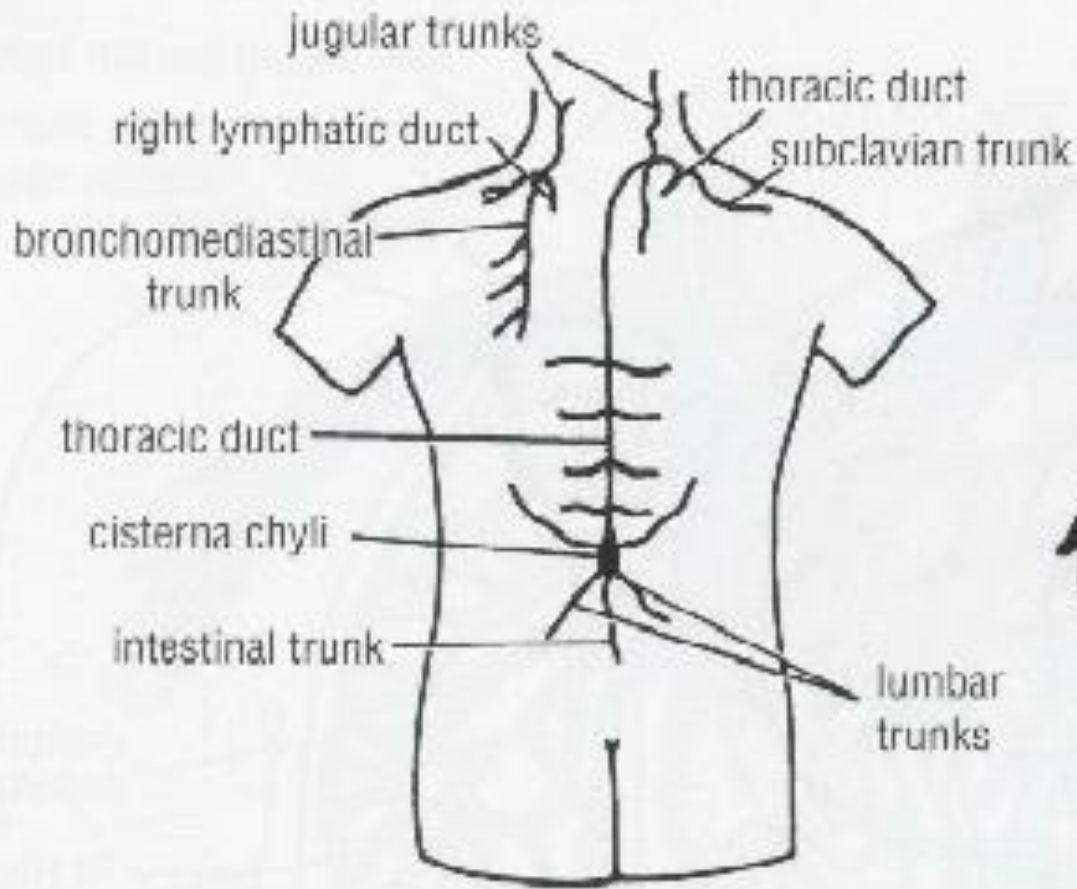
D



E

bicuspid valve of vein

# Lymphatic system

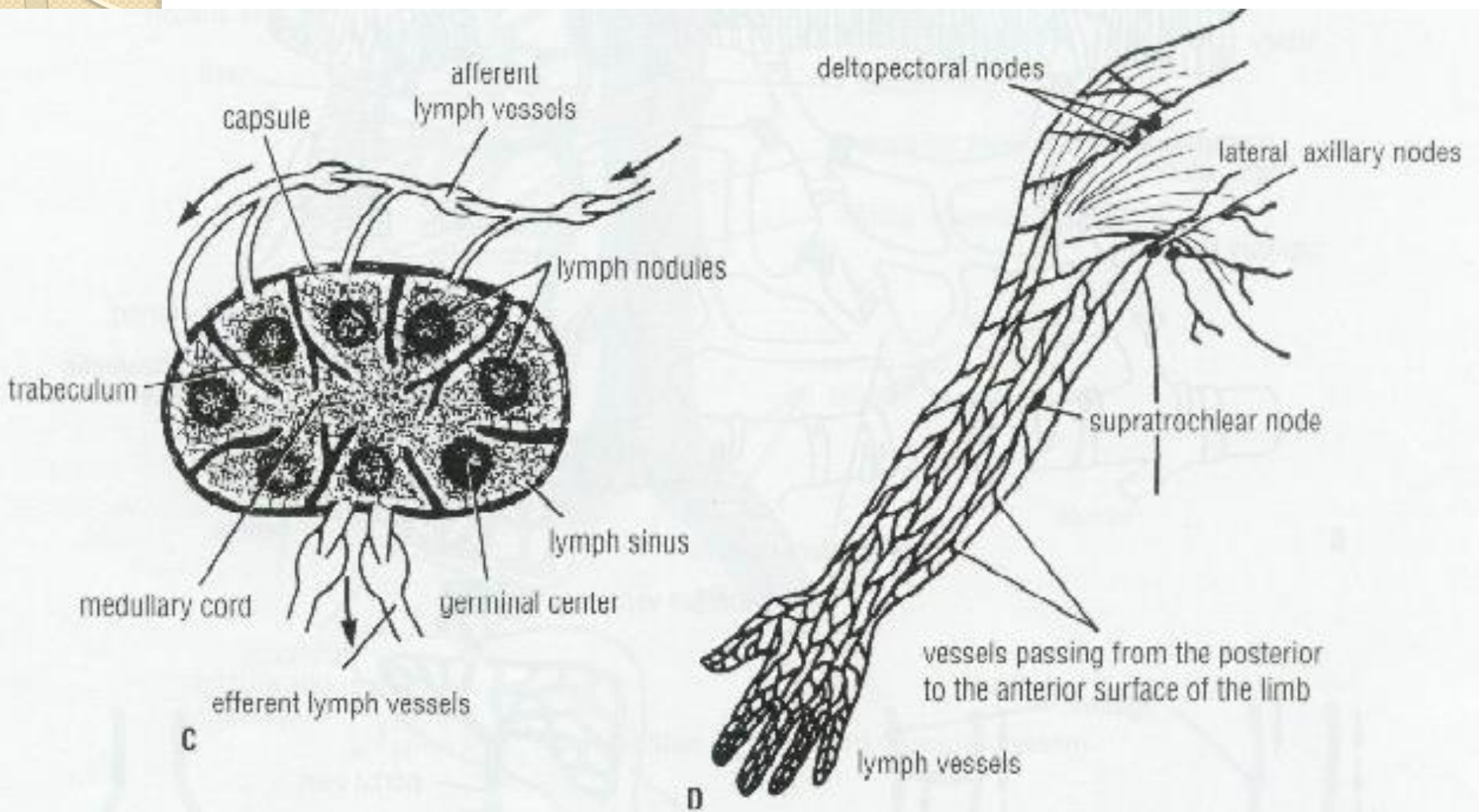


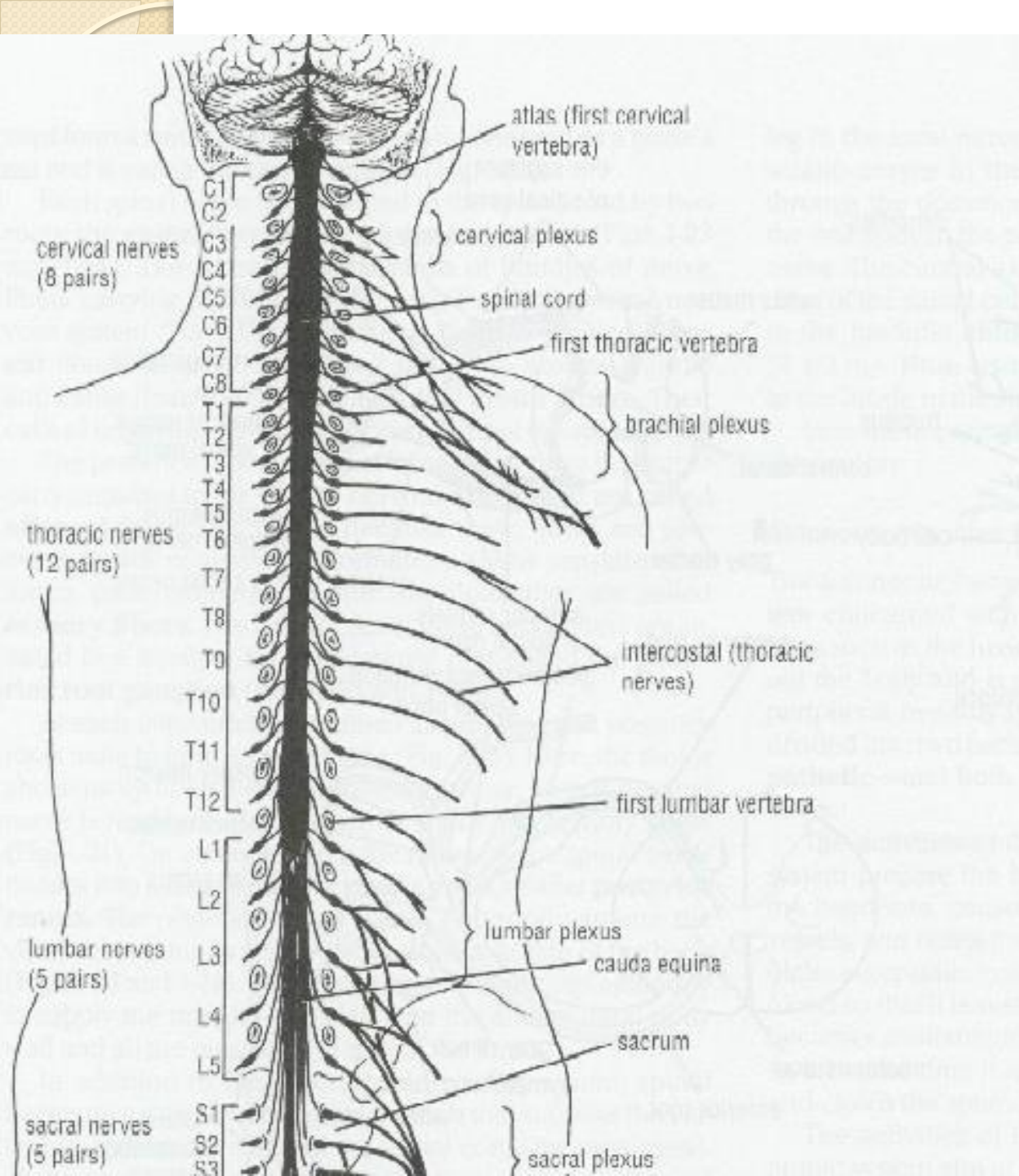
A



B

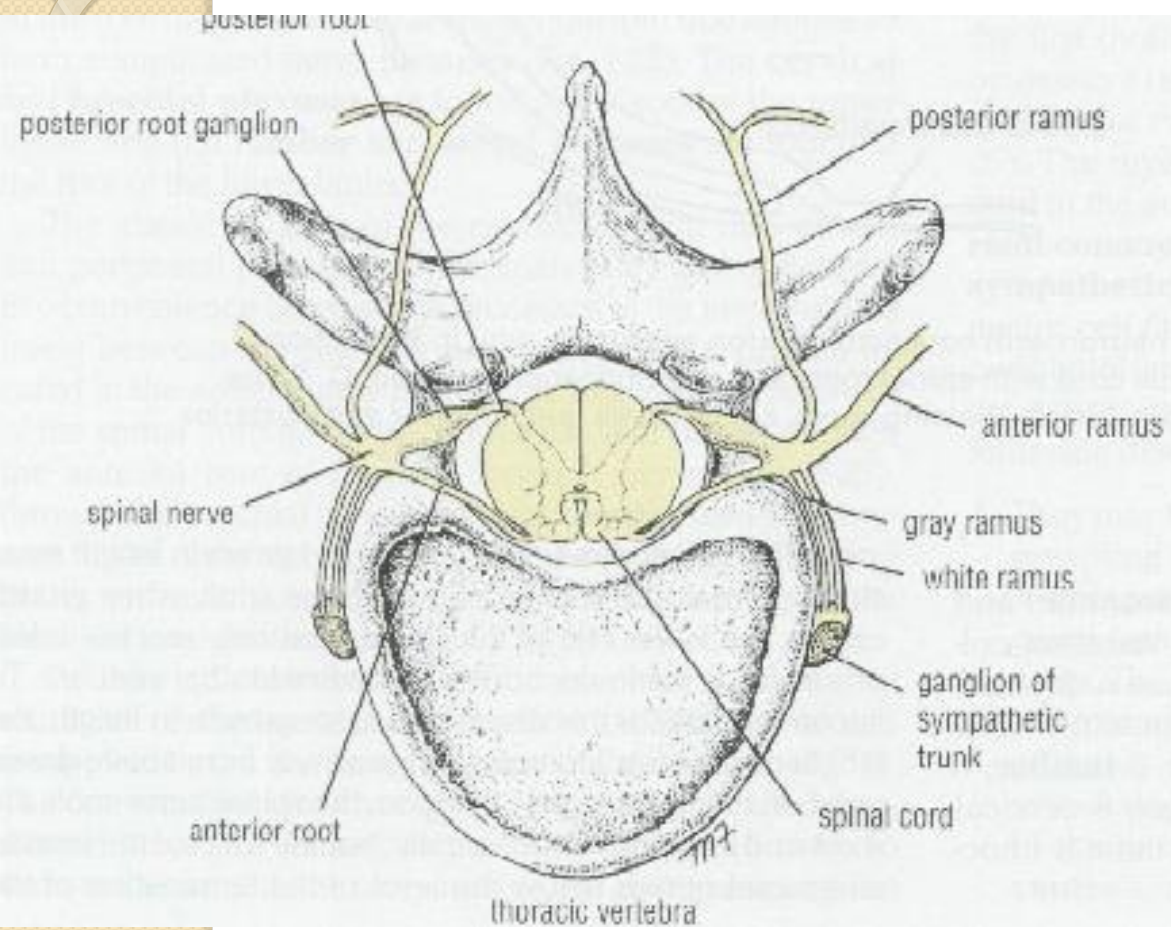
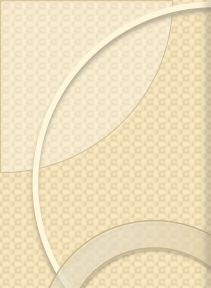
# Lymph nodes





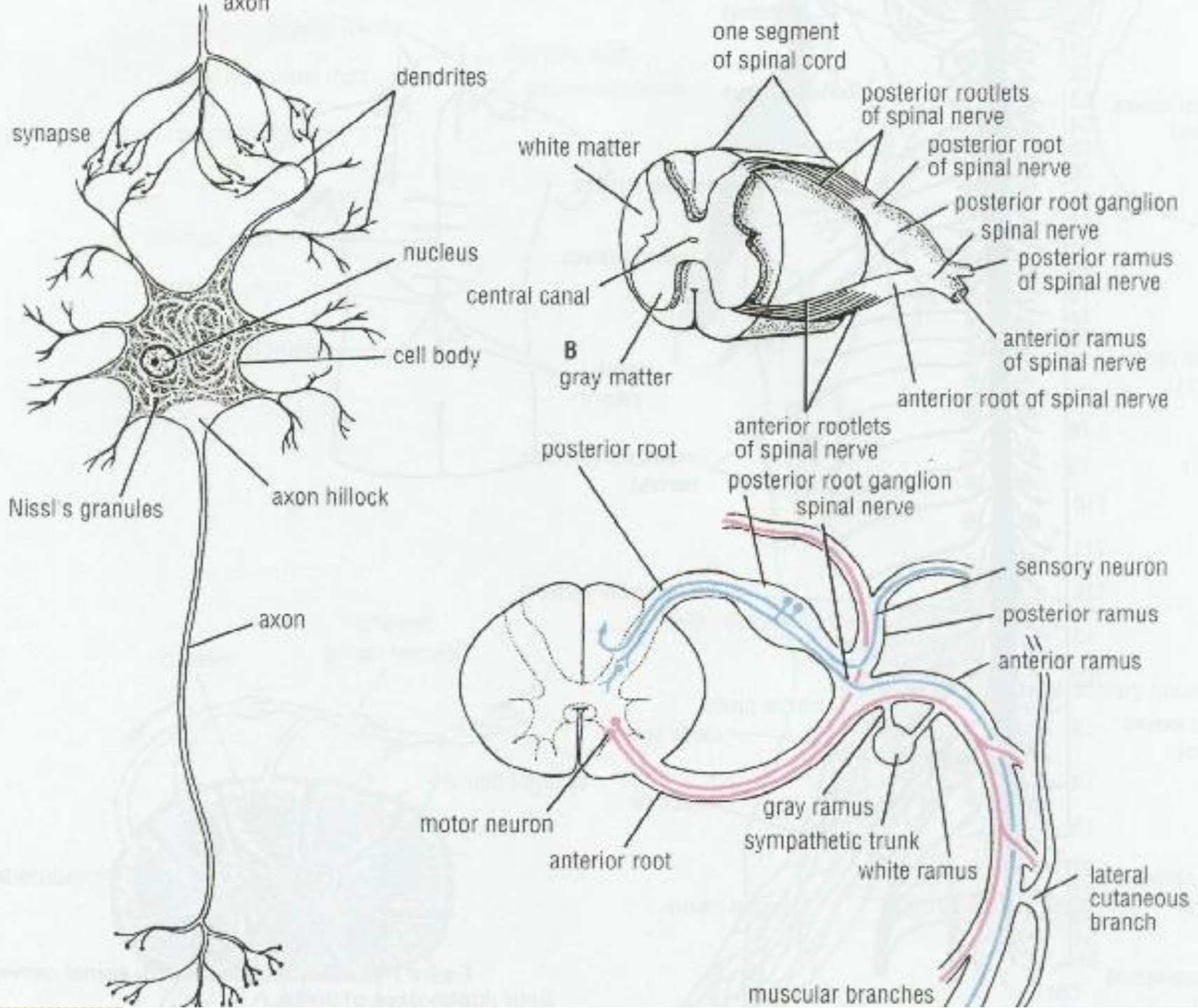
# CNS, PNS

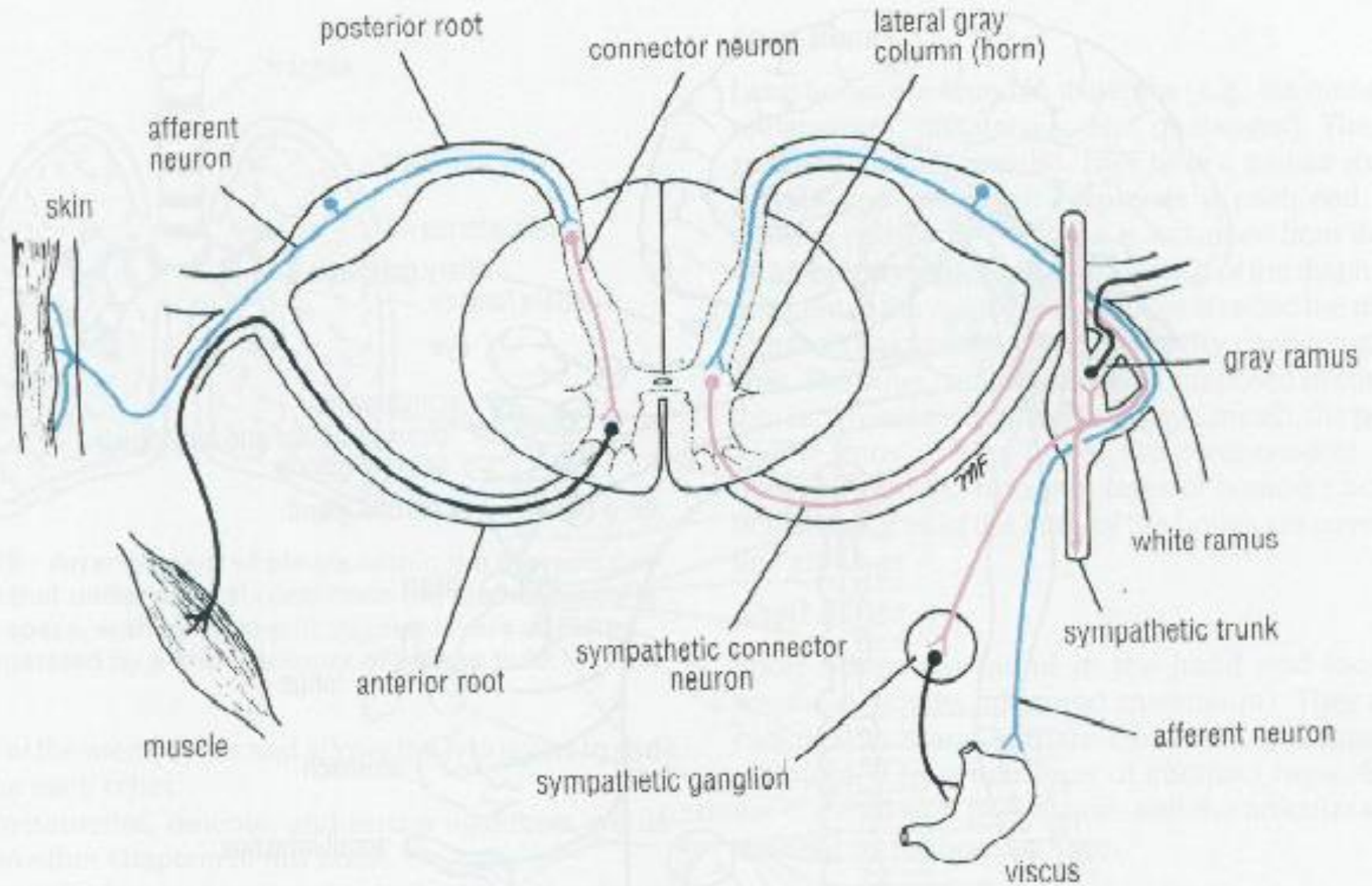




**Figure 1-23** The association between spinal cord, spinal nerves, and sympathetic trunks.

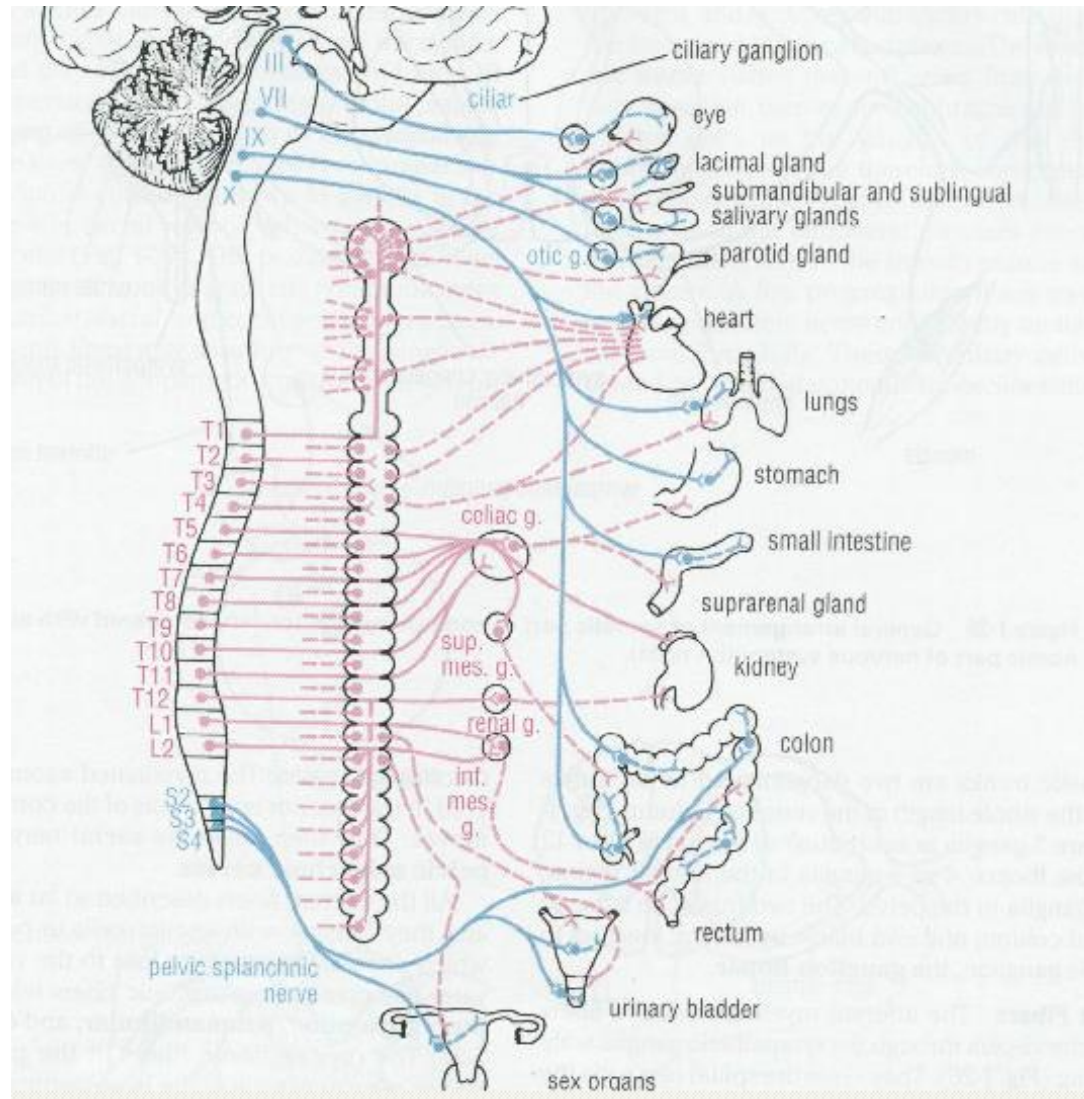




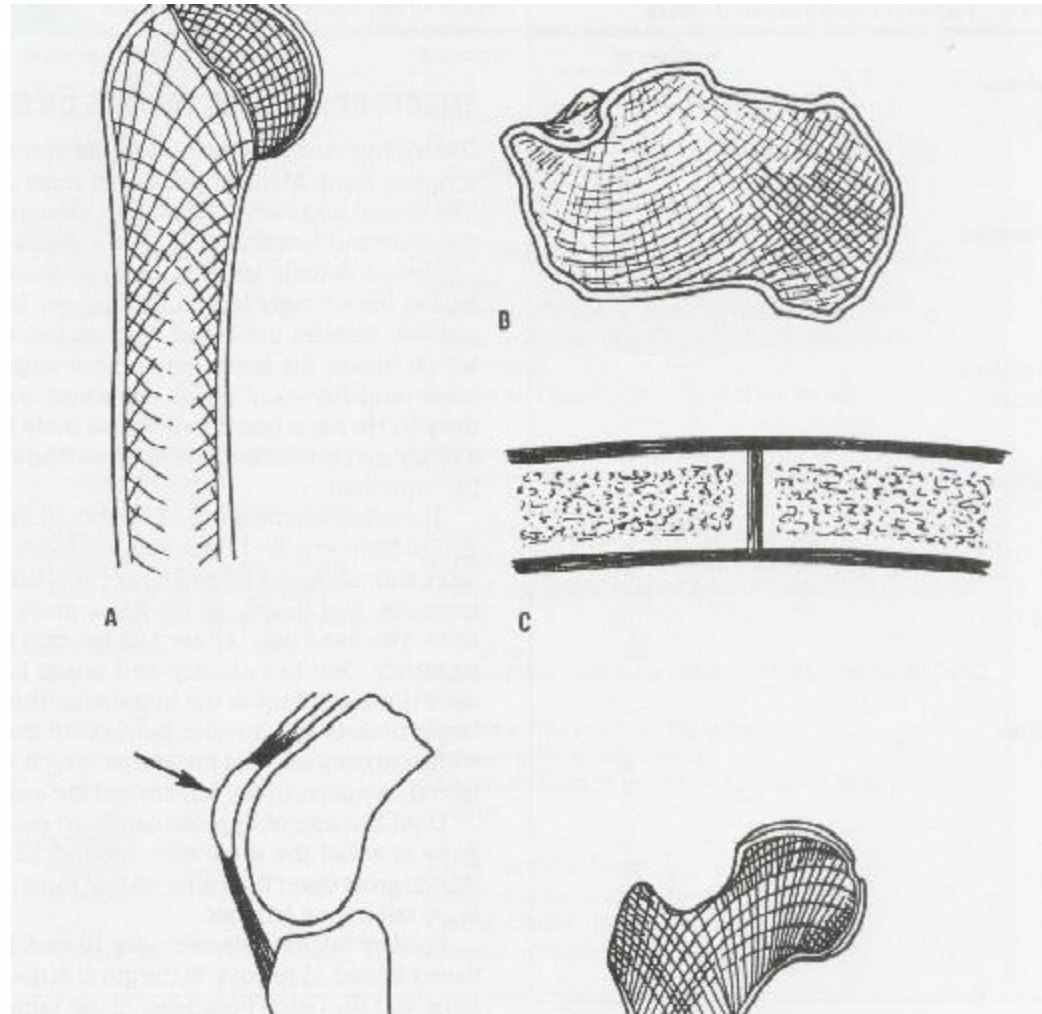


**Figure 1-26** General arrangement of somatic part of nervous system (on left) compared with autonomic part of nervous system (on right).

# AUTONOMIC NS



# BONES



**Table 1-3 Surface Markings of Bones**

<b>Bone Marking</b>	<b>Example</b>
Linear elevation	
Line	Superior nuchal line of the occipital bone
Ridge	The medial and lateral supracondylar ridges of the humerus
Crest	The iliac crest of the hip bone
Rounded elevation	
Tubercle	Pubic tubercle
Protuberance	External occipital protuberance
Tuberosity	Greater and lesser tuberosities of the humerus
Malleolus	Medial malleolus of the tibia and lateral malleolus of the fibula
Trochanter	Greater and lesser trochanters of the femur
Sharp elevation	
Spine or spinous process	Ischial spine, spine of vertebra
Styloid process	Styloid process of temporal bone

Expanded ends for articulation

- Head
  - Head of humerus, head of femur
- Condyle (knucklelike process)
  - Medial and lateral condyles of femur
- Epicondyle (a prominence situated just above condyle)
  - Medial and lateral epicondyles of femur

Small flat area for articulation

- Facet
  - Facet on head of rib for articulation with vertebral body

Depressions

- Notch
  - Greater sciatic notch of hip bone
- Groove or sulcus
  - Bicipital groove of humerus
- Fossa
  - Olecranon fossa of humerus, acetabular fossa of hip bone

Openings

- Fissure
  - Superior orbital fissure
- Foramen
  - Infraorbital foramen of the maxilla
- Canal
  - Carotid canal of temporal bone
- Meatus
  - External acoustic meatus of temporal bone