



JHARKHAND RAI UNIVERSITY
RANCHI

LAB MANUAL

ANATOMY - I

BPT I

LIST OF PRACTICAL

ANATOMY- I

(23A101P)

S.NO	PRACTICAL
1.	Identification and description of all anatomical structures
2.	To study anatomy of Bone Markings
3.	To identify the muscle and naming of muscle
4.	To identify and study structure in the Cubital Fossa
5.	To identify Femoral Triangle and its contents
6.	To identify Popliteal Fossa and its contents

PRACTICAL 1

Aim: Identification and description of all anatomical structures.

THEORY

Anatomy describes the structure and location of the different components of an organism to provide a framework for understanding. Human anatomy studies the way that every part of a human, from molecules to bones, interacts to form a functional whole.

Learning Outcome

At the end of this practical student can able to identify and describe different region of the body and also able to locate position of the body.

Types of Anatomy

Gross Anatomy: Gross anatomy can be further subdivided into three different fields:

- Surface anatomy (or superficial anatomy) is the study of external anatomical features without dissection.
- Regional anatomy focuses on specific external and internal regions of the body (such as the head or chest) and how different systems work together in that region.
- Systemic anatomy focuses on the anatomy of different organ systems, such as the respiratory or nervous system.

Regional anatomy:Regional anatomy is **the study of the interrelationships of all of the structures in a specific body region**, such as the abdomen, Head, neck For example, a systemic anatomical study of the muscular system would consider all of the skeletal muscles of the body.

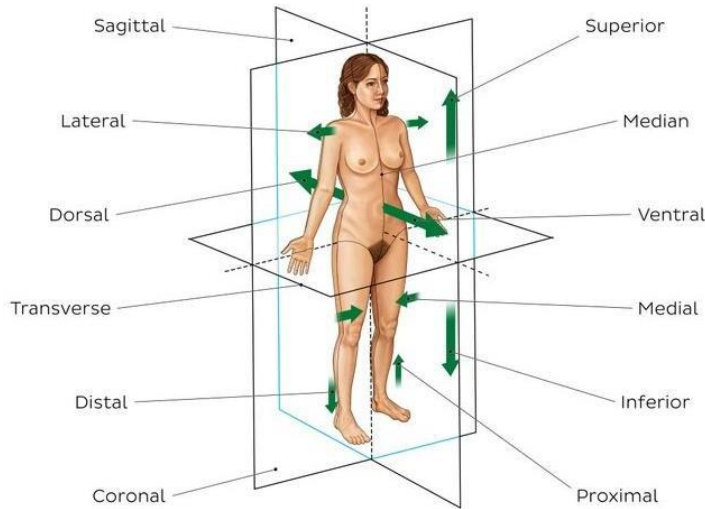
Microscopic Anatomy: Within microscopic anatomy, two topics of study are of great importance:

- Cytology, the study of the structure and function of cells
- Histology, the study of the organization and details of biological tissues

Anatomical position. In this orientation, the person is considered to be standing upright, with the arms hanging by the side, palms facing forward, and thumbs pointing away from the body. The feet are slightly parallel, and toes oriented to the front.

Directional terms: To compare the location of body parts relative to each other, anatomy uses some universal anterior, posterior, ventral, dorsal, distal, proximal, medial, lateral, median, superior, inferior, external, internal, frontal, occipital, rostral, caudal, superficial, deep, central, peripheral, ipsilateral, contralateral, cranial, and cephalic.

Movement, the human body is capable of many of them. Depending on the type of joint in question (the synovial joint being the most flexible), there is: flexion, extension, abduction, adduction, protrusion, retrusion, elevation, depression, lateral (external) rotation, medial (internal) rotation, pronation, supination, circumduction, deviation, opposition, reposition, inversion, and eversion.



Different plane and direction and position in human body

Basic anatomy and terminology	
Anatomical terminology	A list of terms that concern with the anatomy of the human body. It gathers the terms that pertain to the anatomical regions and specific structures, planes, directions and body movements.
Anatomical planes	Imaginary planes that intersect the body, creating slices of inner body structures at different levels. Major planes: median (mid-sagittal), sagittal, frontal (coronal), transverse (axial).
Directional terms	Anatomical terms used to describe the position and relation between various structures (e.g. anterior, posterior, ventral, dorsal, proximal, distal, median, medial, lateral)

Movements	Changing the position of a body part around a certain axis and in one of the anatomical planes (e.g. flexion, extension, abduction, adduction)
Anatomical regions	Areas of the human body defined by the landmarks provided by evident structures that are easily palpable or visible. Major regions: head, neck, thorax, abdomen, pelvis, upper extremity, lower extremity
Human body systems	A group of organs that work together to perform one or more functions in the body. Systems: circulatory, respiratory, digestive, nervous, excretory, endocrine, reproductive, lymphatic , skeletal, and muscular systems

Anatomical regions

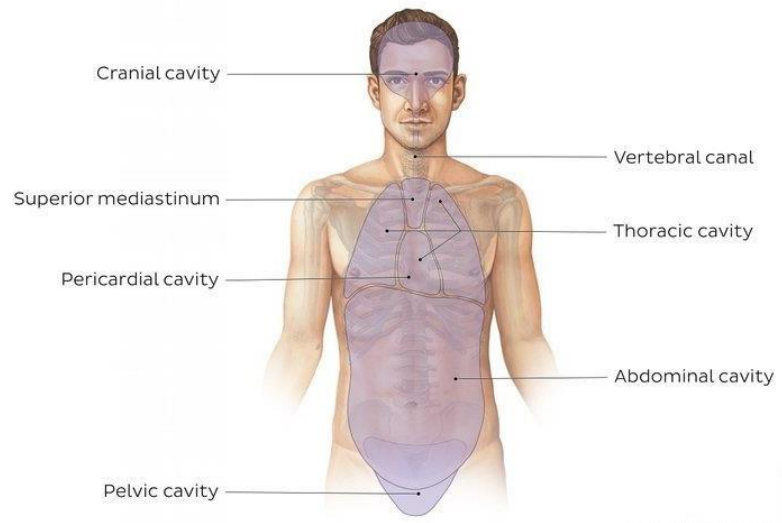
The entire human body is divided into regions, an approach called **regional anatomy**. Each main area (head, neck, thorax, abdomen, upper, and lower extremities) are divided into several smaller regions that aid compartmentalization.

Anatomical regions of the human body	
Head regions	Frontal, parietal, temporal, occipital, auricular, orbital, infraorbital, buccal, parotid, zygomatic, nasal, oral, and mental regions
Neck regions	Submandibular, submental, carotid, muscular, lesser supraclavicular, occipital, omoclavicular, suboccipital triangles/regions
Posterior trunk regions	Deltoid, suprascapular, interscapular, scapular, infrascapular, vertebral, lumbar, sacral, gluteal, and anal regions

Anterior trunk regions (thorax and abdomen)	Presternal, pectoral, inframammary, hypochondriac, epigastric, lumbar, inguinal, umbilical, and pubic regions
Upper limb regions	Infraclavicular, clavipectoral, axillary, deltoid, scapular, anterior arm, posterior arm, anterior forearm, posterior forearm, anterior cubital, posterior cubital, anterior carpal, posterior carpal, palm of hand, dorsum of hand
Lower limb regions	Femoral, anterior thigh, posterior thigh, anterior knee, posterior knee, anterior leg region, posterior leg region, calcaneal, retromalleolar, dorsum of foot, and sole of foot regions

Surface anatomy: The evident and palpable surface features of the body are described. There are common ones to both males and females, but also gender specific surface markers.

Anatomical region. This consists of the cavities of the human body which house many vital organs, neurovasculature, and anatomical structures. There are five major body cavities: cranial, thoracic, abdominal, pelvic, and vertebral cavities. Many of them are subdivided into smaller ones. In particular the thoracic cavity, it consists of the pleural, pericardial, and mediastinal cavities.



Cavities of the human body (anterior view)

PRACTICAL 2

AIM: To study and identify Anatomy of Bone Markings

THEORY

Bone markings are invaluable to the identification of individual bones and bony pieces and aid in the understanding of functional and evolutionary anatomy. They are used by clinicians and surgeons, especially orthopedists, radiologists, forensic scientists, detectives, osteologists, and anatomists. Although the untrained eye may overlook bone markings as contours of the bone, they are not as simple. Bone markings play an important role in human and animal anatomy and physiology. The functionality of bone markings ranges from enabling joints to slide past each other or lock bones in place, providing structural support to muscle and connective tissue, and providing circumferential stabilization and protection to nerves, vessels, and connective tissue.

Learning Outcome:

At the end of the practical student can identify different shape in bone and based on the structure its name

Bone Markings

Angles - Sharp bony angulations that may serve as bony or soft tissue attachments but often are used for precise anatomical description. Examples include the superior, inferior, and acromial angles of the scapula and the superior, inferior, lateral angles of the occiput.

Body - This usually refers to the largest, most prominent segment of bone. Examples include the diaphysis or shaft of long bones like the femur and humerus.

Condyle - Refers to a large prominence, which often provides structural support to the overlying hyaline cartilage. It bears the brunt of the force exerted from the joint. Examples include the knee joint (hinge joint), formed by the femoral lateral and medial condyles, and the tibial lateral and medial condyles. Additionally, the occiput has an occipital condyle which articulates with atlas (C1) and accounts for approximately 25 degrees of cervical flexion and extension.

Crest - A raised or prominent part of the edge of a bone. Crests are often the sites where connective tissue attaches muscle to bone. The iliac crest is found on the ilium.

Diaphysis - Refers to the main part of the shaft of a long bone. Long bones, including the femur, humerus, and tibia, all have a shaft.

Epicondyle - A prominence that sits atop of a condyle. The epicondyle attaches muscle and connective tissue to bone, providing support to this musculoskeletal system. Examples include the femoral medial and lateral epicondyles and humeral medial and lateral epicondyles.

Epiphysis - The articulating segment of a bone, usually at the bone's proximal and distal poles. It usually has a larger diameter than the shaft (diaphysis). The epiphysis is critical for bone growth because it sits adjacent to the physal line, also known as the growth plate.

Facet - A smooth, flat surface that forms a joint with another flat bone or another facet, together creating a gliding joint. Examples can be seen in the facet joints of the vertebrae, which allow for flexion and extension of the spine.

Fissure - An open slit in a bone that usually houses nerves and blood vessels. Examples include superior and inferior orbital fissure.

Foramen - A hole through which nerves and blood vessels pass. Examples include supraorbital foramen, infraorbital foramen, and mental foramen on the cranium.

Fossa - A shallow depression in the bone surface. Here it may receive another articulating bone or act to support brain structures. Examples include trochlear fossa, posterior, middle, and anterior cranial fossa.

Groove - A furrow in the bone surface that runs along the length of a vessel or nerve, providing space to avoid compression by adjacent muscle or external forces. Examples include a radial groove and the groove for the transverse sinus.

Head - A rounded, prominent extension of bone that forms part of a joint. It is separated from the shaft of the bone by the neck. The head is usually covered in hyaline cartilage inside a synovial capsule. It is the main articulating surface with the adjacent bone, forming a "ball-and-socket" joint.

Margin - The edge of any flat bone. It can be used to define a bone's borders accurately. For example, the edge of the temporal bone articulating with the occipital bone is called the occipital margin of the temporal bone. And vice versa, the edge of the occipital bone articulating with the temporal bone is called the temporal margin of the occipital bone.

Meatus - A tube-like channel that extends within the bone, which may provide passage and protection to nerves, vessels, and even sound. Examples include external acoustic meatus and internal auditory meatus.

Neck - The segment between the head and the shaft of a bone. It is often demarcated from the head by the presence of the physeal line in pediatric patients and the physeal scar (physeal line remnant) in adults. It is often separated into the surgical neck and anatomical neck. The anatomical neck, which may represent the old epiphyseal plate, is often demarcated by its attachment to capsular ligaments. The surgical neck is often more distal and is demarcated by the site on the neck that is most commonly fractured. For example, in the humerus, the anatomical neck runs obliquely from the greater tuberosity to just inferior to the humeral head. The surgical neck runs horizontally and a few centimeters distal to the humeral tuberosities.

Notch - A depression in a bone which often, but not always, provides stabilization to an adjacent articulating bone. The articulating bone will slide into and out of the notch, guiding the range of motion of the joint. Examples include the trochlear notch on the ulna, radial notch of the ulna, suprasternal notch, and the mandibular notch.

Ramus - The curved part of a bone that gives structural support to the rest of the bone. Examples include the superior/inferior pubic ramus and ramus of the mandible.

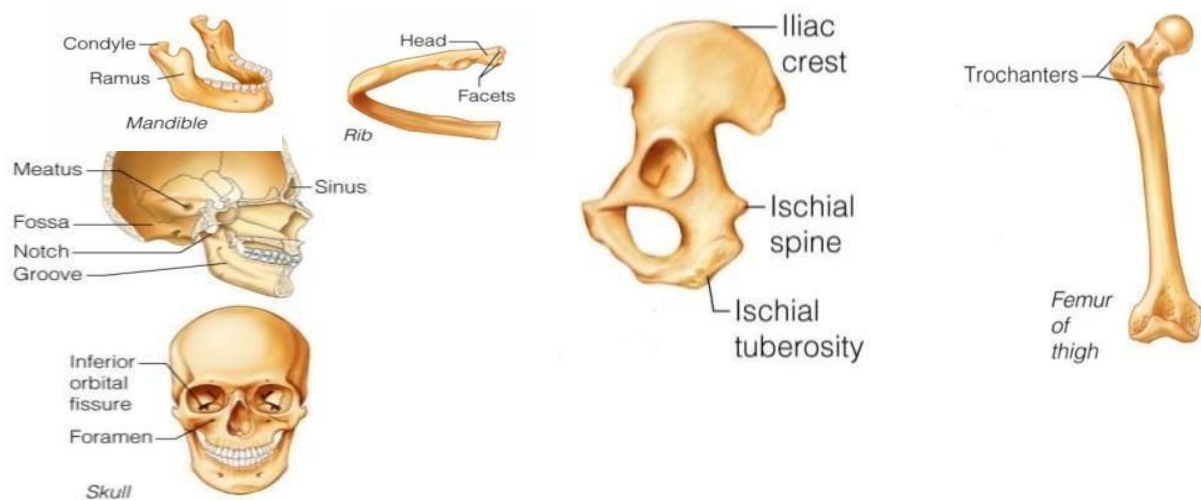
Sinus - A cavity within any organ or tissue. Examples include paranasal sinuses and dural venous sinuses.

Spinous Process - A raised, sharp elevation of bone where muscles and connective tissue attach. It is different than a normal process in that a spinous process is more pronounced.

Trochanter - A large prominence on the side of the bone. Some of the largest muscle groups and most dense connective tissues attach to the trochanter. The most notable examples are the greater and lesser trochanters of the femur.

Tuberosity - A moderate prominence where muscles and connective tissues attach. Its function is similar to that of a trochanter. Examples include the tibial tuberosity, deltoid tuberosity, and ischial tuberosity.

Tubercle - A small, rounded prominence where connective tissues attach. Examples include the greater and lesser tubercle of the humerus.



Basic Anatomy of bony marking

PRACTICAL 3

Aim: To identify the muscle and naming of muscle

Learning Outcome

At the end of practical student will able to identify different fibres and shape of muscles

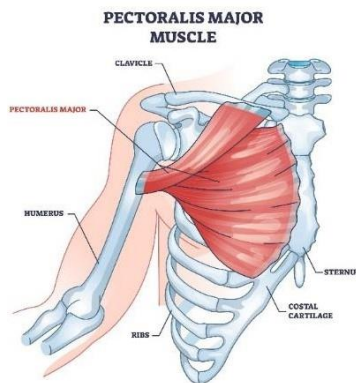
Skeletal muscle of Chest:

Pectoralis Major:

The pectoralis muscle is large located in the upper chest.

Direction of muscle fibres (type): triangular, convergent

Name based on: Size and position.

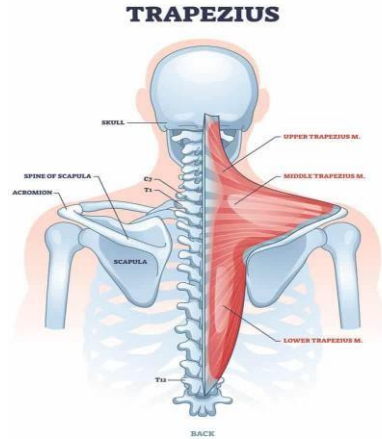


Pectoralis Major muscle orientation

Skeletal muscle of Neck and upper back

Trapezius

It is upper back muscle that extends from occipital bone to the lower thoracic vertebrae of the spine



Trapezius muscle orientation

Skeletal muscle of Upper limb

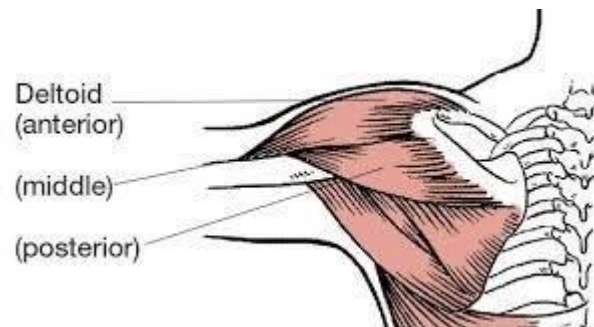
Deltoid:

A muscle in the upper limb located on the uppermost part of the arm and the top of the shoulder

Direction of muscle fibres (Type): Multipennate

Name based on: Shape

Deltoid = Triangular



Deltoid muscle orientation

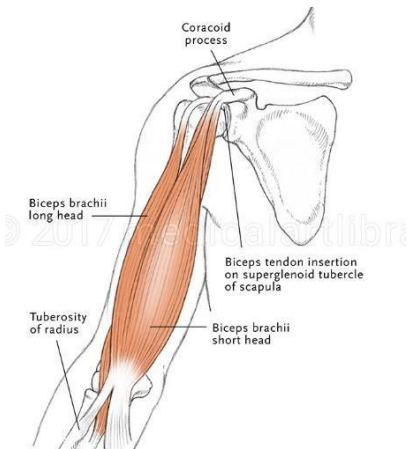
Biceps Brachii:

Located in the upper arm

Name based on number of heads (Biceps = two heads)

Fusiform

Located along the humerus bone (from the front) between the shoulder and the elbow.



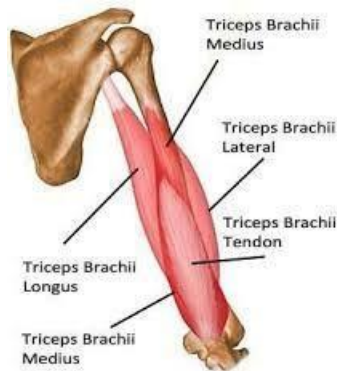
Biceps Brachii muscle orientation

Triceps Brachii:

The triceps brachii is the muscle located in the upper arm. Located along the humerus bone (from the back) between the shoulder and the elbow

Naming due to having three head (tri means three, ceps means head)

Direction of muscle fibres fusiform



Triceps Brachii muscle orientation

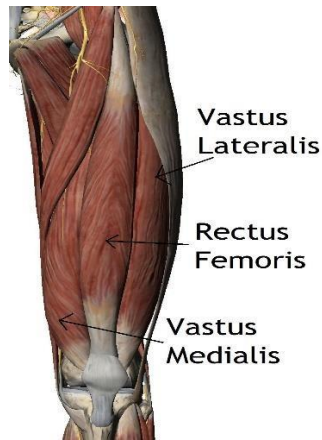
Skeletal muscle of Lower limb

Quadriceps Femoris

Quadriceps femoris is a large fleshy muscle group located in the front of the thigh covering the front and sides of the thigh

Name is based on number of heads (four)

Direction of muscle fibres: Bipennate



Quadriceps Femoris muscle orientation

Hamstring

Group of the muscle at the back of thigh that function to flex and rotate the leg and extended the thigh

The three muscle are semimembranosus, semitendinosus, biceps femoris.



Hamstring muscle orientation

Sartorius

Sartorius is a muscle that crosses the front of the thigh obliquely, assist in rotating the leg to the cross – legged position.

Locate in the proximal (upper) anterior part of the thigh

It is the longest muscle in the human body

Direction of muscle fibres: Parallel



Sartorius muscle orientation

Calf Muscle

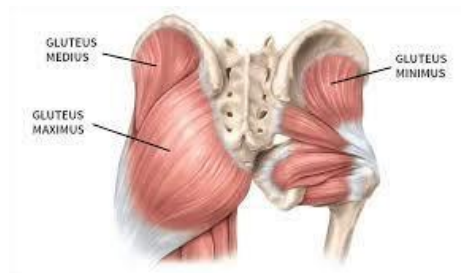
Calf muscle is composed of two muscles (Gastrocnemius and Soleus) in the posterior aspect of leg. Direction of muscle fibres: Bipennate



Calf muscle orientation

Gluteus

The gluteal muscles are a group of three muscles which make up the buttocks. These are Gluteus maximus, medius and minimus.



Gluteus muscle orientation

PRACTICAL 4

Aim: To identify and study structure in the cubital fossa

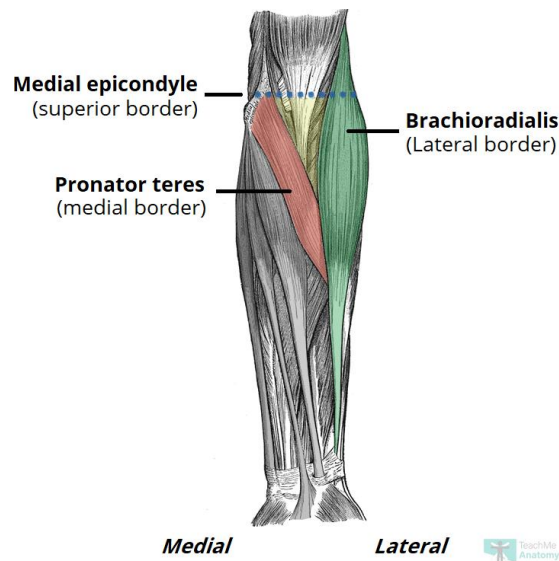
Theory: The cubital fossa is a triangular-shaped depression area over the anterior aspect of the elbow joint. It conveys several important structures.

Learning Outcome: At the end of the practical student can able to identify different content of Cubital fossa and structure in its floor

Borders

The cubital fossa is triangular in shape and consists of three borders, a roof, and a floor:

- **Lateral border** – medial border of the brachioradialis muscle.
- **Medial border** – lateral border of the pronator teres muscle.
- **Superior border** – horizontal line drawn between the epicondyles of the humerus.
- **Roof** – bicipital aponeurosis, fascia, subcutaneous fat and skin.
- **Floor** – brachialis (proximally) and supinator (distally).



Cubital Fossa Border formation

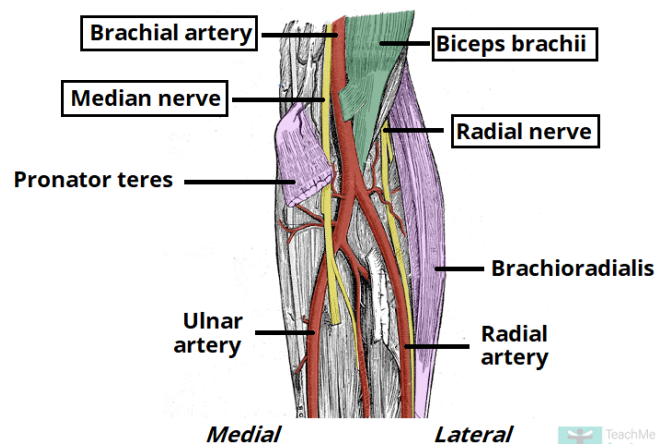
Contents

The cubital fossa is a area for structures to pass between the upper arm and forearm. Its contents are (lateral to medial):

- Radial nerve – travels along the lateral border of the cubital fossa and divides into superficial and deep branches.
 - It has a motor and sensory function in the posterior forearm and hand.

- Biceps tendon – passes centrally through the cubital fossa and attaches the radial tuberosity (immediately distal to the radial neck).
 - It gives rise to the bicipital aponeurosis which contributes to the roof of the cubital fossa.
- Brachial artery – bifurcates into the radial and ulnar arteries at the apex of the cubital fossa.
 - The brachial pulse can be felt in the cubital fossa by palpating medial to the biceps tendon
- Median nerve – travels medially through the cubital fossa, exiting by passing between the two heads of the pronator teres.
 - It has a motor and sensory function in the anterior forearm and hand.

The roof of the cubital fossa also contains several superficial veins. Notably, the median cubital vein, which connects the basilic and cephalic veins and can be accessed easily – a common site for venepuncture.



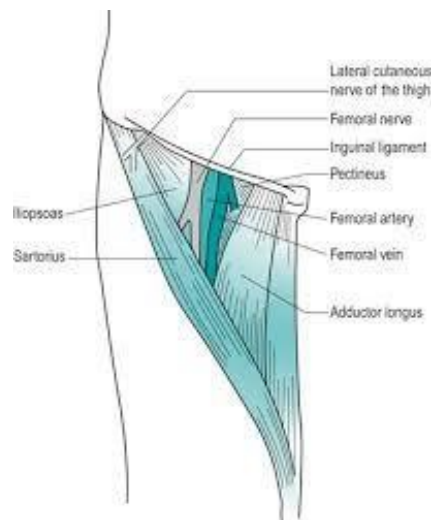
Contents of the cubital fossa

PRACTICAL 5

Aim: To identify femoral triangle and its contents

Theory: The femoral triangle is a wedge-shaped area located within the superomedial aspect of the anterior thigh. It acts as a conduit for structures entering and leaving the anterior thigh.

Learning Outcome: At the end of the practical student can able to identify different content of femoral triangle and structure in its floor



Surface anatomy of the femoral triangle.

Borders

The femoral triangle consists of three borders, a floor and a roof:

- **Roof** – fascia lata.
- **Floor** – pectineus, iliopsoas, and adductor longus muscles.
- **Superior border** – inguinal ligament (a ligament that runs from the anterior superior iliac spine to the pubic tubercle).
- **Lateral border** – medial border of the sartorius muscle.
- **Medial border** – medial border of the adductor longus muscle. The rest of this muscle forms part of the floor of the triangle.

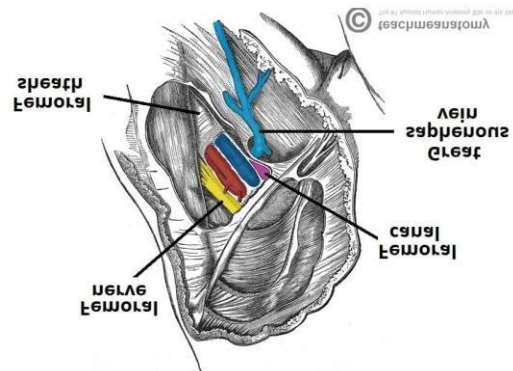
The inguinal ligament acts as a flexor retinaculum, supporting the contents of the femoral triangle during flexion at the hip.

Contents

The femoral triangle contains some of the major neurovascular structures of the lower limb. Its contents (lateral to medial) are:

- Femoral nerve – innervates the anterior compartment of the thigh, and provides sensory branches for the leg and foot.
- Femoral artery – responsible for the majority of the arterial supply to the lower limb.
- Femoral vein – the great saphenous vein drains into the femoral vein within the triangle.
- Femoral canal – contains deep lymph nodes and vessels.

The femoral artery, vein and canal are contained within a fascial compartment – known as the femoral sheath.



The contents of the femoral triangle.

PRACTICAL 6

Aim: To identify Popliteal fossa and its contents

Theory: The popliteal fossa is a diamond shaped area located on the posterior aspect of the knee. It is the main path by which vessels and nerves pass from thigh and to leg.

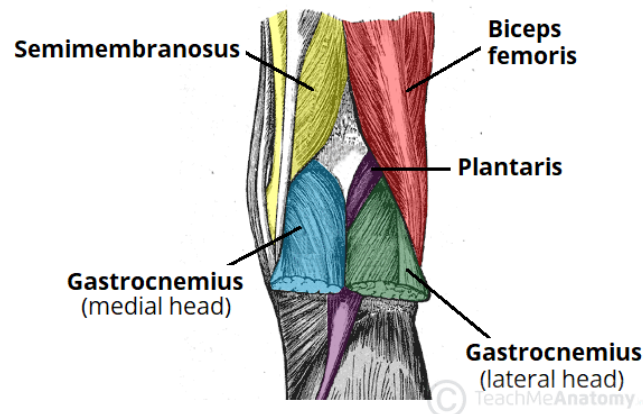
Learning Outcome: At the end of the practical student can able to identify different content of Popliteal fossa and structure in its floor

Borders

The popliteal fossa is diamond shaped with four borders. These borders are formed by the muscles in the posterior compartment of the leg and thigh:

- **Superomedial** – semimembranosus.
- **Superolateral** – biceps femoris.
- **Inferomedial** – medial head of the gastrocnemius.
- **Inferolateral** – lateral head of the gastrocnemius and plantaris.

The floor of the popliteal fossa is formed by the posterior surface of the knee joint capsule, popliteus muscle and posterior femur. The roof is made of up two layers: popliteal fascia and skin. The popliteal fascia is continuous with the fascia lata of the leg.



The borders of the popliteal fossa are formed by the muscles of the thigh and leg

Contents

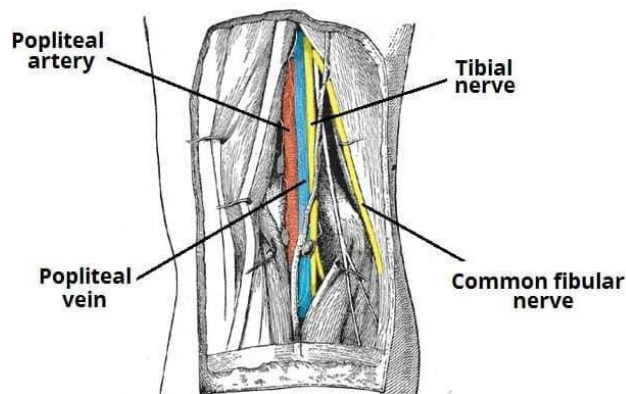
The popliteal fossa is the main conduit for neurovascular structures entering and leaving the leg. Its contents are (medial to lateral):

- Popliteal artery
- Popliteal vein
- Tibial nerve
- Common fibular nerve (common peroneal nerve)

The tibial and common fibular nerves are the most superficial of the contents of the popliteal fossa. They are both branches of the sciatic nerve. The common fibular nerve follows the biceps femoris tendon, travelling along the lateral margin of the popliteal fossa.

The small saphenous vein pierces the popliteal fascia and passes between the two heads of gastrocnemius to empty into the popliteal vein.

In the popliteal fossa, the deepest structure is the popliteal artery. It is a continuation of the femoral artery, and travels into the leg to supply it with blood.



The contents of the popliteal fossa