General Anatomy

Anatomy is the science of the structure and function of the body.
Clinical anatomy is the study of the macroscopic structure and function of the body as it relates to the practice of medicine and other health sciences.

01. Approaches to Study Anatomy

The three main approaches to studying anatomy are regional, systemic, and clinical (applied), reflecting the body's organization and the priorities and purposes for studying it.

Regional Anatomy: Regional anatomy (topographical anatomy) considers the organization of the human body as segments or major parts based on form and mass: a main body, consisting of the head, neck, and trunk (subdivided into thorax, abdomen, back, and pelvis/perineum), and paired upper limbs and lower limbs. All the major parts may be further subdivided into regions and zones.

Systemic Anatomy: Systemic anatomy recognizes the organization of the body's organs into systems or collective apparatuses that work together to carry out complex functions

- The integumentary system (dermatology)
- The skeletal system (osteology)
- The articular system (arthrology)
- The muscular system (mycology)
- The nervous system (neurology)
- The circulatory system (angiology)
- The cardiovascular system (cardiology)
- The lymphatic system
- The digestive or alimentary system (gastroenterology)
- The respiratory system (pulmonology)
- The urinary system (urology)
- The reproductive or genital system (gynecology for females; andrology for males)
- The endocrine system (endocrinology)

Clinical Anatomy: Clinical anatomy emphasizes application of anatomical knowledge to the practice of medicine.
Some terms:

- Macroscopic anatomy
- Microscopic anatomy (histology)
- Developmental anatomy (embryology)
- Surface (living) anatomy
- Radiological anatomy.

02. Descriptive Anatomic Terms

Terms Related to Position:

Anatomical Position: The anatomical position refers to the body position as if the person were standing upright (erect), regardless of the actual posture or position, with the: Head, gaze (eyes), and toes directed anteriorly (forward)
Arms adjacent to the sides with the palms of the hands facing anteriorly
Lower limbs close together with the feet parallel and the toes directed anteriorly.

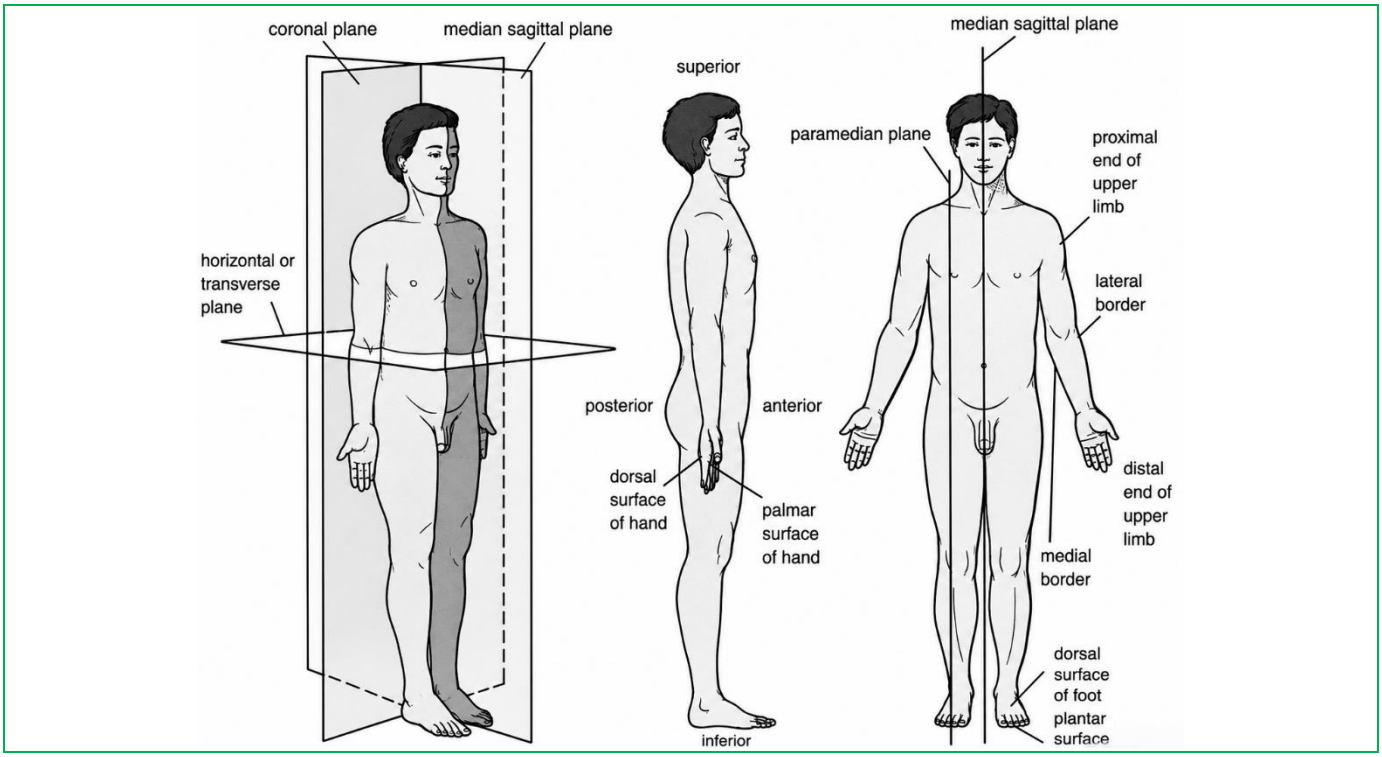


Figure: Anatomic terms used in relation to position

Anatomical Planes: The various parts of the body are described in relation to certain imaginary planes. (Fig. above)

Sagittal plane

- **Median Sagittal Plane or Median Plane:** This is a vertical plane passing longitudinally through the center of the body, dividing it into equal right and left halves.
- **Parasagittal Plane or Paramedian Plane:** Planes situated to one or the other side of the median plane and parallel to it are termed paramedian.

Coronal Planes or Frontal Planes: These planes are imaginary vertical planes at right angles to the median plane, dividing the body into anterior (front) and posterior (back) parts.

Horizontal Planes or Transverse Planes: These planes are planes passing through the body at right angles to both the median and the coronal planes, dividing the body into superior (upper) and inferior (lower) parts.

Sections:

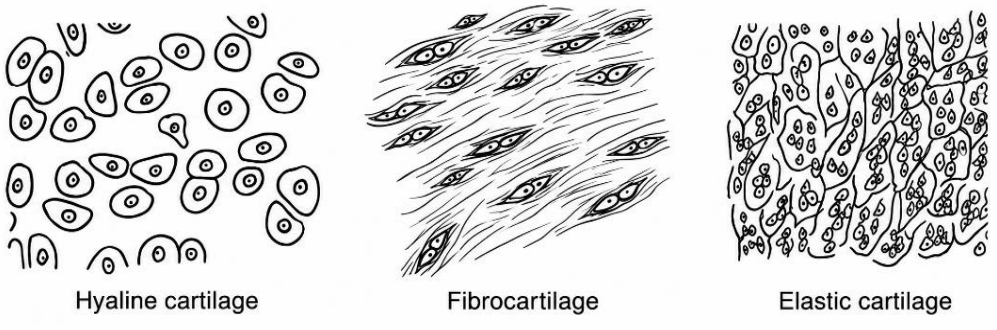
1. Longitudinal sections
2. Transverse sections or cross sections
3. Oblique sections.

Terms of Relationship and Comparison:

Medial is used to indicate that a structure, such as the 5th digit of the hand (little finger), is nearer to the median plane of the body than the other digits.

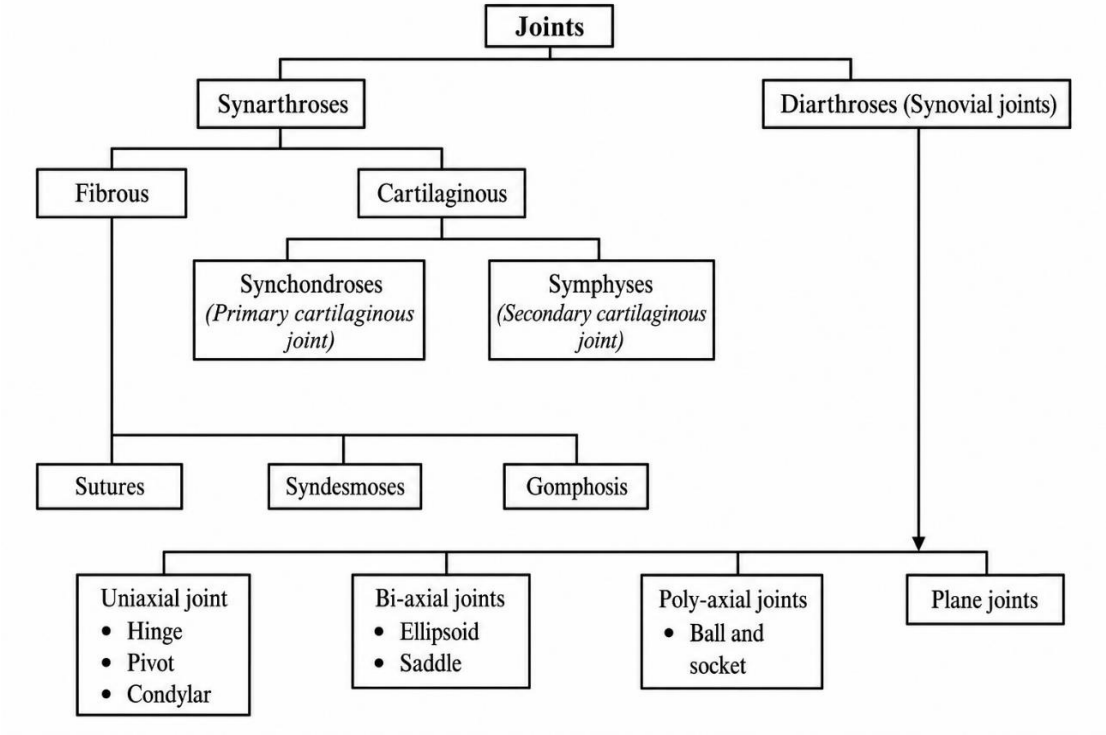
Lateral indicates that a structure, such as the 1 digit of the hand (thumb), is farther away from the median plane.
Anterior (ventral) denotes the front surface of the body.
Posterior (dorsal) denotes the back surface of the body or nearer to the back.
Rostral is often used instead of anterior when describing parts of the brain; it means toward the rostrum (L. from beak); however, in humans it denotes nearer the anterior part of the head (e.g., the frontal lobe of the brain is rostral to the cerebellum).

Superior refers to a structure that is nearer the vertex, the topmost point of the cranium.
Inferior refers to a structure that is situated nearer the sole of the foot.
Cranial relates to the cranium (Mediev. L. skull) and is a useful directional term, meaning toward the head.



07. Joints

Classification of joints



Synovial joints: Most of the joints of the body are synovial, which permits free movements.

Classification of synovial joints: Synovial joints are classified as follows-

(A) According to the number of articulating bones- the joints may be simple, compound and complex.

Simple joint: It occurs when only two bones enter in the articulation.
Example- Interphalangeal joints of the fingers and toes.

Compound joint: Here more than two articular bones are involved sharing a common articular capsule.
Example-Knee, Ankle and radio-carpal joints.

Complex joint: When a joint is divided into two compartments by an articular disc or meniscus, it is known as complex joint.
Examples- Knee joint, sterno-clavicular joint etc.

(B) According to the axis of movements - the joints may be uniaxial, biaxial and polyaxial.

1. **Uniaxial joint:** It has one degree freedom of movement, e. g. knee joint, ankle joint, elbow joint etc.
2. **Bi-axial joints:** These joints have two degree freedom of movements, e.g. atlanto-occipital joint, sterno-calvicular joint etc.
3. **Poly-axial joints:** They possess three degree freedom of movement, e.g. shoulder joint, hip joint etc.

(C) According to the shape of articular surface (morphological classification)-poli

1. **Hinge joint:** Interphalangeal joints of the fingers and toes; elbow and ankle joints.
2. **Pivot joint:** Atlanto-axial joint; here pivot formed by the dens of the axis is fixed, and the ring formed by the anterior arch of atlas and transverse ligament of atlas rotates. Radio-ulnar joint -In this case, pivot formed by the head of the radius rotates and the ring formed by annular ligament and ulna is fixed.
3. **Condylar joint:** Knee joint and temporo-mandibular joint.
4. **Ellipsoid joint:** Radio-carpal, motacarpo-phalangeal, metatarso-phalangeal, and atlanto-occipital joints.
5. **Saddle joint:** Carpo-metacarpal joint of thumb, and sterno-calvicular joint.
6. **Ball and-socket joint:**

Shoulder and hip joints (typical)
Talo-calcaneo-navicular joint; articulation between incus and stapes (restricted ball and socket joints.)

7. Plane joint: The articular surfaces are flat and produce gliding movements in various directions.
Carpometacarpal joints (except for the carpometacarpal joint of the thumb)
Inter-carpal and inter-tarsal joints
Articulations between articular processes of the vertebrae. (Facet joints.)

Factors maintaining the stability of a joint:

1. Bony configuration: This is an important stabilizing factor in hip and ankle joints. In the former, the head of the femur is completely received by the acetabular socket. It the latter, trochlear surface of the talus is embraced by the tibio-fibular mortice.

2. Ligaments: The ligaments permit desirable movements and prevent undesirable one. They can withstand stresses of short duration with sudden onset. But the ligaments cannot resist a continuous stress, because they are composed of collagen fibres which, once stretched, tend to remain elongated.

3. Muscles: The tone of the different muscle groups which act on the joint, is the most important and indispensable factor in maintaining stability. The short muscles of scapula make the shoulder joints stable in all movements of the upper limbs.

4. Atmospheric pressure and force of cohesion: They are negligible factors in most joints.

08. Muscular Tissue

Basic properties of muscle tissue:

- Excitability/irritability
- Conductivity
- Contractility
- Extensibility
- Elasticity
- Viscosity.

Classification of muscular tissue:

A. Morphological classification:	B. Functional classification:	C. General classification:
1. Striated muscle: Skeletal muscle, cardiac muscle. 2. Non-striated muscle: Smooth muscle.	1. Voluntary muscle: Skeletal muscle. 2. Involuntary muscle: Cardiac muscle, smooth muscle.	1. Skeletal muscle (attached to the skeleton) 2. Cardiac muscle (forms the walls of the heart (myocardium)} 3. Smooth muscle (forms the walls of the viscera).

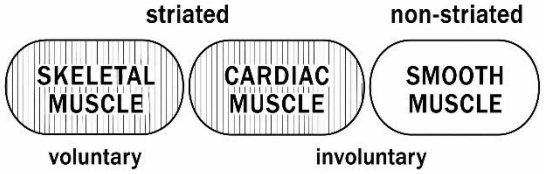


Figure: Classification of musclular tissue.

Dental Anatomy

01. Introduction to Dental Anatomy

Tooth Notation:

It is the way by which tooth expresses or designated in number or letter. Tooth notation acts like a dental "short hand providing a standard and an easy way of communication among dental professionals, students and care providers. It also gives a convenient method of record keeping in dental practice.

Types of notation:

The following are the three tooth notation systems that are in common use

1. Universal numbering system
2. Zsigmondy's method/Palmer notation system
3. FDI (Federation Dentaire Internationale) system.

In all the systems, the dental arch is expressed by a cross. Four sides are used to denote four quadrants as follows-

Upper/Maxillary Right Quadrant	Upper/Maxillary Left Quadrant
Lower/Mandibular Right Quadrant	Lower/Mandibular Left Quadrant

Eniversal notation system:

Universal numbering system was first proposed by Parreidt in 1882. It was officially adopted by the American Dental Association (ADA) in 1975. It is still widely used by dentists in USA and also endorsed by the American Society of Forensic Odontology.

a) The universal notation system for the entire permanent dentition is as follows –

Right								Left							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

Here, 8, 9, 24, 25 are central incisors; 7, 10, 23, 26 are lateral incisors, 6, 11, 22, 27 are canine; 5. 12, 21, 28 are first premolars; 4, 13, 20, 29 are second premolars; 3, 14, 19, 30 are first molars, 2, 15, 18, 32 are second molars; 1, 16, 17, 32 are third molars.

Teeth 1 to 8 = Upper/Maxillary right quadrant
Teeth 9 to 16 Upper/Maxillary Left quadrant
Teeth 17 to 24-Lower/Mandibular Left quadrant
Teeth 25 to 32-Lower/Mandibular Right quadrant

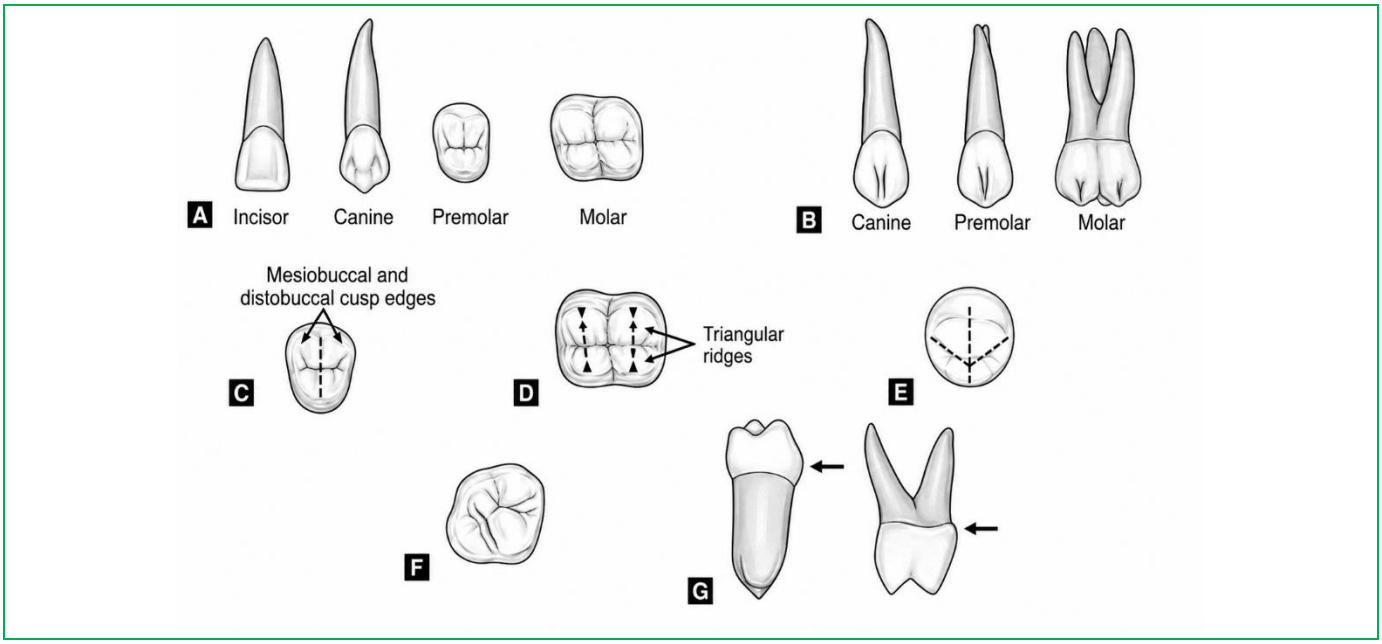
b) The universal notation system for the entire primary dentition is as follows-

Right					Left				
A	B	C	D	E	F	G	H	I	J
T	S	R	Q	P	O	N	M	L	K

Here, E, F, O, P are central incisors: D. G, N, Q are lateral incisors; C, H, M, R are canines; B. I, L, S are first molars; A, J, K, T are second molars.

Advantages of Universal Numbering System:

- Concept is very simple.
- Each tooth has a unique numerical or an alphabetical code.
- Left and right teeth of same type have different designations. For example, permanent left maxillary 1st molar is '3' while permanent right maxillary 1st molar is '14'.



Figures: A to G: Ridges on teeth: (A) Marginal ridge; (B) Labial buccal ridge: (C) Campy ridge: (D) Triangular ridge (E) Transverse ridge (F) Oblique ridge, (G) Cervical ridge

Types of ridges:

1. **Marginal ridge:** All teeth have two marginal ridges, mesial and distal. These are rounded borders of enamel that form the mesial and distal margins of the occlusal surface of posterior teeth. In case of anteriors, the mesial and distal ridges form the mesial and distal margins of the lingual surfaces (Fig. A).
2. **Buccal cusp ridge:** It is a ridge on the buccal surface of a tooth that runs from the tip of a buccal cusp toward the cervical line. There is labial ridge in case of canines (Fig. B).
3. **Lingual cusp ridge:** It is a ridge on the lingual surface of a lingual cusp of premolar/molar tooth that runs from the cusp tip towards the cervical line. In case of canines, the lingual ridge runs on the lingual surface dividing the lingual fossa into two small fossae. (Fig. C)
4. **Triangular ridge:** Triangular ridge is found on the occlusal surface of premolars and molars. It is the ridge that descends from each cusp tip towards the center of the occlusal surface of a posterior tooth (Fig. D). Triangular ridges are so named because the inclined planes on either side of the ridge resemble two sides of a triangle. They take the name of the cusp they belong to, e.g. triangular ridge of the buccal cusp of mandibular permanent 1st premolar.
5. **Transverse ridge:** A transverse ridge is the union of two triangular ridges crossing the occlusal surface of a posterior tooth in a transverse (buccolingual) direction, e.g. transverse ridge between buccal and lingual cusps on premolar (Fig. E).
6. **Oblique ridge:** Oblique ridge is most prominent on permanent maxillary 1st molar (Fig. F). It may be present on maxillary permanent 2nd and 3rd molars. It is also present in deciduous maxillary 2nd molar.
7. **Cervical ridge:** It is a ridge that runs mesiodistally on the cervical third of the buccal surface of the crown. Presence of cervical ridge is a characteristic feature of all primary teeth, most prominent on maxillary and mandibular 1st molars (Fig. G). In permanent dentition, the cervical ridge is noticeable on the molar teeth.

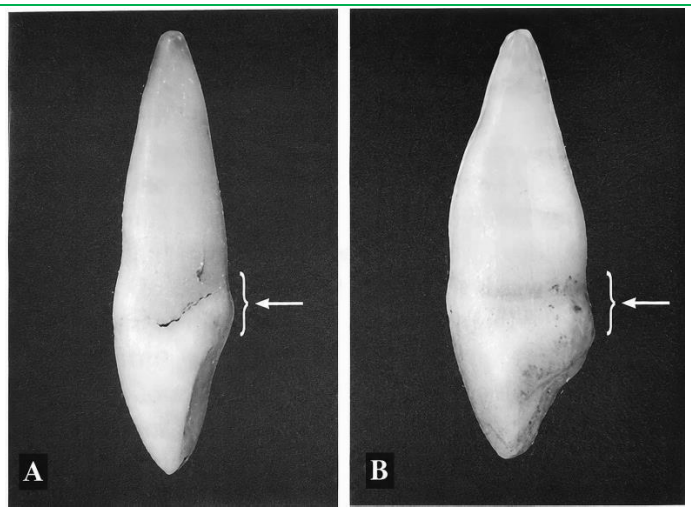
Cingulum

A cingulum (Latin word for "girdle") is the lingual lobe of an anterior tooth. It makes up the bulk of the cervical third of the lingual surface. Its convexity mesiodistally resembles a girdle encircling the lingual surface at the cervical third.

Or,

Cingulum (Latin word for "girdle") is a mound on the cervical third of the lingual surfaces of anterior teeth **(Figs A and B).**

It develops from the lingual lobe of anteriors and makes up the major bulk of cervical third of the crown lingually. Cingulum resembles a girdle encircling the lingual surface at the cervical third of the crown. It is present in all the anteriors and is most prominent on maxillary permanent canine.



A Figures: A and B: Cingulum is present only in anteriors and is most prominent on maxillary canine: (A) Maxillary central incisor; (B) Maxillary canine

Characteristics:

- The cingulum is smooth and convex both mesiodistally and Cervico-incisally.
- It makes up the bulk of cervical third of the lingual surface
- Marginal ridges extend from cingulum forming the mesial and distal borders of the lingual fossa
- There is a concavity next to the cingulum incisally, called the lingual fossa
- Cingulum forms the cervical boundary of the lingual fossa
- Usually two developmental grooves extend from cingulum into the lingual fossa; especially on canines and maxillary incisors.

Tubercle:

A tubercle is a smaller elevation on some portion of the crown produced by an extra formation of enamel.

Or,

It is a smaller elevation on some portion of the crown produced by an extra formation of enamel. A tubercle may be found on the lingual surface of a maxillary lateral incisor.

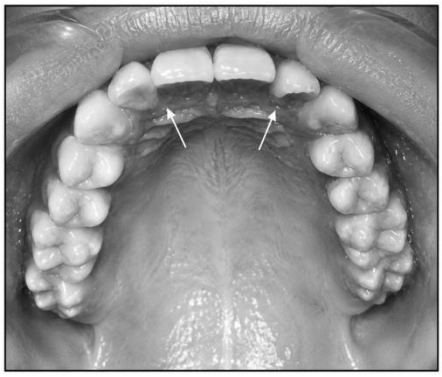


Figure: Tubercle na lingual surface of the maxillary lateral incisor

Fossa:

A fossa is an irregular depression or concavity. Lingual fossae are on the lingual surface of incisors.

Or.

A fossa is a depression or concavity on the lingual surfaces of anteriors and occlusal surface of posterior teeth. A fossa is named according to its location or shape.

Types of fossa:

1. Central fossae: Central fossae are on the occlusal surface of molars. They are formed by the convergence of ridges terminating at a central point in the bottom of the depression where there is a junction of grooves.

Different types of pits:

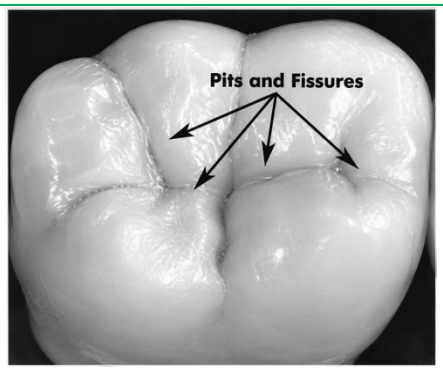
1. Central pit is a pit in the central fossa of molars where the developmental grooves meet.
2. Buccal pit: It is a pit on the buccal surface of a molar where the buccal developmental groove terminates.
3. Lingual pit is a pit on the lingual surface of a molar where the lingual developmental groove terminates. Lingual pit can also be seen on lingual surface of maxillary lateral incisors.

Fissure:

Fissure is a defect on the surface of a tooth due to faulty joining of the enamel of different lobes.

Or.

Deep clefts between adjoining cusps are called fissure.



Morphology of fissure : (Nango, 1960)

1. V – Type
2. U – Type
3. Y – Type
4. I – Type
5. IK – Type

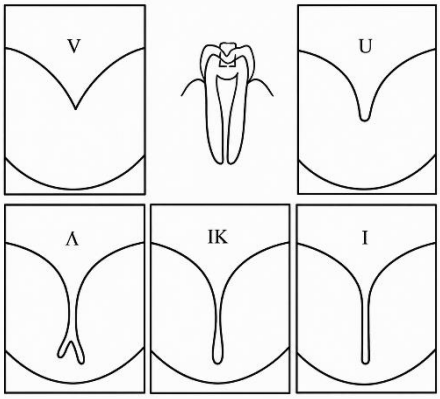


Figure: Different types of fissure

Cusp of Carabelli:

The **cusp of Carabelli,** or **Carabelli's tubercle,** or ***tuberculum anomale*** **of Georg Carabelli** is a small additional cusp at the mesiopalatal line angle of maxillary first molars.

Or.

It is a fifth cusp found on the maxillary first molars, usually located lingual to the mesiolingual cusp.

Or.

It is a small tubercle, resembling a supernumerary cusp, found occasionally on the lingual surface of the mesiolingual cusp of a permanent maxillary first molar.

This extra cusp is usually found on the first molar, and becomes progressively less likely in the second, third molars. This cusp is entirely absent in some individuals and present in others in a variety of forms.

Physiology

01. Transport Process across the Plasma Membrane

Active transport
Definition: The movement of substances across the cell membrane against chemical or electrical gradient with the active expenditure of energy by the help of carrier protein is called active transport.

Definition: Active transport means movement of ions or other substances across the membrane in combination with a carrier protein against a concentration gradient (i.e., from low-concentration to high-concentration state) or against an electrical or pressure gradient with the active expenditure of energy.

Characteristics / Criteria of active transport / primary active transport:
The key criteria are:

1. Movement Against a Concentration Gradient:
- Substances are transported from an area of **lower concentration to higher concentration** (uphill movement), unlike passive transport.

2. Requires Energy:
- **Primary Active Transport:** Directly uses ATP (e.g., Na^+/K^+ ATPase pump).
- **Secondary Active Transport:** Uses energy from an electrochemical gradient created by primary active transport.

3. Involvement of Carrier Proteins (Transporters):
- Specific membrane proteins (**pumps, symporters, or antiporters**) bind and transport molecules/ions selectively.

4. Selective and Saturable:
- Only specific molecules are transported (high specificity).
- The process can reach a maximum rate when all transporters are occupied (saturation kinetics).

5. Regulation by Cellular Needs:
- Active transport is tightly controlled by cellular signaling (e.g., hormones, phosphorylation) to meet metabolic demands.

Classification: It is of two types-
A. Primary active transport:
The movement of substances across the cell membrane against chemical or electrical gradient with the active expenditure of energy which is derived from **ATP or some other high-energy phosphate**, by the help of carrier protein is called **primary active transport**. Among the substances that are transported by primary active transport are sodium, potassium, calcium, hydrogen, chloride, and a few other ions. For example,
- Na^+–K^+ pump
- Ca^{2+} pump
- H^+ pump, etc.

B. Secondary active transport: The movement of substances across the cell membrane against chemical or electrical gradient with the energy which is derived secondarily from concentration or electrical gradient produced by primary active transport, by the help of carrier protein is called secondary active transport. It is again of two types.

1. Co-transport (symport): Secondary active transport of two substances in the **same direction** is called secondary active co-transport.

Example: Na^+–Glucose co-transport.

2. Counter-transport (antiport): Secondary active transport of two substances in the **opposite direction** is called secondary active counter-transport.
Example: Na^+–H^+ counter-transport.

Mechanism of primary active transport:

Substances to be transported plus ATP bind to their respective sites in the carrier protein.
↓
Breakdown of ATP to ADP & phosphate
↓
Phosphate binds to the phosphorylation site of the carrier protein
↓
Conformational change of the carrier protein
↓
Efflux or Influx of the substances.

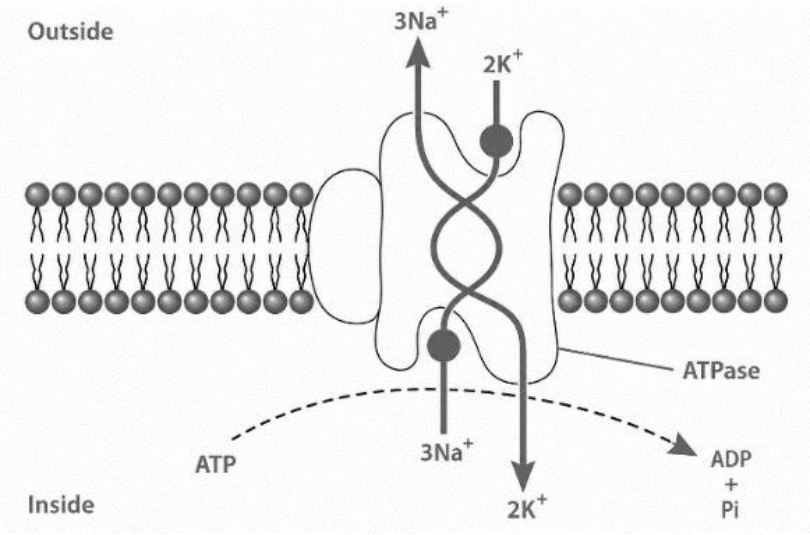


Fig. Mechanism of primary active transport as in Na^+–K^+ pump

Mechanism of secondary active transport:
Firstly, inwardly directed **Na^+ gradient** is produced (**ECF Na^+ > ICF Na^+**) by **primary active transport of sodium** (e.g., Na^+–K^+ pump).

↓

This gradient represents a **storehouse of energy** because the excess ECF Na^+ is always attempting to diffuse to the interior.

- When both Na^+ and a second substance bind to the outer portion of the carrier protein, conformational change occurs in the carrier protein and both Na^+ and the second substance move to the interior of the cell (Secondary active co-transport, e.g., Na^+–glucose co-transport).
- When Na^+ binds to the outer portion and the second substance binds to the inner portion of the carrier protein, conformational change occurs in the carrier protein and Na^+ is transported to the interior and the second substance is transported to the exterior of the cell (Secondary active counter-transport, e.g., Na^+–H^+ or Na^+–Ca^{2+} counter-transport).

Pathology & Microbiology

01. Inflammation

1.1.1 Acute Inflammation

Causes/etiology of acute inflammation**

1) Infectious Agents-Bacteria, virus, fungi, protozoa, helminths and microbial toxins.
2) Immunologic injury: Hypersensitivity reaction e.g.-allergic rhinitis, acute rheumatic fever etc.
3) Physical agents-e.g. burn, ionizing radiation.
4) Chemical Agents, e.g. corrosives, acids, alkalis.
5) Foreign bodies like sutures, dirt, splinters.
6) Tissue necrosis: e.g.-Infarct.

Cells of acute inflammation: ***	Cells of chronic inflammation
• Neutrophil • Eosinophil • Basophil • Macrophage	• Macrophage • Lymphocytes • Mast cells • Plasma

Q. Following cells are involved in Acute inflammation *(42nd Special BCS)*

a) B cells b) Lymphocytes c) Epitheloid cells d) Neutrophil

Answer: D

Cardinal signs of inflammation (Introduced by Celsius, a roman writer of first century)

Cardinal signs	Physiological rationale
Rubor (Redness)	Increased blood flow
Calor (Heat)	Exudation of Fluid
Tumor (Swelling)	Increased blood flow, exudation of fluid, release of inflammatory mediators
Dolor (Pain)	Stretching of pain receptors by inflammatory exudates and chemical mediators
Function lease (loss of function)	Pain, disruption of tissue structure, fibroplasia and metaplasia

1.1.2 Chemotaxis

After extravasation leucocytes migrate in interstitial tissue toward the site of injury by a process called chemotaxis. Chemotaxis is unidirectional locomotion along a chemical gradient in the direction of increasing concentration of chemotactic agent (**chemoattractant**).

Chemoattractant:

1. Exogenous - Bacterial products

2. Endogenous: Endogenous chemoattractant include several chemical mediators

- Cytokines, particularly those of the chemokine family **(IL-8)**
- Components of the complement system particularly **C5a**, and
- Arachidonic acid (AA) metabolites mainly leukotriene B4 **(LTB_4)**

1.1.3 Phagocytosis

Major opsonins are: Helps in phagocytosis

1. **C3b, and ic3b**
2. IgG antibodies
3. Plasma proteins mannose-binding lectin (MBL) C-reactive proteins, Fibrinogen, Fibronectin.

Q. Phagocytosis is promoted by *(42nd Special BCS)*

a) Hyaluronidase
b) Complement
c) Neuraminidase
d) The Hexose monophosphate shunt

Answer: **B**

Killing and Degradation

Killing of microbes is accomplished by reactive oxygen species (ROS also called reactive oxygen intermediates) and reactive nitrogen species mainly derived from nitric oxide (NO) and these as well as lysosomal enzymes destroy phagocytosed debris.

a. Oxygen-dependent mechanism: Microbes are largely killed by this method.

i) H_2O_2 MPO-Halide system: This is the **most efficient bactericidal** system in neutrophils.
ii) Reactive oxygen intermediates (ROIs): O_2^-(superoxide), H_2O_2, $0H^-$
iii) Microbicidal reactive nitrogen intermediate particularly NO.

b. Oxygen-independent mechanisms:

i) Lysozyme hydrolyses muramic acid substance
ii) Lactoferrin
iii) BPI (Bactericidal permeability increasing protein).
iv) Defensins.

Lysosomal Enzymes and Other Lysosomal Proteins:

Neutrophils and monocytes contain lysosomal granules that contribute to microbial killing and, when released, may contribute to tissue damage.

Eosinophil release major basic protein which is cytotoxic to many parasites.

Difference Between Exudate and Transudate: ***

Features	Exudate	Transudate
Total protein count	High protein concentration (30g/L to as in plasma)	Less than 10g/L
Distribution of protein	As in plasma	Mostly albumin
Fibrinogen	Present. It clots spontaneously	Absent. No tendency to clot
Specific gravity	High (> 1.020)	Low (< 1.012)
Cells	Inflammatory cells and much cell debris	Few present, nearly all are mesothelial
Cause	Increased vascular permeability	Imbalance of hydrostatic pressure along the vascular endothelium
Occurrence	Inflammatory condition	Non-inflammatory conditions e.g NS

(Ref: Khaleque Pathology/P-43/Table-4.1)

1.2. Degeneration

1.2.1 Cellular Adaptation

Definition: Cellular adaptation is physiological & morphological response of the cells towards physiological stress or pathological stimuli in which new but altered steady state is achieved, preserving the viability of the cell & modulating the function & thereby escaping injury.

Types of Adaptation***

1.Atrophy:	Decrease in the cell size
2.Hypertrophy:	Increase in the cell size
3.Hyperplasia:	Increase in cell number
4.Metaplasia:	Change in the type of the cell

Types of Hypertrophy

Hypertrophy may be:

1) Physiological and
2) Pathological

It occurs due to increased functional demand or due to stimulation of hormones and growth factors.

A. Physiologic hypertrophy:

1. **Uterus:** During pregnancy. **Hyperplasia also occurs.**
2. **Breast:** Hypertrophy of breast during lactation by prolactin and estrogen.
3. **Skeletal muscle:** In bodybuilder.

B. Pathologic hypertrophy:

- LV hypertrophy Occurs in systemic hypertension, aortic stenosis and mitral regurgitation due to increased workload.

Hyperplasia

Although hyperplasia and hypertrophy are distinct processes, they frequently occur together and may be triggered by the same external stimulus.

Mechanisms of hyperplasia:

Hyperplasia the result of **growth factor-driven proliferation of mature cells** and in some cases by increased output of new cells from tissue stem cells.

Types of hyperplasia

a) Physiologic hyperplasia:

1. Hormonal hyperplasia
2. Compensatory hyperplasia

b) Pathologic Hyperplasia

Pathologic hyperplasia constitutes a fertile soil in which cancerous proliferations may eventually arise.

Difference between hypertrophy & hyperplasia: ***

Points	Hypertrophy	Hyperplasia
1. Definition	Increase in size of cell	Increase in number of cell due to cell division
2. Effect	May lead to increase in size of the organ	May lead to increase in size of the organ
3. Type of cells	Permanent, labile and stable cells	Only in labile and stable cells, not in involved permanent cells
4. Growth cycle	Growth occurs after G2 phase, No mitosis	Growth in the G2 phase, Mitosis
5. Nature of stimuli	Mechanical or hormonal	Hormonal or growth factor
6. Malignant transformation	Does not occur	May occur

Question for Practice

01. Features of Apoptosis are
a) Reduced cell size
b) Disrupted plasma membrane of the cell
c) Inflammation in adjacent tissue
d) Fragmentation of the nucleus
Answer: A

02. Free radical is removed from the cell by
a) Endonuclease
b) Superoxide dismutase
c) Iron
d) Vitamin B12
Answer: B

03. Free Radicals are generated by
a) During inflammation
b) By glutathione
c) By ceruloplasmin
d) By transferrin
Answer: A

04. Edema due to hypoproteinemia does not occurs in
a) Liver cirrhosis
b) Malnutrition
c) Nephrotic syndrome
d) Lymphatic obstruction
Answer: D

05. Generalized body swelling with hypoalbuminemia occurs in patients not suffering from
a) Protein losing enteropathy
b) Cardiac failure
c) Liver cirrhosis
d) Protein calorie malnutrition
Answer: B

06. In acute inflammation redness of the affected area is due to
a) Transcytosis
b) Increased blood flow
c) Endothelial injury
d) Haemorrhage
Answer: B

07. Primary Tumor sites that metastasize to the brain includes
a) Lungs
b) Bones
c) Heart
d) Spleen
Answer: A

08. Asbestoses is not associated with
a) Leukaemia
b) Mesothelioma
c) Oesophageal ca
d) Colonic ca
Answer: A

09. Not true for Grading of the malignant tumour
a) Depends on differentiation
b) Is also known as pathological staging
c) Is a light microscopic assessment
d) Is same in all organs
Answer: B

10. Following tumors secretes hormone except
a) Bronchial ca
b) Choriocarcinoma
c) Carcinoid tumor
d) Craniopharyngioma
Answer: D

11. Recognized precancerous condition include following except
a) Small intestine polyps in Peutz-Jegher's syndrome
b) Colonic polyps of familial adenomatous polyposis coli
c) Xeroderma pigmentosum
d) Bowen's disease
Answer: A

12. Common Childhood Solid tumours is?
a) Hemangioma
b) Nephroblastoma
c) Lymphangioma
d) Hamartoma
Answer: B

13. Following are the stable cells of the body
a) Fibroblasts
b) Neuron
c) Lymphoid tissue
d) Skeletal muscle
Answer: A

14. Role of macrophages in tissue repir are all except
a) Secretion of cytokines
b) Angiogenesis
c) Stimulation of fibroblast proliferation
d) Release of caspases
Answer: D

15. Wound healing is enhanced
a) Zinc
b) Vitamin B12
c) Vitamin D
d) Aldosterone
Answer: A

16. Wound healing is not enhanced by the administration of
a) Cortisol
b) Zinc
c) Antibiotics
d) Oxygen
Answer: A

17. Vascular congestion may lead to
a) Brown indurations of lung
b) Brown atrophy of heart
c) Brown induration of liver
d) Chocolate cyst in ovary
Answer: A

18. Pale infarct is seen in
a) Heart
b) Lung
c) Brain
d) Ovary
Answer: A

19. Red infarct occurs in
a) Lung
b) Heart
c) Spleen
d) Kidney
Answer: A

20. Causes of hypovolemic Shock
a) Burn injury
b) Cardiac tamponade
c) Spinal cord transaction
d) Myocardial infarction
Answer: A

21. Cells that play a role in innate immunity is
a) Plasma cells
b) CD4+ T lymphocytes
c) Neutrophils
d) B- lymphocytes
Answer: C

22. Live atptenuated vaccines is
a) Hepatitis A
b) Rabies
c) Cholera vaccine
d) Rota virus vaccine
Answer: D

23. Professional antigen presenting cells is
a) B lymphocyte
b) Natural killer cell
c) T-lymphocyte
d) Neutrophil
Answer: A

24. B cell immunodeficiency states
a) Hereditary angioedema
b) Diverge syndrome
c) Hyper IgM syndrome
d) Selective IgA deficiency
Answer: D

25. The following statements regarding Immunoglobulin is true?
a) Majority Immunoglobulin's are globulin
b) IgG is present in breast milk
c) IgA cross the Placenta
d) IgE is found in wound infection
Answer: A

26. Disuse atrophy occurs in-
a) Diminished secretion of trophic hormones
b) Immobilization of a joint
c) Interference with the nerve supply to the muscles controlling joint movement
d) Interference with the blood supply
Answer: B

27. Which of the following acts as fertile soil for cancer formation?
a) Atrophy
b) Hyperplasia
c) Necroptosis
d) Hypertrophy
Answer: B

28. Hypoxic cell injury causes all except-
a) ER swelling
b) Blebs
c) Lipolysis
d) Loss of microvilli
Answer: C

29. Which of the following is called double edged sword?
a) Atrophy
b) Hyperplasia
c) Metaplasia
d) Hypertrophy
Answer: C

30. Pathologic hypertrophy occurs in
a) Heart
b) Breast
c) Uterus
d) Prostate
Answer: A