

PSC Anatomy Solve

Cell:

Cytoplasm of cell contains:

1. Membranous organelles- mitochondria, endoplasmic reticulum, Golgi body, lysosome, peroxisome
2. Non membranous organelles- ribosome, centrosome, microtubules, microfilaments.

Functions of cell membrane:

1. Forms the cell boundary,
2. Separates the protoplasmic contents one cell to another,
3. Provides selective transport,
4. Site of receptor,
5. Intracellular contact by glycocalyx,
6. Relay stimulation,

Protoplasm contains: Water- 75%

Organic: nucleic acid, protein, carbohydrate, lipid

Inorganic: K^+ , HCO_3^- , HPO_4^{2-} , SO_4^{2-}

Lateral Surface Features of cells

- Adhesion proteins link plasma membranes of adjacent cells
- Contours of adjacent cell membranes
- Special cell junctions:
 - ✓ Tight Junctions
 - ✓ Adherens Junctions
 - ✓ Desmosomes

<u>Functions of mitochondria:</u> <ol style="list-style-type: none"> 1. Enzymes for- Krebs cycle, respiratory chain, Oxidative phosphorylation 2. Formation of ATP 3. Cellular ATP for various function 4. Contains DNA and concerned with RNA & protein. <u>Golgi complex functions:</u> <ol style="list-style-type: none"> a. Condensation of stored protein. b. Packaging of secretory products c. Formation of secretory vesicles, primary lysosome d. Repair of ruptured cell membrane. 	<u>Functions of endoplasmic reticulum:</u> <ol style="list-style-type: none"> 1. Agranular – <ol style="list-style-type: none"> a. Metabolism of carbohydrate b. Metabolism of lipid c. Detoxification d. Synthesis & storage of cholesterol e. Formation of steroid hormone f. Excites contraction of striated muscles g. Synthesis of fat component absorbed from the intestinal lumen. 2. Granular— <ol style="list-style-type: none"> a. Synthesis of exportable protein b. Transmission of newly synthesized protein c. Synthesis of some carbohydrate.
<u>Lysosome functions:</u> <ol style="list-style-type: none"> 1. Digestion as it contains hydrolytic enzymes. 2. Bacteriocidal phagocytosis 3. Regression 4. Autolysis 5. Intracellular scavengers. <u>Ribosome function:</u> synthesis of protein	<u>Cytoskeleton:</u> <ol style="list-style-type: none"> 1. Microtubules- provides cellular movement 2. Microfilaments- helps in contraction, provides protoplasmic movement. <u>Functions of nucleus:</u> <ol style="list-style-type: none"> 1. Essential for biosynthetic events that characterize cell type & cell function 2. Takes part in cell division. 3. Vault of genetic information.

Mitosis	Meiosis
In somatic cells 2 cell formed Daughter cells are diploid Chiasma & crossing over never One phase Interphase period long Chromosome not visible Redistribution of chromosome never occurs	Sex cells 4 cell formed Daughter cell haploid Usually seen Two phase Interphase short Visible occurs

Genetics:**Mutation:**

1. Gene
2. Chromosome
3. genome

Causes:

1. spontaneous
2. mutagen- UV ray, radiation, anticancer drugs, rubella virus

Autosomal -

Trisomy 21 – Down's syndrome

Trisomy 18 – Edward's syndrome

Trisomy 13 – Patau's syndrome

Sex chromosomal:

Klinefelter's syndrome (47XXXY mainly, may be 48XXXY) – phenotypically male

Turner's syndrome (karyotype: 45XO mainly) – phenotypically female

Characters of autosomal dominant:

1. heterozygous
2. both male female affected
3. 50% chance in offspring

Examples of autosomal dominant disorders:

System	Disorders
Nervous	Huntington disease (chorea) Neurofibromatosis Myotonic dystrophy Tuberous sclerosis Fazio-scapulo-humeral muscular dystrophy Retinoblastoma
Urinary	Polycystic kidney disease
GIT Hepatic	Familial poliposis coli Gilbert's syndrome Hepatic porphyria
Hematopoietic	Hereditary spherocytosis Von Willebrand's disease Hereditary hemorrhagic telangiectasia Erythropoietic protoporphyria (also A. recessive)
Skeletal	Marfan syndrome Ehlers-Danlos syndrome Osteogenesis imperfecta Achondroplasia Gardener's syndrome Charcot-Marie-Tooth syndrome
Metabolic	Familial hypercholesterolemia Acute intermittent porphyria

Autosomal recessive:

1. Metabolic – cystic fibrosis, phenylketonuria, galactosemia, homocystinuria, @ antitrypsin deficiency, Wilson disease, hemochromatosis, glycogen storage disease
2. Hematology- thalassemia, sickle cell disease.
3. Nervous – fredrichs ataxia, spinal muscual atrophy,
4. Skin- albinism, xeroderma pigmentosa,
5. Skeletal- ehlar- danlos syndrome, alkaptonuria

X linked:

1. Recessive- hemophilia, Duchene muscular dystrophy, G6PD deficiency, agammaglobinemia, wiskot-aldrich syndrome, diabetes insipidus, Lesch- Nyhan syndrome.
2. Dominant- vitamin D resistant rickets

Klinefelter syndrome: Tall, abnormal long legs, atrophied testis, gynacemastia, mental retradation

Down's syndrome: flat facies, single palmar crease, severe mental retardation, heart defect, protruded tongue, umbilical hernia, increased chance of leukemia.

Turner syndrome: short stature, wide chest, low posterior hair line, pigmented navus, cubitus valgus, hypertension, peripheral lymphedema, low set ear, webbed neck, coarctation of aorta.

Special senses with their receptors:

Name of special sense	Receptor
Vision	Rods and cones
Hearing	Hair cell of organ of corti
Olfaction or smell	Bipolar cell of olfactory mucosa
Taste	Taste bud of tongue
Equilibrium	Vestibular apparatus

Refractory error of the eye:

1. **Myopia:** Focus is formed in front of the retina.
2. **Hypermetropia:** Focus is formed behind the retina.
3. **Astigmatism:** No single point of focus is formed.
4. **Presbyopia:** Difficulty in both distant and near vision.

Diplopia: Causes:

- i. Cataract
- ii. Squint
- iii. Displacement of eye ball
- iv. Retinal detachment

Tests for visual acuity:

A. For distant vision:

1. Snellen's Chart. (mostly used).
2. Landolt's Broken C test types (For illiterate persons)
3. Universal chart

B. For near vision:

1. Printer's N type.
2. Jaeger's chart
3. Snellen's chart reduced to 1/17th size.

C. Counting finger, Hand movement

D. Perception of light (PL)

Pathway of hearing:

Air vibrate the tympanic membrane → impulse pass through malleus, incus and stapes → fenestra vestibule → endolymph → hair cell of the organ of corti (auditory receptor) → spiral ganglion (1st order neuron) → cochlear nerve → dorsal and ventral cochlear nucleus (2nd order neuron) → auditory fiber → dorsal nucleus of trapezoid body (3rd order neuron) → lateral lemniscus → inferior colliculus → medial geniculate body (4th order neuron) → auditory radiation → auditory cortex (superior and inferior transverse temporal gyrus).

Causes of conductive deafness:

- a. Impacted wax, foreign body
- b. Furunculosis, otomycosis
- c. Perforation of TM
- d. ASOM, CSOM

Causes of sensorineural deafness:

- a. **Congenital** – rubella infection, congenital syphilis, birth trauma
- b. **Acquired-**
 1. Trauma to temporal bone, head injury, blast injury
 2. Post stapedectomy, labyrinthectomy
 3. Labyrinthitis
 4. Measles, mumps,
 5. Toxic- streptomycin, gentamicin, quinine, frusemide, cisplatin, phenytoin
 6. Senile or presbycusis
 7. Menieres disease
 8. CNS damage – stroke, tumor

Mechanism of heat gain of the body:

1. Oxidation of food materials

2. Increasing activity of muscles
3. Ingestion of hot foods or drinks
4. Internal secretions (hormones)
5. Persistalsis action of intestine

Processes of heat loss from the body:

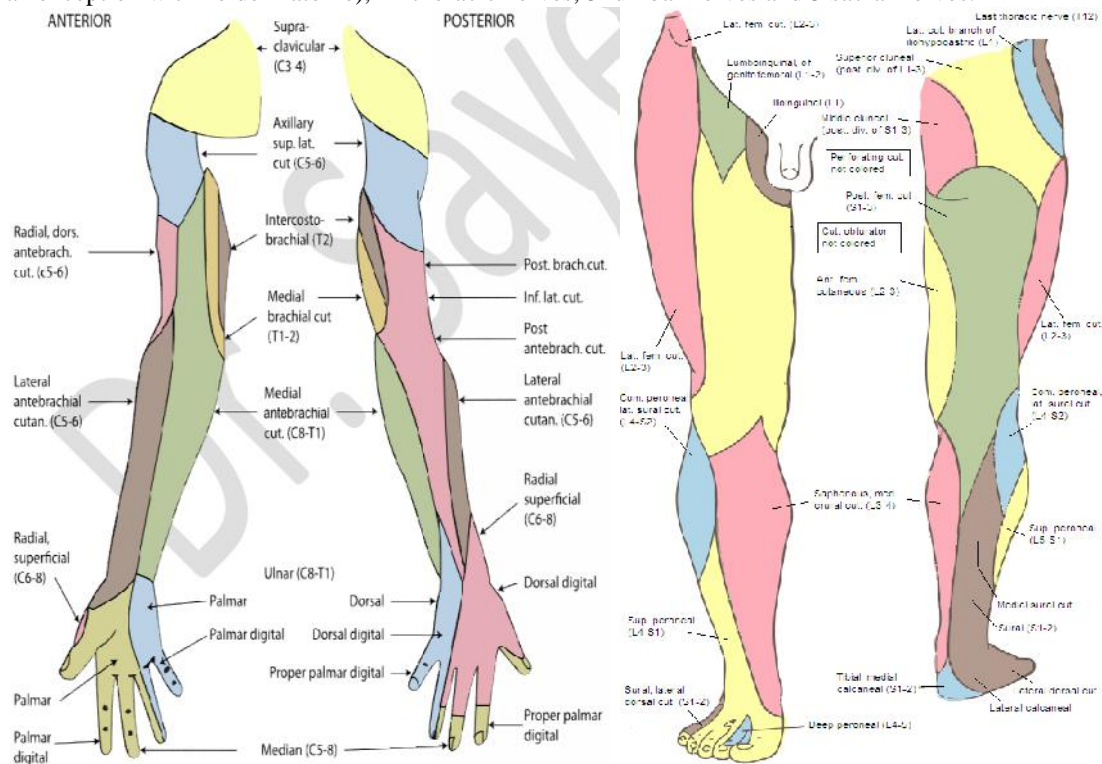
- a) From skin: Radiation, Conduction and convection, Evaporation:
- b) From lungs: Heat lost for warming the inspired air is about 2%.
- c) Through urine and faeces: Heat lost through urine and faeces is about 2%.

The Skin:

- 1) Skin composed of **epidermis and dermis** and line by **stratified squamous epithelium**.
- 2) **Skin Appendages** : sweat glands, sebaceous gland, hair and nail.
- 3) **Epidermis is ectodermal & deeper part dermis is mesodermal origin**
- 4) Dermis contains – **collagen fibre, elastic tissue, blood vessel, lymphatics, nerve fibres**.
- 5) Skin melanocyte number is equal in all person but differs from level of melanin production, so skin color differs.
- 6) **Sweat gland numerous in palm, sole and face** . sweat gland supplied by sympathetic but cholinergic fibres
- 7) **Sweat gland absent: tympanic membrane, lip margin, nipples, inner surface of prepuce, glans penis, labia minora.**
- 8) **Larger apocrine sweat glands present in- axilla, areola, periumbilical region, genitalia, perianal regions.** These are supplied by sympathetic but adrenergic fibres.
- 9) **Sebaceous glands are present in dermis, They are absent in Palm and sole** . They are **numerous in face**. No nerve supply but androgens act on it.

Dermatome:

Dermatome is an area of skin that is mainly supplied by a single spinal nerve. There are 8 cervical nerves (C1 being an exception with no dermatome), 12 thoracic nerves, 5 lumbar nerves and 5 sacral nerves.



Pericardium :**Contents of pericardium:**

1. Heart
2. Ascending aorta
3. Pulmonary trunk
4. SVC, IVC
5. Pulmonary veins

Artery supply: internal thoracic, musculophrenic, descending thoracic aorta

Nerve supply : fibrous and parietal by phrenic nerves, visceral by autonomic nerves.

Heart:

→ Apex- 9cm from midsternal line , Base- posterior surface

Right atrium:

1. Smooth posterior part/ sinus venosum: (from sinus venosus) SVC , IVC, coronary sinus, vena cordis minimi
2. Rough anterior part: (from primitive atrium) - muscular ridges-musculi pectini.

Right atrium receives blood from: SVC, IVC, coronary sinus, anterior cardiac vein, vena cordis minimi, right marginal vein.

Right ventricle: triangular chamber ..

- a. Inflowing part- rough , called trabeculae carneae (3 types- ridges, bridges, pillars)
- b. Outflowing part- smooth , gives rise to pulmonary trunk

Left atrium: quadrangular chamber in posterior surface, receives oxygenated blood.

Left ventricle: forms the apex of heart, receives oxygenated blood, having bicuspid valve, forms 2/3 of diaphragmatic surface .

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Conducting system:

SA node: horse shoe shaped, situated at atrioventricular junction in upper part sulcus terminalis . P Cell, Pale staining, pacemaker (3P)

AV node: lower and dorsal part of atrial septum just above the opening of coronary sinus , 60 beat/min,

AV bundle: muscular connection between atrium and ventricle , right and left branch

Purkinjee fibres: its subendocardial plexus, usually possess double nuclei.

Coronary sinus: situated in the left posterior coronary sulcus , 3 cm long, opening in the posterior wall of right atrium .

Tributaries:

- a. Great cardiac vein
- b. Middle cardiac vein
- c. Small cardiac vein
- d. Posterior vein of left ventricle
- e. Oblique vein
- f. Right marginal vein .

Veins Vs Artery :

Veins	VS	Arteries
• return blood to the heart		• large vessels
• contain valves		• carries blood from the heart to the rest of body
• oxygen poor blood		• oxygen rich blood
• blood flows smoothly		• thick walls
• flows under low pressure		• flows in pulses
		• flows under high pressure

The pleura: visceral layer – surface of lung, fissures except hillum . firmly adherant to lung

Parietal layer – 4 types

1. Costal
2. Diaphragmatic
3. Mediastinal
4. Cervical

Paracentesis: lower part of intercostal space

Lungs anatomy:

Structures related to hillum of both lungs:

Right:	Left:
<ol style="list-style-type: none"> 1. Right atrium, auricle, part of right ventricle 2. SVC, IVC 3. Right brachiocephalic vein 4. Azygos vein 5. Esophagus 6. Trachea 7. Right vagus nerve 8. Right phrenic nerve 	<ol style="list-style-type: none"> 1. Left auricle, left ventricle 2. Pulmonary trunk 3. Arch of aorta 4. Descending thoracic aorta, 5. Left subclavian artery 6. Thoracic duct 7. Esophagus 8. Left brachiocephalic, phrenic, vagus nerve 9. Left recurrent laryngeal nerve

Root of lung relations: থেকে দু' vein, artery, bronchus.
থেকে (right) , (left)

Right lung	Left lung
2 fissure, 3 lobe	1 fissure, 2 lobe
Anterior border is straight	Ant. Border interrupted by cardiac notch
Larger and heavier , weight 700 gm	Smaller lighter, 600 gm
Shorter and broader	Longer and narrower

Artery supply of lungs:

1. Bronchial arteries – supplies bronchial tree and pulmonary tissues
(right- 1 artery, left side- 2 artery)
2. Pulmonary arteries- deoxygenated blood

Venous drainage:

1. bronchial vein, right – drains into azygos vein, left- drains into hemiazygos vein
2. pulmonary vein- oxygenated blood to heart

nerve supply: parasympathetic: vagus , sympathetic: 2nd-5th thoracic segments

Pulmonary unit: alveolar sac, atria, air saccules and pulmonary alveoli

Right bronchus	Left bronchus
Vertical more , 25 degree angle	Less vertical, 45 degree angle
2.5 cm long	5 cm long
wider	Narrower

Bronchopulmonary segments: 10 in number in both lungs ..

Importance:

1. anatomic, functional and surgical sectors
2. each one is aerated by tertiary or segmental bronchus
3. pyramidal shape, apex directed to root of lung
4. each segment has segmental bronchus, segmental artery, autonomic nerves and lymphatics
5. segmental veins lies between two segments
6. during surgery, surgeon resects along with vein .

Mediastinal syndrome: sign & symptoms:

1. SVC obstruction
2. Dyspnea , cough
3. Dysphagia
4. Hoarseness of voice

5. Paralysis of diaphragm
6. Intercostal neuralgia

Causes: bronchogenic carcinoma, lymphoma, aneurism etc.

NOSE:

Nasal septum:

- a. Bone- vomer, ethmoid, frontal, sphenoid,
- b. Cartilage- septal, inf. Nasal cartilage

Little's area: anterior inferior part of nasal septum, common site for bleeding

Formation:

- a. Ant. ethmoidal artery
- b. Post. Ethmoidal artery
- c. Greater palatine artery
- d. Sphenopalatine artery
- e. Superior labial artery

Functions of nose:

- a. Olfaction
- b. Respiration
- c. Protection- sneezing, Ciliary movement
- d. Vocal resonance
- e. Humidification
- f. Passage of nasolacrimal fluid

Functions of paranasal sinuses:

- a. Lighten the skull
- b. Protect the brain
- c. Help in facial development
- d. Resonance of voice
- e. Air conditioning

Openings of meatus:

- a. Superior-posterior ethmoidal air sinus
- b. Middle – maxillary, ant. & middle ethmoidal, , frontal air sinuses
- c. Inferior – nasolacrimal duct

Causes of epistaxis:

- a) Local – pricking, trauma, FB, tumor, infections, angiofibroma
- b) Systemic-
- c) Idiopathic
- d) Hypertension
- e) Warfarin therapy
- f) Bleeding disorder – hemophilia,
- g) Leukemia, Hemangioma

Causes of nasal discharge:

Serous- common cold, allergy, CSF rhinorrhea

Purulent- sinusitis, suppurative infection, rhinolith

Bloody – Rhinosporidiosis, atrophic rhinitis, malignancy, papilloma, rhinolith

Foul smelling- sinusitis, atrophic rhinitis, rhinolith, FB

Causes of unilateral nasal obstruction:

Congenital – choanal atresia, atresia of nares,

Acquired- DNS, FB, Polyp, HIT, Rhinosporidiosis,

Causes of bilateral nasal obstruction:

1. Congenital – bilateral choanal atresia
2. Acquired- ethmoidal polyp, allergy, rhinitis, adenoid, nasopharyngeal carcinoma, angiofibroma,

Muscles of mastication -- Masseter

-- Medial Pterygoid

-- Lateral Pterygoid

--temporalis

Carotid Sheath: tubular investment of deep cervical fascia

Contents :

CCA, ICA—Medially

IJV --- Laterally

Vagus Nerve—Between and behind the CCA & IJV

Tongue muscles:

1. Extrinsic – genioglossus, hyoglossus, styloglossus, palatoglossus
2. Intrinsic- sup. Longitudinal, inf. Longitudinal, transverse, vertical

Nerve supply-

- a. motor: all by hypoglossal, except palatoglossus by accessory nerve
- b. sensory-
 1. anterior 2/3rd – general sense- mandibular, taste- chorda tympani
 2. posterior 1/3rd – general and Taste- glossopharyngeal nerve
 3. most posterior part- both by vagus

Pharynx:

12 cm, upper part widest, middle part narrow, lower part narrowest.

Parts:

1. Nasopharynx
2. Oropharynx
3. Laryngopharynx

Layers:

1. Mucosa
2. Submucosa
3. Pharyngobasilar fascia
4. Muscle coat
5. Buccopharyngeal fascia

Nerve supply: pharyngeal plexus , motor- cranial accessory through vagus. (all muscles except stylopharyngeus- by glossopharyngeal)

Functions of pharynx: Deglutition , respiration, speech, taste sensation. protective functions

Waldever's ring: formed by palatine tonsil, pharyngeal tonsil, lingual tonsil, tubal tonsil

Adenoid: enlargement of pharyngeal tonsil

C/F:

- a. Due to nasal blockage- feeding difficulty, dribbling of saliva, snoring, toneless voice and mouth breathing, adenoid facies.
- b. Due to blockage of Eustachian tube- deafness, intermittent pain, pain in ear.

Tonsil:

Tonsillar bed:

- a. Pharyngobasilar fascia
- b. Superior constrictor muscle
- c. Buccopharyngeal fascia
- d. Styloglossus muscle

Artery supply:

- a. Tonsillar branch of facial artery
- b. Tonsillar branch of ascending pharyngeal artery
- c. Tonsillar branch of lingual artery

Lymphatic drainage: jugulo-digastrics lymph node.

Etiology of tonsillitis:

Streptococcus, Staphylococcus, Hemophilus, Pneumococcus, Influenza virus, Para influenza

Sign of acute tonsillitis:

- a. Temperature high
- b. Increase pulse rate
- c. Tonsil enlarged and congested
- d. Yellowish spot on tonsil
- e. Furred tongue
- f. Foul smelling breath

- g. Enlarged tender lymph node

Sign of chronic tonsillitis:

- a. Tonsil is enlarged
- b. Injected pus may come out
- c. Congested anterior Tonsillar pillar
- d. Non tender lymph node

Complications of tonsillitis:

- a. Peritonsillar abscess/ quinsy- acute emergency
- b. Pharyngeal abscess
- c. Edema of larynx
- d. Acute rheumatism
- e. Acute nephritis
- f. ASOM
- g. Septicemia

Retropharyngeal abscess: incision and drainage without anesthesia via oral cavity

Stage of swallowing-

Oral phase, Pharyngeal phase, Esophageal phase

The laryngeal skeleton consists of six cartilages: three single (epiglottic, thyroid and cricoid) and three paired (arytenoid, corniculate, and cuneiform).

Causes of hoarseness of voice:

- a. Laryngeal web, atresia, stenosis,
- b. Acute laryngitis
- c. Edema of larynx
- d. FB in larynx
- e. Recurrent laryngeal nerve injury
- f. Laryngeal carcinoma
- g. Angioneurotic edema
- h. Hypothyroidism / Myxedema
- i. After endoscopy

Causes of stridor:

- a. Laryngeal trauma
- b. Acute laryngitis
- c. Edema of larynx
- d. Acute epiglottitis
- e. FB in larynx
- f. Multiple papilloma larynx
- g. Vocal cord paralysis

Larynx:

From root of tongue to trachea.

44 mm in male, 36 mm in female. Contains 9 cartilage.

Unpaired- thyroid, cricoids, epiglottis.

Paired- arytenoids, corniculate, cuneiform.

Movements:

1. Elevation- thyrohyoid, mylohyoid
2. Depression- sternothyroid, sternohyoid
3. Opening- thyroepiglotticus.
4. Closing- aryepiglotticus.
5. Abduction- post. Cricothyroid.
6. Adduction- lateral cricothyroid
7. Tensor of vocal cord- cricothyroid
8. Relaxor- thyroarytenoid.

Nerve supply: all muscles by recurrent laryngeal except cricothyroid which is supplied by external laryngeal.

C/F of laryngitis: Respiratory distress, Irritant cough, Sore throat, Fever, Hoarseness of voice, Stridor

Laryngeal carcinoma C/F:

Progressive dysphonia, Respiratory distress, Stridor, Dysphagia, Hoarseness of voice, Pain in advance stage, Anorexia, Cachexia,

Abdomen:

Derivatives of Gut:

- **Pharyngeal gut:** floor of mouth, pharynx, derivatives of pharyngeal pouch, thyroid gland.
- **Foregut:** esophagus, stomach, Duodenum upto bile duct opening, liver & extrabiliary apparatus, pancreas, respiratory system.
- **Midgut:** duodenum beyond bile duct, jejunum, ileum, cecum, appendix, ascending colon, right 2/3 of transverse colon,
- **Hindgut:** left 1/3 of transverse colon, descending & sigmoid colon, rectum, anal canal upto pectinate line, part of urogenital system.

Derivatives of Cloaca:

Ventral part:

1. urinary bladder except trigone, ventral wall of prostatic urethra (male), ventral of proximal 2/3 of urethra (female).
2. Pelvic part: part of prostatic urethra, ejaculatory duct, membranous urethra (male)
Lower 1/3 of urethra
3. Philic part: penile urethra(male), vagina, hymen, vestibule (female)

Dorsal part:

Rectum and proximal 2/3 of anal canal

Rectus Sheath contents:

Muscle:

- a. Rectus abdominis
- b. Pyramidalis (Subcostal nerve)

Vessels:

- a. Inferior epigastric artery
- b. Superior epigastric artery

Nerves: Lower five intercostal nerve & subcostal nerve.

Esophagus:

The esophagus is usually about 25 cm (10 in) in length.

Constrictions

- Cricopharyngeal junction
- Where it is crossed on the front by the aortic arch in the superior mediastinum
- Where the esophagus is compressed by the left main bronchus in the posterior mediastinum
- The esophageal hiatus where it passes through the diaphragm in the posterior mediastinum

Blood supply: The cervical portion is supplied by the inferior thyroid artery. The thoracic portion is supplied by bronchial and esophageal branches of the thoracic aorta. The abdominal portion is supplied by ascending branches of the left phrenic and left gastric arteries.

Complications of GERD: Esophagitis, stricture, ulcer, vocal cord damage,

Causes of carcinoma esophagus: smoking, alcohol, barret's esophagus, Petterson Kelly syndrome.

Causes of dysphagia:

1. **Oropharyngeal cause-** balbar palsy, pseudobalbar palsy, myasthenia gravis
2. **Esophageal cause-** carcinoma, stricture, achalasia, compression

Parts of stomach:

- **2 orifices,** cardiac & pyloric
- **2 curvatures,** greater & lesser
- **2 surfaces,** antero-superior & postero inferior
- **3 parts,** fundus, body & pylorus

Stomach Bed:

- 1) Left crus of diaphragm
- 2) Left suprarenal gland
- 3) Anterior surface of left kidney
- 4) Tortuous splenic artery.
- 5) Anterior surface of pancreas
- 6) Transverse mesocolon

- 7) Lt colic flexure
- 8) Spleen sometimes

Site of peptic ulcer: Stomach, duodenum, lower end of esophagus, gastrojejunostomy stoma, meckels diverticulum.

C/F of peptic ulcer:	Points to be noted:
<ol style="list-style-type: none"> 1. Asymptomatic- 70% 2. Upper abdominal discomfort or pain 3. Chest pain, Heartburn 4. Nausea vomiting 5. Hematemesis , Melena 6. Typical pain criteria 	Pain after taking food- Gastric Ulcer, Pain in empty stomach – Duodenal Ulcer.
	Complications of peptic ulcer: Bleeding(Hematemesis, Melena) , Perforation, Pyloric stenosis, Carcinoma stomach

Pre malignant conditions of oral cavity: Erythroplakia -40%, Leukoplakia 25%, Hyperplastic candidiasis

Causes of Oral ulcer: anemia, TB, malignancy and 6S- smoking, spices, syphilis, sharp teeth, sepsis, spirit , (ATM সানসুজ্জাম)

Artery supply of stomach: branches of celiac trunk, gastroduodenal artery, left & right gastroepiploic artery, branches of splenic artery.

Lymphatic: pancreaticosplenic, left gastric node, right gastroepiploic node, subpyloric, hepatic node.

Test of stomach disease: Endoscopy, contrast Xray, CT scan, gastric juice analysis

Congenital hypertrophic pyloric stenosis:	Surgical Causes of epigastric pain:
<ol style="list-style-type: none"> 1. Within 4 week after birth 2. Symptoms- vomiting, constipation, weight loss 3. Sing- peristalsis movement, oval mass, dehydration 4. Investigation- USG of whole abdomen 5. Rx – Ramstedt operation 	<ol style="list-style-type: none"> 1. Peptic ulcer perforation 2. Pancreatitis 3. Acute cholecystitis 4. Rupture aortic aneurism 5. Biliary colic

Biochemical changes in GOO:	Risk factors for gastric carcinoma
<ol style="list-style-type: none"> 1. metabolic alkalosis 2. hyponatremia, hypokalemia 3. paradoxical aciduria 4. Decreased ionized calcium 	<ol style="list-style-type: none"> 1. middle to elderly age 2. male sex, more in japan 3. H. pylori infection 4. pernicious anemia 5. reflux disease 6. smoking, excess salt intake

C/F of carcinoma stomach: anemia, weight loss, anorexia, early satiety, vomiting, hematemesis, melena, epigastric lump, features of metastasis

Sign- Cachexia, Left supraclavicular lymphadenopathy, upper abdominal lump, engorged vein, ascities

Small gut:

Extends from the pyloric orifice of the stomach to the ileocecal fold.

1. Duodenum
2. Jejunum
3. Ileum

Small gut , ঠোঁট () Small

Jejunum and ileum

Characteristic	Jejunum	Ileum
Position	Upper 2/5	Lower 3/5
Diameter	Greater	Less
Wall	Thicker	Thin
Circular folds	Larger, numerous and large villi	Fewer, smaller and less abundant villi
Vascularity	Greater	Less
Vasa recta	Long	Short
Colour	Deeper red	Paler pink
Lymphatic follicles	Solitary	Aggregated
Fat in mesentery	Less	More

Large intestine:

Extends from the distal end of the ileum to the anus.

Approximately 1.5 m long.

Parts of large intestine:

- Cecum- 6cm breath- 7.5 cm
- Colon-
- Rectum- 12 cm
- Anus- 3.8cm

Characteristic points: appendices epiploicae, taenia coli, sacculum (haustra), semilunar fold

Position of the appendix: Pelvic(30%), Retrocecal(60%), Preileal(2%), Postileal (retroileal)(2%)

APPENDICITIS: Rovsing's sign, Psoas Sign, Obturator sign.

Peritoneal relations of rectum:

Upper 1/3 of rectum is covered by peritoneum

Middle 1/3 of rectum, is covered only in anterior part.

The lower 1/3 of rectum is devoid of peritoneum, and dilated to form the ampulla (ampulla recti). It lies posterior to Douglas pouch (rectouterine pouch) in females; and rectovesical pouch in male.

Digital Rectal Examination:

Male: posterior surface of prostate, seminal vesicle, & vasa deferentia

Female: perineal body & occasionally ovaries

Liver:

- Largest gland of the body, consists of Both exocrine and endocrine parts.
- Liver subserves important function of regulating body temperature.
- Liver is wedge shaped, Avg 1.5 kg, 1/36th of total body wt.
- It is large in child due hemopoietic function.

Location: Right hypochondrium & epigastric region or right upper quadrant

Factor keeping liver in position:

- Hepatic veins
- Intraabdominal pressure
- Ligaments of liver

Surgical removal of 2/3rd of the liver is the compatible of life cause rapid regenerative capacity.

Porta hepatis contents: hepatic artery proper, portal vein, hepatic duct

Blood supply of the liver:

The liver receives -20% of its blood supply through the hepatic artery, and 80% through the portal vein.

Gall bladder structure:

- Serous coat:
- Fibro muscular coat: Consists of smooth muscle fibers run in various directions mixed with fibrous tissue.
- Mucous coat: The mucosa consists of lamina propria and surface epithelium, and is devoid of glands.
- submucous coat is absent.

Pancreas

Exocrine part:

- Consists of numerous lobules separated by interlobular septa. It contains of numerous alveoli. Alveoli connect with main duct Through intercalary, intralobular, interlobular ducts.

Alveolar cells- single layer of tall columnar cells

Junction between ducts & alveoli- cubical cells/ Centroacinar cells.

Endocrine part:

Numerous islets of Langerhans, outside the alveoli, more in tail.

- Alpha:20% Granules dense, rounded
- Beta: 68% Granules rectangular crystal
- Delta: 10%Granule pale, argylophilic, somatostatin inhibit insulin & glucagon secretion.
- PP cell: 2% Granule dark, secrete PPH which stimulate gastric & intestinal enzyme secretion & inhibit intestinal motility.
- Enterochromaffin secrete serotonin.

Spleen:

- Haemolymph organ, belongs to reticuloendothelial system.
- Secondary lymphoid organ, manufacture RBC before birth & lymphocyte after birth.
- Lies mainly It hypochondrium(lateral two third) & Partly epigastrium (medial one third).
- Size decrease in starvation, old age, severe exercise, severe Hemorrhage, sickle cell disease.
- The spleen . . . acts as a blood filter; it controls the amount of red blood cells and blood storage in the body, and helps to fight infection,”

Salivary glands:

- The parotid glands are located between the ear and the jaw. Pure serous secretion. Commonest tumor pleomorphic adenoma. Commonest infection Mumps. Nerve supply – Glossopharyngeal nerve
- The submandibular glands are located under the jaw. Mixed secretion. Nerve supply- Facial nerve via submandibular ganglion
- The sublingual glands are located on the floor of the mouth under the tongue. Pure Mucous secretion. Nerve supply- Facial nerve via submandibular ganglion

Abdominal Aorta:Branches:

Lateral:

1. Inferior phrenic artery
2. Middle suprarenal artery
3. Renal artery
4. Gonadal artery

Dorsal:

1. Four pair of lumbar arteries
2. Median sacral arteries
3. Terminal: Right & Left
Common ileac artery

Tributaries of Portal vein:

1. Superior mesenteric vein
2. Splenic vein
3. Right gastric vein
4. Left gastric vein
5. Cystic vein
6. Paraumbilical vein
7. Superior pancreaticoduodenal vein

Tributaries of IVC:

1. A pair of common ileac vein
2. 3rd & 4th pair of lumbar veins
3. A pair of renal vein
4. A pair of Phrenic vein
5. Right gonadal vein
6. Right supra renal vein

7. Hepatic veins

Portosystemic anastomosis:

- **Abdominal part of the esophagus:**
esophageal tributaries of the left gastric vein (portal) with esophageal tributaries of the azygos & hemiazygos veins (systemic)
- **Umbilicus**
paraumbilical veins (portal) & epigastric veins (systemic)
- **Bare area of liver**
hepatic venules (portal) with the intercostal veins & phrenic vein (systemic)
- **Posterior abdominal wall**
Veins of retroperitoneal organs (portal) with the retroperitoneal veins of the abdominal wall & the renal capsule (systemic)
- **Anal canal**
superior rectal vein (portal) with the middle rectal & inferior rectal veins (systemic)

Note:

Portal vein obstruction or thrombosis → portal hypertension

Caput medusae → at the umbilicus

Esophageal varices → at the gastroesophageal junction

Haemorrhoids → at the anorectal junction

Primary retroperitoneal Organs:

- Kidney
- Suprarenal gland
- Bladder
- Ureter
- Inferior Venacava, aorta
- Rectum
- Esophagus(part)

Secondary retroperitoneal Organs:

- Part of pancreas
- The 2nd, 3rd, 4th portion of duodenum
- Ascending & descending portion of the colon

The mesentery crosses the following structure:

1. Third part of duodenum
2. Abdominal aorta
3. IVC
4. Right ureter
5. Psoas major
6. Rt gonadal vessels
7. Rt genitofemoral nerve.

Contents of Mesentery :

1. Jejunum & ileum
2. Jejunum & ileal branch of superior mesenteric artery
3. Accompanying veins
4. Autonomic nerve plexus
5. Lymphatics & lacteals
6. 100-200 lymph nodes
7. Connective tissue with fat

Kidney:

- ✓ Kidneys are kept in position by perinephric fat, renal fascia, paranephric fat.
- ✓ Excretory organ situated in the posterior abdominal wall.
- ✓ Anterior surface is irregular, posterior surface is flat.
- ✓ **In hilum, from anterior to posterior- VEIN, ARTERY, PELVIS (VAP)**
- ✓ Kidney located in hypochondriac, umbilical, lumbar.
- ✓ Transpyloric plane passes through the upper part of hilus of right kidney & through the lower part of hilus of left kidney.
- ✓ 11cm long, 6cm broad, 3 cm, thick, 150gm male, 130 gm female.

Exposure of kidney from back

1. Skin
2. Superficial fascia
3. Posterior layer of thoracolumber fascia
4. Erector spinae
5. Middle layer of thoracolumber fascia
6. Quadratus lumborum
7. Anterior layer of thoracolumber fascia
8. Related nerves

Ureter:

- ✓ Pair of narrow thick wall muscular tube.
- ✓ They lie deep to the peritoneum.
- ✓ 25 cm long, half in abdomen, half in pelvic cavity.

Constrictions: 3 in number

- 1) At pelviureteric junction
- 2) At the brim of the lesser pelvis
- 3) At its passage through the bladder wall.

Blood supply

Upper part-Branches of renal artery

Middle part- Branches of Aorta.

Lower part- Branches of vesical, middle rectal or uterine artery

Urinary bladder:

Empty- Tetrahedral, Full- Ovoid

Interior of the bladder: Greater part lined by irregular mucosal fold except lower part of base which is smooth due to firm attachment to muscular coat, known **Trigone of bladder** (Ureteric opening is 2.5cm apart).

Reflex control of micturation:

- Motor area of paracentral lobule
- Detrusor center in the pons.
- Sacral micturation center at S2,S3,S4

Urethra:

Male urethra is 18-20 cm long

- ❖ **Prostatic part-** 3cm,
- ❖ **Membranous part** – 2cm, narrowest,
- ❖ **Spongy or penile part** – 15 cm.

Female urethra – 3-4 cm

Male have both external and internal sphincter , but female have only internal sphincter

Prostate:

- Fibro-musculo-glandular organ
- Lies in the lesser pelvis,below the neck of the urinary bladder, behind the lower part of pubic symphysis, in front of the ampulla of the rectum.
- **Lobes:**Has five lobes-Anterior,posterior, median or middle, & right & left lateral.

Central zone: 25% of glandular substance,surrounds the ejaculatory duct & its opening, BEP affects this zone.

Peripheral zone: 75% of glandular substance,surrounds the central zone below & behind forming the lower part of gland, cancer affects this zone.

Enlarged gland is enucleated leaving behind both the capsules & venous plexus between them.

Testis:

- Primary reproductive organ, The epididymis lies along the lateral part of posterior border
- **Layers:**Tunica vaginalis , Tunica albuginea, Tunica vasculosa
- Each lobule contain 2-3 seminiferous tubule, tubules are lined by cells which represent stages in the formation of spermatogoa.
- Seminiferous tubule Straight tubule(20-30) Rete testis efferent ductule (12-30 dilatation) Head of Epididymis Ductus deferens
- Blood supply: Testicular artery
- Lymphatic drainage: Pre aortic & para aortic group of lymph node.
- **Nerve supply:**
 - Sympathetic: T10

- Parasympathetic: through renal & aortic plexus.

The female internal reproductive organs :

Primary -ovaries

Secondary - the vagina, uterus, Fallopian tubes, breast

Pituitary gland:

- **Definition:** It is a small endocrine gland situated in the hypophyseal fossa in relation to the base of the brain.
- **Weight:** 500 mg.
- **Length:** 12-16mm anteroposteriorly, 6-12mm superoinferiorly
- **Adenohypophysis:**
 - Anterior lobe/ pars anterior/ pars distalis/pars glandularis
 - Intermediate lobe/ pars intermedia
 - Tuberal lobe /pars tuberalis
- **Neurohypophysis:**
 - Posterior lobe/pars posterior/ neural lobe.
 - Infundibular stem
 - Median eminence

Blood supply:

- **Arterial supply:** By-
 - Superior hypophyseal artery: Internal carotid artery
 - Inferior hypophyseal artery: Internal carotid artery

Venous drainage: Short veins emerge on the surface of the gland & drains into neighbouring dural venous sinuses.

THYROID GLAND:

→ Lies against C5-7, T1 vertebral level, middle thyroid cartilage to 5th tracheal ring, it has true and false capsule. False capsule formed from pretracheal fascia.

→ Capillary plexus situated deep to the true capsule, so to avoid hemorrhage, thyroid is removed along with capillary plexus.

Blood supply of thyroid gland:

- **Arterial supply:**
 - Upper 1/3rd of lobe & upper 1/2 of isthmus – superior thyroid artery, branch of external carotid artery.
 - Lower 2/3rd of lobe & lower 1/2 of isthmus- inferior thyroid artery, branch of thyrocevic trunk.
- Also by-**
 - Arteria thyroidea ima, branch of brachiocephalic trunk or arch of aorta &
 - Accessory thyroid artery, branch of tracheoesophageal artery
- **Venous drainage:**
 - Superior thyroid vein, drains into internal jugular or common facial vein.
 - Middle thyroid vein, drains into internal jugular vein.
 - Inferior thyroid vein, drains into left brachiocephalic vein

Nerve supply – middle cervical ganglion

Histology:

1. Follicular cells- T3, T4
2. Parafollicular cells- thyrocalcitonin

Development: median endodermis thyroid diverticulum.

Parathyroid glands:

- Two pairs. Lies posterior to the thyroid within the false capsule.
- Superior 2 from 4th pharyngeal pouch, inferior 2 from 3rd pharyngeal pouch.
- Glands are oval shaped, 50 mg weight,
- Regulates calcium & phosphate metabolism
- Position- anastomosis of sup. & inf. Thyroid artery.
- Superior 2 is more constant, middle of the posterior border of thyroid.
- Blood supply: inferior thyroid artery
- Nerve supply: sup. & middle cervical ganglion

Thymus:

- Primary lymphoid organ
- Anterior and middle Mediastinum content
- Well developed at birth, continue growing upto puberty, then gradual atrophy and replaced by fat.
- Bilobed structure which are pyramidal shaped.
- Developed from endoderm of 3rd pharyngeal pouch
- 10-15 gm at birth, 3-40gm at puberty, 10gm upto adult.

Suprarenal gland:

Outer cortex: mesodermal origin which secrete a number of steroid.

3 layers:

- Zona glomerulosa- Aldosterone
- Zona Fasciculata- Steroids
- Zona reticularis- Androgens

Inner medulla of neural crest derivative which is made up of chromaffin cells, secrete adrenaline & noradrenaline.

Lies in the epigastrium at the upper pole of the kidney.

- Rt gland is triangular or pyramidal
- Lt gland is semilunar

Gland is separated from the kidney by a septum.

Nervous system:

- CNS makes 3 fine job- judgement, intelligence, memory.
- Average brain weight -1500 gm, but we feel only 50 gm due to CSF.
- There are 200 billion neurons in brain

Nervous system – CNS(brain, spinal cord), PNS (12 pairs cranial nerves, 31 pairs spinal nerves)

CNS for – learning, memory, intelligence, emotions

PNS for – muscles, glands, blood vessels.

afferent- যা CNS এ যায়, efferent – যা CNS থেকে আসে ।

PNS 2 types-

- somatic- for skeletal muscles
- autonomic- for viscera, gland, vessels

Autonomic Nervous system 2 types-

- sympathetic
- parasympathetic

Cellular structure of nervous tissue:

- nerve cell- neuron
- neuroglial cells – supporting cells

Neuron: parts

- cell body-
 - Forms 3 things – a. Grey matter of brain b. Nucleus in CNS c. Ganglion in PNS
 - 5-120 micrometer, consists of nucleus and cytoplasm
 - Nucleus rounded, centrally placed,
 - contains nissle granules (these are ribosomes) – differentiating point from other cells
- cell process – dendrites , axon

Dendrite	Axon
one or more or absent	always one
carries impulse to cell body (afferent)	carries impulse from cell body (efferent)
short	long
usually branched	not branched
nissle granule present	nissle granule absent
origin from any part of cell body	arise from axon hillock

autonomic neurons:

sympathetic- flight, fright, fight

parasympathetic- rest, taste, digest

Brain parts:

- Fore brain- telencephalon-** cerebrum , **diencephalon-** thalamus, hypothalamus, metathalamus (medial & lateral geniculate body), **epithalamus**(pineal body, habenular trigone, posterior commissure), **subthalamus**

2. Midbrain- crus cerebri, substantia nigra, tegmentum, tectum
3. Hindbrain- *metacephalon* (pons, cerebellum), *myelencephalon* (medulla oblongata).

Cerebrospinal fluid (CSF):

- Modified tissue fluid,
- Contained in the ventricular system and subarachnoid space.
- It replaces the lymph of CNS.
- Total amount is 150 ml , formation rate 200 ml per hour ,
- Normal pressure of CSF is 6-100 mmH₂O
- Site of formation- choroid plexus lateral ventricle , also 3rd & 4th ventricle.
- Absorption- arachnoid villi and granulation , thus into cranial venous sinuses.

Circulation: lateral ventricle → interventricular foramen of Monro → 3rd ventricle → cerebral aqueduct → 4th ventricle → one median aperture (megendi), 2 lateral apertures (Lusk) → subarachnoid space, cerebromedullary and pontine cistern → arachnoid villi → superior sagittal sinus

Spinal cord:

- ✓ Cylindrical lowest part of CNS, two third of vertebral canal, gives rise 31 pairs of spinal nerves.
- ✓ 18 inch or 45 cm long,
- ✓ Extends upto upper border of atlas to lower border of L1 and upper part of L2 , superiorly continuous with medulla , inferiorly conus medullaris,

UMNL	LMNL
Muscle tone increased	Muscle tone reduced
Spastic paralysis	Flaccid paralysis
No muscle atrophy	Muscle atrophy occurs
No degeneration	Reaction of degeneration seen
Tendon reflex exaggerated , so clonus and babinski sign positive.	Tendon reflex absent
Extensive damage	Limited damage

Limbic system:

Parts:

1. Olfactory nerves , bulb, tract, striae, trigone
2. Ant. Perforated substance
3. Pyriform lobe,
4. Parahippocampus, cingulated gyri .
5. Hippocampal formation
6. Amygdaloid nuclei
7. Septal region, fornix, stria habenularis, ant. Commissurae.

Functions: food habits, sex behavior, emotion behavior.

Circle of Willis:

It's a arterial circle in base of brain (**inter peduncular fossa**). Formed by anteriorly ant. & middle cerebral arteries ; posteriorly posterior cerebral branches of basilar artery.

Two anterior cerebral arteries are connected by – ant. Communicating artery.

Middle and posterior cerebral arteries are connected by- post. Communicating artery.

Fertilization:

DEFINITION: it is the process by which male and female gamete fuses to form zygote

Time of Fertilization: Within 24 hours after Ovulation

Site: ampullary region of fallopian tube

1ST WEEK OF DEVELOPMENT

1. Changes in the zygote by successive cleavage division
2. Formation of morula and blastocyst
3. Migration of the Zygote
4. Change in the uterus for implantation

IMPLANTATION

Definition: The adherence and attachment of the blastocyst to the endometrium are referred to as Implantation

Time of implantation: 6-7 days after ovulation

Site of implantation: Normal site: posterior wall near the midline close to the fundus of the uterus

The blastocyst has the inner cell mass & outer cell mass.

Each cell mass differentiated into 2 different cell layers

- ❖ Trophoblast = outer cell mass
- ❖ Embryoblast = inner cell mass

NEURAL crest derivatives:

1. facial Bone and Connective tissue
2. Dermis in the Face and Neck
3. Cranial nerve ganglia
4. Spinal ganglia
5. Sympathetic and pre-aortic ganglia
6. Parasympathetic ganglia of GI Tract
7. Schwann cell
8. Glial cells
9. Melanocytes
10. C cells of the thyroid gland
11. Conotruncal septum in the heart
12. Odontoblast
13. Adrenal medulla
14. Arachnoid and pia matter

DERIVATIVES OF MESODERM

Intra – embryonic mesodermal cells are distributed as a loose sheet on each side of the median plane. Subsequently a longitudinal groove sub divides the mesoderm into three parts:-

1. Paraxial Mesoderm - somite, myotome, dermatome
2. Intermediate Mesoderm- **Adrenal, Genital and Nephric ridge**
1. Lateral plate Mesoderm - Parietal mesoderm and Visceral mesoderm

DERIVATIVES OF ENDODERM

1. Epithelial lining of the respiratory tract.
2. Epithelial lining of the tympanic cavity and Eustachian tube
3. Parenchyma of the Tonsil, Thyroid Parathyroid, Thymus, Liver and Pancreas
4. Epithelial lining of the urinary bladder and urethra.

PLACENTA

Human placenta is a discoid shape chorio-decidual organ connects the fetus with the uterine wall of the mother. It has:

A) fetal surface which is covered by amnion and presents the attachment of the umbilical cord at its center.

B) Maternal surface which is rough and irregular and marked by 15-30 polygonal area known as cotyledons bounded by fissure.

Diameter: 15-20 cm

Thickness: 3 cm at the center

Weight: 500gm

Feto-placental ratio: 6:1

It connects to the fetus by umbilical cord of approximately 55–60 cm (22–24 in) in length that contains two arteries and one vein

Fetal circulation:

5 things:

1. One umbilical vein
2. Two umbilical arteries
3. Ductus venosus
4. Foramen ovale
5. Ductus arteriosus

Changes after birth:

1. Lung start functioning

2. Umbilical vein—ligamentum teres
3. Umbilical artery- medial umbilical ligament
4. Ductus venosus- ligamentum venosus

TYPE OF CLONING

1. DNA Cloning
2. REPRODUCTIVE Cloning
3. THERAPEUTIC Cloning

Dr. Sayed Suion