

TUTORIALS

NEET SS

SURGICAL GASTROENTEROLOGY TRANSPLANT SURGERY

EDITION 3.0

INDEX

S.No. Topic Page No.

3. Upper GI surgery

3.1	Oesophagus Anatomy	1
3.2	Physiology Behind Motility Disorders	8
3.3	Achalasia Cardia	11
3.4	Diverticulum In Esophagus	15
3.5	GERD	19
3.6	Surgical Aspects Of GERD	28
3.7	Paraesophageal Hernia	35
3.8	Esophageal Injuries	40
3.9	Tumors	47
3.10	Conduits & Reconstruction	67
3.11	Esophagus – Bailey And Love 28th Edition Updates	70
3.12	Stomach - Anatomy And Physiology	87
3.13	Peptic Ulcer Disease	93
3.14	Vagotomy And Complications	105
3.15	ZES	111
3.16	Stress Gastritis	112
3.17	Gastric Atony	114
3.18	Gastric Cancer	115
3.19	Gastric Lymphoma	128
3.20	GIST	131
3.21	Gastric NET	133
3.22	Stomach - Miscellaneous Topics	134
3.23	Stomach And Duodenum 28th Edition Updates:	137
3.24	Bariatric Surgery	143
3.25	Bariatric Surgery-Bailey And Love 28th Edition Update	152

4. Lower GI surgery

4.1	Small Intestine–Anatomy And Physiology	154
4.2	Intestinal Obstruction	159
4.3	Crohn's Disease Basics	163
4.4	Management Of Crohn's Disease	166
4.5	Infections Of SB	170
4.6	Neoplasms - Introduction	171
4.7	Benign Tumors Of Small Intestine	172
4.8	Neuroendocrine Neoplasm	173
4.9	Adenocarcinoma Of Small Intestine	176
4.10	Small Bowel Lymphoma	178
4.11	Diverticular Diseases Of Small Bowel	179
4.12	Miscellaneous Disease (Small Intestine)	184
4.13	Stromal Tumors	190
4.14	Small Intestine - Bailey 28th Edition Updates	193
4.15	Colon And Rectum- Anatomy & Physiology	198
4.16	Stomas	207
4.17	ERAS	209
4.18	Diverticular Disease	210
4.19	Large Bowel Obstruction	214
4.20	Inflammatory Bowel Disease	217
4.21	Colitis Types	228
4.22	Genetic Basis Of Colorectal CRC	232
4.23	Polyps In Colon	240
4.24	Polyposis	243
4.25	Management Of Colorectal Cancers	251
4.26	Cancer Rectum And Anus	254
4.27	Pelvic Floor Disorder	259
4.28	Anal Canal	269
4.29	Inflammatory Bowel Disease Updates	277
4.30	Large Intestine-Updates	283
4.31	Rectum	293

5. Miscellaneous

5.1 Classification (Hernia) 299

5.2 Inguinal Hernias (Anatomy) 299

5.3 Inguinal Hernia 301

5.4 Femoral Hernia 307

5.5 Ventral Hernias 308

5.6 Unusual Hernia 310

5.7 Acute GI Bleeding 312

5.8 Appendix 328

5.9 Abdominal Wall, Peritoneum & Mesentery 344

6. Hepatobilliary Pancreastic system

6.1 Biliary System – Anatomy & Physiology 363

6.2 Investigations In Biliary System 369

6.3 Gall Stones Disease 371

6.4 CBD Stones 376

6.5 Other Complications Of Biliary System 378

6.6 Acalculous Cholecystitis 380

6.7 Biliary Dyskinesia And SOD Dysfunction 381

6.8 PSC & Biliary Strictures 382

6.9 Choledochal Cyst 384

6.10 Benign Masses Of GB 386

6.11 Surgical Aspects(HBPS) 387

6.12 Post Cholecystectomy Syndrome 391

6.13 Cholangitis 396

6.14 Gall Bladder Cancer 398

6.15 Bile Duct Cancer 401

6.16 Gall Bladder & Bile Ducts- Bailey And Love 28th Edition Updates 405

6.17 Pancreas -Anatomy, Physiology, Embryology 414

6.18 Acute Pancreatitis 418

6.19 Severity Assessment In AP 423

6.20 Complications Of AP 427

6.21 Chronic Pancreatitis 430
6.22 Cystic Neoplasm Of Pancreas 437
6.23 Pancreatic Adenocarcinoma 440
6.24 Outcomes And Complications Of Whipple's Operation 447
6.25 Adjuvant Treatment For Ca- Pancreas 449
6.26 Pancreatic Trauma 452
6.27 Pancreas – Bailey And Love 28th Edition Updates 454
6.28 Spleen 459
6.29 Spleen – Bailey And Love 28th Edition Updates 471
6.30 Liver (Anatomy And Physiology) 473
6.31 Imaging Of Focal Liver Disease 493
6.32 Investigations On Liver 513
6.33 Portal Hypertension 516
6.34 Surgical Infections Of Liver 524
6.35 Tumors In Liver 531
6.36 Miscellenous: - Liver 540
6.37 Liver- Bailey And Love 28th Edition Updates 543

7. Transplantation surgery

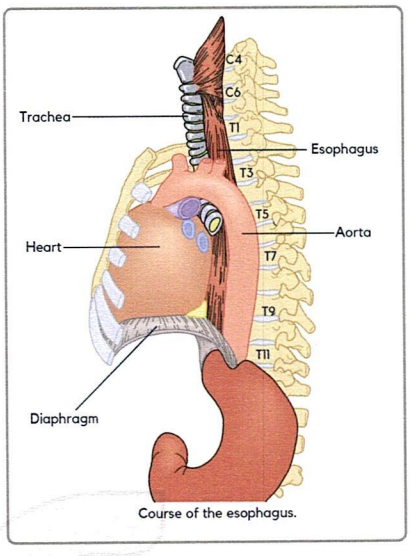
7.1 Immunology Of Transplant Rejection And Immunosuppression 553
7.2 Organ Donation & Preservation, Kidney Transplantation 558
7.3 Surgical Complications, Outcomes Of Renal Transplant 565
7.4 Heart And Lung Transplantation 567
7.5 Pancreas Transplant 576
7.6 Intestinal Transplant 584
7.7 Liver Transplant – Baily 28th Edition Update 596

OESOPHAGUS ANATOMY

Anatomy

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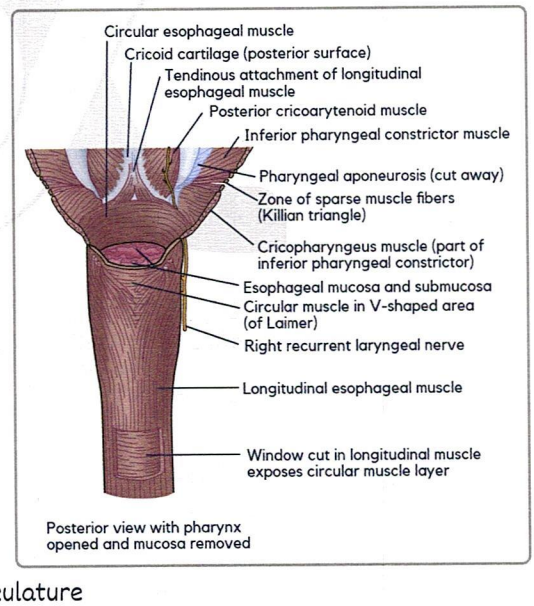
- Starts at the base of the pharynx at c6 .
- Terminates in the abdomen, where it joins the cardia of the stomach at TII
- It is 25 cm in length
- Cricopharynx is the narrowest part
- Seen 15 cm from incisor teeth
- Cranial esophagus is at left side
- At the level of the carina, it deviates to the right to accommodate the arch of the aorta.
- Then it winds its way back under the left main bronchus.
- Enters the diaphragm at TII



Course of the esophagus.

INI CET SS-2021

- Pharyngeal constrictor muscles are three consecutive muscles
  1. Superior
  2. Middle
  3. Inferior
- The inferior constrictor is the final bridge between pharynx and esophageal musculature
- Inferior constrictor is made of two muscles
  1. Oblique thyropharyngeus
  2. Cricopharyngeus (transverse)
- Potential weakness between these two muscles is known as Killian's dehiscence.
- Killian's dehiscence is defect in inferior constrictor of pharynx
- The crico pharyngeus muscle is responsible for generating a high – pressure zone.
- Cricopharyngeus marks the position of the UES and esophageal introitus.
- Its distinctive bowing array of muscle fibers is unique.
- It serves to transition into the inner circular esophageal musculature
- Laimer's triangle defects in longitudinal muscle of esophagus



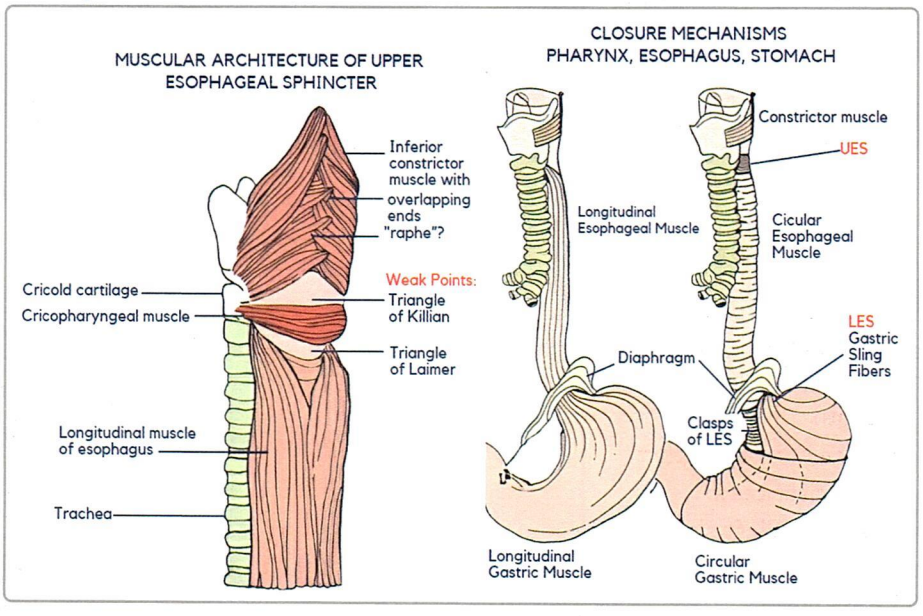
Posterior view with pharynx opened and mucosa removed

Muscles in Esophagus

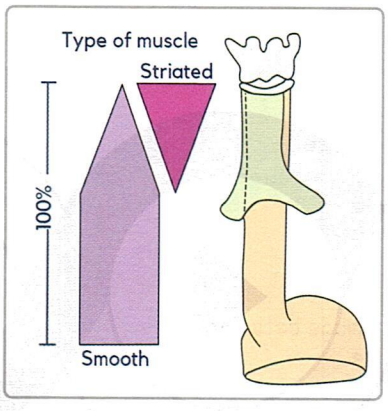
00:07:34

- Consists of straited and smooth muscle
- Inner circular muscle is the extension of cricopharyngeal muscle.
- Traverse through the thoracic cavity into abdomen,
- Become middle circular muscle on lesser curvature of stomach.
- Short clasp fibres on lesser curvature, oblique sling fibres on greater curvature
- Collar of Helvetius- transition of circular muscles of esophagus to oblique muscles of stomach at incisura.
- Outer longitudinal muscles continue as longitudinal muscles of stomach.
- Upper esophagus made of straited muscle
- First smooth muscle starts, 2-3 cm caudal to ES
- Straited muscle end before tracheal bifurcation

Collar of Helvetius or loop of Willis



Striated and smooth muscles



- Distal to tracheal bifurcation there are no striated muscles
- The upper esophagus is made of striated muscles
- The first smooth muscle appear 2-3 mm caudal to UES
- There is gradual change off of the striated muscle to smooth muscle

Natural constrictions

- Hour glass shape
- Esophagus – 14mm in cricopharyngeal muscle
- Broncho aortic constrictions – at level of T4à15-17 mm
- Aorta at 23 cm, left bronchus at 25 cm
- Diaphragmatic constriction -16-19mm
- Dilated parts of esophagus has-2.5cm diameter

Bailey says:

- 15cm – Cricopharynx
- 25cm – Aortic and bronchus
- 40cm – Diaphragmatic sphincter

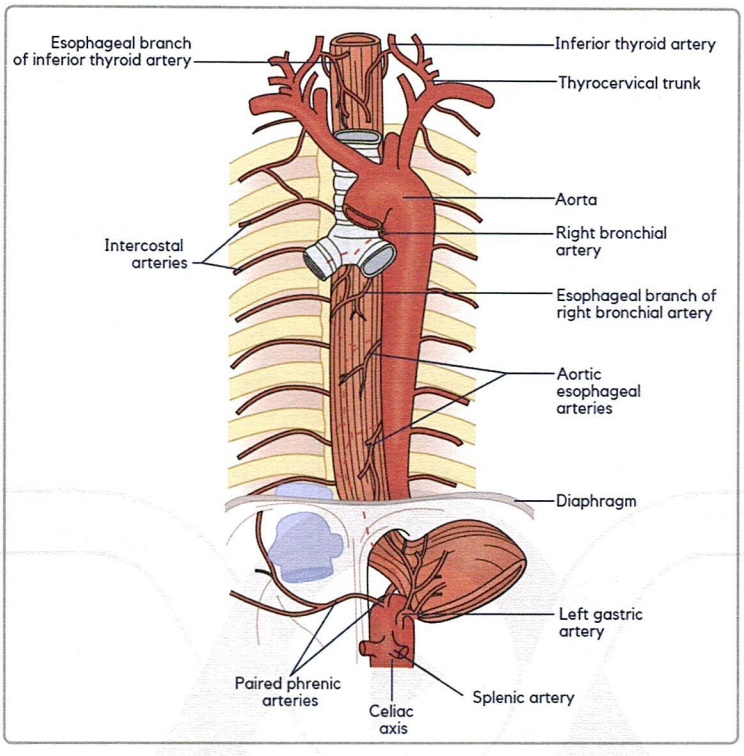
BLOOD SUPPLY

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- Cervical esophagus-inferior thyroid artery (TCT on left and SCA on right)
- Cricopharyngeus muscle supplied by STA
- Abdominal part from LGA and inferior phrenic artery
- The thoracic esophagus - 1) Four to six esophageal arteries coming off the aorta,
  2) esophageal branches off the right and left bronchial arteries.

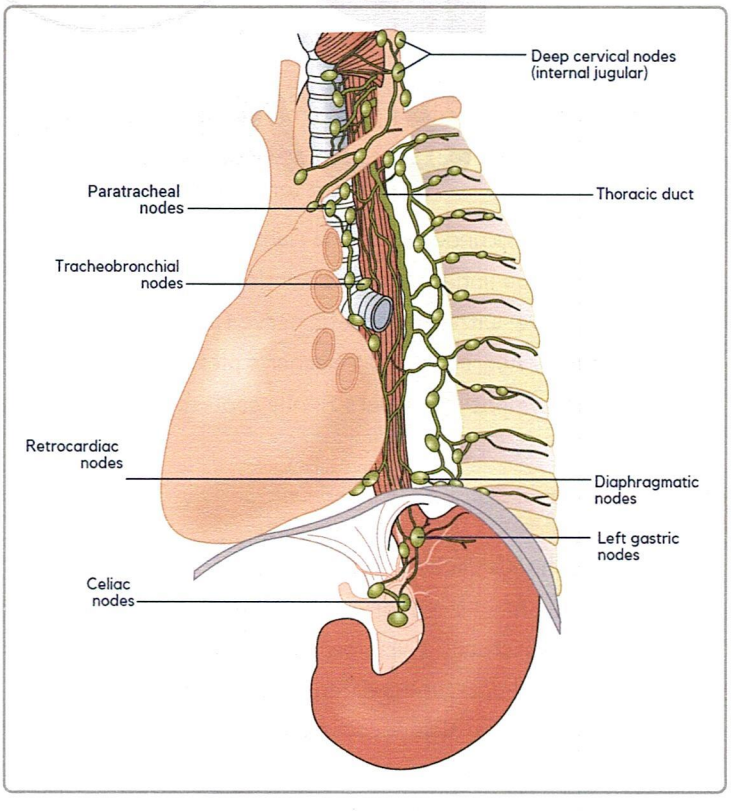
Thoracic esophagus

- Branches from:
  - Aorta
  - Bronchial artery
  - Intercostal artery
  - Inferior thyroid artery
  - Ascending branch of inferior phrenic artery
- Forms capillary network before entering muscle layer and again have a capillary network in submucosal layer



Lymphatic drainage

- Submucosal lymphatics penetrate m. propria and drain into plexus longitudinally.
- In upper 2/3rd esophagus it runs upward (cervical group)
- In lower 1/3rd esophagus it runs downward (coeliac nodes)
- In case of tumors in submucosa it can spread through lymphatics by 10 cm.
- Hence 10cm margin is given in clearance



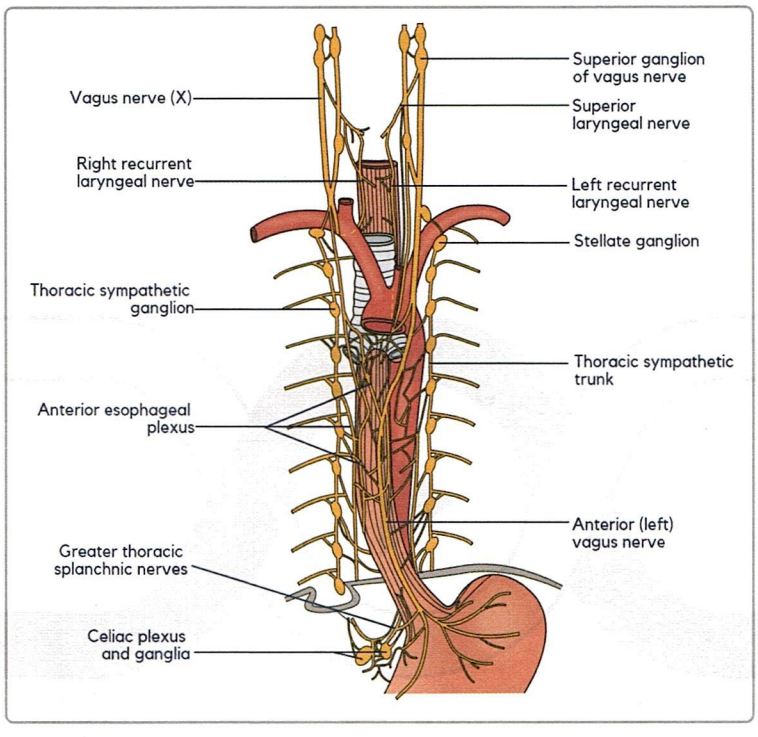
NERVE SUPPLY

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Sympathetic supply of esophagus

- Cervical sympathetic trunk arises from superior ganglion in the neck.
- It extends to the esophagus into the thoracic cavity
- Where it terminates in the cervicothoracic (stellate) ganglion.
- It gives off branches to the cervical esophagus.
- The thoracic sympathetic trunk continues on from the stellate ganglion
- Giving off branches to the esophageal plexus, envelops Thoracic esophagus
- Inferiorly, the greater and lesser splanchnic nerves innervate -distal thoracic esophagus.
- In the abdomen, the sympathetic fibers lay posteriorly alongside the left gastric artery

Parasympathetic innervation



- Parasympathetic fibers arise from vagus nerve .
- Which gives rise to 1) Superior laryngeal nerve
  2) Recurrent laryngeal nerves.
- Right RLN loop underneath the right SCA
- Left RLN loop underneath the Aortic arch.
- Vagus nerve with sympathetic nerve forms a weblike nervous plexus.
- And supply Auerbach and Meissner's plexus.
- The parasympathetic fibers finally coalesce 2cm above diaphragm as 1) Left anterior
  2) Right posterior vagus nerve

PHYSIOLOGY OF OESOPHAGUS

00:24:43

- The Esophagus usually measure 30cm.
- Extending from the pharynx down onto the cardia of the stomach.
- Primary peristalsis-2-4cm/second. Food reaches LES in 9 seconds.
- Intraluminal pressure created is 40-80 mm Hg
- Secondary peristalsis is caused by irritation and distension
- Tertiary peristalsis are non-progressive, non-peristaltic, monophasic or multiphasic and simultaneous waves.
- They represent Un coordinated contractions of smooth muscles leading to spasm

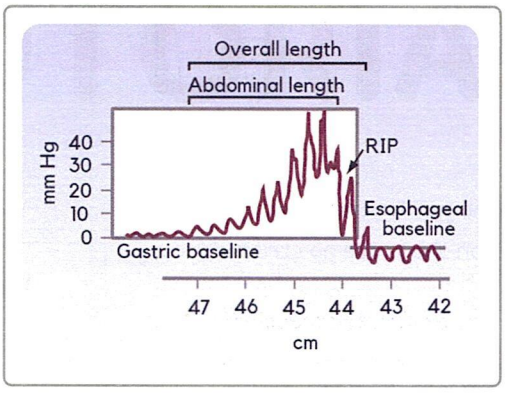
Normal manometric values	
Parameter	Value
Upper esophageal sphincter	
Total length	4.0-5.0cm
Resting pressure	60.0mmHg
Relaxation time	0.58 sec
Residual pressure	0.7-3.7mm Hg
Lower espohageal sphincter	
Total length	3-5cm
Abdominal length	2-4cm
Resting pressure	6-26mm Hg
Residual pressure	3mmHg
Esophageal body contractions	
Amplitude	40-80mm Hg
Duration	2.3-3.6sec

Questions from 21st sabiston

Question 1

- Respiratory inversion point-false statement is
  a. It is a manometric tracing
  b. It stands for transition from intra thoracic sphincter to intra-abdominal sphincter.
  c. The pressure of esophagus changes from negative to positive during expiration.
  d. A minimum total intra – abdominal length of at least 2 cm is needed for a normal LES function
  Ans: c (During inspiration)
- The transition from the intrathoracic to the intraabdominal sphincter is noted on a manometric tracing and is known as the respiratory inversion point

Respiratory inversion Point

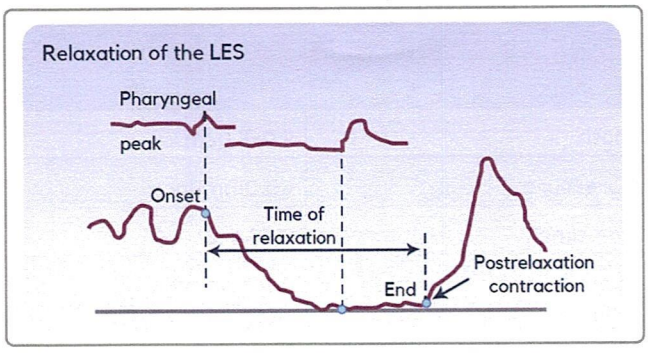


Normal lower Esophageal sphincter RIP, respiratory inversion point

Question 2

- Regarding the opening of LES-false statement is:
  a. Peristaltic contractions alone is enough for opening the LES
  b. Vagal mediated relaxation occurs for 1.5 to 2.5 seconds after swallowing.
  c. The relaxation lasts for 4-6 seconds.
  d. Post relaxation contraction occurs after peristaltic wave is passed out.
  Ans: a

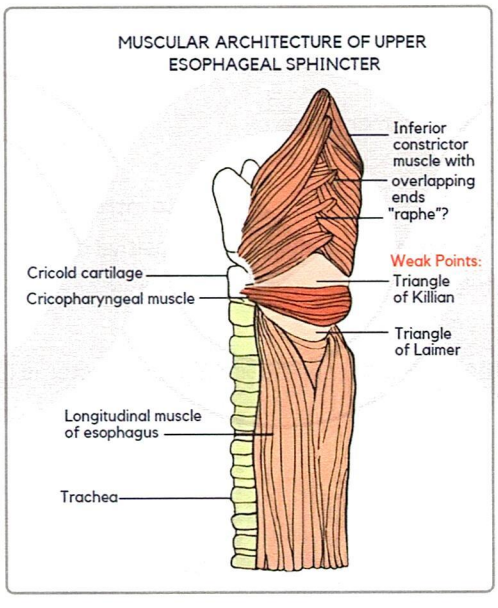
- Peristaltic contractions alone do not generate enough force to open up the LES.



Relaxation of the lower Esophageal sphincter

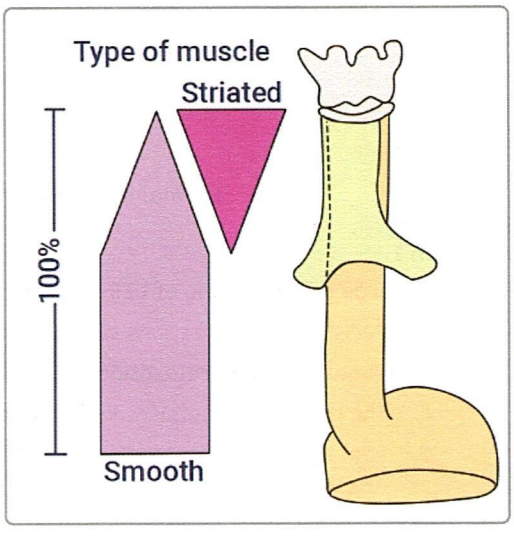
Question 3

- Laimer's triangle is
  a. Defect between the thyropharyngeal and cricopharyngeal
  b. Defect in longitudinal muscle layer
  c. Defect in longitudinal muscle layer
  d. Defect in inferior constrictor
  Ans: b



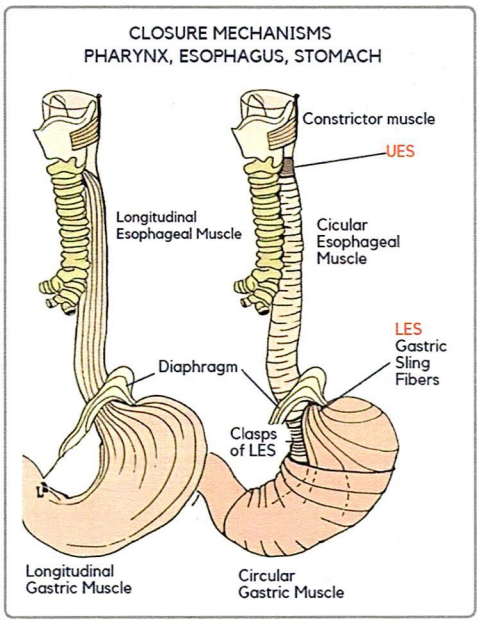
Question 4

- Regarding the muscles of esophagus. True statement is
  a. Distal to tracheal bifurcation there are no striated muscles
  b. The upper esophagus is made of striated muscles
  c. The first smooth muscles fascicles appear 2-3 mm caudal to UES
  d. There is abrupt change off of the striated muscle to smooth muscle
  Ans: d (Gradual change)



Question 5

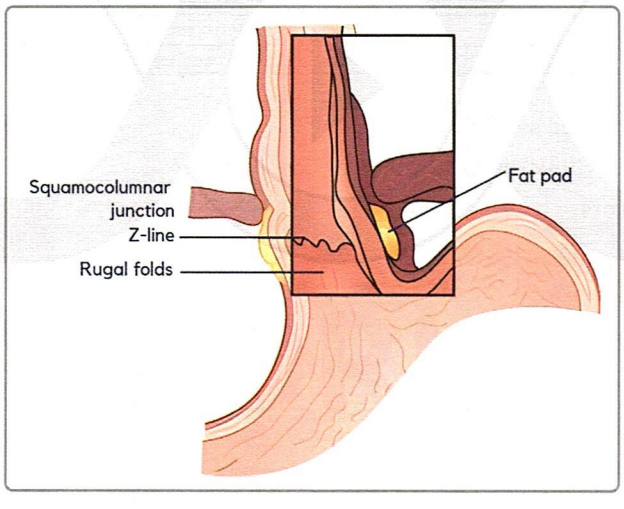
- The false statement regarding the conversion of the` muscle layers of esophagus on the gastric muscle layers -
  a. Longitudinal muscle of esophagus continues as long muscles of stomach
  b. Circular muscle of esophagus forms short clasps on the lesser curve side
  c. Circular muscle of esophagus forms gastric Ring fibres on the greater curve side
  d. None of the above
  Ans: d



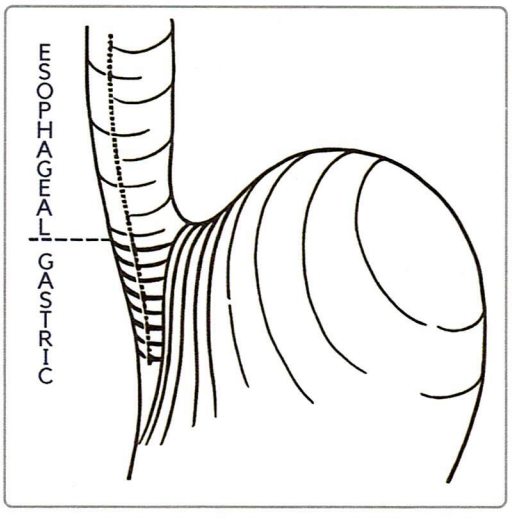
Question 6

- The following are the markers of GEJ externally except...
  a. Collar of Helvetius
  b. Loop of willis
  c. Gastroesophageal pad of fat
  d. Phreno Esophageal membrane
  Ans: d (Ref sabiston 21st edition page 1016)
- Collar of Helvetius = loop of willis is the point where the circular muscle fibres of esophagus join the oblique fibres of stomach

External markers



Collar of Helvetius



The Chicago classification of esophageal motility, v3.0

00:00:30

- Amplitude (renamed) = Distal Contractile Integrity (DCI)
  = Amplitude x Duration x CMS (mmHg CMS)
- Normal DCI= 450 mmHg CMS
- LES (RP= 6 to 26 mmHg) = integrated relaxation pressure (IRP)= <15 mmHg

The Chicago classification of esophageal motility, v3.0.	
Achalasia and Esophagogastric Junction Outflow Obstruction	**CRITERIA**
Type I achalasia (classic)	Median IRP >15 mm Hg, 100% failed peristalsis (DCI <100 mm Hg-s-cm); premature contractions with DCI <450 mm Hg-s-cm satisfy criteria for failed peristalsis
Type II achalasia (with esophageal compression)	Median IRP >15 mm Hg; 100% failed peristalsis, panesophageal pressurization with ≥20% of swallows
Type III achalasia (spastic achalasia)	Median IRP >15 mm Hg; no normal peristalsis, spastic contractions with DCI >450 mm Hg-s-cm with ≥20% of swallows
Esophagogastric junction outflow obstruction (achalasia in evolution)	Median IRP >15 mm Hg; sufficient evidence of peristalsis such that criteria for types I-III are not met
Major Disorders of Peristalsis	
Absent contractility	Normal median IRP, 100% failed peristalsis
Distal esophageal spasm	Normal median IRP; ≥20% premature contractions with DCI >450 mm Hg-s-cm
Hypercontractile esophagus (nutcracker or jackhammer)	At least 2 swallows with DCI >8000 mm Hg-s-cm
Minor Disorders of Peristalsis	
Ineffective esophageal motility	≥50% ineffective swallows
Fragmented peristalsis	≥50% fragmented contractions with DCI >450 mm Hg-s-cm
Normal esophageal motility	None of the above criteria are met

- Conventional manometry used sensors -5 cm apart
- High resolution manometry(HRM) used 36 sensors- 1 cm apart
- HRM gives topography plots

Diffuse Esophageal Spasm

00:14:03

- MC in women
- 5 times less common
- Pathology - motor abnormality in body of esophagus.
- Most notable in lower 2/3rd
- Muscular hypertrophy and Vagus nerve branches degeneration is noted.
- DES - **Repetitive (Mirrored), Simultaneous and High Amplitude Contractions.**
- **Patient has squeezing pressure in chest that radiates in jaw, upper arm and back**
- The symptoms **are often pronounced during times of heightened emotional stress.**
- Regurgitation of Esophageal contents and saliva is common, but acid reflux is not.
- **Acid reflux** can aggravate the symptoms, as can cold liquids.
- A Asociated with Functional GI symptoms-1) Irritable bowel syndrome
  2) Pyloric Spasm may accompany DES.
- Gall stones, Pancreatitis and Peptic ulcer can all trigger DES.