

# The A to Z of the Digestive Tract



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## Introduction

This is the 1st edition of a “pathway” using the A to Z format.

It encompasses all the structures involved in the digestion of food from the beginning to end, which is why all the structures from lips to buttocks have been included. They all play a role. Remember when the anus shuts down – nothing works: the brain cannot think; the eyes cannot see; the legs cannot run... and this means... do not forget ALL the factors.

I hope it has been successful – Please let me know what you think.

The A to Zs may be viewed on 2 sites - [www.amandasatoz.com](http://www.amandasatoz.com) and <http://www.aspenpharma.com.au/atlas/student.htm>

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## Acknowledgement

Thank you Aspenpharmacare Australia for your support and assistance in this valuable project, particularly Greg Lan, Rob Koster, Richard Clement, Peter Penn, Phill Ryman and Quentin and everyone who provided valuable feedback.

## Dedication

To all those people out there who have an interest in their DIGESTIVE SYSTEM from the entrance to the exit. Those dieting and those not, those who cook and those who don't, those health conscious and those not, those with fussy palates and those without – WE ALL EAT!!!

## How to use this book

The format of this A to Z book has been maintained as in the last edition – the beginning has overviews and then the sections of the Digestive tract = DT are broken up and listed alphabetically and cross referenced for ease of data retrieval. The book is its own index in each section.

As with all the A to Z books - think of it and then find it alphabetically.

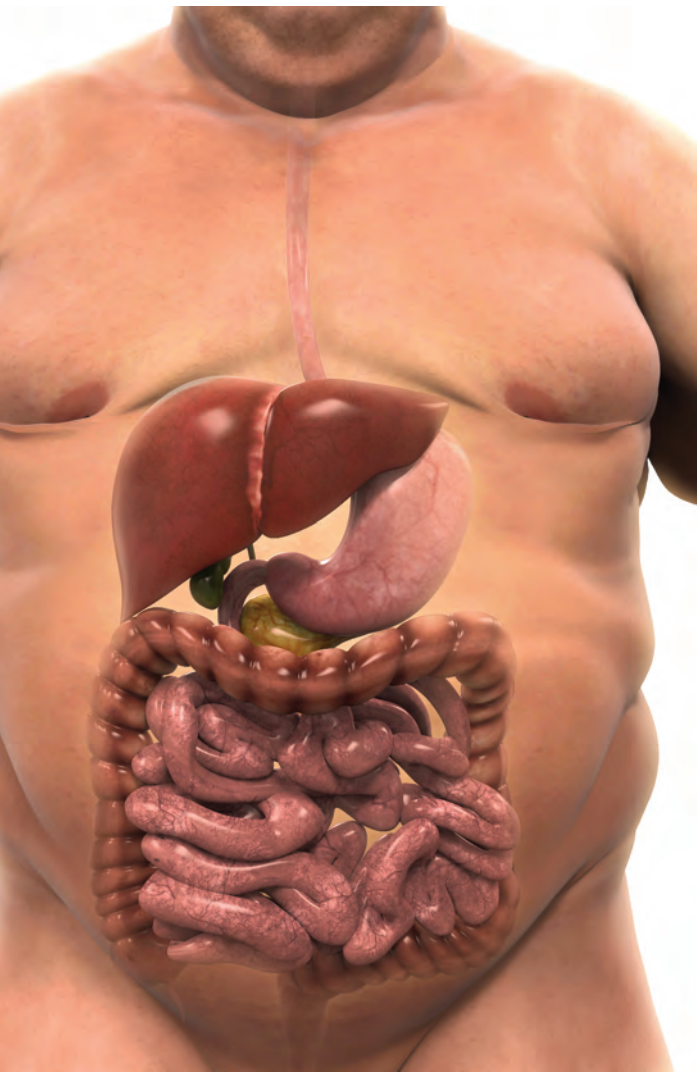
Cross referencing in the index is in the usual manner i.e. *see* for go to and *see also* for additional images listed under that heading, and this book is cross-referenced with all the other *A to Zs*.

Thank you

**A. L. Neill**

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## Abbreviations

a	= artery	EAM	= external acoustic meatus
aa	= anastomosis (ses)	EAS	= external anal sphincter
ACF	= anterior cranial fossa	EC	= extracellular (outside the cell)
adj.	= adjective	ext.	= extensor (as in muscle to extend across a joint)
aka	= also known as	GALT	= gut associated lymphoid tissue
alt.	= alternative	GB	= gall bladder
ANS	= autonomic nervous system	gld	= gland
ant.	= anterior	GIT	= gastro-intestinal tract
art.	= articulation (joint w/o the additional support structures)	Gk.	= Greek
AS	= Alternative Spelling, generally referring to the diff. b/n British & American spelling	H	= hormone
ASIS	= anterior superior iliac spine (of hip bone)	HP	= high pressure
bc	= because	I	= insertion
BF	= blood flow	IBD	= inflammatory bowel disease
BM	= basement membrane	IAS	= internal anal sphincter
b/n	= between	jt(s)	= joints = articulations
br	= branch	l	= lymphatic
BS	= Blood Supply	L	= lumbar / left
CC	= cerebral cortex	LI	= large intestine
c.f.	= compared to	lig	= ligament
CN	= cranial nerve	LP	= lumbar plexus/lamina propria/
CNS	= central nervous system	LP	= Low pressure
Co	= coccygeal	Lt.	= Latin
CP	= cervical plexus	m	= muscle
collat.	= collateral	MCL	= mid clavicular line
Cr	= cranial	med.	= medial
CT	= connective tissue	MM	= mucous membrane
DT	= digestive tract	N (s)	= nerve(s)
diff.	= difference(s)	NAD	= normal (size, shape)
dist.	= distal	NAD	= no abnormality detected
DM	= dura mater	NR	= nerve root origin
Duo	= duodenum	NS	= nervous supply / nerve system
e.g.	= example	NT	= nervous tissue

nv	= neurovascular bundle	w/o	= without
O	= origin	wrt	= with respect to
P	= pressure	&	= and
PaNS	= parasympathetic nervous system	n	= intersection with
ParaNs	= parasympathetic nerves ± fibres		
pl.	= plural		
PN	= peripheral nerve		
post.	= posterior		
proc.	= process		
prox.	= proximal		
R	= right / resistance		
SC	= spinal cord		
SCM	= sternocleidomastoid muscle		
SI	= small intestine		
sing.	= singular		
SN	= spinal nerve		
SP	= spinous process / sacral plexus		
SS	= signs and symptoms		
subcut	= subcutaneous (just under the skin)		
supf	= superficial		
SyNS	= sympathetic nervous system		
T	= TEST / thoracic		
TC	= Transverse colon		
TMJ	= temporomandibular joint		
Tx	= therapy / treatment		
UC	= ulcerative colitis		
UL	= upper limb, arm		
V	= vertebra / vein		
VB	= vertebral body		
VC	= vertebral column		
WM	= white matter		
w/n	= within		

## Common terms in the Study and Examination of the Digestive Tract.

<b>Ablation</b>	the removal of part of the body, generally a bony part, most commonly the teeth.
<b>Additus</b>	opening /entrance.
<b>Adenoid</b>	gland.
<b>Ala</b>	a wing, hence a wing-like process as in the Ethmoid bone <i>pl. -alae.</i>
<b>Alveolus</b>	air filled bone - tooth socket <i>adj. - alveolar</i> (as in air filled bone in the maxilla)
<b>Annulus fibrosus</b>	the peripheral fibrous ring around the intervertebral disc.
<b>Ansa</b>	loop-like structure
<b>Aperture</b>	an opening or space between bones or within a bone.
<b>Areola</b>	small, open spaces as in the areolar part of the axilla may lead or develop into sinuses.
<b>Basiocranium</b>	bones of the base of the skull
<b>Bite</b>	to bring the upper and lower jaws together - <i>noun the Bite</i> - the examination of the closed jaws <i>see Occlusion.</i>
<b>Buccal</b>	pertaining to the cheek
<b>Canal</b>	tunnel / extended foramen as in the carotid canal at the base of the skull <i>adj. - canular</i> (canicular - small canal).
<b>Carotid</b>	to put to sleep; compression of the common or internal carotid artery causes coma. This refers to bony points related to the Carotid vessels.
<b>Cavity</b>	an open area or sinus within a bone or formed by two or more bones ( <i>adj. - cavernous</i> ), may be used interchangeably with fossa. A Cavity tends to be more enclosed, a fossa a shallower bowl-like space (Orbital fossa - Orbital cavity).
<b>Cementum</b>	fibres often w/in the periodontal membrane around the teeth attaching them to the socket.
<b>Cephalic</b>	pertaining to the head
<b>Chief cells</b>	produce pepsinogen, inactive form of pepsin the enzyme which digests protein - converts the active form in an acid environment
<b>Chyme</b>	the liquid which leaves the stomach after it has been digested
<b>Colitis</b>	inflammation of the colon
<b>Colon</b>	term used interchangeably with Large intestine (LI) but actually only consisting of 4 parts - the ascending + transverse + descending + sigmoid colons – not including the caecum or appendix which are usually included in the LI.
<b>Concha</b>	a shell shaped bone as in the ear or nose. <i>(pl. - conchae adj. - conchoid)</i> old term for this turbinate.
<b>Constipation</b>	difficult, incomplete evacuation of the faecal material from the colon.
<b>Constrictor</b>	to squeeze
<b>Cornu</b>	a horn (as in the Hyoid)

Corona	a crown. <i>adj.</i> - <i>coronary, coronoid or coronal</i> ; hence a coronal plane is parallel to the main arch of a crown which passes from ear to ear (c.f. coronal suture).
Cranium	the cranium of the skull comprises all of the bones of the skull except for the mandible.
Crest	a prominent sharp thin ridge of bone formed by the attachment of muscles particularly powerful ones e.g. Temporalis forming the Sagittal crest.
Cribiform/Ethmoid	a sieve or bone with small sieve-like holes.
Cricoid	a ring
-crine	<b>to secrete</b>
Cutus	skin - hence cutaneous branches refers to the nerves supplying the skin and adnexae.
Dens	a tooth hence dentine and dental relating to teeth, denticulate having tooth-like projections <i>adj.</i> - <i>dentate</i> also refers to a serrated edge as in the dentate line b/n anus and rectum.
Depression	a concavity on a surface.
Dentine (aka) dentin	ivory - like substance forming the bulk of the tooth beneath the enamel.
Diarrhoea AS Diarrhea	frequent evacuation of watery faecal material - generally pathological.
Distal	further away from the axial skeleton (opposite of Proximal)
Dorsi	back
Edentulous	without teeth
Eminence	a smooth projection or elevation on a bone as in iliopubic eminence.
Endocrine	secretion of a substance from cells directly to the BS w/o a duct
Enteritis	inflammation of the bowel, generally the SI
Entero-	<b>pertaining to the bowel</b>
Exocrine	secretion of substances from cells via ducts as in exocrine glands generally into a lumen
Facet	A face, a small bony surface (occlusal facet on the chewing surfaces of the teeth) seen in planar joints.
Facies	Face or appearance may be used to designate a number of facial expressions or systemic conditions eg steroid facies.
Fascia	a sheet of fibrous CT which surrounds muscles, organs and regions - often supporting their BS & NS.
Fasciule	fascies / fascicles / bundles / small bundles
Fauces	jaws or throat
Fissure	a narrow slit or gap from cleft.
Flexure	a fixed bend generally due to a tether by lig or mesentery to the peritoneal wall as in the Hepatic flexure of the LI
Foramen	a natural hole in a bone usually for the transmission of blood vessels and/or nerves. ( <i>pl. foramina</i> ).



<b>Fossa</b>	a pit, depression, or concavity, on a bone, or formed from several bones as in temporomandibular fossa. Shallower and more like a "bowl" than a cavity.
<b>Fovea</b>	a small pit (usually smaller than a fossa)- as in the fovea of the occlusal surface of the molar tooth.
<b>GALT</b>	a general term for all the lymphoid tissue associated with the GIT
<b>Gastric</b>	belly (as in the belly of a muscle)
<b>Gingiva</b>	gum
<b>Glottis</b>	pertaining to the vocal cords and structures involved in the production of the voice.
<b>Gomphosis</b>	joint b/n the roots of the teeth and the jaw bones <i>pl. - gomphoses</i>
<b>Groove</b>	long pit or furrow
<b>Haematemesis</b>	blood in vomit
<b>Haematochezia</b>	bright red clots of blood in the stools
<b>Hamus</b>	a hook hence the term used for bones which "hook around other bones or where other structures are able to attach by hooking - hamulus = a small hook.
<b>Hyoid</b>	U-shaped
<b>Ileitis</b>	inflammation of the ileum
<b>Incisura</b>	a notch.
<b>Inferior</b>	under
<b>Inter</b>	between
<b>Intra</b>	within
<b>Intracrine</b>	secretion in a cell which acts internally on actions in that cell.
<b>Intracrine Introitus</b>	an orifice or point of entry to a cavity or space.
<b>Labial</b>	pertaining to the lips.
<b>Lacerum</b>	something lacerated, mangled or torn e.g. foramen lacerum small sharp hole at the base of the skull often ripping.
<b>Lacrimal</b>	related to tears and tear drops. ( <i>noun - lacrima</i> ).
<b>Lamina</b>	a plate as in the lamina of the vertebra, a plate of bone connecting the vertical and transverse spines ( <i>pl. - laminae</i> ).
<b>Levator</b>	to raise
<b>Ligament</b>	A ligament is a tie or a connection. Originally <i>sing. - igitamentum pl. - ligamenta</i> .
<b>Linea</b>	a line as in the nuchal lines of the Occipitum.
<b>Lingual</b>	pertaining to the tongue
<b>Malar</b>	cheek
<b>Malleus</b>	hammer (as in the ear ossicle)
<b>Malocclusion</b>	misalignment of the teeth as in over-bite or under-bite
<b>Mandible</b>	from the verb to chew, hence, the movable lower jaw; <i>adj. - mandibular</i> .
<b>Masseter</b>	to chew
<b>Mastoid</b>	a breast or teat shape - mastoid process of the Temporal bone.

<b>Maxilla</b>	the jaw-bone; now used only for the upper jaw; <i>adj.</i> - <i>maxillary</i> .
<b>Meatus</b>	a short passage; <i>adj.</i> - <i>meatal</i> as in EAM connecting the outer ear with the middle ear.
<b>Mental</b>	relating to the chin ( <b>mentum = chin not mens = mind</b> ).
<b>Mesial</b>	along the dental arch in the direction of the medial plane anteriorly (opposite to distal).
<b>Modiolus</b>	hub or central core used in the face to indicate that fibrous hub at the edge of the mouth for the insertion of a number of muscles /used in the ear to indicate the centre of the spongy bone of the cochlea tubes.
<b>Mucosa</b>	tissue in the GIT immediately beneath the epithelial lining.
<b>Mucus</b>	substance excreted by Mucous glands to lubricate food or protect mucosal surfaces - i.e. <i>noun</i> - <i>mucus</i> / <i>adj.</i> - <i>mucous, muroid</i> .
<b>Muscularis Mucosa</b>	term for the muscle layer in the mucosa separating the mucosa from the submucosa.
<b>Naris</b>	nostrils <i>pl.</i> - <i>nares</i>
<b>Notch</b>	an indentation in the margin of a structure.
<b>Nucha</b>	the nape or back of the neck <i>adj.</i> - <i>nuchal</i> .
<b>Oculus</b>	an eye
<b>Odontoid</b>	relating to teeth, toothlike <i>see</i> <i>Dens</i>
<b>Omo</b>	shoulder
<b>Orbit</b>	a circle; the name given to the bony socket in which the eyeball rotates; <i>adj.</i> - <i>orbital</i> .
<b>Orifice</b>	an opening.
<b>Palate</b>	a roof <i>adj.</i> <i>palatal</i> or <i>palatine</i> .
<b>Papilla</b>	outpouching – point generally with an opening as in the duodenal papilla; <i>pl.</i> - <i>papillae</i> .
<b>Parietal</b>	pertaining to the outer wall of a cavity from <i>paries</i> , a wall.
<b>Parotid</b>	pertaining to a region beside or near the ear.
<b>Pars</b>	a part of
<b>Pecten</b>	a comb.
<b>Perikymata</b>	transverse ridges and the grooves on the surfaces of teeth.
<b>Periodontum</b>	CT membrane surrounding the tooth to allow for support and cushioning of tooth movements with mastication.
<b>Periosteum</b>	layer of fascial tissue, CT on the outside of compact bone not present on articular. (joint) surfaces.
<b>Peristalsis</b>	the automatic coordinated contraction & relaxation of the GIT smooth muscle triggered by the presence of a food bolus & propagated by the internal NS of the GIT the Auerbach & Myenteric plexi – directing food in one direction
<b>Petrous</b>	pertaining to a rock / rocky / stoney <i>adj.</i> - <i>petrosal</i>
<b>Plica (e)</b>	fold(s) generally fixed folds as found in the SI.

<b>Process</b>	a general term describing any marked projection or prominence as in the mandibular process.
<b>Proximal</b>	closer to the axial skeleton (opposite of distal).
<b>Raphe</b>	line of joint b/n two halves, generally of bone or muscles for e.g. a fibrous raphe in the tongue allowing for muscle insertion.
<b>Recess</b>	a secluded area or pocket; a small cavity set apart from a main cavity.
<b>Rectus</b>	straight - erect
<b>rhino-</b>	<b>pertaining to the nose</b>
<b>Ridge</b>	elevated bony growth often roughened.
<b>Rotundum</b>	round
<b>Ruga (e)</b>	fold – generally more mobile and less structured than Plicae
<b>Sagittal</b>	an arrow, the sagittal suture is notched posteriorly, making it look like an arrow by the lambdoid sutures. <b>See Anatomical planes.</b>
<b>Sclerosis</b>	hard
<b>Septum</b>	a division
<b>Sinus</b>	a space usually w/n a bone lined with mm, such as the frontal and maxillary sinuses in the head, (also, a space usually w/in a bone, may contain air, blood or mucous. <b>adj.- sinusoid</b> Sinusoid capillaries are found in the liver and wide enough to have cellular elements pass into the lumen.
<b>Skull</b>	the skull refers to all of the bones that comprise the head.
<b>Spine</b>	a thorn <b>adj. - spinous</b> , descriptive of a sharp, slender process/protrusion.
<b>Sphincter</b>	ring of muscle around a tube or opening.
<b>Splanchocranium</b>	the splanchocranium refers to the facial bones of the skull.
<b>-stoma</b>	<b>to do with the mouth</b>
<b>Subcutaneous</b>	under the skin
<b>Submucosa</b>	layer common to all the gut layers deep to the mucosa
<b>Sulcus</b>	long wide groove often due to a BV indentation.
<b>Suture</b>	the saw-like edge of a cranial bone that serves as jt b/n bones of the skull.
<b>Sulcus</b>	furrow
<b>Superior</b>	above
<b>Syn</b>	<b>means together i.e. the close proximity of or fusion of two structures</b>
<b>Temporal</b>	refers to time and the fact that grey hair (marking the passage of time) often appears first at the site of the Temporal bone.
<b>Tendon</b>	a tie or cord of collagen fibres connecting muscle with bone (as opposed to articular ligaments which connect bone with bone).
<b>Tenesmus</b>	an urgent but ineffectual desire to constantly defaecate or urinate seen in UC
<b>Tensor</b>	to stretch
<b>Tonsil</b>	little pole

<b>Trachea</b>	rough
<b>Transverse</b>	to go across
<b>Tuberosity</b>	a large rounded process or eminence, a swelling or large rough prominence often associated with a tendon or ligament attachment.
<b>Turbinate</b>	a child's spinning top, hence shaped like a top. An old term for the nasal conchae.
<b>Uvula</b>	little grape
<b>Vagina</b>	a sheath; hence, invagination is the acquisition of a sheath by pushing inwards into a structure, and evagination is similar but produced by pushing outwards <i>adj.</i> - <i>vaginal</i> .
<b>Vomer</b>	plough
<b>Wormian bone</b>	extrasutural bone in the skull.
<b>Xerostomia</b>	dry mouth
<b>Zygal</b>	H - shaped
<b>Zygoma</b>	a yoke, hence, the bone joining the maxillary, frontal, temporal & sphenoid bones <i>adj.</i> - <i>zygomatic</i> .

## Anatomical planes and Anatomical positions

**A** = Anterior Aspect from the front = or / Posterior Aspect from the back.  
Used interchangeably with ventral and dorsal respectively

**B** = Lateral Aspect from either side

**C** = Transverse / Horizontal plane

**D** = Midsagittal plane = Median plane; trunk moving away from this plane = lateral flexion or lateral movement  
plane medial movement;

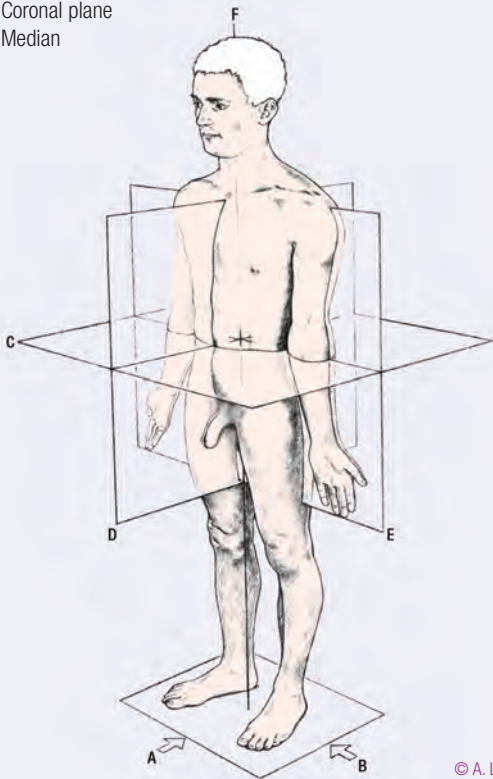
limbs moving away from this direction = abduction

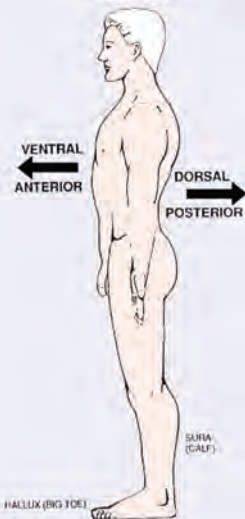
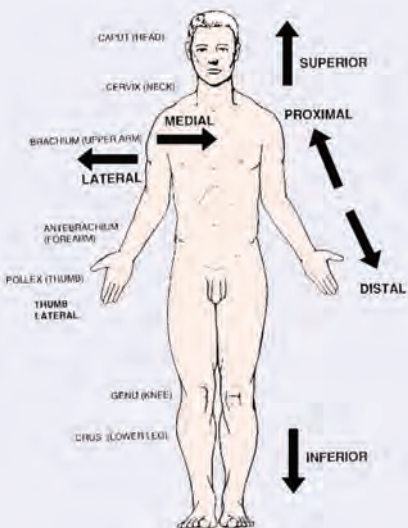
limbs moving closer to this plane = adduction

Note parasagittal plane / sagittal plane - indicates planes in the same direction but other than in the middle

**E** = Coronal plane

**F** = Median





## Notes...

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## The Digestive Tract – Overviews

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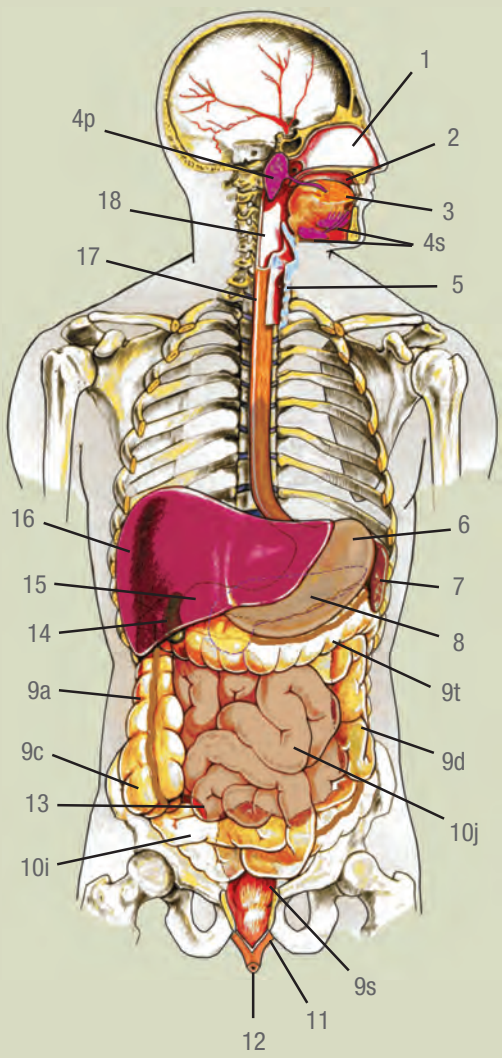


## Digestive Tract (DT) overview

### Anterior

**Definition:** the DT consists of the tunnel from mouth to anus. It has a number of glands and organs which feed into it and are necessary for its function. It is a 3D structure.

- 1 Nasal septum dividing the nasal cavity & cartilages
- 2 Oral cavity
- 3 Tongue
- 4 Salivary glands s = sublingual & submandibular  
p = parotid
- 5 Trachea
- 6 Stomach (semi-concealed by the liver)
- 7 Spleen
- 8 Pancreas (retroperitoneal)
- 9 LI a = ascending d = descending s = sigmoid  
t = transverse
- 10 SI i = ileum j = jejunum
- 11 Rectum
- 12 Anus
- 13 Appendix
- 14 Gall bladder
- 15 Duodenum
- 16 Liver
- 17 Oesophagus
- 18 Pharynx
- 19 Pharyngeal sphincters superior / middle / inferior
- 20 sulcus for the IVC
- 21 renal impression on the Liver
- 22 Taeni coli + haustrations
- 23 Thyroid cartilage
- 24 Buccinator with parotid duct protruding

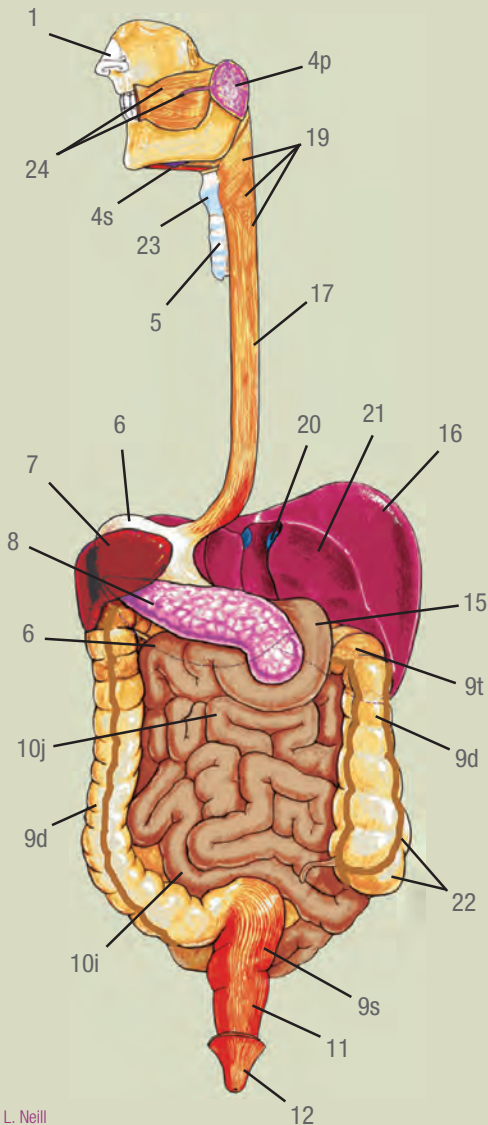


## Digestive Tract overview

### Posterior

**Definition:** the DT consists of the tunnel from mouth to anus, it has a number of glands and organs which feed into it and are necessary for its function. It is a 3D structure.

- 1 Nasal septum dividing the nasal cavity & cartilages
- 2 Oral cavity
- 3 Tongue
- 4 Salivary glands s = sublingual & submandibular  
p = parotid
- 5 Trachea
- 6 Stomach (semi-concealed by the liver)
- 7 Spleen
- 8 Pancreas (retroperitoneal)
- 9 LI a = ascending d = descending s = sigmoid  
t = transverse
- 10 SI i = ileum j = jejunum
- 11 Rectum
- 12 Anus
- 13 Appendix
- 14 Gall bladder
- 15 Duodenum
- 16 Liver
- 17 Oesophagus
- 18 Pharynx
- 19 Pharyngeal sphincters superior / middle / inferior
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- 22 Taeni coli + haustrations
- 23 Thyroid cartilage
- 24 Buccinator with parotid duct protruding



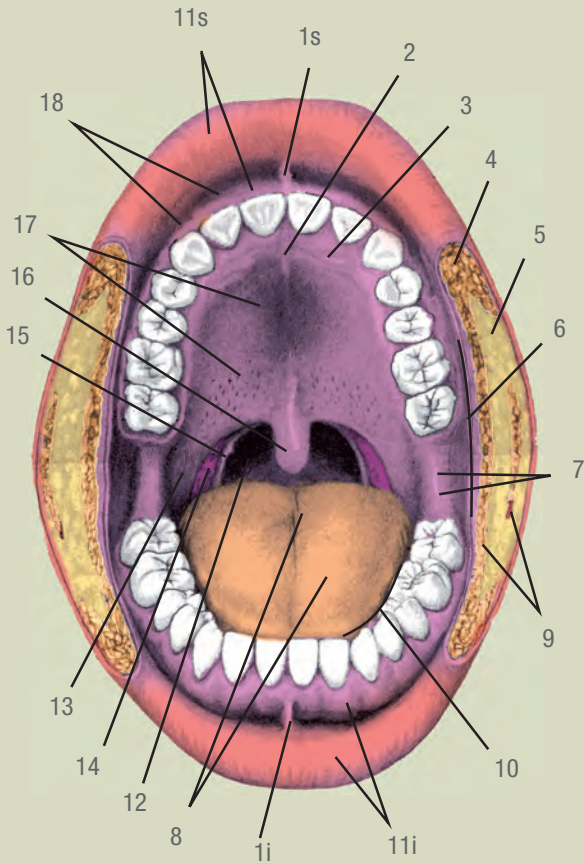
## Mouth – Oral Cavity

*Open mouth – anterior view – looking into the oral cavity*

**Description:** The oral cavity is the first point of the DT where food enters. It is masticated / pulverized & lubricated – and exposed to the ring of immune defense, the tonsils and tonsillar tissue. These form a rim at the back of the throat. The saliva commences food breakdown and water soluble elements including alcohol are directly absorbed, through the oral mucosa.

- 1 Labial frenulum i = inf / s = superior
- 2 Incisive papilla
- 3 Palatine rugae = transverse palatine plicae
- 4 Orbicularis oris large circle of muscle around the lips
- 5 Subcutaneous fat – in the cheek
- 6 Buccal fold
- 7 Pterygomandibular fold (+ retromolar trigone & retromolar fossa)
- 8 Dorsum of the tongue + median lingual sulcus
- 9 Superficial muscles in the facial fascia – muscles of expression\*
- 10 Lingual fold
- 11 Lips (labia) & gums (gingiva) – i = inf / s = superior
- 12 Oropharynx – posterior wall
- 13 Palatoglossal arch (fold )
- 14 Palatine tonsil
- 15 Palatopharyngeal fold
- 16 Uvula – pendulous extension of the soft palate
- 17 Palates – hard & soft
- 18 Labial fold = vestibular oral fold

*\*for more details of the bones & muscles see the A to Z of the Head & Neck bones & muscles*



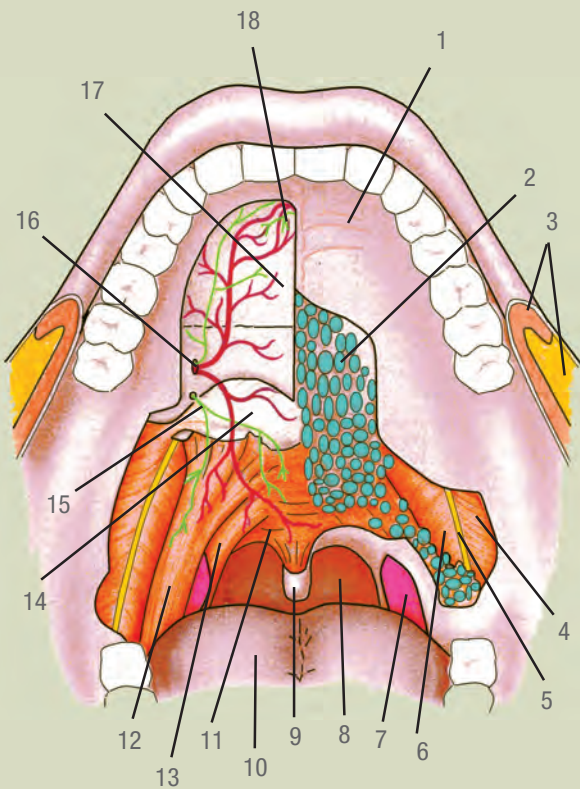
## Roof of the Mouth – Palates (hard + soft)

*Inferior view - looking up onto the roof of the mouth*

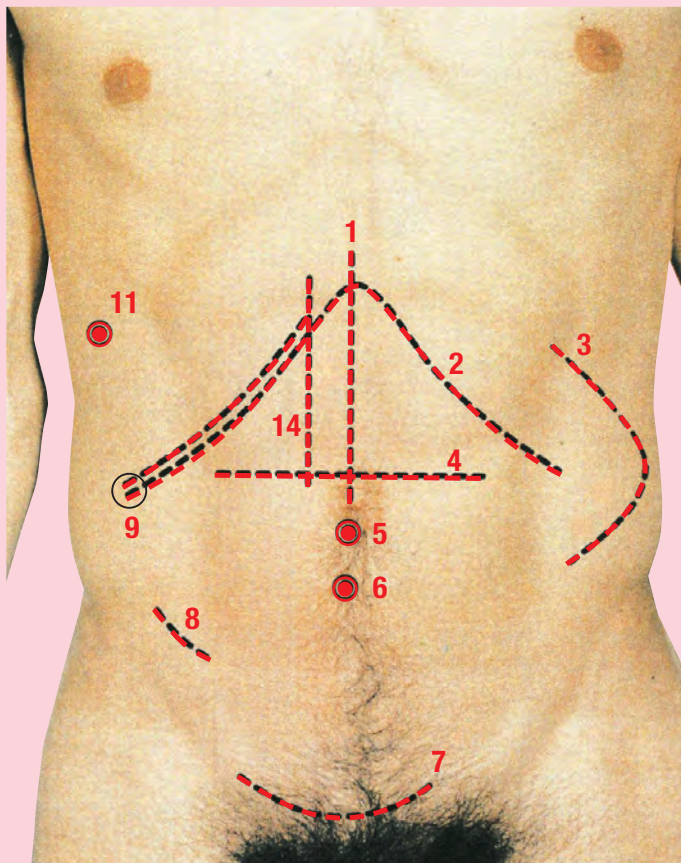
**Description:** The hard palate is formed by the fusion of the 2 Maxilla bones + 2 Palatine bones\*; the soft palate by the muscles and tissues of the region along with part of the ring of lymphoid tissues (tonsils) which surround the entrance to the pharynx.

- 1 Rugae on the hard palate – made up of hard mucosal tissue
- 2 Mucous glands under the epithelial lining
- 3 Muscles of the lips – eg Orbicularis oris + fat
- 4 Buccinator
- 5 Insertion raphe
- 6 Superior pharyngeal constrictor
- 7 Tonsil (note this is much larger and quite visible in a child and in infections)
- 8 Entrance to oral pharynx
- 9 Uvula = pendulous extension of the soft palate
- 10 Tongue
- 11 Muscles of the soft palate – involved in snoring
- 12 Palatoglossus
- 13 Palatopharyngeus
- 14 Palatine bone
- 15 Lesser palatine Ns – emerging from the lesser pharyngeal fossa
- 16 Greater palatine Ns and BVs – emerging from the greater palatine fossa
- 17 Maxilla inf surface
- 18 Nasopalatine Ns & BVs emerging from the Alveolare (not shown)

*\*for details of the bones & muscles see the A to Z of the Head & Neck bones & muscles*







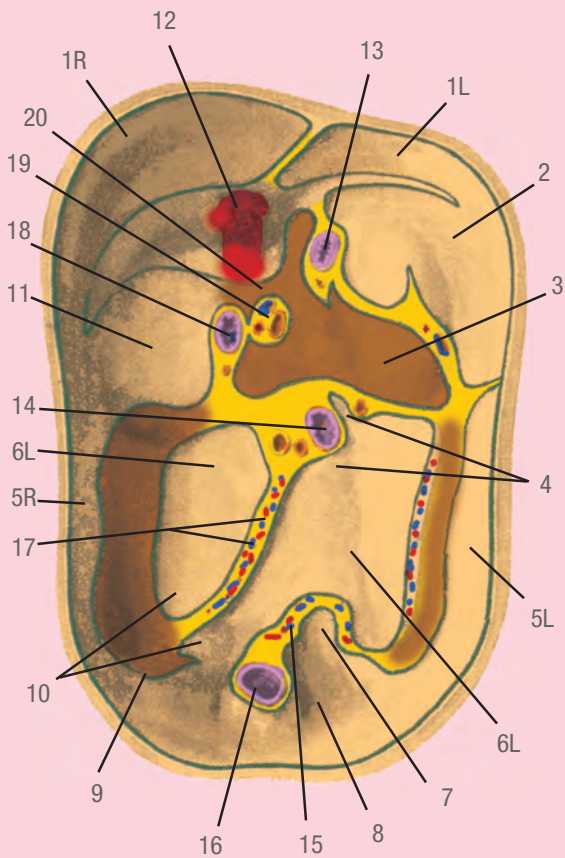
## A Abdominal wall – Posterior

### B Abdominal recesses

C *Schematic - Anterior view of the posterior abdominal wall, organs removed*

D **Description:** the posterior abdominal wall contains many organs  
E some of which are fixed to its surface and immobile – retro –  
F peritoneal and others attached via a mesentery from which it gains  
G its BS, lymphatic drainage and NS – increased mobility. In order to  
H access these structures and understand the way diseases or  
I cancers spread, it is necessary understand their connections.

- I 1 Subphrenic recesses L = left / R = right
- J 2 Hepatogastric recess = Subhepatic recess
- K 3 Omental bursa = Lesser sac
- L 4 Duodenal recesses – inf / superior
- M 5 Paracolic gutter L = left / R = right
- N 6 Infracolic recesses L = left / R =right
- O 7 Intersigmoiodal recess
- P 8 Pelvic space
- Q 9 Retrocaecal recess
- R 10 Ileocaecal recesses – inf./ superior
- S 11 Hepatorenal recess = Morrison's recess
- T 12 Coeliac trunk
- U 13 Cardia = cardiac oesophagus into the stomach
- V 14 Duodeno-jejunal flexure – opening
- W 15 Sigmoid colon mesentery root
- X 16 Rectum
- Y 17 Root of SI mesentery
- Z 18 Pylorus
- 19 Hepatoduodenal lig
- 20 Epiploic foramen



## A Anal Sphincter – External =

### B External Anal Sphincter = (EAS)

C *Schematic - looking onto the Sphincter from the side and up from below*

D **Definition:** the anus is the external opening of the DT, preceded by  
E the anal canal and controlled by the anal sphincters a series of  
F muscles which under voluntary and involuntary control determine  
the passage of faecal material.

G The EAS is under voluntary control (NS = S2, 3, 4) and consists of  
H 3 parts. It lies inferior and is more superficial than Levator ani and  
the IAS.

I It is normally contracted and relaxes to allow the passage of  
J material.

- K 1 Rectum
- L 2 Puborectalis = anal sling
- M 3 EAS - deep
- N 4 EAS – superficial (inserting into the Peroneal body)
- O 5 EAS – subcutaneous
- P 6 Anus
- Q 7 Coccyx

Q

R

S

T

U

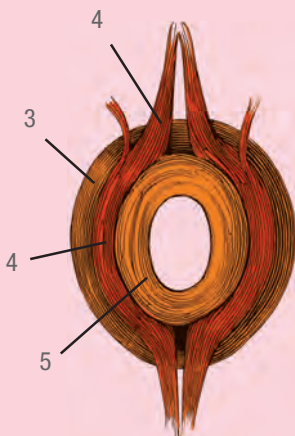
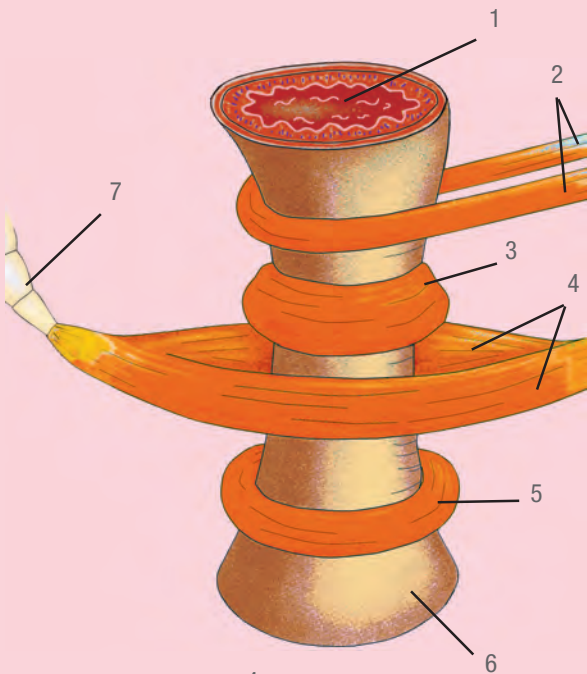
V

W

X

Y

Z



## A Anus & Rectum

B *Anterolateral* - looking onto the DT cavities, wall opened to see  
C *the internal surfaces.*

D **Definition:** the anus is the external opening of the DT, preceded by  
E the anal canal and controlled by the anal sphincters. The Rectum  
F is superior - lying b/n the Sigmoid colon and anorectal line  
(dentate line). Often the site of hemorrhoids - due to the meeting  
of the portal and systemic BS.

G 1 Sigmoid colon

H 2 Rectal valves i = inf / m = middle / s = superior

I 3 Muscular layers of the rectum – outer longitudinal /  
J inner circular – smooth muscle

K 4 Levator Ani m

L 5 EAS deep, superficial & subcut. parts

M 6 Fibrous septum

N 7 Corrugator cutis ani m

O 8 Anal glands – supplying lubrication in defecation

P 9 Anal columns – leading to the anal crypts on the  
Dentate line (note the serrated edge)  
division b/n the anus and the rectum\*

Q 10 Anal verge

R 11 Internal venous plexus in submucosa

S 12 IAS

T 13 Fat

U 14 Rectal fascia

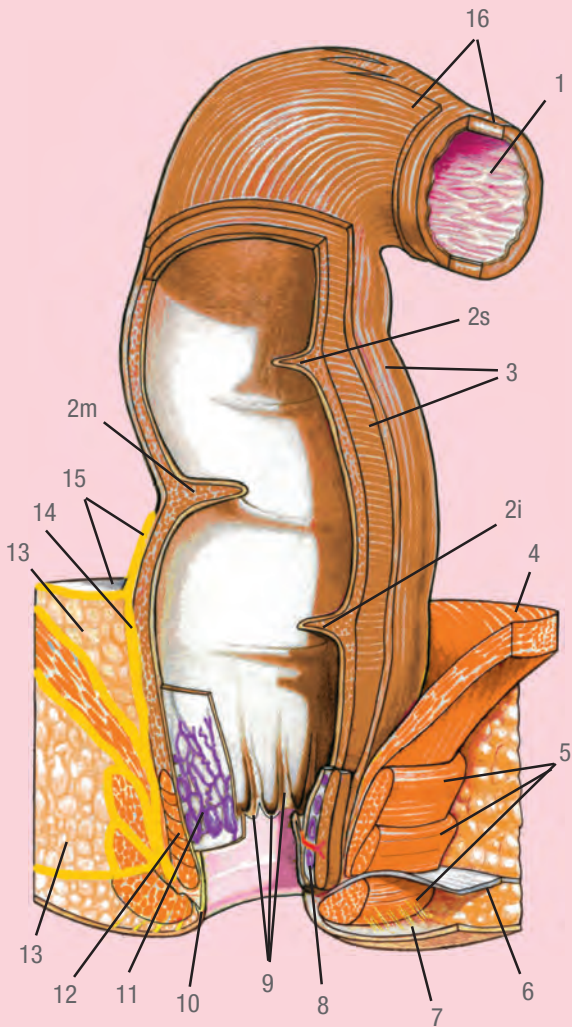
V 15 Peritoneal fascia – reflected

W 16 Taeni coli of the Sigmoid colon – merging to form  
continuous layer in the Rectum

X \* *site of Hemorrhoids*

Y

Z



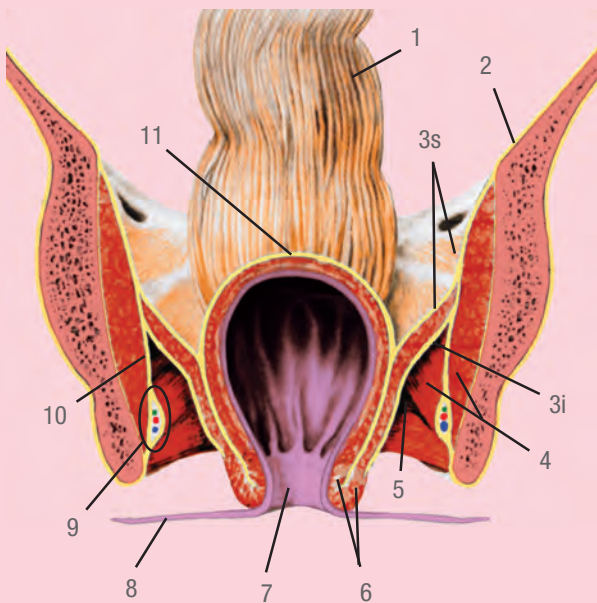
## A Anus + Rectum in situ – fascial layers

B *Coronal*

C **Definition:** the anus and rectum are supported by the Levator Ani which borders the Ischiorectal fossa (= ischioanal fossa) the space filled with soft semi-liquid fatty material which allows for the shape changes of substances which pass through

- F 1 Rectum
- G 2 Pelvic fascia
- H 3 Pelvic Diaphragmatic fascia inf /superior
- I 4 Obturator internus
- J 5 Ischio rectal fossa
- K 6 EAS + IAS
- L 7 Anus
- M 8 Skin
- N 9 Pudendal canal = Alcock's canal – containing Pudendal Artery, Nerve + Vein
- O 10 Obturator fascia
- P 11 Rectal fascia

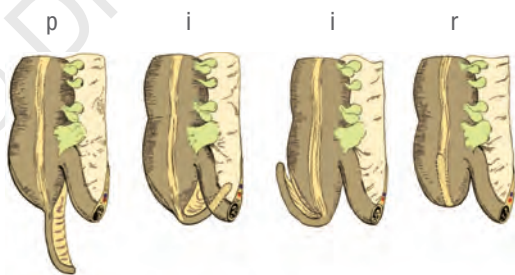


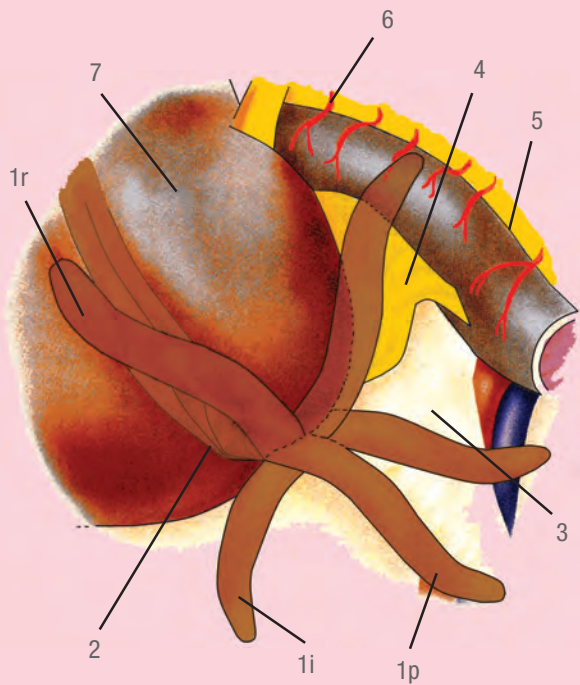


## A Appendix = Vermiform Appendix – positions

**Description:** the appendix has its own mesentery and is very mobile. The pain of an inflamed appendix may present in several different locations. A ruptured appendix may spill its contents over several different organs of the peritoneum and this may result in serious consequences, such as the fibrosis of the ovary rendering it infertile.

- 1 Appendix (8-10cm)  
i = iliac  
p = pelvic  
r = retrocaecal – the commonest position – corresponding to McBirney's point
- 2/3 of the line from the ASIS to the umbilicus
- 2 point of convergence of the taeniae coli – base of the appendix
- 3 inferior ileocaecal recess
- 4 mesoappendix = mesentery of the appendix
- 5 Ileum
- 6 branches of the appendicular artery
- 7 Caecum (5-7cm)



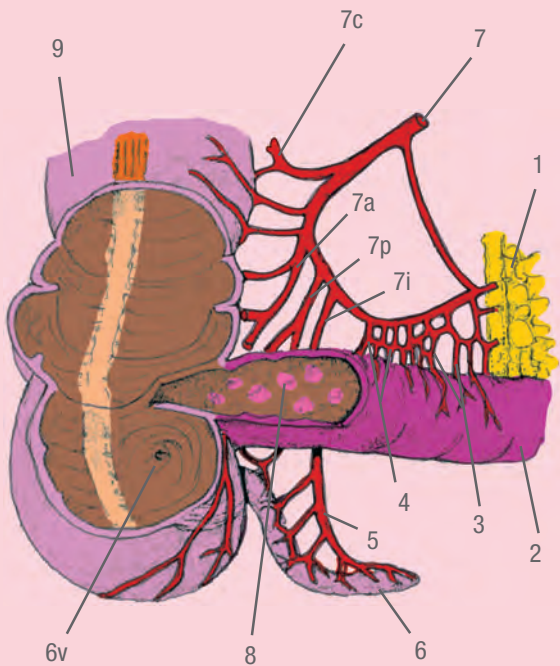


## **A Appendix, Caecum Ileocaecal junction –**

### **B Blood supply – Arterial**

**C** *Anterior - wall cut away from caecum and mesentery removed from the BVs.*

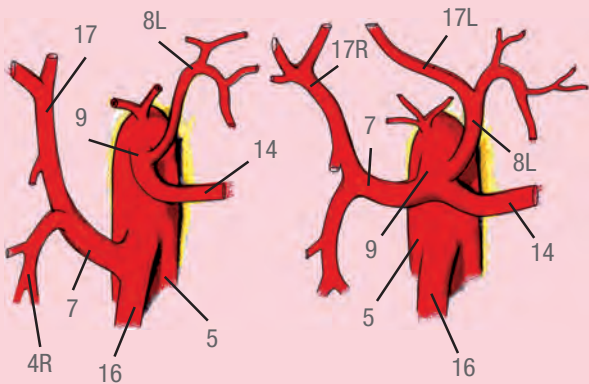
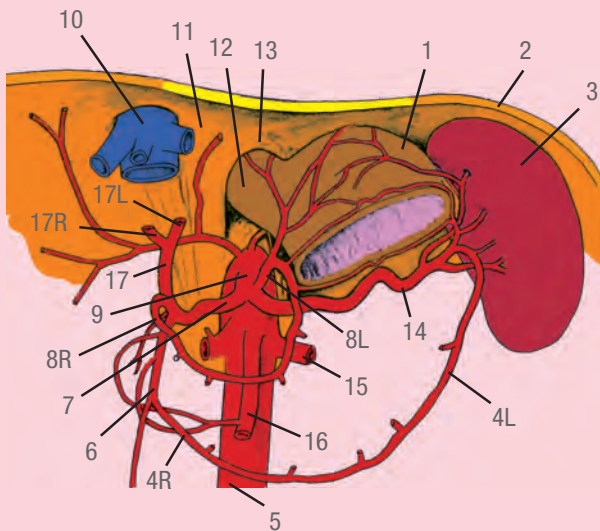
- D** 1 Mesentery (cut)
- E** 2 Ileum
- F** 3 straight arteries = arteriae rectae
- G** 4 arterial arcades
- H** 5 Appendicular a
- I** 6 Appendix v = appendix orifice
- J** 7 Ileocolic artery
- K**   Brs –
- a = ant. caecal a
- L**   c = colic a
- i = ileal a
- M**   p = post. caecal a
- N** 8 Lymphatic follicles = Peyers' patches
- O** 9 Ascending colon
- P**
- Q**
- R**
- S**
- T**
- U**
- V**
- W**
- X**
- Y**
- Z**



## A **Coeliac Trunk = Celiac Trunk**

B *Description:* The first unbranched artery arising from the abdominal aorta, part of the GIT BS. It supplies the lower end of the oesophagus stomach and duodenum. The branches of the superior mesenteric and the coeliac art have a number of variations – the commonest are demonstrated here.

- C
- D
- E
- F
- G
- H
- I
- J
- K
- L
- M
- N
- O
- P
- Q
- R
- S
- T
- U
- V
- W
- X
- Y
- Z
- 1 Fundus of the stomach
  - 2 Diaphragm
  - 3 Spleen
  - 4 Gastroepiploic art. L = left , R = right
  - 5 Aorta
  - 6 Gastroduodenal a
  - 7 Common hepatic a
  - 8 Gastric art L = left, R = right
  - 9 Coeliac trunk
  - 10 IVC
  - 11 R crus of the diaphragm
  - 12 Oesophagus
  - 13 Physiological sphincter of the diaphragm
  - 14 Splenic a
  - 15 Renal a – note this is not part of the GIT BS
  - 16 Superior mesenteric a
  - 17 Hepatic art. L = left, R = right branches



## A Colon – Large Intestine (LI)

B *Description:* the Colon is a muscular tube up to 1.5 m long –  
C divided into 4 parts which ring the abdominal cavity, fixed on  
the sides.

D 1 Ileum

E 2 Ileocaecal valve – site of Vitamin B12 & bile resorption

F 3 Vermiform appendix = Appendix

G 4 Caecum (5-7cm)

H 5 Lymphoid tissue and nodes in the mucosa

I 6 Ascending colon = R sided colon (12cm) fixed to the  
post abdominal wall – no mesentery

J 7 Hepatic flexure = R colic flexure inf to the liver

K 8 Transverse Colon = Horizontal Colon (45cm) has a  
mesentery which allows movement

L 9 Splenic flexure = L colic flexure – higher than the R -  
M inf to the spleen

N 10 Appendices epiploicae – small fat filled tags -  
O increasing in size with increased fat storage

P 11 Taeniae Coli – one of 3 discontinuous layers of  
longitudinal muscles in the LI

Q 12 Sigmoid colon = S – shaped colon (20-30cm) has a  
R separate mesentery may store up to 2 kg of matter

S 13 Rectum – fixed

T 14 recto-anal junction

U 15 Levator Ani

V 16 Anus

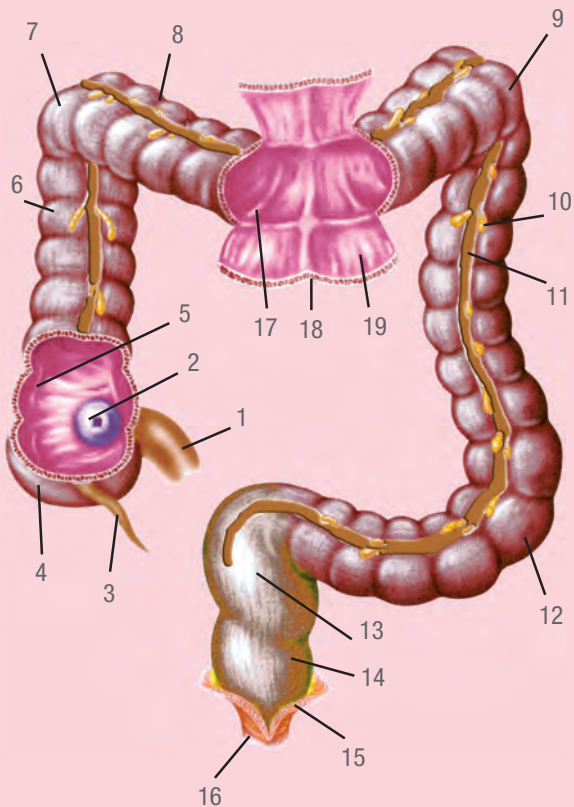
W 17 internal semi-lunar valves

X 18 inner circular layer of smooth muscle

Y 19 Mucosal surface

Z





## A Colon – Blood Supply

B *Description:* the arterial and venous BS of the Colon mirror each other. The superior mesenteric artery arises from the abdominal aorta and supplies the ascending and most of the TC; the inferior mesenteric artery supplies the rest. There are extensive overlaps and aas b/n the 2 vessels.

E The superior mesenteric vein drains to the splenic vein; the inferior mesenteric vein to the portal vein.

G 1 Colon

H a = ascending

H d = descending

I t = transverse

J s = sigmoid

K 2 Rectum

L 3 Anus

L 4 Appendix

M 5 Superior mesenteric art /vein

N 6 R colic art/vein

O 7 Ileocolic art/ vein

P 8 Middle colic a / v

Q 9 L colic a / v

R 10 Sigmoid a / v

S 11 Appendical branches of the ileocolic vessels

T 12 Abdominal aorta / Portal vein

T 13 Coelic trunk

U 14 Splenic v

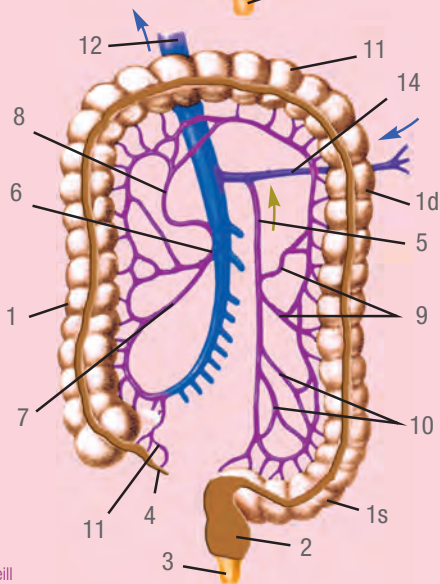
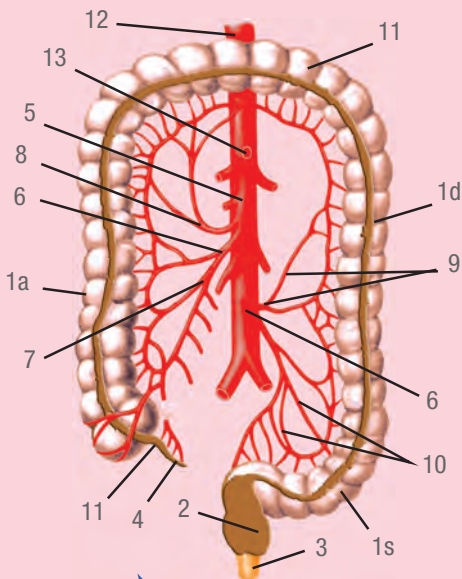
V

W

X

Y

Z



## A Colon – Large Intestine - lymphatics

B *Schematic - Anterior view of the peritoneum*

C *SI and organs removed showing LI and the lymphatics*

D **Description:** As with all structures along the GIT the intestines  
E have an extensive lymphatic drainage and rich vascularity. The BS  
F of the SI enters via its supportive mesentery and the LNs lie along  
G the root of this mesentery. The LI is a fixed retroperitoneal  
structure for most of its length – its LNs flank its walls and follow  
its BS. The lymph drains to the thoracic duct.

H 1 thoracic duct

I 2 abdominal aorta

J 3 coeliac nodes

K 4 epiploic LNs

L 5 paracolic LNs

M 6 posterior abdominal wall – outside the peritoneum + rib

N 7 inferior mesenteric LNs (+ art)

O 8 L colic LNs

P 9 sigmoid LNs

Q 10 pre-aortic LNs

R 11 superior rectal LNs

S 12 bladder

T 13 inguinal lig

U 14 appendicular LNs + mesentery

V 15 caecal LNs

W 16 ileocolic LNs

X 17 R colic LNs

Y 18 paracolic gutter

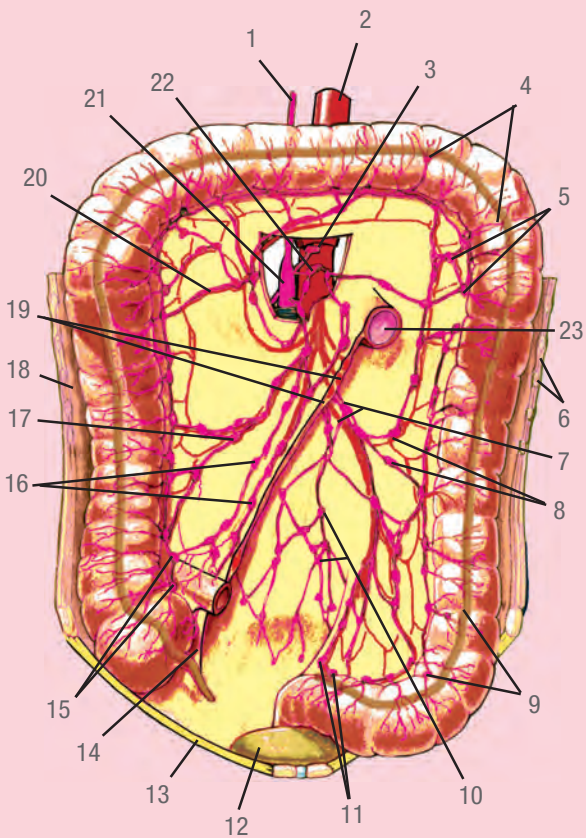
Z 19 small intestine mesentery and BVs

1 20 middle colic LNs

2 21 cisternae chyli

3 22 superior mesenteric LNs

4 23 duodenojejunal junction



## A Duodenum – structure

B *Anterior – Stomach & TC removed*

C *note the pancreas has been cut away to demonstrate the ducts*

D **Definition:** the Duodenum is the 1st part of the SI = about 25cm long and C – shaped. It is divided into 4 parts, retroperitoneal, immovable, lies on the Psoas muscles, kidneys and adrenals and encircles the pancreas. It receives secretions from the GB, pancreas and its own highly alkaline mucous glands – Brünner's glands. BS is from the coeliac trunk.

H 1 Duodenum

I a = 1<sup>st</sup> part = superior

J b = 2<sup>nd</sup> part = descending

K c = 3<sup>rd</sup> part = horizontal

L d = 4<sup>th</sup> part = ascending

M 2 Coeliac trunk

N 3 Adrenal gland

O 4 Kidney

P 5 Pancreas

Q 6 Transverse mesocolon

R 7 Descending colon

S 8 Jejunum

T 9 Psoas major muscle

U 10 abdominal aorta

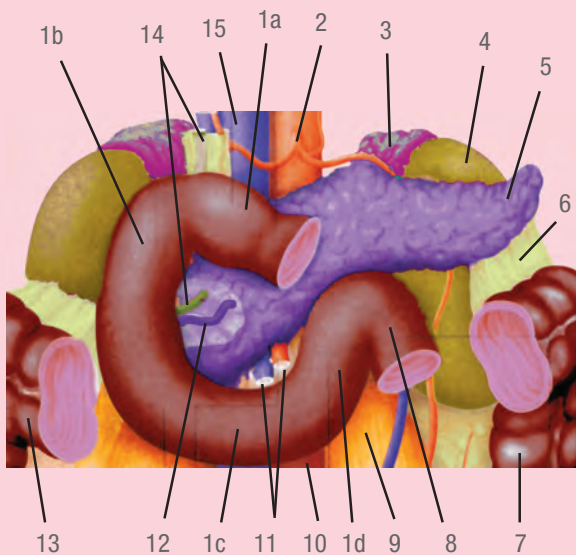
V 11 Superior mesenteric BVs

W 12 Pancreatic ducts – major + accessory + common

X 13 Transverse colon

Y 14 Common bile duct

Z 15 IVC



## A Duodenum – structure internal

B *Anterior – Stomach and TC removed*

C note the pancreas has been cut away to demonstrate the ducts and the wall opened to demonstrate the layers and structures.

D **Definition:** the Duodenum is the 1st part of the SI = about 25cm  
E long and divided into 4 parts. It is retroperitoneal and immovable. It  
F receives secretions from the GB, pancreas and its own highly  
G alkaline mucous glands – Brünner's glands; specific to this section  
H of the GIT. This mucus is important to reverse the acid chyme  
entering via the pyloric sphincter from the stomach.

### I 1 Duodenum

J a = 1<sup>st</sup> part = superior    b = 2<sup>nd</sup> part = descending

K c = 3<sup>rd</sup> part = horizontal    d = 4<sup>th</sup> part = ascending

L 2 Duodenal papilla – entrance of the pancreatic & bile  
ducts through a muscular sphincter

M 3 Kidney

N 4 Pancreas

O 5 Brünner's glands = duodenal glands – alkaline  
mucous glands of the duodenum in the Submucosa

P 6 mucosa – permanent folds are present in parts  
2,3,4

Q plicae circulares (smooth mucosa in the 1st part)

R 7 thick smooth muscle layers – inner circular,  
outer longitudinal

S 8 outer serosal covering

T 9 Abdominal aorta

U 10 Superior mesenteric BVs

V 11 Pancreatic ducts – major + accessory\* + common

W 12 Transverse colon

X 13 Common bile duct

Y *\* note the pancreatic duct may enter with the common bile duct in a  
common opening or a separate opening. The accessory pancreatic duct  
is only present in 30% of patients.*



