

CASE REPORT

- A **37-year-old male** with no past medical history, presented to the emergency department (ED) with acute abdominal pain (**right lower quadrant pain**) as well as **fever**, followed by **nausea and vomiting**. He had no significant findings on laboratory workup except moderate **leukocytosis**.
- Physical examination **revealed painful tender abdomen especially near peri-umbilical region**.
- **Ultrasound** revealed the presence of an **inflamed tubular structure**.

ACUTE APPENDICITIS

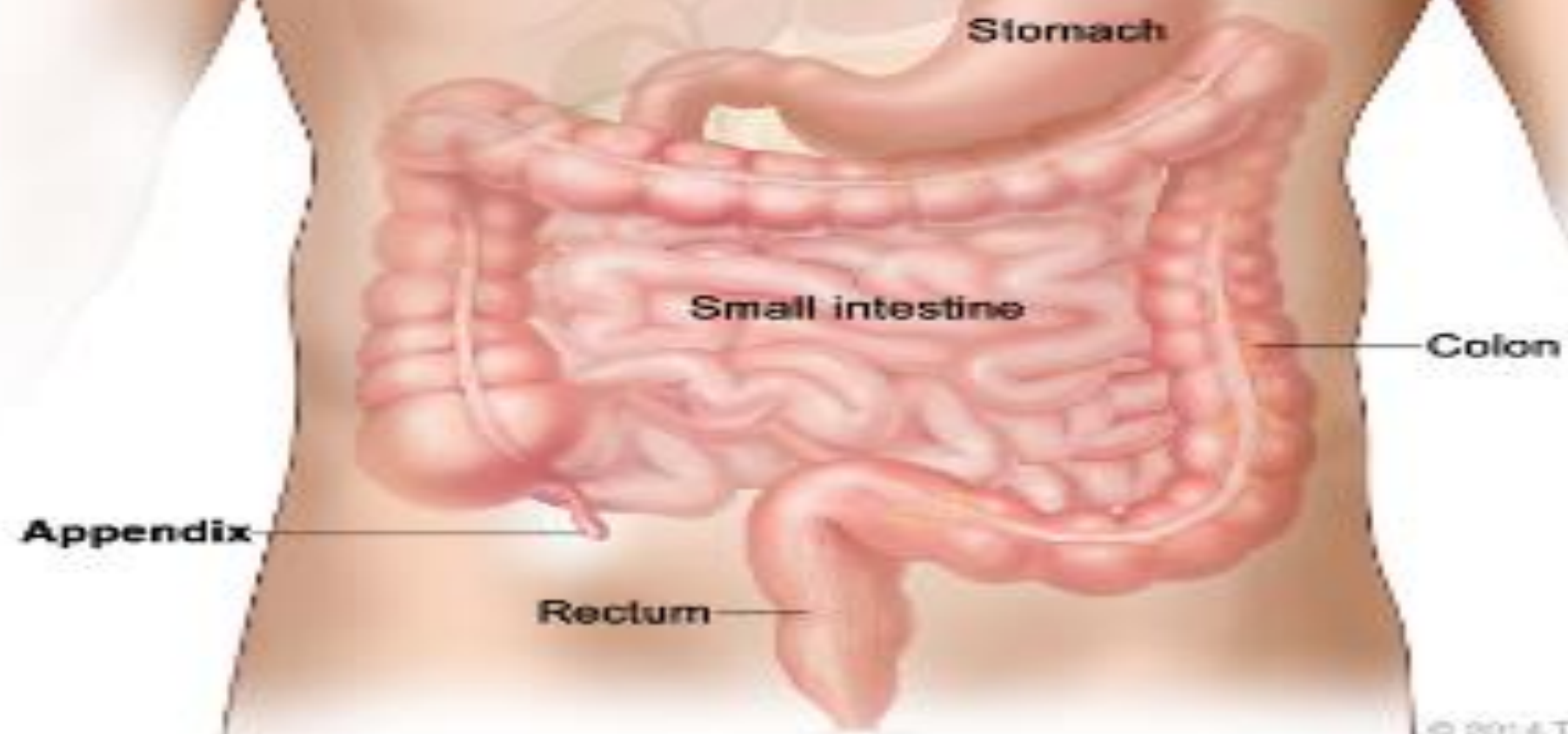
DR ANJUM

LEARNING OBJECTIVES

- INTRODUCTION
- MICROSCOPIC ANATOMY
- DEFINITIONS
- ETIOLOGY
- ETIOPATHOGENESIS
- TYPES
- CLINICAL FEATURES
- MORPHOLOGY
- COMPLICATIONS

APPENDIX ...NORMAL STRUCTURE

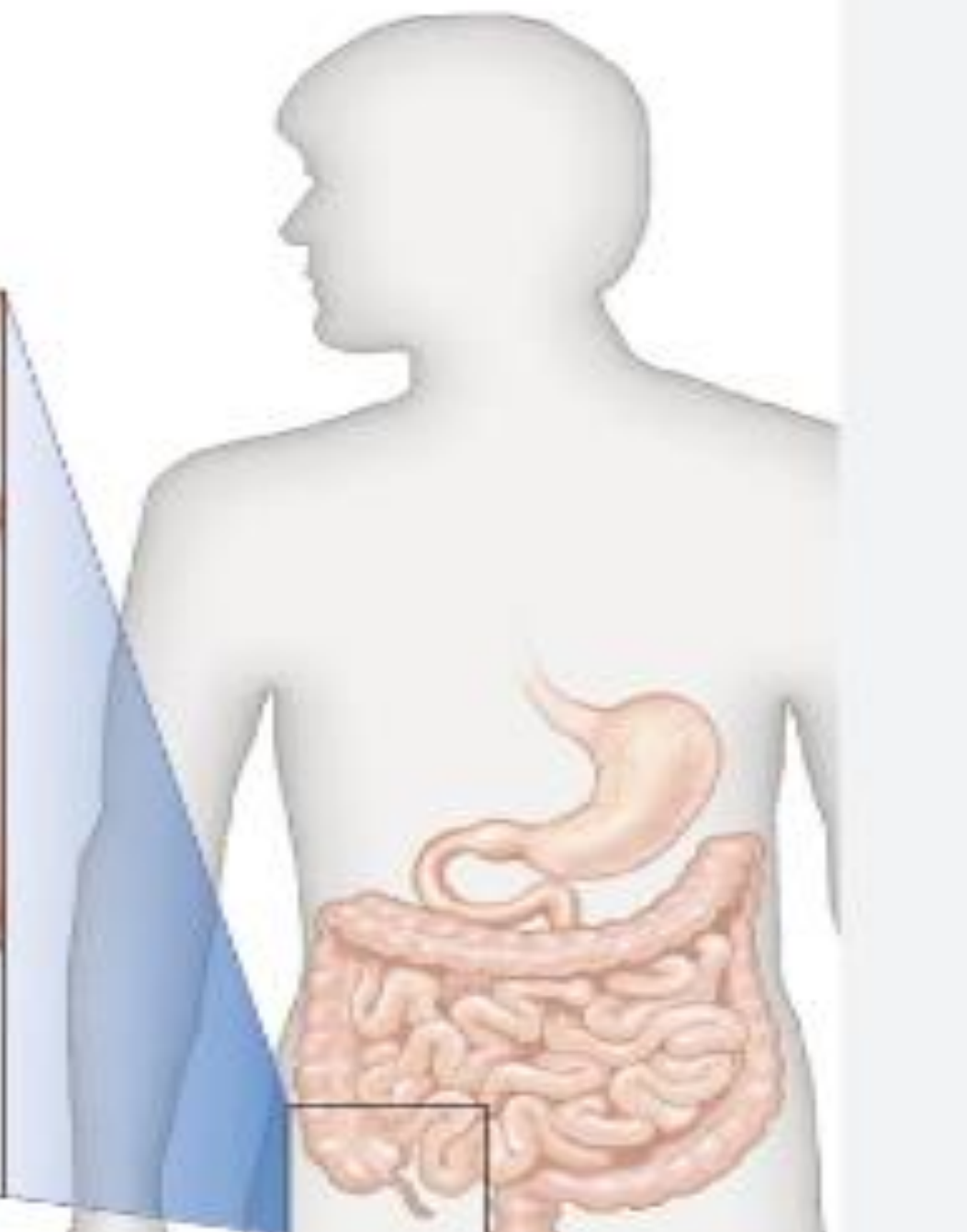
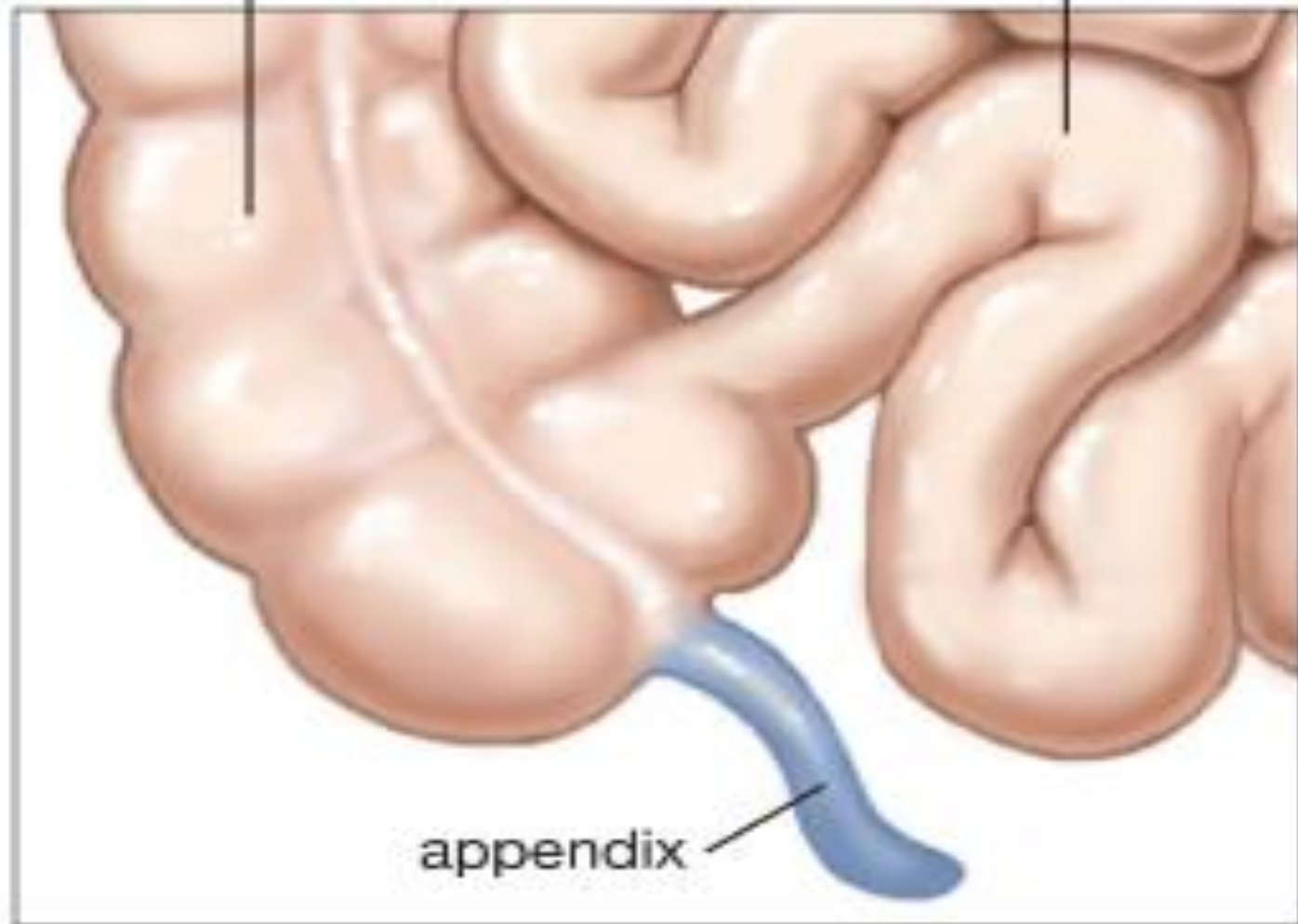
The appendix is a blind-ending tubular diverticulum of the cecum, usually lying behind the caecum and varies in length from 4 to 20 cm (average 7 cm). The wall of the appendix consists of all the four typical coats of the digestive tube: mucosa, submucosa, muscularis externa & serosa.



large intestine

small intestine

appendix



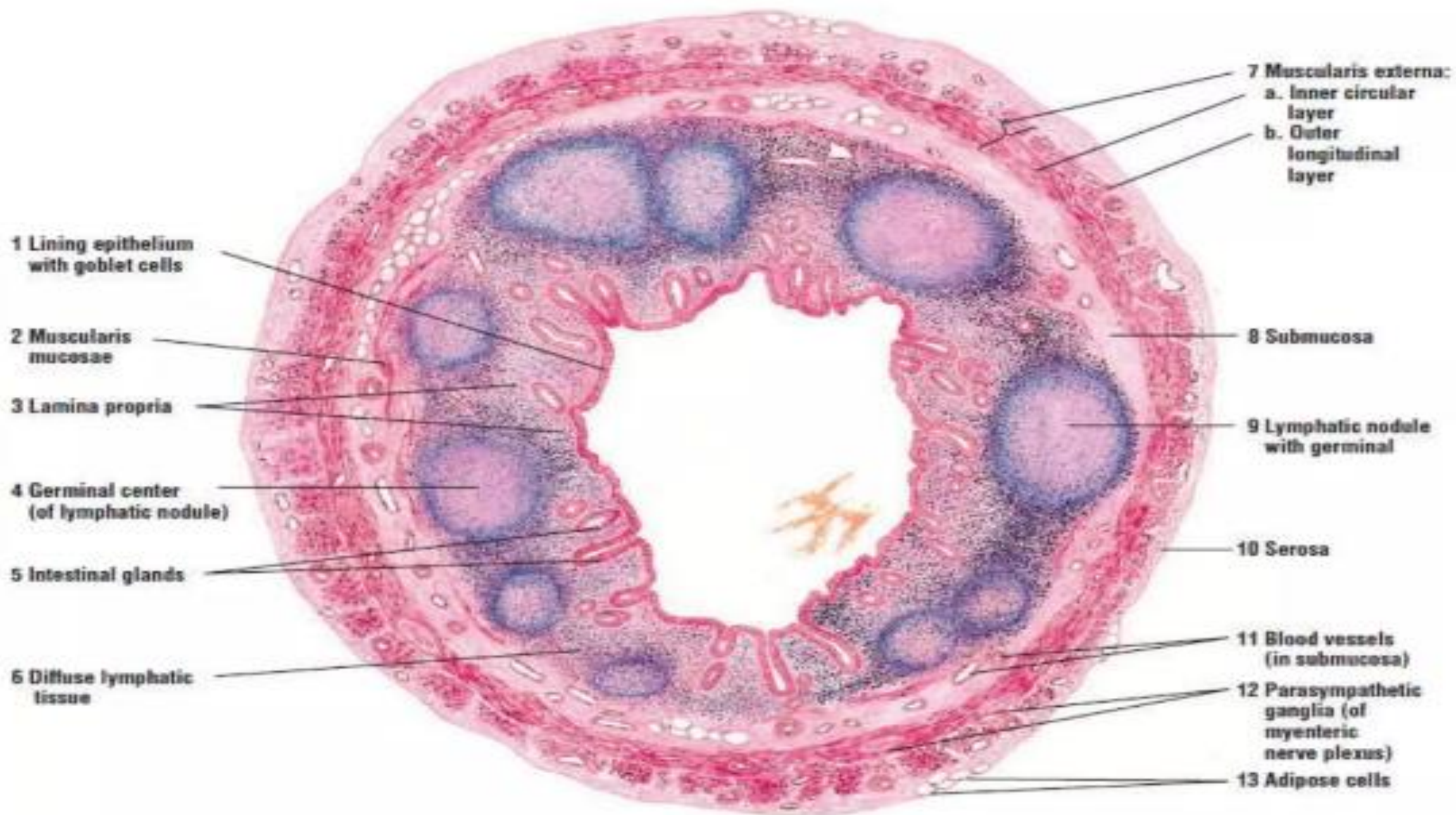
INTRODUCTION

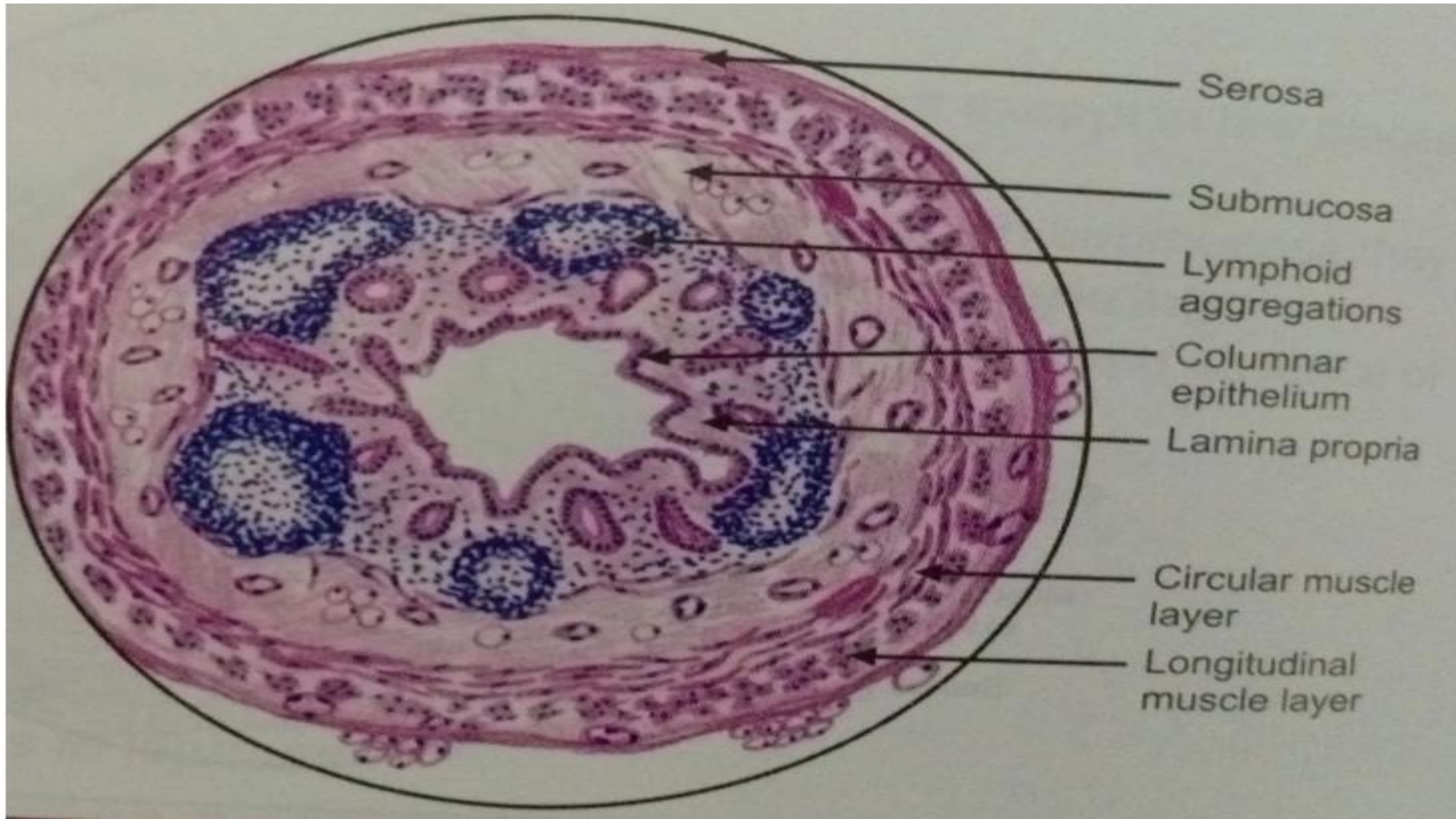
- Vestigial organ??
- Surgical importance Propensity to inflammation
- Most important cause of “ **ACUTE INFLAMMATION**” in young adults.
- Present only in humans .
- **At birth**.... Short and broad at its junction with caecum.
- Typical tubular structure produced by 2 years of age
- Results from differential growth of caecum.

MICROSCOPIC ANATOMY

LAYERS :

- Mucosa..... epithelium, lamina propria , muscularis mucosa
- **EPITHELIUM**.....columnar cells like rest of the intestine
- **LAMINA PROPRIA**....shows intestinal glands (crypts of lieberkuhn) and also heavily infiltrated with **LYMPHOCYTES** and contain numerous **LYMPHOID NODULES** THE MOST IMPORTANT HISTOLOGIC FEATURE.
- **SUB-MUCOSA**.....numerous blood vessels and lymphoid tissue .
- **MUSCULARIS EXTERNA**.... Is thin and two layers of smooth muscles
- **SEROSA**.....outer most coat of appendix

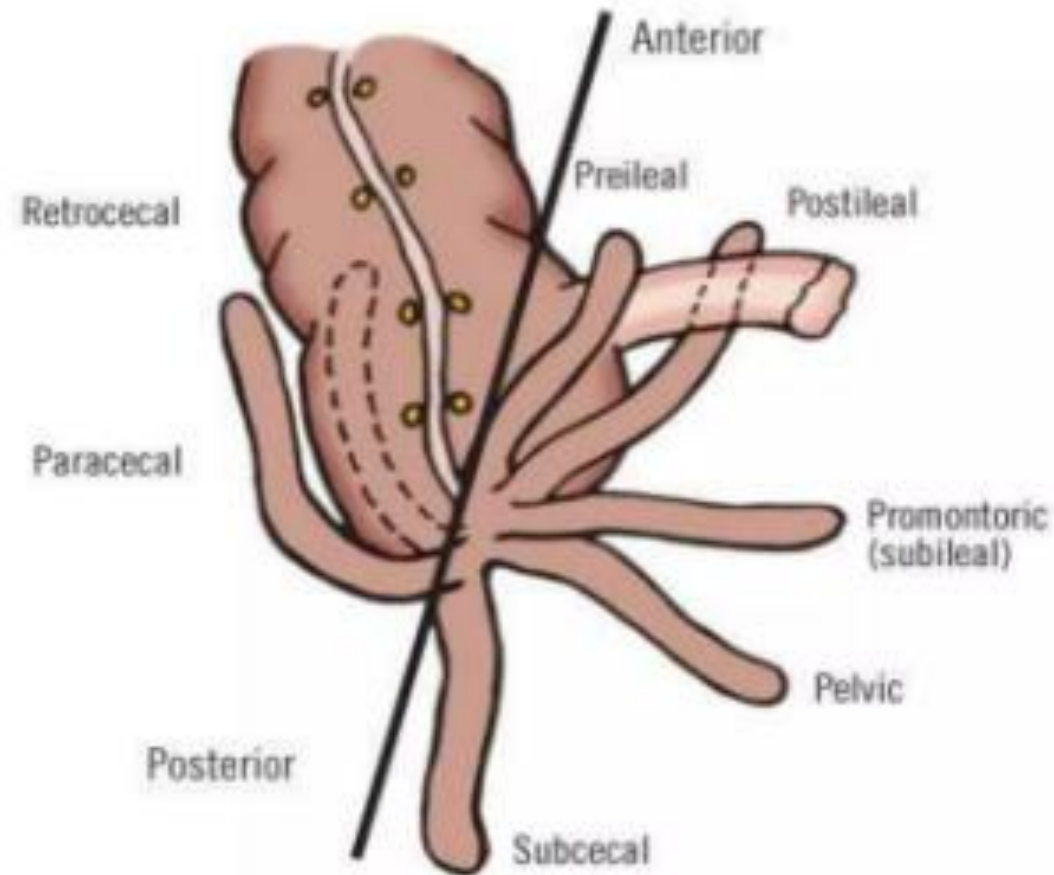




ANATOMICAL POSITIONS

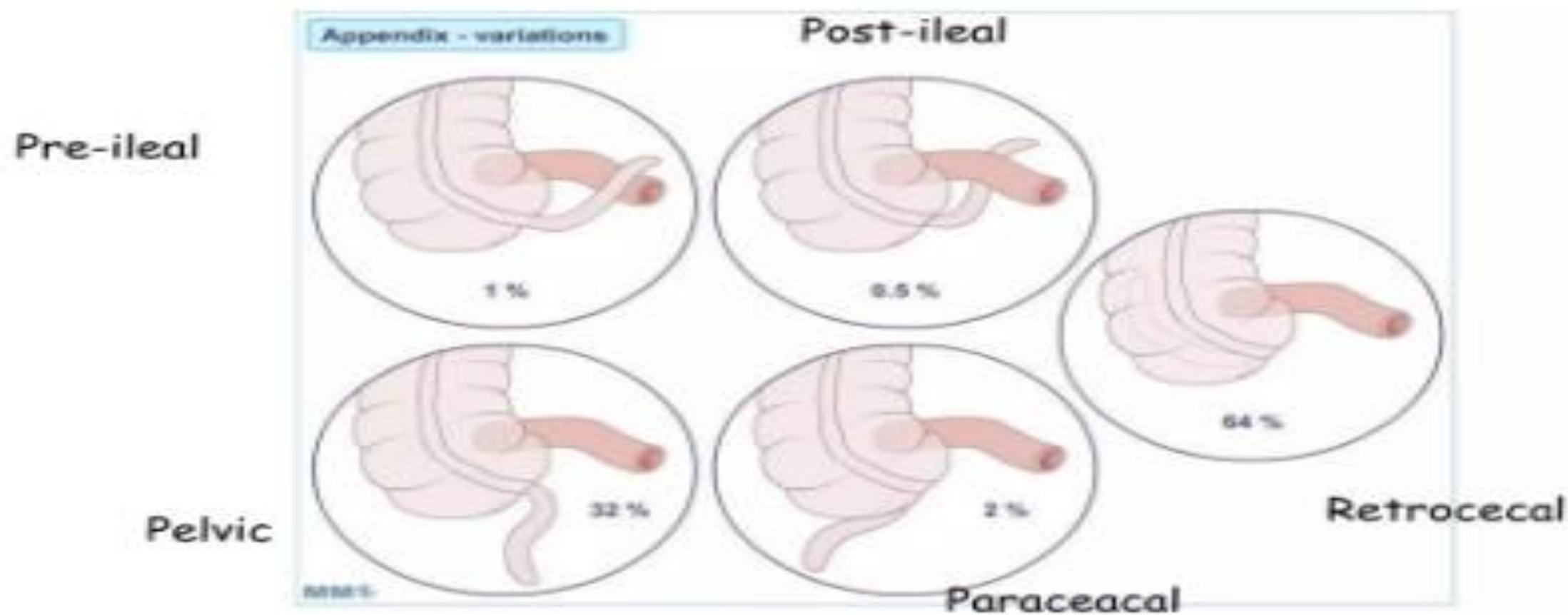
- Retrocecal..... 75 %
- Pelvic 21%
- Paracecal..... 2%
- Subcecal..... 1.5
- Pre-ileal..... 1%
- Post-ileal..... 0.5%

Anatomical positions



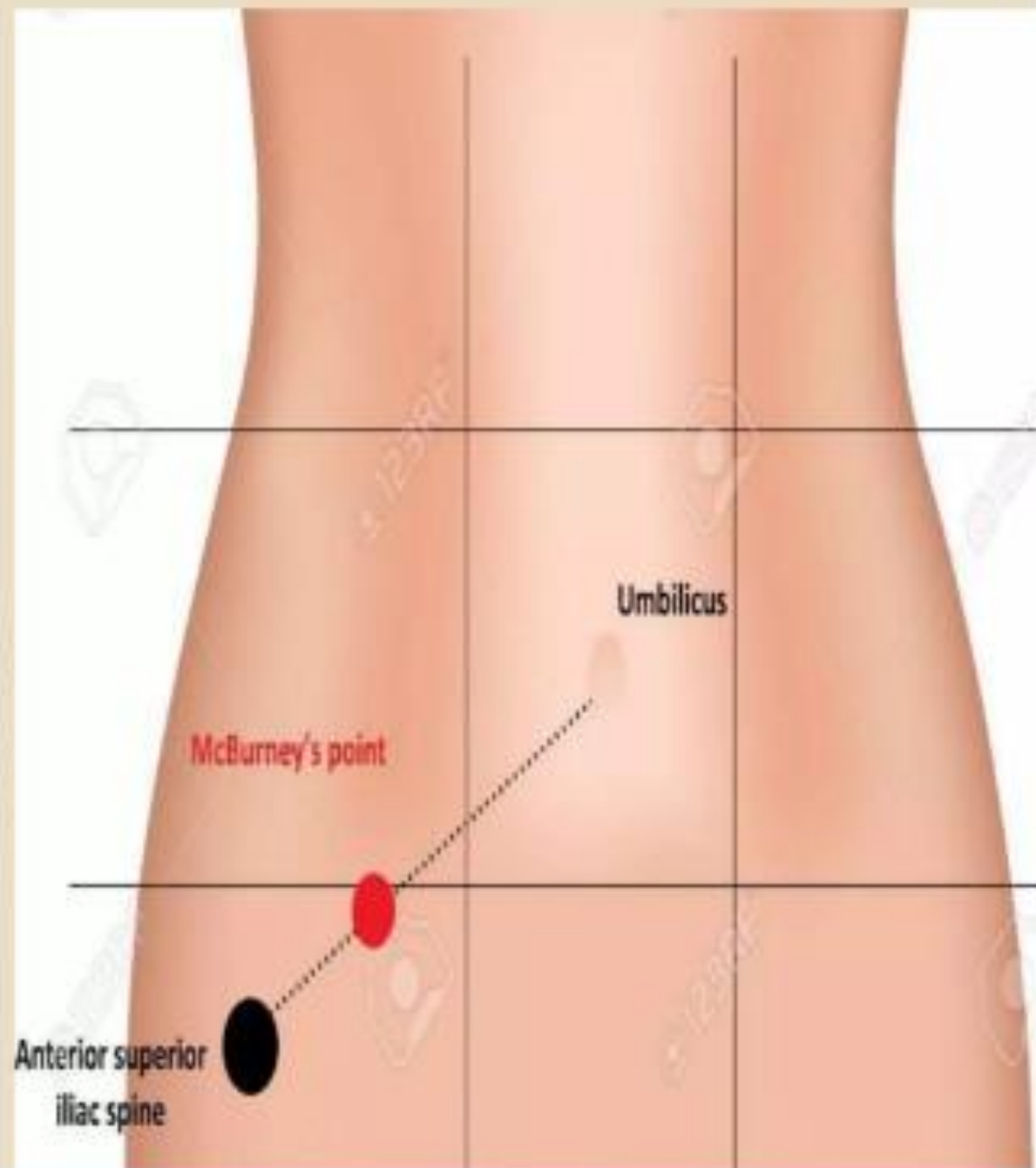
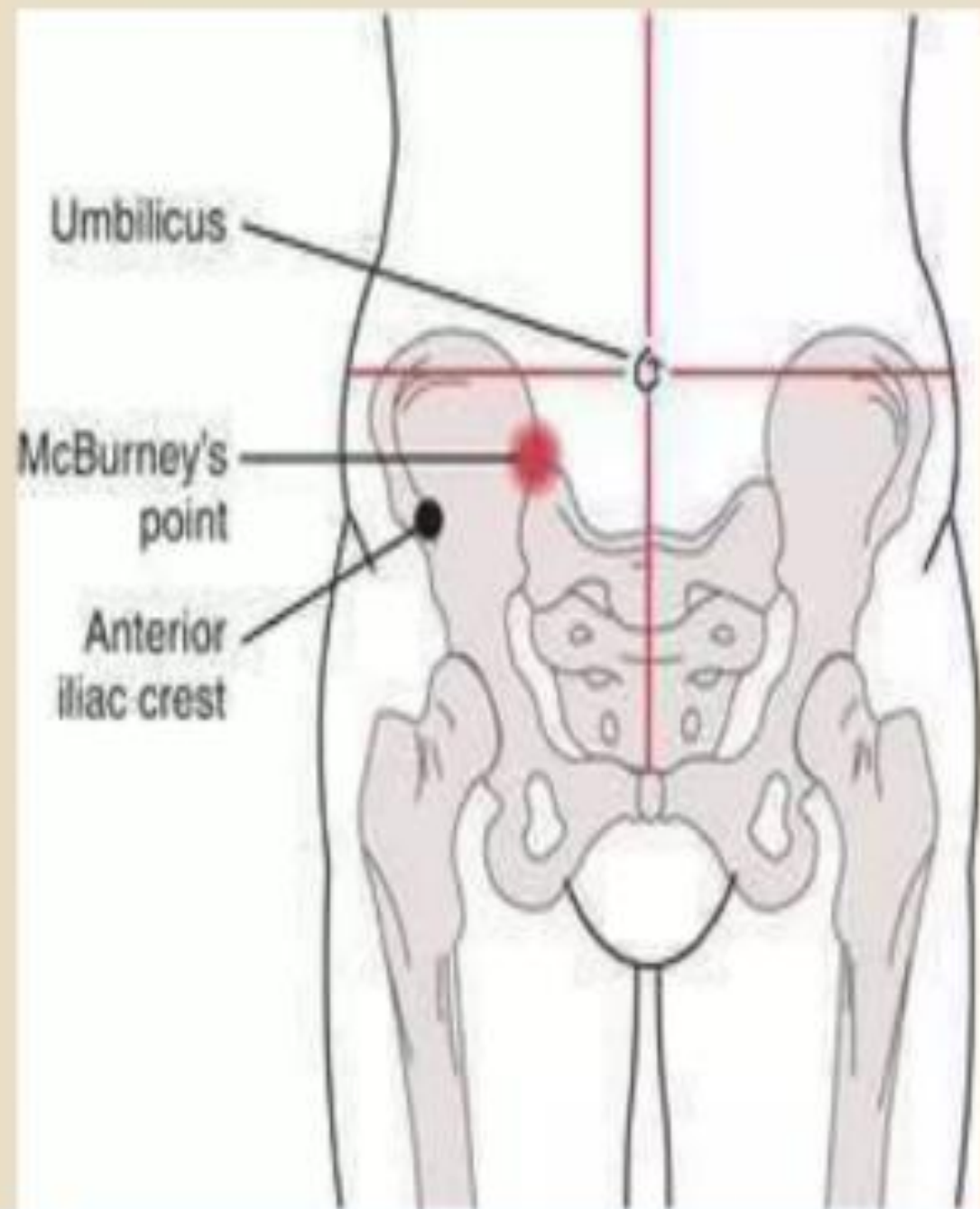
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Anatomical variations of appendix



DEFINITION

- **APPENDICITIS.....** Acute inflammation of appendix
- Develops most commonly in **adolescents and young adults.**
- **Most common cause of severe, acute abdominal pain.**
- The abdomen is most tender at **Mc BURNEY'S POINT.....**one third of the distance from the right anterior iliac spine to the umbilicus This corresponds to the **base of the appendix.**



ETIOLOGY

➤ OBSTRUCTIVE CAUSES

- Fecalith (a fecal calculus or stone) that occlude lumen of the appendix.
- Kinking of the appendix (Twisting or curling)
- Swelling of bowel wall

➤ NONOBSTRUCTIVE CAUSES

- Haematogenous spread of infection
- Vascular occlusion
- Trauma
- Diet lacking fibres

ETIOPATHOGENESIS

- **ACUTE APPENDICITIS..... End result of primary luminal obstruction**
LYMPHOID HYPERPLASIA , FECALITH, WORMS TUMOR ETC
- **Obstruction**appendix gets filled with mucus and swells.
- **Increased mucus production**increased intra luminal pressure causing pressure on the blood vessels to produce ischemic injury favoring **bacterial proliferation****ACUTE APPENDICITIS**
- ALSO results in thrombosis and occlusion of small vessels**stasis of lymphatic flow.**

PATHOLOGY

Lymphatic hyperplasia



Luminal obstruction



Increased intra-luminal pressure

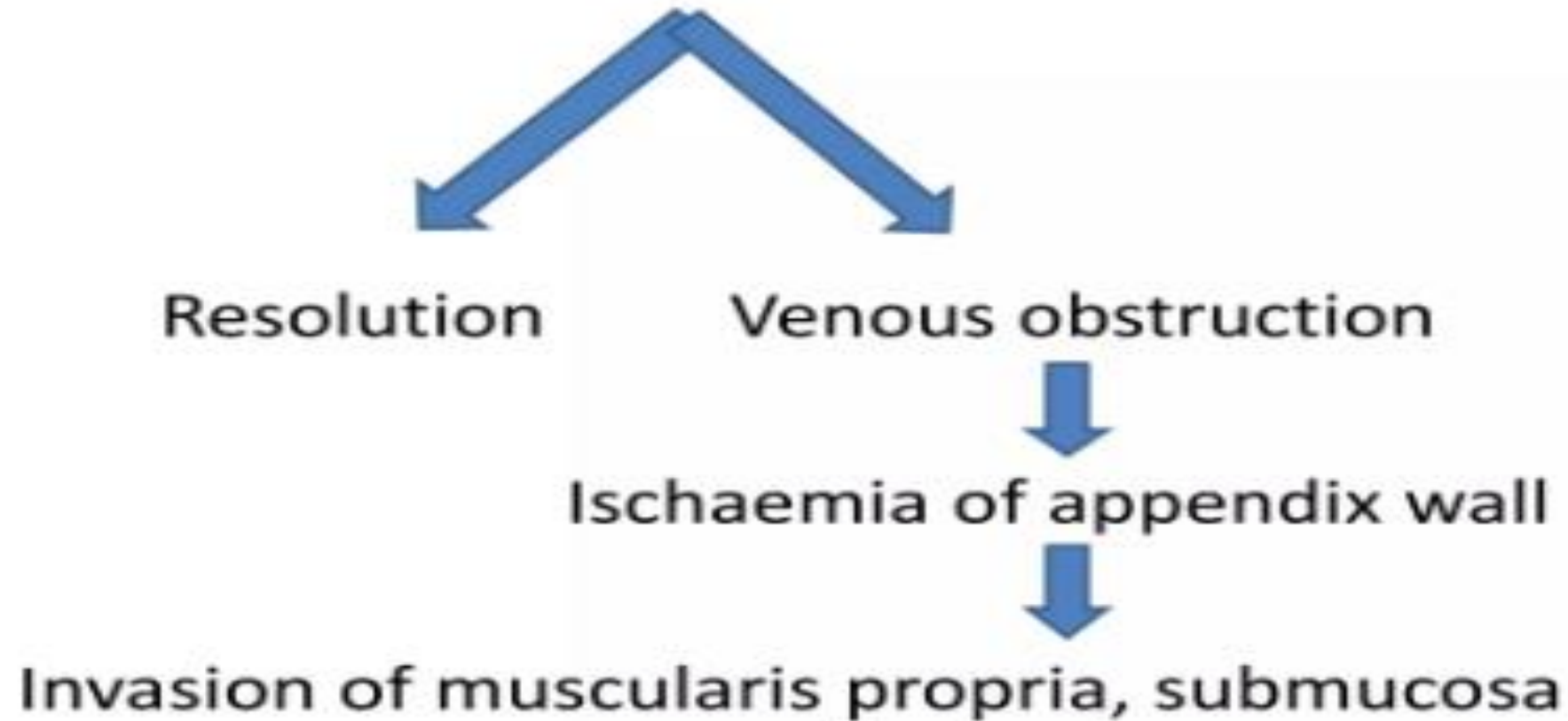


Edema, mucosal ulceration

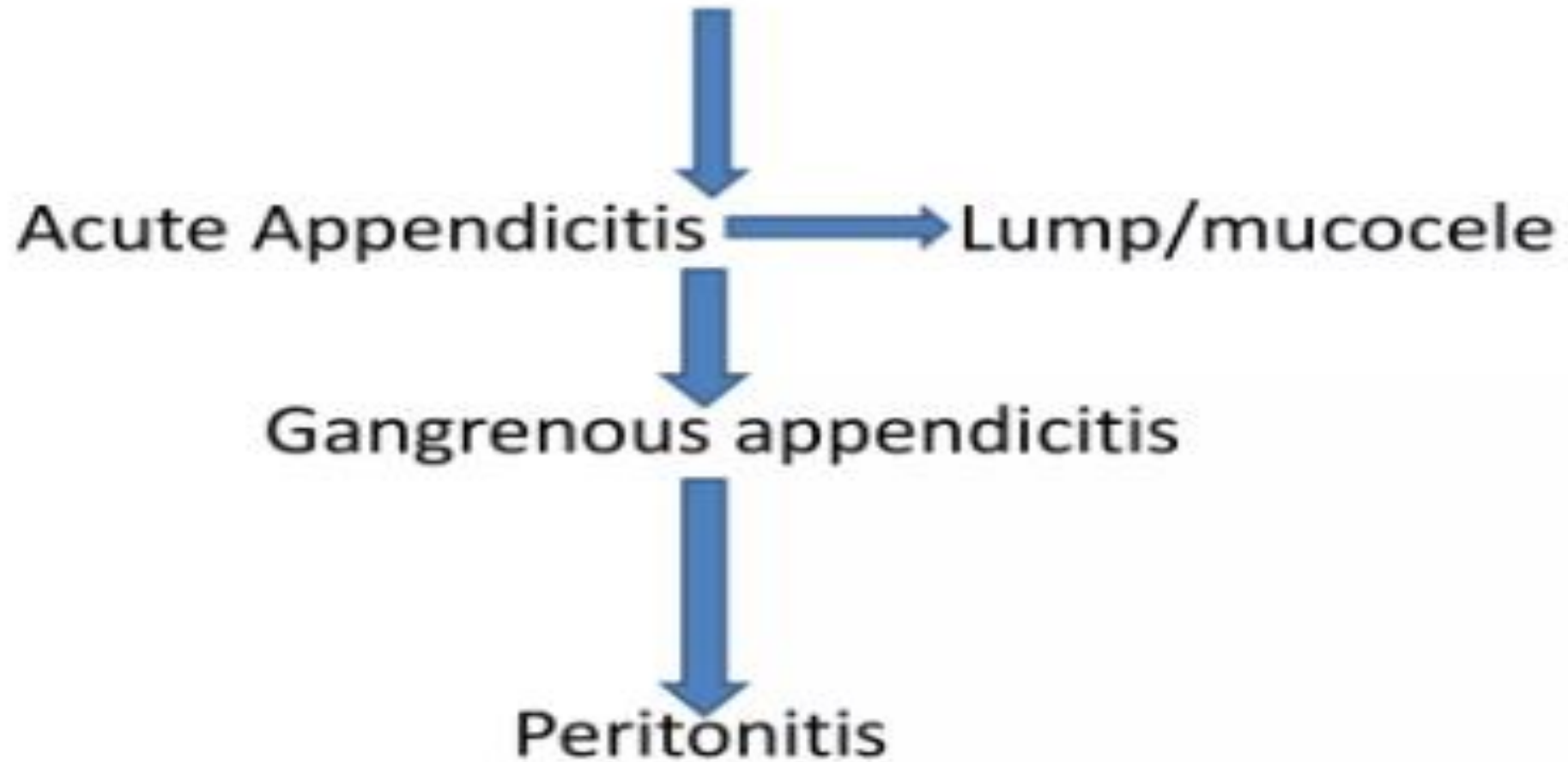


Bacterial translocation to submucosa

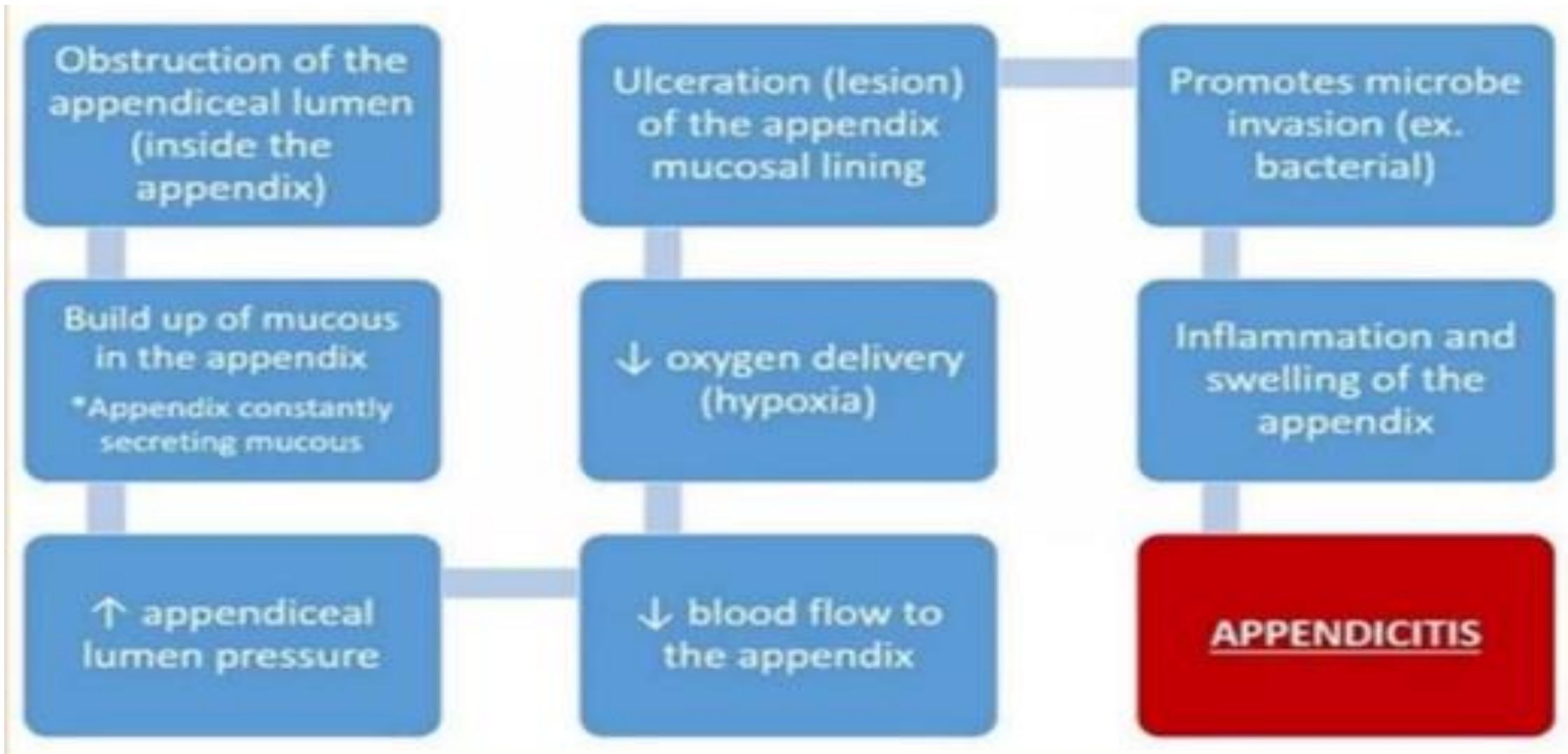
PATHOLOGY



PATHOLOGY



PATHOPHYSIOLOGY



COMMON CAUSES OF APPENDICITIS

A. Obstructive

1. Faecolith/ Fecalith
2. Calculi (Stones)
3. Foreign body
4. Tumour
5. Worms (especially *Enterobius vermicularis*)
6. Diffuse lymphoid hyperplasia, especially in children.

B. Non-obstructive

1. Haematogenous spread of generalised infection
2. Vascular occlusion
3. Inappropriate diet lacking roughage.



TYPES OF APPENDICITIS

FOUR TYPES :

1. Acute simple appendicitis
2. Acute purulent appendicitis
3. Perforation and gangrenous
4. Appendiceal abscess

BACTERIOLOGY OF PERFORATED APPENDICITIS

TYPE OF BACTERIA	PATIENTS (%)
ANAEROBIC	
B. fragilis	80
B. thetaotaomicron	61
Bilophila wadsworthia	55
Peptostreptococcus spp	46
AEROBIC	
E.coli	77
S.viridans	43
Group D streptococcus	27
P.aeruginosa	18

CLINICAL FEATURES

- Symptoms:

1. Periumbilical pain

2. Pain shifts to RIF

3. Anorexia

4. Nausea/vomiting

} 50% cases

CLINICAL FEATURES

- Signs:
 1. Pyrexia
 2. Localized tenderness in RIF
 3. Muscle guarding
 4. Rebound tenderness
 5. Rovsing's sign
 6. Pointing sign
 7. Psoas sign
 8. Obturator sign

APPENDICITIS SYMPTOMS



SUDDEN PAIN ON THE
RIGHT SIDE OF ABDOMEN



NAUSEA AND
VOMITING



LOSS OF
APPETITE



FEVER



CONSTIPATION OR
DIARRHEA



ABDOMINAL
BLOATING

RISKS FACTORS FOR PERFORATION

1. Extremes of age
2. Immunosuppression
3. Diabetes mellitus
4. Pelvic appendix
5. Previous abdominal surgery

MORPHOLOGY

Gross Findings :

- Congested & swollen.
- Dilated lumen contain pus, or a fecolith, or both.
- Serosa coated with fibrin, fibrino-purulent exudate, or pus..... **Transforms the normal glistening surface into dull, granular and erythematous**
- **Cut surface...** may show **hyperemia or intraluminal or intramural abscess**
- **Appendiceal wall may be completely necrotic in gangrenous appendicitis.**
- **Perforation in severe cases**

MORPHOLOGY

GROSS DESCRIPTION:

- Inflammation may involve entire appendix or only a segment.
- Appendix may appear grossly **normal**... when inflammation is limited to the mucosa and submucosa.
- Appendix appears **swollen and erythematous** ..when inflammation extends into the muscularis propria
- When the **serosa is affected**..... a purulent exudate appears

ACUTE APPENDICITIS

Dilated and swollen appendix

Dilated & Congested blood vessels on the serosal surface

1 cm

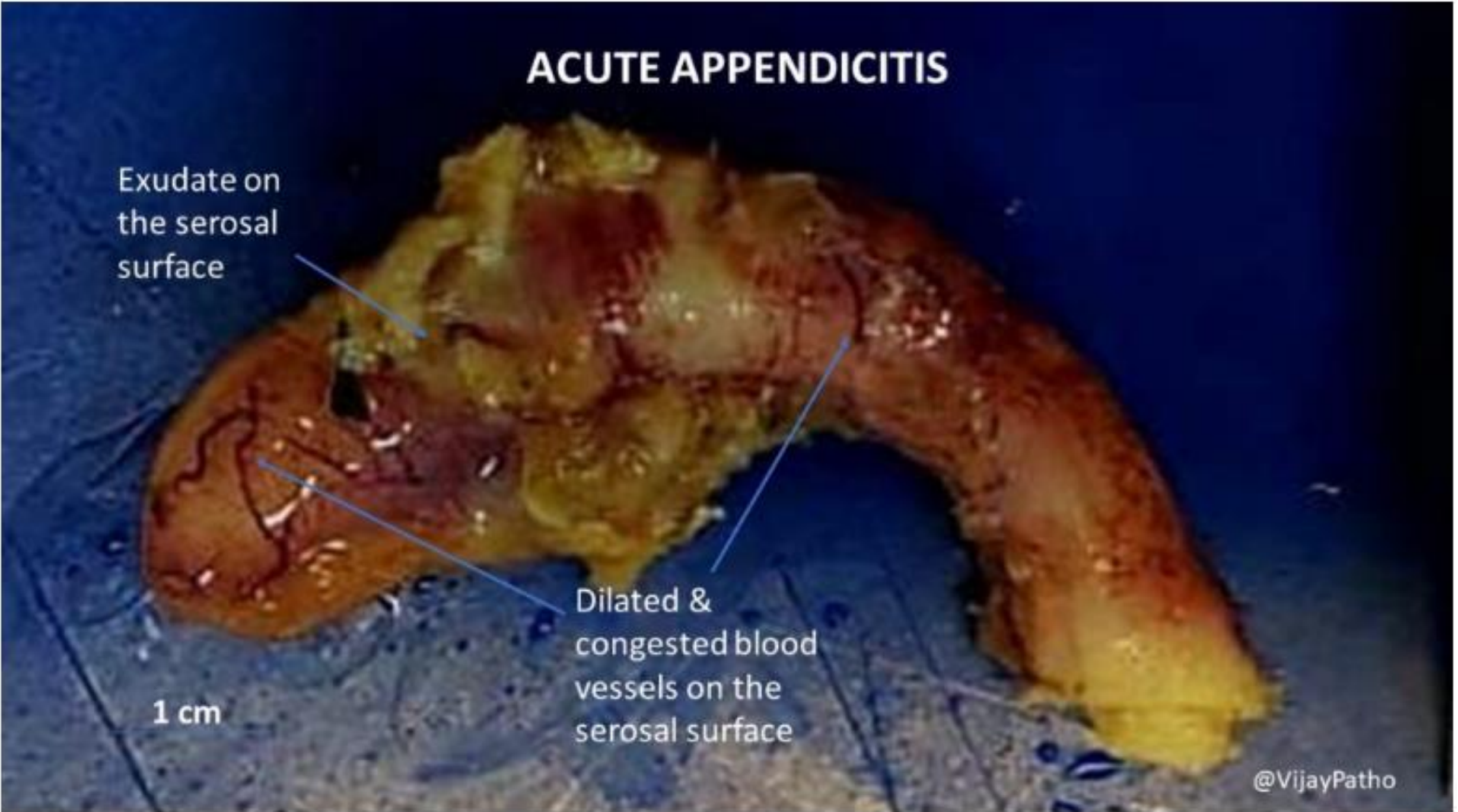


ACUTE APPENDICITIS

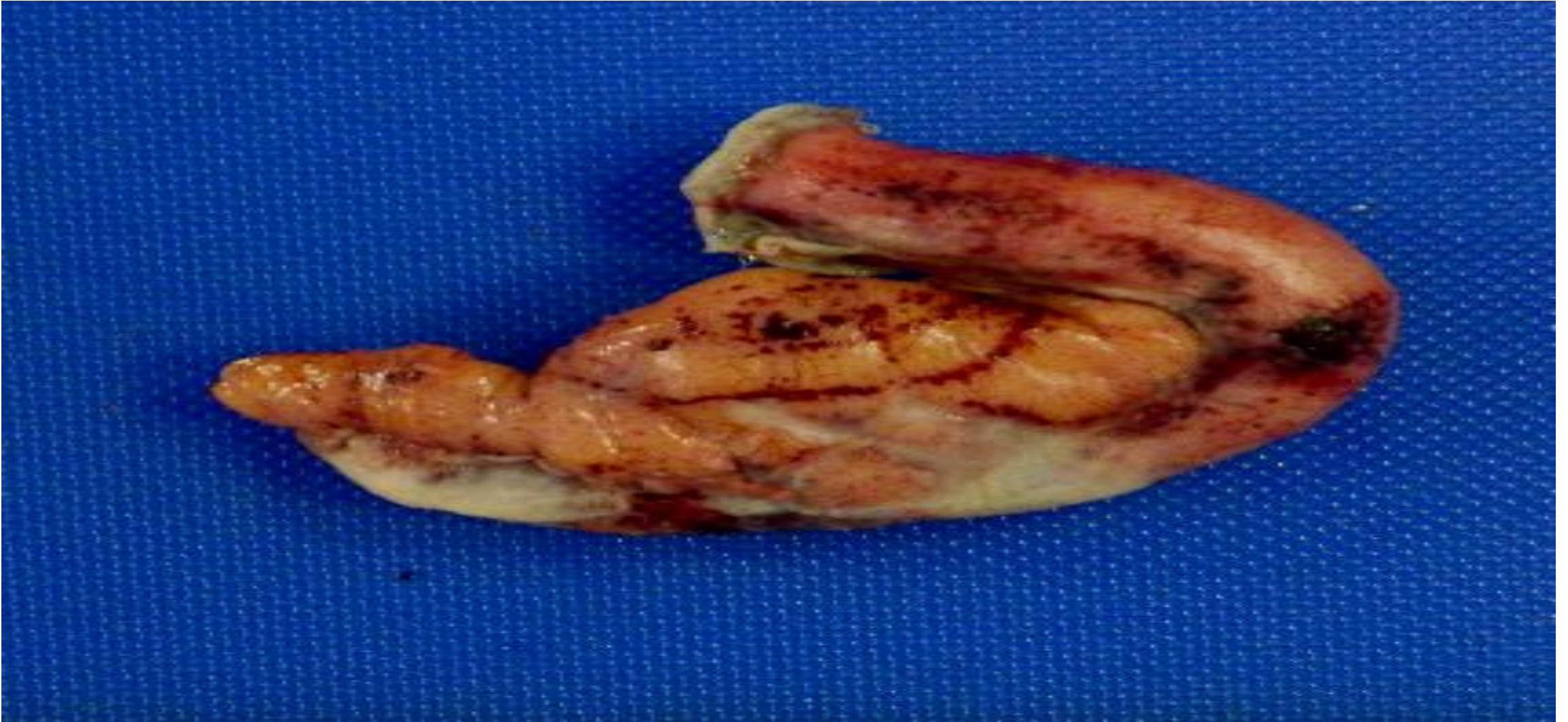
Exudate on
the serosal
surface

Dilated &
congested blood
vessels on the
serosal surface

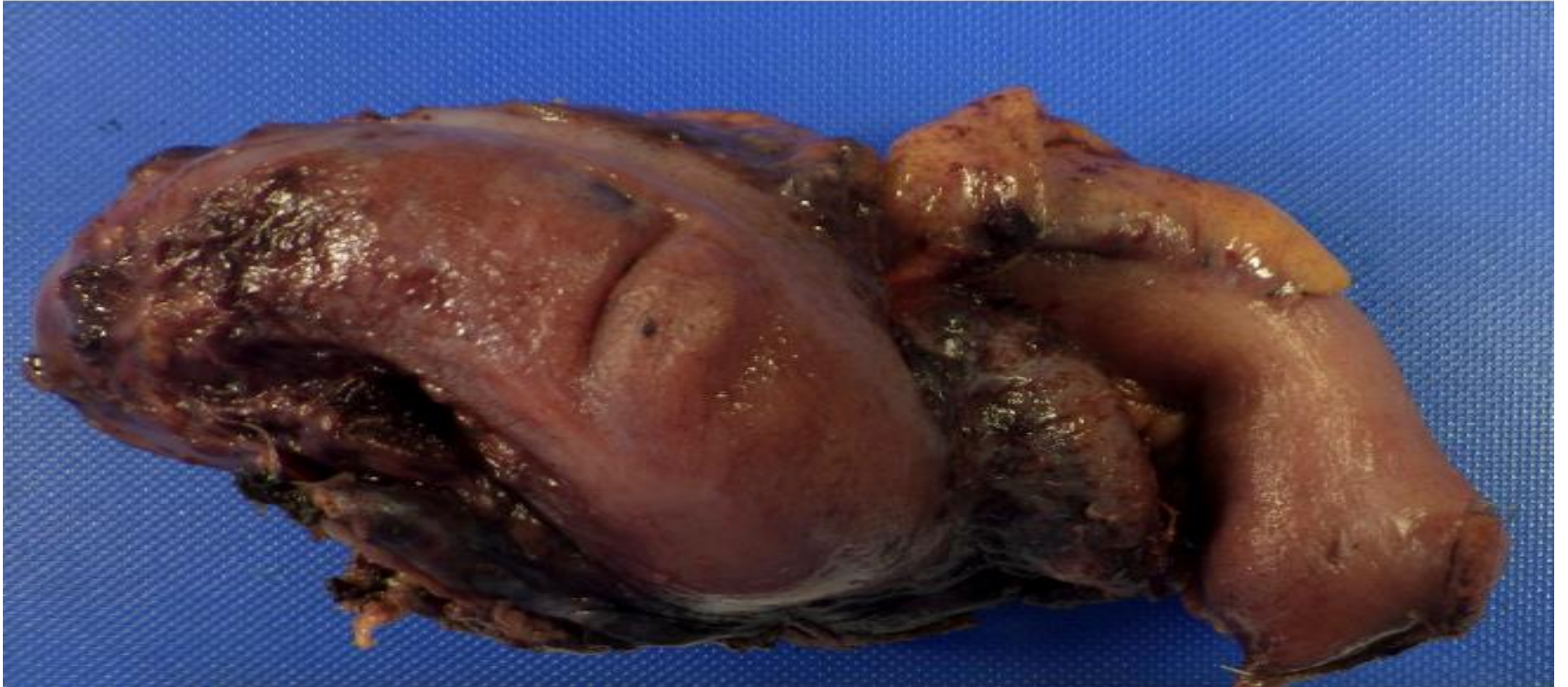
1 cm



FIBRINO-PURULENT EXUDATE



SEVERE CASES



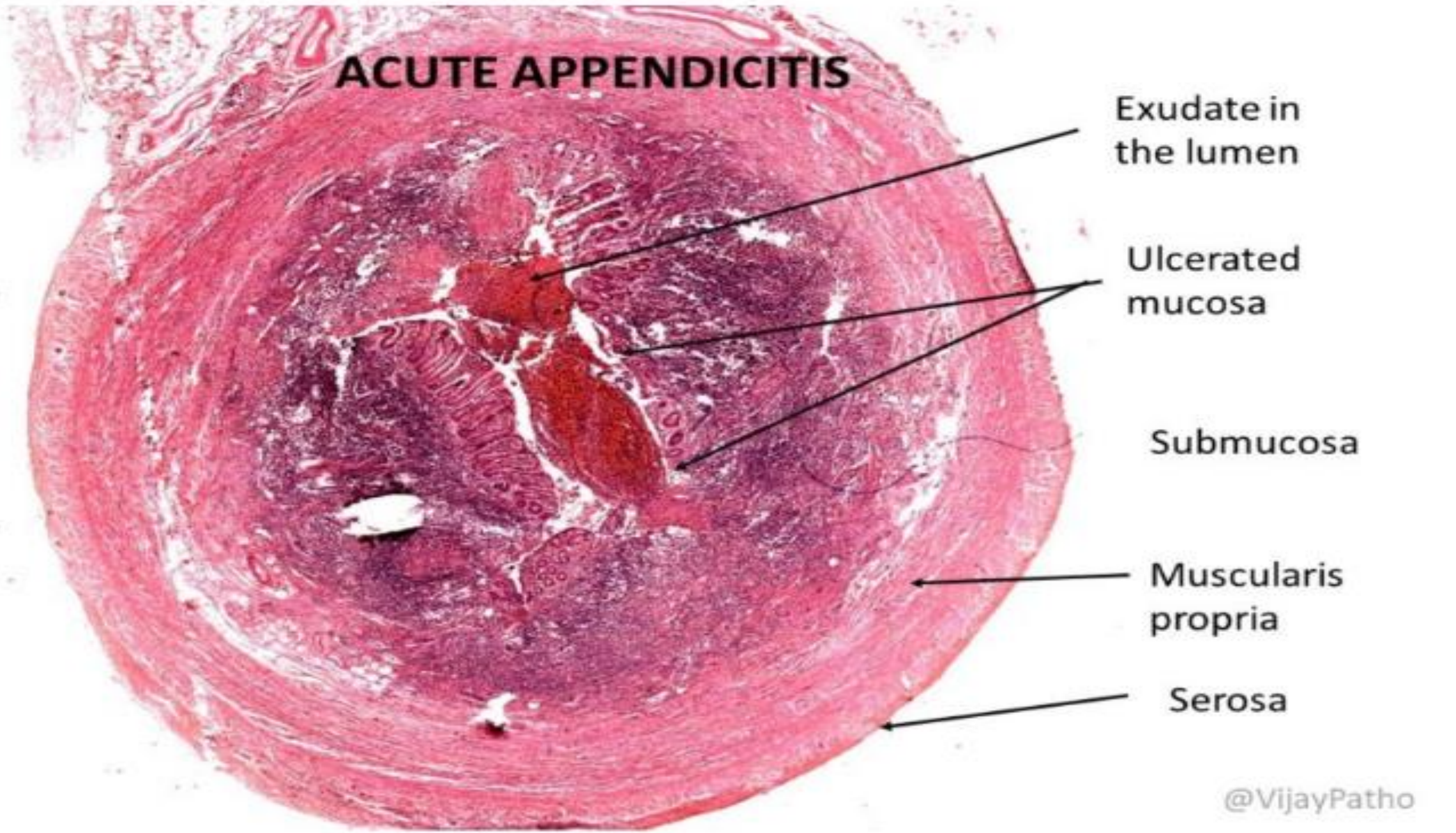
DARK MUCOSA



MICROSCOPIC

- **Lumen:** may be filled with **exudate** (collections of neutrophils in the lumen)
- **Mucosa:** may show **erosions or ulcerations**
- **Submucosa:** may show **hyperplastic lymphoid follicles**. Dense acute inflammation is seen in all the layers
- **Muscularis:** **The diagnosis of acute appendicitis is made only by the demonstration of neutrophils in the muscularis layer.**
- **Serosa:** The inflammation may be extended to the serosa.

ACUTE APPENDICITIS



Exudate in the lumen

Ulcerated mucosa

Submucosa

Muscularis propria

Serosa

MICROSCOPIC

- **Neutrophils in the muscularis propria - key feature.**
- +/- Vascular thrombosis (and necrosis) - known as **gangrenous appendicitis**
- Mucosal ulceration & infiltration by PMNs, eosinophils, plasma cells and lymphocytes throughout all layers & frequently into serosa.
- **More advanced stage**....the inflammatory process involved the full thickness of wall, with partial necrosis or infarction of wall (perforated areas).

ACUTE APPENDICITIS

Ulcerated mucosa

Exudate

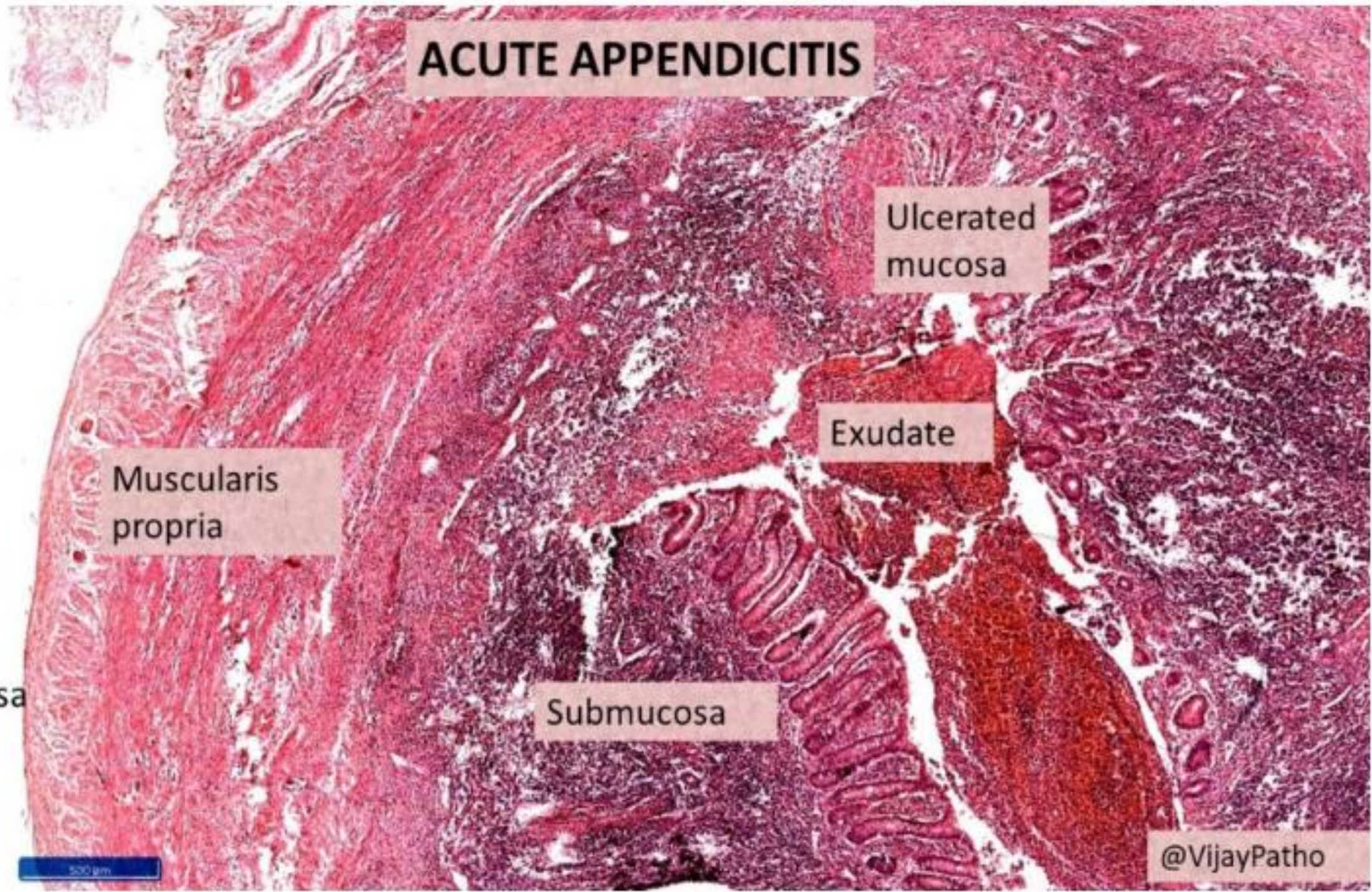
Muscularis propria

Submucosa

Serosa

500 µm

@VijayPatho

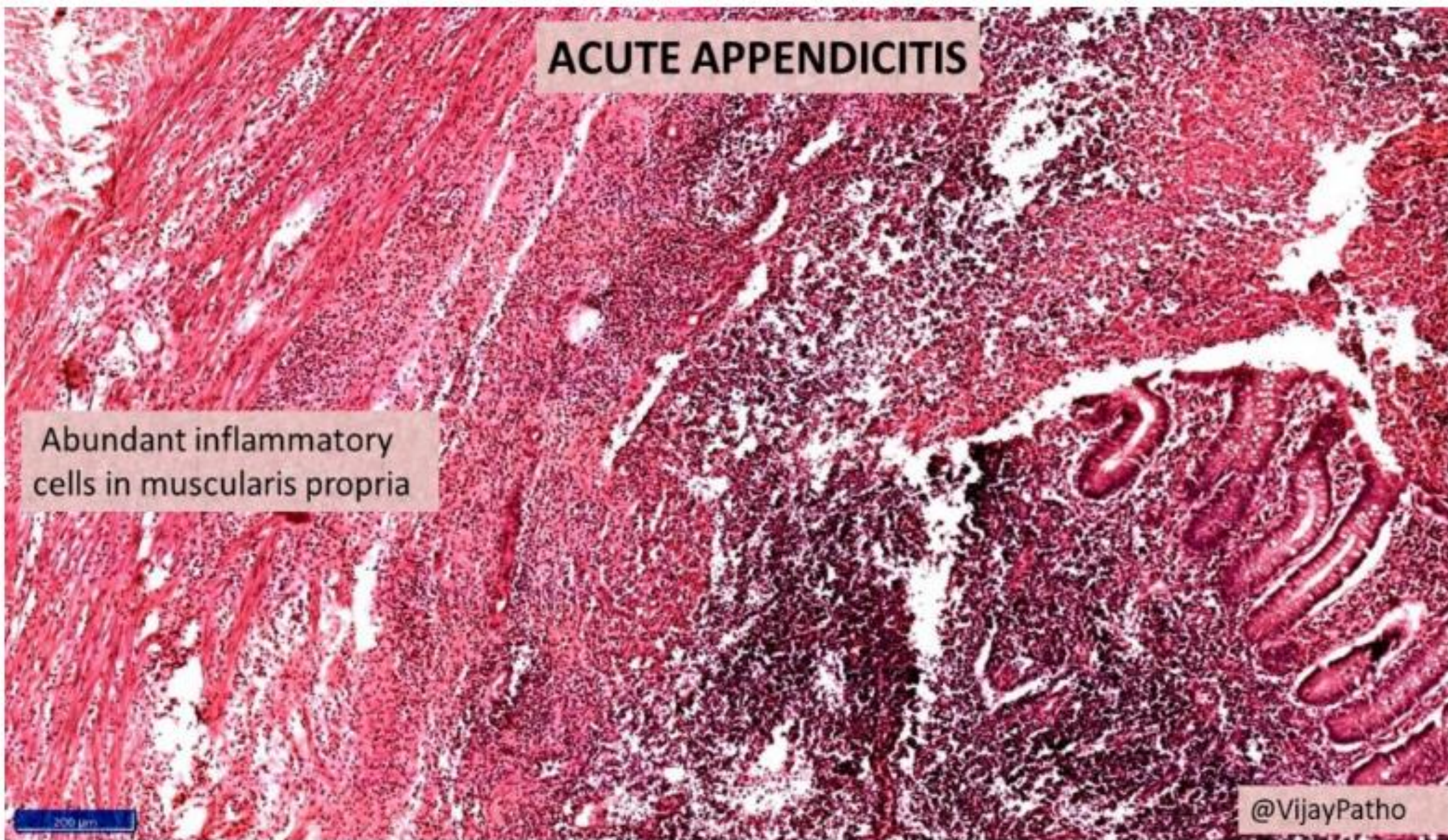


ACUTE APPENDICITIS


Abundant inflammatory cells in muscularis propria

200 µm

@VijayPatho

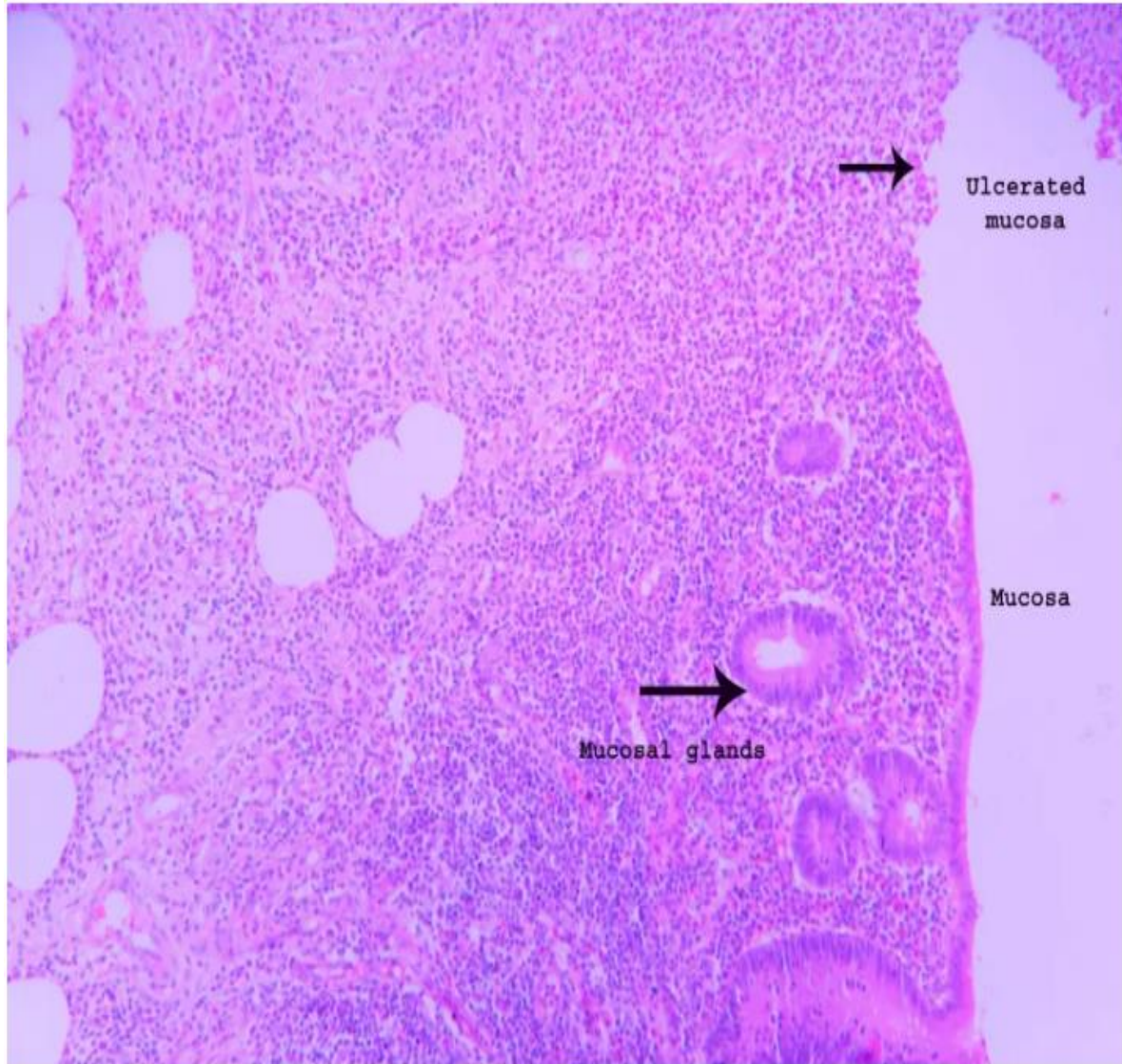


ACUTE APPENDICITIS

A high-magnification histological image of the muscularis propria of the appendix. The tissue is stained with hematoxylin and eosin (H&E), showing pink muscle fibers and purple nuclei. There is a significant infiltration of neutrophils, which are characterized by their multi-lobed nuclei, into the muscle layer. The overall appearance is one of acute inflammation.

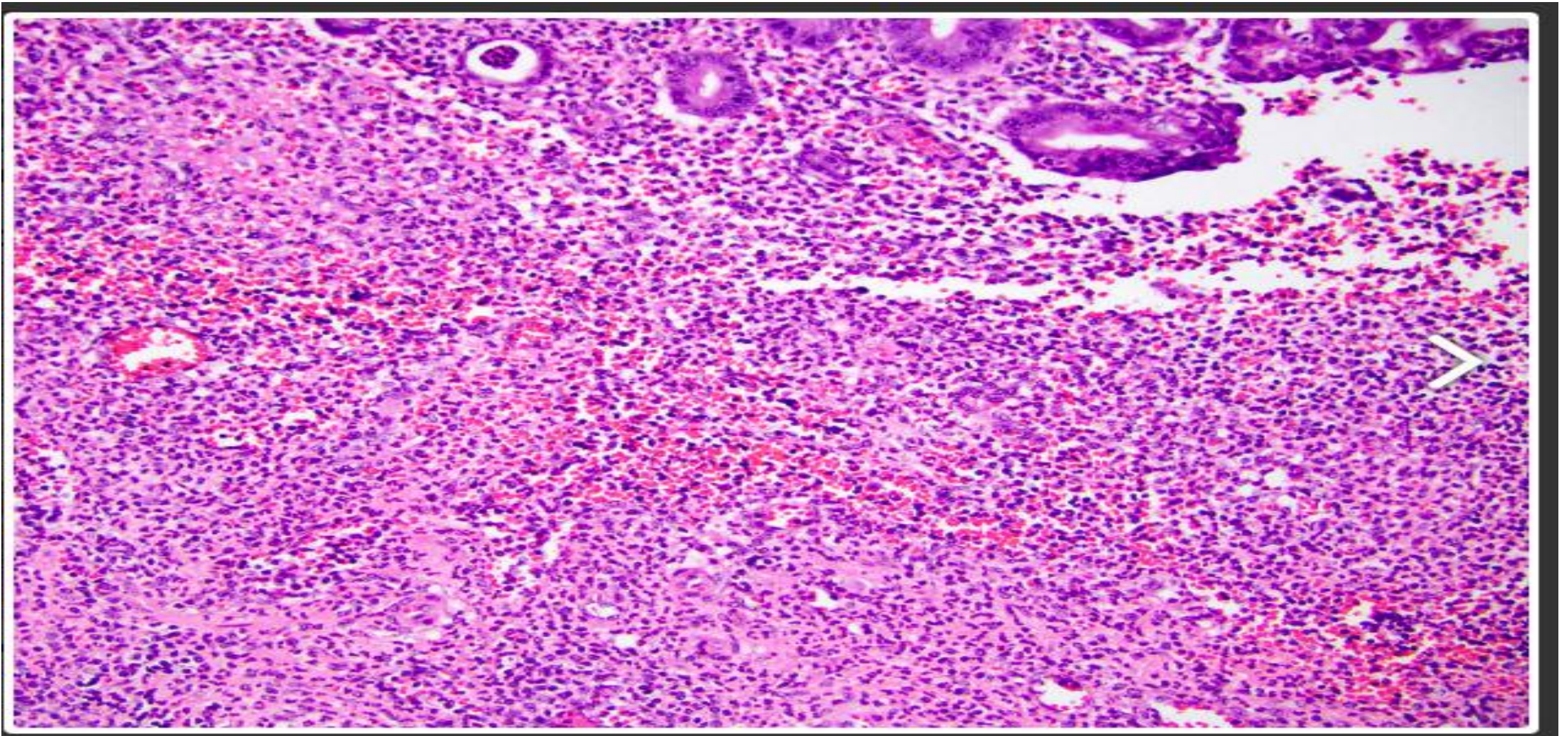
Numerous **NEUTROPHILS**
in muscularis propria

ACUTE APPENDICITIS

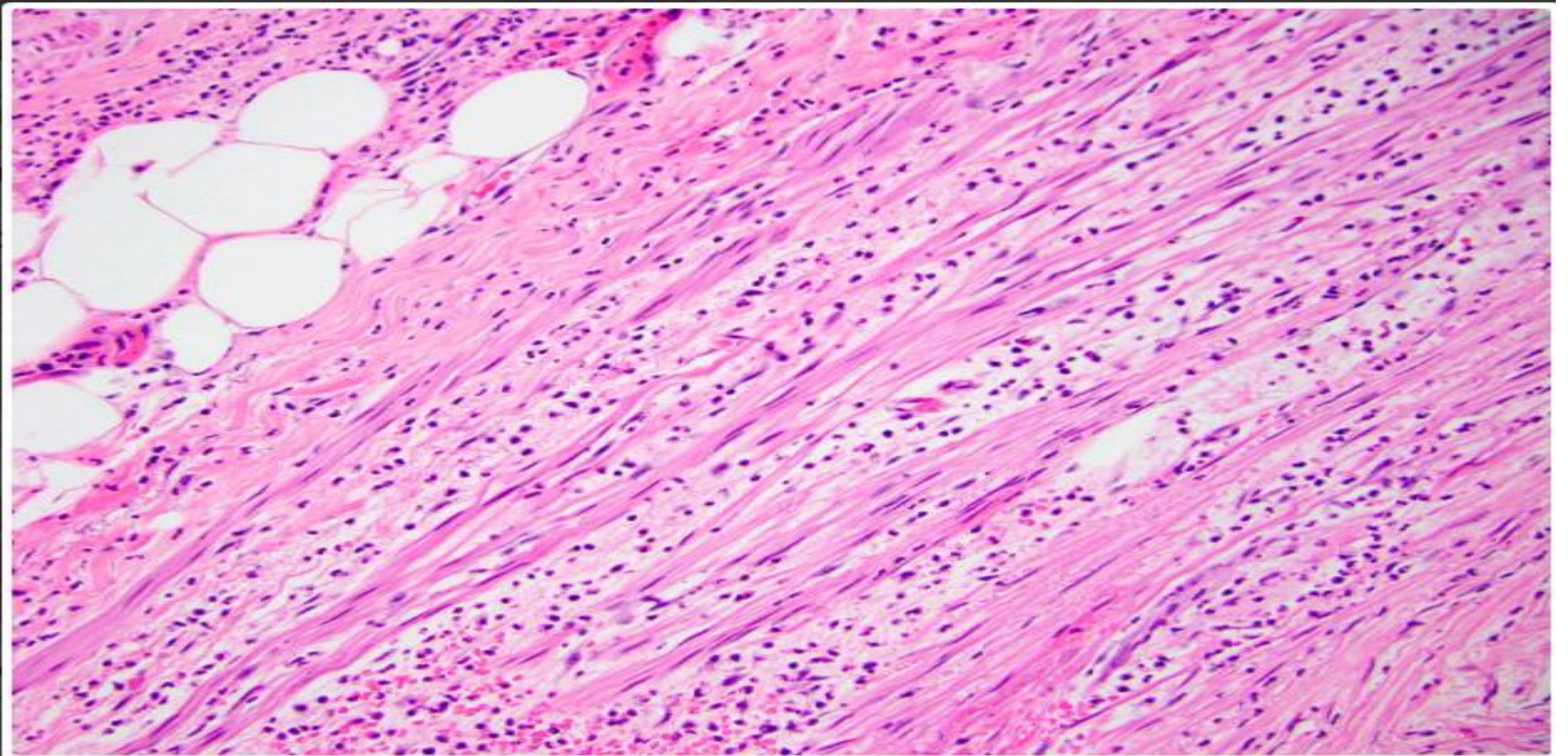


- **Ulcerated mucosa...** with lamina propria showing benign glands, mixed inflammatory infiltrate and focal lymphoid aggregates

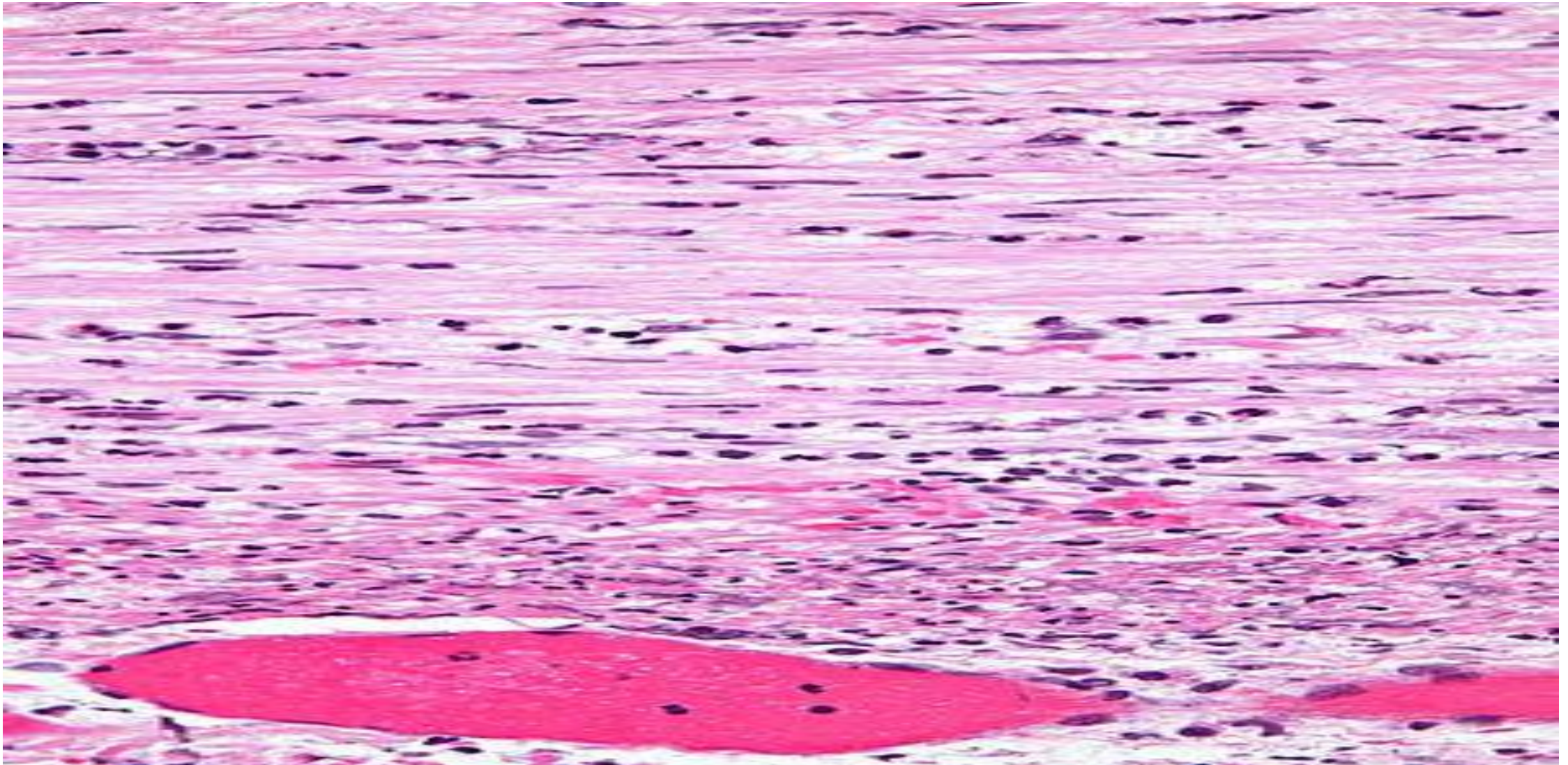
MARKED NEUTROPHILIC INFILTRATION



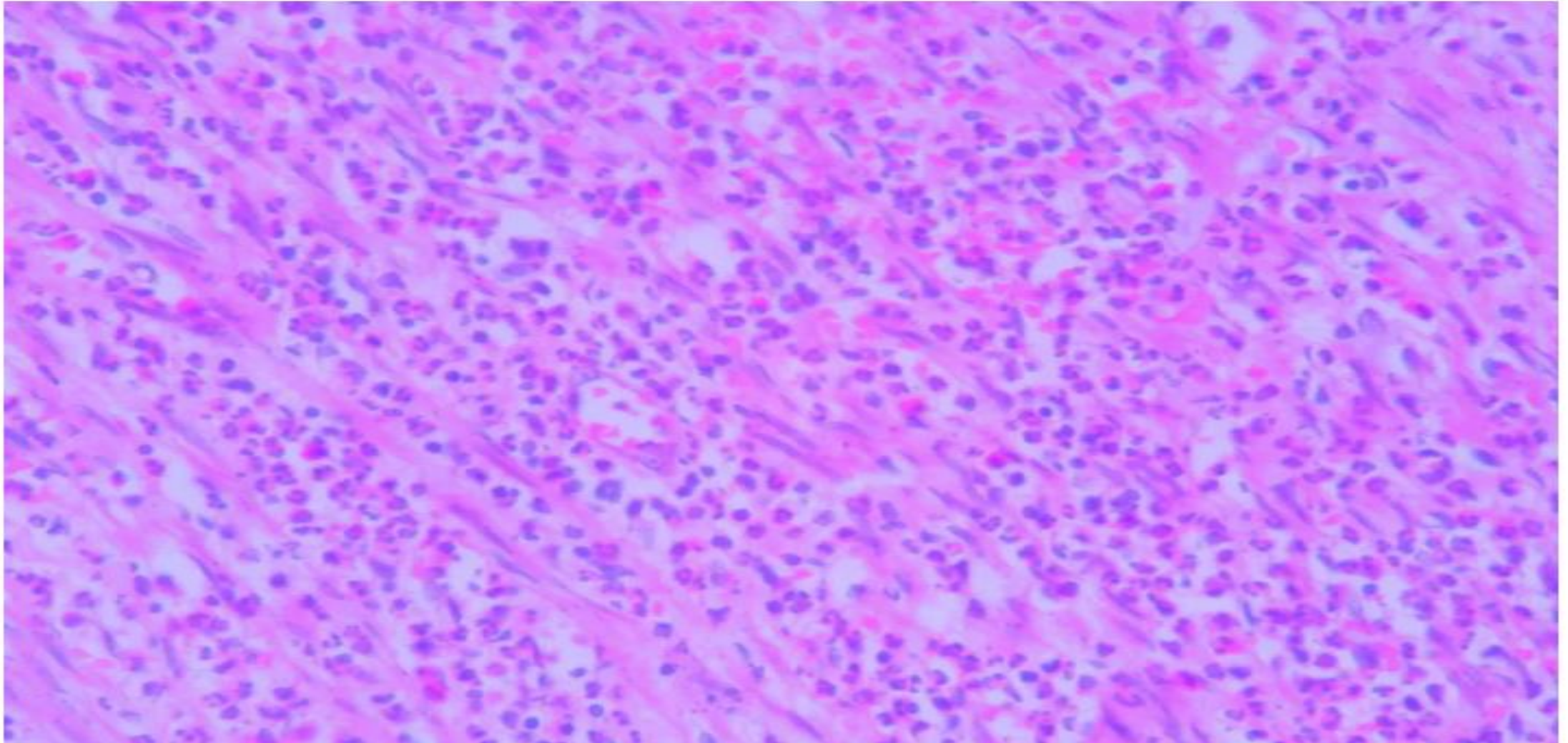
MARKED NEUTROPHILIC INFILTRATION



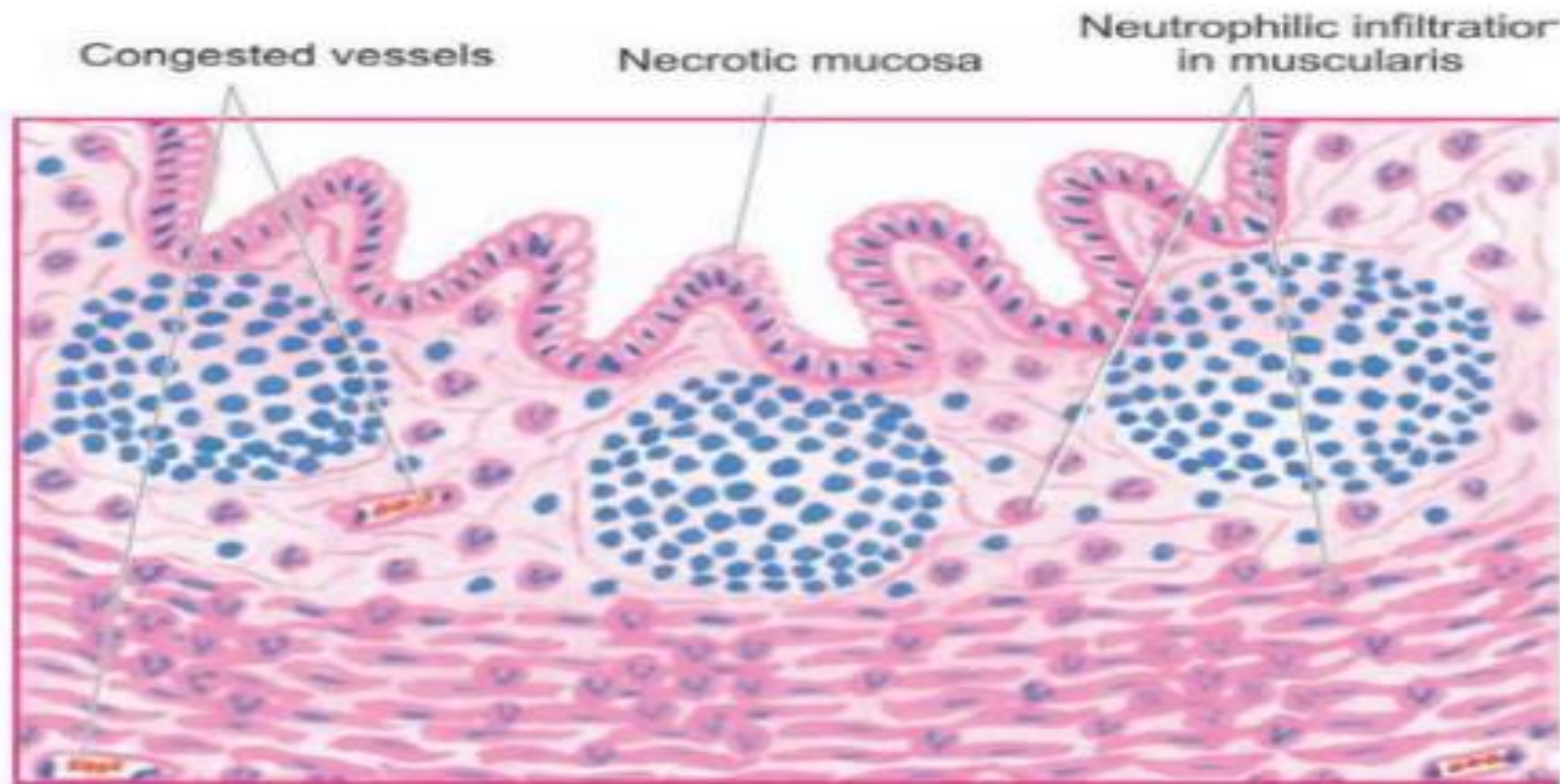
NEUTROPHILS IN THE MUSCULARIS PROPRIA

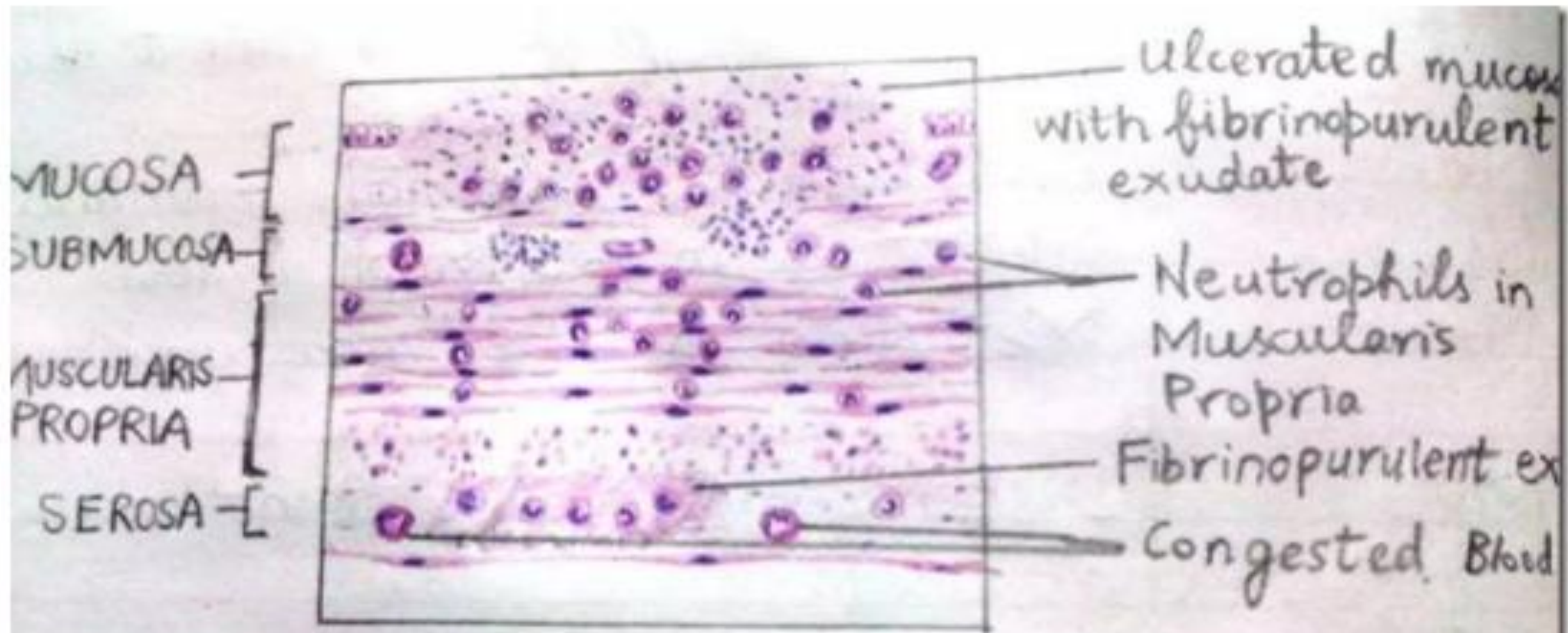


ACUTE APPENDICITIS:
MUSCULARIS SHOWING NEUTROPHILIC INFILTRATE



Acute appendicitis. Microscopic appearance showing diagnostic neutrophilic infiltration into the muscularis propria. Other changes present are necrosis of mucosa and periappendicitis.





Acute Appendicitis

COMPLICATIONS OF ACUTE APPENDICITIS

- a. Acute suppurative appendicitis
- b. Gangrenous appendicitis
- c. Perforation leading to peritonitis
- d. Formation of peri-appendicular abscess/ mass
- e. Rarely portal venous thrombosis, liver abscess and bacteremia.

Thank You!