

# Oesophagus

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# Oesophagus

- Muscular tube, approximately 25 cm long
- Wall similar to the rest of the GIT  
(mucosa, submucosa, muscle layer & serosa)
- Upper ( UOS) and lower oesophageal (LOS)  
sphincters at either end

Vagus

UOS

Striated  
muscle

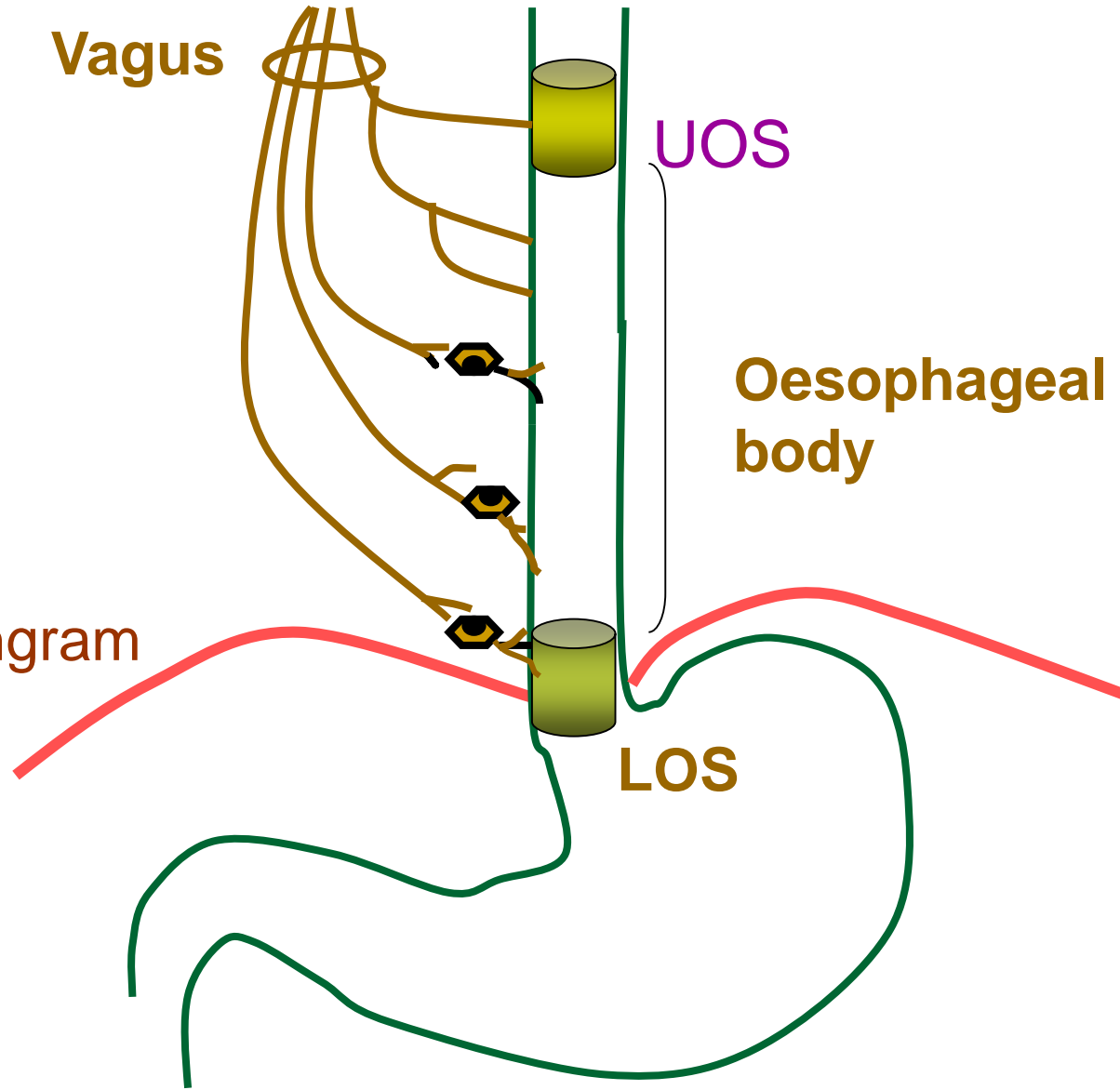
Oesophageal  
body

mixed

Smooth  
muscle

Diaphragm

LOS



# Innervation-

- Striated muscles in the proximal oesophagus - **Motor nerves in the vagus** which originates in the brain stem
- Smooth muscles in the distal oesophagus - **Autonomic innervation** via the parasympathetic and sympathetic nervous systems
- All parasympathetic input to the oesophagus is provided via the **vagus** nerve

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## **Main function of the oesophagus**

- Transport food to the stomach

## **Functions of the sphincters**

- Keep oesophagus empty between swallows
  - Prevent regurgitation of stomach contents to oesophagus
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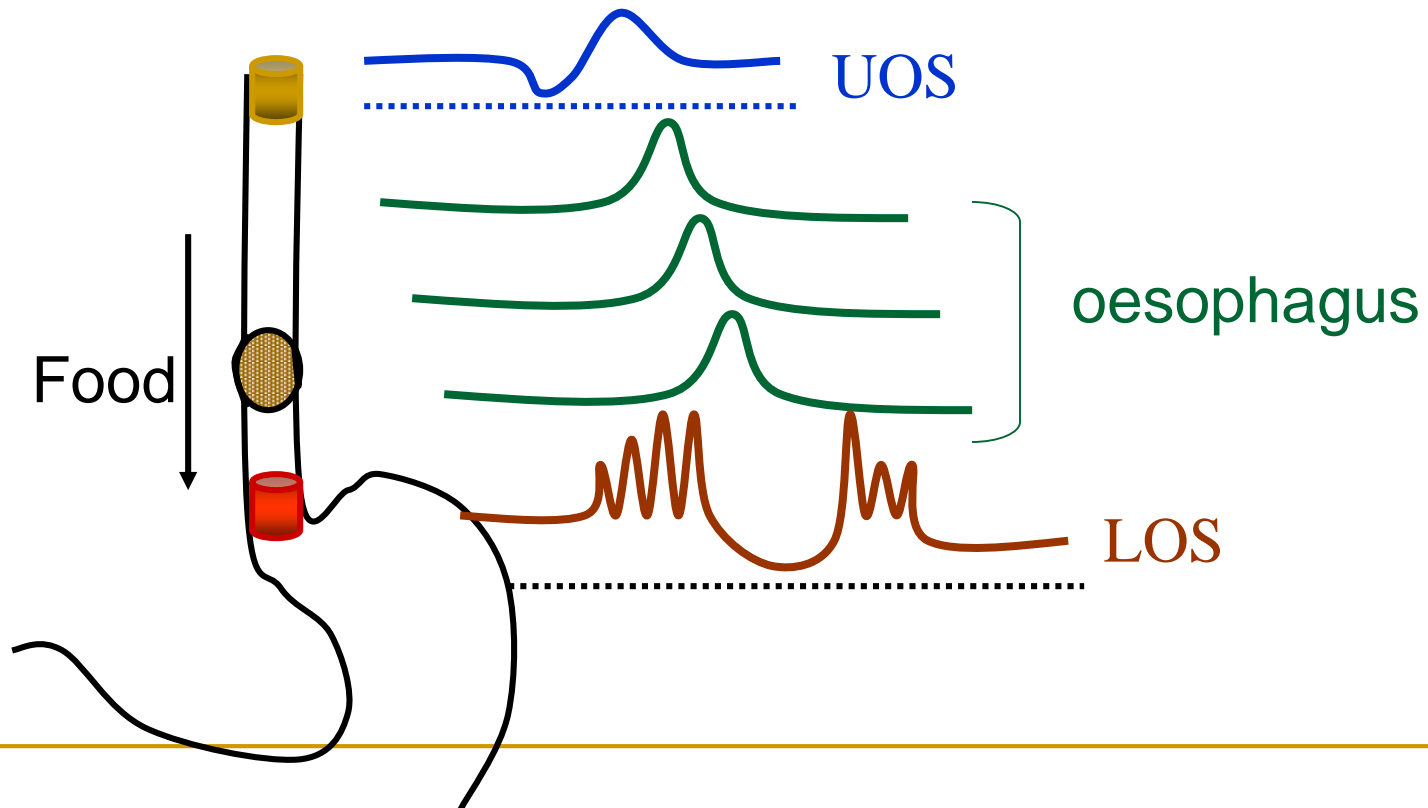
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# Objectives

- Describe the main motility pattern of the oesophagus
  - Describe the anti-reflux mechanisms that operate at the lower oesophageal sphincter
  - Outline the disorders caused by oesophageal dysfunction
    - Dysphagia
    - Gastro-oesophageal reflux disease
    - Achalasia
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# Oesophageal motility

- ❑ Food is transported by peristalsis and by gravity
- ❑ The LOS relaxes to allow food to pass into stomach
- ❑ LOS has a resting pressure which is approximately 15mmHg higher than the intragastric pressure





mmHg

80

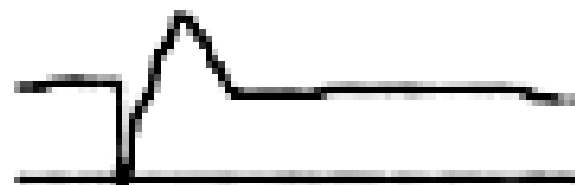
0



Pharynx

80

0



UES

80

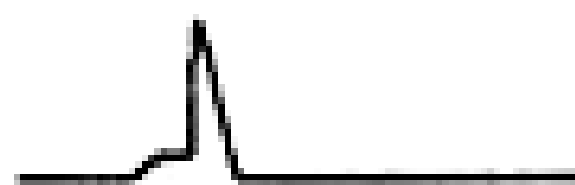
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Esophageal  
body

80

0



5 sec

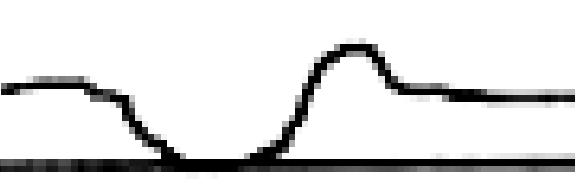
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0



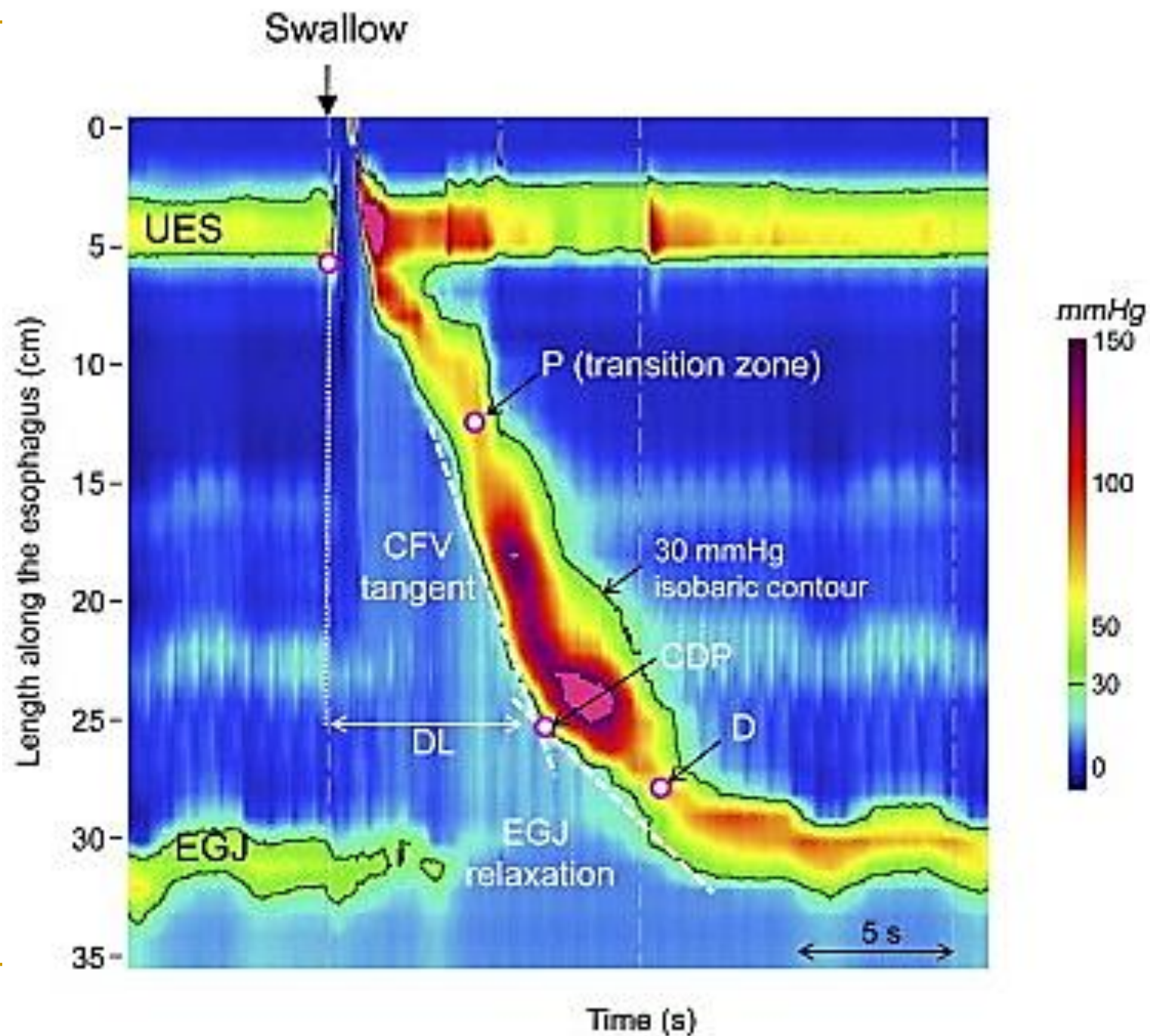
20

0



LES





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# Lower oesophageal sphincter-

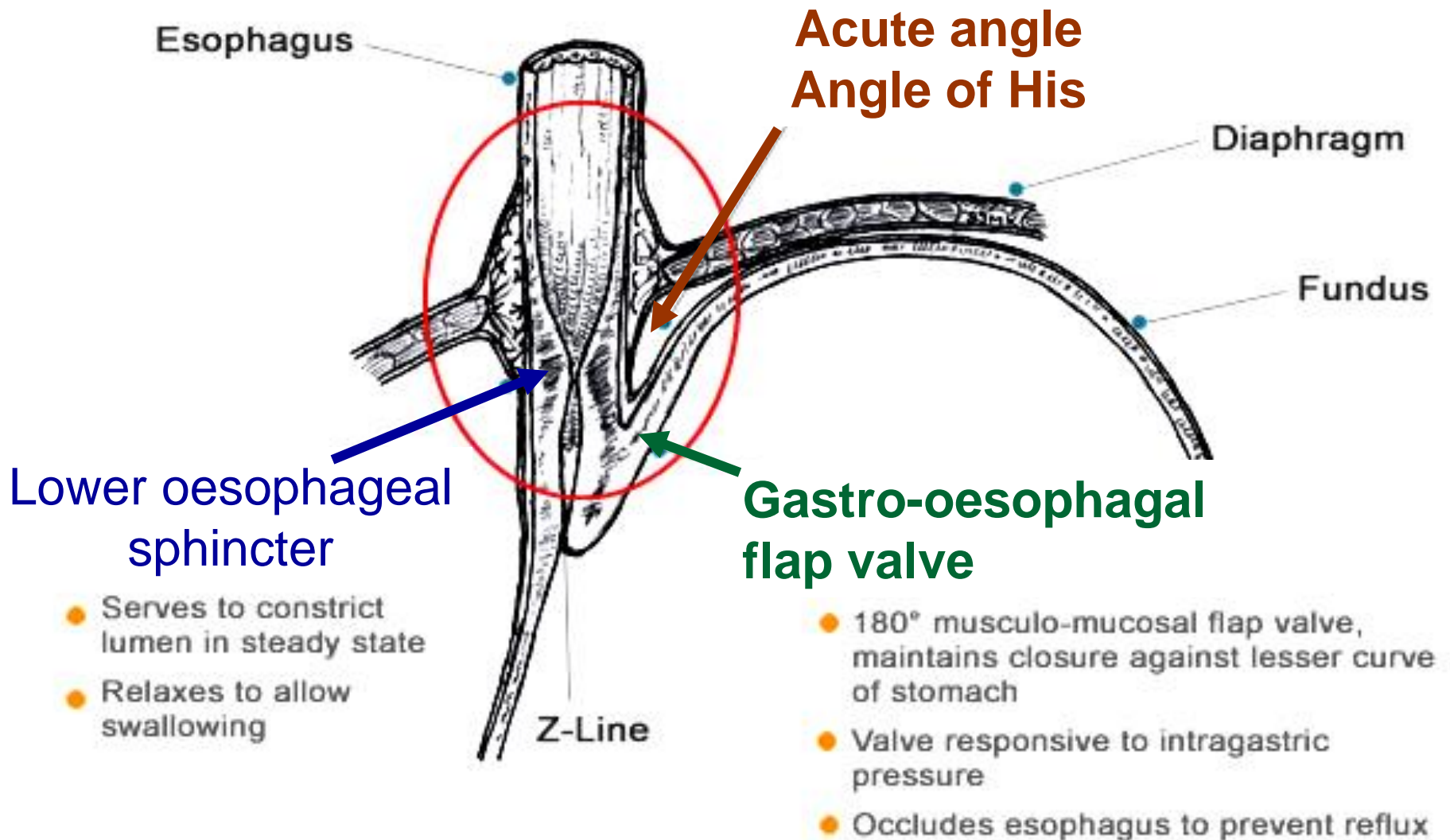
## Factors maintaining the ant-reflux barrier

- ❑ Intrinsic muscles of the distal oesophagus (smooth)
- ❑ Sling fibres of the proximal stomach
- ❑ Crural diaphragm (striated)
- ❑ Intra-abdominal pressure compressing lowest part of oesophagus
- ❑ Angle between lower oesophagus and stomach
- ❑ Mucosal folds at gastro-oesophageal junction

All the above factors contribute to oesophago-gastric junction pressure.

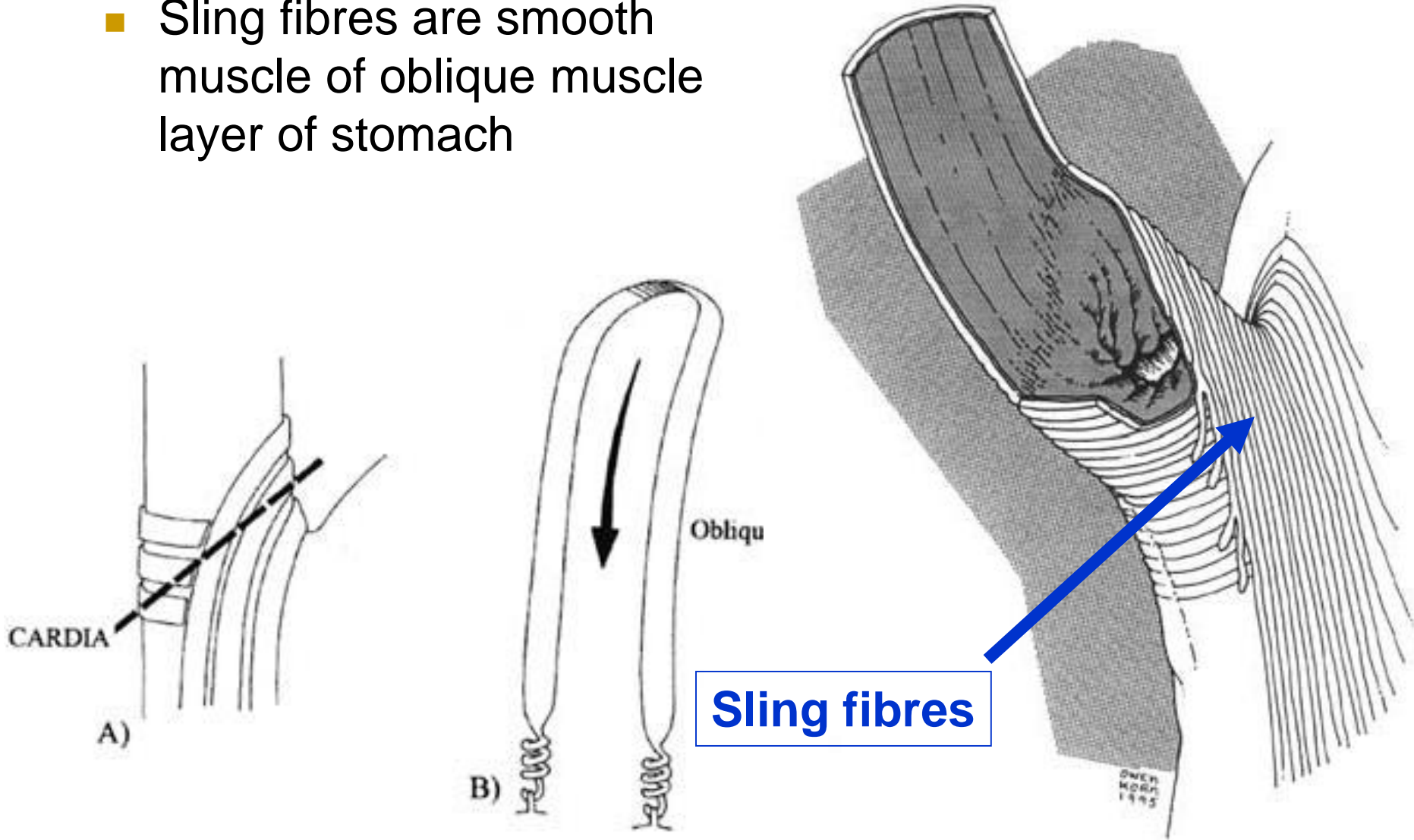
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# Lower oesophageal sphincter cont...



# Lower oesophageal sphincter cont...

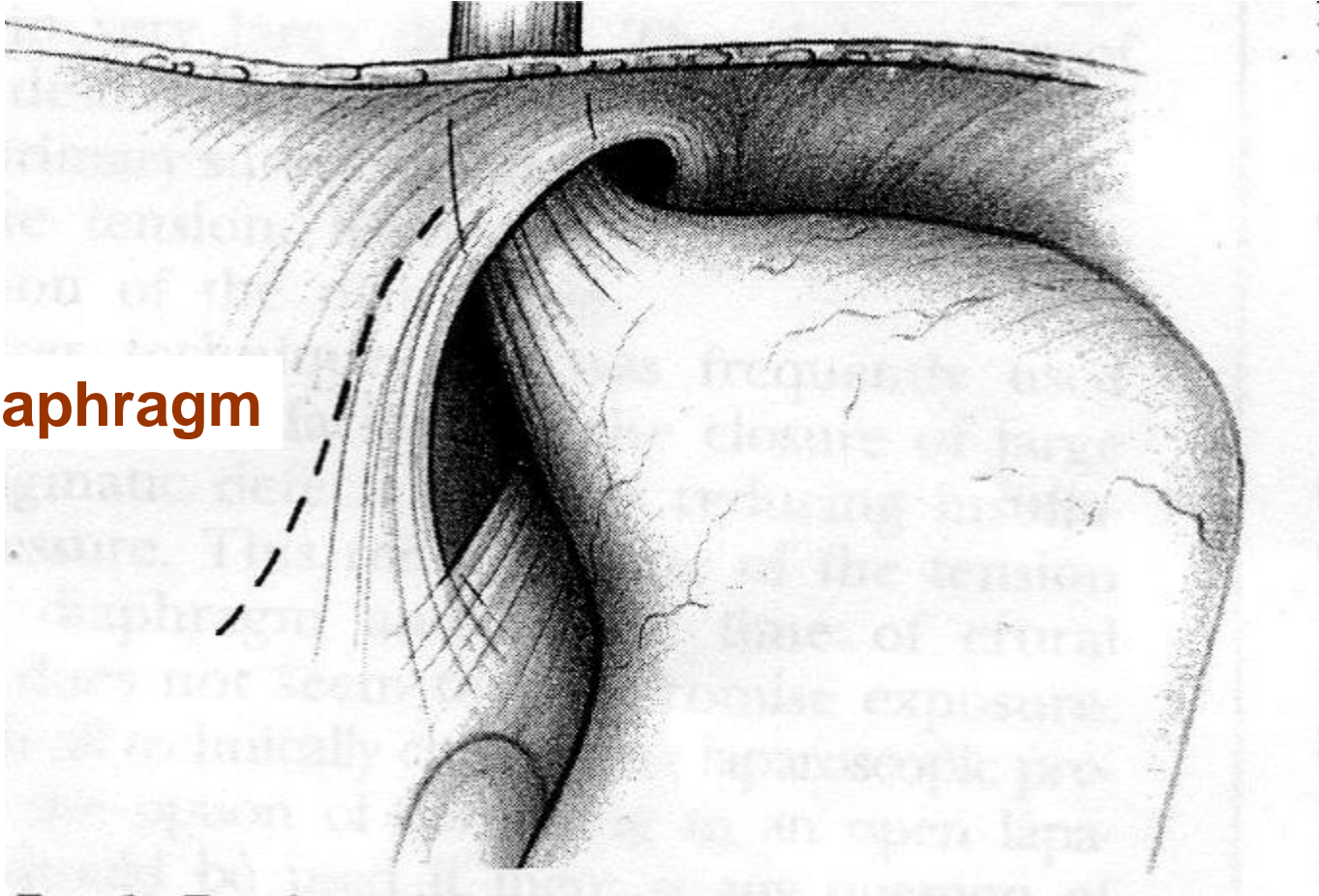
- Sling fibres are smooth muscle of oblique muscle layer of stomach





# Low oesophageal sphincter cont...

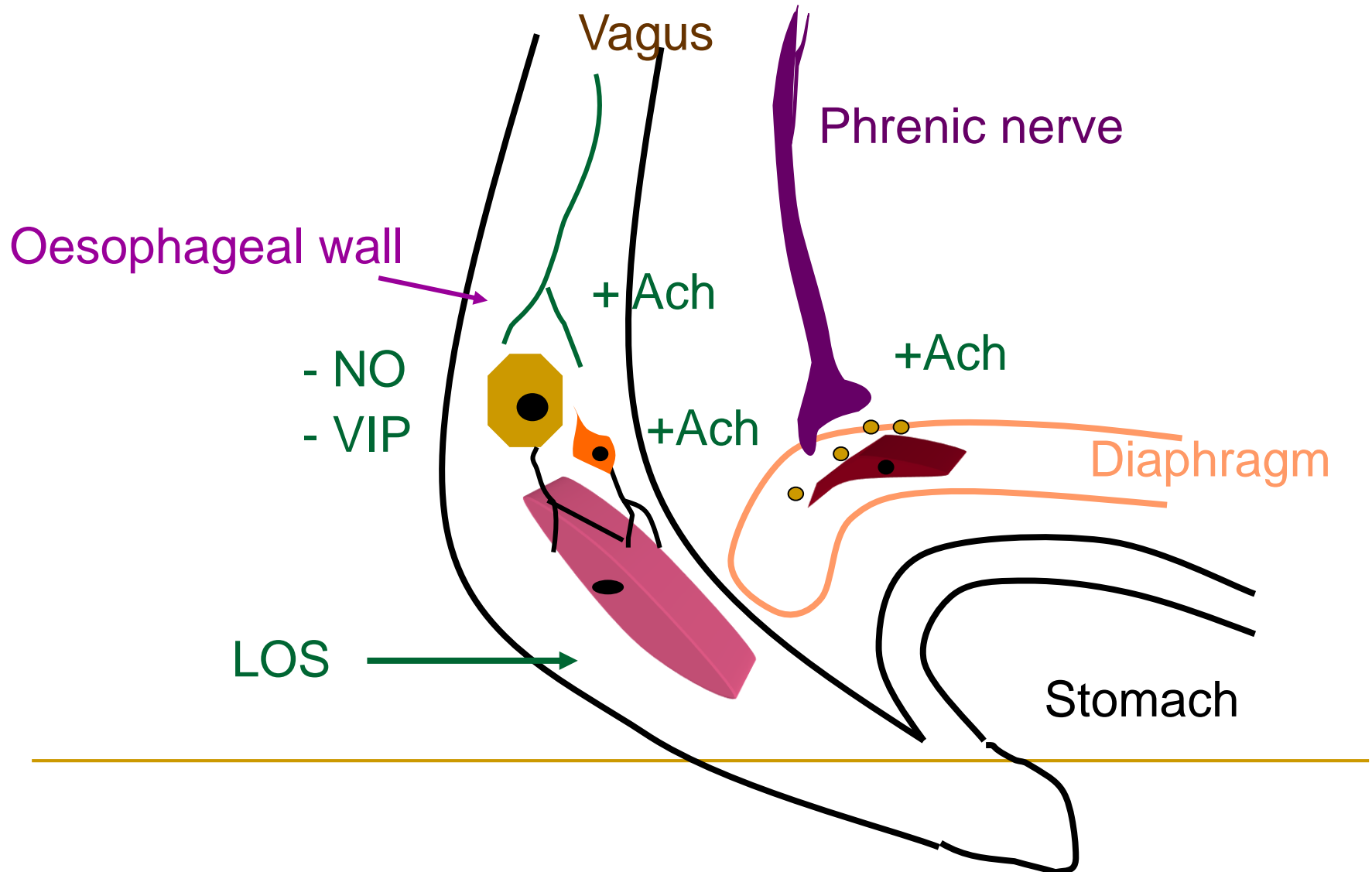
**Diaphragm**



## During inspiration

- Intra-gastric pressure increases & intra-oesophageal pressure decreases
- Tendency to reflux more
- Contraction of the crural diaphragm during inspiration increases oesophago-gastric junction pressure preventing reflux

- ❑ Muscle tone of the intrinsic muscles of the distal oesophagus is the result of neurogenic (mainly cholinergic) and myogenic mechanisms



# Oesophageal motility-

- In order to transport food to the stomach there are two types of peristalsis.
- **Primary peristalsis- co-ordinated by vagal fibres**
  - ❑ Is initiated by swallowing
  - ❑ The circular muscle layer contracts around the top of the food bolus
  - ❑ The longitudinal muscle fibres below the bolus contract, shortening the oesophagus
  - ❑ As a result food moves towards the stomach
- **Secondary peristalsis- co-ordinated by ENS**
  - ❑ Is initiated by distension of the oesophagus
  - ❑ caused by retained materials (food, refluxed material)

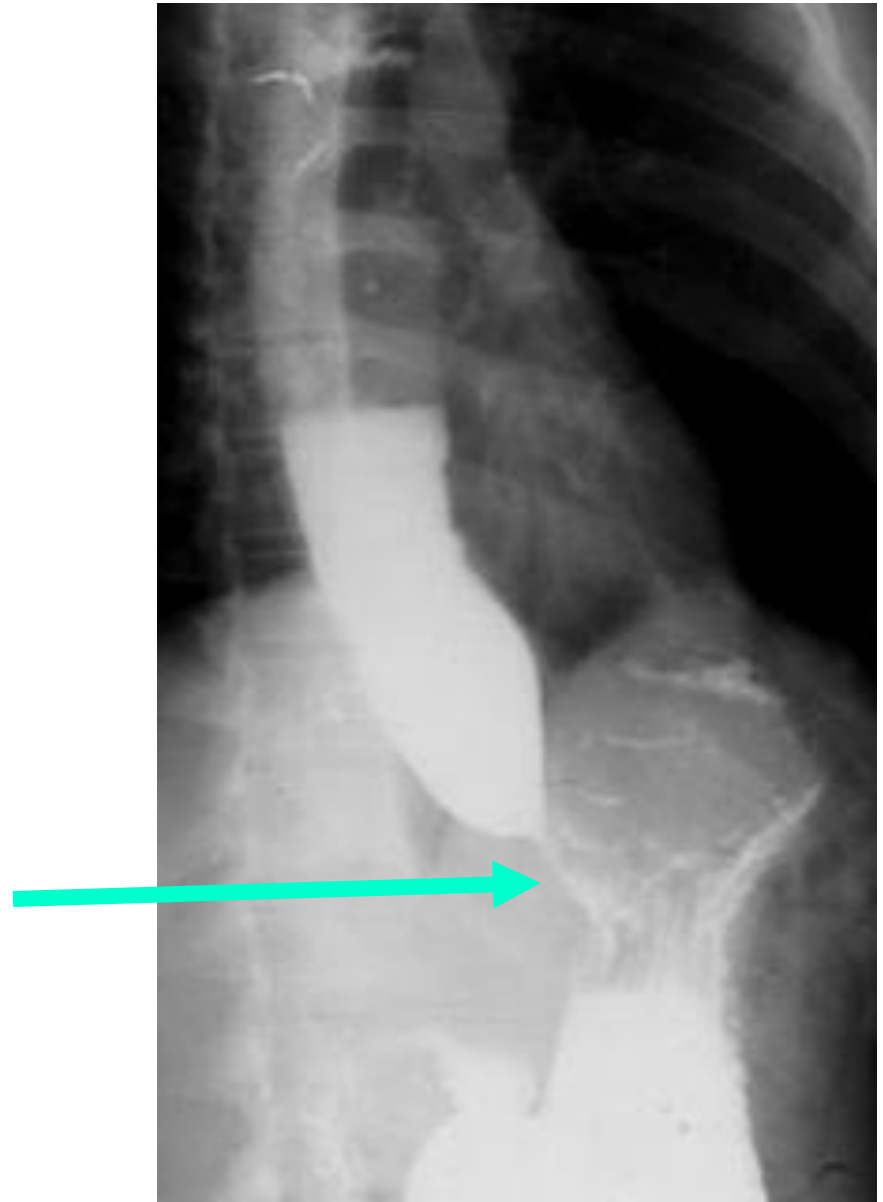


# Dysphagia- difficulty in swallowing

- Dysphagia can be due to oropharyngeal causes or oesophageal causes
    - **structural abnormalities**
      - e.g tumors, strictures in to esophagus
    - **motor abnormalities**
      - neurogenic or muscular disorders affecting normal oropharyngeal contractions / oesophageal peristalsis and sphincter functions ( e.g. achalasia)
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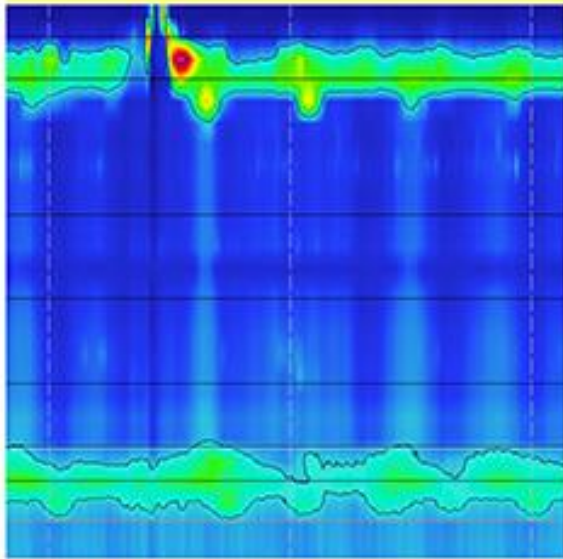
# Achalasia

- Damaged myenteric plexus in lower oesophagus
- Lower oesophageal sphincter fail to relax



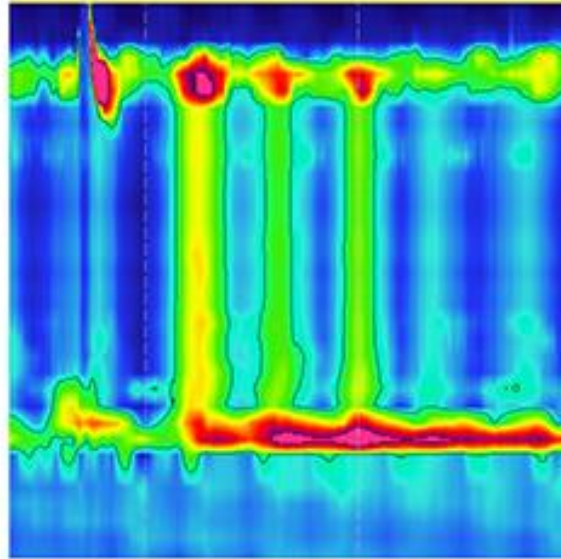
# Achalasia

**Without  
Pressurization**



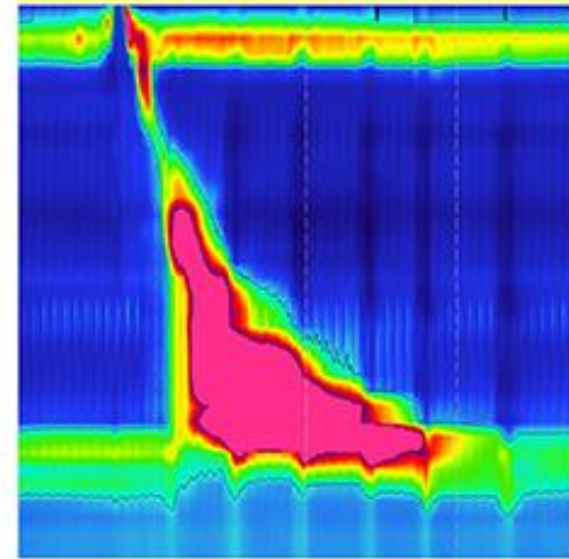
**Type I**

**Pan-Esophageal  
Pressurization**



**Type II**

**Achalasia with  
Spasm**



**Type III**

# Gastroesophageal reflux

Retrograde movement of gastric contents through the LOS to the oesophagus.

## Physiological reflux-

- occurs mainly after meals (infrequent during sleep)
- does not cause symptoms
- short duration of reflux episodes

## Pathological reflux- cause GORD

- frequent reflux episodes of longer duration
- may produce symptoms and inflammation/mucosal injury of the oesophagus

# Aetiology-

1. Incompetent lower oesophageal sphincter
2. Transient lower oesophageal sphincter relaxations
3. Deficient oesophageal acid clearance (abnormalities in oesophageal motility)
4. Gastric abnormalities increasing intra-gastric pressure (e.g gastric outlet obstruction, delayed gastric emptying)

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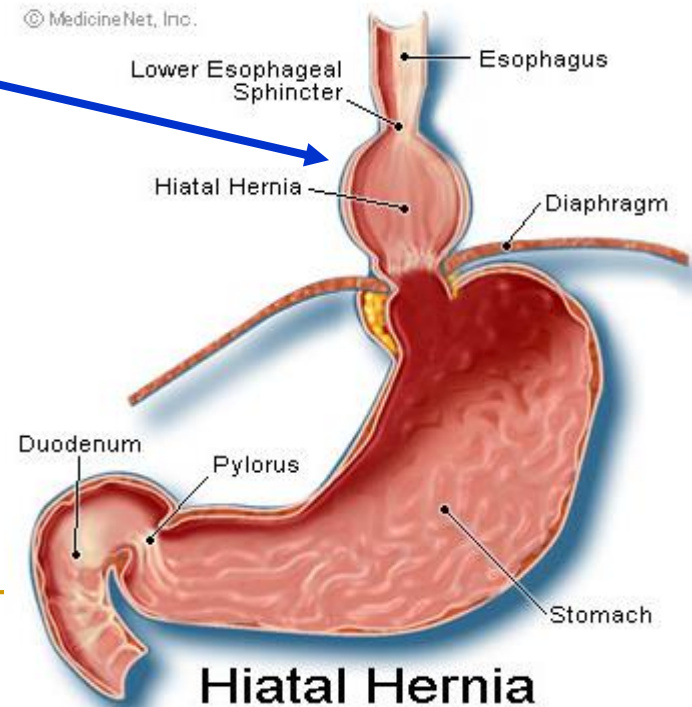
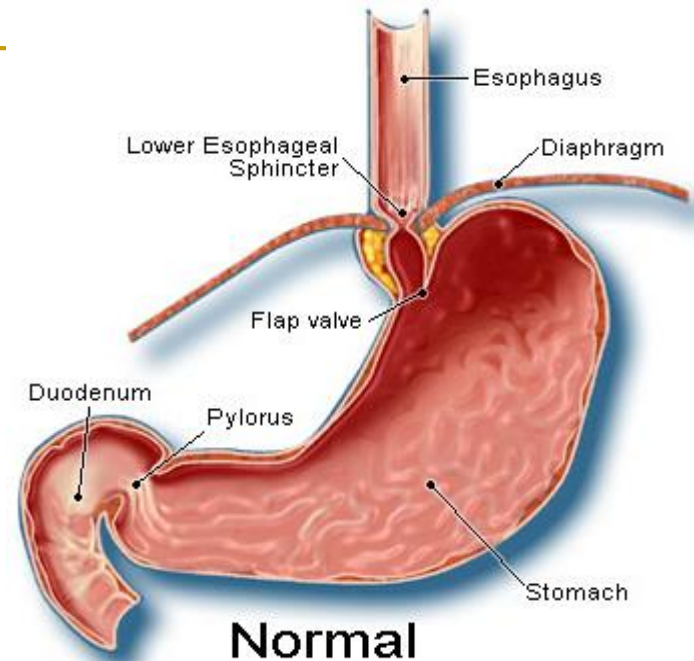
## Efficacy of the LOS depends on many factors-

### 1. LOS basal pressure - can be reduced by

- Fat, caffeine, chocolate
  - Nicotine, Alcohol
  - Drugs such as anticholinergics, beta adrenoceptor agonists, calcium channel blockers
  - Hormones such as progesterone
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2. Length of the intra-abdominal segment of the LOS

3. Overall LOS length  
e.g. hiatus hernia



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# Investigations for GORD

- pH impedance study
  - Upper GI endoscopy
  - Oesophageal manometry
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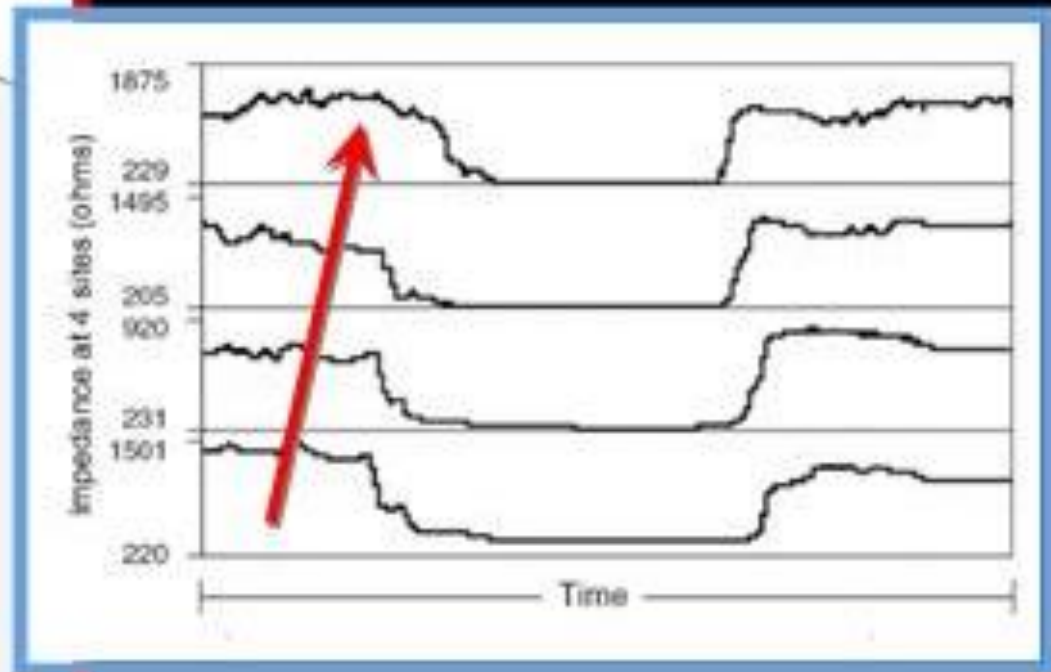
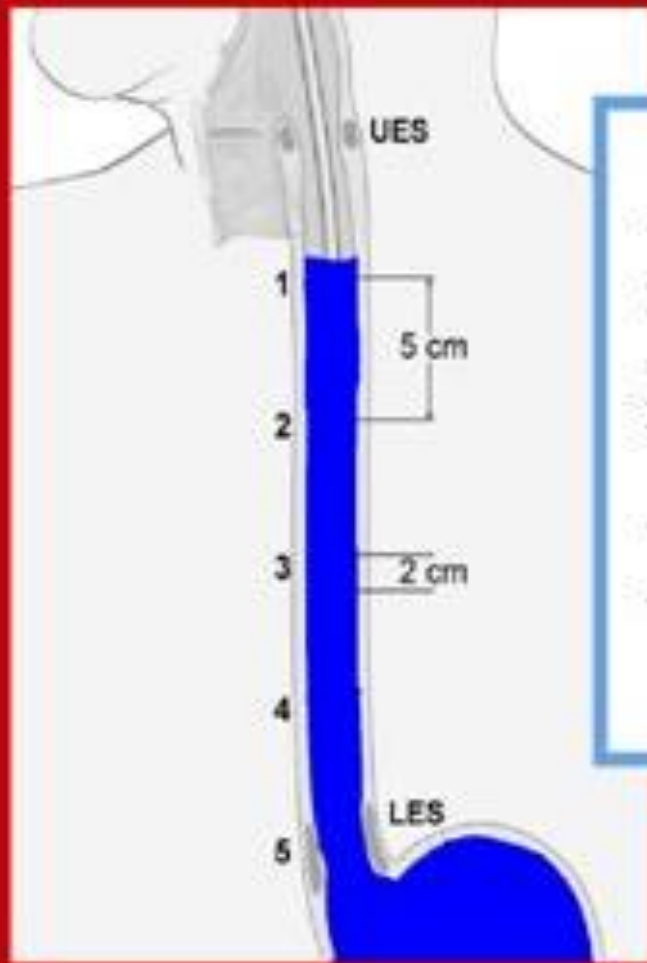
# pH impedance - Swallow

## Antegrade bolus movement



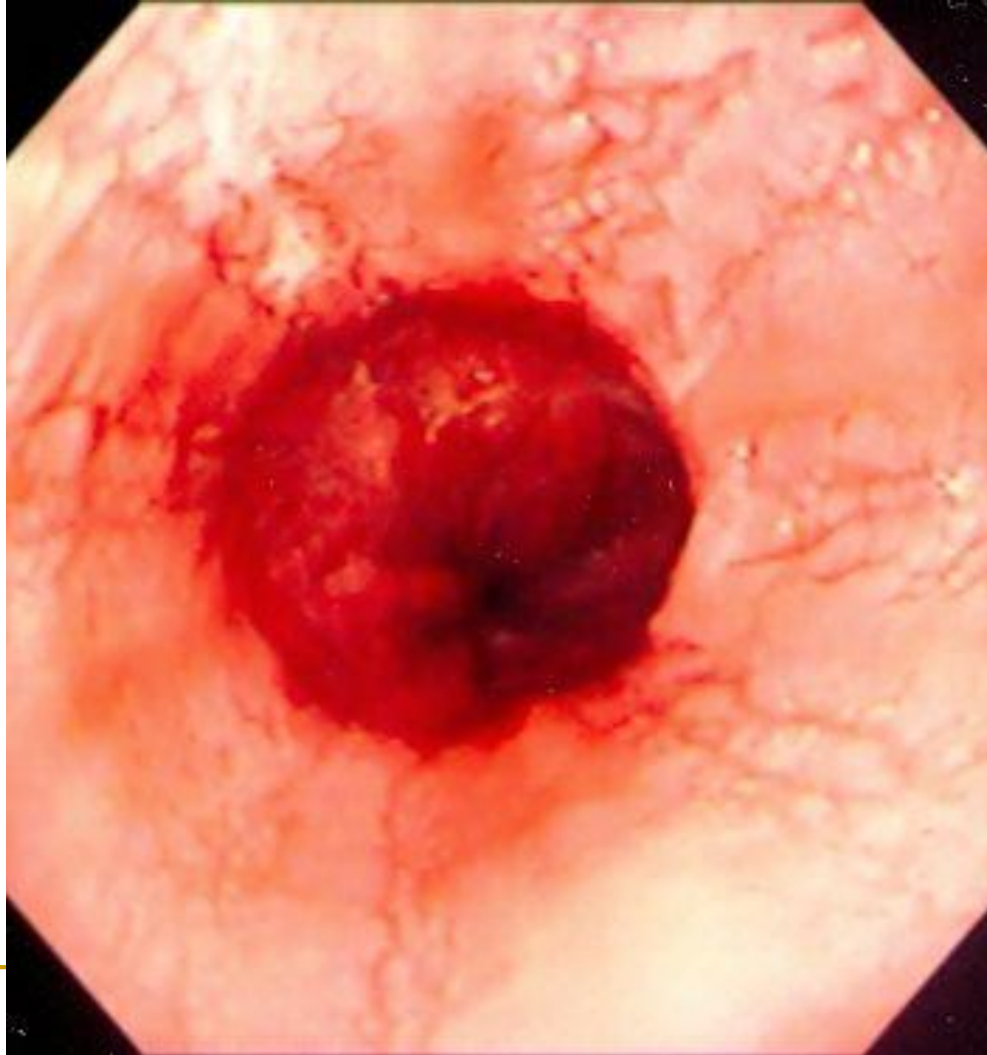
# pH impedance - Reflux

## Retrograde bolus movement

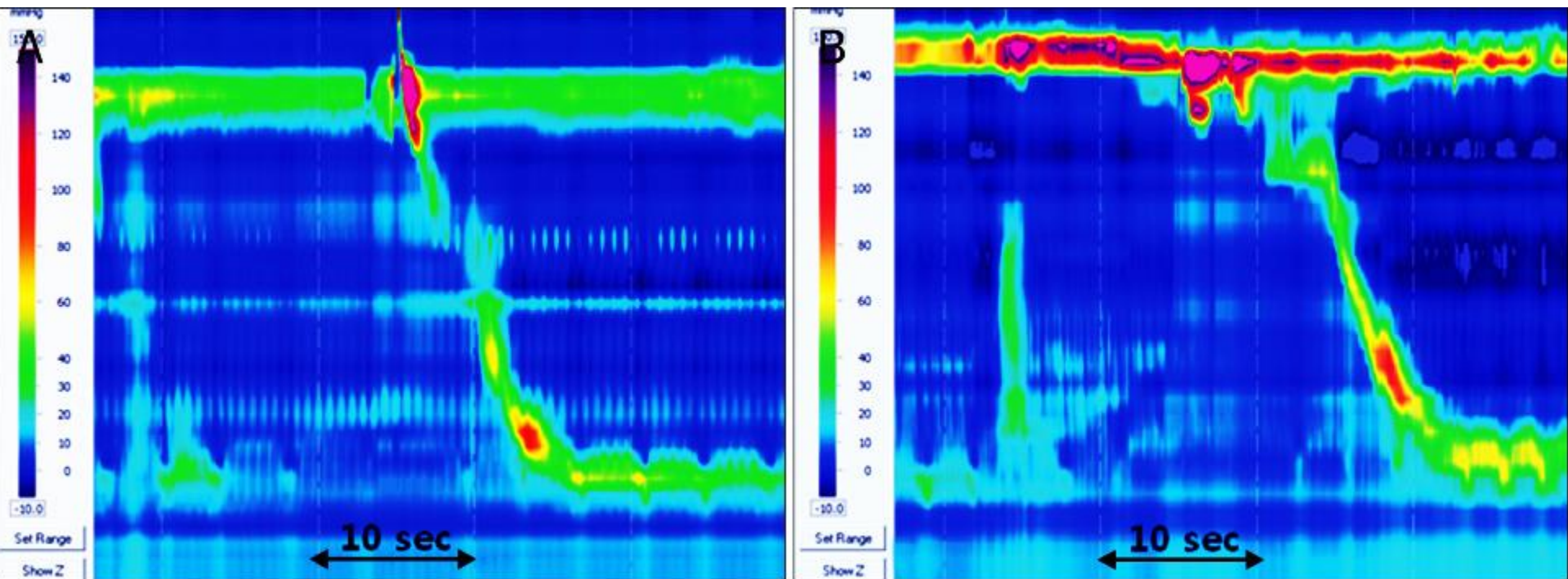


Silny et al, *J Gastrointest Motil* 1993; 5: 107  
Simren et al, *Gut* 2003; 52: 784

# Endoscopy - oesophagitis



# Oesophageal manometry – transient relaxation of lower oesophageal sphincter

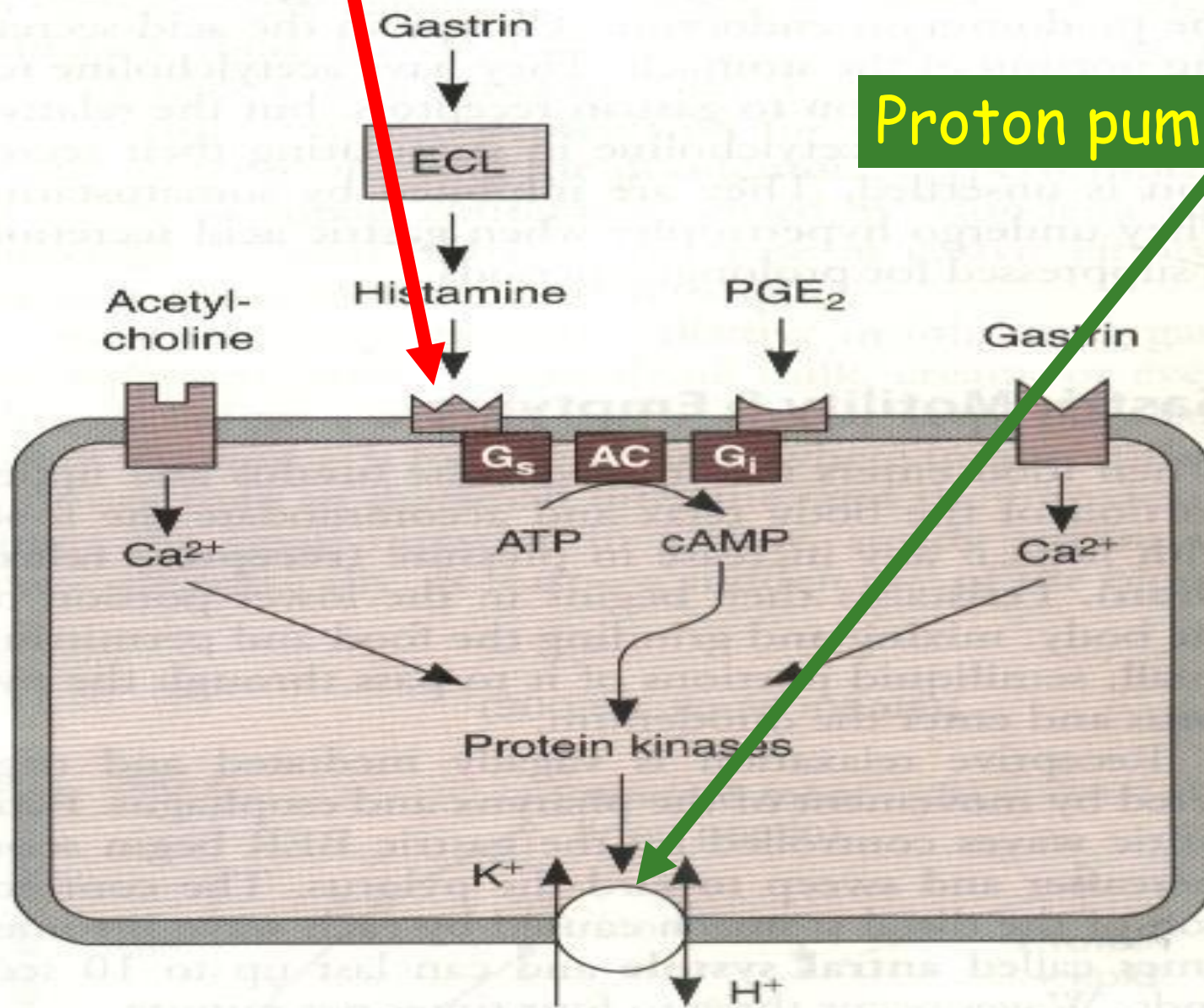


# Physiological basis of GORD management

- Reduce acidity of the gastric juice
  - Antacids
  - H<sub>2</sub> receptor blockers
  - Proton pump inhibitors
- Increase gastric emptying
  - Prokinetic drugs
  - Avoid high fat diet
- Decrease risk factors – alcohol, smoking, stress etc.
- ?Increase LOS pressure
- ?Improve Oesophageal peristalsis



# H2 receptor blockers



Proton pump inhibitors

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<https://www.youtube.com/watch?v=KAfnlPYN0X0>

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