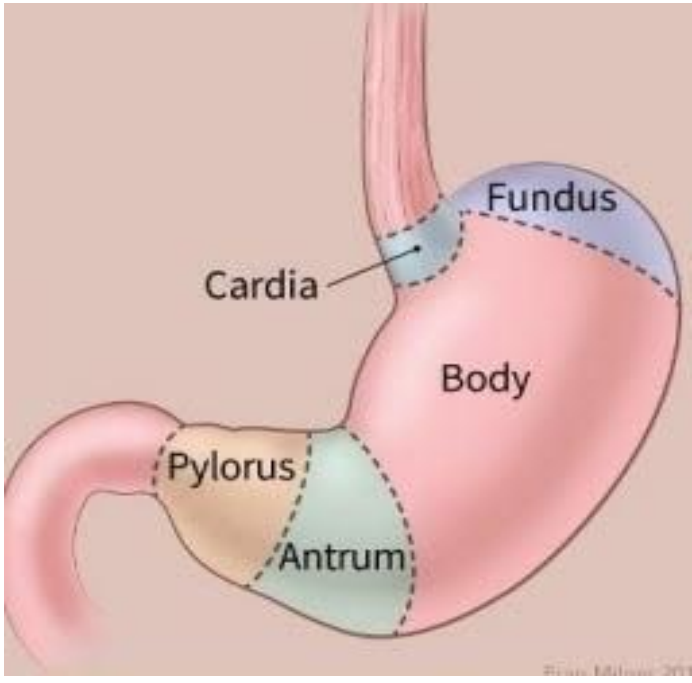
GASTRIC FUNCTION TESTS



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Indications of gastric function tests

1. Diagnosis of gastric ulcer
2. In chronic duodenal ulcer
3. Evaluate pernicious anemia in adult
4. Presumptive diagnosis of Zollinger – Ellison syndrome
5. Determination of completeness of surgical vagotomy

CLASSIFICATION

1.Examination of resting contents in resting juice (GASTRIC RESIDUM)

2.Fractional test meal

3.Examination of contents after stimulation

a) Alcohol stimulation
b) Caffeine stimulation
c) Histamine stimulation
d) Augmented histamine test
e) Insulin stimulation test
f) Pentagastrin test

4.Tubeless gastric analysis

5. Endoscopy

Collection of sample

Collection of contents of stomach

- After overnight fast
- After test meal

Types of stomach tubes

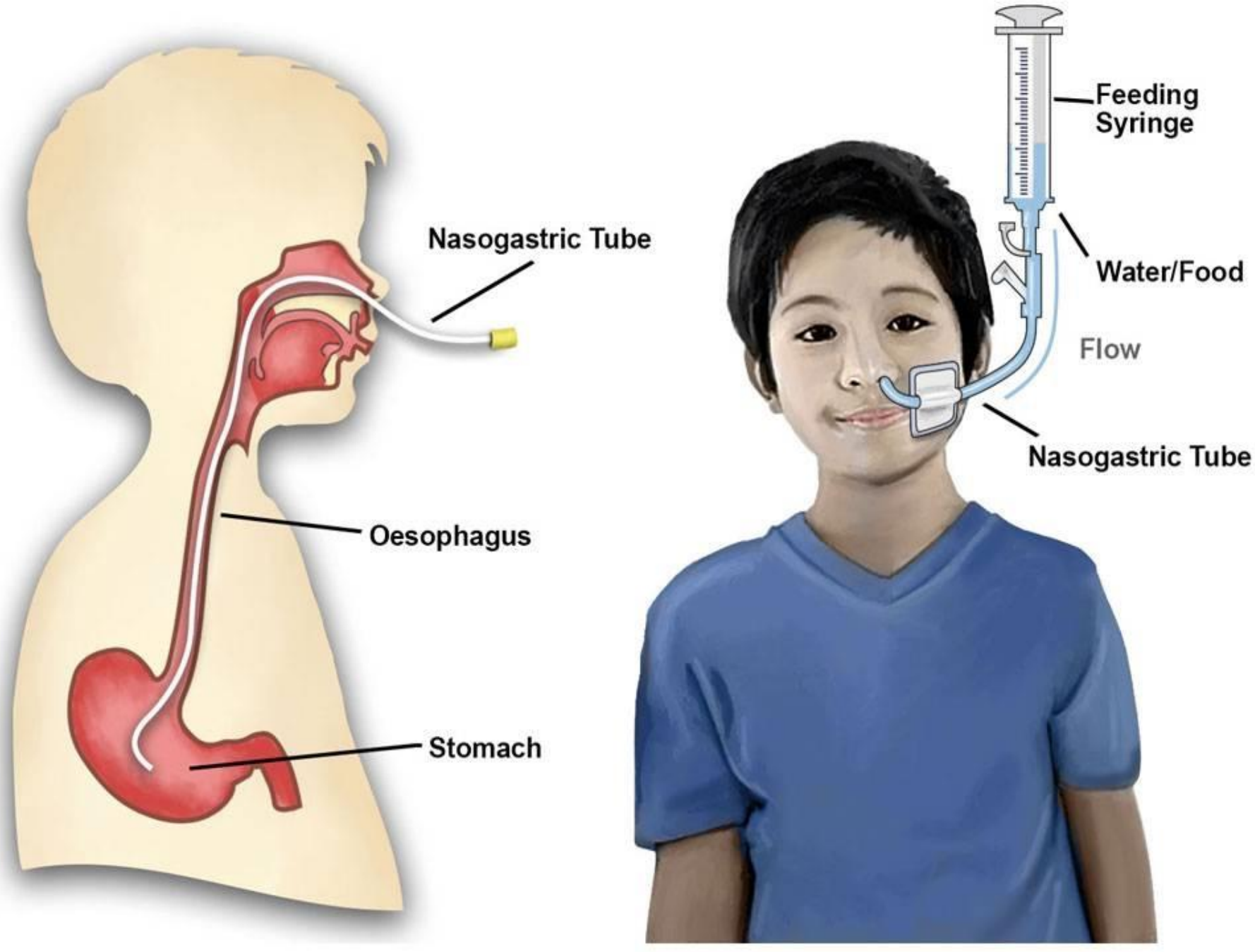
Rehfuss tube

Ryles tube

Markings on tube

Single ring reaches lips ----Tip reaches cardiac end

Double ring reaches lips--- Tube in body of stomach



Examination of resting contents

1. Volume

Normal ----20 – 50 ml

Abnormal -----greater than 100 – 120 ml

Hypersecretion of gastric juice

I. Retention of gastric contents due to delayed emptying

II. Due to regurgitation of duodenal contents

2. Consistency

Normal -----fluid

Abnormal ----food residues (Ca stomach)

3.Colour

Normal -----clear or colourless

Abnormal ------

slightly yellow /green -- regurgitation of bile

red brown--- due to presence of blood

4.Bile

Intestinal obstruction

Ileal stasis

5.Blood

In trace amount – may be due to trauma during Ryles tube passage

Increased amount –

Gastric carcinoma

Erosive gastritis

Bleeding peptic ulcer

6. Mucus

Normal --- small amount

Increased mucus ----gastritis and gastric carcinoma

7. Organic acids

Absence of HCl ------micro organisms thrive and ferment food residues to produce organic acids, lactic acid and butyric acid

8. Pepsin

Absence ---Achylia Gastrica

Incresed --- Z E syndrome
duodenal ulcer
gastritis

Decresed --- chief cell mass
atrophic gastritis
gastric carcinoma

9. FREE AND TOTAL ACIDITY

Free acidity (0 – 30 mEq/L)

measures only HCl

it is measured by titration with N/10 NaOH using Topfer's reagent as indicator

Combined acidity (FA-TA)

include Protein hydrochlorides, acid phosphates, and organic acids like lactic acid and other organic acids

Total Acidity (10 – 40 mEq/L)

sum total of free and combined study.

it is measured by titration with NaOH by phenophthalein indicator

Fractional gastric analysis/fractional test meal

Introduction of ryles tube in stomach of fasting patient Removal of residual gastric contents and its analysis

Ingestion of test meal

(Ewald meal: toast, with water or tea Fractional test meal of Rehffus: Pint of oat meal gruel)

Analysis of samples

Hyperacidity/ hyperchlorhydria	Max free acidity exceeds 45 mEq/L	Duodenal ulcer Gastric ulcer Gastric carcinoma Hyperirritability
Hypoacidity	Free acid below the normal range	Pernicious anemia
Achlorhydria	No secretion of HCl but enzyme pepsin is present	Carcinoma stomach Partial gastrectomy Pernicious anemia Hyperthyroidism myxedema

Achylia gastrica – both enzymes and acids are absent indicating complete absence of gastric secretions
Advanced gastric cancer
Typically seen in pernicious anemia and subacute combined degeneration of spinal cord

Stimulation tests –

1. Alcohol stimulation test

Overnight fast, Ryles tube passed – resting contents removed for analysis

100 ml of 7% ethyl alcohol is administered

Samples removed after every 15 mins and analysed for free and total acidity, presence of bile, blood and mucus

2. Caffeine stimulation Test

caffeine sodium benzoate (500 mg in 200 ml water) given orally

3. Histamine stimulation test

Powerful stimulant for HCl in normal stomach

Acts on receptors of oxyntic cells, increasing cAMP, which causes secretion of increased volume of high acidic gastric juice with low pepsin content

Best to differentiate between true achlorhydria from false achlohydria

.

Augmented histamine test

- Normal persons ---Upto 10 mEq/hr acid is present in pre histamine specimen ,
  with 10 -25 mEq in post histamine specimens

Pernicious anemia ----No free HCl secreted

Duodenal ulcer ----- > 100 meq

4. Insulin stimulation test (Hollander's test)

Potent stimulus for gastric acid secretion – hypoglycemia

Indication :

To check the effectiveness of vagotomy in patients with duodenal ulcer

Stimulus – 0.1-0.2U/kg body weight of soluble insulin iv

After successful vagotomy , since there is no response to insulin, gastric acidity remains at a low level of 15 -20 meq/L before as well as after insulin administration.

5.Pentagastrin stimulation test

- Pentagastrin is a synthetic peptide.
- It stimulates the gastric secretion in a manner similar to the natural gastrin.
- The stomach contents are aspirated by Ryle's tube in a fasting condition.
- This is referred to as residual juice.
- The gastric juice elaborated for the next one hour is collected and pooled which represents the basal secretion.

- Pentagastrin (6 micg/kg body wt given sc) is now given to stimulate gastric secretion.
- The gastric juice is collected at 15 minute intervals for one hour.
- This represents the maximum secretion.
- Each sample of the gastric secretion collected is measured for acidity by titrating the samples with N/10 NaOH to pH 7.4.
- The end point may be detected by an indicator (phenol red) or a pH meter

Basal acid output (BAO) refers to the acid output (millimol per hour) under the basal conditions i.e. basal secretion.

Maximal acid output (MAO) represents the acid output (millimol per hour) after the gastric stimulation by pentagastrin i.e. maximum secretion.

- In normal individuals,

  BAO is 1- 2.5 mmol/hr

  MAO is 20-40 mmol/hr.

Condition	Basal secretion	Maximal scretion
Normal	1 – 2.5 mEq/hr	20 – 40 mEq/hr
Duodenal ulcer	Moderately raised	Above 40 mEq/hr
Zollinger Ellinsons Syndrome	Highly raised	Highly raised
Gastric cancer		True achlorhydria
Pernicious anemia		True achlorhydria

Tubeless gastric analysis

- The tubeless gastric analysis involves administration of a cation exchange resin tagged with a dye Azure A is given orally.

HCl secreted by stomach displaces the dye

Absorbed in intestine

Excreted in Urine

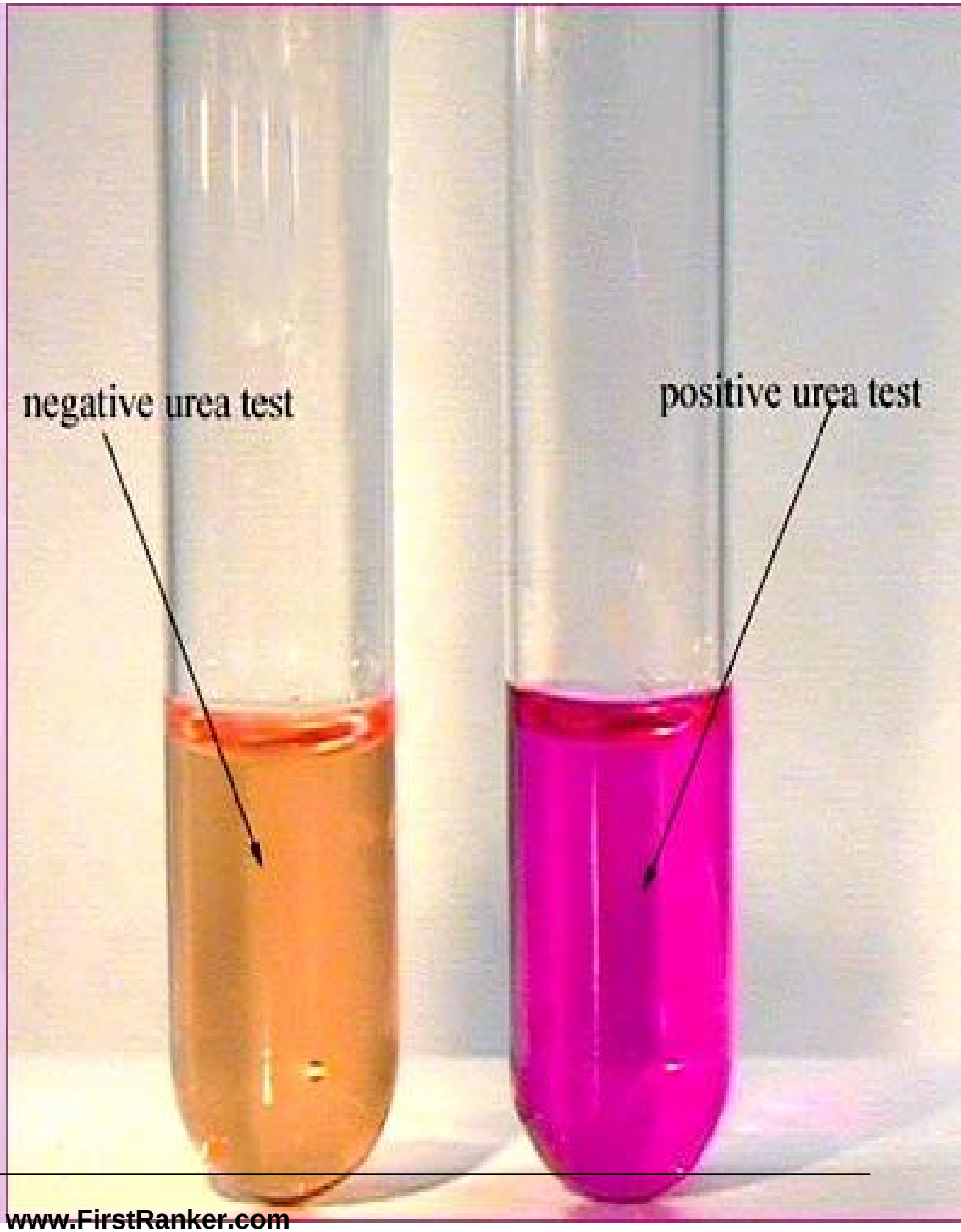
The amount of dye excreted in urine is proportional to acid output.

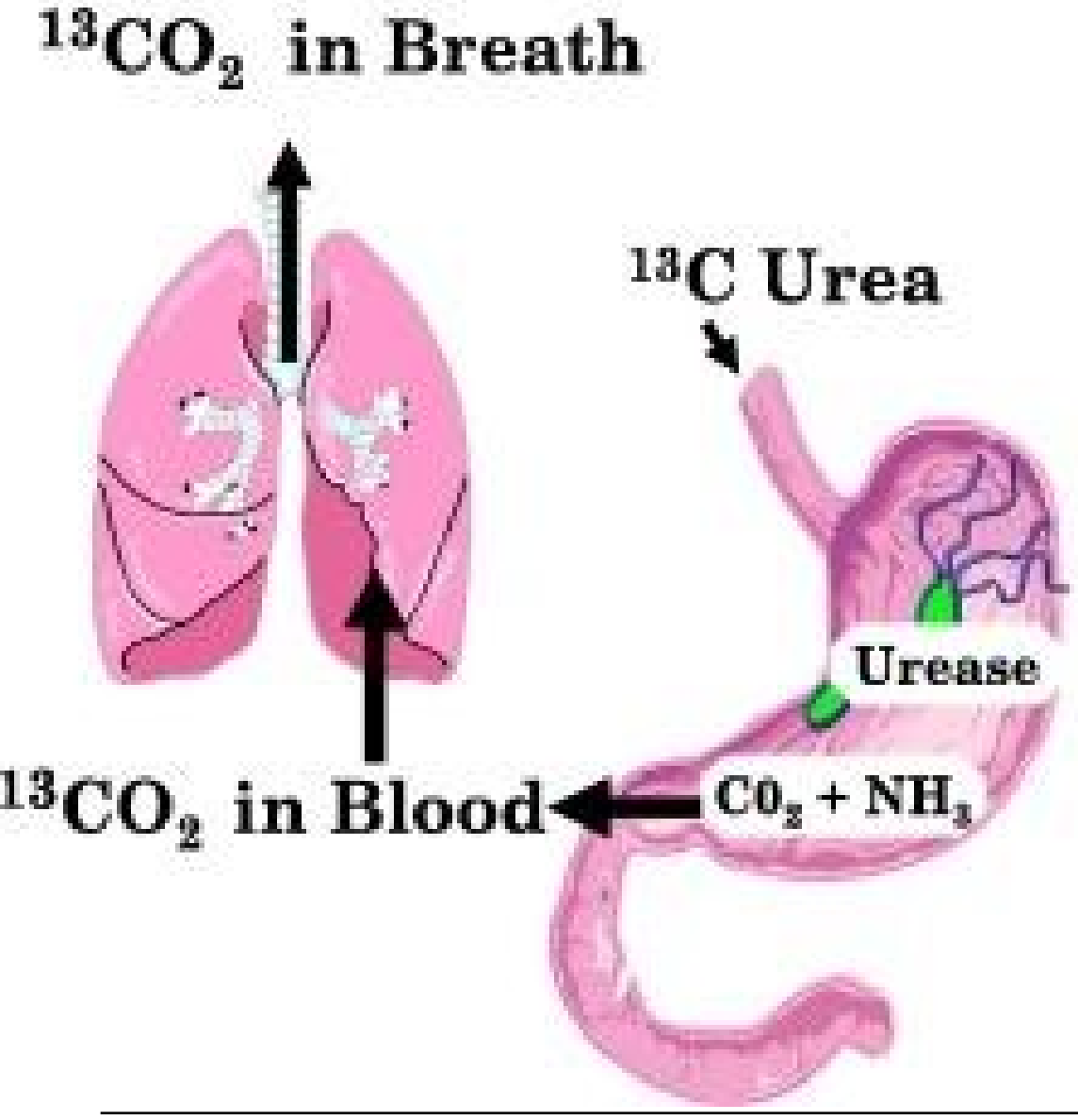
Helicobacter Pylori Detection

- H.pylori infection is playing a role in acid peptic disease.
- The bacteria releases Urease enzyme

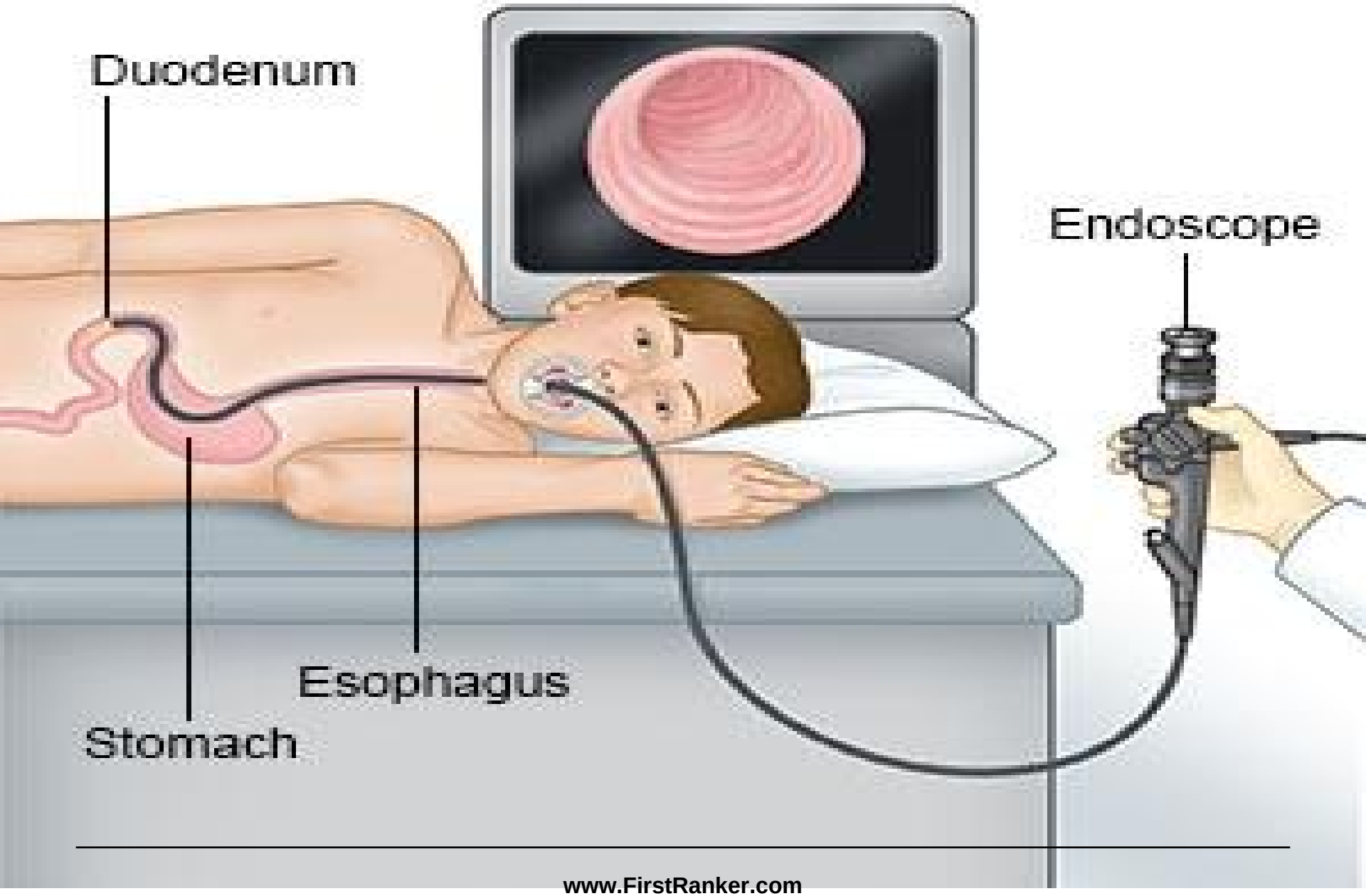
Tests for H.Pylori

1. Rapid urease test in gastric biopsy
2. Serological tests – anti H.Pylori antibody ,less reliable
3. ^{13}C, ^{14}C- Urea breath CO_2 test
4. Stool antigen for H.Pylori
5. Histological examination and culture of gastric biopsy sample.





Upper Endoscopy



Importance

Limited but specific uses in certain conditions

- Perinicious anaemia
- ZES
- Peptic ulcer
- Now endoscopy plays a major role
- Biopsy can be taken