* GERD - Involuntary, effortless passage of gastric contents into the oesophagus +/- ejected from the mouth resulting in troublesome symptoms or complications
1 in 300 - 1 in 1000 infants have significant symptoms.

- Frequent vomiters
  - < 3 months: 50% have GOR
  - > 3 months: 60% have GOR

- Good news
  - 9 - 12 months: > 90% resolve spontaneously
Differential Diagnosis

- Gastro-oesophageal reflux
- Pyloric stenosis
- Tracheo-oesophageal fistulae
- Sepsis, gastroenteritis
- Cow’s milk protein intolerance
ANTI REFLUX MECHANISMS

- Crural diaphragm
- Angle of His
- Mucosal choke
- LES
A — Lower oesophageal sphincter
B — Intra-abdominal oesophagus
C — Angle of His
D — Mucosal choke
* Specialized high pressure zone in muscle of distal oesophagus

* Length: 1cm neonates 3cm adults

* Within hiatus, surrounded by phreno oesphageal ligament

* Upper part in Thorax, lower in abdomen

* Descending wave of oesophagus contraction results in its relaxation
WHY DO CHILDREN HAVE A HIGHER INCIDENCE OF GORD?
GOR in Children

- Increased feeds frequency
- Shorter oesophagus
- Increased intra-abdominal pressure
- Decreased gastric compliance
- Wider angle between oesophagus and stomach
- Supine position
- Liquid feeds
PRESENTATION

INFANTS

- Regurgitation- 50-70%
- Feeding refusal, choking
- Apnoea, recurrent chest symptoms
- Irritability
- Haematemesis
- Anaemia
- Failure to thrive
- Sandifer syndrome
PRESENTATION

PRESCHOOL

* Intermittent regurgitation
* Respiratory symptoms, persistent wheezing
* Decreased food intake
* Growth failure
OLDER CHILD/ADOLESCENTS

- Chronic heartburn
- Regurgitation
- Chest pain
- Nausea
- Epigastric pain
- Dysphagia
- Hoarseness
- Recurrent chest infections, wheeze
“Red flag” signs and symptoms

- Severe symptoms
- Apnoea
- Haematemesis
- Recurrent forceful vomiting
- Anaemia
- Dysphagia
- Weight loss / failure to thrive
Guidelines for Diagnoses and Management

Pediatric Gastroesophageal Reflux Clinical Practice Guidelines: Joint Recommendations of the North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition (NASPGHAN) and the European Society for Pediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN)

Co-Chairs: *Yvan Vandenplas and †Colin D. Rudolph
Committee Members: ‡Carlo Di Lorenzo, §Eric Hassall, ||Gregory Liptak, ¶Lynnette Mazur, #Judith Sondheimer, **Annamaria Staiano, ††Michael Thomson, ‡‡Gigi Veereman-Wauters, and §§Tobias G. Wenzl

Journal of Pediatric Gastroenterology and Nutrition. 2009: 498 - 547
INVESTIGATIONS FOR GERD

- Barium Meal
- Milk Scan
- PH Study
- Impedance study
- Oesophagoscopy/ other invasive tests
BARIUM MEAL

To detect anatomical abnormality
* H type TOF

* Oesophagus stricture/ ring

* Stomach- Hiatus Hernia

* Duodenum- Pyloric/ duodenal stenosis
  - Malrotation
**NUCLEAR SCINTIGRAPHY (MILK SCAN)**

- 99 Technetium labelled milk
- Identifies:
  - Postprandial GOR
  - Aspiration into lungs
  - Gastric emptying
PH STUDY

* Determines acidification of oesophagus
  - duration over 24hrs
  - length of episodes mimics lifestyle

* Identifies number of refluxes
  - duration of reflux
  - relation to intake

* Confirms if episodic resp symptoms (e.g. apnoea) caused by GORD

* Efficacy of acid suppression
Measures movement of fluids/solids/air in oesophagus, using a catheter with sequentially placed electrodes which measure change in electrical impedance.

Identifies:
- oes clearance/acid exposure
- oes/gastric motility
- episodes of gastro-oes reflux and its upper extent
- symptom association
INVASIVE TESTS FOR GORD

Oesophagoscopy/ Laryngoscopy

Assess
- GOR damage to oesophagus
- Biopsy to confirm histo normal (up to 20% abn)
- Other causes of symptoms/ seq from GOR
- Barretts
- Eosinophilic/ viral oesophagitis
- Web
<table>
<thead>
<tr>
<th>Investigation</th>
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<tr>
<td>Scintigraphy</td>
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<td>Prolonged pH monitoring</td>
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Natural History of GER in Children Up to Age 2yrs: Infant Spilling

(=‘Spitting up’/ Vomiting / Regurgitating/ ‘Possetting’)

41% of infants age 3 to 4 months spit up most of their feedings

GER occurs in <5% of infants age 13 to 14 months

Natural history of reflux in infancy

Prevalence of regurgitation in healthy infants

- Orange bars: ≥ 1 / day
- Green bars: ≥ 4 / day

% of Infants

Age (months)

0-3
4-6
7-9
10-12

n=948

Adapted from Nelson et al, Arch Pediatr Adolesc Med 1997
MEDICAL MANAGEMENT

- Approach depends on:
  - specific symptoms
  - severity
  - expected natural history
  - concomitant problems

- Goals of therapy:
  - to relieve symptoms
  - to prevent complications
  - to treat complications
MEDICAL MANAGEMENT

- **Position**
  - Decrease GOR episodes in prone but increase SIDS
  - Not recommended
- **Thickening of feeds (guar gum / cereals)**
  - No and height of non acid reflux episodes
  - But does not decrease oesophageal exposure
  - Increase work of sucking
- **Hypoallergenic feeds trial**
  - Limited 2 week trial
  - Determine cow or soy milk protein allergy
- **Mode of delivery**
  - Small volume feeds or continuous gastric feeds
  - Continuous jejunal feeds
**Pharmacological therapy:**

- Surface agents
  - sodium alginate, sucralfate

- Motility agents
  - domperidone, baclofen

- Acid-suppressive agents
  - H₂RAs, PPIs
Antacids – not for prolonged use
Alginate – efficacy in studies varies
Sucralfate
  Effective for oesophagitis
  ??? For GORD

NOT TO BE USED AS THE SOLE TREATMENT
PROKINETIC THERAPY

- Cisapride - prolonged QTc
- Domperidone - anxiety, tremors, dystonia
- Metoclopramide - anxiety, tremors, dystonia
- Bethanechol

- All have significant side effects

- NOT FOR ROUTINE USE
Acid Suppression: Parietal Cell

**H2RA**
- Active drug available to block receptor soon after absorption
- ‘On-demand’ use
- Tachyphylaxis
- Fail to block meal-stimulated acid secretion

**PPI**
- Coated: protect v gastric acid
- Absorbed small bowel
- Pro-drug to active sulfenamide
- Secreted into lumen, binds only new/active acid pumps: take before breakfast
  - Delayed action
Rapid onset of action
Tachyphylaxis (response) after 6 weeks
Tolerance develops
Not for chronic use – better for episodic relief
Not as effective as PPIs for symptom relief or oesophagitis
PPIs better for long term treatment of GORD
MAINSTAY OF THERAPY

- Better and faster healing rates of erosive oesophagitis than H₂RAs
- Inhibit acid secretion by blocking H/K ATPase in the stomach
- Extraoesophageal symptoms less responsive than oesophageal
- PPIs are very effective and safe for the treatment of GORD.
- Children (1-10yrs) metabolize PPIs faster than adults
- No PPI approved in infants less than 1 year
- PPIs should be tapered, not stopped abruptly because of acid rebound.
- Protected from gastric acid by enteric coating
- Give once daily dose 30 minutes before breakfast.
- Effect does not decrease with chronic use
- Omeprazole, Lanzoprazole, Esomeprazole
ADVERSE EFFECTS OF HYPOCHLORIDIA

- Community acquired pneumonia
- Gastroenteritis in children
- Candidaemia
- C. difficile–associated disease
- NEC in preterms
- ? B12 deficiency in adults
- ? Hip fractures in adults
- ? Interstitial nephritis causing acute renal failure

- Achloridia is not the goal of therapy
· Start treatment with less potent acid suppression
  $\text{H}_2\text{RA} \rightarrow \text{PPI}$

· Low dose $\rightarrow$ high dose of the same drug

· Start with other treatments $\rightarrow$ acid suppression
FACTORS IN FAVOUR OF STEP-THERAPY

- No need to use a potent drug if a less potent drug works
- Less expensive up front
- More potent suppression of acid has risks
- Quicker onset of acid inhibition with H2RAs than current PPIs
- PPIs do not inhibit nocturnal acid breakthrough
- No need to taper: less acid rebound hypersecretion than with PPIs
- Liquid formulations are easily dosed per kilogram, well accepted by infants/younger children
Compared with H2RAs, more potent and longer-lasting acid suppression

Highly efficacious in children and for the most severe GORD

Most effective drug should be used first; step-down can be cost effective

More useful than H2RAs as diagnostic test

Adverse effects of acid suppression also occur with H2RAs

Long-term use can avoid surgery

PPIs approved for 1- to 17-year-olds (omeprazole, lansoprazole, esomeprazole) are now available in disintegrating tablet or powder formulations
There is no one-size-fits-all treatment approach to paediatric patients.

- Empiric trials of PPI in children < 12 months old are seldom indicated.

- PPI use in children < 12 months should be done under specialist care.

- In infants < 12 months, H2RAs may be a better starting Rx.

- For patients 2–5 years or those with moderate symptoms, use of PPIs is the better approach.

- Empiric trials of PPI may be useful if symptoms are likely those of GORD if no “red flag” symptoms.

- Empiric trials should not be given for more than 6–12 weeks.
USING ACID SUPPRESSION IN CHILDREN

- PPIs should not be stopped abruptly because of acid rebound, which may cause symptoms. Taper dose.

- PPI should be given as a single dose 15–30 mins before breakfast.

- Stop all acid suppression for 2 weeks prior to endoscopy.

- There are risks to chronic acid suppression.

- Do not use twice-daily dosing PPI or high-dose PPI without an indication.

- Patients should not be given long-term PPI therapy without a diagnosis.

- Even in established GORD, trials of tapering PPI should be given.
INDICATIONS FOR SURGERY

1. Infants and children who have failed two weeks of medical management.
2. Atypical symptoms especially respiratory symptoms with confirmation of GERD by any of the previously mentioned tests.
3. Patients with complications of GERD such as aspiration, stricture or Barrett’s esophagitis.
4. In the case of near SIDS and other clinical symptoms of GERD, risk of death may be decreased by operative therapy.
5. Patients with neurologic impairment requiring feeding gastrostomy who are tested to have pathologic reflux are candidates for antireflux procedures
6. Patients post repair of oesophageal atresia with reflux and recurrence of anastomotic stricture.
TOUPET PARTIAL FUNDOPPLICATION

A partial wrap does not go all the way around the esophagus.
THAL FUNDOPLICATION
THANK YOU