



**Gastro-Esophageal  
Reflux in Children less  
than 2 years of age**

## Definition

- **Passive transfer of gastric contents into the esophagus due to transient or chronic relaxation of the lower esophageal sphincter**

QuickTime™ and a  
TIFF (Uncompressed) decompressor  
are needed to see this picture.

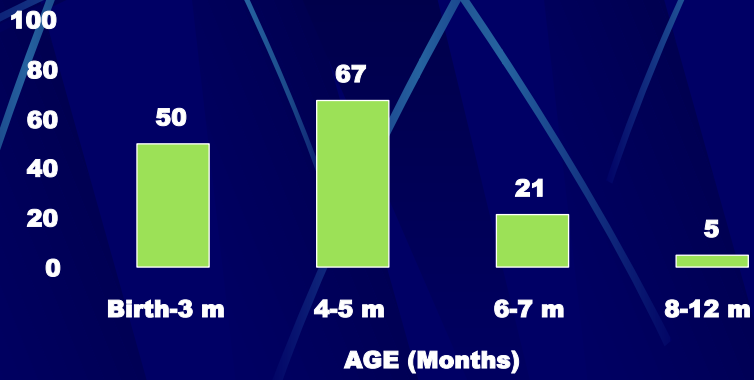
## More Definitions

- Gastroesophageal Reflux (GER) = physiologic reflux
- GERD = gastroesophageal reflux disease = reflux with complications
- Dysphagia = difficulty or problems with swallowing

## Natural History: Children vs. Adults

- Birth to 2 years
  - Physiologic, especially < 6 months
  - 90% resolve by 12-18 months
- 2 years to Adulthood
  - Vomiting is never physiologic
  - GERD is chronic relapsing disease

# Normal Daily GE Reflux



Hassall E 2005 Nelson SP 1998

~~20 GER episodes/24 hours are normal!!~~

## **GER Symptoms**

- Vomiting (72%)
- Abdominal pain (36%)
- Feeding problems (29%)
- Failure to thrive (28%)
- Irritability (19%)
- Heartburn (1%)

## **Indications for Investigation < 2 years old**

- Irritability with feeds
- Recurrent pneumonias/chronic cough
- Unhappy infant
- Failure to thrive
- Torticollis (?Sandifer's syndrome)
- Persistent vomiting at 18 - 24 months

## **GER Presentation**

- Nature of Vomiting
  - Effortless
  - Forceful or projectile
- Disposition of the Child
  - Happy, spitters/ Thriving
  - Unhappy, Irritable/ Poor weight gain



## **Risk Factors**

- **Genetic - autosomal dominant**
- **Immaturity of the LES**
- **Increased abdominal pressure**
- **Gastric distention**
- **Esophagus dysmotility**
- **Prematurity**
- **Neurologic problems**
- **Chronic lung disorder**
- **H.pylori infection**
- **Cow's milk allergy**

## **Prevalence and Natural History (Nelson SP 1998)**

- Survey of parents of 63 children with vomiting at 6 - 12 months vs 92 controls
- Results:
  - 4 times feeding refusal compared to control
  - Longer feeding time, >1 hr
  - Parents had more anxiety re feeding
  - No difference in ENT problems/wheezing between the groups

## Diagnostic Studies

- Barium swallow - 60% accurate, mainly for anatomical abnormalities
- Endoscopy - to dx esophagitis which is rare
- Esophageal pH probe - Gold Standard
  - Detects only acid events, not non-acid events
  - <5% reflux over 24 hours is normal?
  - # episodes > 5 minutes
- GE Scintiscan - to dx aspiration pneumonia and postprandial reflux. False positives are common
- Impedance monitoring - detects fluid and gas independent of pH. Norms not established

## Prognosis

- Considered benign, most resolve spontaneously by 12-18 months
- Peak age of GER is 5 months of age
- Rare complications
  - Esophagitis with hematemesis
  - Anemia
  - Respiratory (cough, apnea, wheezes)
  - Delayed feeding skills

# Treatments

- Milk thickeners
- Positioning
- Formula Changes
- H<sub>2</sub> antagonists\*\*
- Metoclopramide\*\*
- Proton pump inhibitors\*
- Surgery\*

\* No studies \*\*Inconclusive

## **Gum Thickeners**

- Water soluble polysaccharides from plants, microorganisms that increase viscosity in a liquid by trapping water
- Nontoxic and nonirritating (Committee on Food Additives)
- No adverse physiologic effects on hematology, chemistry, or immunology

# Thickened Feedings

- Meta-analyses review of 20 studies 1966-2003
- pH probe studies found that thickened feeds reduce the severity and frequency of emesis

Craig WR, Cochrane DatabaseSyst Rev, 2004

## Feeding Position

- Frequent small, or continuous feedings
- 30° - 45 degrees left side with straight spine and head up with support
- No or little pressure on infant's stomach
  - Diaper changing or too tight fitting diaper will ↑ GER



# Positioning

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**Due to the posterior position of the esophagus, gastric acid is closest to the esophagus when the infant is sitting or supine. In the prone position the gastric content is farthest away from the esophagus**

## Sleep Positioning

- Supine, prone, right lateral, left lateral?
- Prone and left lateral positions decrease reflux over 48 hrs compared to the other positions ( $P < 0.001$ )
- Caution - prone position may increase SIDS

Ewer AK 1999  
Tobin JM 1997

## Positioning and Gastric Residuals

- The amount of gastric residuals 1 hour after feeding are the following in decreasing order:
  - Left
  - Supine
  - Prone
  - Right

Cohen S 2004

## **Formula Changes for GERD**

- Not effective: human milk v whey dominant formula v MCT enriched formulas (Tolia V 1992)
- Increased osmolality may ↑ GERD (Stutphen JR 1989)
- Concentrating formula may improve GERD by ↓ volume

## GER Drugs

	Class	Dose	Side Effects
Mylanta	Antacid	2-4 mL	Diarrhea, AI
Gaviscon Powder/Liquid	Antacid Rafts formed	1p/120 mL 5 mL/120 mL	Constipation, AI, Mg
Ranitidine (Zantac)	H <sub>2</sub> receptor antagonist	4-8 mg/kg/d	Bitter taste, lethargic Avoid with antacids, ↓ folic acid, B <sub>12</sub> , Fe, Mg absorption, ↑NEC
Omeprazole (Prilosec)	ProtonPump Inhibitor(PPI)	0.7-3 mg/k/d	Bitter taste, Low B <sub>12</sub> , ↑Na
Metoclopramide (Reglan)	Prokinetic	0.5 mg/k/d	Lethargic, ↑ Breasts Diarrhea
Erythromycin	Prokinetic	20 mg/k/d	Allergic, ↑liver enz, rash, pyloric stenosis
Lansoprazole (Prevacid)	PPI	0.5 mg/k/d	Fatigue, nausea, ↓ BP, diarrhea, ↑theo levels

# Indications for Surgery

- After all medical interventions have been tried
  - Failure to thrive
  - Life threatening symptoms
  - Severe aspiration
  - Severe esophagitis or strictures
  - Severe airway damage
- Mechanical way to suppress GER

## **Contraindications to Surgery**

- Delayed gastric emptying or motility
- Infants with swallowing disorders

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# Post Op Complications ≈ 17%

- Inability to tolerate feedings
- Retching
- Slip of the wrap above the diaphragm
- Disruption of the wrap
- Re-operation rate 3% -18.9%

J Pediatr Gastroenterol Nutr 2001

## **If the emesis occurs within 1 hour post feeding:**

- Try smaller feedings
- Try positioning
- Try thickening the feedings

## **If the emesis occurs > 2 hrs after a feeding:**

- Related to slow gastric emptying or
- Chronic low lower esophageal tone
  - Smaller feeding volume
  - Hydrolyzed elemental formula
  - Reglan
  - Erythromycin

## **My Recommendations for GER**

- Feedings
  - Small, frequent or
  - Continuous
  - Thickening
- Positioning
  - Prone 1 hr after feeding
  - Feeding upright, left side



**Thank You**