Gastroesophageal Reflux: Anatomy and Physiology

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Disclosure Information

I have no disclosures.

Objectives

• Review embryologic development of GI system
• Review normal anatomy and physiology of esophagus and stomach
• Review pathophysiology of Gastroesophageal Reflux
Embryology of the Gastrointestinal System

GI and Respiratory systems are derived from the endoderm after cephalocaudal and lateral folding of the yolk sac of the embryo. The primitive gut can be divided into three sections:

Foregut
- Extends from oropharynx to the liver outgrowth
- Thyroid, esophagus, respiratory epithelium, stomach, liver, biliary tree, pancreas, and proximal portion of duodenum

Midgut
- Liver outgrowth to the transverse colon
- Develops into the small intestine and proximal colon

Hindgut
- Extends from transverse colon to the cloacal membrane
- Forms the remainder of the colon and rectum
- Forms the urogenital tract

Embryology of the Gastrointestinal System

Respiratory epithelium appears as a bud of the esophagus around the 4th week of gestation.

Tracheoesophageal septum develops to separate the foregut into ventral tracheal epithelium and dorsal esophageal epithelium.

Esophagus starts out short and lengthens to final extent by 7 weeks.

Anatomy and Physiology of GI System

Upper GI Tract

- Mouth
- Pharynx
- Esophagus
- Stomach
  - Located below diaphragm and above small intestine
  - 2 smooth muscles valves keep food contained within stomach
  - Surrounded by parasympathetic and orthosympathetic nerve plexus
Gastroesophageal Junction

- Complex system that effectively divides the abdominal compartment with its higher pressure from the thoracic compartment and its lower pressure
- This prevents constant reflux from the stomach back into the esophagus

Gastroesophageal Junction

- Consists of several structures
  - Crura of the diaphragmatic hiatus
  - Angle of His
  - Lower Esophageal Sphincter
    - Lies within diaphragmatic hiatus
    - Tone of 12-25 mm Hg in neonates, infants, and adults
    - Approx 1 cm in infants and 3 cm in adults
    - Flutter valve (muscular fold)

Gastroesophageal Reflux (GERD) Pathophysiology

- Involves dilation of the esophagus and intrusion of acid contents back into it
- Typically due to the relaxation or incompetence of the Lower Esophageal Sphincter (LES)
- Usually the tone of the LES relaxes through propulsive peristaltic waves and transient lower esophageal sphincter relaxations (TLESRs) of 5-30 seconds
- TLESR primary pathophysiologic mechanism
  - Usually disappear by 1-2 years of age
Gastroesophageal Reflux: Work Up

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Disclosure Information

I have no disclosures

Clinical Manifestations

- Infants
  - Difficulty feeding
  - Crying/irritability
  - Failure to thrive
  - Wheezing
- Toddler-older children
  - Heartburn
  - Dental problems
Diagnostic Studies

- Endoscopy
- pH testing
- Upper GI series
- Chest x-ray
- Bloodwork

GERD Management

- Conservative Medical treatment includes:
  - Dietary restrictions
  - Medications-for example: Prevacid, Zantac, or Protonix
- Surgical treatment
  - Nissen fundoplication

Pre-operative Education

- NPO Guidelines
- Post-op feeding plan
- Surgical procedure
- IV
- Nasogastric tube
- Pain management plan
Gastroesophageal Reflux: Medical Management

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Disclosure Information

No disclosures

Objectives

Participant will be able to discuss medical management for GERD

Discuss symptoms found in various age groups

Identify most common medications used to treat GERD
Infants
Determine if infant has colic, milk intolerance or actual GERD
Symptoms reported by parent
Formula options: Almentin, Alecare or Neocare (prescription only)
Medications: Ranitidine, Mylanta or Maalox

Symptoms persist until 3-6 months - Next line of medication
Omeprazole
Addition of rice or oat cereal
At 9-12 months – if still not gaining weight, unable to tolerate pureed foods or is pocketing food many need to consider ? Esophagitis – consider scope - Silent reflux
Start PPI 3-4 weeks before scope

School age
Symptoms reported by patient and parent
TUMS
Ranitidine/Omeprazole or Prilosec
? Allergic esophagitis- enociphile esophagitis
Probiotic
Endoscopy
Adolescent Symptoms per patient Medications - Ranitidine/Omeprazole

No relief from medications Endoscopy

With special needs population - Dx most likely FTT, food avoidance, unable to gain weight or tolerate liquids
Patients may or may not have a g-tube when present to surgical clinic after a complete workup has been done

Other studies PH probe for 24 hours

Gastroesophageal Reflux: Intraoperative Management

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Disclosure Information

I have no disclosures.

Objectives

• Describe intraoperative considerations for Nissen Fundoplication
• Discuss and compare the previous history and use of the Nissen Fundoplication vs modern techniques
• Discuss the role of the operating room nurse
• Identify OR equipment and instruments during a laparoscopic Nissen Fundoplication
• Discuss perioperative strategies and importance of communication with patient transfer/hand off

Nissen Fundoplication

• Indicated for infants and children who experience severe GERD
• Anatomic and physiologic factors
• Medical management versus surgical interventions
• Surgical candidates:
  • Patients with esophagitis, adverse reaction to PPI, those who wish to avoid long-term drug therapy
  • Patients who have completed a comprehensive GI workup with GERD refractory to medical management
Nissen Fundoplication

- Surgery: Laparoscopic vs Open
  - Goal: create a competent anti-reflux barrier
  - Full and partial wrap (Toupet)
  - Procedural consideration: position, anesthesia

History of the Nissen Fundoplication

- First fundoplication performed in the 1950’s
- Prolonged hospitalization and recovery
- Side effects: dysphagia
- Development of laparoscopic surgery
  - 1991: 1st laparoscopic Nissen fundoplication in children
  - Improved outcomes, shorter length of stay, decreased time to full enteral feeds

Role of OR Nurse

- Team effort: surgeon, anesthesia, nursing
  - Importance of communication and organization
- Operating Room set-up, appropriate equipment available, anticipate complications, discuss critical steps of the procedure
- Maintain the flow of surgery
Perioperative Transition

- Family-centered care
- Appropriate documentation
- Transfer to Post Anesthesia Care Unit
- Surgical Debrief
- Prepare for post-operative recovery

References

Original slides by Jennifer T. Francis, RN, BSN, CNOR, CPN, Naval Medical Center Portsmouth, Portsmouth, VA


Gastroesophageal Reflux: Post-Operative Care

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Disclosure Information

- The speaker does not have any disclosures.

Objectives

- Discuss post-operative feeding strategies s/p Nissen Fundoplication
- Identify three common early complications s/p Nissen Fundoplication
- Identify two late complications s/p Nissen Fundoplication
- Identify two risk factors for Nissen Fundoplication failure
- Describe three parameters for post-operative monitoring
### Post-Operative Feeding Strategies
- Nissen Fundoplication
  - Liquid/Pureed/Soft Diet
  - Foods to Avoid
- Nissen Fundoplication with Gastrostomy Tube
  - Enteral feedings

### Early Complications s/p Nissen Fundoplication
- Gas Bloat/Retching
  - Venting Strategies
- Dysphagia
- Aerophagia
- Delayed Gastric Emptying
- Adhesions

### Late Post-Operative Complications
- Diarrhea/Dumping Syndrome
- Small Bowel Obstruction
- Nissen Failure
  - Risk Factors:
    - Neurologic Status
    - Open Surgery at first Fundoplication
    - Prematurity
    - Repaired Esophageal Atresia
    - Chronic Lung Disease
Follow-Up Care

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<tr>
<th>Essential to Monitor for:</th>
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<tbody>
<tr>
<td>• Weight gain</td>
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<tr>
<td>• Feeding Tolerance</td>
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<tr>
<td>• Reflux Symptom Resolution</td>
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