Esophageal Motility and Functional Esophageal Disorders

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August 14, 2015
Chicago, IL
Objectives

1. Define and diagnose primary esophageal motor and functional disorders.
2. Identify appropriate diagnostic testing and learn the clinical utility of esophageal manometry.
3. Discuss available therapies for the treatment of functional esophageal disorders.
Control of Esophageal Motor Function

- **Muscularis mucosa**
- **Submucosa**
- **Circular muscle layer**
- **Longitudinal muscle layer**
- **Epithelium**
- **Mucosal plexus** (Meissner’s)
- **Myenteric plexus** (Auerbach’s)

Classic Symptoms of Esophageal Motor/Sensory Dysfunction

- Heartburn
- Regurgitation
- Chest pain
- Dysphagia
  - Liquids vs solids or both
- Odynophagia

GERD/Functional

Motor or Structural Cause
Work-up of Esophageal Disorders

• History
• Physical Exam
• Barium Swallow
  – Evaluate mechanical causes
  – Best first test for chronic dysphagia
• Endoscopy
  – Mucosal assessment
  – Acute dysphagia- ? Impaction
• High Resolution Manometry

Holloway, R. GI Motility Online 2006
Diagnostic Technology

- High Resolution and Intraluminal Impedance Manometry
Why Do We Need Manometry?

• Evaluation of patients with dysphagia and chest pain (with inconclusive prior w/u)
  – Primary motility disorders i.e. achalasia, spastic disorders (<5%).
  – Secondary motility disorders
    • Scleroderma, connective tissue disorders, pseudoobstruction, Diabetes, Parkinson's, myopathies

Holloway R. GI Motility online 2006
Pandolfino J, and Kahrilis P. Gastro 2005
Why Do We Need Manometry?

• Pre-operative evaluation for GERD
  – pH probe placement
  – Evaluate effectiveness of peristaltic function*

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High Resolution Manometry

- 36 closely spaced transducers
- Pressure data transformed into a color spatiotemporal plot display
- More precise
- Reduces interpretation variability
- Esophageal pressure topography metrics based on Chicago Classification

Intraluminal Impedance Manometry

- Changes in resistance to current flow
- Measures movement of intraluminal contents
- Esophageal clearance or bolus transit
- Retrograde bolus transit
  - GERD, rumination, belching

HRM: Normal Swallow

UES

Swallow

prox

Peristaltic wave

Distal

LES

LES relaxation
Incomplete bolus Transit - “IBT”
Impedance Manometry
Major High Resolution Manometry Metrics

- Median integrated relaxation pressure (IRP)
  - Residual pressure with maximal LES relaxation
- Distal contractile integral (DCI)
  - Contraction vigor
- Distal latency (DL)
  - Measures velocity of the contraction
- Breaks in the isobaric contour (>5cm)

Primary Esophageal Motility Abnormalities

**Disorders of EGJ outflow obstruction**
- Achalasia: IRP > ULN and 100% failed peristalsis
  - Type 1: No contractility
  - Type II: >20% PEP
  - Type III: >20% spasm (DL < 4.5s)

**Major Disorders of peristalsis**
- DES: >20% premature
- Jackhammer esophagus: >20% DCI > 8,000
- Absent contractility

**Incompletely expressed achalasia**

**Minor Disorders of peristalsis**
- Ineffective esophageal motility: >50% ineffective swallows

**Fragmented peristalsis**

**Normal**

Fragmented Peristalsis
Diffuse Esophageal Spasm
Jackhammer esophagus

UES

LES

Distal

2.7 mmHg
Treatment of DES and Jackhammer Esophagus

- Proton pump inhibitors

- Ca2+ channel blockers
  - mixed results in small trials
  - Diltiazem 60 to 90 mg qid better than placebo (N=22)
  - Nifedipine-no change in symptoms

- Nitrates- no randomized trials

- Tricyclic antidepressants
  - Trazodone 100 mg to 150 mg -decrease chest pain compared to placebo
  - Imipramine-52% reduction in episodes of chest pain

Treatment of Hypercontractile Disorders

• **Sildenafil** - phosphodiesterase-5 inhibitor
  - Blocks degradation of NO, prolonged smooth muscle relaxation
  - Small trials-reduction in LES pressure and amplitude of esophageal contraction.

• **Other drugs for NCCP**
  - Theophylline
  - Sertraline

Esophagus and Scleroderma
Case #1

• A 38 y/o male was presented with a 7 year h/o chest pain and heartburn. Initially his symptoms responded to PPI tx. However, one year ago he began experiencing worsening dysphagia to both liquids and solids, slight cough, choking at night. Also complained of bloating, 20 lb wt loss.

• Exam-unremarkable

• Previous studies
  – EGD- dilated esophagus, manometry-low LES resting pressure, no esophageal peristalsis.
  – DDx ?
  – What diagnostic studies would you do next?
Achalasia

- Prevalence of 7.9 to 12.6/100,000 population.
- Presents with dysphagia to liquids and solids.
- Regurgitation.
- Chest pain in 63% of patients.
- Cough or heartburn.
Pathogenesis of Achalasia

- Inflammatory infiltrate of the myenteric plexus.
- Lacking nitric oxide producing inhibitory ganglion cells & VIP that influence relaxation the smooth muscle.
- Incomplete relaxation of the LES
- Absent peristalsis
Achalasia
Achalasia

Lower esophageal sphincter

Dilated, debris filled esophagus
Medical Treatment of Achalasia

• **Ca²⁺ channel Blockers**
  
  – Nifedipine 10-30 mg qid
  
  – Decrease in LESP by 20% to 40% compared to placebo, no symptom improvement
  
  – Study of 20 pts, symptom improved with SL nifedipine over 6 to 18 mths.

• **Nitrates**
  
  – Isosorbide dinitrate-reduces LES pressure
    • Short-lived effect
    • Higher side effects
  
  – Better than nifedipine for symptom relief in randomized trial-n=15

Endoscopic Therapy

- **Botulinum toxin**
  - Simple
  - 85% short-term improvement
  - Only 26% remission at 6 mths

- **Pneumatic balloon dilation**
  - Rigiflex balloon
  - Excellent short-term results
  - Success rate of 50%-70% after long-term f/u
  - 5-10% perforation rate

- **Per-Oral Endoscopic Myotomy (POEM)**
Surgical Tx of Achalasia

• Heller Myotomy
  – 93% relief of symptoms
  – Sustained remission of 75% to 80% at 10 years
  – Severe reflux esophagitis in 10%
  – Dor fundoplication to prevent reflux
    • Study of n=22, decrease GERD from 47.6% to 9.1%.

• Esophagectomy

• Gastrostomy feeding
Case

- Patient underwent laparoscopic myotomy with Dor fundoplication with good response.
Functional Esophageal Disorders

- Chest pain
- Visceral Hypersensitivity
- Functional heartburn
- Globus
- Functional Dysphagia
Functional Dysphagia

• Dysphagia without mechanical obstruction, GERD, or a histopathology based motor disorder.
• Occurs in 10% of people over 50 years old.
• Older age associated with manometric abnormalities
  – Weak peristalsis
  – Large and small defects
  – Failed peristalsis

Management of Functional Esophageal Disorders

- Reassurance
- Avoidance of triggers
- Antidepressants
- Psychological therapies

Effects of Antidepressants in Functional Esophageal Disorders

- RCTs found benefit:
  - Globus
    - 75% response for amitriptyline vs 36% for pantoprazole
  - Functional Chest Pain
    - Imipramine, sertraline, and venlafaxine
    - 50% reduction in symptoms compared to placebo

Key Take Home Points

- Heartburn, chest pain and dysphagia are common symptoms of an esophageal motility and a functional GI disorder.
- The etiology can be complex and multi-faceted.
- High resolution manometry is an important technological tool to assess esophageal symptoms such as dysphagia.
- Treatment of functional esophageal disorders largely depends on managing visceral hypersensitivity.