Esophagology and Esophagoscopy

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Grand Rounds Presentation
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Esophageal Anatomy

- Vertical Muscular Tube extending from hypopharynx to stomach
- 23-25 cm in length
- Passes through neck, superior mediastinum, posterior mediastinum anterior to cervical and thoracic vertebrae
- Slight left curve before returning to the midline
Esophageal Anatomy

- In superior mediastinum, runs posterior to trachea in contact with common carotid arteries
- Recurrent laryngeal nerves lie in tracheoesophageal groove
- Thoracic duct lies to the left of the esophagus
- Passes posterior and to right of descending aorta until inferior mediastinum
- Inferior mediastinum, passes anterior and slightly to left of aorta
- Left bronchus crosses anterior and indents esophagus below arch of aorta
Esophageal Landmarkes

Three external compression of esophagus: Aorta, Left Mainstem Bronchus, Diaphragm
Esophageal Anatomy

- In thorax, right vagus nerve descends posterior to esophagus and left vagus nerve descends anterior to esophagus
- Muscles of esophagus consist of inner circular layer continuous with inferior constrictor of pharynx and an outer longitudinal layer
Esophageal Anatomy

- Auerbach’s myenteric plexus lies between the inner circular and outer longitudinal layer. Responsible for peristalsis
- Longitudinal fibers arranged proximally into fascicles attaching to cricoid
- Distally, fascicles blend to form a uniform layer surrounding esophagus
- Muscle is striated in upper third, mixed in middle third and smooth in lower third
- Outer coat or fibrosa is loose fibroelastic tissue rather than strong serosa

Outer fibrosa different from the rest of the GI tract: has strong serosa
Auerbach’s plexus responsible for peristalsis.
Histology

- Lined by nonkeratinized stratified squamous epithelium which covers thin lamina propria
- Muscularis mucosae: smooth muscle fibers arranged longitudinally; this layer thickens in lower third of the esophagus
- Submucosa: thick collagenous and coarse elastic fibers, contains mucous glands and Meissner’s plexus
Esophageal Epithelium

Esophagus lined by nonkeratinized stratified squamous epithelium
Upper Esophageal Sphincter

- High pressure zone
- Inner circular layer of muscle slightly thicker at level of cricoid and blends with cricopharyngeal muscle
Lower Esophageal Sphincter

- Approximately 3 cm in length
- May descend 1 to 3 cm with normal respiration
- No single distinct muscle responsible for lower ES has been identified
- Resting tone is 15-45 mm Hg
- Relaxes in response to swallowing, secondary peristalsis or without peristalsis
Transient Lower Esophageal Sphincter Relaxation

- Vagally mediated reflux, part of normal digestion
- Triggered by gastric distention
- Primary mechanism for gastroesophageal reflux in normal individuals and those with mild gastroesophageal reflux disease.
Swallowing or Primary Peristalsis

- UES, esophageal body, LES work in coordinated behavior
- Bolus propelled into pharynx from mouth (oropharyngeal phase)
- Larynx then elevated, epiglottis seals the airway, bolus passed through relaxed UES
- UES closes, progressive circular contractions propel bolus down esophagus through relaxed LES
- Normal pressures range from 30 to 180 mm Hg

Oropharyngeal phase is voluntary; Esophageal Phase not voluntary
Pharyngeal Swallowing

- Glossopalatal junction opening
- Velopharyngeal junction closure
- Laryngeal vestibule closure
- UES opening

Pharyngeal reconfiguration
- Volume dependent
  - 1 mL = 0.0 s
  - 20 mL = 0.2 s

Pharyngeal clearance and offset of reconfiguration
Peristalsis

Courtesy Cummings
Secondary Peristalsis

- Secondary peristalsis: progressive contraction in the esophageal body stimulated by sensory receptors rather than swallowing
- Clears food contents poorly cleared by primary peristalsis
Dysphagia

- Sensation of food being delayed in its normal passage from the mouth to the stomach
- Difficulty initiating swallow: Oropharyngeal dysphagia
- Food “sticks” after swallowing: Esophageal dysphagia
Clinical History

- Solid food dysphagia most often represents a structural lesion.
- Intermittent solid food dysphagia may represent an esophageal ring.
- Dysphagia to solids and liquids likely represents a motility disorder (i.e. achalasia or scleroderma).
Oropharyngeal dysphagia

- Also known as transfer dysphagia
- Abnormality related to the movement of a food bolus from the hypopharynx to the esophagus
- Arises from diseases of upper esophagus, pharynx or UES
- Present with difficulty initiating a swallow with immediate coughing, choking, gagging or nasal regurgitation
- 30% of patients with esophageal dysphagia localize to cervical or throat area
- Most commonly caused by neuromuscular dysfunction
Causes of Oropharyngeal Dysphagia

- Neuromuscular:
  - CVA
  - Amyotrophic lateral sclerosis
  - Parkinson’s disease
  - Myasthenia gravis
  - Tardive dyskinesia

- Structural:
  - Cervical Osteophytes
  - Zenker’s diverticulum
  - Tumors
  - Postcricoid webs
Esophageal Dysphagia

- Motility Abnormalities
- Strictures
- Rings and Webs
- Eosinophilic Esophagitis
Esophageal Motility Disorders

- Latests classification system consists of 4 major patterns
  - Inadequate relaxation of lower esophageal sphincter (LES)
  - Atypical Disorders of LES relaxation
  - Hypercontraction
  - Hypocontraction
Inadequate relaxation of LES

- Classical Achalasia
- Atypical Disorders of LES relaxation
Achalasia

- Primary esophageal motility disorder
- Generally of unknown etiology
- Patchy inflammatory infiltrate of T cells, eosinophils, and mast cells of Myenteric plexus
- Dysphagia to solids and liquids
- Try to accommodate with various maneuvers
- 75% of pts with regurgitation, 60% with weight loss although generally minimal
Achalasia

- Diagnosis with barium esophagram with fluoroscopy
- Esophageal Manometry reveals aperistalsis in body of esophagus with baseline LES pressure elevated

Classic esophagram with “bird’s beak” tapering of distal esophagus
Treatment of Achalasia

- No cure
- Treatments include pneumatic dilation and surgical myotomy
- All pts considered for dilation must be surgical candidates
  - Pneumatic dilation associated with 2-5% risk of perforation
- Heller’s myotomy- anterior myotomy across LES usually associated with anti-reflux procedure
- Botulinum toxin: injected in LES
  - Effective in 85% of patients
  - Symptoms recur in 90% of patients in 6 months
  - Reserved for poor surgical candidates
Uncoordinated contraction

- Diffuse esophageal spasm
Diffuse Esophageal Spasm

- Presence of simultaneous and repetitive contractions in esophageal body
- Unlike achalasia, some normal peristalsis remains
- “Corkscrew esophagus”
- Often patients worked up for chest pain
- Treatment includes nitrates and calcium channel blockers
Corkscrew Esophagus
Hypercontraction

- Nutcracker esophagus
- Isolated hypertensive LES
Nutcracker esophagus

- Pts presents with noncardiac chest pain
- High-amplitude peristalsis
- Unlikely to be a true primary motility disorder
Hypocontraction

- Ineffective Esophageal Motility
Ineffective Esophageal Motility

- Hypocontractile disorder
- Distal esophageal contraction amplitude of less than 30 mm Hg in 30% or more of wet swallows
- Higher incidence in pts with GERD
Secondary motility disorders

- Results of systemic conditions
- Most common: Scleroderma or progressive systemic sclerosis
- Hypothyroidism
- Diabetes mellitus
- Amyloidosis
Stricture

- Loss of lumen area within the esophagus
- Normal diameter: 20 mm
- Dysphagia generally occurs when diameter less than 15 mm
- Intrinsic vs. Extrinsic Causes for strictures
Intrinsic Strictures

- Peptic Acid
- Pill-induced
- Chemical/lye
- Post-NG intubation
- Infectious esophagitis
- Sclerotherapy-induced
- Irradiation-induced
- Esophageal/gastric malignancies
- Congenital
- Systemic inflammatory disease
- Epidermolysis bullosa
Extrinsic Strictures

- Pulmonary/mediastinal malignancies
- Anomalous vessels and aneurysms
- Metastatic submucosal infiltration
  - Breast cancer
  - Mesothelioma
  - Adenocarcinoma of Gastric Cardia
Treatment of Strictures

- Foundation of treatment is esophageal dilation
- Different Types of Dilators
  - Mercury-filled rubber Maloney bougies
  - Wire-guided rigid Savary-Gilliard dilators
  - Balloon dilators
Complications of Esophageal dilation

- Bacteremia (20-50%)
- Perforation (0.5%)
- Bleeding (0.3%)
- Radiation and malignancy-induced strictures at greater risk of perforation
- Use “rule-of-threes”
  - No more than three sequential dilators used per session
- Goal is to obtain objective diameter greater than 15 mm

90% of patients in whom esophagus dilated to 15 mm have no recurrence at 24 months
Refractory esophageal strictures

- Causes include ongoing insults from pills or nonsteroidal anti-inflammatory drugs, uncontrolled acid reflux, inadequate lumen diameter achieved by dilation.
- Treatment includes removing offending agent, gentle dilation to 15 mm.
- Intralesional steroid injections are safe and probably effective for refractory strictures.
Rings or Webs

- Often incidentally found in asymptomatic patients
- Rings: circumferential, can consist of mucosa or muscle, mostly occur in distal esophagus
- Webs: occupy only part of lumen, always mucosal, mostly occur in proximal esophagus
- Barium swallow most sensitive means of diagnosis
Plummer-Vinson or Paterson-Kelly Syndrome

- Association noted by Gastroenterologists Plummer and Vinson in the US and otolaryngologists Paterson and Kelly in the UK.

- Triad:
  - Proximal Esophageal Webs
  - Iron Deficiency Anemia
  - Dysphagia
Schatzki’s Ring

- Also known as B ring
- Occurs at distal margin of LES or GEJ
- Most common cause of intermittent solid food dysphagia and food impaction
- Controversy over cause (GERD vs. Congenital)
- Barium swallow is most sensitive
- Treatment is dilation and possible acid suppression
Schatzki’s Ring

Courtesy Cummings
A ring

- Muscular ring
- Occurs proximal margin of LES 2 cm proximal to squamocolumnar junction
Eosinophilic Esophagitis

- Endoscopic findings of multiple esophageal rings
- Esophageal eosinophilia
- Requires greater than 15 eosinophils per high-power field in mucosa that does not clear after appropriate treatment with PPI
- Often associated with other atopic disease and strong family hx of atopy
Eosinophilic Esophagitis

- Increasingly recognized cause of dysphagia and food impaction in young adults
- Dietary modification and food elimination effective in pediatric population
Eosinophilic Esophagitis

“Ringed Esophagus”, Mucosal Tear after Dilation, Courtesy Cummings
Barrett’s Esophagus

- Most significant outcome of chronic GERD and predisposes to development of esophageal adenocarcinoma
- Normal stratified squamous epithelium of distal esophagus replaced with intestinal columnar metaplasia
- 6-12% of patients undergoing endoscopy for GERD have Barrett’s esophagus
- Risk of esophageal adenocarcinoma is 0.5% annually
Barrett’s Esophagus

- Current Endoscopic Surveillance Guidelines: 4 quadrant biopsies at 2-cm intervals along entire length of Barrett’s esophagus every 3 years
Histology of Barrett’s Esophagus

Goblet cells in distal esophagus; Transition to In-office dysphagia discussion
In-office Dysphagia Consult
Dr. Jonathan Aviv

- Divide patients into 2 categories
  - Cough, Throat Clearing and Hoarseness without Dysphagia
  - Complain of Dysphagia
Laryngopharyngeal Reflux

- Estimated to be why up to 10% of pts visit an Otolaryngologists office
- Present in up to 50% of patients with hoarseness
- Also present in 51% of patients with dysphagia
Laryngeal Sensory Testing

- Delivery of a discrete pulse of air to the epithelium innervated by the internal branch of the superior laryngeal nerve to elicit laryngeal adductor reflex
- Air pulse, 50 ms in width, delivered via channel associated with a flexible laryngoscope
  - Normal: sensory threshold < 4 mm Hg air pulse pressure
  - Moderate: 4.1-6.0 mm Hg air pulse pressure
  - Severe: >6.1 mm Hg air pulse pressure

Laryngeal adductor reflex is brain stem-mediated reflex
Cough, Throat Clearing, Hoarseness without dysphagia

- Flexible Laryngoscopy, Laryngeal Sensory Testing
  - LPR, Symmetrical Sensory Deficit
  - LPR, Asymmetrical Sensory Deficit
  - Tumor
LPR, Symmetrical Sensory Deficit

PPI, Diet/Behavioral Modifications

F/U in 6-12 weeks

Improvement
  - Continue PPI

Persistence
  - TNE
LPR, Asymmetrical Sensory Deficit

Imaging to r/o mass or neoplastic process

Positive

Referral to MD

Negative

Persistence

TNE
Dysphagia as chief complaint

- Flexible endoscopic evaluation of swallowing with sensory testing (FEESST)
- Assess both airway protection and bolus transport
- Utilize laryngeal sensory testing
- Endoscopic swallowing evaluation
FEE SST

- First phase: assessment of anatomy of the nasopharynx, tongue base, hypopharynx, larynx and vocal folds
  - Assess velopharyngeal closure, vocal fold mobility, baseline secretion management, pharyngeal muscle strength, and laryngeal elevation
- Second phase: Sensory testing of laryngopharynx
- Third phase: Motor evaluation of swallowing with administration of food consistencies varying from thin liquids to solids
FEESST

No Sensory Deficit, Laryngeal Exam WNL

Tumor

TNE/Flexible Laryngoscopy with biopsy
Trans-nasal Esophagoscopy

- Important advance in the care of patients with reflux, dysphagia, and esophageal pathology
- Brilliant illumination and excellent image quality with air-insufflation and irrigation capability through 2-mm working channel
- No conscious sedation needed

Lack of sedation allows for patients with comorbidities to have this done safely
Indications

- Divided into esophageal indications and extra-esophageal indications
- As per ASGE and ACG:
  - Esophageal symptoms persist despite adequate therapy
  - Dysphagia
  - Odynophagia
  - Weight loss
  - Anorexia
  - Radiologically Demonstrated lesions
Indications (continued)

- Acute injury after caustic ingestion
- Longstanding (5 yr) symptoms of GERD or GERD and >50 y/o
- Continuous anti-reflux therapy
- FB evaluation and possible removal
- Cirrhosis screening for varices
- Guide wire placement of manometry
Therapeutic indications

- Dilation of strictures
- Placement of feeding tube
- Botox treatment of achalasia
- Laser therapy
- Placement of wireless pH telemetry capsule
Relative Extra-esophageal Indications

- Globus pharyngeus
- Chronic cough
- Cervical dysphagia
- Asthma or COPD
- Odynophagia
- Hemoptysis
- LPRD
- Head and Neck Cancer
Daily abdominal pain and nausea with a history of ulcer disease are strong predictors of major gastric and duodenal diseases.

Pts with reflux and without these associated predictors are highly unlikely to have a major disease involving the stomach or duodenum.
Technique

- Preferable that patient be NPO for 3 hours
- No conscious or IV sedation used
- Need adequate topical nasal anesthesia and decongestion
- Many authors recommend minimal hypopharyngeal anesthesia to prevent secretion buildup and aspiration/cough of secretions
Technique

- Can be held in various ways
- “Standard”
- “Fishing Pole”
Technique

- Lubricated esophagoscope passed through nare then inserted into esophagus
- 2 techniques to intubate esophagus
  - Patient asked to burp, scope passed posterior to cricoid and into cervical esophagus
  - Patient tucks chin toward chest and swallow, tip passed above arytenoids or in the left pyriform, gentle pressure then applied as scope intubated into esophagus
Technique

- Excessive resistance to intubation of esophagus should terminate the procedure, and barium swallow or MBS should be obtained.

- Endoscope then passed to region of squamocolumnar junction and LES:
  - Swallow will open LES
  - Sniff allows evaluation for diaphragmatic hernia
Technique

• Scope then passed into stomach and retroflexion of tip to view LES
• Stomach then suctioned free of air to decrease belching and vomiting
• Middle and proximal esophagus then evaluated on withdrawal
• Post-cricoid area visualized with generous air insufflation as endoscope removed
Transnasal Esophagoscopy: Revisited (over 700 Consecutive Cases)

Gregory N. Postma, MD; Jacob T. Cohen, MD, Peter C. Belafsky, MD, PhD; Stacey L. Halum, MD; Sumeer K. Gupta, MD; Kevin K. Bach, MD; Jamie A. Koufman, MD

• Series of 700 consecutive patients underwent TNE
• Well-tolerated in 98% of patients
Esophageal Landmarkes

Three external compression of esophagus: Aorta, Left Mainstem Bronchus, Diaphragm
Esophageal Landmarks

- Aortic Compression at 24 mm from nasal ala
- Represented by blue arrows
Esophageal Landmarks

- Compression of esophagus by left mainstem bronchus at 26 mm from nasal ala
Esophageal Landmarks

- Diaphragmatic compression at 41 mm from nasal ala
- Represented by blue arrows
Squamocolumnar Junction
Barrett’s Metaplasia

Pink “tongue” of columnar epithelium in esophagus
Unsedated transnasal endoscopy accurately detects Barrett’s metaplasia and dysplasia

Kia Saeian, MD, David M. Staff, MD, Sotirios Vasilopoulos, MD, William F. Townsend, MD, Urias A. Almagro, MD, Richard A. Komorowski, MD, Hongyung Choi, MD, Reza Shaker, MD
Milwaukee, Wisconsin

• 32 patients with Barrett’s metaplasia
• Quadrantic biopsy specimens taken with standard (conventional esophagoscopy) and pediatric (TNE) biopsy forceps at least 1 week apart
• Two blinded pathologists evaluated specimens
• Excellent agreement in biopsy specimen
Prevention of Esophageal Carcinoma

- Fastest growing cancer in the USA and Western Europe in the past 25 years
- Usually detected at an advanced stage with 5 yr survival rate for symptomatic pts at <10%
- Barrett’s metaplasia and GERD are noted risk factors
- Endoscopic bx can detect early stage AdenoCa with 5 yr survival rate reaching 90%
- No need for IV sedation with TNE
TNE
Procedures

- Biopsy
- Insertion of wireless pH-monitoring device
- Flexible lasers
- Esophageal dilation
- TEP placement
- Botox injections
Biopsy

- Safely biopsy with 1.8 mm biopsy cupped forcep through working channel of scope
- Can biopsy in any area of the upper aerodigestive tract
Biopsy
Wireless pH probe placement

- Utilized to localize upper and lower esophageal sphincters and determine accurate position of pH probes
- Distal pH sensor is 6 cm above SCJ
- Hypopharyngeal sensor is 1 cm above proximal border of UES
Flexible Laser Therapy

- Working channel allows for placement of flexible laser wires
- Often KTP laser is utilized
- Most often for laryngeal and hypopharyngeal lesions
Esophageal Dilation

- Can be safely performed without sedation using a guidewire placed through the transnasal esophagoscope
- Can use Savary dilators or hydrostatic balloon dilators
Savary Dilator
Savary Dilation

- Placement of guide wire under direct visualization through esophagoscope
- Esophagoscope removed while guide wire in place
- Guide wire then extracted with Kelly clamp transorally and dilator passed over guide wire
Use of wire-guided placement of esophageal dilators
Balloon Dilation
Balloon Dilation

- 2 mm working channel too small for conventional hydrostatic balloons
- Esophagoscopy used to visualize stricture then guide wire placed through working channel
- Esophagoscopy then removed while guide wire in place, Balloon passed over guide wire then esophagoscopy placed in nare for direct visualization of balloon passage
Direct Visualization of Balloon Insertion
TEP placement

- Secondary TEP placement can be safely performed using TNE in office
- Uses 18 gauge needle, TEP dilator, local anesthesia, 15 blade scalpel
TEP Placement
TEP Placement
TEP Placement
Botulinum Toxin Injection

- Useful in treatment of achalasia, hypertensive lower esophageal sphincter, distal esophageal spasm, nutcracker esophagus, obstructing muscular rings
- Utilizes endoscopic sclerotherapy needle through working channel of the scope
- 100 units of Botulinum toxin suspended into 4-ml sterile saline
- Must account for dead space in long injection needle
Botulinum Toxin Injection

- Generally 0.5 ml injected into the LES musculature
- 2 injections per quadrant for 4 quadrants
Conclusions

- Otolaryngologists routinely see patients with extra-esophageal and esophageal complaints that may benefit from in-office TNE
- TNE is safe and easy to perform
- Procedures are safe with low complication rates
- Multiple uses currently for TNE
Works Cited:


Works Cited


