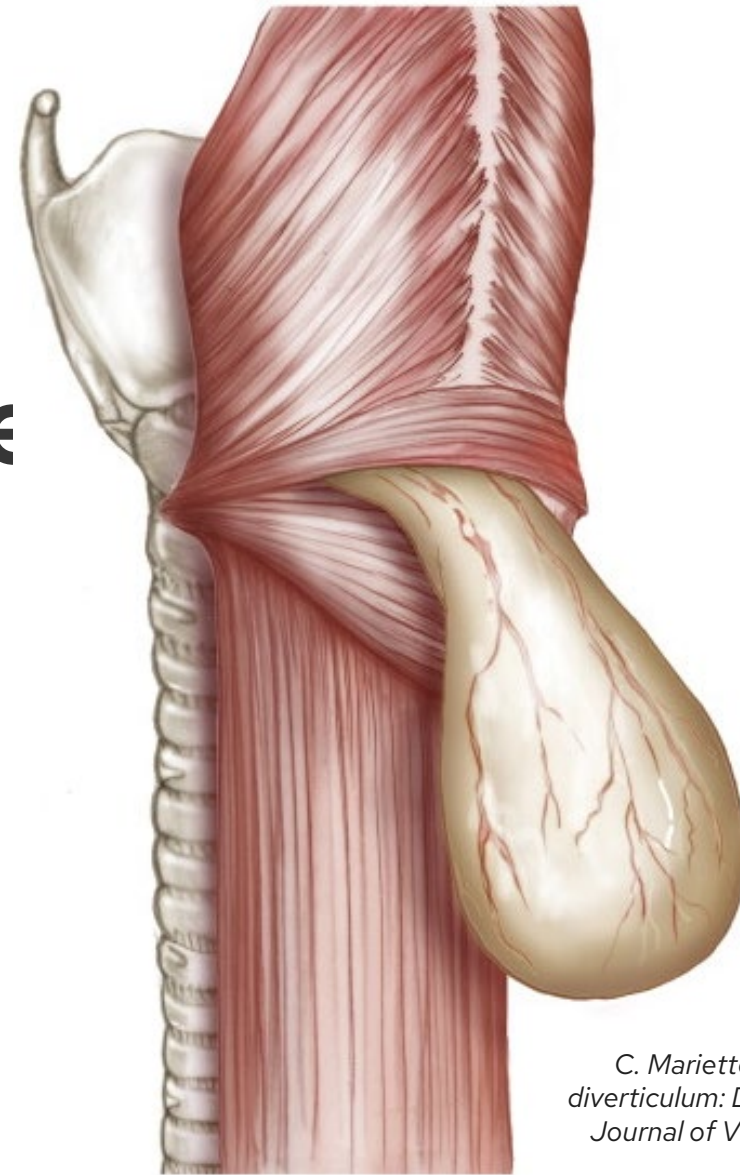




Management of Zenker Diverticulum

—
An Update



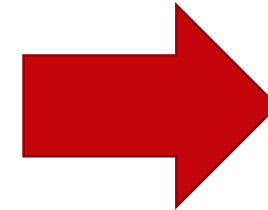
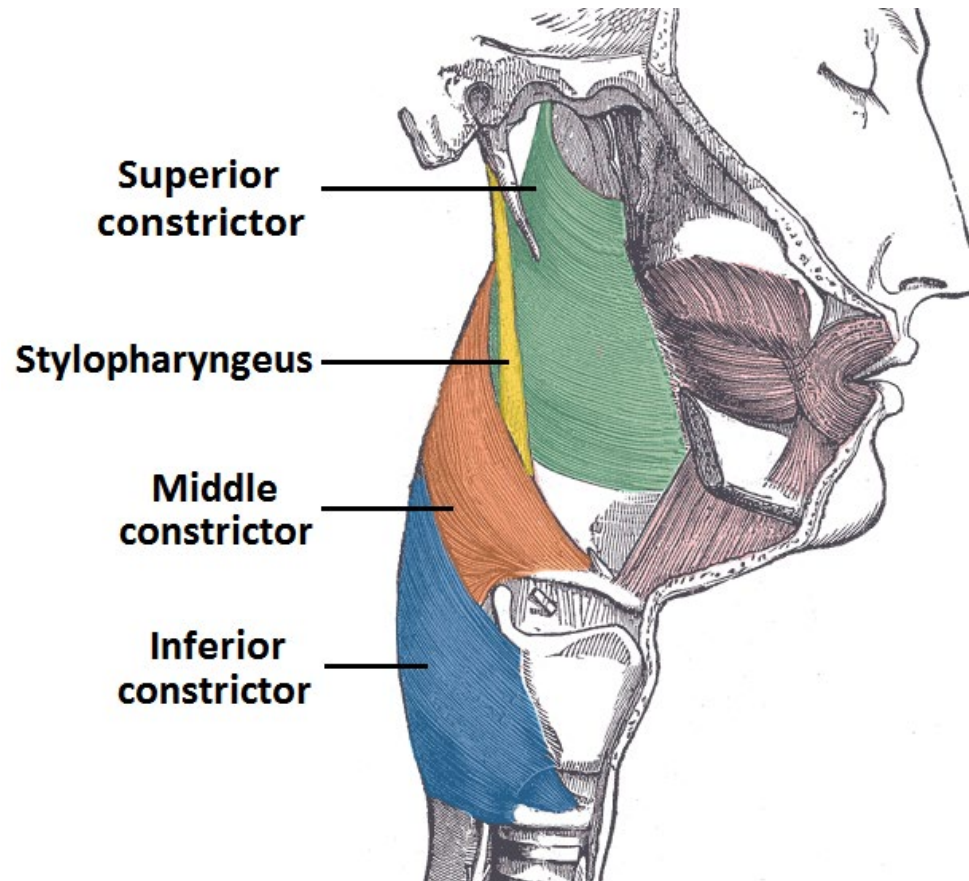
C. Mariette. Zenker's pharyngo-esophageal diverticulum: Diverticulectomy and diverticulopexy. Journal of Visceral Surgery, Volume 151, Issue 2, 2014, Pages 145-149

Andrew Bowen MD MS
Laryngology Fellow
University of Wisconsin-Madison

Anatomy of the Esophagus and Upper Esophageal Sphincter



- Pharyngeal musculature
 - 3 constrictor muscles

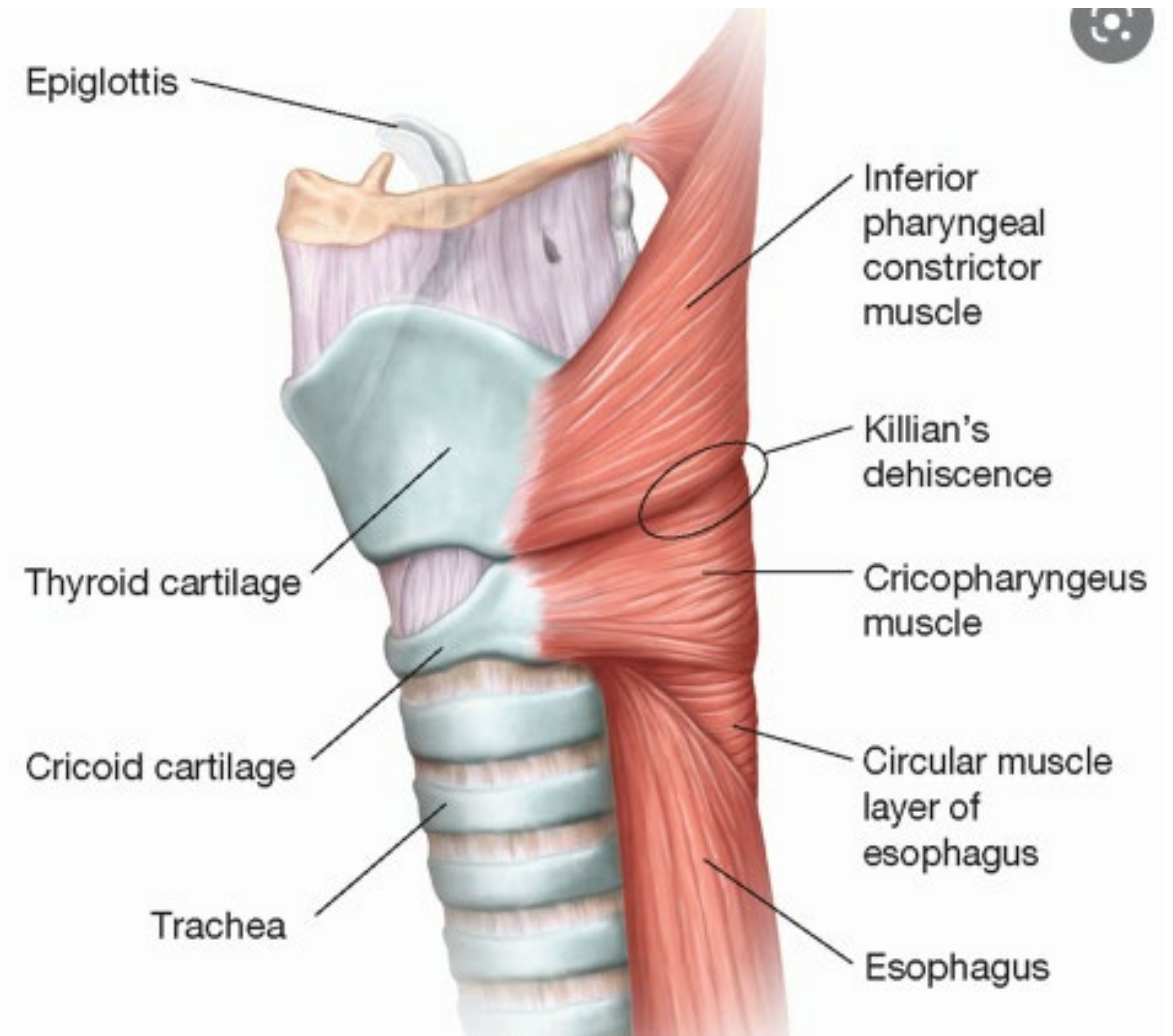


Anatomy of the Esophagus and Upper Esophageal Sphincter



Upper Esophageal Sphincter (UES)

- Consists primarily of the inferior constrictor muscle and upper esophagus
- Inferior constrictor muscle- has 2 major parts
 - Thyropharyngeus (oblique fibers to thyroid lamina)
 - Cricopharyngeus (horizontal fibers to cricoid cartilage)

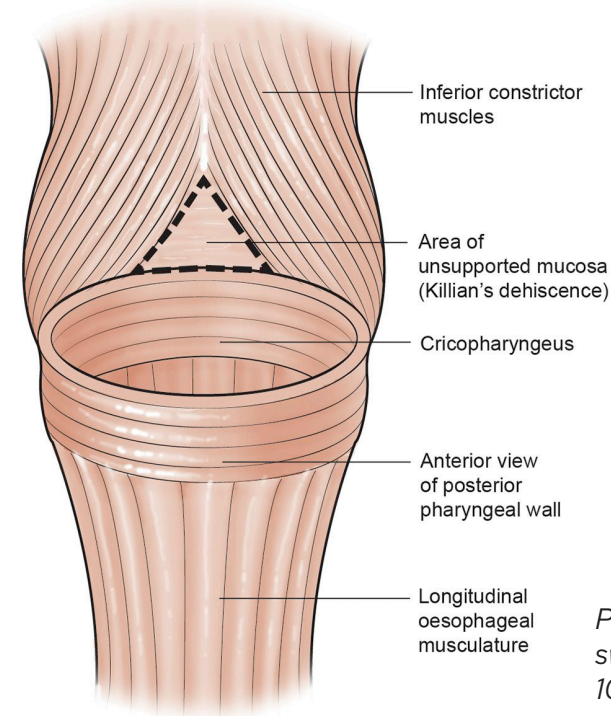


Birth of a Zenker's Diverticulum

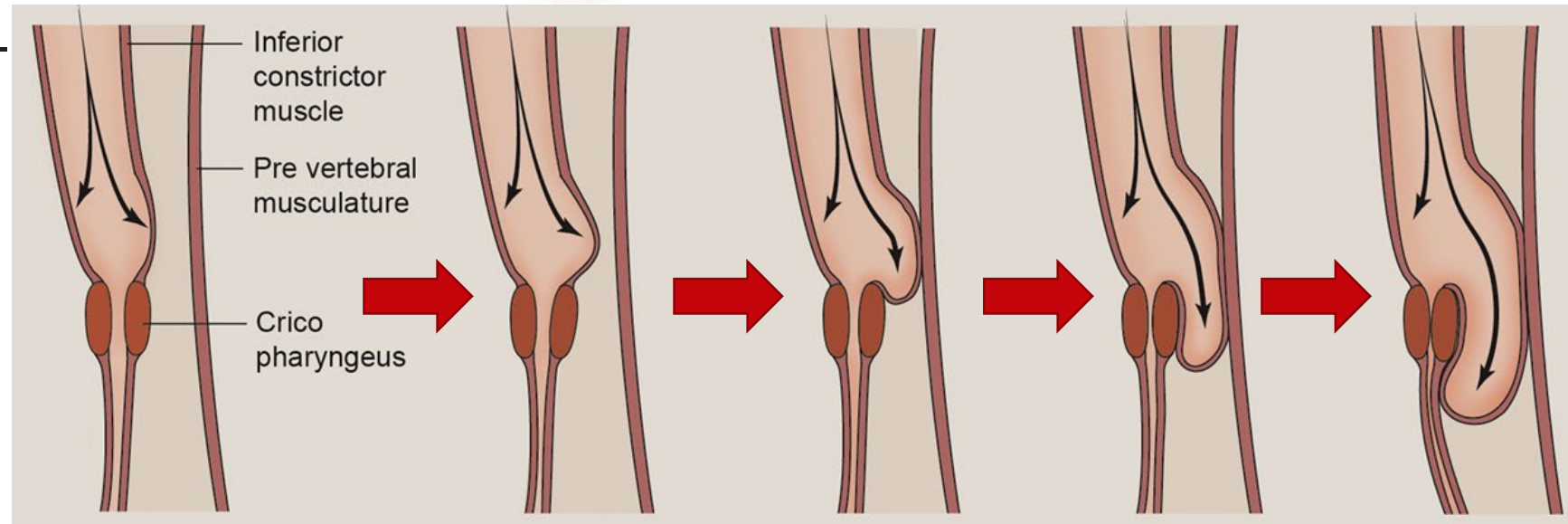


Killian's Dehiscence

- Transition of oblique to horizontal muscle fibers, inherent weakness posteriorly
- Impaired relaxation leads to mucosal herniation
- Why does this happen?—Unclear
 - Age?
 - GERD?



Paul R. Counter, Jen H. Ong. Disorders of swallowing, Surgery (Oxford). Volume 36, Issue 10. 2018, Pages 535-542



Clinical Presentation and Diagnosis

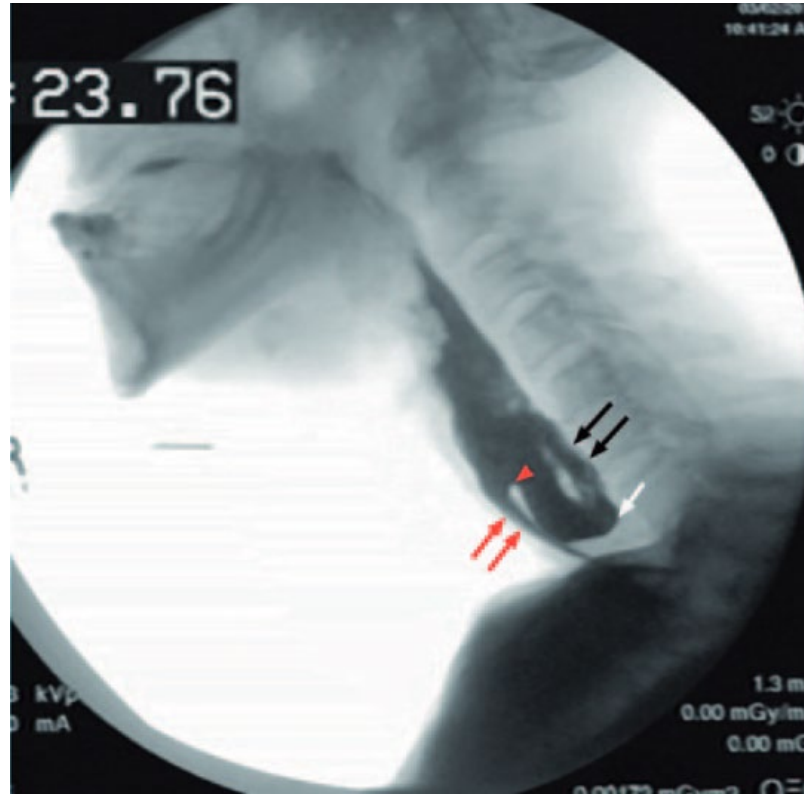


Clinical Presentation

- Solid food dysphagia
- Regurgitation solids + pills
- Gurgling sounds
- Aspiration pneumonia-severe cases
- Weight loss-severe cases

Diagnosis

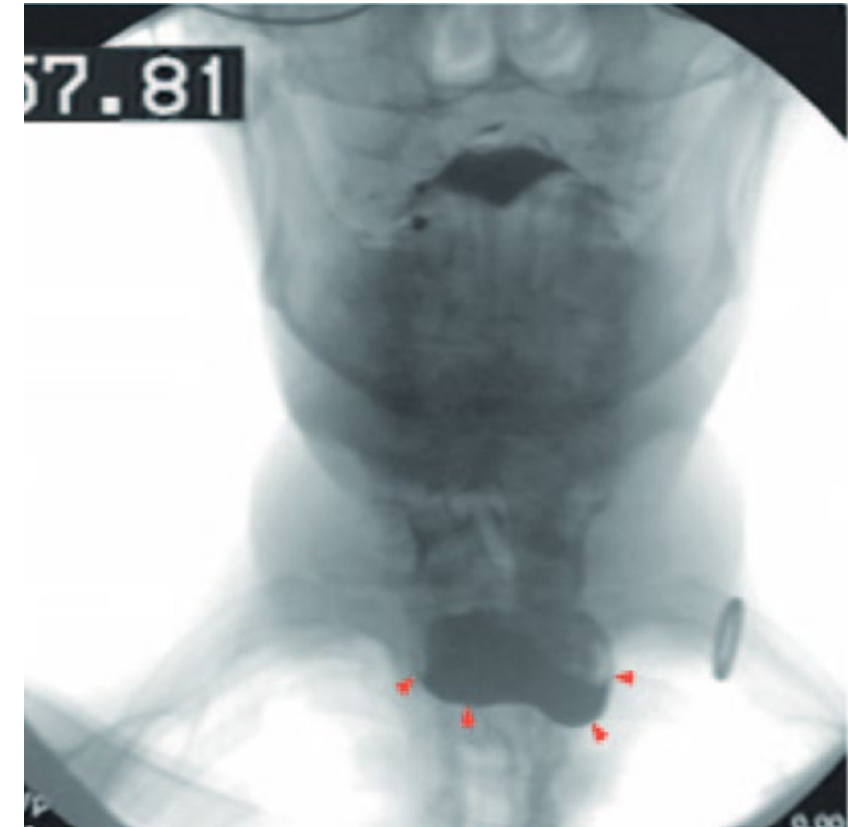
- Video fluoroscopic swallow study



Lateral view

Belafsky 2014. The Clinician's Guide to Swallowing Fluoroscopy

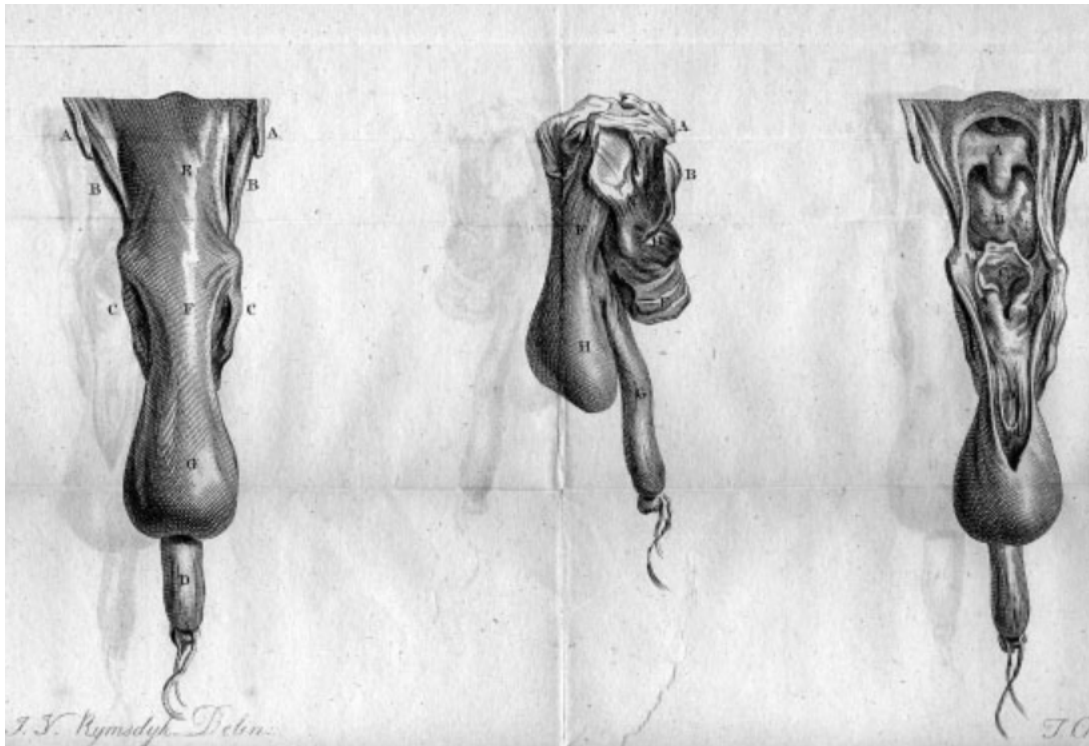
Anterior-posterior view



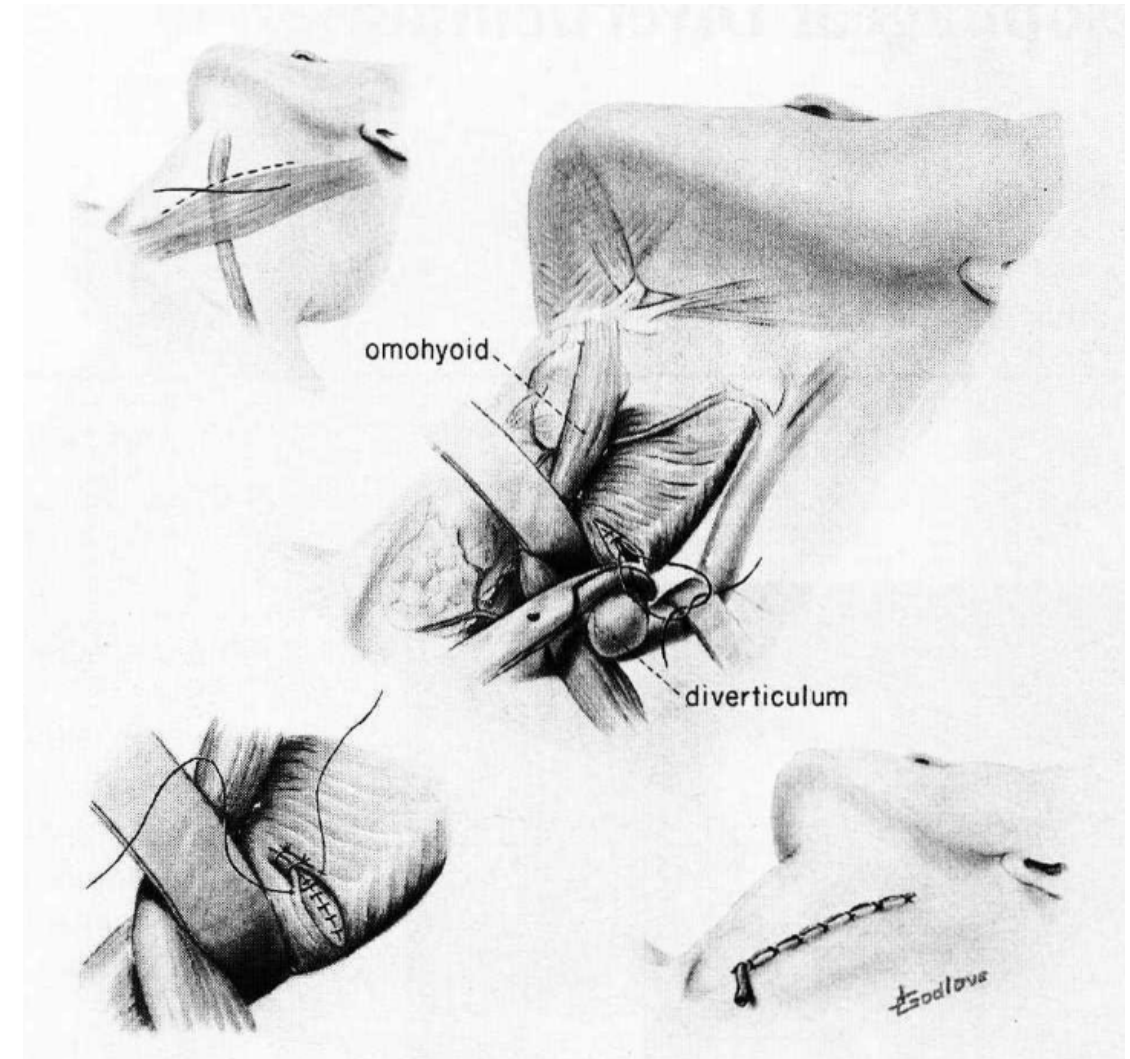
Treatment of Zenker's Through Time



- Initially all transcervical
- Initially two stage procedure, then one stage
- Initial high rate of fistulization, infection, and mortality
- Improved over time, became single staged procedure



First illustration of Zenker's from Abraham Ludlow in 1764



Payne 1992. *The Treatment of Pharyngoesophageal Diverticula: The Simple and Complex*

Treatment of Zenker's Through Time



- Endoscopic diverticulotomy first attempted in 1906- high risk mediastinitis
- 1958-Dohlman reports improved infection risk using diathermy
- 1980s CO2 excision introduced
- 1990s endoscopic stapler technique described by Martin-Hirsch and Collard
- Still limitations
 - Rigid endoscopy candidates must be exposable with good neck extension
- Past 2 decades
 - Flexible endoscopic techniques described



CO2 Laser



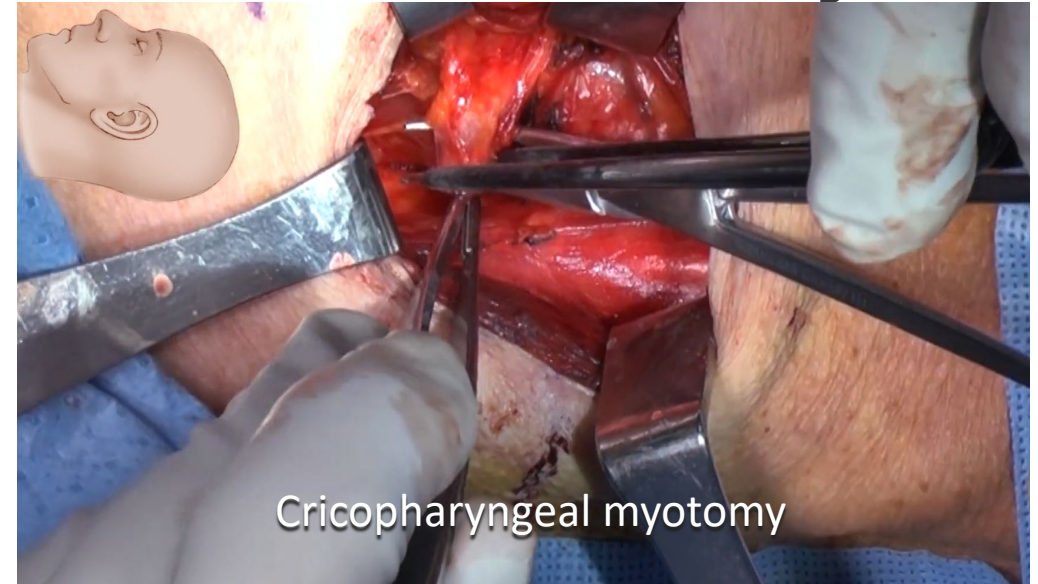
GIA™ Stapler



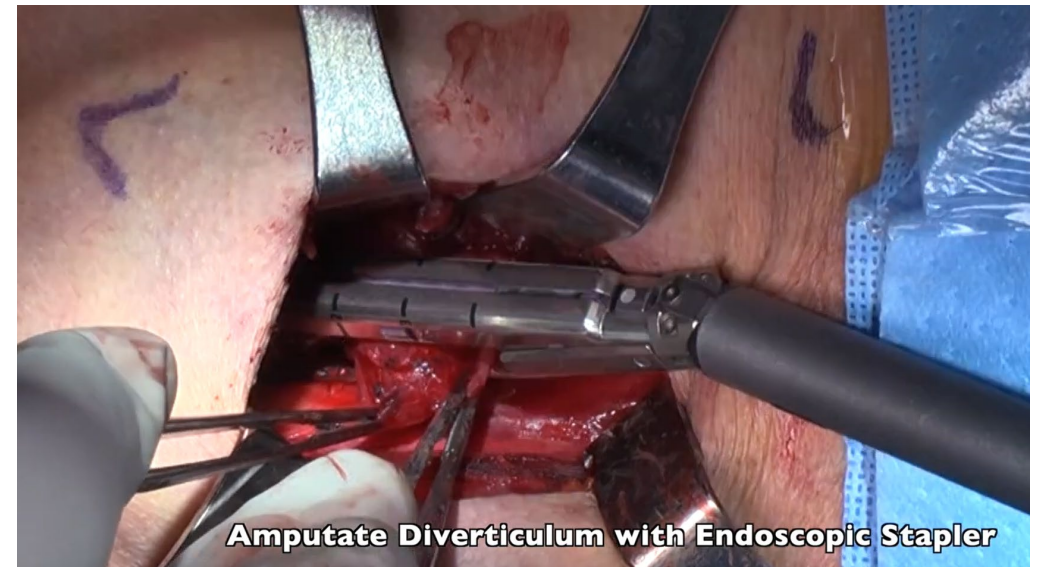
EGD Working Channel Scope

Transcervical (Open) Zenker's Diverticulectomy

- Removal of Zenker's through transcervical excision
- Combined with cricopharyngeal myotomy
- Benefits
 - Greatest rate of success
 - Zenker's pouch is definitively gone
- Cons
 - Neck incision
 - Historical high rate of complications
- Ideal candidates
 - Endoscopic exposure not possible
 - Large diverticular sacs
 - Younger patients



Cricopharyngeal myotomy

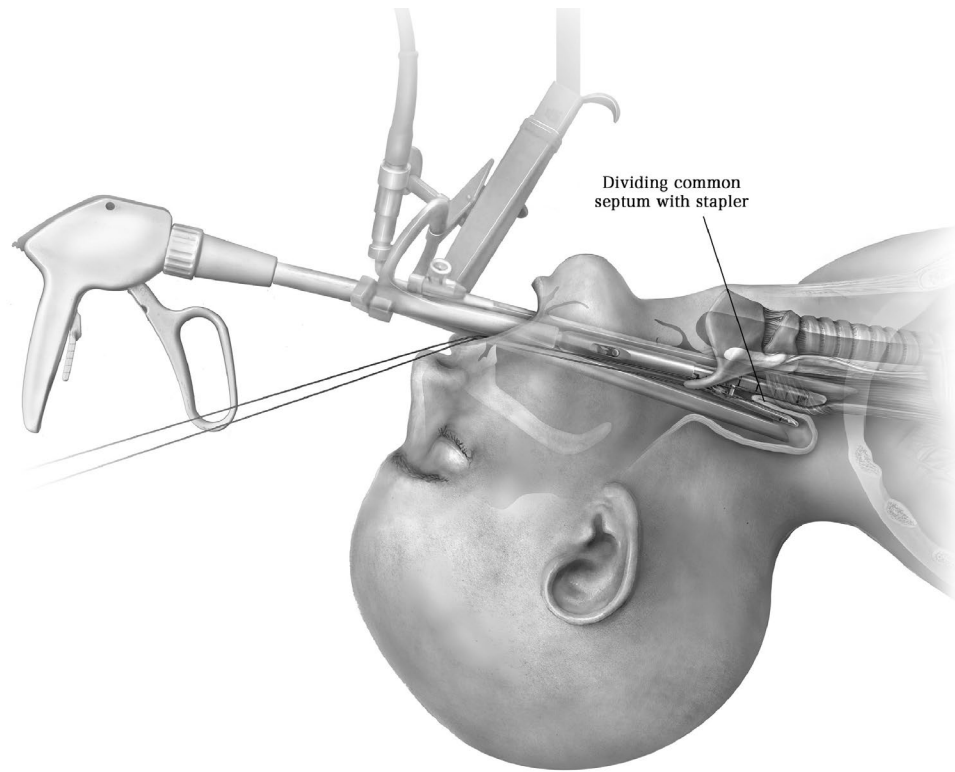


Amputate Diverticulum with Endoscopic Stapler



Rigid Endoscopic Staple Zenker's Diverticulotomy

- Division and stapling of septum through endoscopic exposure
- Benefits
 - No neck incision!
 - Edges of myotomy are primarily closed
 - Decreases risk of post-operative leak
- Cons
 - Must use Weerda diverticuloscope
 - May not completely divide septum at inferior edge
 - Makes small diverticulum's difficult to treat
 - Risk of recurrence is higher
- Ideal candidates
 - Patients with mid-sized to large pouches



Chan et al. Transoral Stapling Technique for Zenker's Diverticulum, Operative Techniques in Thoracic and Cardiovascular Surgery, Volume 25, Issue 3, 2020, Pages 171-189, ISSN 1522-2942

Cohen et al. Zenker's diverticulum: endoscopic staple-assisted diverticulotomy. J Med Insight. 2022;2022(275).

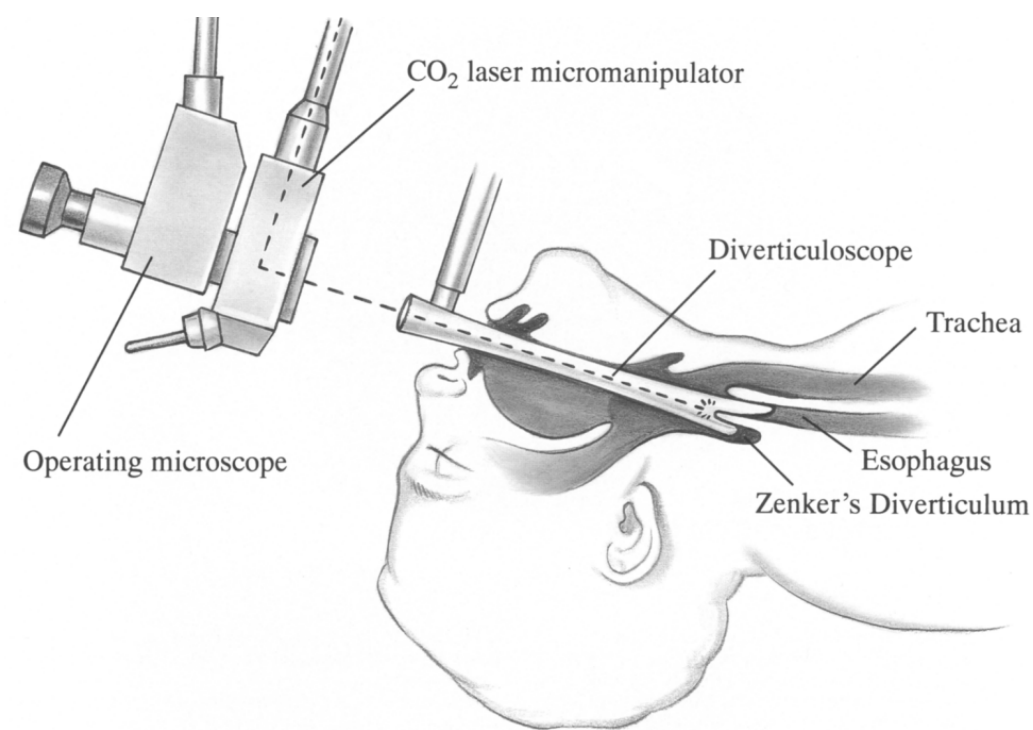


Final Appearance of Staple Line



Rigid Endoscopic CO2 Laser Zenker's Diverticulotomy

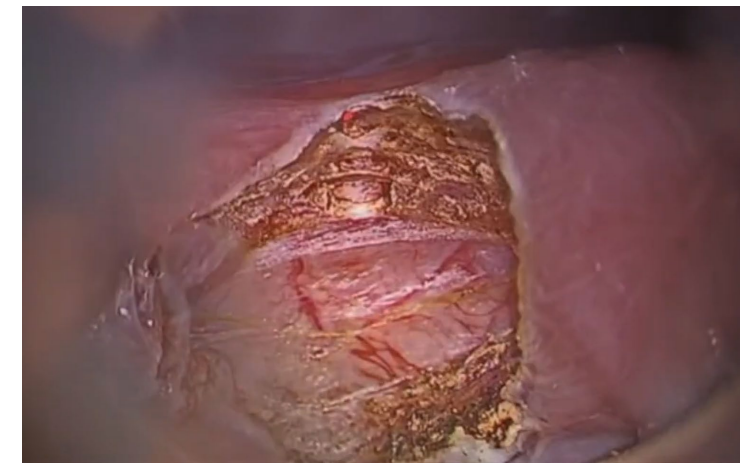
- Division of septum through endoscopic exposure
- Benefits
 - No neck incision!
 - Amenable to multiple diverticulosopes for exposure
 - Complete division of septum attainable
 - Small pouches included
- Cons
 - Edges of myotomy heal by secondary intention
 - Increases risk of post operative leak
- Ideal candidates
 - Patients with small to large pouches that do not want transcervical approach



Shapiro and van Overbeek, Endoscopic laser cricopharyngeal myotomy, Operative Techniques in Otolaryngology-Head and Neck Surgery, Volume 8, Issue 4, 1997, Pages 209-212, ISSN 1043-1810,



Division of Cricopharyngeus



Division to BPF

Flexible Endoscopic Approach

- Use of gastroscopes to perform intervention to the septum of diverticulum
- Benefits
 - Rigid endoscopy free
 - Can be done under MAC
 - Shorter operative times
- Cons
 - Difficult visualization particularly with bleeding
 - Recurrence is high
 - Complication rate is unknown



Standard transparent cap placed on the tip of the endoscope



Dedicated hood with oblique design placed



Soft diverticuloscope

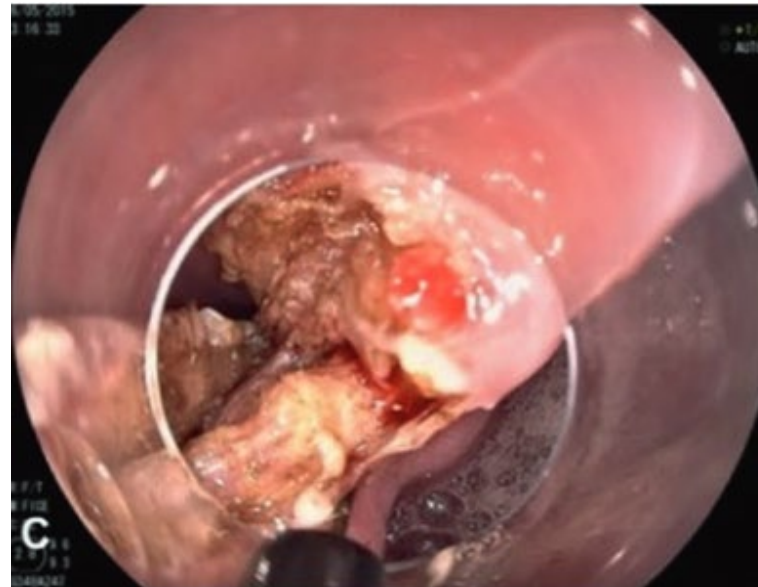
Fugazza, Maselli, and Repici. Endoscopic Myotomy for Zenker's Diverticulum (Z-POEM). Gastrointestinal Interventional Endoscopy. M. S. Wagh, S. B. Wani (eds.). Springer Nature Switzerland AG 2020. 283-290.

Flexible Endoscopic Approaches

- Endoscopic septum division
 - Needle knife
 - hook knife
 - monopolar forceps
 - argon plasma coagulation



Exposure of septum with oblique hood



Division with hook knife



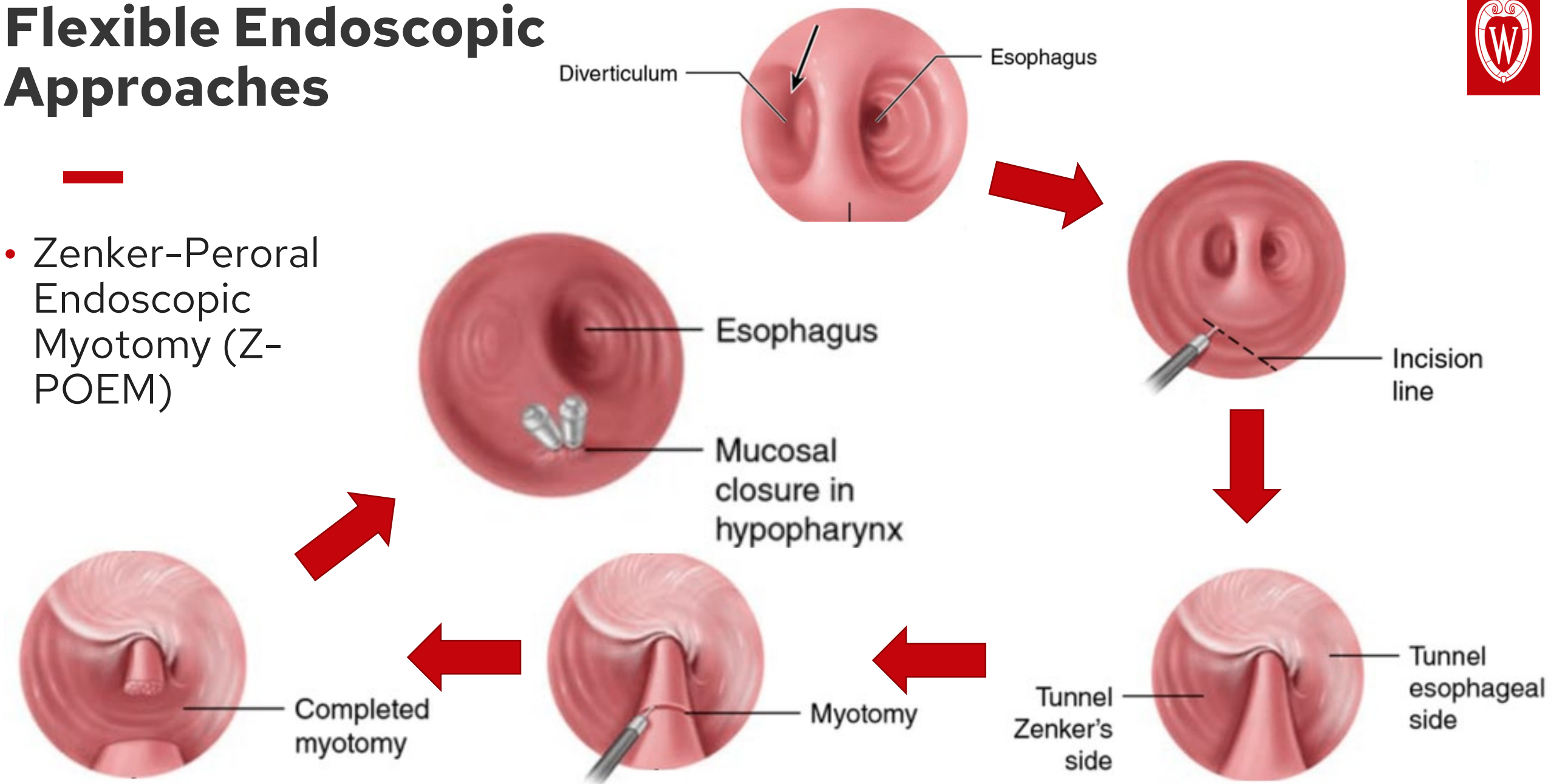
Finished septum division

Fugazza, Maselli, and Repici. Endoscopic Myotomy for Zenker's Diverticulum (Z-POEM). Gastrointestinal Interventional Endoscopy. M. S. Wagh, S. B. Wani (eds.). Springer Nature Switzerland AG 2020. 283-290.



Flexible Endoscopic Approaches

- Zenker-Peroral Endoscopic Myotomy (Z-POEM)



The Mayo Experience with Zenker's Diverticulum



- 14 year retrospective analysis of 424 Zenker's procedures
- No difference in morbidity between groups
- Endoscopic laser time had longest operative time (117 minutes)
- Majority of flexible endoscopic performed under general anesthesia (65%)
- Procedure related perforation highest in flexible endoscopic group

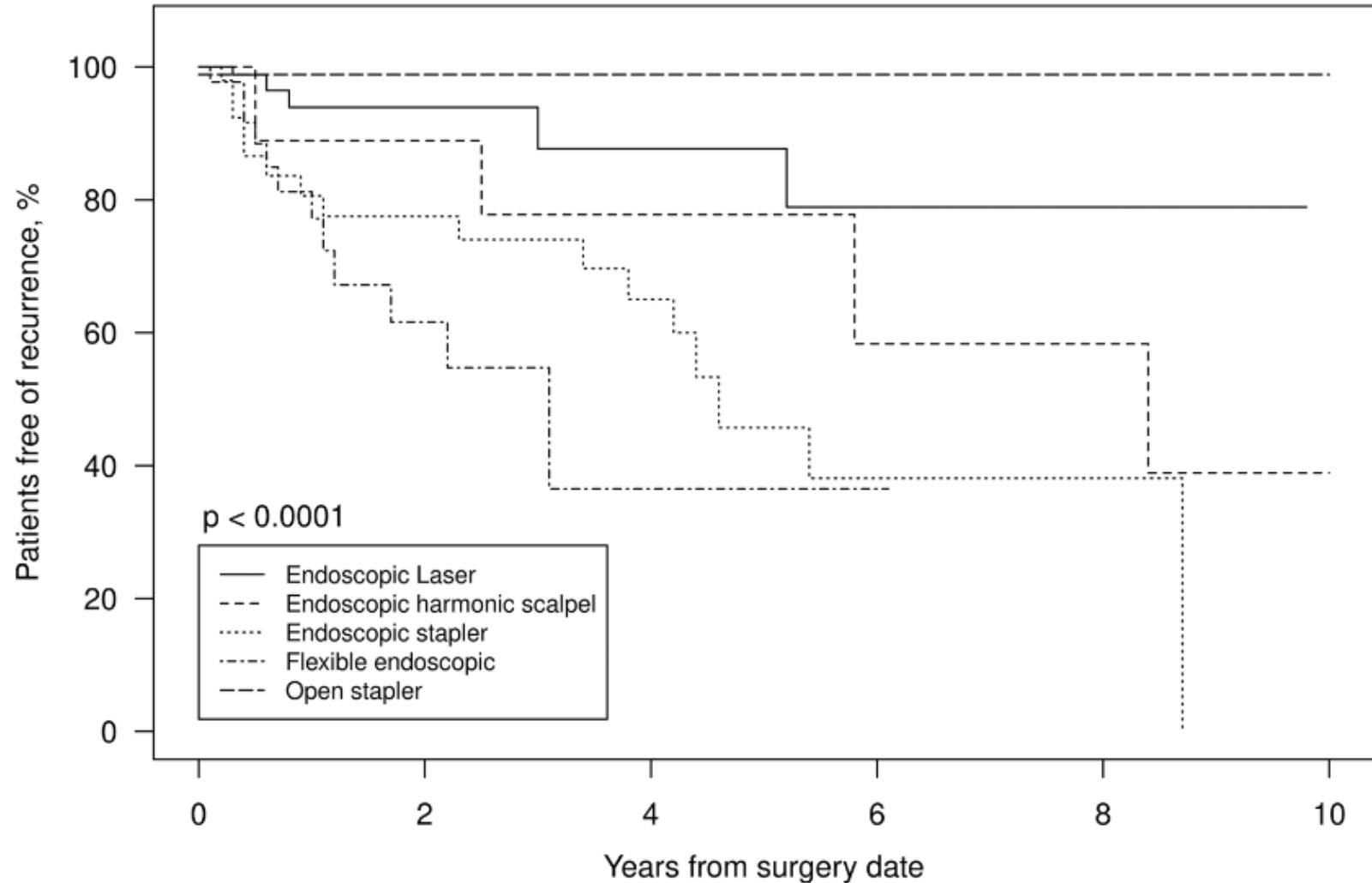
Procedure	# Procedures
Open Surgery	87
Endoscopic CO2	142
Endoscopic Stapler	92
Endoscopic Scalpel	33
Flexible Endoscopic	70

Wallerius et al 2023. Comparing Open Versus Rigid Endoscopic and Flexible Endoscopic Techniques for the Treatment of Zenker's Diverticulum

The Mayo Experience with Zenker's Diverticulostomies



- Endoscopic laser has lowest recurrence rate amongst endoscopic techniques (4.2%)
- Endoscopic stapler and flexible endoscopic demonstrated similar recurrences (17%)
- Open surgery demonstrated lowest recurrence rate (1%)



Wallerius et al 2023. Comparing Open Versus Rigid Endoscopic and Flexible Endoscopic Techniques for the Treatment of Zenker's Diverticulum



Summary of Information on Treatment Options for Zenker's Diverticulum

- Zenker's diverticulum is a pulsion diverticulum at the upper esophageal sphincter of unclear etiology
- Zenker's were historically treated through open neck surgery with later widespread adoption of endoscopic laser and stapler techniques
- Endoscopic diverticulotomy with CO2 laser may allow more complete division of septum at cost of a higher rate of perforation
- Endoscopic stapler may have a higher rate of recurrence but less risk of perforation
- Flexible endoscopic Zenker's diverticulotomy is good option for sickest patients with no neck extension but appears to have elevated rate of recurrence

