

Update in the Management of Zenker's Diverticulum

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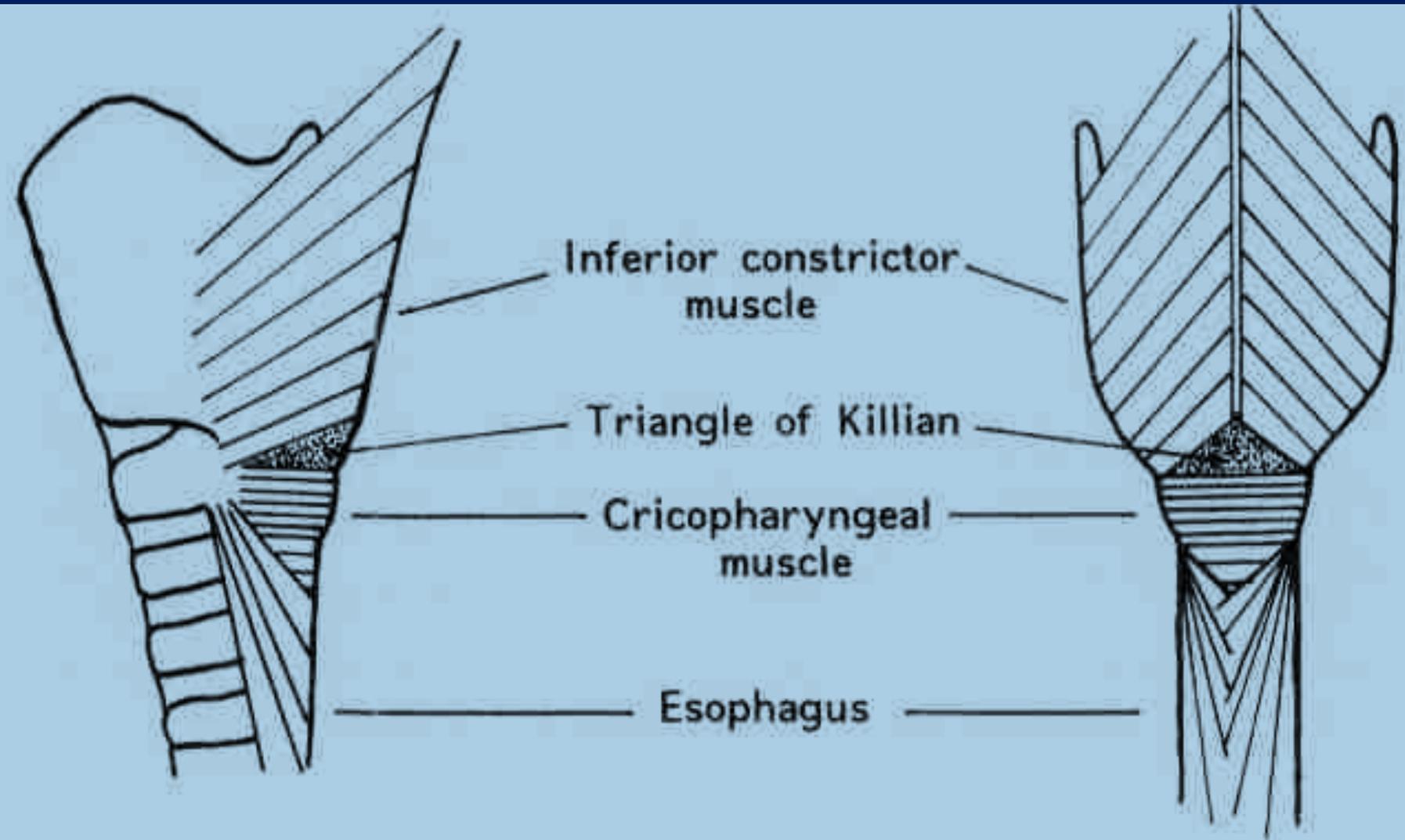
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Zenker's Diverticulum

- 1769 – First described by Ludlow
- 1878 - F.A. Zenker described a pulsion diverticulum above the esophageal inlet. Published a study of 23 patients
- Male-female ratio 1.5 to 1.
- More common in North European descent, rare in Asians, Africans
- Mean age 71 years (rare age < 40)
- Prevalence 0.01-0.11%

Zenker's Diverticulum Anatomy

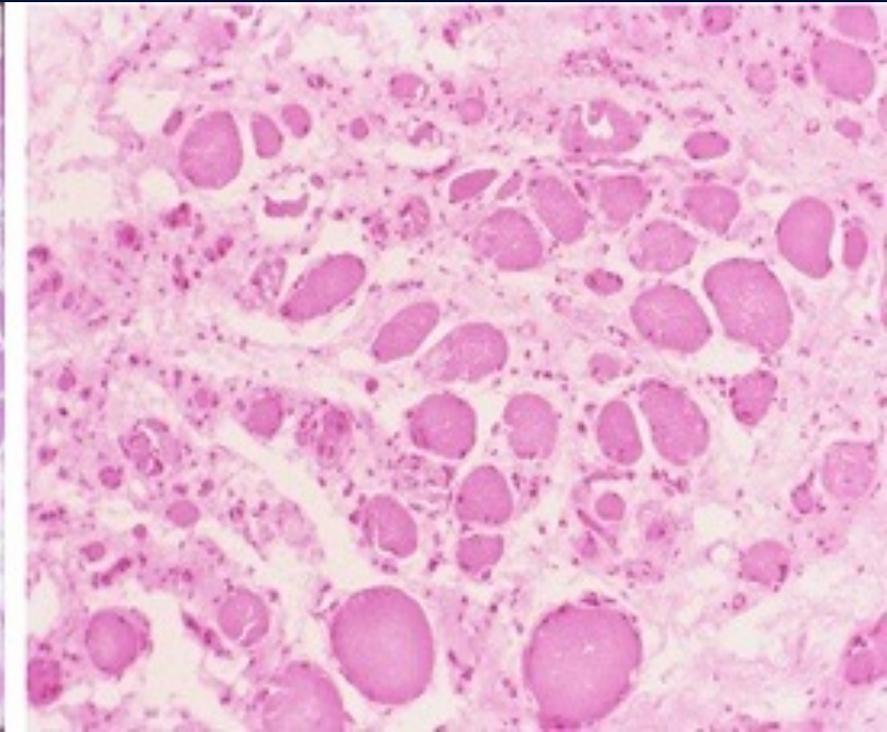
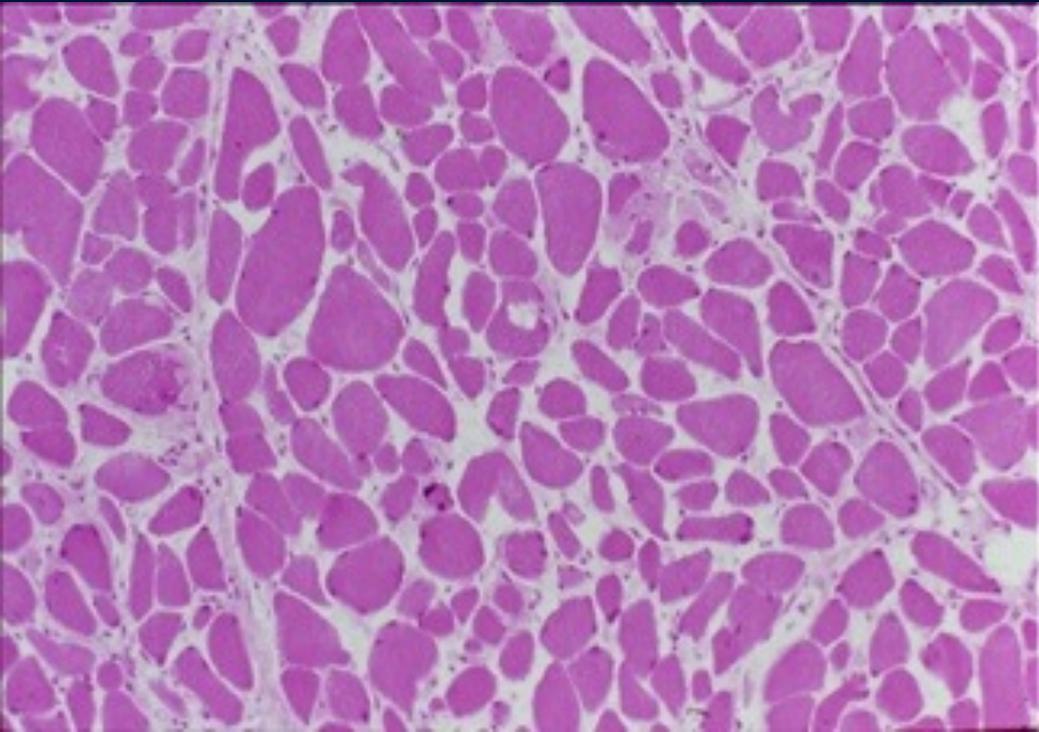


Zenker's Diverticulum Pathogenesis

Mucosal prolapse forms a diverticular sac @ Killian's triangle due to pressure gradient between the wide hypopharynx (inferior constrictor muscle) and UES (CP and upper esophageal muscles).

Zenker's Diverticulum Pathogenesis

Increased fibrosis of the CP muscle is the only consistent histopathologic change seen on muscle biopsy.



Zenker's Diverticulum Predisposing Factors

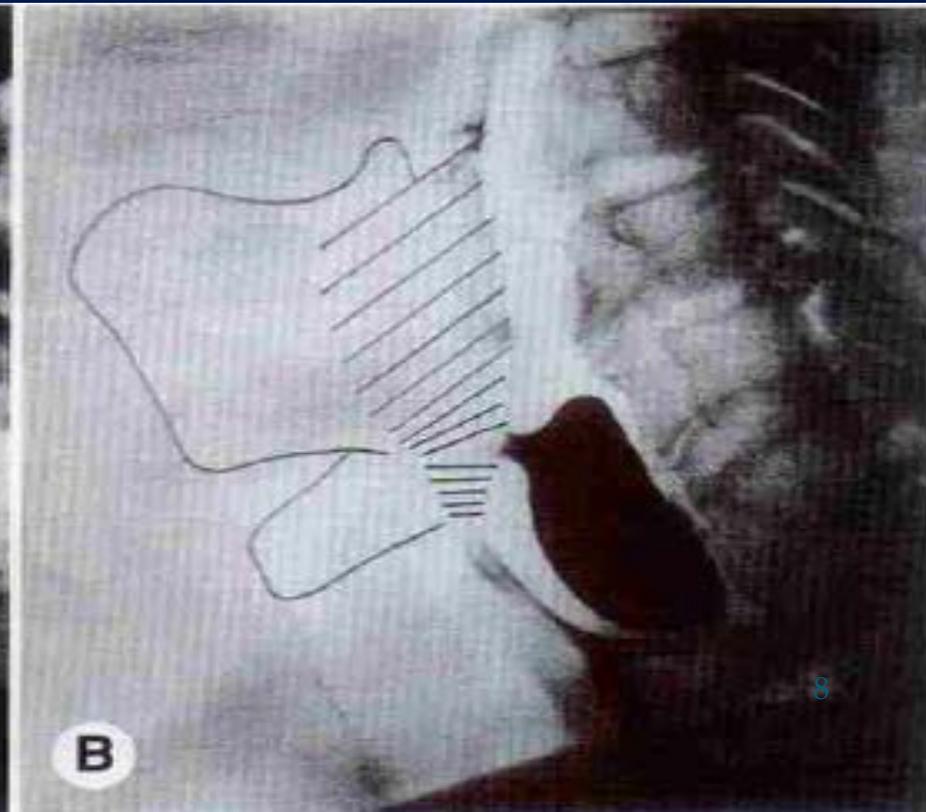
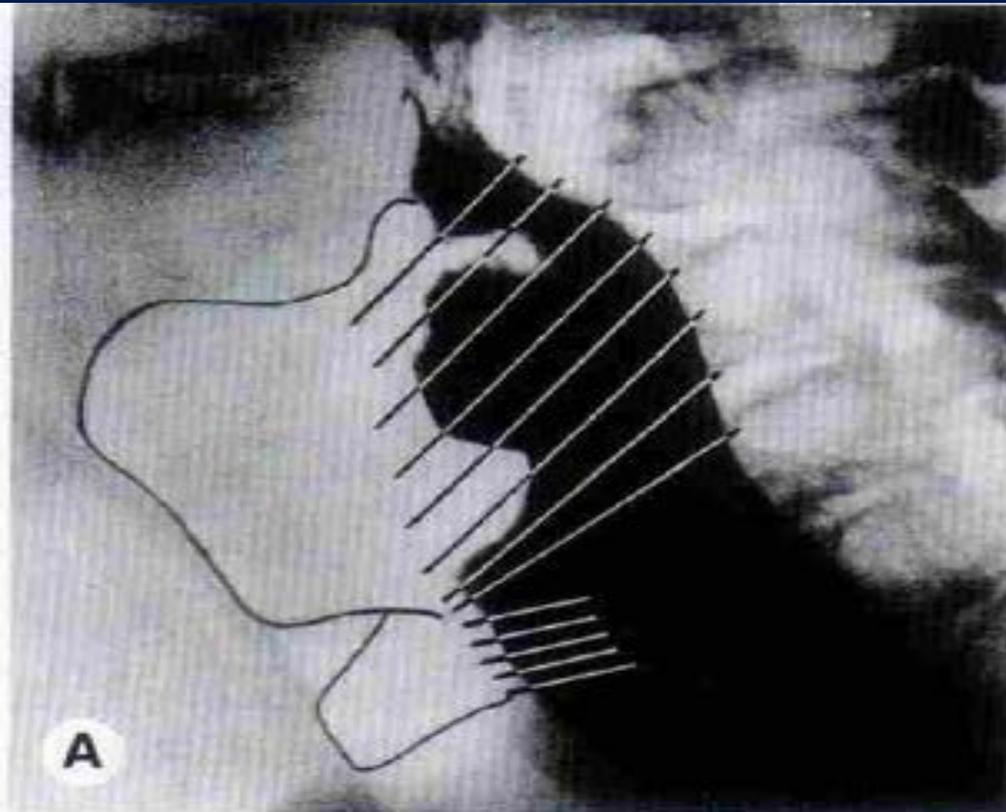
1. Large Killian's triangle
 2. High intraluminal pressure in hypopharynx during swallowing
 3. Increased CP muscle fibrosis
- GERD has been implicated

Symptoms

- Dysphagia & weight loss
- Regurgitation of undigested food
- Halitosis
- Recurrent aspiration & cough
(30-40%)
- Cervical borborygmi

Diagnosis

Barium Swallow Study (BSS) – lateral or oblique projection



Zenker's Diverticulum Carcinoma

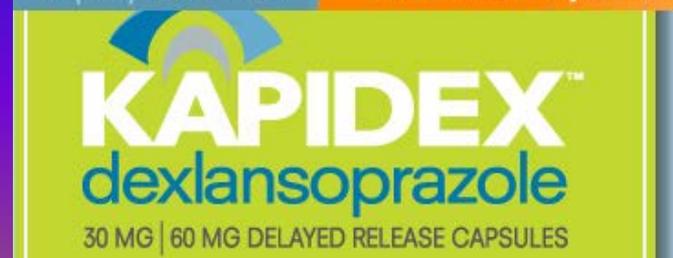
- Incidence of CA in ZD is $< 0.5\%$ *Mayo study 1932-1982, 6/1249 patients with CA in sac (0.48%)*
- Regurgitated food may be blood-tinged or
- Sudden increase in dysphagia
- Recommend careful examination of sac with scope prior to endoscopic therapy.

Carcinoma in Pouch



Conservative Treatment Options for Zenker's Diverticulum

- A. Anti-reflux treatment
- B. Botulinum toxin injection
- C. CP muscle dilation



Surgical Treatment Options for Zenker's Diverticulum

A. Open

1. Invagination
2. Myotomy only
3. Diverticulopexy & myotomy
4. Diverticulectomy +/- myotomy

B. Endoscopic

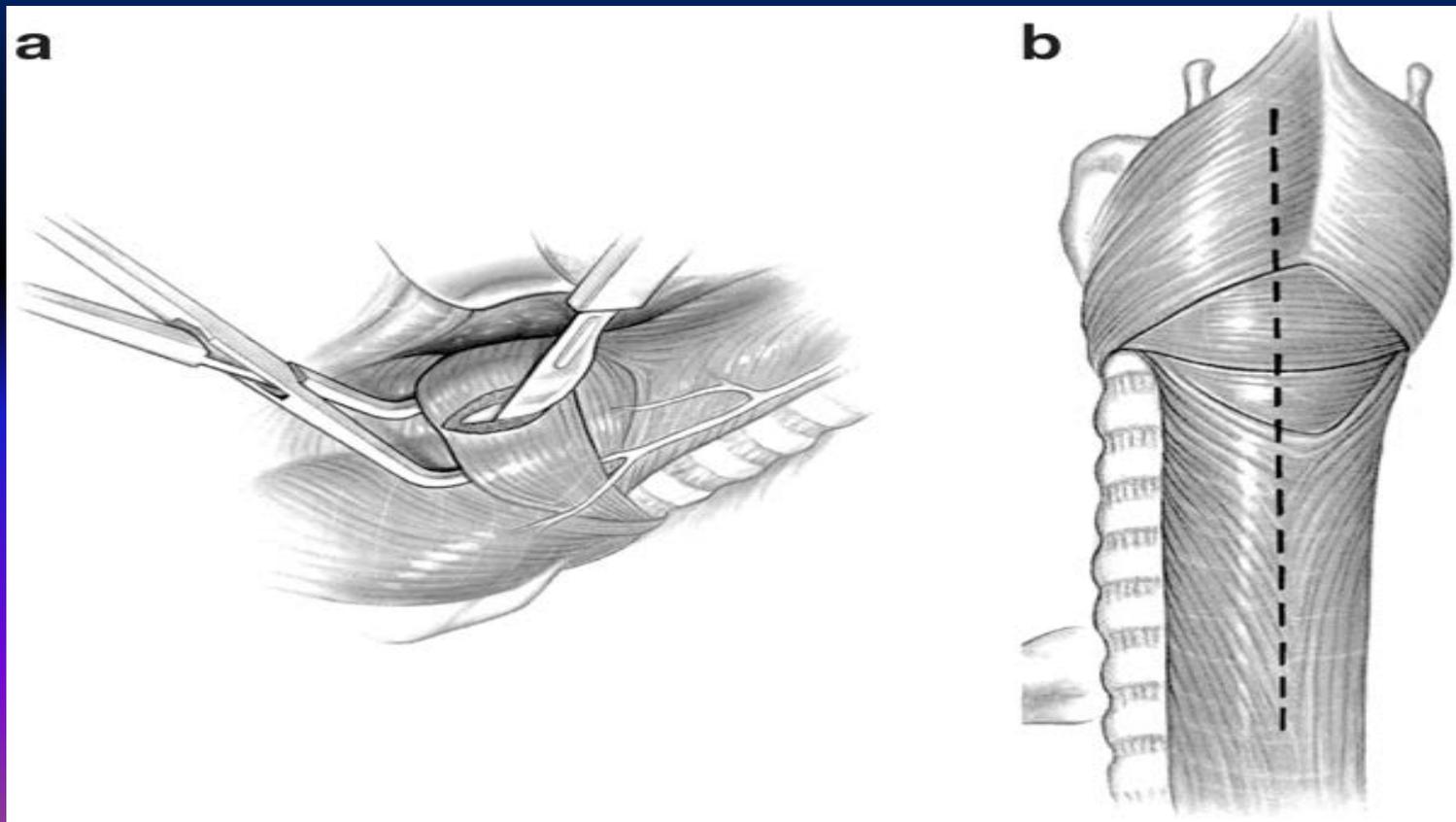
1. Dohlman
2. CO₂ laser
3. Stapler

Invagination of Diverticulum

- Fewer complications and decreased operative time and hospital stay compared to diverticulotomy
- Purse string suture

Exclusive External CP Myotomy

- Excellent option for small $<2\text{cm}$ symptomatic ZD (4-5 cm length myotomy recommended)

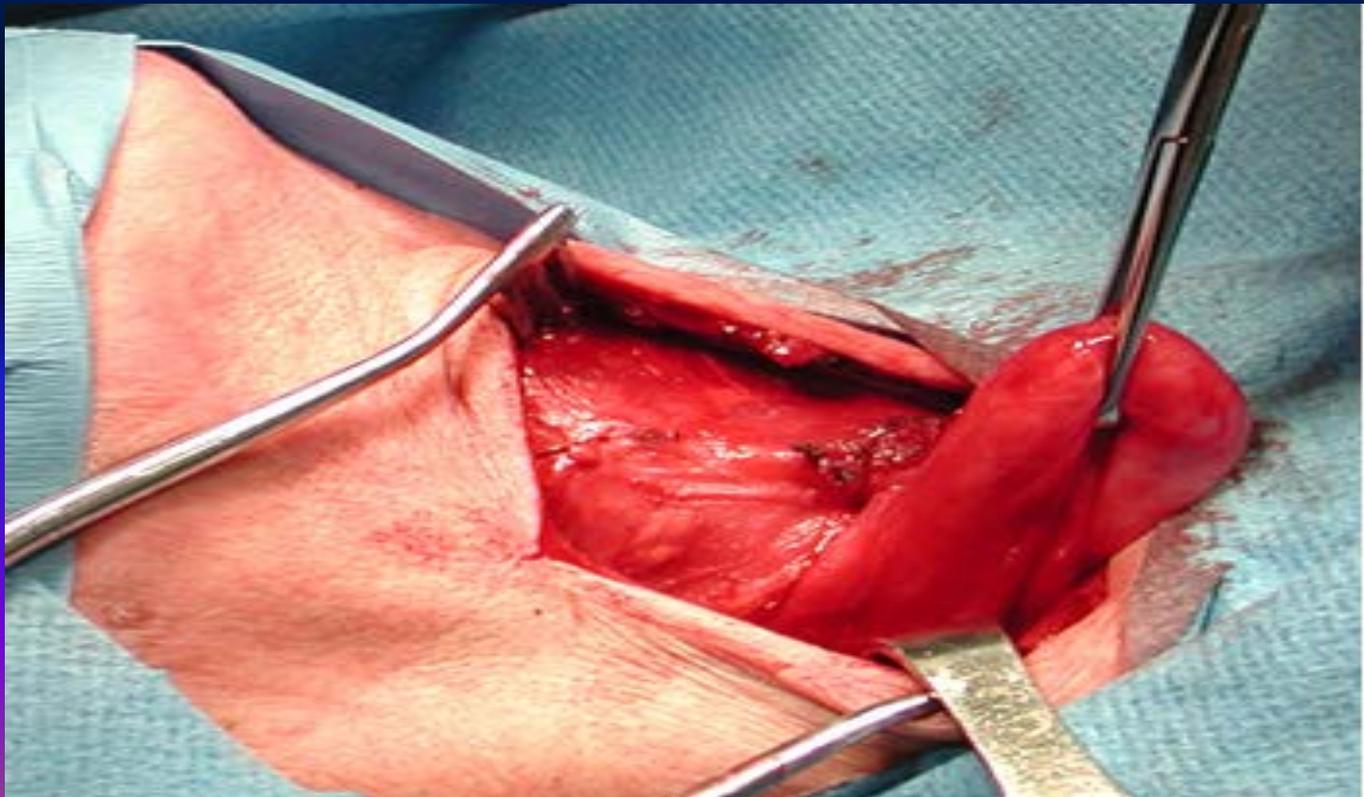


Exclusive External Myotomy Surgical Technique

1. Torsion of larynx gives more dorsal view of UES
2. Place esophagoscope to transilluminate and balloon sac
3. Use microscope to divide muscle down to mucosa
4. Fill site with saline and check for bubbles while ballooning with esophagoscope

Diverticulectomy

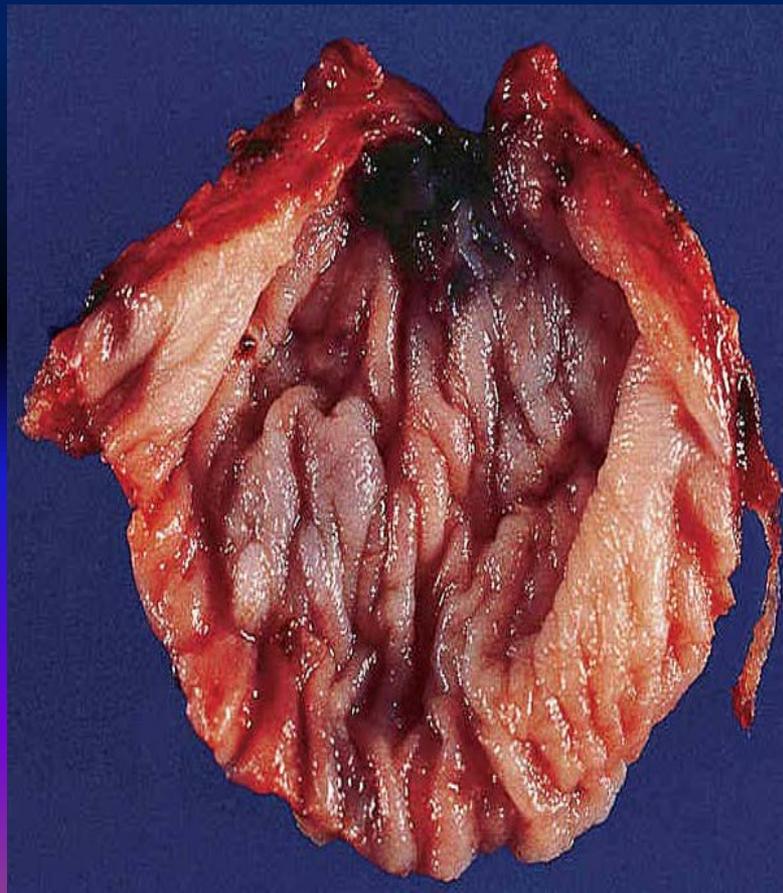
- Amputate neck of sac with stapler for better leak rate.
- Use recurrent laryngeal nerve monitor (Medtronic) with ET tube.



Risks of Diverticulectomy

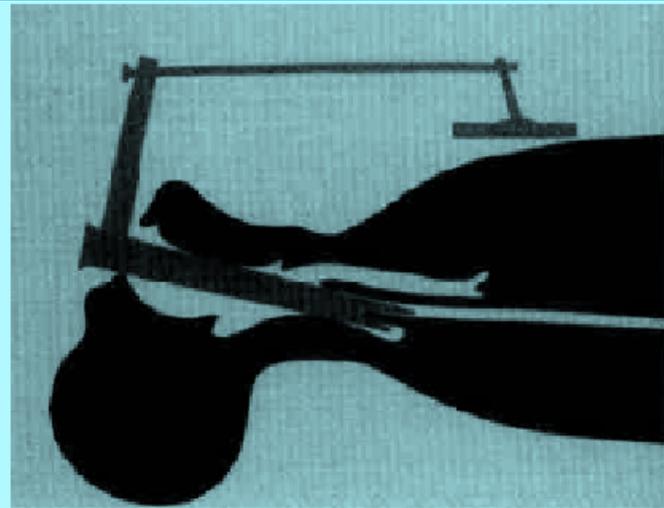
Mayo retrospective study of 888 patients

- TVC paralysis 3%
- Wound infection 3%
- Mediastinitis 3%
- Recurrence 4%
- Death 1%



Endoscopic Diverticulotomy

1. Dohlman procedure – use of electrocoagulation and diathermy
2. CO₂ laser with microscope
3. Stapler



Advantages of Endoscopic (vs. Open) Technique

1. Shorter surgical time (32 vs. 106 minutes)
2. Low morbidity (RLN injury)
3. Shorter hospital stay
4. Quicker resumption to oral intake
5. Fewer complications

CO₂ laser vs. Stapler

Miller, Frank et al. Laryngoscope 116: September 2006, 1608-1611.

40 patients

- 12.5% failed endoscopic exposure
- Similar symptom improvement
- Laser group had higher length of stay (3.4 vs 1.5 days)
- Laser group with more complications (31 vs. 11%) subQ emphysema, bleeding

Success Rate of Endoscopic Stapler Diverticulostomy

Symptom relief:

74% complete resolution

22% partial improvement

3% no change in symptoms



Complications of Endoscopic Stapler Diverticulostomy

- 4% No improvement in symptoms
- 0-5% Convert to open approach
- 0-4% Perforation/mediastinitis
- 8-15% Recurrence of diverticulum
- Chipped tooth from laryngoscopy

Postop Orders after Endoscopic Stapler Diverticulostomy

- Observe in RR 4 hours for fever
- DC home same day
- BID PPI therapy for 2-3 months
- Start liquids day of surgery
- General diet POD#1 as tolerated
- Postop MBS only for suspected complication or recurrence

Endoscopic Stapler Technique

1. If locating esophageal inlet is difficult:
 - a. have patient swallow a black thread tied to metallic pellet the day before surgery
 - b. balloon during endoscopy
2. Empty sac of retained food to carefully inspect sac to r/o SCCA with magnification

Endoscopic Staple-Assisted Diverticulotomy (ESD)

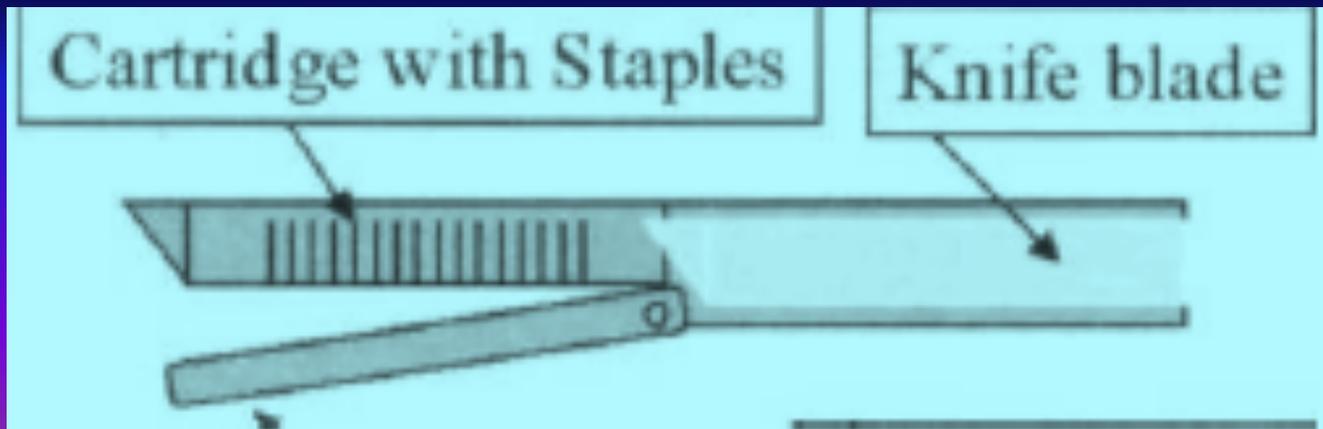
Choice of staplers

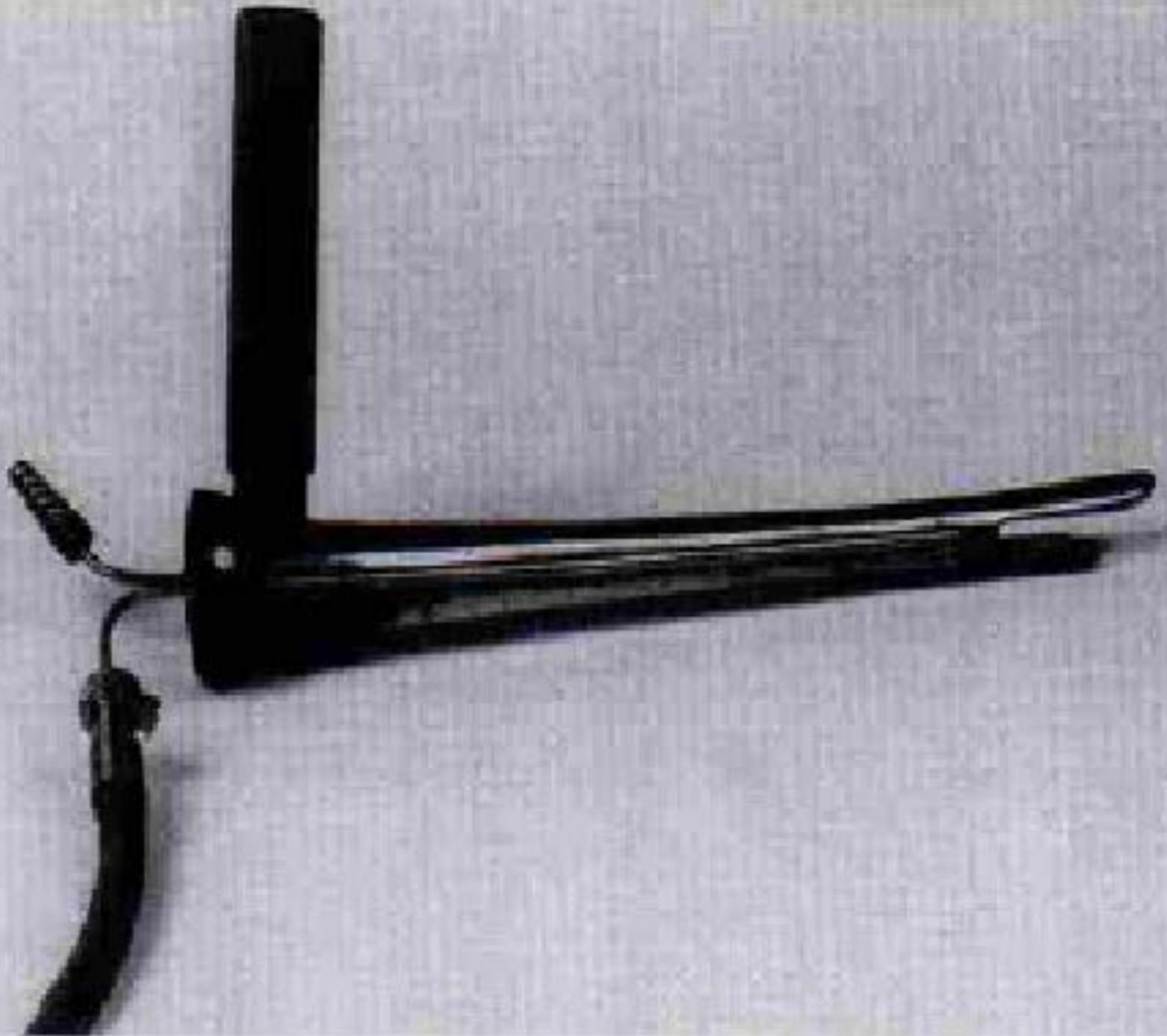
1. *Endo **GIA 30** (Covidien/USS Surgical)
2. Endo **GIA Universal Autosuture** (Covidien/USS Surgical)
3. *Endopath ETS Flex45 Endoscopic Articulation Linear Cutter loaded with thin/vascular cartridge (**Ethicon**)

*These staplers can be modified.

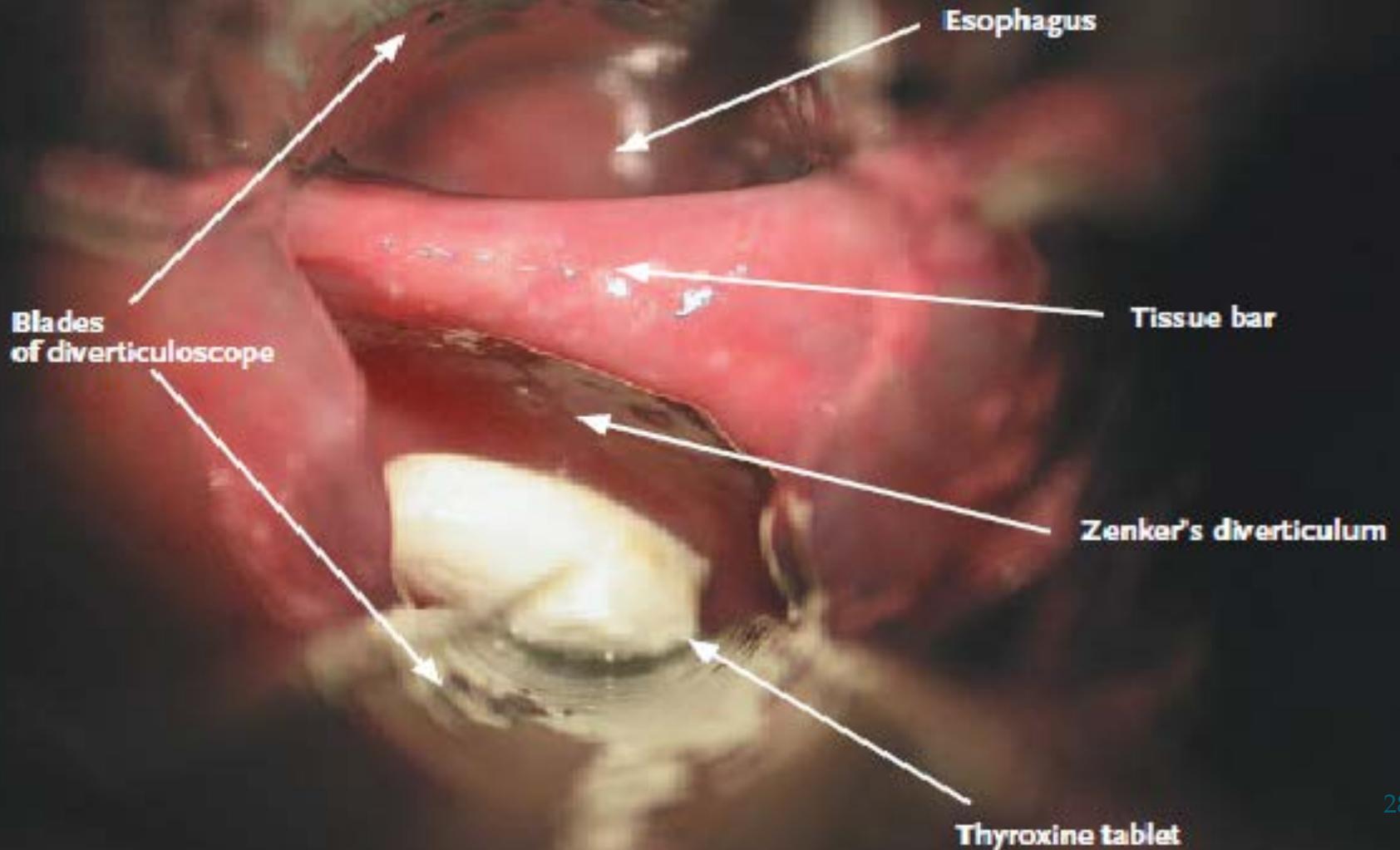
Endoscopic Stapler Technique

- Anatomy of a stapler head
 1. Cartridge-contains staples and knife
 2. Anvil-place this shorter part into ZD sac





Endoscopic View



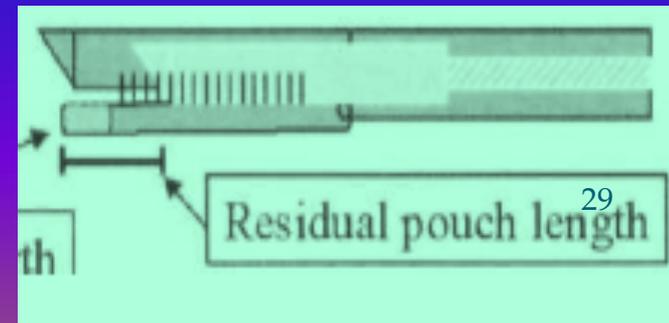
Endoscopic Stapler Technique

Factors affecting length of residual pouch:

1. Length of anvil
2. Distance between the end of the razor and the last staple line.

*Need to counsel patients on limitations of endoscopic approach if sac is $< 3\text{cm}$

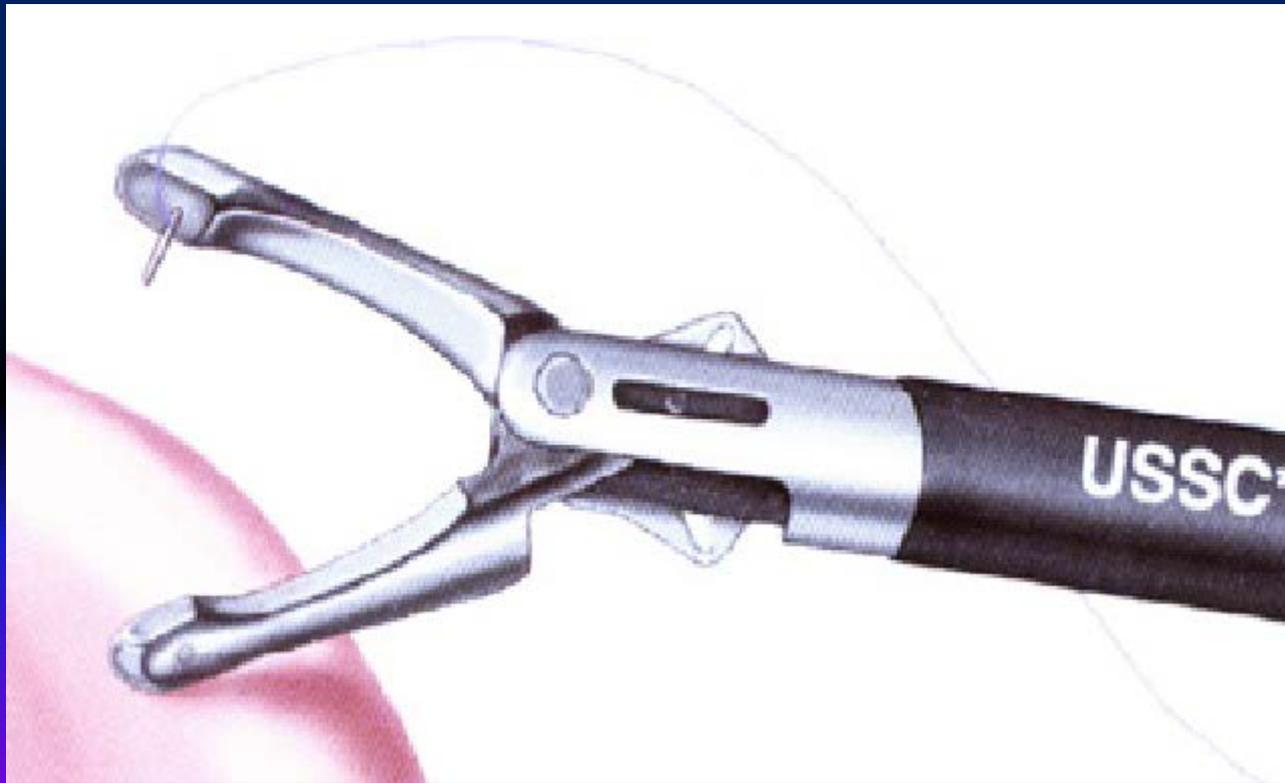
Both Covidian and Ethicon make no knife staplers.



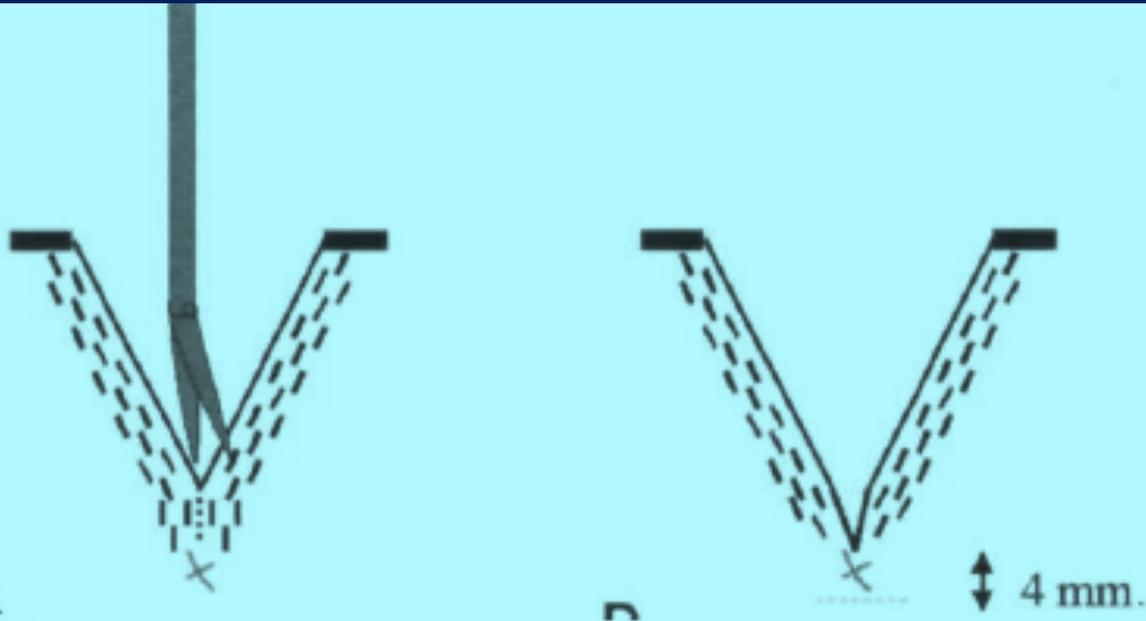
Methods to Reduce Residual Pouch

- All 3 staplers left a 1.5cm residual pouch
 1. Grind down 3-4mm of anvil tip to reduce residual pouch down to 11mm (Ethicon and USS GIA 30 can be modified, USS Universal cannot)
 2. Use endostitch as traction suture to draw party wall up as much as possible
 3. Apex suture can reduce residual pouch down to 3-4mm.

Endo Stitch™ 10 mm Suturing Device (Covidien)



Apex Suture to Minimize Residual Pouch



Placement of endostitch (US surgical Autosuture endostitch) requires practice and the help of a knot pusher. 32

Factors Precluding Endoscopic Approach

- Retrognathia - overbite > 1 cm
- Trismus < 2.5 cm
- Cervical osteophytes > 2 cm
- Inner mandibular arch < 2.5 cm
- Arthritis of C spine
- Deformities of the mandible

Revision Zenker's Diverticulum

- 8-15% Recurrence of Zenker's
- 0-60 months after treatment
- Due to stenosis of cut party wall near apex.

Methods to Decrease Recurrence of Zenker's

1. Postop treatment of GERD
2. Decrease residual pouch

Endoscopic Staple Diverticulostomy (ESD) is treatment of choice for recurrence after initial endoscopic or open treatment

- Staple across complete/partial stenosis/web across original diverticulostomy
- ESD is not technically more difficult for treatment of recurrence

Duke Study for ESD Treatment of Recurrent Zenker's

- 127 patients s/p ZD treatment open or ESD
- 18 with recurrent ZD (14%)
- 16 treatable with ESD (2/18 too small)
- 15/16 complete symptoms relief
- 1/16 partial symptom relief (prior RT for tonsil SCCA)

Flexible Endoscopic-Assisted Diverticulostomy (FEAD)

- Alternative for patients who cannot be exposed with rigid endoscope or cannot tolerate general anesthesia.
- Can use coagulation forceps, argon plasma laser, or stapler (with overtube)

Flexible Endoscopic-Assisted Diverticulostomy (FEAD)

- Alternative to open approach
- Requires multiple procedures (often done in stages)
- Higher complications of bleeding, perforation, etc.

Summary

- ESD treatment of choice $> 3\text{cm}$
- CP myotomy for $< 2\text{cm}$
- Any treatment option should include CP myotomy
- Recurrent Zenker's should be treated with ESD

Summary

- Carefully inspect pouch with magnification to rule out SCCA
- Decrease recurrence with postop PPI x 2-3 months and decrease size of residual pouch
 1. Anvil in pouch
 2. Engage Weerda far distal
 3. Grind down anvil
 4. Use traction and apex sutures

Summary

- Open diverticulectomy or FEAD if rigid endoscope not possible
- Always counsel patients about possible need to convert to open approach.
- Use stapler for open approach

That's all Folks!

