Zenker’s Diverticulum – A review and treatment options.

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I have no disclosures
• 75 y/o patient
• Increasing dysphagia for solids and recently liquids
• Pills stick, excess mucus, coughs and throat clears
• Loosing weight (almost 22kg)
• Other than cachexia no apparent abnormalities on examination

Case
Case

- Differential Diagnosis
- Esophageal tumors – benign and malignant
- Neuromuscular disorders (Parkinson’s Disease, Amyotrophic Lateral Sclerosis etc)
- Post radiation therapy
- Zenker’s Diverticulum
History

- Ludlow originally described what would later be called a Zenker’s diverticulum in an autopsy report written in 1764.
- The lesion was given its current name in 1877, referring to the pathologist Friedrich Albert von Zenker of Erlangen, Germany.

Zenker’s Diverticulum - Anatomy

- The pathological finding is a saclike out-pouching of the mucosa and submucosa of the posterior wall of the hypopharynx
  - Located cranial to the upper esophageal sphincter
  - Pseudodiverticulum
  - It arises for two main reasons
    - A weak spot in the muscular wall of the hypopharynx - Killian’s triangle.
    - Elevated pressure in the hypopharynx - increased tone in the cricopharyngeus muscle, insufficient relaxation of the esophageal sphincter.

Siewert R: Lehrbuch für Chirurgie. 8th ed., Chap. 7, p. 542. Fig. 7.41
Zenker's Diverticulum – Clinical Features

• Common symptoms are dysphagia and regurgitation (chewed but undigested).
  – In the early stages, dysphagia is usually only for solids
• Acute symptoms
  – Food or often pills seem to catch or lodge in the throat and coughing while eating.
• Other symptoms
  – Nocturnal regurgitation of undigested food, hoarseness, and halitosis.
• Sufferers alter their eating habits
• Become apparent:
  – After age 50, peak age is around 70.
  – Patients are usually old and often have significant comorbidities

Zenker's Diverticulum - Diagnosis

• Key diagnostic procedure
  – Barium swallow, with imaging at multiple levels.
    • At the level of the sternoclavicular joint, outpouching of the dorsal surface of the esophagus.
    • Zenker's diverticula are classified by size, measured in the craniocaudal direction: small (up to 2 cm), intermediate (2 to 4 cm), and large (4 to 6 cm).
Zenkers Diverticulum - Treatment

- Expectant (observation)
- Dietary Modification
  - Switch to liquid or crushable medications
- Feeding tube
- Surgery
  - Lateral cervical
    - Classic approach
  - Endoscopic
    - Rigid
    - Flexible (latest modification)

Lateral cervical approach

- The surgical excision of a diverticulum through a lateral cervical approach
  - Described first 1884.
  - The division (myotomy) of the cricopharyngeus muscle were added later.
  - In 1917, Mosher divided the muscular bridge between the esophagus and the diverticulum by an endoscopic approach in a small number of patients
  - Dohlmann and Mattson described splitting of the septum by coagulation via rigid transoral endoscopy 1960
Lateral Cervical Zenker’s Diverticulectomy

- Surgical resection of the diverticulum (classic description)
  - General endotracheal anesthesia.
  - Incision at the anterior border of the left sternocleidomastid muscle
  - Transition anterior to the great vessel and enter the retropharangeal space
  - Dissect the diverticulum free and deliver into the incision
  - The diverticulum is resected with suturing of the resulting esophagotomy or it may be resected and closed with a surgical stapling device (GIA stapler).
  - A myotomy of the cricopharyngeus muscle is performed over a distance of 3 to 5 cm, without opening the underlying esophageal mucosa.
  - Alternatives: diverticulopexy (sutured superiorly to the prevertebral fascia) or invaginating the diverticulum into the esophagus and purse-string type suturing (like appendectomy stump)

Outcomes – Lateral Cervical Repair of Zenker’s Diverticulum

- Symptomatic improvement of up to 94%, with up to 91% of patients being free of symptoms after the procedure is reported.
- Recurrence rate up to 7.5%.
- Serious complications such as mediastinitis, pneumonia, and severe hemorrhage occurs in up to 7.5%.
- Fistula formation, stenosis, recurrent laryngeal nerve palsy, and wound infections occur in up to 25% of the patients.
- In three studies, there was mortality ranging from 1.2% to 3.4%
Transoral endoscopic repair of Zenker's Diverticulum

- The principle underlying this form of treatment is that the septum between the esophageal lumen and the diverticulum is divided as completely as possible.
  - The cricopharyngeus muscle makes up the muscular portion of this septum and therefore a myotomy is performed.
- Rigid endoscope
  - General anesthesia.
  - A Weerda laryngoscope, is used to visualize the partition wall (septum) of the diverticulum. This scope consists of two moveable blades. The upper blade is introduced into the esophagus and the lower blade into the diverticulum and the septum is visualized between the blades.

Transoral endoscopic repair of Zenker's Diverticulum

- In the initial description diathermy was used to divide the septum.
- A modification involves the use of a surgical stapling device. Once this device is in position, the diverticular septum is divided and the edges of the wound are simultaneously stapled. The theoretical advantage of this technique is the lower risk of perforation and bleeding through simultaneous wound closure by stapling.
Flexible Endoscopic Repair of Zenker’s Diverticulum

- “Mucomyotomy” via flexible endoscopy is performed with a gastroscope.
  - The patient is not intubated, but is given analgesia and sedation.
- An NG tube is placed. The tube enables better orientation during the procedure and stabilizes the esophageal wall.
- The endoscope is introduced and the septum is divided with a needle-knife through the working channel of the endoscope.
- Optionally, the wound edges can be closed with metal clips.

Endoscopic Repair of Zenker’s Diverticulum

- In two meta-analysis of seven studies on CO$_2$ and stapler treatment
  - symptoms markedly improved in up to 53-100% of patients
  - recurrence rate ranged as high as 15.4%.
  - complications were dental injury, transient vocal cord paresis, hemorrhage, fistula formation, cervical abscesses, cervical emphysema, aspiration pneumonia, and perforations that could be managed conservatively.
  - serious complications occurred in 2.6 - 3.8% of the patients
  - stapler treatment was not possible in as high as 30%
  - there were two deaths, yielding a mortality of 0.43
  - CO$_2$ laser is typically reported to have a slightly higher rate of perforation than the stapler method
Outcomes – Flexible endoscopic repair of Zenker’s Diverticulum

• Improvement of symptoms is reportedly achieved in 84% to 96%
  – One to three sessions were needed to produce these results.
• Recurrence rate ranges from 3% to 35%; in most cases of recurrence, total relief of symptoms was achieved by repeated treatment.
• Complications occurred at rates ranging from 2% to 23%.
• There have been no reports of mortality.

Zenker’s Repair - How I do it

• History and physical exam
• Barium swallow – complete (not a “modified” or “three phase” barium swallow).
• Discuss findings
  – If there are other findings (ie dysmotility etc on Barium swallow) make sure to inform patient regarding implications
  – Review options
    • No intervention
    • Feeding Tube
    • Endoscopic Repair (I do not currently perform flexible endoscopic repair).
      – Approximately 10% inability to repair
      – Approximately 15% recurrence
      – Approximately 10% little improvement
      – Approximately 5-7% risk of serious complication (thoroughly discuss perforation and risk of sepsis)
      – I rarely will convert to an open approach without further discussion
      – I prefer not to use the CO2 laser unless I judge it necessary
    • Lateral Cervical Approach

• General anesthetic
• Protect teeth (mouth guard)
• Direct laryngoscopy
• Rigid esophagoscopy – empty diverticulum, examine esophagus and helps with placement of Weerda scope or packing
Zenker’s Diverticulum Repair: Endoscopic Approach—How I do it

• Place Weerda Scope – suspend
• Use laryngeal telescope to visualize the septum while using Endo GIA stapler to divide the septum.
• If the Zenker’s Diverticulum is too shallow or for some other reason I cannot adequately divide the septum with the stapler I will use the CO2 laser (Microscope)
  – Change to a laser safe tube
  – Place a moist cottonoid in the esophagus to protect it
  – I use 2-5 watts in the continuous mode.

How I do - Instruments
How I do it - Instruments

- Post operative
  - DVT prophylaxis (SCD’s +/- heparin)
  - Monitor for fevers, chest pain, tachycardia (I admit for 23 hour observation)
  - Start H2O
  - The following day clear liquids then progress to a soft diet
  - Stay on a soft diet for a week
  - I do not routinely obtain a Barium swallow at any point post operatively
  - No antibiotics

Zenker’s Diverticulum Repair – How I do it
Endoscopic repair with the CO2 laser (revision after previous staple repair)
Endoscopic Repair – An large diverticulum with an unexpected outcome

Zenker’s Diverticulum – How I do it
An unusual early revision

Early revision surgery
Zenker’s Repair Lateral Cervical Approach – How I do it

• “Open” repair
  – I usually do not perform unless I have been unsuccessful at an endoscopic repair
    • Risk of serious complications higher up to 14%
      – I include discussion about injury to the recurrent laryngeal nerve and stroke
    • Recurrence rate is less than 10%
    • Rarely little or no improvement
  – General Anesthetic

Zenker’s Repair Lateral Cervical Approach – How I do it

• Surgical resection of the diverticulum
  – If possible I pack strip gauze into the diverticulum and place a Maloney dilator
  – 5-6 cm incision in RSTL at anterior border of left SCM (approximately at level of cricoid)
  – Transition anterior to the great vessel and enter the retropharyngeal space
  – Gently dissect the diverticulum out using finger dissection and gentle rotation of the larynx (place a hook on the lateral border of the thyroid cartilage and gently retract it).
Zenker’s Repair: Lateral Cervical Approach  
– How I do it

– The diverticulum is dissected free and delivered into the neck incision.
– The packing is removed.
– 3-5 cm cricopharyngeal myotomy (I use loupe magnification) – remove the dilator
– I frequently perform a diverticulopexy (suspend the diverticulum superiorly) by suturing the diverticulum superiorly to the prevertebral fasacia with two or three 2-0 prolene sutures
– Alternatives: Resection (stapler or with scissors and sutured closed) or invaginating the diverticulum into the esophagus and purse-string type suturing
– I place a drain and close with absorbable sutures
– Post operative
  • Monitor for signs of perforation
  • Routine perioperative antibiotics for 24 hours
  • DVT prophylaxis
  • NPO then H2O followed by clear liquids
  • Soft diet for 2 weeks
  • I do not routinely obtain a swallow study

Zenker’s Diverticulum

• Simple anatomy for the Otolaryngology-HNS
• Endoscopic
  – Quick (30 minutes)
  – Safe (stapler>C02 laser)
  – Results in more frequent recurrences
• Trans cervical
  – Slower (60-90 minutes)
  – Safe (but higher risk than endoscopic)
  – Lower recurrence rate
• I keep for 23 hours observation
  – Any sign of a leak/perforation
    • NPO
    • Antibiotics
    • Thin Barium Swallow
    • NG under fluoroscopy
Traumatic Zenker’s Diverticulum

Zenker’s Diverticulum

- Questions??
- Comments??