Management of Zenker’s Diverticulum

Paul Chung, MD
Department of Surgery
SUNY Downstate Medical Center
May 21, 2015
Case

55M presented to clinic with chief complaint of dysphagia and halitosis for 1 year

PMHx: GERD, BPH
PSHx: Lipoma excision
Meds: Omeprazole, Flomax
SHx: no Tobacco/EtOH/Drugs
Ax: NKDA
Case

HR: 62
BP: 108/66

Gen: AAOx3, NAD
HEENT: Trachea midline, no palpable masses
Resp: CTA B/L
CV: RRR
Abd: Soft, non-tender, non-distended
Tests

Labs were unremarkable
Tests

Labs were unremarkable

Barium swallow was performed
Tests
Treatment

Cricopharyngomyotomy and Zenker’s Diverticulectomy
Incision
Dissection

- Carotid artery
- Sternoleidomastoid muscle
- Thyroid gland
- Left recurrent laryngeal nerve
- Diverticulum
- Esophagus
- Omohyoid muscle
Bougie!
Cricopharyngeal Myotomy
Diverticulectomy
Leak Test
Drain!
Postop Course

POD 0
Transferred to floor
NPO overnight
Postop Course

**POD 0**
Transferred to floor
NPO overnight

**POD 1**
Started on CLD in AM, advanced to soft diet in PM
Postop Course

POD 0
Transferred to floor
NPO overnight

POD 1
Started on CLD in AM, advanced to soft diet in PM

POD2
Tolerated regular diet
Drain DCed
DCed Home
Questions?

“There are no stupid questions, so let’s also agree there are no stupid answers.”
Outline

- Epidemiology
- Presentation
- Pathophysiology
- Diagnosis
- Treatment
- Controversies
Epidemiology

- 2.3% of patients with dysphagia
- Prevalence of 0.01 - 0.11%
- Slight male predominance (1.5:1)
- Peak incidence 7th to 9th decade
Presentation

- Dysphagia
- Regurgitation
- Cough
- “Wet voice”
- Halitosis
- History of aspiration/recurrent pneumonia
- Weight loss
- Associations
  - GERD
  - Hiatal hernia
History - Anatomy

- **Antonio Maria Valsalva** (1666 - 1723)
  - Described the “Cricopharyngeal Muscle” (1704)
History - Anatomy

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- **Abraham Ludlow** (1737 - 1807)
  - “a case of obstructed deglutition from a preternatural dilatation of, and a bag formed in the pharynx”
    - Letter to William Hunter (1764)
History - Anatomy

● Antonio Maria Valsalva (1666 - 1723)
  ○ Described the “Cricopharyngeal Muscle” (1704)

● Abraham Ludlow (1737 - 1807)
  ○ “a case of obstructed deglutition from a preternatural dilatation of, and a bag formed in the pharynx”
    - Letter to William Hunter (1764)
History - Pathophysiology

- **Sir Charles Bell** (1774 - 1842)
  - Postulated (1816)
    - Distension of pharynx from ineffectual attempts to swallow
    - Resultant protrusion through *hypertrophied bundles of the inferior constrictor pharyngis muscle*
History - Pathophysiology

- Freidrich Albert von Zenker (1825 - 1898)
  - Hugo Wilhelm von Ziemssen (1829 - 1902)
    - Traction (true) & Pressure (pseudo) diverticula
    - “Krankheiten des Oesophagus” (1877)
      - 5 personal cases (from 1854) and 22 from the literature
      - “[H]erniation of the posterior wall of the hypopharynx through a weakened muscular layer, immediately above the esophageal inlet”
    - Rejected popular theory of foreign objects as cause of pharyngeal diverticula
    - Suggested dilation due to forces within lumen acting against a restriction zone
History - Pathophysiology

- **Gustav Killian** (1860 - 1921)
  - Described what is now known as “Killian’s Triangle” (1908)
History - Pathophysiology

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History - Pathophysiology

- **Gustav Killian** (1860 - 1921)
  - Described what is now known as “Killian’s Triangle” (1908)
  - Father of Bronchoscopy
History - Diverticulectomy

- **William Ireland Wheeler** (1846 - 1899)
  - First successful Zenker’s Diverticulectomy (1886)
History - Failures

- Denis G. Zesas
  - “Meta-analysis” of diverticulectomy (1906)
  - 42 patients from published reports at the time
    - Primary healing in 6
    - Fistulization in 26 (62%)
    - Death in 8 (19%)
History - Cricopharyngomyotomy

- Andre Leon Aubin (1887 - 1967)
  - Diverticulectomy and Cricopharyngeal Myotomy (1936)
  - Based on Bell’s observation in 1816
History - Cricopharyngomyotomy

- Andre Leon Aubin (1887 - 1967)
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- H. D. Sutherland
  - Successful treatment of 2 patients by external cricopharyngeal myotomy alone (1962)
History - Cricopharyngomyotomy

- Andre Leon Aubin (1887 - 1967)
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  - *Based on Bell’s observation in 1816*

- H. D. Sutherland
  - Successful treatment of 2 patients by external cricopharyngeal myotomy alone (1962)

- Ronald H. Belsey (1910 - 2007)
  - Advocated cricopharyngeal myotomy and diverticulopexy (in lecture to AATS in 1966)
History - Endoscopic Treatment

- Harris Peyton Mosher (1867 - 1954)
  - Endoscopic esophagodiverticulostomy (1906)
  - Used scissors to cut the esophagodiverticular wall
History - Endoscopic Treatment

- **Harris Peyton Mosher (1867 - 1954)**
  - Endoscopic esophagodiverticulostomy (1906)
  - Used scissors to cut the esophagodiverticular wall

- **Gosta Dohlman (1890 - 1983)**
  - Endoscopic cricopharyngomyotomy (1960)
  - Improved on Mosher’s method
  - Used diathermy
  - Case series of 100 patients
  - No mediastinitis
  - Low recurrence rate (7%)
History - Bottom Line

- Pharyngeal Diverticula were a well recognized phenomenon
- Diverticulectomy alone had high morbidity and mortality
- Endoscopic treatments developed to reduce morbidity and mortality
- Bell hypothesized hypertrophied inferior pharyngeal muscles were to blame
- Zenker (and Ziemssen) classified types of esophageal diverticula and provided etiology of increased intraluminal pressure from a restriction zone

- Dismotility vs Mechanical obstruction?
Pathophysiology

Pharyngeal (Zenker’s) Diverticulum Is a Disorder of Upper Esophageal Sphincter Opening

IAN J. COOK, MARY GABB, VOULA PANAGOPoulos, GLYN G. JAMIESON, WYLIE J. DODDS, JOHN DENT, and DAVID J. SHEARMAN

Departments of Medicine, Gastroenterology, Radiology, and Surgery, University of Adelaide, North Terrace, Adelaide, Australia; and Department of Radiology, Froedtert Memorial Lutheran Hospital, Milwaukee, Wisconsin
Pathophysiology

- No difference in timing of pharyngeal contraction and UES relaxation
- Higher intrabolus pressures
- Reduced sphincter opening
- Zenker’s Diverticulum due to **lack of compliance** of UES
Diagnosis

- Barium Fluoroscopic Esophagram
- Endoscopy not typically used
Treatment Options

- Observation
- Diverticulectomy
- Cricopharyngomyototomy + Diverticulectomy
- Cricopharyngomyototomy + Diverticulopexy
- Cricopharyngomyototomy
- Endoscopic Stapling
- Endoscopic Carbon Dioxide Laser Division

- Which one to choose?
Principles of Treatment

- Must address the underlying pathophysiology
Principles of Treatment

- Must address the underlying pathophysiology
- Resolution of symptoms
Principles of Treatment

- Must address the underlying pathophysiology
- Resolution of symptoms
- Awareness of the patient population
Treatment Options - When to Use

- **Small Zenker’s Diverticulum (< 3 cm)**
  - Cricopharyngomyotomy
  - Cricopharyngomyotomy + Diverticulectomy
- **Large Zenker’s Diverticulum (≥ 3 cm)**
  - Cricopharyngomyotomy + Diverticulopexy
  - Cricopharyngomyotomy + Diverticulectomy
  - Endoscopic Stapling
  - Endoscopic Carbon Dioxide Laser Division
- **Absence of Hypertrophic Cricopharyngeus**
  - Diverticulectomy alone
- **Elderly Patient/Poor Operative Tolerance**
  - Endoscopic Stapling
  - Endoscopic Carbon Dioxide Laser Division
• Compared Open vs Endoscopic approaches
• \( n = 184 \)
• Six groups
  ○ Open
    ■ Resection (\( n = 34 \))
    ■ Resection + Myotomy (\( n = 12 \))
    ■ Myotomy (\( n = 8 \))
    ■ Myotomy + Diverticulopexy (\( n = 47 \))
  ○ Endoscopic
    ■ Endoscopic Stapling (\( n = 31 \))
    ■ Endoscopic Laser Division (\( n = 52 \))
Length of Stay
## Management of Zenker’s Diverticulum: Which Technique?

Christian A. Gutschow, MD, Marc Hamoir, MD, Philippe Rombaux, MD, Jean-Bernard Otte, MD, Louis Goncette, MD, and Jean-Marie Collard, MD

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<td>3 (1–6)</td>
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<td>5 (3–43)</td>
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*Results are median (range).  

One additional patient who died postoperatively was not suitable for analysis.
Management of Postcraniectomy Diverticulum: Which Technique?

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Complications
Management of Pharyngeal pouch (Zenker’s) Diverticulum: Which Technique?

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^p = 0.037.
1 death in Group VI (cardiac arrest) $\rightarrow$ 0.5\% overall mortality rate
Symptomatic Outcomes
Management of Pharyngeal Serosity (Zenker’s) Diverticulum: Which Technique?

Christian A. Gutschow, MD, Marc Hamoir, MD, Philippe Rombaux, MD, Jean-Bernard Otte, MD, Louis Goncette, MD, and Jean-Marie Collard, MD

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The charts illustrate the percentage of excellent and good outcomes for lesions of different sizes, comparing open and endoscopic techniques. The data suggest that for lesions <3cm, open surgery is significantly better than endoscopy (p<0.001), while for lesions ≥3cm, endoscopic stapling is preferred over endoscopy (p<0.004 vs. p=0.409). For lesions <3cm, endo-laser is preferred over endoscopy (p=0.533 vs. p=0.815), and for lesions ≥3cm, no significant difference is observed between endo-laser and endoscopy (p=0.757 vs. p=0.286).
Management of Primary Stomach Diverticulum (Zenker’s) Diverticulum: Which Technique?

Christian A. Gutschow, MD, Marc Hamoir, MD, Philippe Rombaux, MD, Jean-Bernard Otte, MD, Louis Goncette, MD, and Jean-Marie Collard, MD

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Management of Postrachial Age (Zenker’s) Diverticulum: Which Technique?

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Management of Distal Staged-aged (Zenker’s) Diverticulum: Which Technique?

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Open approach persistently gives excellent outcomes compared to endoscopic approach.
Open approach persistently gives excellent outcomes compared to endoscopic approach.

Endoscopic approach can persistently give “good outcomes” when diverticulum ≥ 3 cm.
Open approach persistently gives excellent outcomes compared to endoscopic approach.

Endoscopic approach can persistently give “good outcomes” when diverticulum ≥ 3 cm.

Large sac required to transect “cricopharyngeal bar”
Incision of "Cricopharyngeal Bar" with endoscopic stapler
Management of Thoracic Esophageal (Zenker's) Diverticulum: Which Technique?

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Management of Pharyngeal Diverticulum (Zenker's) Diverticulum: Which Technique?

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Units of Upper G-I Surgery, ENT Surgery, and Radiology, Louvain Medical School, Brussels, Belgium


![Graphs showing outcomes of management methods for Zenker's diverticulum]
Management of Prevertebral Soft Tissue (Zenker’s) Diverticulum: Which Technique?

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Management of Postratag Tracheoesophageal (Zenker’s) Diverticulum: Which Technique?

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Management of Early Stage Esophageal (Zenker’s) Diverticulum: Which Technique?

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- No difference in patient satisfaction between Endoscopic Stapling and Laser treatment
Management of Zenker’s (Zenker’s) Diverticulum: Which Technique?

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- No difference in patient satisfaction between patients who did or did not receive myotomy
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Symptoms are mainly caused by the sac itself.
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Symptoms are mainly caused by the sac itself.

Resection of sac without myotomy predisposes to cervical fistula formation and long-term recurrence.
Treatment Options - When to Use

- **Small Zenker’s Diverticulum (< 3 cm)**
  - Cricopharyngomyotomy
  - Cricopharyngomyotomy + Diverticulectomy

- **Large Zenker’s Diverticulum (≥ 3 cm)**
  - Cricopharyngomyotomy + Diverticulopexy
  - Cricopharyngomyotomy + Diverticulectomy
  - Endoscopic Stapling
  - Endoscopic Carbon Dioxide Laser Division

- **Higher satisfaction in Open vs Endoscopic**
- **Salivary fistula associated with Open**
- **Mediastinitis associated with Endoscopic**
Cricopharyngeal Myotomy in the Treatment of Zenker’s Diverticulum

Mario Colombo-Benkmann, MD, Volker Unruh, MD, Christian Kriegstein, MD, Norbert Senninger, MD, FACS


- Cricopharyngomyotomy only if hypertrophic fibers present
- n = 79
  - Cricopharyngomyotomy group (n = 47)
  - No cricopharyngomyotomy group (n = 32)
# Cricopharyngeal Myotomy in the Treatment of Zenker’s Diverticulum

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<th>Group B (n = 32)</th>
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*One patient per group had two complications. Difference between group A (diverticulectomy plus myotomy) and group B (diverticulectomy without myotomy) is not significant (p > 0.05).
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- No difference in postoperative complication rate
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- No difference in postoperative complication rate
- No postoperative deaths
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- Significant symptomatic improvement in both groups
Cricopharyngeal Myotomy in the Treatment of Zenker’s Diverticulum

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- 1 recurrence per group after 5 years follow up
- Longer follow up time required
Treatment Options - When to Use

- Absence of Hypertrophic Cricopharyngeus
  - Diverticulectomy alone potentially an option*
  - No long term data for recurrence
Selective Cricopharyngeal Myotomy for Zenker’s Diverticulum

Tom DeMeester, MD, FACS, Cedric G Bremner, MD, FACS, Los Angeles, CA
Selective Cricopharyngeal Myotomy for Zenker’s Diverticulum

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Table 1. Recurrence Rates of Zenker Diverticulum after Diverticulectomy Alone

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- Can take >15 years for Zenker’s Diverticulum to recur
Selecting Cricopharyngeal Myotomy for Zenker’s Diverticulum

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- Can take >15 years for Zenker’s Diverticulum to recur
- Longer follow up required to determine if selective cricopharyngomyotomy is a viable approach
Treatment Options - Summary

- **Small Zenker’s Diverticulum (< 3 cm)**
  - Cricopharyngomyotomy
  - Cricopharyngomyotomy + Diverticulectomy

- **Large Zenker’s Diverticulum (≥ 3 cm)**
  - Cricopharyngomyotomy + Diverticulopexy
  - Cricopharyngomyotomy + Diverticulectomy
  - Endoscopic Stapling
  - Endoscopic Carbon Dioxide Laser Division

- **Absence of Hypertrophic Cricopharyngeus**
  - Diverticulectomy alone

- **Elderly Patient/Poor Operative Tolerance**
  - Endoscopic Stapling
  - Endoscopic Carbon Dioxide Laser Division
Summary

- Zenker’s Diverticulum is a **pseudo-diverticulum**
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- Caused by lack of compliance of the Cricopharyngeus
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Summary

- Zenker’s Diverticulum is a pseudo-diverticulum
- Caused by lack of compliance of the Cricopharyngeus
- Open approach has superior outcomes to endoscopic approach
- Endoscopic approach is a viable alternative in certain scenarios
  - Poor functional status
  - Inability to tolerate general anesthesia
  - Diverticulum ≥ 3 cm
References