12th Annual Otolaryngology Literature Update
Laryngology

Ashli K. O'Rourke, M.D.
Professor
Director, Laryngology
Department of Otolaryngology - Head & Neck Surgery
Medical University of South Carolina
aorourke@musc.edu

Ashli O'Rourke, M.D. MS, joined the MUSC Evelyn Trammell Institute for Voice & Swallowing in September 2012. Dr. O'Rourke began her professional career as a speech-language pathologist (SLP), earning her Master's degree in Speech-Language Pathology and Audiology from Florida State University.

After more than seven years of clinical speech therapy practice at Emory University Hospital, she attended medical school at the Medical College of Georgia. She completed her residency in Otolaryngology &- Head and Neck Surgery at the University of Virginia in Charlottesville and her fellowship in Laryngology &- Voice and Swallowing disorders at the Medical College of Georgia.

She is particularly interested in the diagnosis and treatment of swallowing disorders. Dr. O'Rourke is board certified through the American Board of Otolaryngology and serves in the Exam Council (Senior Examiner) for the Board. She is on the Board of Directors for the Dysphagia Research Society and holds the Mark & Evelyn Trammell Endowed Chair in Otolaryngology.

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Howell RJ, Ekbom D, Kasperbauer J, Tabangin M, Altaye M, Wahab S, Belafsky P, Allen J, Amin M, Bayan S, Cervenka B, deSilva B, Dion G, Friedman A, Fritz M, Giliberto JP, Guardiani E, Harmon J, Khosla S, Kim B, Kuhn M, Kwak P, Ma Y, Madden L, Matrka L, Mayerhoff R, Piraka C, Rosen C, Wilson K, Wright C, Young V, Yuen S, Postma G. Cricopharyngeus Muscle Dysfunction and Hypopharyngeal Diverticula (e.g., Zenker): A Multicenter Study. Laryngoscope. 2023 Jun;133(6):1349-1355. doi: 10.1002/lary.30387. Epub 2022 Sep 14. PMID: 36102298.

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Walters RK, Gudipudi R, Davidson K, Cooke M, Barengo J, Smyre D, Garand KL, Martin-Harris B, Matheus MG, Nguyen SA, O'Rourke AK. The Impact of Cervical Spinal Disease on Pharyngeal Swallowing Function. Am J Speech Lang Pathol. 2023 Mar 9;32(2):565-575. doi: 10.1044/2022_AJSLP-22-00257. Epub 2023 Feb 7. PMID: 36749843; PMCID: PMC10171843.

Laryngology Literature Review

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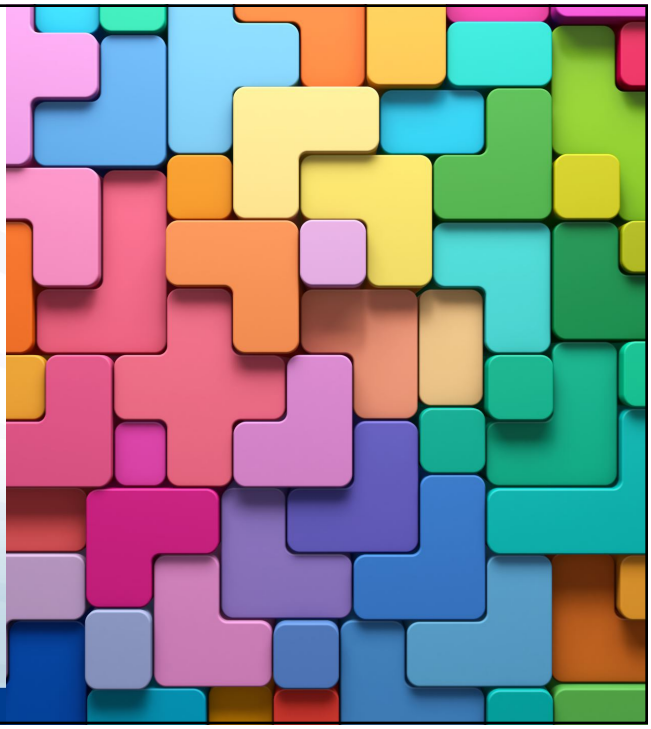

Articles

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Presbyphonia as an Individual Process of Voice Change

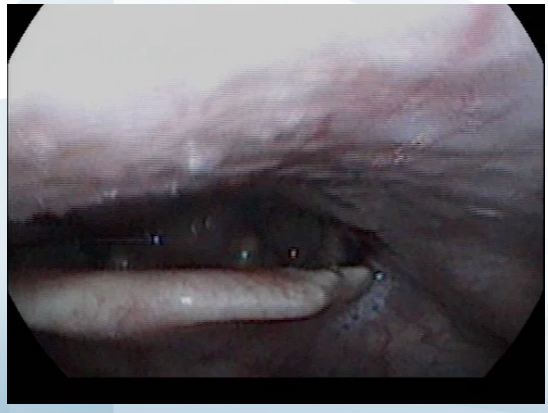
Bożena Kosztyła-Hojna, Maciej Zdrojkowski, and Emilia Duchnowska, *Białystok, Poland*

Journal of Voice, Vol. 37, No. 2, 2023

- The process of voice aging begins after the age of 60 and has an individually variable course (ranging from no problem to severe dysphonia).
- Dysphonia due to age-related changes is called presbyphonia.
- The incidence of voice disorders in persons > 60 ranges from 12 – 35%
- Presbyphonia is caused by structural/anatomic changes to the vocal folds and changes in respiratory support for phonation.
- The absence of perceptual dysphonia does not preclude changes on videostroboscopy.

Aim was to determine the variability of dysphonia severity in older men and women.

Presbylarynges



Muscle atrophy
Loss of elasticity
Decreased hydration
Decreased muscle tone

Reduced volume
Breathy, "thin" voice
Increased effort
Vocal fatigue

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Methods

Group 1
- 230 patients with self-reported dysphonia & perceptual dysphonia
- Avg age 71.2 years (SD 3.44); 70% women

Group 2
- 72 subjects without self reported dysphonia but had perceptual dysphonia
- Avg age 68.7 years (SD 2.58); 75% women

Group 3:
- 50 subjects with euphonic voice
- Average age: 31 (range 24 – 39); 60% women

- 302 Subjects, aged 65 – 75 years
- Outcome measures:
  - GRBAS scale (grade, roughness, breathiness, asthenia, strain) by SLP with voice sample and prolonged phonation /a/
  - Rigid high-speed, high-resolution digital laryngoscopy with /i/ and at rest →
  - Acoustic analysis including F0, NHR, MPT, jitter, and shimmer.

symmetry
synchronicity
vibration amplitude
glottic closure type
mucosal wave morphology
symmetry of vibration
position of vocal fold during rest
Vocal fold movement

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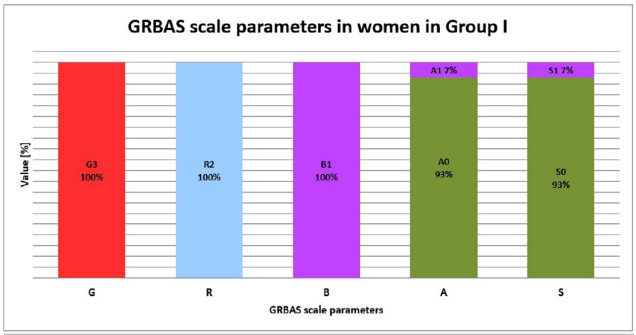
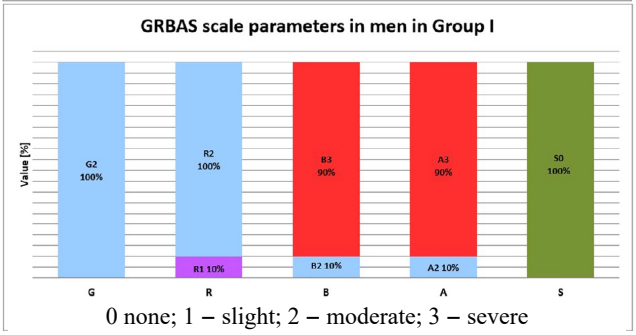
GRBAS Results

Group I
- Women
  - 150 (93%) were judged as G3R2B1A0S0
  - 11 (7%) were G3R2B1A1S1
- Men
  - 62 (90 were judged as G2R2B3A3S0.
  - 7 (10%) men were G2R1B2A2S0

Group II
- Women
  - 48 (89%) G1R1B0A0S0
  - 6 (11%) G0R0B0A0S0
- Men
  - 3 (17%) G1R0B1A1S0
  - 15 (83%) G0R0B0A0S0

Group III
- All were G0R0B0A0S0

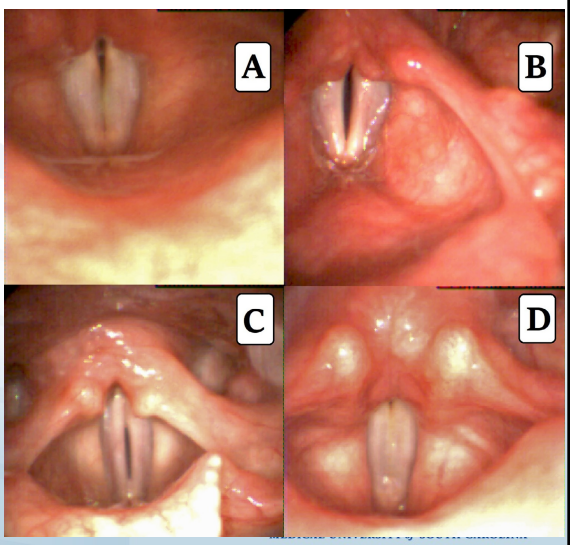




0 none; 1 – slight; 2 – moderate; 3 – severe

High Speed Video Results

- Morphological changes seen:
  - A – Edema (in women with dysphonia)
    - Asymmetry, aperiodicity, hourglass closure, reduced mucosal wave, increase in amplitude.
  - B = Hypofunctional (in men with dysphonia)
    - Glottic insufficiency with increased amplitude, indicating not only loss of muscle mass but of strength and tension.
  - C = Atrophy (in men with dysphonia)
  - D =Euphonic Voice



Fundamental Frequency Results

Adult male avg F0
85 to 155 Hz

Adult female avg F0
165 to 255 Hz

F0		Group I			Group II		Group III	
Gender		Women	Men		Women	Men	Women	Men
Clinical Form		Edema	Atrophy	Hypofunctional Dysphonia	Mild Morphological Changes		Physiology	Physiology
	Number	161	62	7	54	18	30	20
	Standard deviation	11.452	11.365	6.0788	6.211	6.685	8.708	8.454
	Minimum value	110	200	213	187	115	219	126
	Maximum value	162	241	231	212	142	253	157
	Median	125	213	226	196	130	229	140,5
	Mean	127	215.855	225.429	196.370	130.111	230.466	141
women	Group I vs Group II				$P < 0.001$			
	Group I vs Group III				$P < 0.001$			
	Group II vs Group III				$P < 0.001$			
men	Group I (atrophy) vs Group II				$P < 0.001$			
	Group I (atrophy) vs Group III				$P < 0.001$			
	Group I (hypofunctional dysphonia) vs Group II				$P < 0.001$			
	Group I (hypofunctional dysphonia) vs Group III				$P < 0.001$			
	Group II vs Group III				$P < 0.01$			

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Take Home Points

- There are a lot of data in this article.
- We all age at different rates and severity in all parts of our bodies.
- The aging larynx does not necessarily only equal atrophy.
- Older dysphonic women may complain of lower pitch while men of higher pitches.
- Intervention in the form of voice therapy as well as augmentation can be helpful.

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Articles

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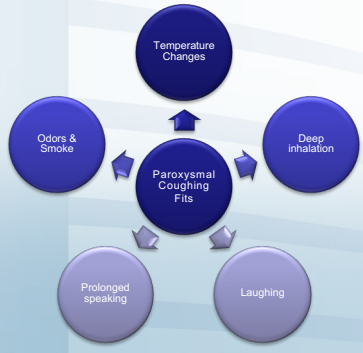
The Laryngoscope

The Efficacy of Superior Laryngeal Nerve Block for Neurogenic Cough: A Placebo-Controlled Trial

Courtney B Tipton, MD; Rameen Walters, BS; Rachana Gudipudi, MD; Drasti Smyre, PA-C; Shaun Nguyen, MD; Ashli K O'Rourke, MD



- Also known as neurogenic, idiopathic or unexplained cough.
- It is a cough that persists despite comprehensive diagnostics to exclude common causes and failure to respond to appropriate therapeutic trials.
- Hallmark of a neurogenic cough is hypersensitivity to normal stimuli

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TREATMENT OF REFRACTORY COUGH

Therapy	Medications	Procedures
Cognitive Behavioral	Central Acting	**SLN Block**
Speech Language Therapy	Peripherally Active	Botulinum Toxin Injections
	Anti-inflammatory	Injection Augmentation

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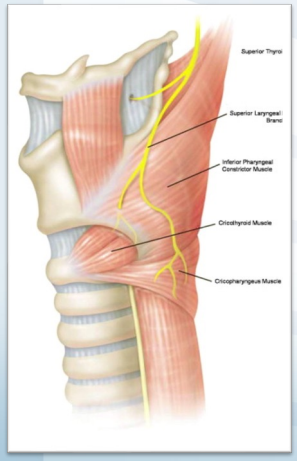
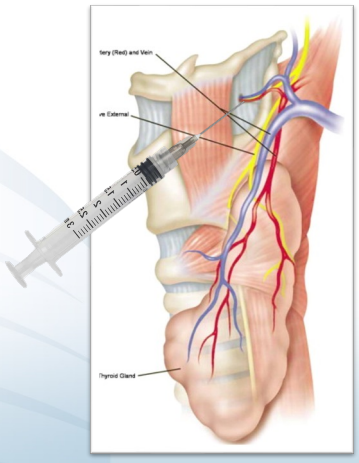
Superior Laryngeal Nerve Block



2 ml of a 1:1 solution of triamcinolone 40 mg: 1% lidocaine with 1:200,000 epinephrine



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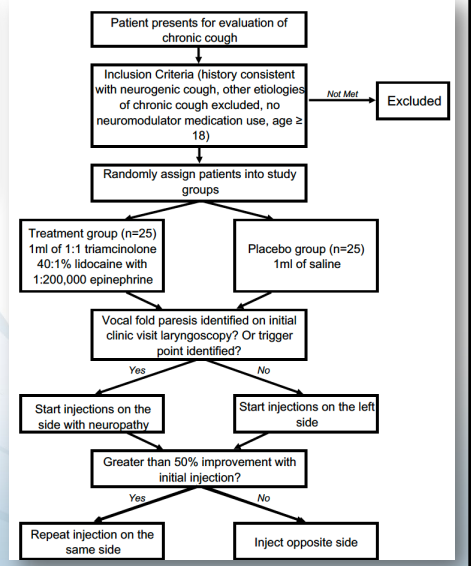
Courtney B Tipton [1], Rameen Walters [1], Rachana Gudipudi [1], Drasti Smyre [1], Shaun Nguyen [1], Ashli K O'Rourke [1]

15 patients
9 treatment
6 placebo

Table 1. Patient Demographics

Gender		
	Male	1 (6.7%)
	Female	14 (93.3%)
Age, average (years)		56.3
Race		
	Black/African American	1 (6.7%)
	White/Caucasian	13 (86.7%)
	Asian	1 (6.7%)
Ethnicity		
	Not Hispanic or Latino	14 (93.3%)
	Hispanic or Latino	1 (6.7%)



No significant adverse events
- 7/15 (46.7%) endorsed globus sensation limited to < 1 day
- 4/15 (26.7%) reported a few hours of soreness

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Assessment of Improvement

Patient Reported % Improvement

"If your cough before injection was 10/10, what is it now on a scale of 10/10??

>50% (5/10 or less was considered improvement)

Visual Analog Scale

Log was filled out daily by patient.

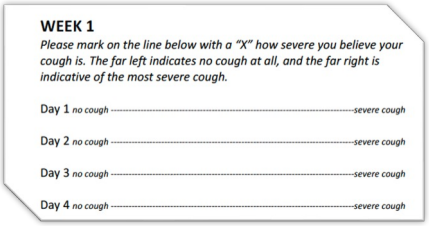
Leister Cough Questionnaire

Total

Physical Domain

Psychological Domain

Social Domain



WEEK 1

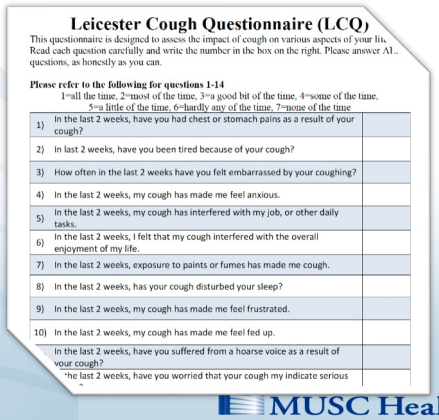
Please mark on the line below with a "X" how severe you believe your cough is. The far left indicates no cough at all, and the far right is indicative of the most severe cough.

Day 1 *no cough* ----------*severe cough*

Day 2 *no cough* ----------*severe cough*

Day 3 *no cough* ----------*severe cough*

Day 4 *no cough* ----------*severe cough*



Leicester Cough Questionnaire (LCQ)

This questionnaire is designed to assess the impact of cough on various aspects of your life. Read each question carefully and write the number in the box on the right. Please answer all questions, as honestly as you can.

Please refer to the following for questions 1-14

1=all the time, 2=most of the time, 3=a good bit of the time, 4=some of the time, 5=a little of the time, 6=hardly any of the time, 7=none of the time

1)	In the last 2 weeks, have you had chest or stomach pains as a result of your cough?	
2)	In last 2 weeks, have you been tired because of your cough?	
3)	How often in the last 2 weeks have you felt embarrassed by your coughing?	
4)	In the last 2 weeks, my cough has made me feel anxious.	
5)	In the last 2 weeks, my cough has interfered with my job, or other daily tasks.	
6)	In the last 2 weeks, I felt that my cough interfered with the overall enjoyment of my life.	
7)	In the last 2 weeks, exposure to paints or fumes has made me cough.	
8)	In the last 2 weeks, has your cough disturbed your sleep?	
9)	In the last 2 weeks, my cough has made me feel frustrated.	
10)	In the last 2 weeks, my cough has made me feel fed up.	
	In the last 2 weeks, have you suffered from a hoarse voice as a result of your cough?	
	The last 2 weeks, have you worried that your cough my indicate serious	

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Patient % Reported Improvement

- Treatment Group (N = 9)
- 8 patients (80%) reported improvement in symptoms with the series of two injections.
  - 5 patients > 50% improvement after 1st injection
  - 2 were > 50% improved after 2nd injection (contralateral side)
  - 1 no improvement
- Placebo Group (N = 6)
  - 1 patient in the placebo group reported > 50% improvement (14.3%).
- There was a statistically significant difference in overall improvement between the treatment and placebo groups ($p < 0.0001$).

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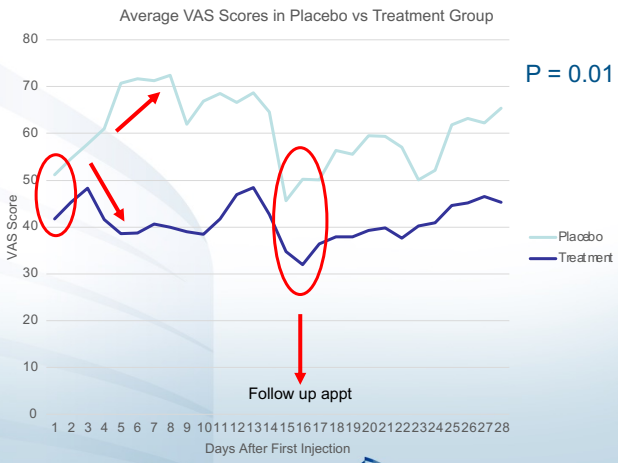
Visual Analog Scales

- Treatment group = 41.0 (SD = 29.65)
- Placebo group = 53.71 (SD = 24.96).
- The treatment group showed overall lower scores which signify less cough severity (p = 0.01).



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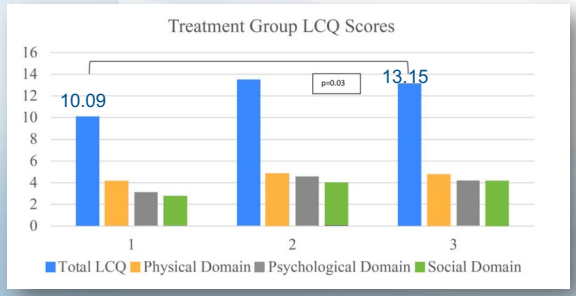
Leister Cough Questionnaire

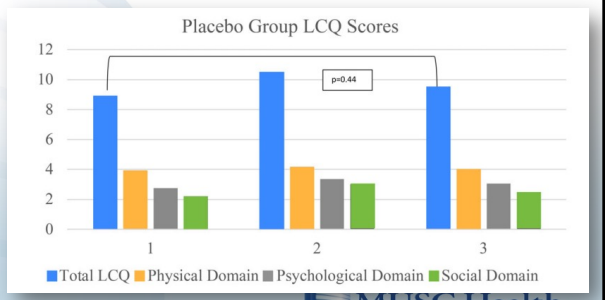
Treatment Group

- Total LCQ scores increased by 3.06 points (p = 0.03, SD = 4.52).
- Physical domain scores + 0.61 (p = 0.09, SD = 1.37)
- Psychological domain scores + 1.06 (p = 0.07, SD = 1.49)
- Social domain scores + 1.40 (p = 0.01, SD = 1.90)

Placebo Group

- Total LCQ score increased by 0.62 points (p = 0.44, SD 3.87).
- Physical domain increased by 0.07 (p = 0.83, SD 1.06)
- Psychological domain increased by 0.31 (p = 0.27, SD = 1.43)
- Social domain increased by 0.25 (p = 0.39, SD = 1.61)





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Conclusions

- SLN block is a safe and effective option for treatment of unexplained/neurogenic cough
  - No serious adverse events with most common side effect being globus sensation
  - Most all studies show statistically significant improvement in PROM with SLN block
  - What is a clinically significant difference for these patients? Most in treatment group reported >50% improvement.
- If treatment with neurogenic cough does not improve with neurogenic medications and/or SLN block, consider further investigation of other causes
- Further studies are needed to determine:
  - Long-term benefits
  - Possible benefit of combination with neurogenic medications and/or cough suppression therapy
  - Optimal combination of anesthetic and steroid, as well as dosing and frequency of injection

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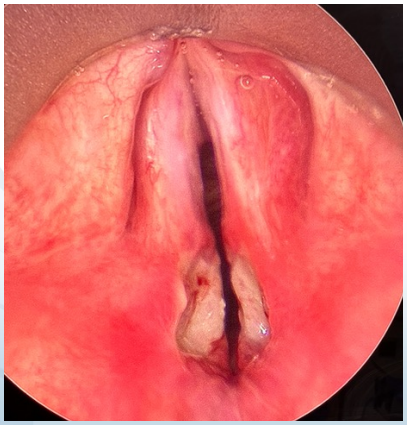
JAMA Otolaryngology-Head & Neck Surgery | Original Investigation

Endotracheal Tube Size in Critically Ill Patients

Brandon I. Esianor, MD; Benjamin R. Campbell, MD; Jonathan D. Casey, MD; Liping Du, PhD; Adam Wright, PhD; Bryan Steitz, PhD; Matthew W. Semler, MD; Alexander Gelbard, MD

- 2 to 3 million adults require tracheal intubation for critical illness each year.
- Up to 57% of these patients with intubation > 12 hours will develop airway mucosal injury.
- Larger ETT (>7.0) are associated with increased airway injury risk.
- Larger ETTs (>7.5 mm ID)are often used based on concerns that small ETTs may prevent ventilator weaning
  - Low airflow resistance
  - Lower risk of obstruction
  - Suctioning
  - Bronchoscopy



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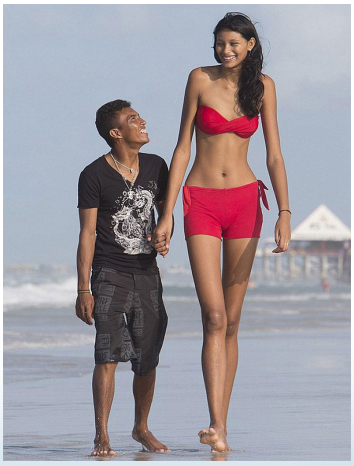
Brandon I. Esianor, MD; Benjamin R. Campbell, MD; Jonathan D. Casey, MD; Liping Du, PhD; Adam Wright, PhD; Bryan Steitz, PhD; Matthew W. Semler, MD; Alexander Gelbard, MD

- Height is the primary determinant of airway diameter, *not* weight.
- No clear guidelines exist for ETT size selection in adults (unlike kids).
- Nearly 1 in 4 patients are intubated with an inappropriately large ETT (≥1.0 mm larger than recommended based on patient height).
- It has been hypothesized that smaller ETTs may be associated with better laryngeal functional outcomes.
- The effect of ETT size on early outcomes of mechanical ventilation for critical illness is relatively unknown.



Aim was to determine if smaller endotracheal tubes are noninferior to larger tubes with respect to critical illness outcomes.

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Methods

- Retrospective, propensity score matched analysis to test the hypothesis that use of smaller ETT would be non-inferior to appropriate size.
- Primary Endpoint
  - 30-day all cause in-hospital survival (days from intubation to death)
- Secondary Endpoints
  - Duration of mechanical ventilation
  - Length of hospital stay
  - Mean peak inspiratory pressure
  - 30-day readmission
  - Need for reintubation
  - Ventilator Associated Pneumonia (VAP)
  - Need for tracheostomy or gastrostomy tube

- Propensity score matching (PSM) is an experimental method used to construct a control group by matching the treated person with an untreated person of similar characteristics.
- The authors performed a 1:1 best neighbor matching method that included:
  - Sex
  - Height
  - Body mass Index
  - Admission diagnosis
  - Location of intubation

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Table 1. Overall Cohort Characteristics

Measure	No. (%) Total cohort (n = 814)	Appropriate for height (n = 408)	Large for height (n = 224)	Small for height (n = 182)
Sex				
Male	523 (64)	248 (61)	141 (63)	134 (74)
Female	291 (36)	160 (39)	83 (37)	48 (26)
Height, median (IQR), cm	173 (165-180)	173 (165-183)	168 (158-175)	183 (171-183)
BMI, median (IQR)	27.3 (23.6-33.1)	27.5 (23.7-33.2)	27.7 (23.5-33.9)	27 (23.9-30.7)
Intubation location				
ED	354 (43)	187 (46)	75 (33)	92 (51)
ICU	460 (57)	221 (54)	149 (67)	90 (49)
Training				
Attending	374 (62)	177 (58)	102 (59)	95 (74)
Fellow	103 (17)	57 (19)	36 (21)	10 (8)
Resident	129 (21)	71 (23)	34 (20)	24 (19)
Specialty				
Anesthesia	129 (25)	57 (22)	33 (23)	39 (34)
Critical care	192 (37)	103 (41)	64 (44)	25 (22)
Emergency medicine	192 (37)	94 (37)	48 (33)	50 (44)
Admission diagnosis				
Trauma	174 (21)	88 (22)	35 (16)	51 (28)
Respiratory	170 (21)	87 (21)	53 (24)	30 (16)
Neurologic	193 (24)	108 (26)	48 (21)	37 (20)
Cardiac	61 (7)	27 (7)	20 (9)	14 (8)
Gastrointestinal	57 (7)	27 (7)	19 (8)	11 (6)
Other	159 (20)	71 (17)	49 (22)	39 (21)

Patients intubated with large ETTs were more likely to be intubated in the ICU.

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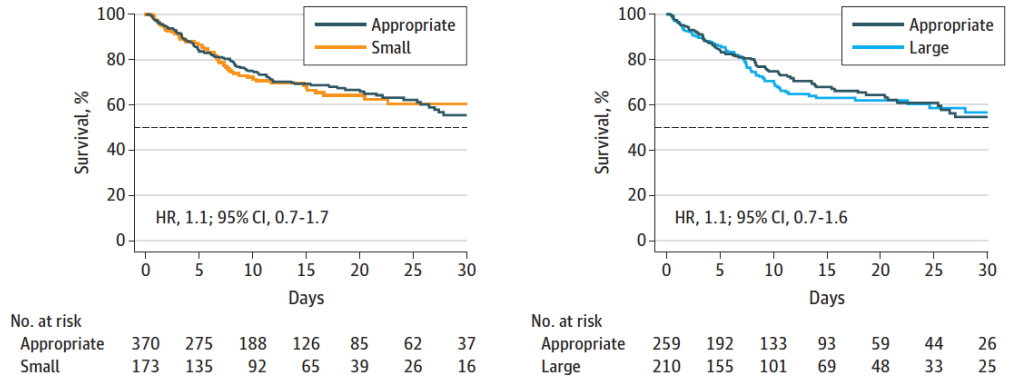
Figure. 30-Day Overall In-Hospital Survival by Endotracheal Tube (ETT) Size Group

A Nomogram for ETT size by patient height

7.0 mm	7.5 mm	8.0 mm
<160 cm	160-180 cm	>180 cm
(5'2" and shorter)	(5'3" to 5'10")	(5'11" and taller)



Secondary Outcomes

- As compared to the appropriate-sized ETT group, small ETT group had:
  - Longer duration of intubation (+32.5 hours; 95% CI, 6.4-58.6).
  - *Longer hospital stay (+3.5 days; 95% CI, –0.04 to 7.1)
  - *Increased peak inspiratory pressure (+1.1 cm H2O; 95% CI, –0.2 to 2.4)

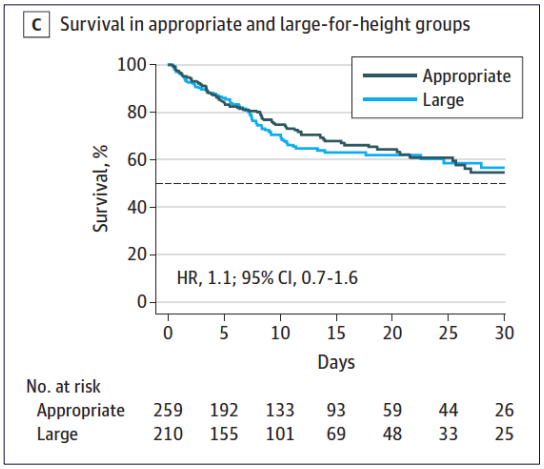
*The width of the CIs prevented definitive conclusions from being drawn.

Table 2. Outcome Results Comparing Small and Appropriate Endotracheal Tube (ETT) Size Groups

Variable	PS-matched pairs, No.	Effect measure	Estimated effect size (95% CI)[a]
Primary end point			
30-d in-hospital overall survival	173	HR	1.1 (0.7 to 1.8)
Secondary end points			
30-d readmission after discharge	105	OR	1.02 (0.93 to 1.11)
Tracheostomy at discharge or death among those survived to discharge	108	OR	1.1 (0.9 to 1.2)
PEG at discharge or death among those survived to discharge	108	OR	1.05 (0.97 to 1.13)
Reintubation within 14 d in hospital after index extubation among those survived to discharge	106	OR	0.95 (0.85 to 1.07)
Duration of intubation among those survived to hospital discharge, h	108	Mean difference	32.5 (6.4 to 58.6)
Average PIP during intubation, cm H_2O	178	Mean difference	1.1 (−0.2 to 2.4)
Length of hospital stay among those survived to discharge, d	108	Mean difference	3.5 (−0.04 to 7.1)
Bronchoscopy while intubated	180	OR	0.96 (0.90 to 1.03)
Ventilator-associated pneumonia	180	OR	0.99 (0.94 to 1.05)

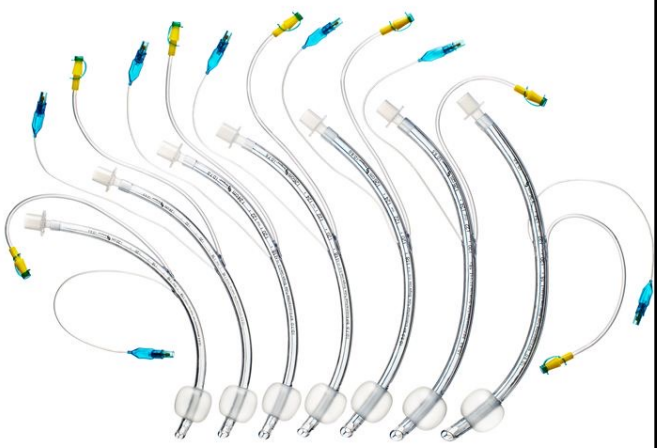
Large ETT Group Outcomes

- As compared to the appropriate-sized ETT group, the large ETT group had:
  - Small decrease in the 30-day all-cause in-hospital mortality but the width of the CI (210 PSM pairs; HR, 1.1; 95%CI, 0.7-1.6) precluded conclusion.
  - No clinically meaningful difference in any secondary endpoints



Large vs Small ETT

- Smaller ETT Group had:
  - Small increase in 30-day mortality but no definitive conclusions could be made.
  - Small ETTs had a longer duration of intubation (+45.2 hours; 95%CI, 6.2-84.1)
  - Increased rates of percutaneous endoscopic gastrostomy tube placement (OR, 1.18; 95%CI, 1.03-1.37).
  - There were no other clinically meaningful differences in the other secondary endpoints between these groups.



Take Home Points

7.0 mm <160 cm (5'2" and shorter)	7.5 mm 160-180 cm (5'3" to 5'10")	8.0 mm >180 cm (5'11" and taller)

- Intubation-related injuries can happen with relatively short-term intubation (days).
- Using a height-based ETT selection nomogram, 224 patients (27.5%) in this study received an inappropriately large ETT.
- While patients with smaller ETT had a longer duration of intubation than appropriate and large ETT groups (+32.5 hours and +45.2 hours, respectively), there were no higher rates of
  - Tracheostomy
  - Bronchoscopy
  - Reintubation
  - VAP
  - Length of hospitalization
- Large for height ETT was not associated with increased survival or other evaluated metrics.

Articles

- Kosztyła-Hojna B, et al. Presbyphonia as an Individual Process of Voice Change. J Voice. 2023 Mar;37(2):303.e1-303.e14.
- Tipton C et al.. The Efficacy of Superior Laryngeal Nerve Block for Neurogenic Cough: A Placebo-Controlled Trial. Laryngoscope. 2023 May 11. doi: 10.1002/lary.30739. Epub ahead of print.
- Esianor BI, Campbell BR, Casey JD, et al. Endotracheal Tube Size in Critically Ill Patients *JAMA Otolaryngol Head Neck Surg.* 2022;148(9):849–853.
- **Howell R et al. . Cricopharyngeus Muscle Dysfunction and Hypopharyngeal Diverticula (e.g., Zenker): A Multicenter Study. Laryngoscope. 2023 Jun;133(6):1349-1355.**
- Walters R et al. The Impact of Cervical Spinal Disease on Pharyngeal Swallowing Function. Am J Speech Lang Pathol. 2023 Mar 9;32(2):565-575.

The Laryngoscope

Cricopharyngeus Muscle Dysfunction and Hypopharyngeal Diverticula (e.g., Zenker): A Multicenter Study

Rebecca J. Howell, MD; Dale Ekbom, MD; Jan Kasperbauer, MD; Meredith Tabangin, MPH; Mekibib Altaye, PhD; Shaun Wahab, MD; Peter Belafsky, MD; Jacqui Allen, MD; Milan Amin, MD; Semirra Bayan, MD; Brian Cervenka, MD; Brad deSilva, MD; Greg Dion, MD; Aaron Friedman, MD; Mark Fritz, MD; John Paul Giliberto, MD; Elizabeth Guardiani, MD; Jeffrey Harmon, MD; Sid Khosla, MD; Brandon Kim, MD; Maggie Kuhn, MD; Paul Kwak, MD; Yue Ma, MD; Lyndsay Madden, MD; Laura Matrka, MD; Ross Mayerhoff, MD; Cyrus Piraka, MD; Clark Rosen, MD; Keith Wilson, MD; Carter Wright, MD; Vyvy Young, MD; Sonia Yuen, MD; Greg Postma, MD

Objective: Describe demographics and imaging and compare findings and symptoms at presentation in a large cohort of persons with cricopharyngeus muscle dysfunction (CPMD) with and without hypopharyngeal diverticula.

Purpose: To understand the natural history of disease by identifying risk factors for recurrence and to compare treatment outcomes.

This Manuscript: Describes the pre-treatment study population and compares age, gender, and patient-reported symptoms in persons with CPMD, Zenkers Diverticula (ZD), and Killian Jamieson diverticula (KJD).

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Background

- Complete relaxation of the UES is achieved via a complex interaction of:
  - Intrabolus pressure
  - Hyolaryngeal mechanics
  - Neural inhibition
- Failure of CP relaxation increases the risk of post-swallow pharyngeal residue and penetration or aspiration.
- CPD may present as:
  - Solid food dysphagia (most common)
  - Choking or coughing with liquids
  - Globus sensation
  - Sensation of food sticking
  - Regurgitation (not delayed)

This study defined CPMD as dysphagia *plus* the presence of CPM bar (occluding >50% esophageal lumen) without diverticula.

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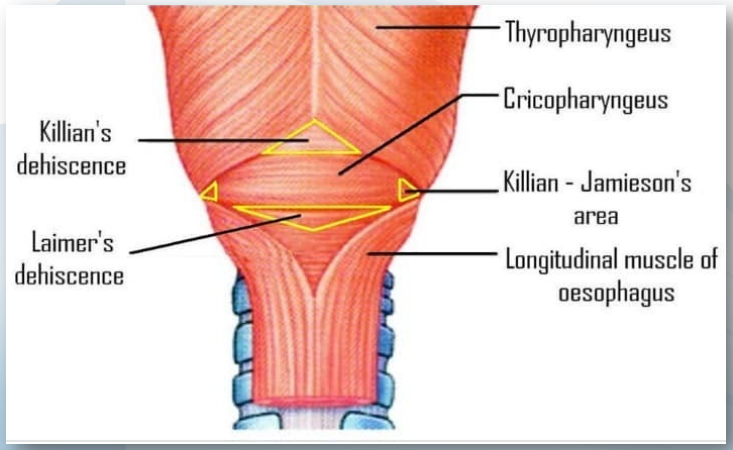
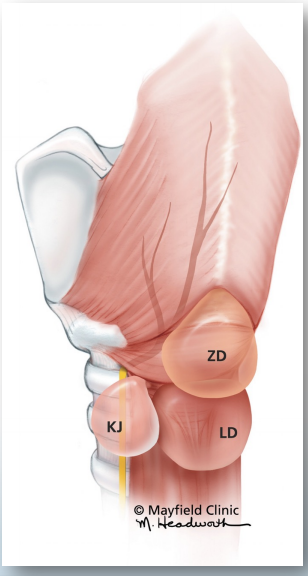
Hypopharyngeal and Upper Esophageal Diverticular Anatomy



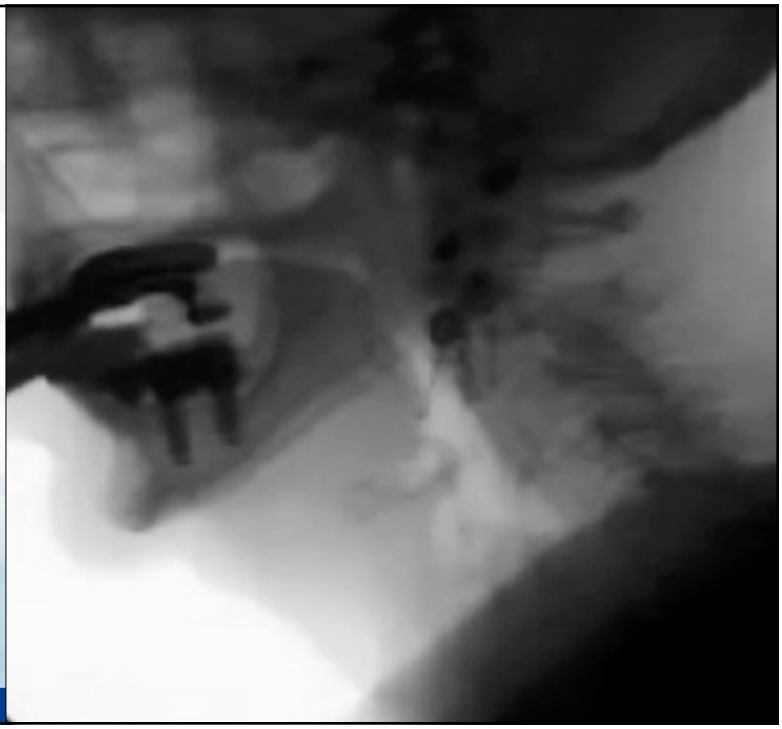
CPMD was defined the presence of dysphagia & CPM bar occluding >50% of lumen.



ZD: Zenker's Diverticulum
KJ: Killian Jamieson Diverticulum
LD: Laimer's Diverticulum

Prospective Outcomes Cricopharyngeal Hypertonicity (POUCH) Collaborative

- 11 centers
- Prospective database
- This investigation included persons enrolled between August 2017 to January 2022



Methods: Data Collected

Barium esophagram findings included:

- Presence or absence of esophageal dysmotility
- Hiatal hernia
- Achalasia
- Gastroesophageal reflux

Laryngoscopy findings included:

- Presence or absence of vocal fold paralysis
- Vocal fold atrophy
- Pharyngeal residue

Preoperative comorbidity data included: neurologic diagnosis (e.g., stroke, Parkinson's disease, amyotrophic lateral sclerosis, multiple sclerosis [MS], or other neuromuscular disease), and history of prior other neck or spine surgery.

Validated symptom indices (PROMs)

- Eating Assessment Tool (EAT-10)
- Voice Handicap Index (VHI-10)
- Reflux Symptom Index (RSI)

Data were summarized using means, medians, percentages, and frequencies.

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Results

- 250 persons
  - Mean age of 69 years.
  - 42% female (in line with literature ZD more common in men)
- Types
  - Zenker diverticula (ZD) 85.2%
  - Cricopharyngeal Muscle Dysfunction (CPMD) 9.2%
  - Killian Jamieson diverticula (KJD) 4.4%
  - Traction-type diverticula 1.2%
- No differences between diagnostic categories with age, gender, and duration of symptoms (1 – 3 years).
- Mean (SD) EAT-10 score for each group was :
  - ZD: 17.1 (10.1)
  - CPMD 20.2 (9.3)*
  - KJD 10.3 (9.4)

*Significantly greater than other diagnostic groups (p = 0.03).

TABLE I.
Characteristics of Study Population.

Characteristics	N = 250
Diagnosis	
Isolated CPMD	23 (9.2)
Zenker*	213 (85.2)
Killian Jamieson	11 (4.4)
Other (traction, latrogenic)	3 (1.2)
Comorbidities	
Unintentional weight loss	64/240 (26.7)
History of feeding tube	4/243 (1.6)
Stroke	13/242 (5.4)
Parkinson's disease	9/250 (3.6)
ALS	1/250 (0.40)
MS	1/250 (0.40)
Other neuromuscular	9/250 (3.6)
Vocal fold paralysis	3/172 (1.7)
GERD	135/243 (55.6)
Aspiration pneumonia	18/238 (7.6)
Prior neck surgery	52/240 (21.7)
Esophagram findings	
Reflux	69/218 (31.6)
Dysmotility	162/227 (71.4)
Achalasia	3/222 (1.3)
Hiatal hernia	74/231 (32.0)
Laryngoscopy findings	
Vocal fold paralysis	10/236 (4.2)
Vocal fold atrophy	62/233 (26.6)

*One patient with Zenker diverticula (ZD) and Killian Jamieson diverticula grouped as ZD.

Results

Hoarseness is anecdotally a common complaint in patients with diverticula.

This study used VHI-10 > 11 as a diagnostic for dysphonia.

Median (IQR) VHI-10 scores: ($p > 0.05$)

CPMD	7.0 [0.0–12.0]
ZD	0.50 [0.0–10.0]
KJD	2.00 [0.0–4.0]

4.2% with a reported vocal paralysis

26.6% with vocal fold atrophy

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The importance of understanding MBS/esophagrams…

Fig. 3. 77-year-old male with imaging characteristics of a Zenker diverticulum. (A) Anterior–posterior view of an esophagram demonstrating a diverticulum in the midline. (B). Lateral view of the esophagram demonstrating the diverticulum is posterior and immediately inferior to the enlarged cricopharyngeus muscle. A barium tablet is also noted anteriorly and was taped to the patient's neck for an internal size reference.

Take Home Points

Not all diverticula are Zenkers. We must be able to distinguish radiographically as differences have surgical consequences.

Difficulty making conclusions regarding CPMD versus ZD given selection bias, but isolated obstructing CPMD may be more symptomatic than persons with ZD or KJD.

CPMD and Diverticuli should be considered separate entities with potentially different etiologies

Patients with CPMD don't always develop diverticula

Patients with diverticula always have CPMD

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Articles

- Kosztyła-Hojna B, et al. Presbyphonia as an Individual Process of Voice Change. J Voice. 2023 Mar;37(2):303.e1-303.e14.
- Tipton C et al.. The Efficacy of Superior Laryngeal Nerve Block for Neurogenic Cough: A Placebo-Controlled Trial. Laryngoscope. 2023 May 11. doi: 10.1002/lary.30739. Epub ahead of print.
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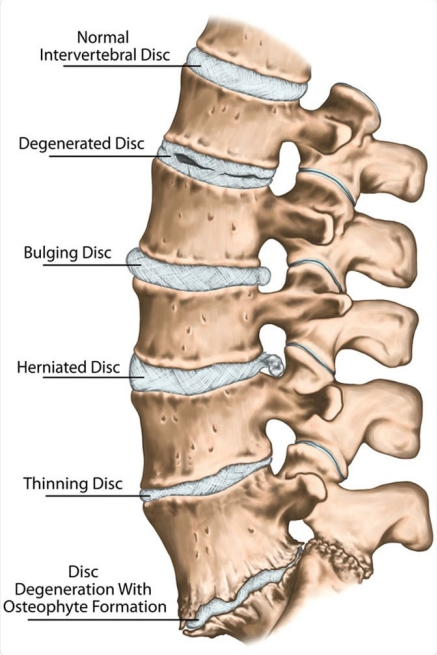
ASHA Speech-Language-Hearing Association
AJSLP

Research Article

The Impact of Cervical Spinal Disease on Pharyngeal Swallowing Function

Rameen K. Walters,[a] Rachana Gudipudi,[a] Kate Davidson,[b] Melissa Cooke,[b] Jenna Barengo,[a] Drasti Smyre,[a] Kendrea L. Garand,[c] Bonnie Martin-Harris,[d,e] Maria G. Matheus,[f] Shaun A. Nguyen,[a] and Ashli K. O'Rourke[a]

- Both discs and bone degenerate with age
  - ~60% of patients over 40 years of age
  - ~90% of patients over 60 years of age
- Possible Changes Seen on MBS/x-ray:
  - Loss of normal cervical lordosis
  - Pronounced Lordosis
  - Osteophytes (posterior, lateral, anterior)
  - Diffuse Idiopathic Skeletal Hyperostosis (DISH)
- The association of **dysphagia** with spinal pathology is most established with anterior (ventral) cervical osteophytes & anterior approach cervical spine surgery.



Aim & Hypotheses

- This study aimed to characterize the spines of patients with dysphagia undergoing MBS compared to healthy controls.
- Based on previous prevalence studies, the hypothesis was that spinal disease would be present in most swallow studies and may contribute to swallowing dysfunction when severe.
- Because C3-4 is the spinal level where epiglottic inversion takes place and C4-6 is the level at which the pharyngoesophageal segment lies, we hypothesized that osteophytes at these levels would impair those areas of swallow.

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Study Design

- Retrospective review of modified barium swallow studies of 100 dysphagic patients and 100 age- and gender-matched healthy controls were reviewed.
- Spinal anatomy of dysphagic individuals and controls was classified into 11 pre-determined categories, peer-reviewed by a head and neck radiologist. Two dominant features were selected for each patient.
- Categorization was performed as a group (R.G., K.D., M.C., J.B., D.S., and A.K.O).
- Reliability of this assessment was measured against a radiologist experienced in spine pathology (M.G.M)
- If spinal pathology was present, it was evaluated for its effect on swallow function and categorized into Spine-associated dysphagia (SAD) or non-spine associated dysphagia (NSAD).
- This was determined by consensus of two laryngology providers and two SLPs.

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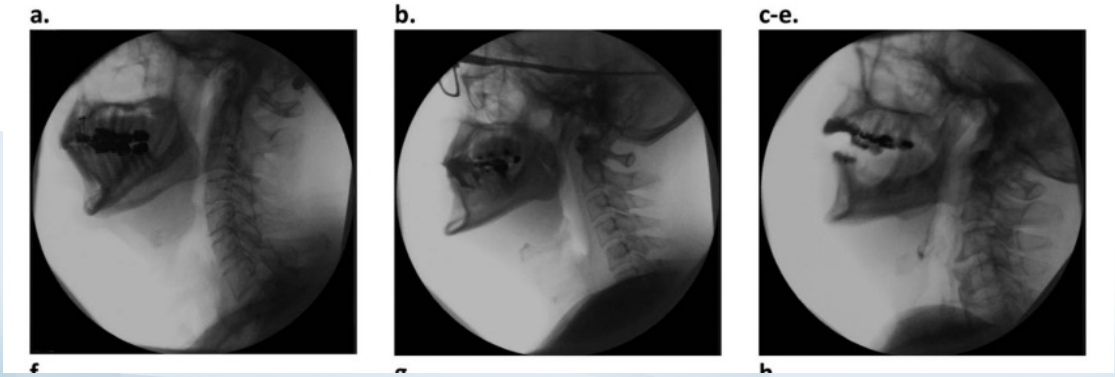
Spinal Characterizations



Normal | Loss of Normal Lordosis | Osteophyte
No, Partially, Complete Obstruction

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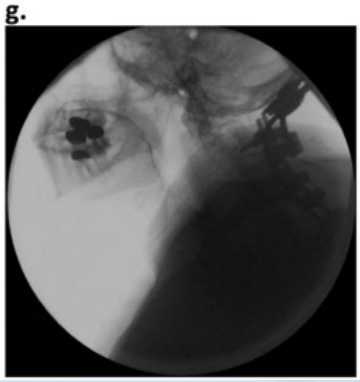
Spinal Characterizations

f.

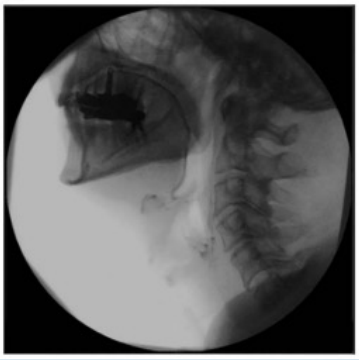
History of Anterior Spine Surgery

g.



History of Posterior Spine Surgery

h.



Early Degenerative Disease

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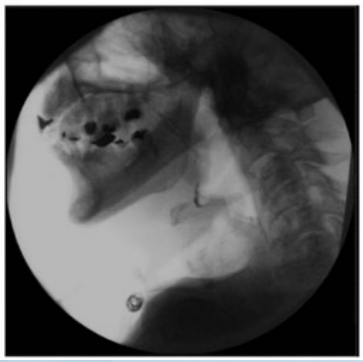
Spinal Characterizations

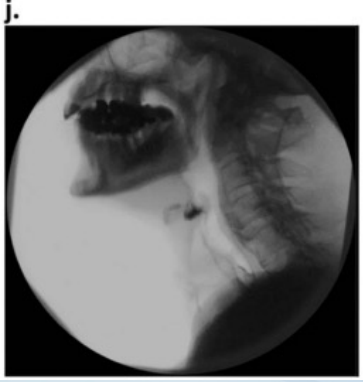
Inter-rater reliability consisted of 92% agreement overall.

i.



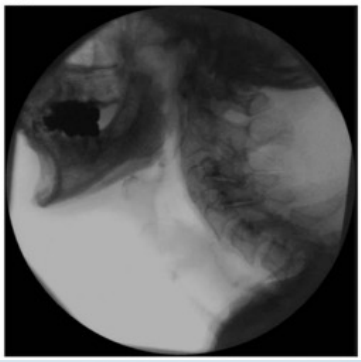
Advanced Degenerative Disc Disease

j.



Diffuse Idiopathic Skeletal Hyperostosis

k.



Pronounced Lordosis

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Study Design: Analysis

- Videofluoroscopic and swallow data was analyzed with multiple validated measures. This analysis was blinded to categorization.
- Modified Barium Swallow Impairment Profile (MBSImP): evaluates multiple levels of physiologic swallow
- Penetration-Aspiration Scale (PAS): Degree of airway invasion
- Dynamic Imaging Grade of Swallowing Toxicity (DIGEST): safety and efficacy of pharyngeal swallow
- Functional Oral Intake Scale (FOIS): patient's oral intake
- Eating Assessment Tool (EAT-10): patient-reported swallowing outcome measure

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Results

Characteristics	All dysphagic patients	Spine-associated dysphagia	Non–spine-associated dysphagia	Healthy controls	*p* value
Total patients (*N*)	100	15	85	100	
Age (years)					.34
M (*SD*)	67.7 (13.1)	71.3 (7.2)	67.1 (13.9)	66.8 (13.0)	
Median (IQR)	70.0 (63.8–76.3)	73.0 (65.0–76.0)	69.0 (59.0–77.0)	70.0 (61.8–72.5)	
Gender					.15
Female	50	4	46	50	
Male	50	11	39	50	
Race					.41
African American	13	3	10	8	
Asian	1	0	1	1	
White	86	12	74	91	
Ethnicity					.92
Hispanic	1	0	1	1	
Non-Hispanic	99	15	84	99	

Note. IQR = interquartile range.

- Patients were generally elderly, with median age of 68 years (dysphagia group)
- Abnormal spinal anatomy was observed in 89 of the 100 dysphagic individuals, and 84 of the 100 matched healthy controls.
- Of dysphagic individuals, spinal disease was determined to be the primary etiology of dysphagia in only 15 out of 100 individuals

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Spinal Characterization and Etiologies

- Most common spinal characterizations in dysphagic patients were:
  - Osteophytes (44/100, 44%)
  - Degenerative disc disease (37/100, 37%)
- Most common spinal characterizations in patients with SAD
  - Osteophytes (6/15; 40%)
  - ACDF (6/15; 40%)
  - Degenerative disc disease (4/15; 27%)
- Patients with SAD were significantly more likely to have a history of ACDF than NSAD (P=0.002).

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Characteristics	SAD	NSAD	HCs	*p* value
Number of patients (*n*)	15	85	100	
Prestudy FOIS				
M (*SD*)	6.7 (0.6)	6.1 (1.6)	7.0 (0)	< .001
Median (IQR)	7.0 (7.0–7.0)[a]	7.0 (6.0–7.0)[a,b]	7.0 (7.0–7.0)[b]	
Poststudy FOIS				
M (*SD*)	6.5 (0.7)	6.1 (1.4)		< .40
Median (IQR)	7.0 (6.0–7.0)	7.0 (6.0–7.0)		
DIGEST total				
M (*SD*)	1.1 (1.1)	1.2 (1.2)		< .96
Median (IQR)	1.0 (0–1.0)	1.0 (0–2.0)		
PAS max score				
M (*SD*)	2.9 (2.1)	3.1 (2.7)	1.6 (1.0)	< .001
Median (IQR)	2.0 (1.0–5.0)[a]	2.0 (1.0–6.0)[b]	1.0 (1.0–2.0)[a,b]	
EAT-10				
M (*SD*)	9.9 (8.2)	16.3 (11.6)	1.0 (1.9)	< .001
Median (IQR)	6.0 (4.0–14.5)[a,c]	13.0 (6.0–26.0)[b,c]	0 (0–1.0)[a,b]	
MBSImP Oral Total (Components 1–6)				
M (*SD*)	5.4 (3.2)	6.7 (3.4)	5.4 (2.1)	.034
Median (IQR)	5.0 (3.0–7.0)	7.0 (4.0–9.0)[b]	5.0 (4.0–7.0)[b]	
MBSImP Pharyngeal Total (Components 7–16)				
M (*SD*)	7.9 (4.8)	7.6 (4.9)	6.0 (2.3)	.16
Median (IQR)	8.0 (3.0–12.0)	6.0 (4.0–11.0)	6.0 (5.0–8.0)	

- Both SAD and NSAD groups had worse PAS Max and EAT-10 scores compared to controls
- MBSImP composite scores were not significantly different between groups, however were significantly different in the oral components

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Osteophytes

- Those with osteophytes at C3-C4 did not have worse swallowing outcomes for epiglottic inversion (Component 10, p = 0.99).
- Those with osteophytes at C4-C6 did not have worse swallowing outcomes for upper esophageal sphincter opening (Component 14) (p = .94).

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Take Home Points

- Cervical spine disease is very common, particularly with advanced age.
- Dysphagia can be associated with spine disease, but it is more commonly caused by other problems.
- Symptomatic spine disease can contribute to dysphagia in some patients and should be evaluated and treated.
- Further studies evaluating spinal pathology in dysphagic patients would enable us to draw more definitive conclusions and guide treatment decisions

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aorourke@musc.edu