FEES: Interpreting Mild, Moderate and Severe Dysphagia

Joy Hesse, M.A. CCC-SLP BCS-S
Sydney Brotherton, M.A. CCC-SLP
THERAPYLEARNINGCOMPANY.COM

Speaker Disclosures

Joy Hesse- Co-Owner Of Therapy Learning Company

No Financial Disclosures

Nonfinancial-no relationships to disclose

- Joy Hesse -LinkedIn
- Therapy Learning Company on Facebook

Sydney Brotherton

Financial: Works for MercyOne in Des Moines

Nonfinancial: no relationships to disclose

Course Objectives

1. Name 3 indications to choose FEES over a modified when selecting the appropriate instrumental swallow evaluation.
2. Participants will correctly score Penetration/Aspiration using the Pen/asp scale for mild, mod, and severe dysphagia.
3. Participants will correctly score residue in the vallecula and pyriform sinuses using the Yale Residue scale for mild, mod, and severe dysphagia.
4. Participants will grade safety, efficiency to find the DIGEST-FEES Score for mild, mod and severe dysphagia.
5. Participants will write a summary of case studies noting safety, efficiency, risk and biomechanical dysfunctions.

Have We Finally Gotten The Message?

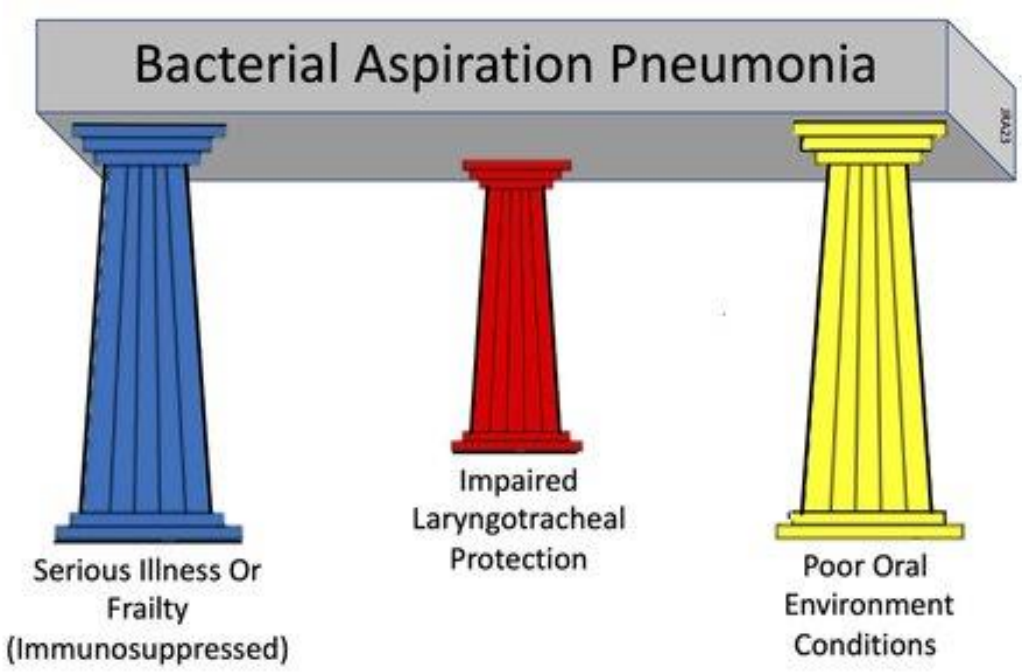
“Dysphagia is an important risk for aspiration pneumonia, but generally not sufficient to cause pneumonia unless other risk factors are present as well” (Langmore, 1998)

General Risk Factors for Dysphagia

Age, Medical conditions, Cognitive status, Feeding Status, Pulmonary Factors

Pneumonia Risk Factors

- Three Pillars of Bacterial Aspiration PNA (Ashford, in revision)
- Describes the three hallmarks for the development of bacterial aspiration PNA and outlines the clinical evidence for each pillar.



How to Assess

Assessing the Three Pillars of Bacterial Aspiration Pneumonia (BAP)

Impaired Health Status

Tests

-Acute Physiology & Chronic Health Eval (APACHE II)-ICU
-Complete Blood Count (CBC)
-Vital Signs (Temp, HR, RR or 02)
-Clinical Pulmonary Infection Score (Ventilator patients)
-Confusion, Urea, Respiratory Rate, Blood Pressure, Age 65 (CURB65)-Community-Acquired

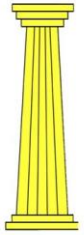
Impaired Airway Protection

Tests

-Videofluoroscopic Swallow Study (VFSS)
-Flexible Endoscopic Evaluation of Swallowing (FEES)

Ames et al., (2011). *Am J Crit Care*
Khalil et al. (2007) EMJ
Nguyen et al., (2020) J Infect
Haliloglu et al., (2020) Arch Med Sci
Mumtaz et al., (2023) Ann Med Surg (Lond)
Harris & Jones (2008) Phys Med Rehabil Clin N Am
Langmore et al., (1988) Dysphagia

Impaired Oral Status



Tests

-Oral Health Assessment Tool (OHAT)
-Beck Oral Assessment Scale (BOAS)
-Mucosal-Plaque Score (MPS)

Chalmers et al. (2005) Australia Dent J
Henriksen et al. (1999) Spec Care Dent

Pneumonia "Risk" Predictor

	Oral Health Status		Laryngeal Valve Integrity*		Immune System Status#		Predicted Outcome*# JRA
1	Good	+	No Aspiration	+	Normal	=	No Pneumonia
2	Poor	+	No Aspiration	+	Normal	=	No Pneumonia
3	Poor	+	Aspiration	+	Normal	=	No Pneumonia
4	Good	+	Aspiration	+	Normal	=	No Pneumonia
5	Good	+	No Aspiration	+	Reduced	=	No Pneumonia
6	Poor	+	No Aspiration	+	Reduced	=	No Pneumonia
7	Good	+	Aspiration	+	Reduced	=	Low Risk of Pneumonia
8	Poor	+	Aspiration	+	Reduced	=	High Risk of Pneumonia

*Nakajoh et al., 2000

#Tobin & Grenik, 1984;
Shockley, 1995;
Terpenning et al., 2001

Beck Oral Health Assessment

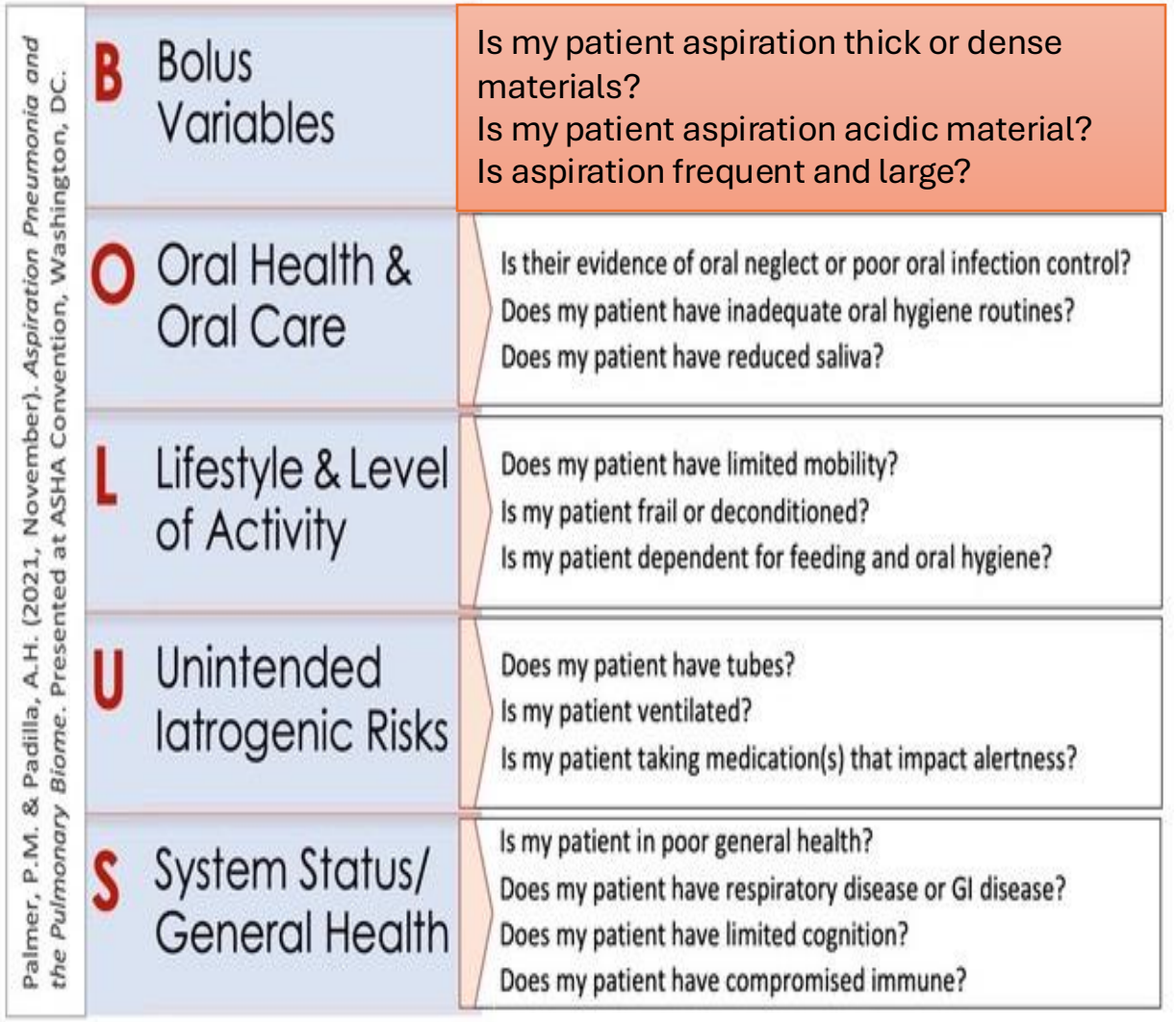
Table 1
Beck Oral Assessment Scale (BOAS), modified[a]

Area	Score 1	2	3	4
Lips	Smooth, pink, moist, and intact	Slightly dry, red	Dry, swollen isolated blisters	Edematous, inflamed blisters
Gingiva and oral mucosa	Smooth, pink, moist, and intact	Pale, dry, isolated lesions	Swollen red	Very dry and edematous, inflamed
Tongue	Smooth, pink, moist, and intact	Dry, prominent papillae	Dry, swollen, tip and papillae are red with lesions	Very dry, edematous, engorged coating
Teeth	Clean, no debris	Minimal debris	Moderate debris	Covered with debris
Saliva	Thin, watery plentiful	Increase in amount	Scanty and somewhat thicker	Thick and ropy, viscid or mucid
Total score[b]	5 No dysfunction	6-10 Mild dysfunction	11-15 Moderate dysfunction	16-20 Severe dysfunction
Note: Provide moisture more often than oral care.	Minimum care every 12 h	Minimum care every 8-12 h	Minimum care every 8 h	Minimum care every 4 h

[a] Modified from Beck.[21]
[b] Interpretation of total score:
BOAS 0-5: Perform an oral assessment once a day. Follow oral care as outlined in the systematic oral care procedure twice per day.
BOAS 6-10: Perform oral assessments twice a day. Moisten mouth/lips every 4 hours. Follow oral care as outlined in the systematic oral care procedure twice per day.
BOAS 11-15: Perform an oral assessment every shift (every 8-12 h). Follow oral care as outlined in the systematic oral care every shift. Use an ultrasoft toothbrush. Moisten lips and mouth every 2 h.
BOAS 16-20: Perform an oral assessment every 4 hours. Follow oral care as outlined. If brushing not possible, use soft gauze-wrapped finger. Moisten lips and mouth every 1-2 h.

Pneumonia Risk Factors

- BOLUS Framework (Palmer & Padilla, 2024)
- Clearly outlines risk factors and function as a clinical decision-making tool.
- B- must be determined by instrumental swallow evaluation!
- If any of these are “YES” then there is increased risk!



Thickened Liquids Discussion- ASHA 2024

Consequences of Thickened Liquids

- Overdiagnosis or misdiagnosis could lead to:
  - Treatment with no benefit or medical necessity
  - Expensive
  - Wastes limited healthcare resources
  - Unnecessary diet modifications
    - Decreased quality of life with health, physical and swallowing-related QOL
    - Impacts nutritional status
    - Inpatients with texture-modified diet have lower protein and energy intake than those consuming regular diets

    - Kwok et al, 2016, MacDonald et al, 2020

Why do we recommend thickened liquids?

- More time for sensory information to reach the swallowing center
- More time for our brains to send appropriate motor signals to our muscles.
- Slows oral and pharyngal bolus transit, increases duration of the pharyngeal striping wave and prolongs UES opening.

The Adverse Effects and Events of Thickened Liquid Use in Adults: A Systematic Review

- Reduced Quality of Life
- Reduced Fluid Intake
- Dehydration
- Aspiration
- Increased Residue
- Pneumonia

Werden Abrams et al, 2023

Thick Liquids and Clinical Outcomes in Hospitalized Patients With Alzheimer Disease and Related Dementias and Dysphagia

- Makhnevich A, Perrin A, Talukder D, et al. Thick Liquids and Clinical Outcomes in Hospitalized Patients With Alzheimer Disease and Related Dementias and Dysphagia. *JAMA Intern Med*. 2024;184(7):778–785. doi:10.1001/jamainternmed.2024.0736

What Did They Find?

- Hospital Mortality: No significant differences between groups
- Intubation: Patients receiving thick liquids were less likely to be intubated
- Respiratory Complications: patient receiving thickened liquids were more likely to have a respiratory complication (e.g. aspiration, choking, pneumonia)
- Dehydration: No significant difference
- LOS: No significant difference
- 30 day readmission: No significant difference

Dysphagia and Diets in Skilled Nursing Facility's When Patients Health Status Changes: The Role of Imaging

- 120 SNF Patients
- No Agreement between diet level pre and post FEES
- 61% of residents with feeding tubes did not have dysphagia
- 45% of NPO residents had not had imaging since acute care
- 67% of residents on a modified diet did not have dysphagia

- Bice EM, Galek KE, Ward M. Dysphagia and Diets in Skilled Nursing Facilities When Patient's Health Status Changes: The Role of Imaging. J Am Med Dir Assoc. 2024 Feb;25(2):381-386. doi: 10.1016/j.jamda.2023.11.008. Epub 2023 Dec 15. PMID: 38109943.


Onward and
Upward
ONTO FEES

FEES Includes 5 Components

1. Assessment of anatomy as it affects swallowing.
2. Assessment of movement and sensation of critical structures within the hypopharynx and laryngopharynx.
3. Assessment of secretion management.
4. Direct assessment of swallowing function for food and liquid.
5. Response to therapeutic maneuvers and interventions to improve the swallow.

What We Can See Endoscopically

- Presence/absence of Secretions
- Pharyngeal Pooling/Residue Before/During/After Exam
- Vocal fold Mobility
- Presence of erythema/edema of the posterior larynx
- Tongue base movement/hyolaryngeal movement
- Soft Palate movement
- Epiglottic movement before and after the swallow
- Pharyngeal Squeeze

Indications for Completing FEES/Videostroboscopy

- Need exam on that day
- Positioning in fluoroscopy is problematic- bedridden, contractures, obese, ventilator…
- Transportation to fluoroscopy is problematic- ICU, CCU, medically fragile patient
- Concern about excess radiation exposure
- Severe dysphagia with very weak or possibly absent swallow reflex and/or very limited ability to tolerate aspiration (brainstem stroke, tube fed for prolonged period of time, poor pulmonary status.
- Post-intubation or post-surgery especially CABG, carotid endarterectomy cervical fusion or any surgery where RLN was vulnerable. Endoscopy can visualize larynx directly for signs of trauma or neurologic damage and assess laryngeal competence.

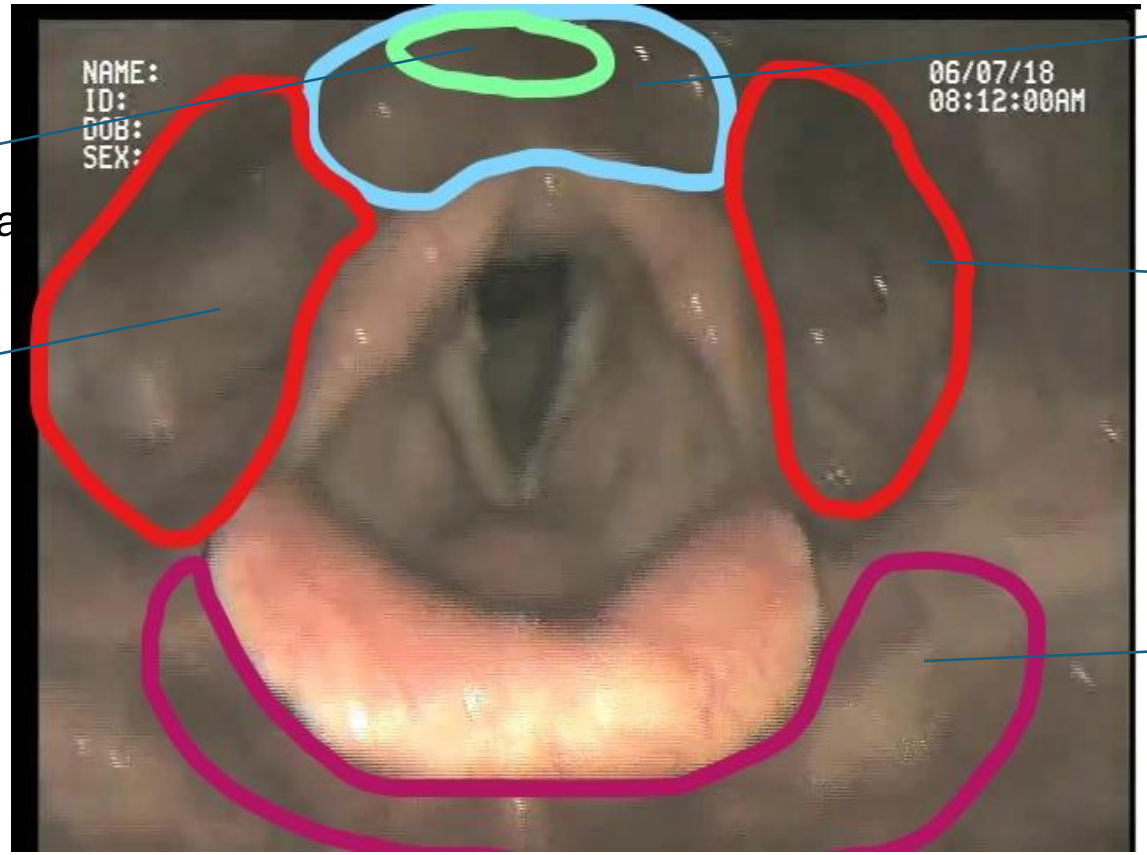
Indications Continued

- Tracheostomy if you suspect laryngeal competence may be impacted.
- Need to assess fatigue or swallow status over an entire meal.
- Repeat exam to assess change; to assess effectiveness or need for maneuvers
- Therapeutic exam that requires time to try out several maneuvers, several consistencies, or use as biofeedback for patient/family

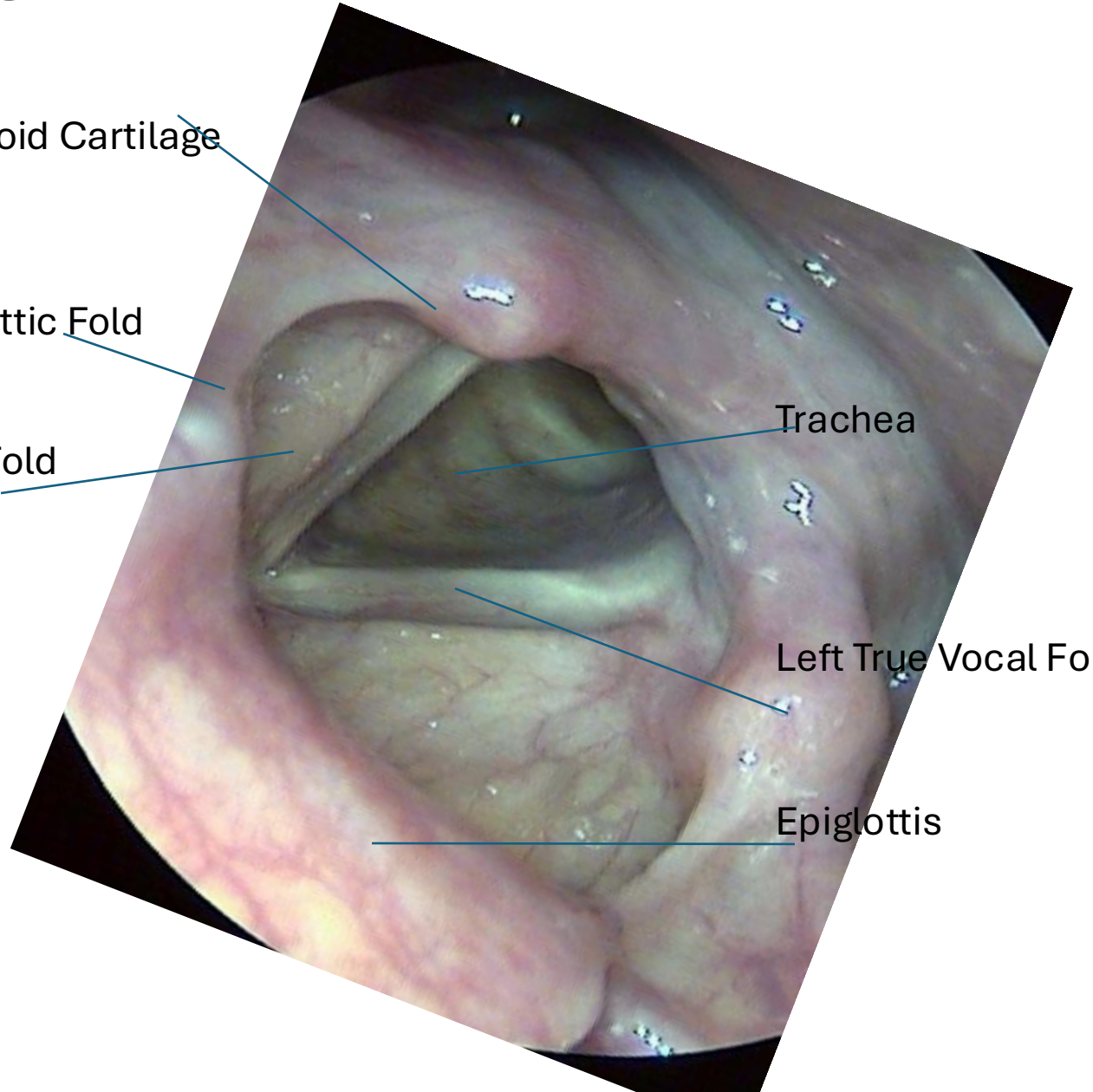
When These Clinical Symptoms are Present

- Hypernasal Voice
- Hoarse, breathy voice
- Wet vocal quality
- Rapid respiratory rate, effortful breathing
- Inability to handle own secretions

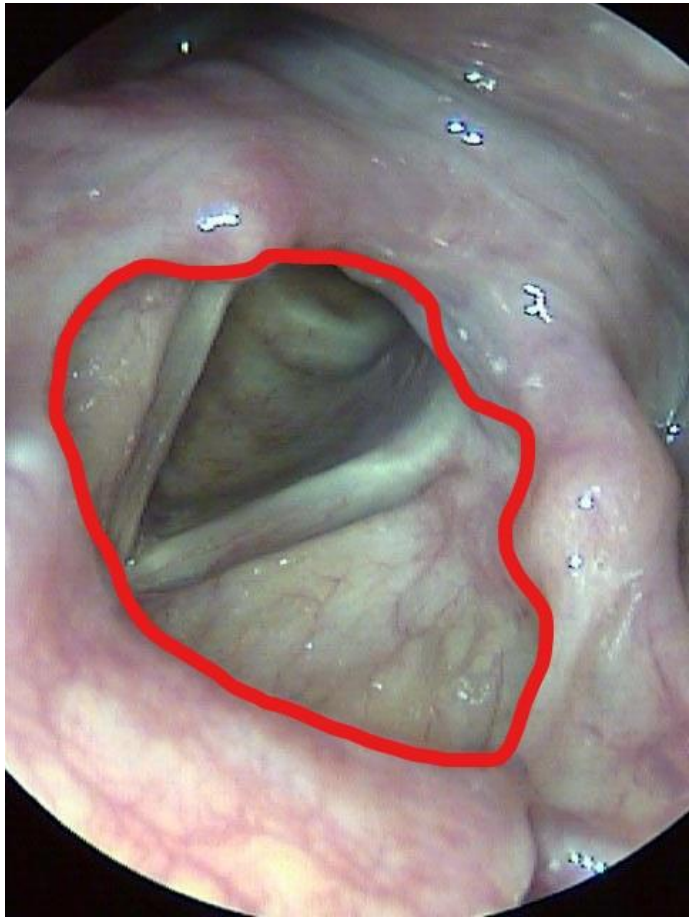
Appropriate Terminology For Pharyngeal Anatomy

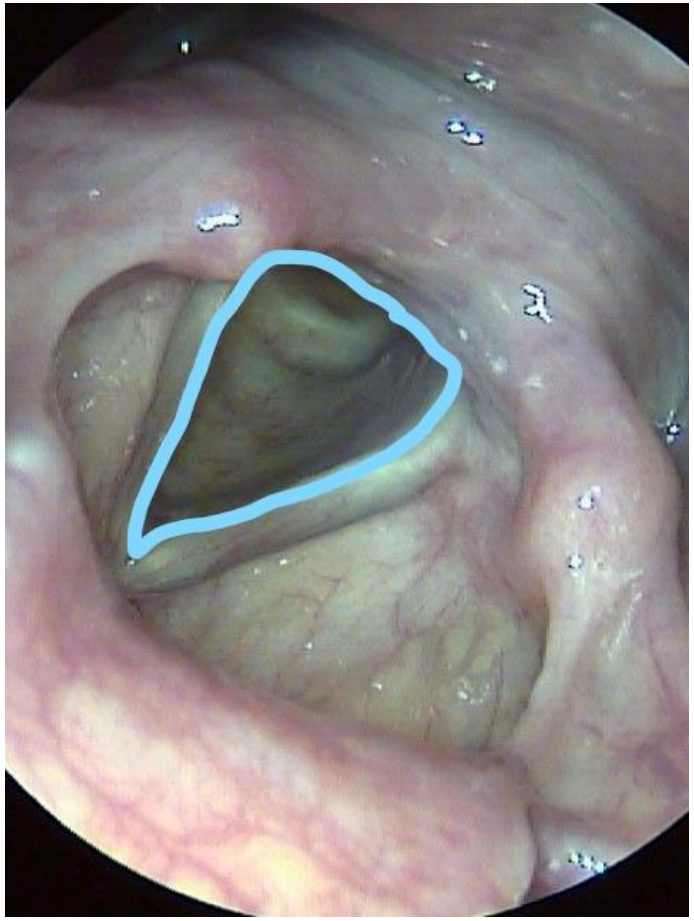


Laryngeal Anatomy



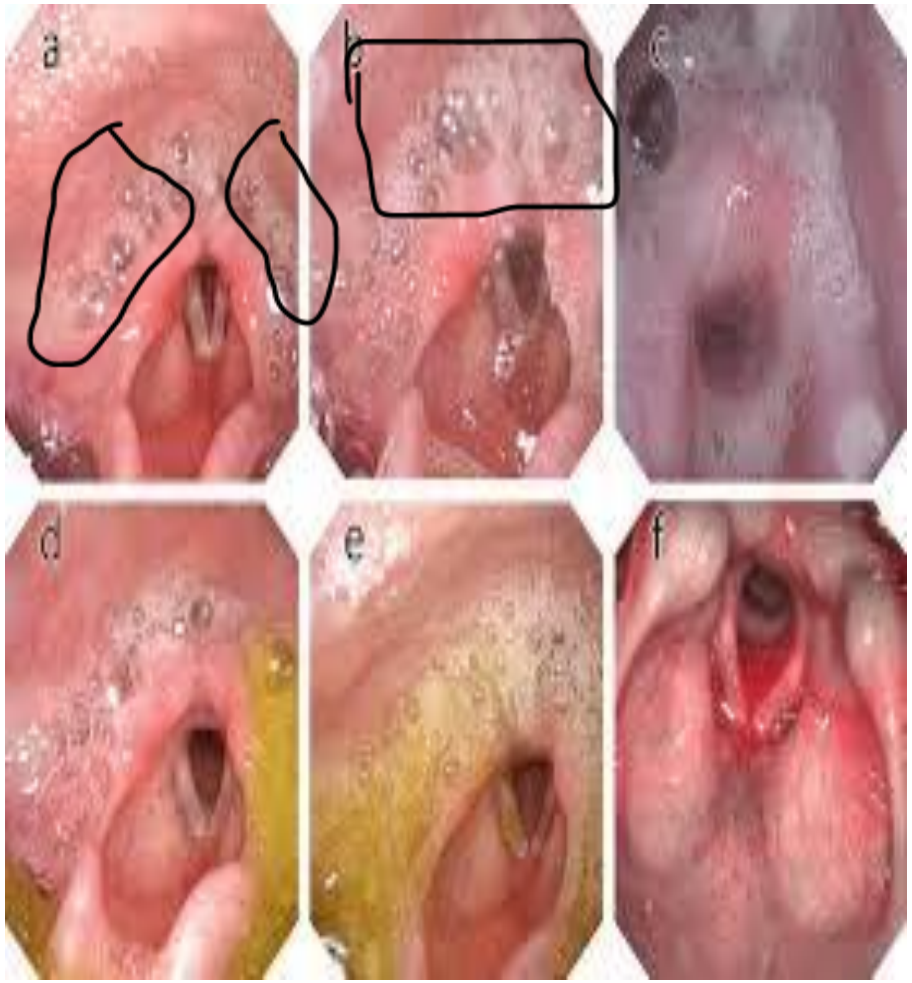
Penetration and Aspiration





Secretion Rating Scale

- Observe presence and location of secretions and patient response such as coughing, clearing throat, and swallowing.
- Note secretions in the endolarynx.
- Aspirated secretions may be predictive of aspiration of liquid or food and poor outcomes (e.g., pneumonia).

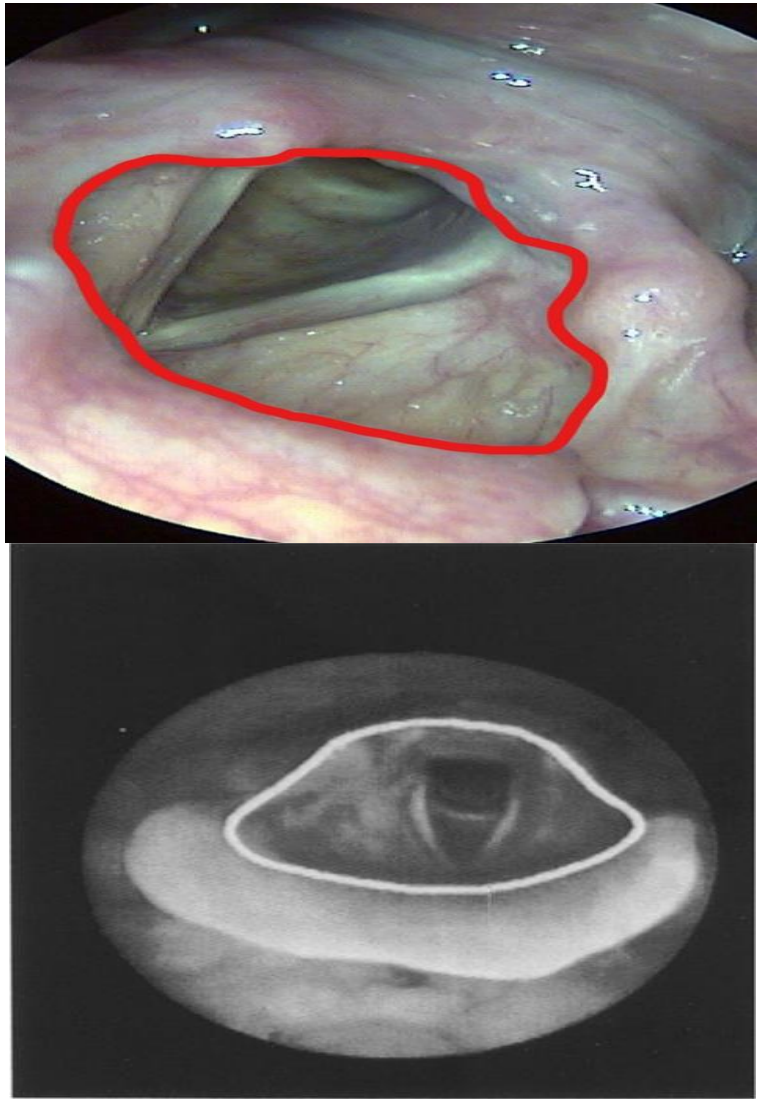


Secretion Rating Scales

Murray Secretion Scale

A three-point scale developed in 1996 that rates the presence of secretions and whether they enter the laryngeal vestibule. A study found that the scale has good intrarater and interrater reliability, and high concurrent validity.

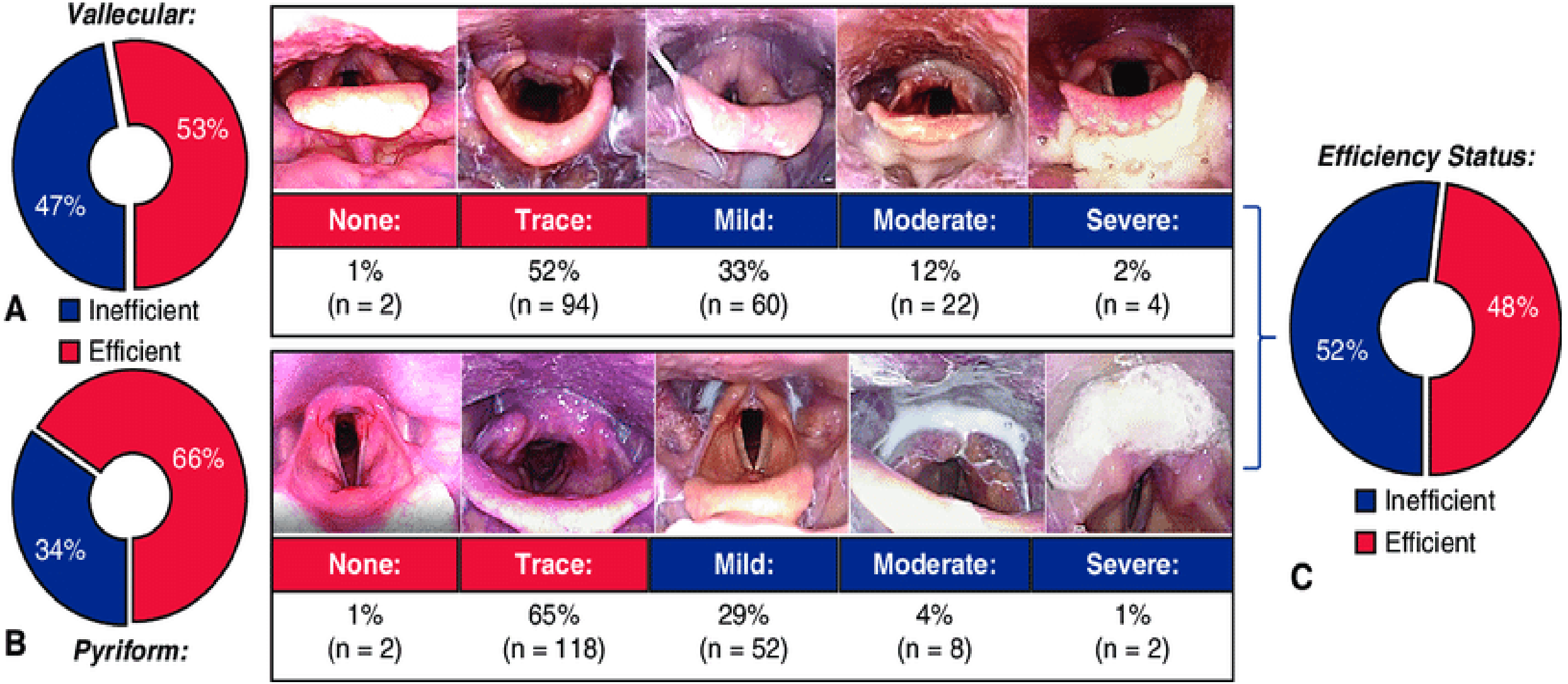
- **Grade 0**: Normal, no visible secretions
- **Grade 1**: Mild, secretions in the protective structures around the laryngeal vestibule
- **Grade 2**: Moderate, secretions deeply pooled in the pyriform sinuses
- **Grade 3**: Severe, secretions in the laryngeal vestibule



Penetration/Aspiration Scale (Pen/Asp)

PAS Scale	Score-Description
1	Material Does Not Enter Airway
2	Material enters the airway, remains above the TVFs, and is ejected
3	Material enters the airway, remains above the TVFs, is not ejected
4	Material enters the airway, contacts the TVFs and is ejected
5	Material enters the airway, contacts the TVFs and is not ejected
6	Material enters the airway, passes below the TVFS, is ejected into larynx or from the airway
7	Material enters the airway, passes below the TVFS, is not ejected into larynx or from the airway despite effort
8	Material enters the airway, passes below the TVFS, is not ejected into larynx or from the airway, no effort made to eject
	Rosenbeck, Robbins, Roecker, Coyle, & Wood (1996)

Yale Pharyngeal Residue Severity- (Neubauer et al, 2015)



DIGEST-FEES

- Overall Toxicity Grade for Swallowing

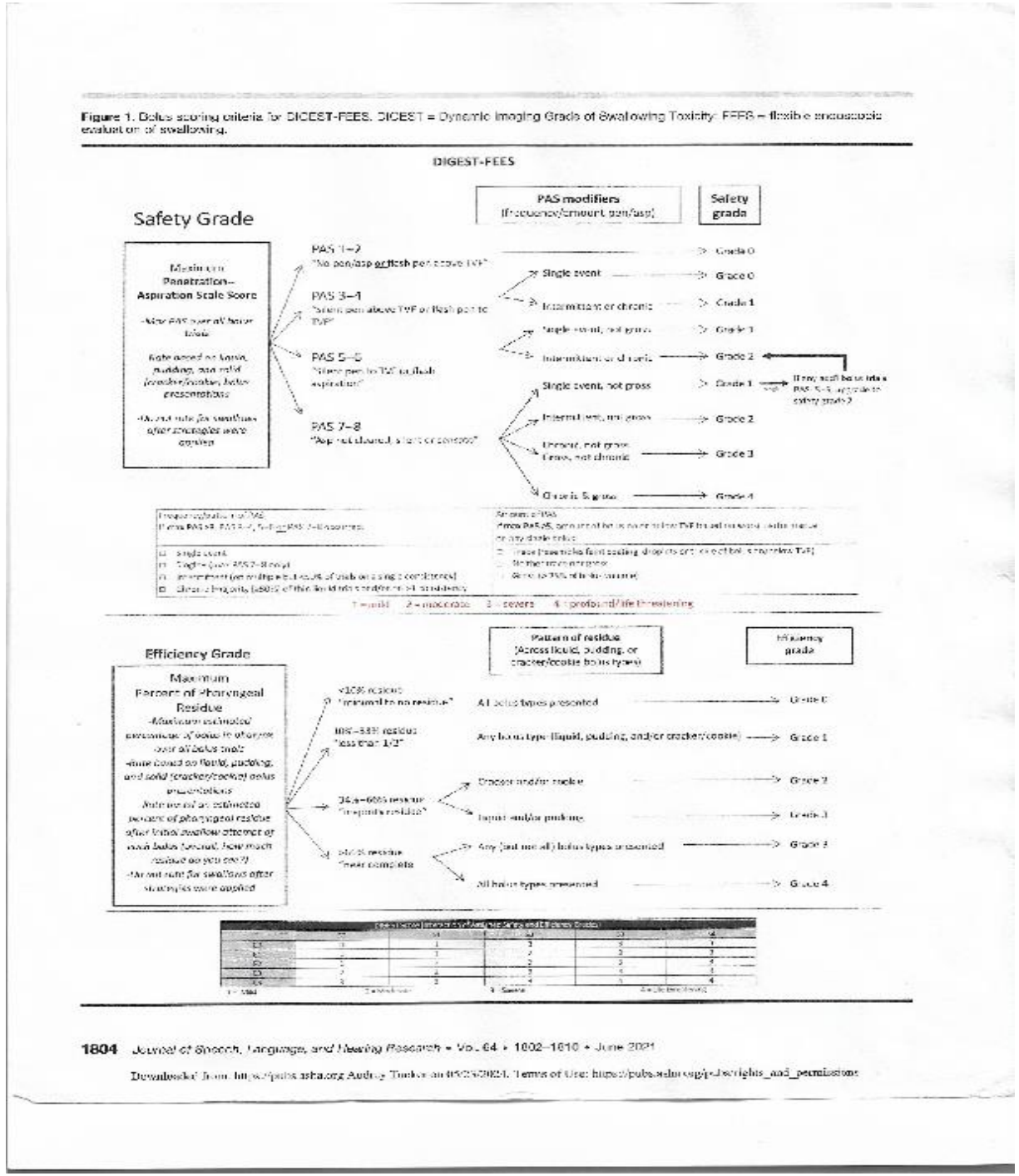


Figure 1. Bolus scoring criteria for DIGEST-FEES. DIGEST = Dynamic Imaging Grade of Swallowing Toxicity; FEES = flexible endoscopic evaluation of swallowing.

DIGEST-FEES

Safety Grade

Maximum Penetration–Aspiration Scale Score

PAS 1–2

PAS 3–4

PAS 5–6

PAS 7–8

PAS modifiers (If present/amount, pen/asp)

Safety grade

Single event

Grade 0

Grade 1

Grade 2

Grade 3

Grade 4

Efficiency Grade

Maximum Percent of Pharyngeal Residue

Pattern of residue (Across liquid, pudding, or cracker/cookie bolus types)

Efficiency grade

<10% residue

10%–33% residue

34%–66% residue

>66% residue

All bolus types presented

Any bolus type (liquid, pudding, and/or cracker/cookie)

Cracker and/or cookie

Liquid and/or pudding

Any (but not all) bolus types presented

All bolus types presented

Grade 0

Grade 1

Grade 2

Grade 3

Grade 4

Biomechanical Actions During the Oropharyngeal Swallow

- Velar-Tongue Seal
- Tongue Base Retraction
- Arytenoid then True Vocal Fold Closure
- Laryngeal Elevation
- Epiglottic Inversion
- Pharyngeal Shortening
- Pharyngeal Squeeze-Lateral pharyngeal wall medialization
- UES opening

- Langmore 2001

Report Writing

- 1. Identify the biomechanical impairment related to the patient's medical problem as well as the inefficiencies that the impairment causes.

2. Swallowing safety is the primary consideration –address it early in the report

3. Formula for a diagnosis:
   a. Severity of dysphagia
   b. Specific symptom assessed
   c. Relationship- secondary to…
   d. Primary medical disorder- CVA, HNC, Parkinsons

General Evaluation Structure

1. General summary statement
2. Assessment of safety, problem avenue and consistencies, why penetration/aspiration occurred and biomechanical reason.
3. Address efficiency: problems, location, and biomechanical reasons why
4. Statement of risk

SA Swallowing Services-John Ashford

Report Summary Formula

Pt. exhibited

+

Biomechanical Impairment (reduced hyolaryngeal elevation)

+

Swallowing deficit caused (penetration, aspiration etc.)

+

When did deficit occur (before, during, after swallow)

+

Where did deficit occur (over epiglottis, between arytenoids etc)

SA Swallowing Services-John Ashford

Example 1

Patient exhibited delayed pharyngeal swallow with spillage to the left pyriform sinus combined with reduced hyolaryngeal elevation which resulted in silent aspiration before the swallow between the arytenoids.

How to Treat?

Trial of head turn left and chin tuck

Improve timing of pharyngeal swallow

Hyolaryngeal elevation exercises

SA Swallowing Services-John Ashford

Example 2

Liquid bolus material spilled prematurely over the epiglottis into the open laryngeal vestibule prior to the swallow onset secondary to impaired velar-tongue seal and resulted in silent aspiration. After the swallow, residue remained in the pharyngeal cavities as a result of reduced pharyngeal squeeze. Subsequent cleansing swallows resulted in the residual material spilling over the aryepiglottic folds and the interarytenoid space with silent aspiration.

How To Treat:

LSVT

EMST

Improve laryngeal closure, pharyngeal strength, tongue strength

Diet modifications?

SA Swallowing Services-John Ashford

Compensatory Strategies With Biomechanical Dysfunction

Dysfunction	**<u>Premature Spillage</u>** **Incomplete bolus formation** **Loss of bolus control** **Inappropriate head position** **Cognitive Deficits**
Deficit	Impaired lingual velar seal Lack of sensation
Compensatory Strategies/Rehabilitation	Chin Tuck Bolus Hold Head Turn

Compensatory Strategies With Biomechanical Dysfunction

Dysfunction	**Vallecular Residue**
Deficit	Impaired tongue base retraction Impaired lateral wall squeeze Impaired hyolaryngeal elevation which reduces epiglottic inversion
Compensatory Strategies/Rehabilitation	Effortful Swallow Double Swallow Head Turn/Chin Down Alternate Textures

Compensatory Strategies With Biomechanical Dysfunction

Dysfunction	**Pyriform Sinus Residue**
Deficit	Impaired pharyngeal shortening Impaired lateral wall squeeze Impaired hyolaryngeal reducing UES opening Impaired UES opening
Compensatory Strategies/Rehabilitation	Effortful Swallow Head Turn Alternate textures Shaker Mendelsohn

Compensatory Strategies With Biomechanical Dysfunction

Dysfunction	**Aspiration or Penetration**	
Deficit	Impaired pharyngeal shortening Epiglottic Inversion Impaired hyolaryngeal reducing UES opening Impaired UES opening Impaired Pharyngeal Shortening	Impaired Vocal Fold Closure
Compensatory Strategies/Rehabilitation	Mendelsohn Breath Hold- Superglottic Swallow, Super Supraglottic Swallow Cough Re-swallow Effortful Swallow	

Compensatory Strategies With Biomechanical Dysfunction

Dysfunction	**UES Opening/Closing**
Deficit	Pyriform Stasis, Vallecular Stasis, Diffuse pharyngeal stasis Post Cricoid Stasis Laryngeal penetration/aspiration
Compensatory Strategies/Rehabilition	Mendelsohn Shaker Double Swallow Cough/Re-Swallow Head Turn/Tilt

Esophageal Regurgitation

- Bubbling Back
  - Air in esophagus above material in lower esophagus forced upward
  - Regurgitation
    - Retrograde movement of food material in esophagus

Case Study #1

Throat Complaints Mr. Hackett is a 75 year old male referred for evaluation of dysphagia. The patient reports that he has had food sticking in his throat for the past year. No specific antecedent injury, illness, or event marked the onset of this problem. Initially this began is an intermittent problem but has subsequently become somewhat more frequent.

He reports having undergone EGD which is reportedly normal. His swallow study was also normal. The patient's voice quality in general is good. He is a singer and does report some morning raspiness of the voice but otherwise no major changes. He is on omeprazole 20 mg once a day for reflux. His reflux symptom index today is 12.

Past Medical History

Coronary artery disease I25.10 (414.00)

PVC (premature ventricular contraction) I49.3 (427.69)

Hypercholesteremia E78.00 (272.0)

Surgical History

nasal surgery: 2005

Orbital fracture repair

Kidney Stone Removal

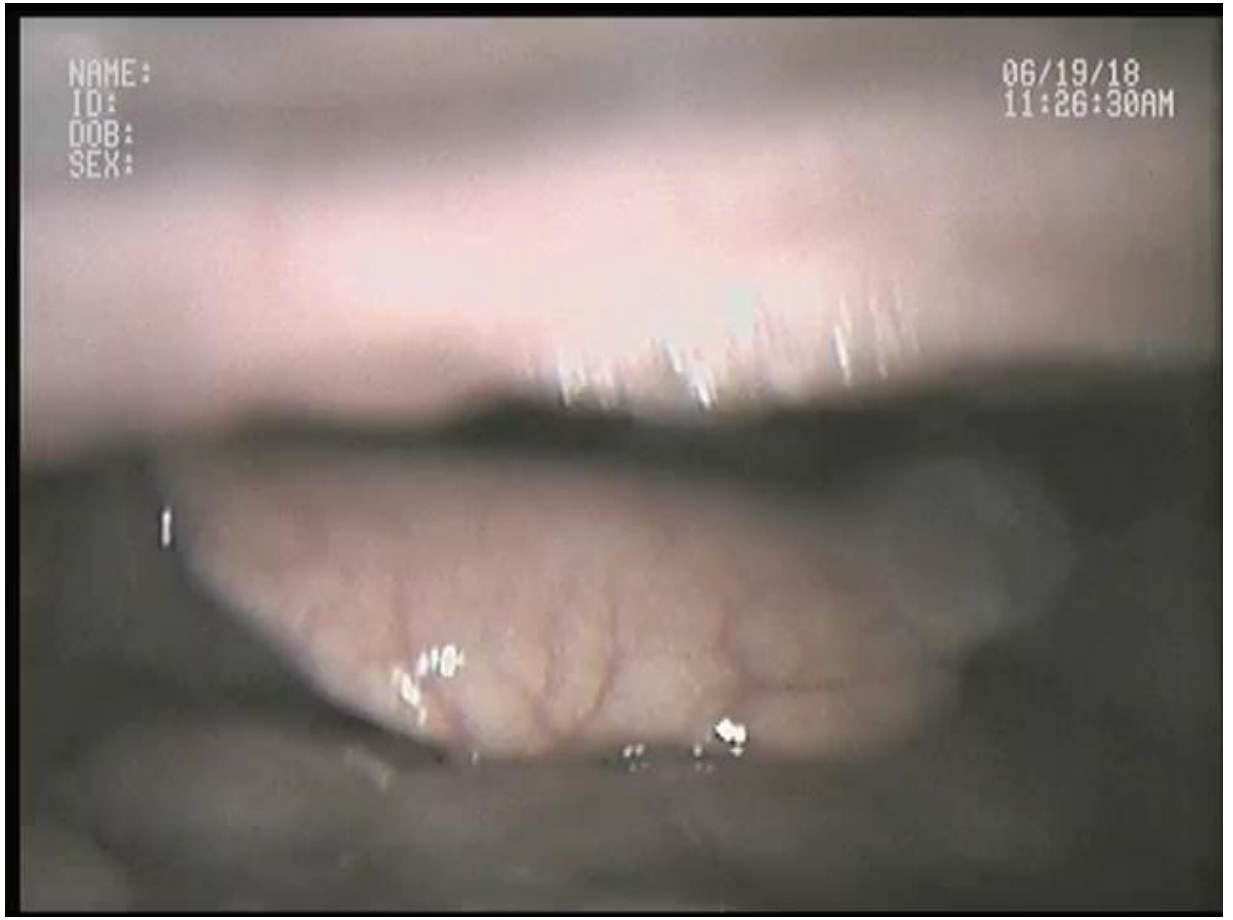
Tonsillectomy and Adenoidectomy

Rotator Cuff Repair

Speech Therapy Exam

- Oral Motor Exam- Within normal limits
- Voice: Mild breathiness, no roughness, is a singer and has noticed reduced range and vocal fatigue
- Modified Barium Swallow Study was reportedly normal

FEES Case Study #1



Case Study Review

- Pen/Asp Score:_____
- Yale Residue Score:_____
- Digest Safety Grade:_____
- Digest Efficiency Grade:_____
- Digest Overall Score:_____

Summary Statement:

_____

_____

_____

_____

_____

_____

_____

_____

_____

Interpretation Case 1

- Pen/Asp Scale Rating: 1 no penetration or aspiration.
- Vallecular/pyriform reside: Vallecular Residue 4 and Pyriform Sinus Residue 1

- DIGEST FEES Safety Grade: 0 Efficiency Grade: 2
- DIGEST FEES Score=1 MILD
- Compensatory Strategies: Chin tuck was not helpful, alternating textures was successful in reducing/eliminating residue from vallecula

Pneumonia "Risk" Predictor

	Oral Health Status		Laryngeal Valve Integrity*		Immune System Status#		Predicted Outcome*# JRA
1	Good	+	No Aspiration	+	Normal	=	No Pneumonia
2	Poor	+	No Aspiration	+	Normal	=	No Pneumonia
3	Poor	+	Aspiration	+	Normal	=	No Pneumonia
4	Good	+	Aspiration	+	Normal	=	No Pneumonia
5	Good	+	No Aspiration	+	Reduced	=	No Pneumonia
6	Poor	+	No Aspiration	+	Reduced	=	No Pneumonia
7	Good	+	Aspiration	+	Reduced	=	Low Risk of Pneumonia
8	Poor	+	Aspiration	+	Reduced	=	High Risk of Pneumonia

*Nakajoh et al., 2000

#Tobin & Grenik, 1984;
Shockley, 1995;
Terpenning et al., 2001

Recommendations

- Compensatory Strategies:
  - Alternate Textures
- Rehabilitative Strategies:

  Base of Tongue Strengthening (base of tongue retractors)
  - Effortful Swallow (pharyngeal wall constrictors)

Compensatory Strategies

Impairment	Consequence	Intervention
Lingual Velar Seal	Premature spillage	Chin Down
Tongue Base Retraction	Vallecular Stasis	Effortful Swallow
Epiglottic Inversion	Laryngeal penetration/aspiration	Mendelsohn Maneuver
Arytenoid/Vocal fold closure	Laryngeal aspiration	Breath hold

Compensatory Strategies

Impairment	Consequence	Intervention
Laryngeal Elevation	Laryngeal penetration/aspiration	Mendelsohn Maneuver
Pharyngeal Shortening	Laryngeal penetration/aspiration Pyriform sinus stasis Reduced UES opening	Effortful Swallow Effortful Swallow Effortful Swallow
Pharyngeal Wall Squeeze	Vallecular Stasis Pyriform Stasis Post pharyngeal wall stasis	Effortful Swallow Head Turn Alternate solids and liquids
UES opening/closing	Pyriform sinus stasis/vallecular stasis Post cricoid stasis Laryngeal penetration/aspiration	Shaker 2nd swallow Cough/re-swallow

Example of Report Case Study #1

Patient exhibited reduced tongue base retraction and reduced pharyngeal wall squeeze resulting in moderate residue in the vallecula after the swallow. Patient's swallow is safe with all consistencies, but moderately inefficient. Patient presenting with mild pharyngeal phase dysphagia secondary to moderate pooling in the vallecula.

Recommendations: Discussed compensatory strategies and/or trial of rehabilitative exercises. Compensatory strategies include small bites/alternate with liquid wash. Rehab exercises should focus on improving tongue base strength/retraction with tongue resistance exercises using biofeedback with IOPI or Tongueometer and improving pharyngeal wall squeeze with effortful swallows.

Case Study #2

Patient is an 85 year old male living in an independent living facility with his wife. He has had increasing difficulty swallowing per family report although due to decreased cognitive status he is largely unaware of difficulty. He is on a mechanical soft diet with thin liquids at home. Family is concerned because he wakes up with a lot of phlegm and coughs throughout his meals as well as several minutes after each meal.

Past Medical History

Coronary artery disease I25.10 (414.00)

Parkinson's disease

Prostate Cancer

Hypercholesteremia E78.00 (272.0)

Surgical History

Open Heart 2015

Internal Hemorrhoid

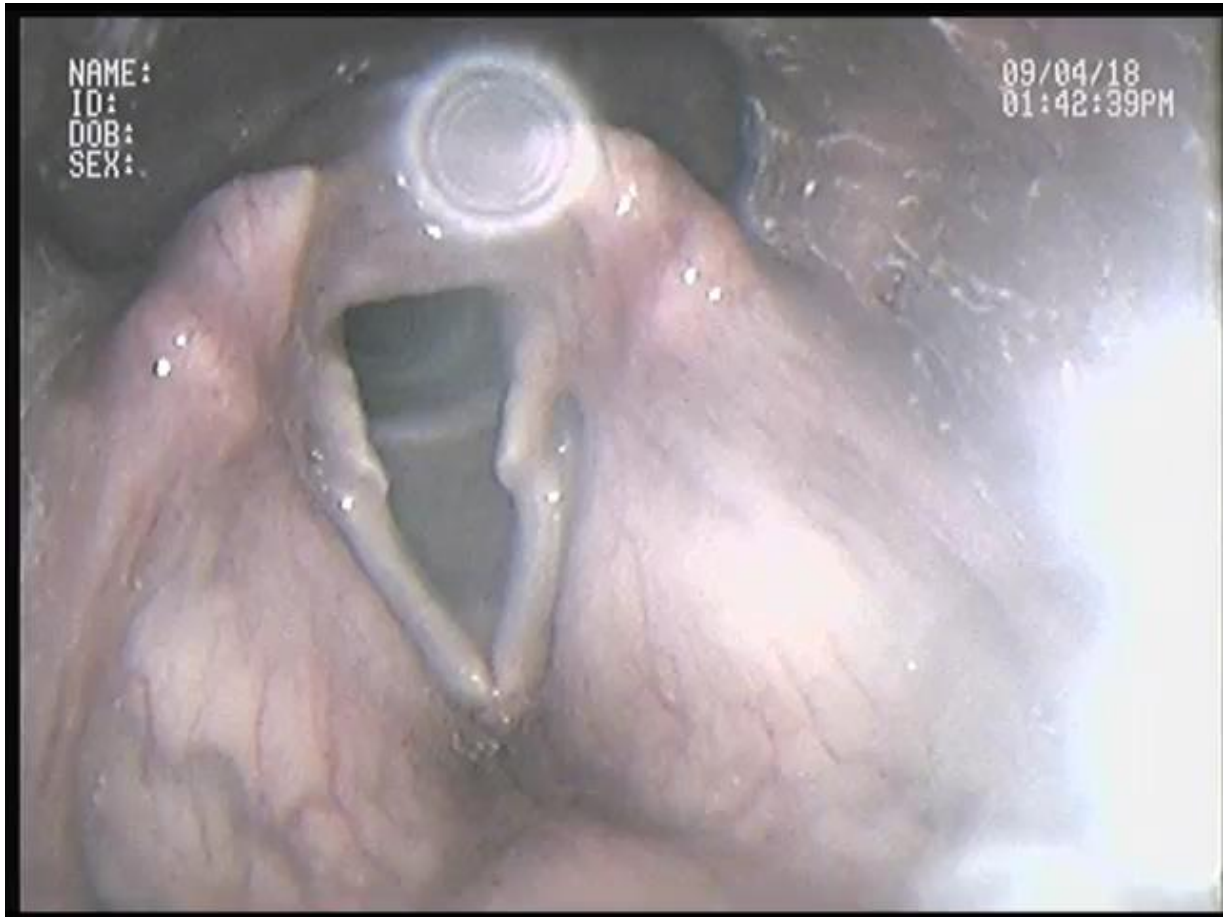
Tonsillectomy and Adenoidectomy

Mitral Valve 2015

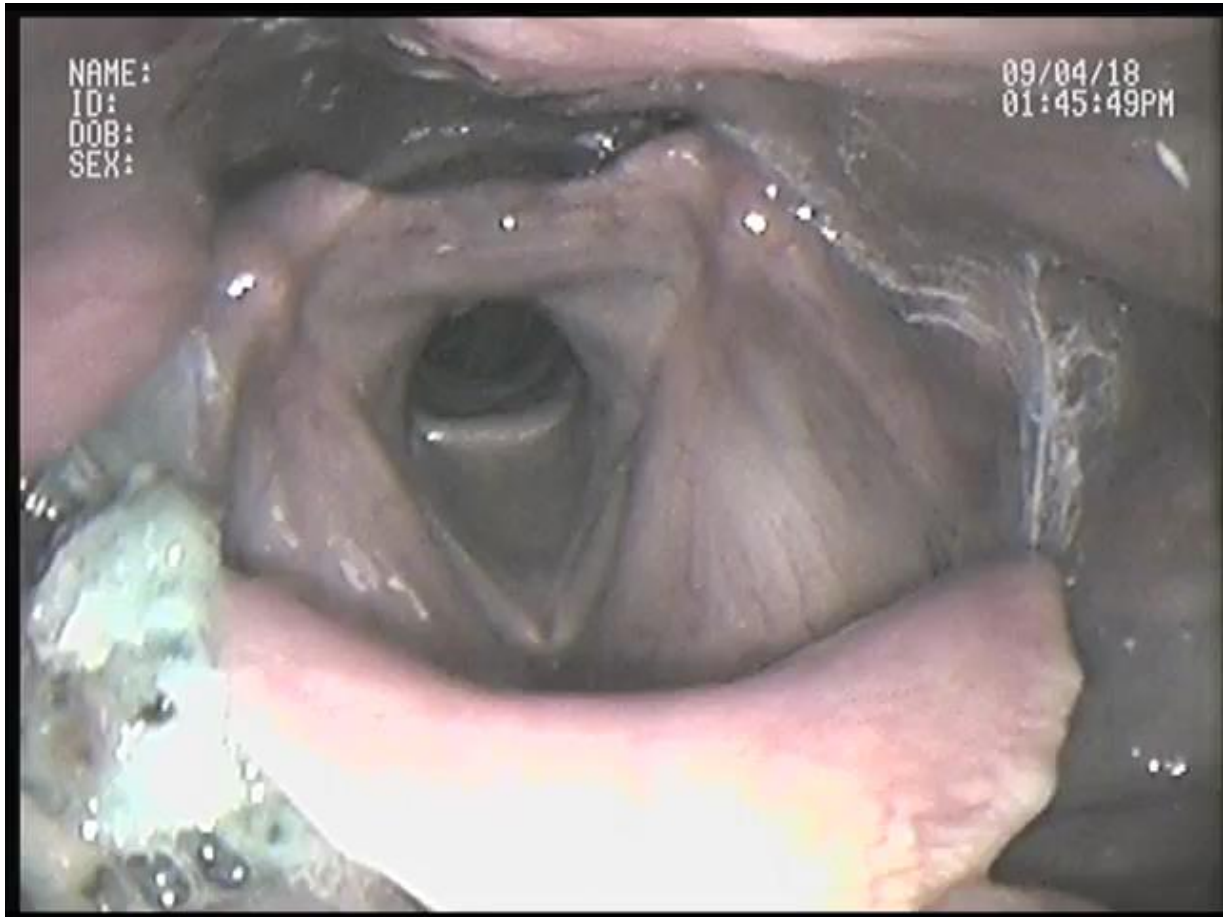
Speech Pathology Evaluation

- Voice moderate-breathiness, significantly reduced intensity
- Oral Motor Exam: Tongue fasciculations, reduced range, speed, strength of movement of the tongue and lips, normal movement of the palate

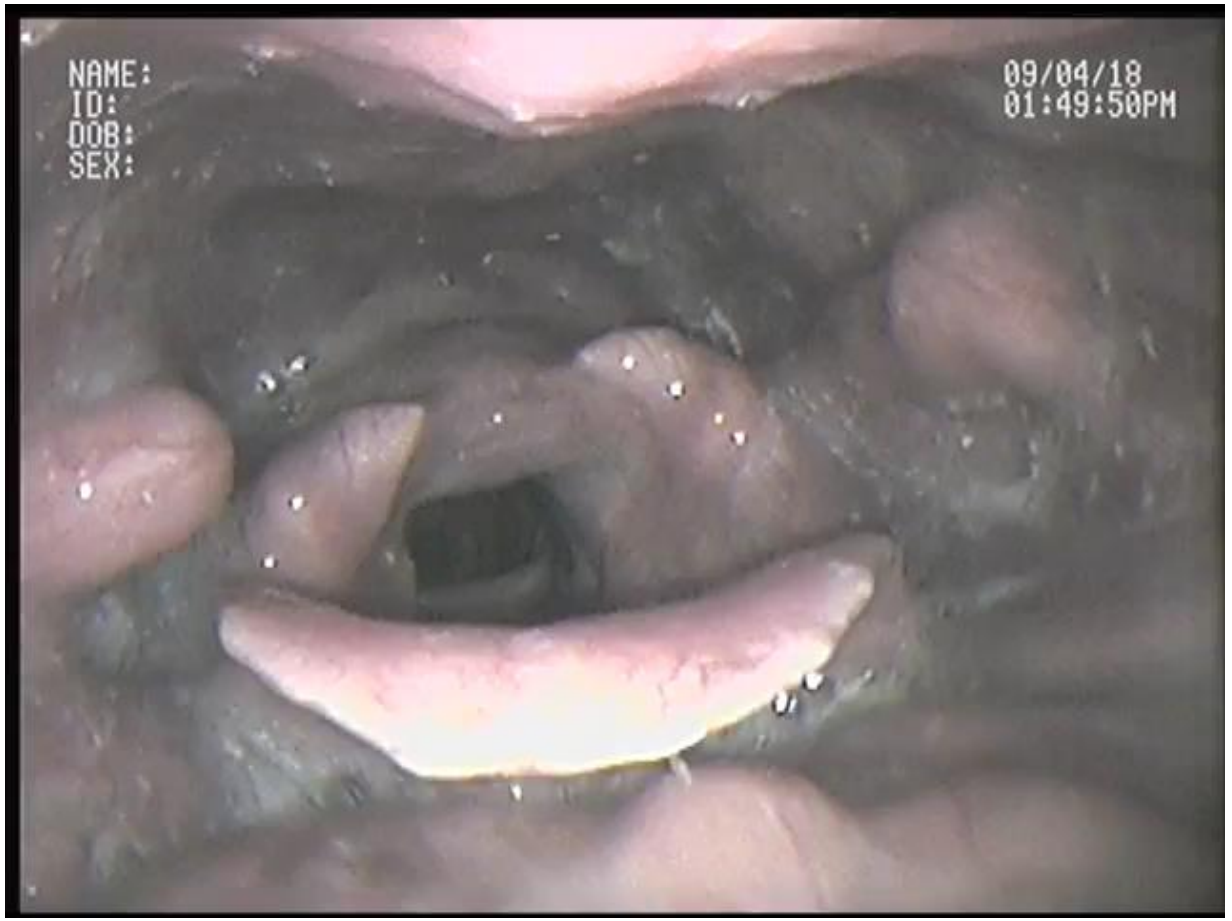
Case Study #2 (clip 1) Pudding



Case Study #2 (clip 2) Ground meat



Case Study #2 (clip 3) Mixed texture



Case Study Review

- Pen/Asp Score:_____
- Yale Residue Score:_____
- Digest Safety Grade:_____
- Digest Efficiency Grade:_____
- Digest Overall Score:_____

Summary Statement:

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Interpretation

- Penetration/Aspiration Scale: 4
- Vallecular/Pyriform Residue: Vallecular is 5 and pyriform sinus is 5.

- DIGEST FEES: Safety Grade- 1 Efficiency Grade- 3

- DIGEST-FEES Score = 2 Moderate

Pneumonia "Risk" Predictor

	Oral Health Status		Laryngeal Valve Integrity*		Immune System Status#		Predicted Outcome*# JRA
1	Good	+	No Aspiration	+	Normal	=	No Pneumonia
2	Poor	+	No Aspiration	+	Normal	=	No Pneumonia
3	Poor	+	Aspiration	+	Normal	=	No Pneumonia
4	Good	+	Aspiration	+	Normal	=	No Pneumonia
5	Good	+	No Aspiration	+	Reduced	=	No Pneumonia
6	Poor	+	No Aspiration	+	Reduced	=	No Pneumonia
7	Good	+	Aspiration	+	Reduced	=	Low Risk of Pneumonia
8	Poor	+	Aspiration	+	Reduced	=	High Risk of Pneumonia

*Nakajoh et al., 2000

#Tobin & Grenik, 1984;
Shockley, 1995;
Terpenning et al., 2001

Example of Report for Case #2

- Patient presenting with moderate pharyngeal phase dysphagia secondary to penetration of solids to the true vocal folds and severe residue post swallow as a result of his reduced cognition and Parkinson's disease. Patient exhibited delayed pharyngeal swallow with spillage to the right pyriform sinus combined with reduced tongue base retraction, delayed epiglottic inversion, delayed vocal fold closure, reduced pharyngeal wall squeeze and laryngeal elevation resulting in penetration to the level of the true vocal folds and severe residue in the vallecula and right pyriform sinus after the swallow. Patient's swallow exhibits mild safety concerns with solid textures and severe efficiency issues.

Recommendations

1. Train compensatory strategies:
   - head turn to the left, small bites, swallow prior to next bite, slow rate, monitor vocal quality
2. Rehabilitative strategies:
   - Patient would benefit from LSVT to improve laryngeal adduction resulting in improved voice and airway protection. EMST-75 for improving strength of cough and pharyngeal phase of swallow.

Case Study #3

Patient is a 50 year old male presenting to the clinic with difficulty swallowing solids. He has a history of a motor vehicle accident with head injury, but is currently cognitively intact and functioning well besides recent onset of difficulty swallowing.

Past Medical History

Motor Vehicle Accident with Brain injury, shoulder injury, lung injury, and mandible broken in 2 places

Surgical History

Esophageal dilation

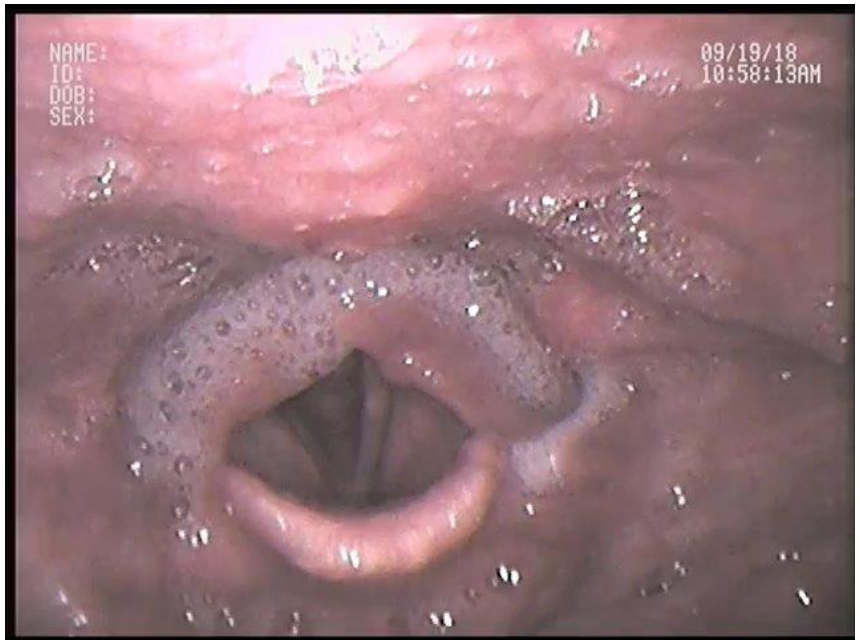
Right shoulder surgery

Tracheotomy

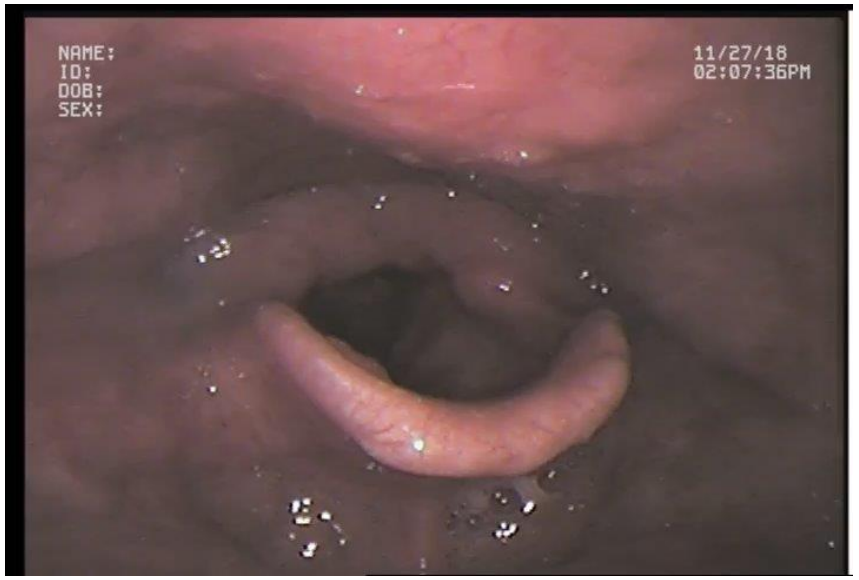
Speech Pathology Exam

- Voice: mild roughness and mild breathiness
- Oral Motor Exam: Normal movement of the tongue and palate, no asymmetry noted of the facial musculature.

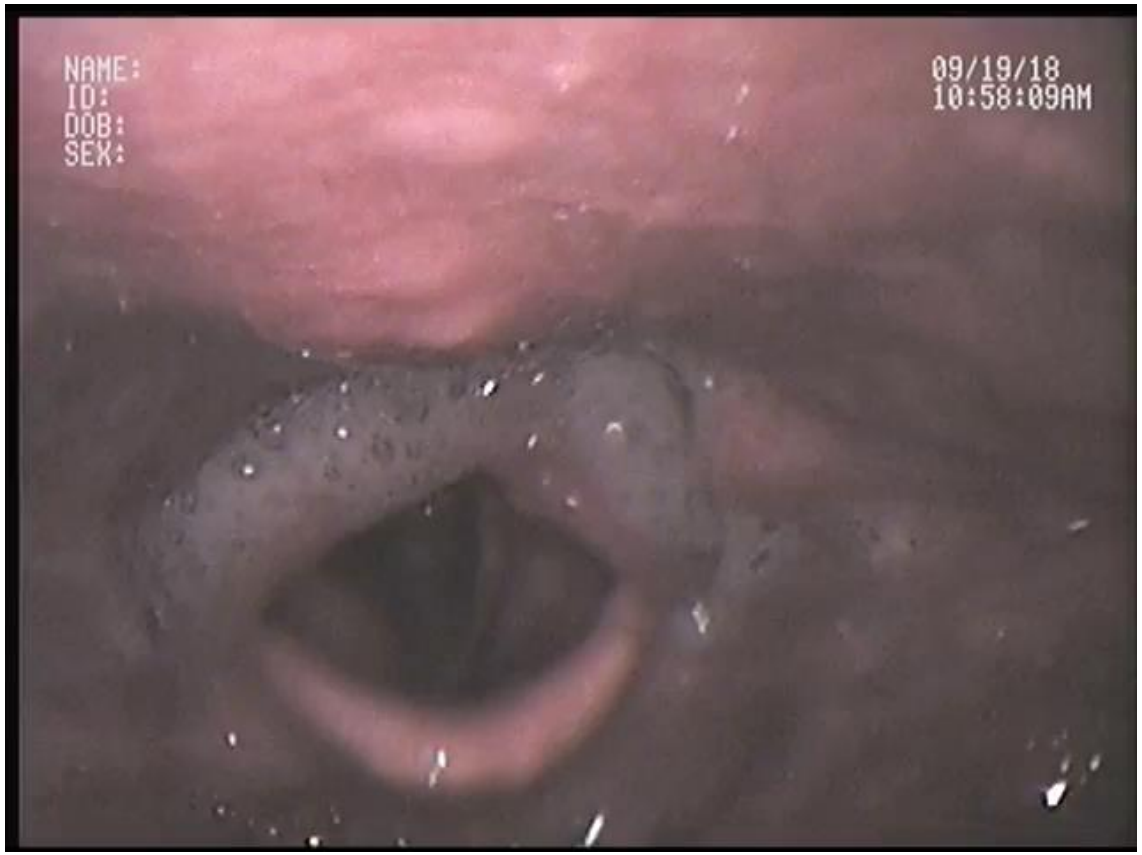
Pooled secretions before esophageal dilation



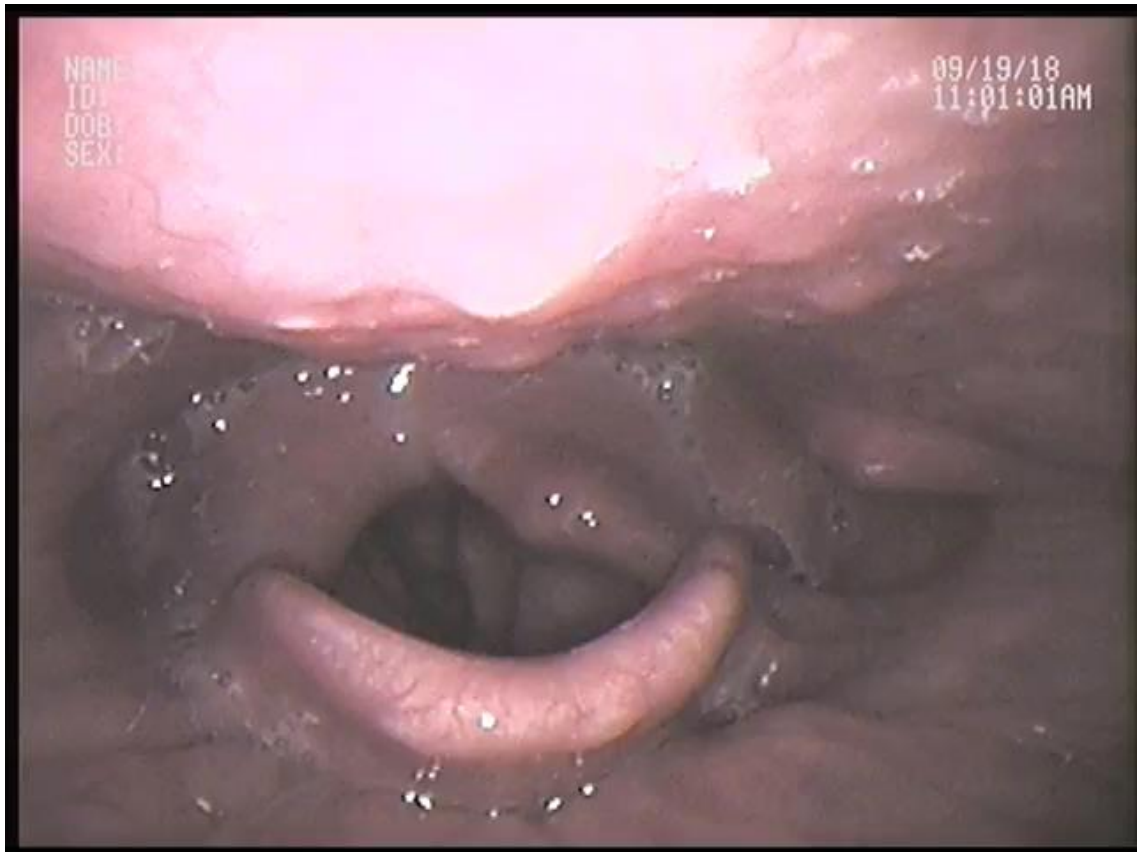
No pooled secretions after esophageal dilation



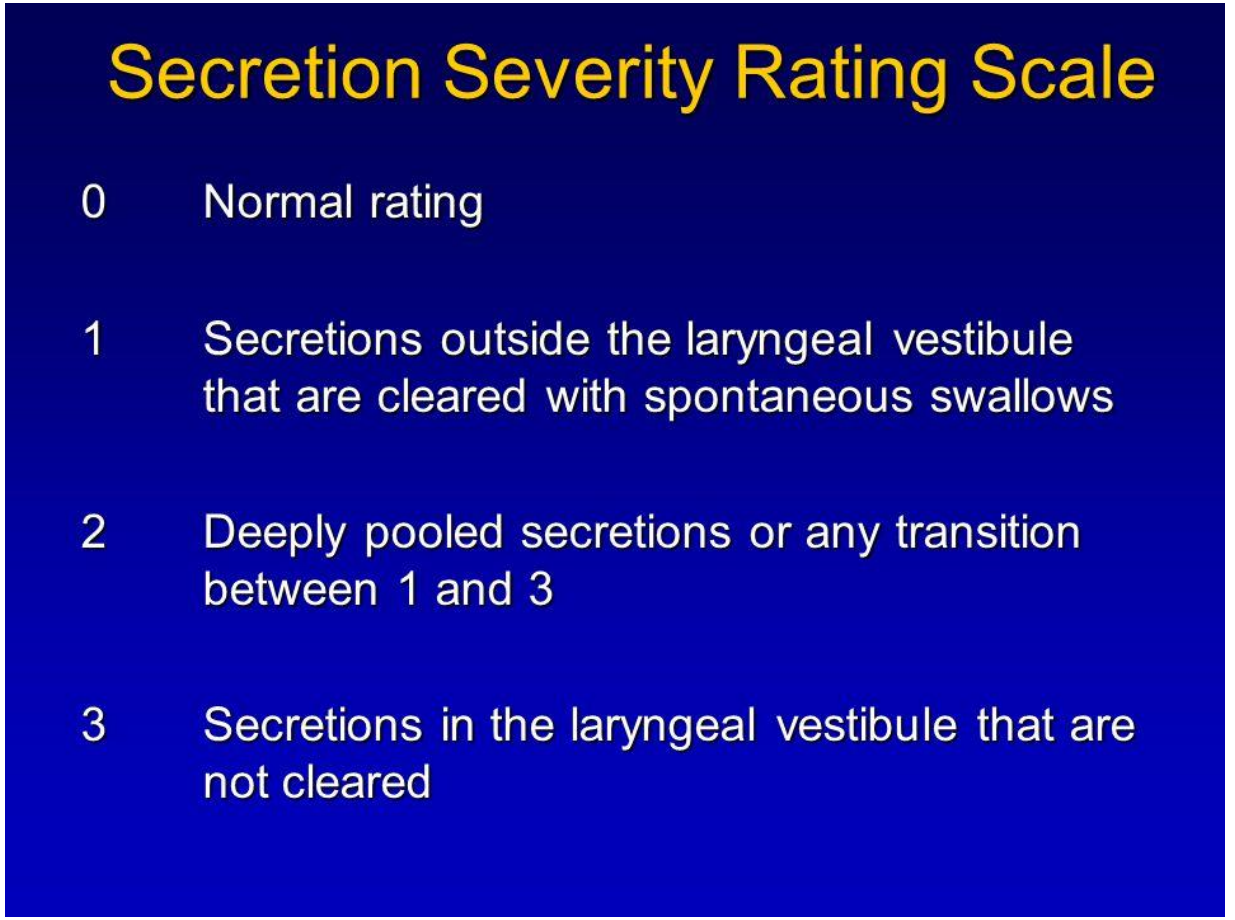
Case Study #3 Video 1



Case Study #3 Video 2



Murray Secretion Rating Scale



Case Study Review

- Pen/Asp Score:_____
- Yale Residue Score:_____
- Digest Safety Grade:_____
- Digest Efficiency Grade:_____
- Digest Overall Score:_____

Summary Statement:

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Interpretation

- Murray Secretion Scale: 3
- Pen/Asp Scale: 8 with material entering the airway, passing below the vocal folds and no effort was made to eject
- Vallecular/pyriform sinus Residue Scale: 5 trace coating in the vallecula, pyriform sinus residue 5
- DIGEST: Safety Grade 3 Efficiency Grade 3
- DIGEST Score= 3 Severe

Pneumonia "Risk" Predictor

	Oral Health Status		Laryngeal Valve Integrity*		Immune System Status#		Predicted Outcome*# JRA
1	Good	+	No Aspiration	+	Normal	=	No Pneumonia
2	Poor	+	No Aspiration	+	Normal	=	No Pneumonia
3	Poor	+	Aspiration	+	Normal	=	No Pneumonia
4	Good	+	Aspiration	+	Normal	=	No Pneumonia
5	Good	+	No Aspiration	+	Reduced	=	No Pneumonia
6	Poor	+	No Aspiration	+	Reduced	=	No Pneumonia
7	Good	+	Aspiration	+	Reduced	=	Low Risk of Pneumonia
8	Poor	+	Aspiration	+	Reduced	=	High Risk of Pneumonia

*Nakajoh et al., 2000

#Tobin & Grenik, 1984;
Shockley, 1995;
Terpenning et al., 2001

Recommendations

- Compensatory Strategy: Chin tuck was helpful in reducing residue especially with solids and right head tilt was also helpful in reducing vallecular residue with solids.
- Scheduled barium swallow and esophageal dilation.

Example of Report for Case #3

- Patient presenting with severe pharyngeal phase deficits secondary to aspiration of liquids and solids and severe residue post swallow as a result of suspected stenosis or narrowing of the UES. Patient exhibited reduced opening of the UES resulting in silent aspiration of both liquids and solids after the swallow and severe residue in both pyriforms and the vallecula. Patient's swallow exhibits significant safety concerns with liquid and solid textures and severe efficiency issues.

Case Study #4

Patient is a 55 year old male diagnosed with T1NaM0 invasive squamous cell carcinoma with primary site in the right lingual tonsil, right base of tongue, HPV negative.

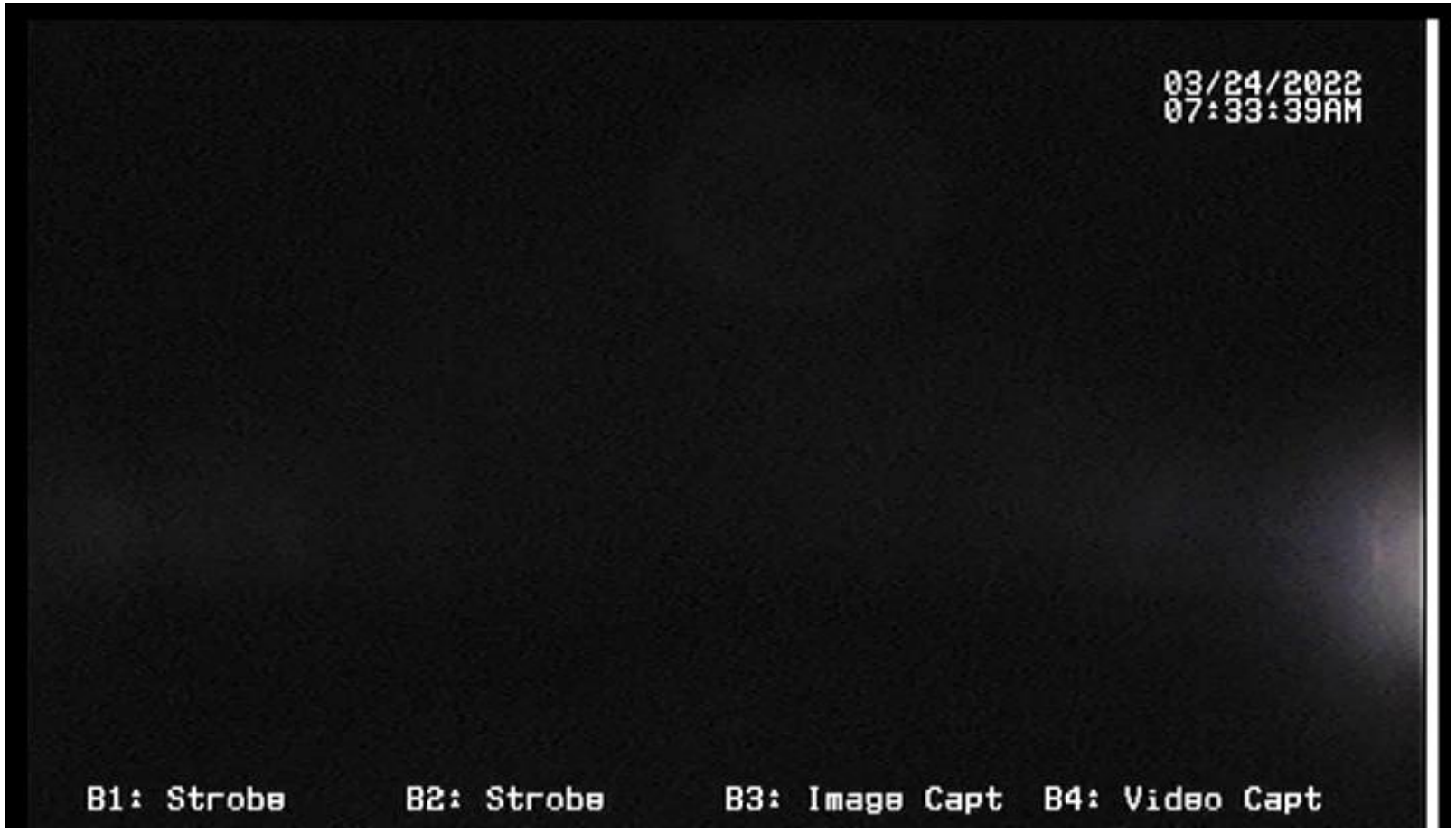
Past Medical History:

Smoked for 5 years ½ ppd, hypothyroidism

Speech Pathology Exam

- Voice: voice is within normal limits
- Oral Motor Exam: Normal range of movement, strength and speed of movement of the articulators. Patient has his own teeth and they are in good condition.

Case Study #4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B4: Video Capt

Case Study Review

- Pen/Asp Score:_____
- Yale Residue Score:_____
- Digest Safety Grade:_____
- Digest Efficiency Grade:_____
- Digest Overall Score:_____

Summary Statement:

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Interpretation

- Murray Secretion Scale: 1
- Pen/Asp Scale: 1 material does not enter airway
- Vallecular Residue Scale: 4 Pyriform sinus residue 1
- DIGEST: Safety Grade 0 Efficiency Grade 2
- DIGEST Score= 1 Mild

Pneumonia "Risk" Predictor

	Oral Health Status		Laryngeal Valve Integrity*		Immune System Status#		Predicted Outcome*# JRA
1	Good	+	No Aspiration	+	Normal	=	No Pneumonia
2	Poor	+	No Aspiration	+	Normal	=	No Pneumonia
3	Poor	+	Aspiration	+	Normal	=	No Pneumonia
4	Good	+	Aspiration	+	Normal	=	No Pneumonia
5	Good	+	No Aspiration	+	Reduced	=	No Pneumonia
6	Poor	+	No Aspiration	+	Reduced	=	No Pneumonia
7	Good	+	Aspiration	+	Reduced	=	Low Risk of Pneumonia
8	Poor	+	Aspiration	+	Reduced	=	High Risk of Pneumonia

*Nakajoh et al., 2000

#Tobin & Grenik, 1984;
Shockley, 1995;
Terpenning et al., 2001

Example of Report for Case #4

- Patient presenting with mild pharyngeal phase deficits secondary to moderate residue in the vallecula post swallow due to radiation induced internal lymphedema. Patient exhibited reduced tongue base retraction and reduced pharyngeal wall squeeze resulting in severe residue in the vallecula after the swallow. Patient's swallow exhibits no safety concerns with liquid and solid textures and mild efficiency issues.

Case #5

Patient is seen at Iowa ENT Center for FEES:

Patient reports she was admitted to the hospital last month for heart failure and pulmonary edema. She was emergently intubated and on a ventilator for one day. She has had hoarseness since she was extubated a day after admission. She tells me that her voice has gradually improved since the extubation but she has not regained her normal voice. Shortly after her extubation in the hospital she had a swallow assessment and this did demonstrate aspiration. We were asked to evaluate her to see if she is still having aspiration. She denies problems with throat pain. She does have coughing if she drinks water. According to the family there was no reported difficulty with her intubation and no history of prior hoarseness. She is here with her daughter.

Past Medical History

CAD (coronary artery disease) I25.10 (414.00)

Hyperlipidemia E78.5 (272.4)

Female bladder prolapse N81.10 (618.01)

Diabetes E11.9 (250.00)

Breast cancer C50.919 (174.9)

Surgical History

Cataract Surgery

Hysterectomy

Mastectomy

Cardiac Bypass Surgery

Speech Pathology Exam

- Voice: mild roughness and moderate breathiness
- Oral Motor Exam: Normal range of movement, strength and speed of movement of the articulators. Patient has dentures which appear to fit well.
- Patient resides at home and is on a regular diet with thin liquids.

Case Study #5 video 1 (before treatment)

Case Study Review

- Pen/Asp Score:_____
- Yale Residue Score:_____
- Digest Safety Grade:_____
- Digest Efficiency Grade:_____
- Digest Overall Score:_____

Summary Statement:

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Interpretation Case 5

- Pen/Asp Scale Rating: 8 material passes below the level of the vocal folds with no attempt to remove
- Vallecular/pyriform reside: 1 residue in valleculae and 1 residue in the pyriforms
- DIGEST: Safety Grade 3 Efficiency Grade 1 Score= 3 Severe with thin
- Compensatory Strategies: Chin tuck and breath hold not effective for eliminating aspiration with thin liquids therefore recommending nectar thick liquids

Recommendations

- Patient presenting with severe pharyngeal phase dysphagia characterized by silent aspiration of thin liquids.
- It was assumed this was due to significant bowing of the true vocal folds therapy focused on strengthening glottal closure with straw exercises and effortful pitch glides. Valsalva was not recommended due to heart condition and recent surgery.

Example of Report for Case #5

- Patient presenting with severe pharyngeal phase deficits secondary to severe atrophy of the left true vocal fold. Patient exhibited incomplete closure of the true vocal folds during the swallow causing silent aspiration of thin liquids during the swallow. Patient's swallow exhibits significant safety concerns with thin liquid, no safety concerns with mildly thick liquids and no efficiency concerns with any texture were noted.

Case Study #5 Video 2 Post Treatment

Interpretation Case #5 post treatment

- Pen/Asp Scale Rating: 3 Material enters the airway, remains above the TVFs, is not ejected
- Valleculer/pyriform reside: 2 residue noted in pyriforms and valleculae as well as trace coating near cricopharyngeus area
- DIGEST: Safety Grade 1 Efficiency Grade 1 Score= 1 Mild
- Compensatory Strategies: Patient no longer needed nectar thick liquids, she was safe for intake with head in neutral position for thin liquids.

Pneumonia "Risk" Predictor

	Oral Health Status		Laryngeal Valve Integrity*		Immune System Status#		Predicted Outcome*# JRA
1	Good	+	No Aspiration	+	Normal	=	No Pneumonia
2	Poor	+	No Aspiration	+	Normal	=	No Pneumonia
3	Poor	+	Aspiration	+	Normal	=	No Pneumonia
4	Good	+	Aspiration	+	Normal	=	No Pneumonia
5	Good	+	No Aspiration	+	Reduced	=	No Pneumonia
6	Poor	+	No Aspiration	+	Reduced	=	No Pneumonia
7	Good	+	Aspiration	+	Reduced	=	Low Risk of Pneumonia
8	Poor	+	Aspiration	+	Reduced	=	High Risk of Pneumonia

*Nakajoh et al., 2000

#Tobin & Grenik, 1984;
Shockley, 1995;
Terpenning et al., 2001

Case Study #6

Patient is a 45 year old female complaining of aphonia and dysphagia.

Past Medical History

- **Spinal cord injury**
- **broken bones**
- **vocal fold paralysis**
- **Shunt Placement**

Surgical History

Hysterectomy .

shunt placement.

tracheotomy.

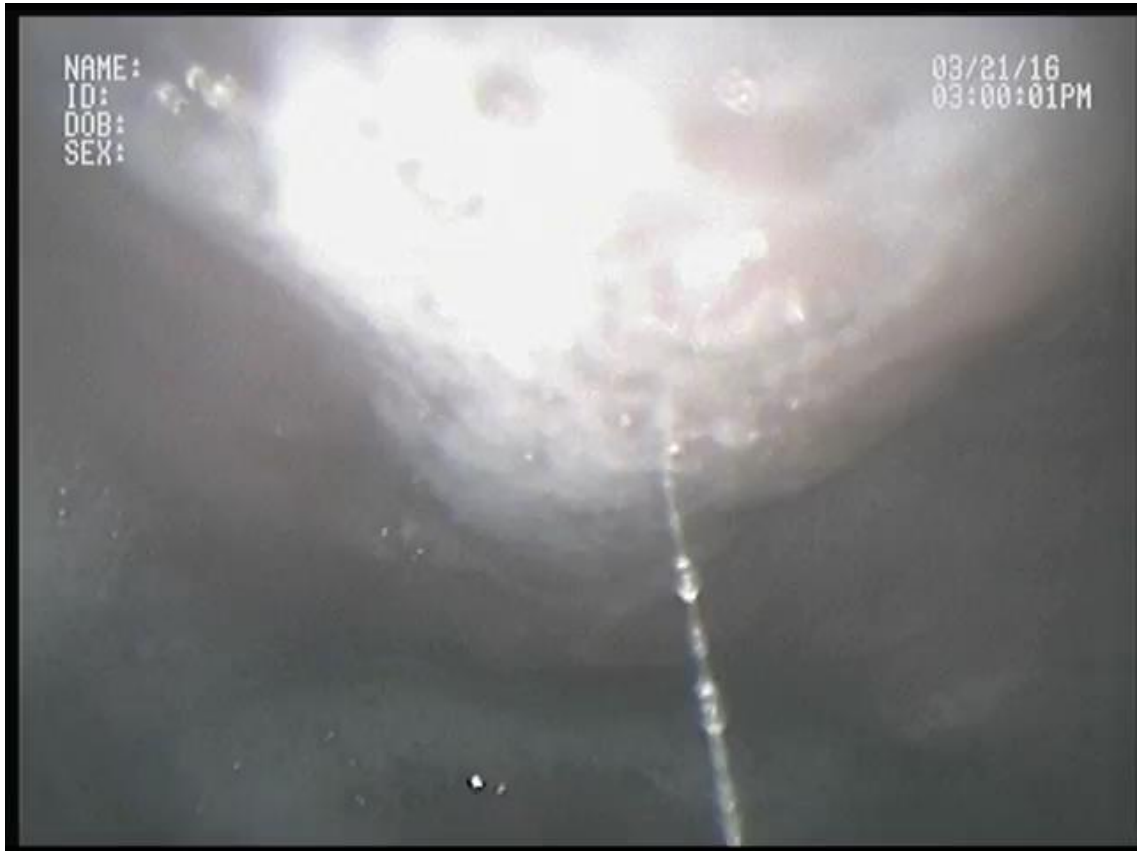
Leg Surgery .

Spinal Surgery.

Speech Pathology Evaluation

- Voice: severe breathiness, patient speaks in 2-3 word utterances
- Oral Motor Exam: Labial closure WNL, tongue has fasciculations, moderate weakness with lateralization, protrusion and retraction. Moderate palatal weakness, voice is hypernasal.

Case Study #6 Video 1



Case Study Review

- Pen/Asp Score:_____
- Yale Residue Score:_____
- Digest Safety Grade:_____
- Digest Efficiency Grade:_____
- Digest Overall Score:_____

Summary Statement:

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Interpretation

- Pen/Asp Scale: 8 with material entering the airway, passing below the vocal folds and is not ejected from the trachea despite effort.
- Vallecular/pyriform sinus Residue Scale: 5 severe residue in the valleculae, pyriform sinus residue 5
- DIGEST Safety Grade 4 Efficiency Grade 4 Score= 4 Life Threatening?????

Recommendations

Patient presenting with severe pharyngeal phase dysphagia. She is presently on a soft diet with thin liquids. She uses a percussion vest twice daily. Has not had pneumonia for several years. Long discussion with patient and her husband regarding risks of continued PO intake. Would recommend training frequent cough/throat clearing, hard breath hold, EMST-75 and continuing with percussion vest.

Example of Report for Case #5

- Patient presenting with severe pharyngeal phase deficits secondary to severe sensory deficits and severely reduced ability to protect her airway. Patient exhibited reduced tongue base retraction, no epiglottic inversion, poor laryngeal closure due to bilateral paresis of the true vocal folds, poor laryngeal elevation and severely reduced pharyngeal shortening/squeeze causing silent aspiration of all textures and her own secretions. Patient's swallow exhibits severe safety concerns with all textures and also significant efficiency concerns with severe residue throughout the hypopharynx after the swallow. Patient does have an inconsistent cough with airway invasion but this is not functional in removing material from airway.

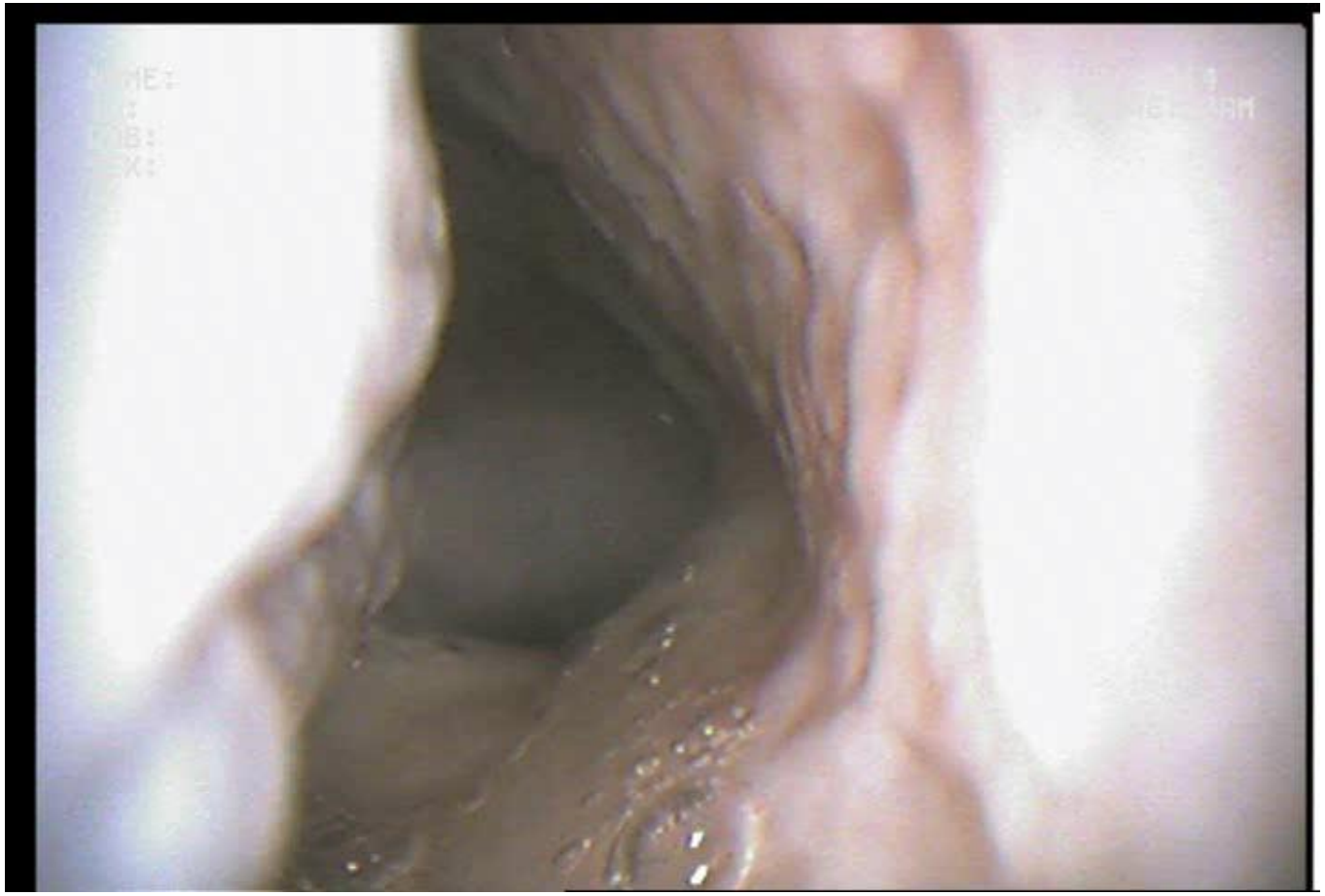
Pneumonia "Risk" Predictor

	Oral Health Status		Laryngeal Valve Integrity*		Immune System Status#		Predicted Outcome*# JRA
1	Good	+	No Aspiration	+	Normal	=	No Pneumonia
2	Poor	+	No Aspiration	+	Normal	=	No Pneumonia
3	Poor	+	Aspiration	+	Normal	=	No Pneumonia
4	Good	+	Aspiration	+	Normal	=	No Pneumonia
5	Good	+	No Aspiration	+	Reduced	=	No Pneumonia
6	Poor	+	No Aspiration	+	Reduced	=	No Pneumonia
7	Good	+	Aspiration	+	Reduced	=	Low Risk of Pneumonia
8	Poor	+	Aspiration	+	Reduced	=	High Risk of Pneumonia

*Nakajoh et al., 2000

#Tobin & Grenik, 1984;
Shockley, 1995;
Terpenning et al., 2001

Case Study # 7 Laryngectomy Endoscopy/TNE



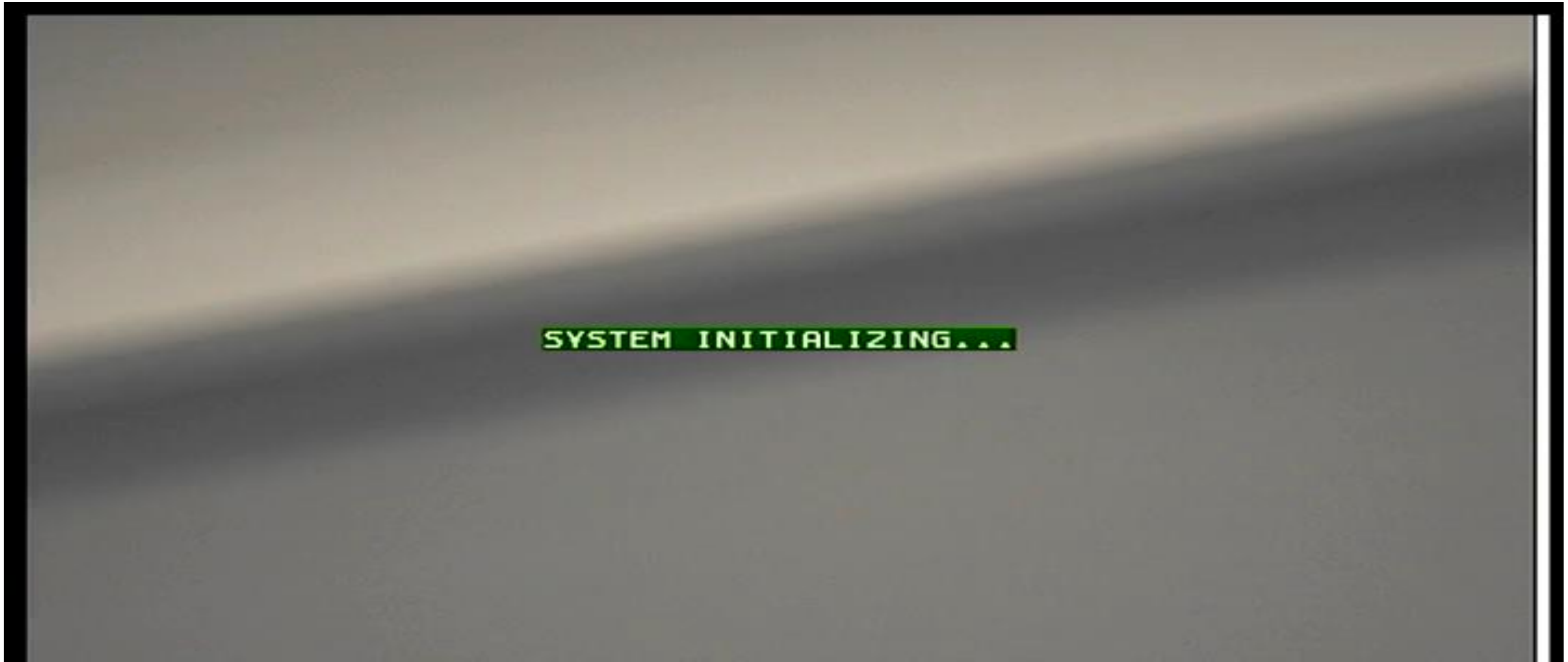
Case Study #8

- Patient is a 61 year old male. History of base of tongue cancer diagnosed in 2015, status post pec flap of left hypopharynx and chemoradiation. He was initially being seen with complaints of significant weight loss in the last few months and increasing difficulty swallowing. There is questionable history of aspiration pneumonia treated with antibiotics.
- Past medical history: Base of tongue cancer 2015, vertigo, history of PEG, history of trach, acute bronchitis, carotid artery stenosis, cellulitis, GERD, lymphedema

Speech Pathology Evaluation

- Voice: Voice quality is within normal limits
- Oral Motor Exam: Labial closure WNL, tongue has fasciculations, moderate weakness with lateralization, protrusion and retraction.

Case Study #8 Severe Dysphagia



Case Study Review

- Pen/Asp Score:_____
- Yale Residue Score:_____
- Digest Safety Grade:_____
- Digest Efficiency Grade:_____
- Digest Overall Score:_____

Summary Statement:

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Interpretation

- Pen/Asp Scale: 7 with material entering the airway, passing below the vocal folds and is not ejected from the trachea despite effort
- Vallecular/pyriform sinus Residue Scale: 3 mild coating in the hypopharynx, right pyriform sinus and post cricoid regions. Unable to visualize after first swallow.
- DIGEST Safety Grade 3 Efficiency Grade 1 Score= 3 Severe pharyngeal phase dysphagia

Example of Report for Case #8

- Patient presenting with severe pharyngeal phase deficits secondary to late radiation associated dysphagia and reconstruction of the hypopharynx following HNC diagnosis. Patient exhibited severely reduced tongue base retraction due to atrophy, absent epiglottis, severely reduced laryngeal elevation and poor pharyngeal shortening and squeeze during the swallow causing aspiration of all textures during and after the swallow. Patient's swallow exhibits significant safety concerns but does have a strong cough and was able to remove the majority of the tested material from his airway. Patient practices meticulous oral care, he has an active lifestyle and good general health, no polypharmacy.

Pneumonia "Risk" Predictor

	Oral Health Status		Laryngeal Valve Integrity*		Immune System Status#		Predicted Outcome*# JRA
1	Good	+	No Aspiration	+	Normal	=	No Pneumonia
2	Poor	+	No Aspiration	+	Normal	=	No Pneumonia
3	Poor	+	Aspiration	+	Normal	=	No Pneumonia
4	Good	+	Aspiration	+	Normal	=	No Pneumonia
5	Good	+	No Aspiration	+	Reduced	=	No Pneumonia
6	Poor	+	No Aspiration	+	Reduced	=	No Pneumonia
7	Good	+	Aspiration	+	Reduced	=	Low Risk of Pneumonia
8	Poor	+	Aspiration	+	Reduced	=	High Risk of Pneumonia

*Nakajoh et al., 2000

#Tobin & Grenik, 1984;
Shockley, 1995;
Terpenning et al., 2001

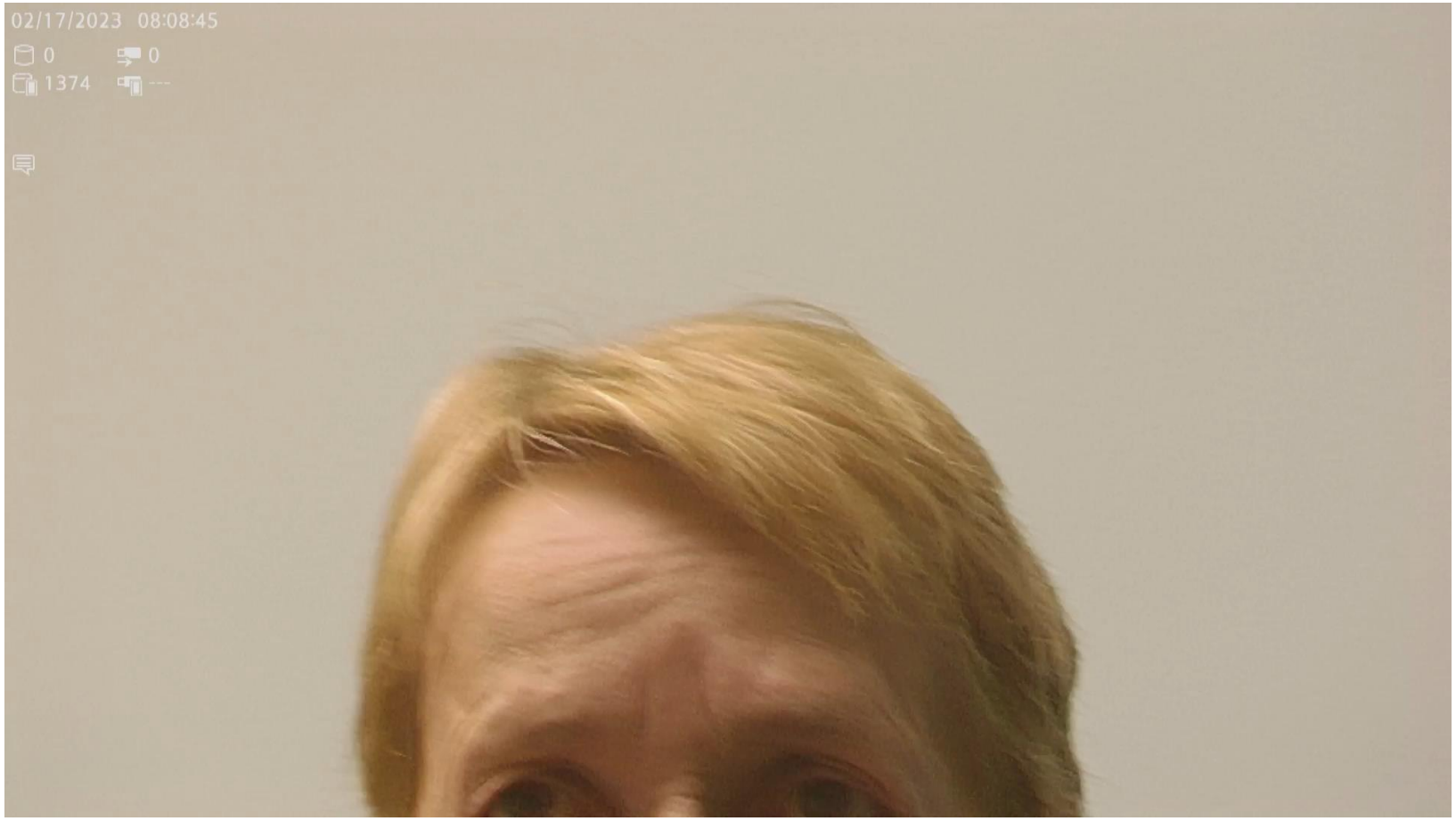
Case Study #9

- DIAGNOSIS: Patient is a 62 year old female. Malignant lesion of oropharynx (J39.2), Squamous cell carcinoma of soft palate, Status post radical neck dissection right, history or radiation therapy to head and neck, s/p right radial forearm free flap graft PEG, Dysphagia
- HISTORY: Patient's past medical history is significant for T2N0M0 p16-right tonsil SCC, s/p radiation 12/2017, TORS mandibulectomy, tracheotomy, unilateral neck dissection, radial forearm free flap on 4-10-18. Patient had a recent recurrence of her cancer in the left base of tongue. Patient recently completed a second round of chemotherapy and radiation therapy at the University of Iowa.

Speech Pathology Evaluation

- Voice: Voice severe hypernasality, mild-moderate dysphonia
- Oral Motor Exam: Labial closure WNL, tongue has fasciculations, severe weakness with lateralization, protrusion and retraction. Moderate palatal weakness

Case Study # 9



Case Study # 9 FEES

Case Study Review

- Pen/Asp Score:_____
- Yale Residue Score:_____
- Digest Safety Grade:_____
- Digest Efficiency Grade:_____
- Digest Overall Score:_____

Summary Statement:

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Interpretation

- Pen/Asp Scale: 1 with no material entering the airway
- Vallecular/pyriform sinus Residue Scale: 5 severe residue throughout the hypopharynx, vallecula, pyriforms and coating on the flap or donor tissue.
- DIGEST Safety Grade 0 Efficiency Grade 3 Score= 2 Moderate pharyngeal phase dysphagia

Pneumonia "Risk" Predictor

	Oral Health Status		Laryngeal Valve Integrity*		Immune System Status#		Predicted Outcome*# JRA
1	Good	+	No Aspiration	+	Normal	=	No Pneumonia
2	Poor	+	No Aspiration	+	Normal	=	No Pneumonia
3	Poor	+	Aspiration	+	Normal	=	No Pneumonia
4	Good	+	Aspiration	+	Normal	=	No Pneumonia
5	Good	+	No Aspiration	+	Reduced	=	No Pneumonia
6	Poor	+	No Aspiration	+	Reduced	=	No Pneumonia
7	Good	+	Aspiration	+	Reduced	=	Low Risk of Pneumonia
8	Poor	+	Aspiration	+	Reduced	=	High Risk of Pneumonia

*Nakajoh et al., 2000

#Tobin & Grenik, 1984;
Shockley, 1995;
Terpenning et al., 2001

Example of Report for Case #9

- Patient presenting with moderate pharyngeal phase deficits secondary to late radiation associated dysphagia and reconstruction of the hypopharynx. Patient exhibited reduced tongue base retraction, no epiglottic inversion, reduced laryngeal elevation and pharyngeal constriction only of the left hypopharynx with no pharyngeal stripping observed. Patient's swallow exhibits no safety concerns but significant efficiency issues. Patient is compensating well with left head tilt and alternating with liquid wash. Overall patient practices meticulous oral health, leads an active lifestyle, and her general health is good. Therefore, she is at low risk for development of prandial PNA.

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