Deglutition: “... the semiautomatic motor action of the muscles of the respiratory and gastrointestinal tracts to propel food from the oral cavity to the stomach.” Miller, 1996

[French déglutition, from déglutir, to swallow, from Latin dgltre : d-, de- + gltre, to gulp.]

“Deglutition” is a French word, which evolved from the Latin “deglutire” (to swallow down). Related to “glutton” (someone who eats too much).

Swallowing Begins during Pre-natal Development

- Plays a role in the regulation of amniotic fluid volume and contributes to development of GI tract and fetal growth
- Frequency increases as infant approaches term

El-Haddad et al. J.Soc Gynecol Investig. 2004

Fetal Swallowing

Attainment of oral feeding does not depend on the presence of a fully mature suck-swallow pattern – suggesting that as with acquisition of other motor milestone, learning continues to occur.

Brigham, J. Child Neurol. 2009
Frequency of Deglutition

- **Occurs:** 24/7 (most often during meals)
- **Adults:**
  - $\bar{X} = 585$ (SD: ± 208.9, range: 233-1008) per day\(^1\)
- **Children (8.6 ± 2.9 yrs):** during sleep
  - $\bar{X} = 2.8$ (SD: ± 1.7) per hour\(^2\)

\(^1\) Lear et al. Arch. Oral Biol. 1965

Regardless of Age, Deglutition Must Be...

- Safe
- Adequate (hydration & nutrition)
- Enjoyable

Post-Natal Swallowing

- One component of feeding development

“Normal feeding and swallowing development is ‘biopsychosocial’ process that involves children, their caregivers, and a host of other factors (e.g., culture, professionals).”

Stevenson & Allaire, 1991

Feeding and Swallowing are linked during infancy and early childhood

- **Feeding:** provides children and caregivers with communication and social experiences that form the basis for many future interactions.
- **Swallowing:** process of deglutition that occurs after liquids or foods enter the mouth


Post-Natal Swallowing

- One component of feeding development
- **“Simple”**
  - Involves 26 muscles in the mouth, throat, and esophagus
  - Involves multiple cranial nerves
  - Is coordinated with breathing
Post-natal Feeding / Swallowing Development

Interaction of Multiple Factors

Post-Natal Swallowing: Primary Functions

- Direct food, liquid, & saliva from the mouth to the stomach while keeping airway protected
- Provide enough of the right types of liquids & foods for:
  - adults to stay healthy
  - children to grow and develop
- *Corollary: Adaptation

Deglutition Must Adapt to:

- Alterations in anatomic relationships of pharyngeal structures
  - Normal developmental changes, including aging
  - Changes in head & neck posture → alterations in anatomic relationships of pharynx

Deglutition Must Adapt to:

- Bolus variability
  - Consistency, viscosity, elasticity, volume, & temperature
- Changes in head & neck posture → alterations in anatomic relationships of pharynx
- Normal development & aging

Buchholz et al, 1985

Feeding/Swallowing Must Adapt to:

- Demands of typical oral motor skill development (in context of overall development)
Feeding/Swallowing Must Adapt to:

- Demands of typical feeding progression: Development and oral-motor skills
- Infant/child – caregiver interactions

“Feeding is an interactive process that depends on the ability and characteristics of both the parents and the child”. Satter, 1999

Must Be Enjoyable...: Consistent w/ Developmental Skills & Child/Caregiver Interactions (Satter, 1999)

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>Progression of Oral-Motor Skills</th>
<th>Developmental Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 4</td>
<td>Suck on nipple</td>
<td>Head control</td>
</tr>
<tr>
<td></td>
<td>suck off spoon at first</td>
<td>Sucking balance</td>
</tr>
<tr>
<td></td>
<td>Sucking – suck</td>
<td>Handle small</td>
</tr>
<tr>
<td>6 - 9</td>
<td>Soft chewable</td>
<td>Hand-to-mouth play</td>
</tr>
<tr>
<td></td>
<td>Cup drinking</td>
<td>Mealtimes</td>
</tr>
<tr>
<td></td>
<td>Independent mobility</td>
<td>Finger feeding begins</td>
</tr>
<tr>
<td>9 - 12</td>
<td>Ground nancy stage</td>
<td>Finger feeding</td>
</tr>
<tr>
<td></td>
<td>Lateral tongue</td>
<td>Independence for</td>
</tr>
<tr>
<td></td>
<td>action emerges</td>
<td>Feeding</td>
</tr>
<tr>
<td></td>
<td>Straw drinking</td>
<td>Independence for</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feeding</td>
</tr>
<tr>
<td>12 - 18</td>
<td>All textures</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 - 24</td>
<td>More chewable food</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rotary chewing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 food intake by 24 mos.</td>
<td></td>
</tr>
<tr>
<td>24+</td>
<td>Tougher solids</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Treating chewing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>for “tougher” solids</td>
<td></td>
</tr>
</tbody>
</table>

Feeding/Swallowing Must Adapt to:

- Demands of typical feeding progression: Development and oral-motor skills
- Infant/child – caregiver interactions

“Feeding is an interactive process that depends on the ability and characteristics of both the parents and the child”. Satter, 1999

- Unexpected changes

Normal Swallowing

For Review of Neurobiology of Oral Feeding and Swallowing, See:
Four Phases of Swallowing

1. **Oral preparatory Phase**
   - Bolus preparation
   - Variable length
   - Voluntary
   - Airway is open

2. **Oral Phase**
   - Transport bolus to back of oral cavity
   - Duration ≅ 1 sec.
   - Regardless of texture
   - Voluntary
   - Airway is open

3. **Pharyngeal Phase**
   - Transport thru pharynx / protected airway
   - Duration
     - Adults ≅ 1.0 second
     - Infants ≅ 0.6 ± 0.10 seconds
   - Voluntary & involuntary
   - Airway closed

4. **Esophageal Phase**
   - Transport bolus into stomach
   - Duration ≅ 6 - 10 seconds
   - Involuntary
   - Airway open

**Normal Infant Swallow**

- Infant Suckle Feeding
**Normal Swallowing: Older Child**

Dysphagia (dīs-fā' jē-ā)  
[G. dys, difficult + G. phagein, to eat]

Inability to swallow or difficulty swallowing

“Dysphagia is not a disease. Rather it is a symptom of a disease that may be affecting any part of the swallowing tract from the mouth to the stomach.”

Donner,1986

**Swallowing Disorders: Incidence in United States**

- Older individuals with neurologic disorders 300,000 - 600,000 annually (AHCPR, 2002)
- No comparable data in pediatrics, presumed increasing incidence
  - Better diagnostic tools and recognition
  - Increased survival rates of children with complex and medically fragile conditions

**Factors that May Interfer with Feeding/Swallowing Development**

- Anatomic anomalies
- Neurologic conditions
- Complex medical conditions
- Environmental factors
- Lack of or delayed introduction of feeding
Pediatric Populations at Increased Risk of Dysphagia

- Anatomic or structural anomalies
- Congenital
- Acquired
- Neurologic conditions
- Preterm + low birth weights
- Cardiopulmonary disease
- Medically fragile
- Genetic anomalies
- Misc.

Why is Swallowing Dysfunction so Problematic for Pediatric Patients?

Babies and young children are at risk for airway and nutritional compromises and disrupted interactions with caregivers, which in turn may have long lasting consequences.

Regardless of Age, Deglutition Must Be...

- Safe
- Adequate (hydration & nutrition)
- Enjoyable

Regardless of Age, Deglutition Must Be... SAFE

- Provide adequate airway protection

Levels of Airway Protection

1. Swallow
   - Cough
   - Mucociliary action
   - Immune system

Aspiration

- Oral Phase
- Hypopharyngeal Phase
- Esophageal Phase
- Aspiration

- Satiation
- Tactile
- Cephalic
- Esophageal
- Neural
Dysphagia: Common Acute or Episodic Airway Presentations
- During / immediately after feeding
- Coughing, choking or gagging
- Change in respiratory rate, effort or respiratory or phonatory sounds (noisy breathing)
- Decline in activity or alertness

Arvedson & Lefton-Greif, 1998

Dysphagia: Chronic Airway Presentations in Young Children
- Coughing (chronic bronchitis)
- Recurrent pneumonia
- Asthma (difficult to control)
- Frequent or long lasting upper respiratory infections
- Unexpected poor resolution of airway related issues (e.g., URI’s or airway diseases associated with prematurity)

Regardless of Age, Deglutition Must Be... ADEQUATE / ENOUGH
- Poor nutritional intake can result in
  - Adverse development
  - Compromised CNS growth

Dysphagia: Chronic Airway Presentations
- Aspiration → possible lung injury to developing lung.
- In turn, injury to developing lung → may be associated with long-term pulmonary sequelae
- Almost 90% of alveolar growth occurs postnatally (Thurlbeck, 1982)

Potential Impact of Fetal and Infant Malnourishment …
- Behavioral and cognitive deficits
- Slower language development
- Slower gross & fine motor development
- Lower IQ
- Poorer school performance

Growth Charts: CDC
http://www.cdc.gov/growthcharts/clinical_charts.htm
Regardless of Age, Deglutition Must Be... ENJOYABLE

- Disrupted child/infant- caregiver interactions
- Behavioral problems
- Disrupted feeding/swallowing development
  - Medical/surgical diagnoses & procedures
  - Behavioral problems
  - Sensory issues
  - Multiple interactive factors

The “desirable” goals for children with feeding and/or swallowing disorders can only be accomplished by a team (with rare exceptions).

Pediatric Feeding / Swallowing Teams: Primary Goals

- Maximize child’s potential for growth & development
- Optimize overall health status
- Facilitate positive interactions between caregiver & child

EVALUATION OF INFANTS AND CHILDREN WITH FEEDING/SWALLOWING PROBLEMS

Dr. Joan Arvedson

Global Feeding Evaluation Goal

- To determine consistencies that are safest & most efficient for a child to eat orally (to whatever extent possible) while maintaining adequate nutrition & hydration

4 Key Questions to Ask Parents

- How long does it take to feed your child?
  - Longer than 30 minutes, tip-off for problem
- Are meal times stressful to child &/or parent?
  - Neurologic based skill & safety issues?
  - Behavior &/or sensory issues?
- Is your child gaining weight OK?
  - If no weight gain for 2-3 months, problem
- Are there signs of respiratory problems?
  - e.g., congestion ↑ during feeding; gurgly voice
Specific Feeding Evaluation Goals

- Identify nature & extent of problem
- Formulate hypotheses
- Establish baseline of behaviors
- Make therapeutic modifications

Goals of Clinical Evaluation

CAN'T versus WON'T

Caregiver Questions to SLP

What is the cause of the problem?
How can it be fixed?
When will it be fixed?

Answer: When the dysphagia resolves enough for the child to “tolerate” the sequelae associated with the swallowing dysfunction

Major Components of a Feeding/Swallowing Evaluation

- History
- Physical examination
- Observation of feeding
  - Responses by child & feeder
  - Non-nutritive in some
  - Nutritive (oral feeding)

History: Areas to Cover

- Caregivers define concerns
- Past medical history
- Temporal manifestation of problem(s)
- Health issues
- Developmental history
- Diet / feeding history & routines
- Medications

Impact of Potential Influences: Dysphagic Characteristics

Adapted from Rogers, 1996
### Physical Examination
- General appearance
- Examination of oral-peripheral structures & functions
  - Structural symmetry
  - Rooting in young infants
  - Gag (no correlation to swallowing in absence of other findings)
- For infants, non-nutritive pre-requisite for oral feeding/swallowing

### Observation of a Meal
- Multiple factors to evaluate, e.g.,
  - Level of dependence or independence?
  - Oral skills appropriate for age or commensurate with global skill levels?
- Caregiver – child interactions
- Introduction of therapeutic techniques

### Why a Bedside/Clinic Evaluation?
- Determine if a feeding/swallowing problem is present
- Establish a baseline of function
- Determine if an instrumental swallow evaluation is needed
  - Phases of swallowing
  - Ability AND willingness of child to cooperate

### Which Instrumental Assessment?
- Specific questions
- Suspected phases of swallowing problem
- Ability AND willingness of child to cooperate

### Instrumental Assessment Procedures
- Upper Gastrointestinal Examination (UGI):
  - Study of anatomy, not swallowing function
  - Not a study to “rule out reflux”
- Flexible Endoscopic Evaluation of Swallowing (FEES)
- Videofluoroscopic Swallow Study (VFSS)

### Flexible Endoscopic Evaluation of Swallowing (FEES)
FEES Candidates: Children Who

- Have upper airway structural or suspected structural abnormalities
- Have abnormal VFSS + question re: airway / respiratory / swallowing interaction
- Are eating or drinking too little to participate in VFSS (rare)
- Need repeated exams that relate to specific questions – no radiation

Modified Barium Swallow Study (MBS): Dr. Jeri Logemann (1983)

- “The MBS procedure is designed to study the anatomy and physiology of the oral preparatory, oral, pharyngeal & cervical esophageal phases of swallowing”
- MBS was not only to address “whether the patient is aspirating, but also the reason for the aspiration, so appropriate treatment can be initiated”.

VFSS is a tool…

But it’s NOT an All-in-one tool!

Instrumental Assessment Procedures

- Upper Gastrointestinal Examination (UGI)
- Flexible Endoscopic Evaluation of Swallowing (FEES)
- Videofluoroscopic Swallow Study (VFSS)

Videofluoroscopic Swallow Study (VFSS)

- Indications
  - Suspected oropharyngeal dysphagia
  - Diagnostic or management needs which would be clarified by VFSS findings
  - Patient is ready, willing, & able to participate

… by another name

- Videofluoroscopic Swallow Study (VFSS)
- Cookie Swallow
- Three-phase or two-phase swallow
- Rehabilitation Swallow Study
VFSS is a tool that
- Provides information that enhances the safety & efficiency of swallowing
- Bolus & positioning variables
- Oral feeding strategies
- Therapeutic maneuvers

However, a VFSS does not...
- Define feeding & swallowing development
- Rule out aspiration
- Determine the impact of the swallowing problem on a specific child (& family)
- Predict the progression of the feeding / swallowing problem or timing of its resolution

VFSS Procedure = Process
- Decision
- Planning
- Carrying it out
- Reading
- Interpreting
- Documenting

VFSS Procedure
- **Decision:** yes / no
  - Planning
  - Carrying it out
  - Reading
  - Interpreting
  - Documenting

VFSS: Decisions & Indications
Suspected oropharyngeal dysphagia
AND
Findings would assist with diagnostic process & / or management
AND
Patient is ready, willing, & able to participate

Determinants: “Ready, Willing, & Able”
- Medical stability
- Cardiopulmonary stability
- Nutrition stability (may be exceptions)
- Alertness, maturity, & organization or state
- Ability to tolerate bolus feeds (may be exceptions)
Determinants: “Ready, Willing, & Able”
- Signs of swallowing, even if limited to saliva & “tastes” of food or liquid
- Signs of interest in increasing volume of oral feeding if safe to do so
- For infants, non-nutritive suck (NNS)

VFSS Procedure
- Decisions: yes / no

**Planning**
- Carrying it out
- Reading
- Interpreting
- Documenting

VFSS Procedure: Planning
- Preparation: Caregivers & children
  - Oral vs. non-oral feeders
  - Medications
  - Physical set-up
    - Radiologic considerations
    - Seating & positioning

VFSS Procedural Considerations
- Positioning/seating: typical & optimal
- Barium contrast mixed into liquid/food
- Utensil selection
- Suction, monitors when needed
- Cooperative patient imperative for interpretation
- Caregivers included, findings reviewed
- Findings interpreted & used as part of total team approach: maximize safety
- Review in slow motion, frame-by-frame

VFSS Procedure: Planning
- Contrast preparation (mixed with food/liquid)
- Utensil selection
- Other considerations
  - Suctioning
  - Monitors
Procedural Decisions
- No fixed order for presentations in pediatrics
- Preferable to start with thinnest liquid
- Controlled bolus size to start, e.g., spoon before going to bottle or cup drinking
- Work toward thicker as needed
- Not want residue in pharynx that may complicate interpretation with thinner later
- Exceptions: Parents tell us that child will not accept anything else if she gets liquid first

Lateral View
- Encompassing
  - Lips anterior
  - Soft palate superior
  - Posterior pharyngeal wall posterior
  - Fifth to seventh cervical vertebrae inferior, varying with age of child
- Simultaneous view of oral, pharyngeal & upper esophagus before food is presented

Antero-Posterior View
- When asymmetry is known or suspected
- Unilateral vocal fold paralysis or paresis
- Tonsil related questions
- Other possibilities?
  - Keep in mind radiation exposure time
  - Importance of findings for management

VFSS Procedure: Carrying it out
- Remember reasons for doing VFSS
- Get as much information as quickly as possible
- Know when to terminate VFSS
  - Needed information obtained
  - Not likely to get information

Mean Duration of Radiation Exposure During VFSS

<table>
<thead>
<tr>
<th>Source of Information</th>
<th>Mean Duration (minutes)</th>
<th>Range of Duration (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literature</td>
<td>2.48 ± 0.81</td>
<td>0.05 to 8.12</td>
</tr>
</tbody>
</table>

VFSS Procedure
- Decisions: yes / no
- Planning
- Carrying it out
- Reading = what you see
  - Interpreting
  - Documenting
Findings: Objective Descriptors by Phase of Swallowing

- **Primary focus is on pharyngeal phase, but oral & upper esophageal functions interrelates – (Not purpose of this session to go into details)**
- Do not use terms that reflect severity in findings, e.g., mild, moderate, severe are interpretations of severity, not findings
- Frequency of a particular finding may be important prognostic indicator

**What is the relationship between penetration & aspiration?**

**What is known about penetration-aspiration relationship in children?**

- Relationship between depth of penetration & aspiration\(^1\)
  - 85% children (n = 125, 7 days -19 yrs) w/ deep laryngeal pen → asp
- **Temporal relationship\(^2\)**
  - Asp. occurs later than laryngeal pen. on VFSS
    - 1\(^{st}\) pen = 50.77 sec
    - 1\(^{st}\) asp = 65.41 sec.

\(^1\)Friedman & Frazier, 2000
\(^2\)Newman et al, 2001

**Silent Aspiration**

Aspiration without any signs (such as, coughing or choking) to observers

**If aspiration is “silent”, is it a problem?**

- Primary airway response to aspiration is absent
- Caregivers keep feeding children because primary “signal” of feeding difficulty is absent
- Likely bigger problem than with a response that would imply sensory awareness

**How common is silent aspiration?**

<table>
<thead>
<tr>
<th>Population</th>
<th>Age Range (Years)</th>
<th>% pts. with silent aspiration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young Peds</td>
<td>0 - 5</td>
<td>89 - 100</td>
</tr>
<tr>
<td>Older Peds + Adults</td>
<td>5 - 55</td>
<td>71 - 94</td>
</tr>
<tr>
<td>Varied</td>
<td>Median 65</td>
<td>51 - 58</td>
</tr>
<tr>
<td>Very old</td>
<td>&gt; 90</td>
<td>73 - 88</td>
</tr>
</tbody>
</table>
### Literature Review: Aspiration in Children

<table>
<thead>
<tr>
<th>No. Participants</th>
<th>Oropharyngeal Aspiration (%)</th>
<th>Silent Aspiration (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 - 43</td>
<td>21 - 29</td>
<td>60 - 100</td>
</tr>
<tr>
<td>51 - 186</td>
<td>27 - 38</td>
<td>71 - 97</td>
</tr>
</tbody>
</table>

Weir et al, 2011

### VFSS Procedure
- Decisions: yes / no
- Planning
- Carrying it out
- Reading

- **Interpreting**
  - Documenting

### Interpretation of VFSS Findings
- SLP reviews with caregivers & therapists or others involved in care
- Findings by phase of swallow
- Timing of penetration/aspiration related to physiologic processes
- If review reveals a finding not anticipated or noted during exam, SLP contacts PA or radiologist to discuss or review together
- Important that reports are not discrepant

### Problem Areas from VFSS
- Oral phase
- Initiating pharyngeal swallow
- Pharyngeal phase
- Esophageal phase (upper)
  - Esophagram or UGI may be needed to define esophageal function
  - Impedance, manometry, or pH probe
  - Manometry with fluoroscopy for some

### After VFSS: Interpretation for Individual Child in Context of...
- Underlying diagnostic conditions (history)
- Clinical examination
  - Physical examination
  - Clinical findings
- Phase of swallowing
- Ability to tolerate impact of dysphagia

### After VFSS: Interpretation for Individual Child in Context of...
- Phases of swallowing: structure + function
- Summary of swallowing function
  - Risk of aspiration
  - Risk of nutrition / hydration compromise
- Ability to tolerate impact of dysphagia (prognosis statement needed)
  - Short term
  - Long term
Impact of Dysphagia: Potential Influential Host Factors

- Age
- Diagnostic condition(s)
- Medical, health, nutritional, neurodevelopmental status
- Severity of swallowing dysfunction
  - Frequency of aspiration
  - Amount of aspiration
  - Duration of dysfunction

Factors that May Modify the Respiratory Status in Children with Dysfunctional Swallowing

- Host Characteristics
  - Diagnostic condition(s)
  - Co-morbidities
  - Severity of dysphagia

- Environmental / Social Factors
  - Feeding techniques
  - Health care access and management
  - Exposure to environmental stressors

Reporting of VFSS Findings

- Findings and interpretations are discussed with other team members to develop a plan that addresses child’s needs & caregiver goals

VFSS Procedure

- Decisions: yes / no
- Planning
- Carrying it out
- Reading
- Interpreting

Documenting

After VFSS: Documentation

- Prognostic statement
- Recommendations

After VFSS: Documentation

- Description of phases of swallow: structure & function
- ID potential etiology underlying swallowing dysfunction
- Comment on
  - Risk of aspiration
  - Risk of nutrition / hydration compromise
Hierarchy for Development of Therapy Strategies: Pediatric Dysphagia
- Adhere to basic management principles
- ID and support management and therapy decision-making guidelines
- Determine level of intervention
- Select specific therapeutic goals and strategies

Basic Management Principles: Pediatric Dysphagia
- Maintain cardiopulmonary stability
- Maintain nutritional stability
- Whole child approach (e.g., safety, comfort, enjoyment)

Management Corollaries: Pediatric Dysphagia
- Total oral feeding is NOT always the goal
- Adjust management / therapy with gains or regression → re-evaluate
- Account for developmental levels and child/caregiver interactions when planning interventions

Management & Therapy Decision-making Guidelines
- ↓ risk of aspiration
- ↓ risk of nutrition compromise
- Maximize growth & development
- Facilitate appropriate child/caregiver interactions

Management & Therapy Recommendations
- Route for nutrition / hydration
- Feeding routine modifications
  - Position
  - Liquid & food characteristics (e.g., textures, temperature)
  - Timing and pacing (e.g., meals, liquids, & food presentations)
  - Selection of utensils

Management & Therapy Recommendations
- Specific therapy recommendations
  - SLP
  - OT / PT
- Additional recommendations
  - CPR
  - Other evaluations
- Plans for follow-up or re-evaluation
Determine Level of Intervention

- Prevent problems, early detection
- "Normalize" function / support "optimal" developmental progression
- Manage well-established patterns or deficits with specific phase(s) of swallowing

Focus of Specific Therapeutic Goals

- General development
- Tone
- Sensori-motor integration
- Speech, language, & communication
- Phases of swallowing
- Child / caregiver interactions

Selection of Specific Therapeutic Goals and Strategies

- Promote compensatory patterns
  - Changes in position
  - Modifications of food or liquid
- Strengthen or improve movement patterns of swallowing structures
  - Stimulation for non-nutritive sucking
  - Tongue lateralization exercises / chewing

Selection of Specific Therapeutic Goals and Strategies

- Therapy maneuvers
  - Older children

Children at Increased Risk of Dysphagia

- Anatomic or structural anomalies
- Neurologic conditions
- Preterm + low birth weight
- Cardiopulmonary disease
- Medically fragile
- Misc.

Case Presentation:
Anatomic / Structural Etiology
Diagnostic Conditions
- Anatomic or structural defects
  - Congenital
  - Acquired
- Neurologic deficits
  - Cerebral Palsy
  - Traumatic Brain Injury (TBI)
  - Genetic syndromes

Types of Laryngeal Clefts
I  Supraglottic interarytenoid clefts
II  Partial cricoid defects
III  Complete cricoid defect +/- cervical tracheal involvement
IV  Laryngotracheoesophageal clefts into thorax

Benjamin / Inglis Classification of Posterior Laryngeal Clefts

Case Presentation:
Neurologic Etiology
Diagnostic Conditions

- Anatomic or structural defects
  - Congenital
  - Acquired
- Neurologic deficits
  - Cerebral Palsy
  - Traumatic Brain Injury (TBI)
  - Genetic syndromes

Clinical Case Presentations:
Neurologic Etiology

Laryngeal Cleft
None
Otherwise Healthy
No Compensations
No Concerns

Past

Future
Reading VFSS: Standardization is Needed

- Descriptive guidelines for reading per Logemann since early 1980’s
- Quantitative descriptions per Martin-Harris, Dysphagia, 2008: MBSImp: Establishing a Standard
- Pediatric descriptions are not available: research in progress (Lefton-Greif & Martin-Harris)

Standardization of Reading & Interpretation of VFSS Images is Needed

- Consistent terminology is 1st step
- Objective findings provide accurate descriptions of physiologic swallowing function that allow for improved management decisions & communication
- Provide outcome measures for interventions
- Define biomarkers for clinical trials for children with diagnostic conditions associated with dysphagia

Standardization of Reading & Interpretation of VFSS Images is Important to

- Decrease variability in exchange of patient information
- Standardize VFSS practices
- Potentially reduce exposure to radiation

Opportunities

- Special Interest Group 13 – Swallowing and Swallowing Disorders
- Specialty Board Recognition in Swallowing and Swallowing Disorders (BRS-S)
  www.swallowingdisorders.org