

Children's Hospital of Los Angeles THE SARGAN RESEARCH PROGRAM USC University of Southern California

Evaluation and Management of Pediatric Dysphagia

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Disclosures


None

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Pediatric Dysphagia

- Background/Causes
- Diagnosis / Assessment
- Treatment
- Cases




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Pediatric Feeding Disorders: Background and Epidemiology

- Estimated Prevalence 25-45%
 - Significantly higher when:
 - Prematurity/low birth weight
 - Craniofacial abnormalities
 - Genetic syndromes
 - Neurologic insults
 - CP – 90%




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Pediatric Feeding Disorders: Background and Epidemiology

- Pediatric dysphagia is on the rise:
 - Preterm survival rates have increased
 - Lack of coordinated swallow at birth (32-34 weeks gestational age)
 - Presence of comorbidities (eg CLDI)
 - Repeated NPO or instrumentation
 - Recognition/Interest is increasing, Aerodigestive centers
 - Diagnostic modalities are improving
 - Management is Cost effective, decreased G tube placement (51% fewer G tubes, \$9 million savings per 100 child cohort)




Jacobson SA, Peng L, Moore R, et al. J Pediatr Gastroenterol Nutr. 2012;54(1):62-70.

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Pediatric Feeding Disorders: Dysphagia and Aspiration


- Dysphagia = difficulty swallowing
 - Variable severity/ spectrum
 - Failure to thrive vs parental concern
 - Prolonged feeding times vs. oral aversion
 - Drooling vs. aspiration with recurrent pneumonias
- Aspiration = Entry of foreign material into the respiratory tract and lungs
 - Anterograde/direct (ingested)
 - Retrograde/indirect (reflux)
 - Silent



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The Normal Swallow: Aerodigestive Function

- Oral Phase (voluntary)
 - A/P tongue movement
 - Bolus presented to OP
- Pharyngeal Phase (1 second)
 - Bolus passes anterior tonsillar pillar and triggers involuntary reflexes
 - Palate elevates to close NP
 - Larynx closes (epiglottis, FVC, TVC) and elevates
 - Pharyngeal muscles contract
 - CP muscle relaxes
- Esophageal Phase (8-20 seconds, 1-4 cm/sec)
 - UES to LES



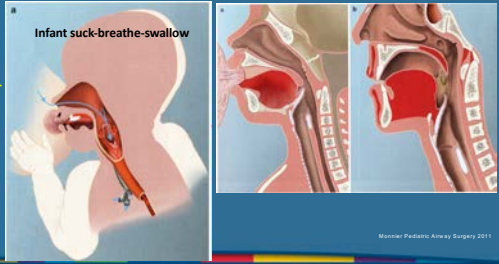
Monter Pediatric Airway Surgery 2011

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The Normal Swallow: Aerodigestive Function

The Larynx is the gatekeeper between the airway and the digestive system

Infant suck-breathe-swallow




Monter Pediatric Airway Surgery 2011

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Pediatric Swallowing Evaluation

1. Is the problem **Anatomic/Structural**?
 - Lack of normal boundary (laryngeal cleft, TEF)
 - Obstruction (tumor, tonsil, CP spasm, stricture, FB)
2. Is the problem **Nonstructural/Functional**?
 - Lack of coordination
 - Lack of sensation
 - Vocal fold paralysis?
 - Pain (infection/inflammation)
 - Psychogenic (aversion)
3. Is the patient **SAFE**?
 - Aspiration
 - Nutritional status



Type 2 laryngeal cleft

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Pediatric Swallowing Evaluation

History:

- Abnormal events during feeding (WOB? Cyanosis? Pauses? Regurgitation?)

Physical Exam:

- Posture and head control
- Size and tone of tongue (PRS, BWS)
- Suck/root reflex
- Gag reflex
- Voice




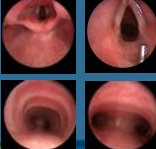
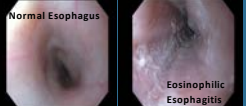
- Flexible laryngoscopy - structures and VF mobility

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Pediatric Swallowing Evaluation

Aerodigestive evaluation - "Triple" endoscopy - Structural test


- Sedated evaluation of the entire aerodigestive tract by Pulmonary, Otolaryngology, Gastroenterology (lightest to deepest anesthesia)

<p>Pulmonary bronchoscopy Airway dynamics, BAL</p>  <p>Tracheomalacia</p>	<p>Otolaryngology rigid L&B Airway structure/palpation</p> 	<p>Gastroenterology EGD Esophageal appearance, biopsies</p>  <p>Normal Esophagus</p> <p>Eosinophilic Esophagitis</p>
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Aerodigestive diagnoses by Location

<p>Nasal</p> <ul style="list-style-type: none"> Adenoid hypertrophy Choanal atresia/stenosis Piriform aperture stenosis Neoplasm 	<p>Laryngeal/Tracheal</p> <ul style="list-style-type: none"> Cleft Stenosis Malacia Paralysis (UVCP/BVCP) Vascular Ring
<p>Oral/Oropharyngeal</p> <ul style="list-style-type: none"> Cleft lip Pharyngitis/abscess Tonsillar hypertrophy Caustic ingestion Neoplasm Tongue Tie 	<p>Esophageal</p> <ul style="list-style-type: none"> GERD Eosinophilic esophagitis Foreign body TEF/Atresia Neoplasm



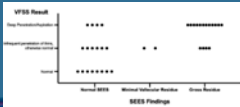
Monter Pediatric Airway Surgery 2011

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Children's Hospital of Los Angeles USC University of Southern California **Pediatric Swallowing Evaluation**

Instrumental Assessment of Swallowing (Functional tests)

- MBSS (Modified Barium swallow study) = VFSS (Videofluoroscopic swallow study)
- FEES (Flexible/Fiberoptic endoscopic evaluation of swallowing)
- SEES (Static endoscopic evaluation of swallowing)



Master et al. Laryngoscope. 2016.

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Children's Hospital of Los Angeles USC University of Southern California **FEES vs MBSS**

FEES	MBSS
<ul style="list-style-type: none"> • pharyngeal phase • no radiation exposure • ok if limited or no feeding • breastfeeding • can miss silent aspiration "white out" 	<ul style="list-style-type: none"> • oral, pharyngeal, esophageal phases • Radiation (~0.16 mSv=10 chest Xrays) • need patient to be able to feed • only bottlefeeding in infants • good for silent aspiration detection

Reynolds et al. Adv Neonatal Care. 2016 Feb;16(2):37-43. Hersh et al. Int J Pediatr Otorhinolaryngol. 2016 Oct;89:92-6.

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Children's Hospital of Los Angeles USC University of Southern California **FEES assessment**

Evaluation:


- Timing of swallow, pooling, residue penetration, aspiration

Modifications:

- Nipple selection and flow rate: ultra preemie, preemie, level 1, level 2
- Thickness and texture: Thin liquid, 1/2 nectar, nectar, honey, puree, solid
- Positioning


Recommendations:

- Feeding therapy, other studies, surgery




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Children's Hospital of Los Angeles USC University of Southern California **Pediatric FEES: normal**



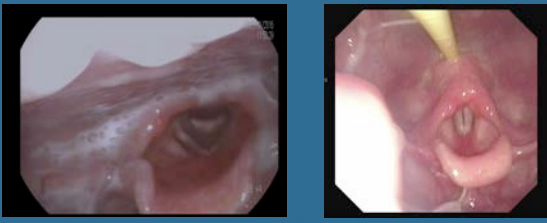
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Children's Hospital of Los Angeles USC University of Southern California **Pediatric FEES: breastfeeding**

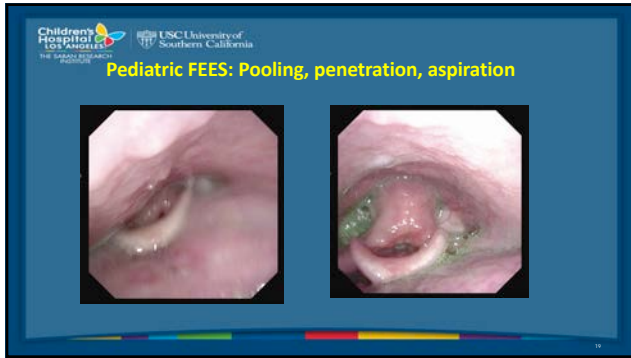


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Children's Hospital of Los Angeles USC University of Southern California **Pediatric FEES: Pooling, poor sensation, penetration, aspiration**



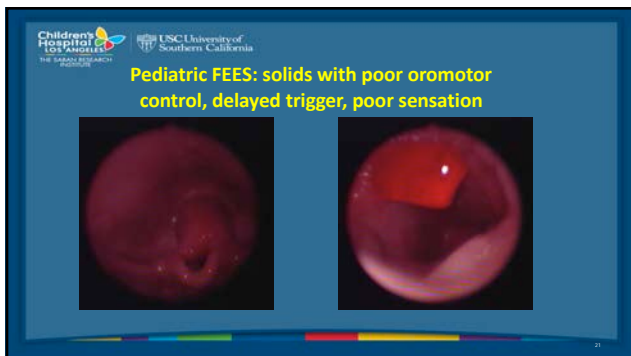
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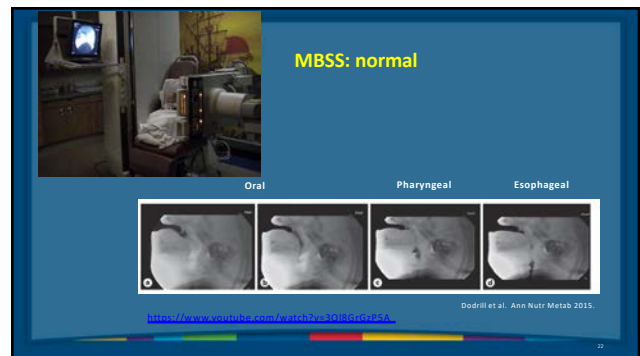
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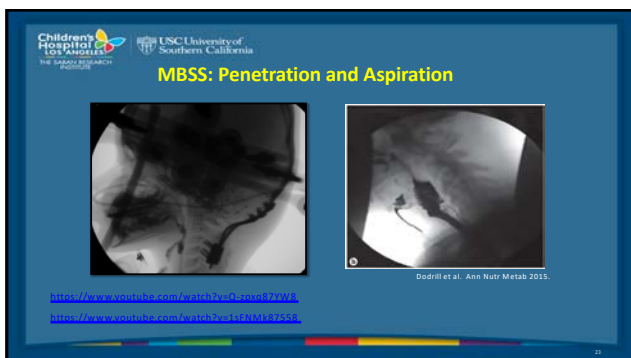
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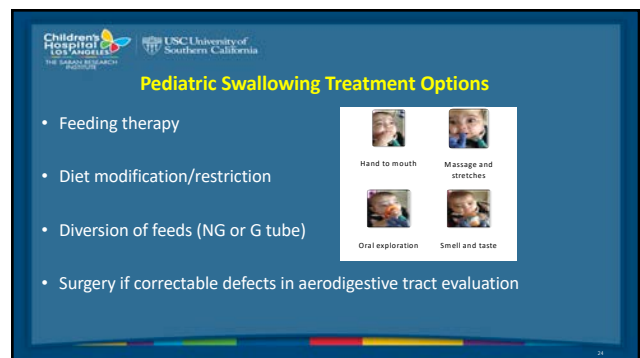
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Laryngeal cleft

- 1 in 10,000 live births
- Boys-girls 5:3

Manifestations

- Frequent regurgitation
- Choking/cough with feeds
- Chronic aspiration
- Chronic cough

Diagnosis

- L&B


Benjamin/Inglis classification (1989):

- Type 1: "supraglottic intrarytenoid defect extending no further than the true vocal folds"
- Type 2: below the true vocal folds and into cricoid lamina
- Type 3: through cricoid completely and into cervical trachea
- Type 4: thoracic trachea or bronchus

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Laryngeal cleft



Benjamin/Inglis classification (1989):

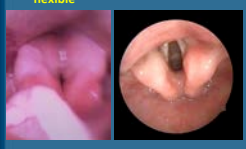
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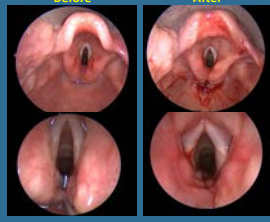
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Laryngeal cleft repair

flexible



Before **After**

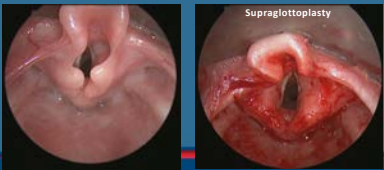


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Laryngomalacia and feeding

- Stridor
- Retractions, poor weight gain, failure to thrive
- Most cases self-limiting, resolve by 12-24 months
- Interventions: reflux management, supraglottoplasty
- Supraglottoplasty may improve or worsen aspiration

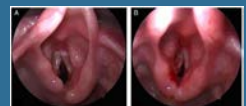
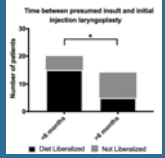


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Injection laryngoplasty for UVFI

- Early injection <6 months s/p injury with improvement in oral diet in ~60-70%

Time between presumed insult and initial injection laryngoplasty

Time between presumed insult and initial injection laryngoplasty	Oral Diet Improvement	No Oral Diet Improvement
< 6 months	~15	~5
> 6 months	~10	~10

Benjamin et al. Laryngoscope. 2019. Meender et al. Otolaryngology Head and Neck Surgery. 2019.

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Case #1

13 month old boy choking and coughing with drinking water

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Case #1

13 month old boy choking and coughing with drinking water

History: unremarkable
 Physical exam: including flexible laryngoscopy normal
 MBSS – aspiration with thin liquids, normal with nectar thick
 FEES – deep penetration with cough with thin liquids, exam limited (crying)

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Case #1

13 month old boy choking and coughing with drinking water

MBSS – aspiration with thin liquids, normal with nectar thick
 FEES – deep penetration with cough with thin liquids, exam limited (crying)

Treatment: Thickening, repeat MBSS in 6 months normal

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Case #2


6 year old girl with coughing and choking with feeding, recurrent pneumonias, History of TEF repair in infancy, G tube removed 2 years ago then lost to follow up

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Case #2

6 year old girl with coughing and choking with feeding, recurrent pneumonias, History of TEF repair in infancy, G tube removed 2 years ago then lost to follow up



Triple Endoscopy:
 Recurrent TEF, type 3 laryngeal cleft

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Case #3

9 year old girl with food impaction x 1 (steak), difficulty swallowing solids, cuts up into small pieces


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Case #3

9 year old girl with food impaction x 1 (steak), difficulty swallowing solids, cuts up into small pieces

- EGD with biopsies:
 Eosinophilic esophagitis



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Case #4

2 week old girl with stertor, desaturations with feeding trials

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Case #4

2 week old girl with stertor, desaturations with feeding trials

- Flexible scope – normal larynx, crowded nasal passages/nasopharynx filled with secretions


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Case #4

2 week old girl with stertor, desaturations with feeding trials


- OR endoscopy: nasopharyngeal mass
- Treatment: excisional biopsy
- Path: teratoma
- Feeding normalized



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Thank You!



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