Pediatric Aspiration
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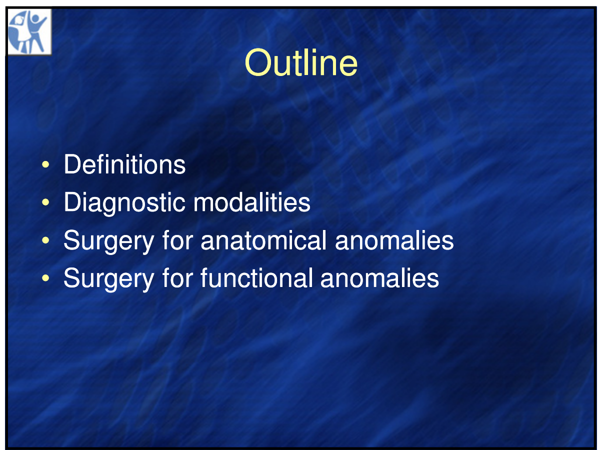
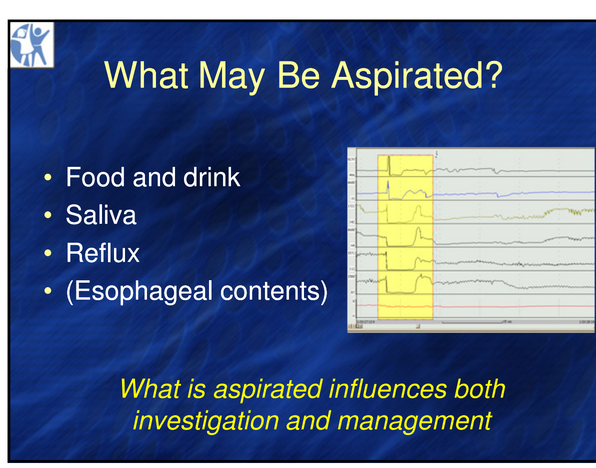
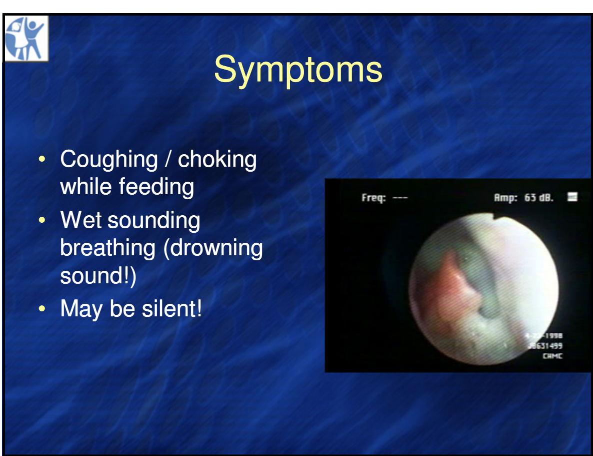
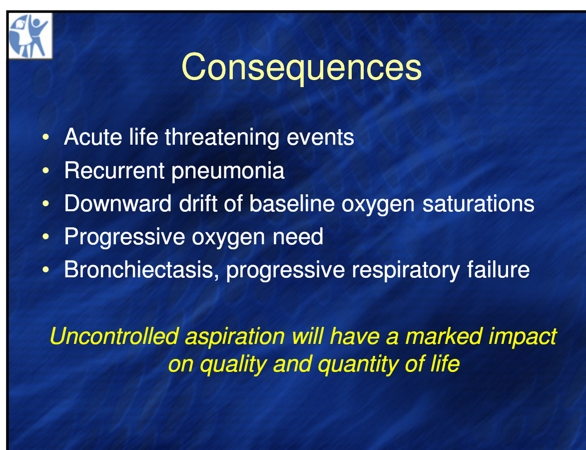

Outline
• Definitions
• Diagnostic modalities
• Surgery for anatomical anomalies
• Surgery for functional anomalies

Pediatric Aspiration - To Recap
• What is aspiration?
• Definitions:
• Solid or liquid matter passing below vocal cord level?
• Solid or liquid passing below vocal cords and leading to pulmonary compromise?
Aspiration may be overt or covert

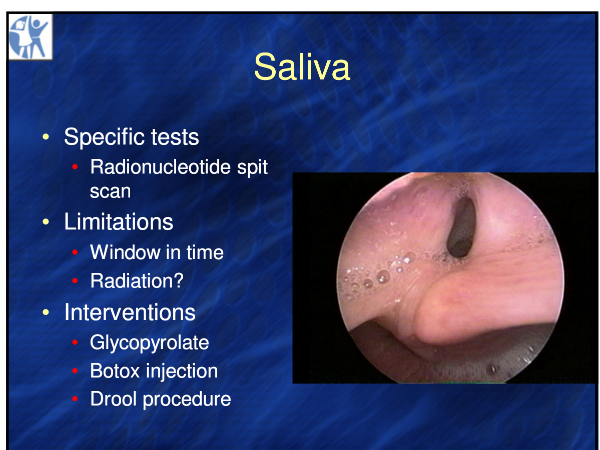
Which Children Aspirate?
• Anatomical anomaly
• Tracheoesophageal fistula
• Laryngeal cleft
• Esophageal stricture
• CNS disorder
• Cerebral palsy
• Anoxic brain injury
• Peripheral neurological disorder
• Congenital coxsackie infection
• Esophageal dysmotility
• CHARGE association

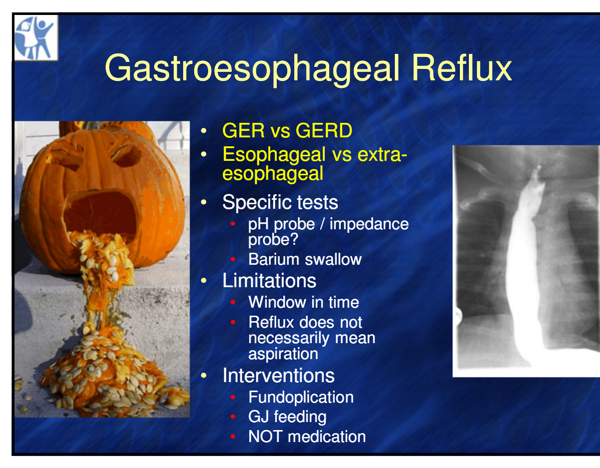

What May Be Aspirated?
• Food and drink
• Saliva
• Reflux
• (Esophageal contents)
What is aspirated influences both investigation and management

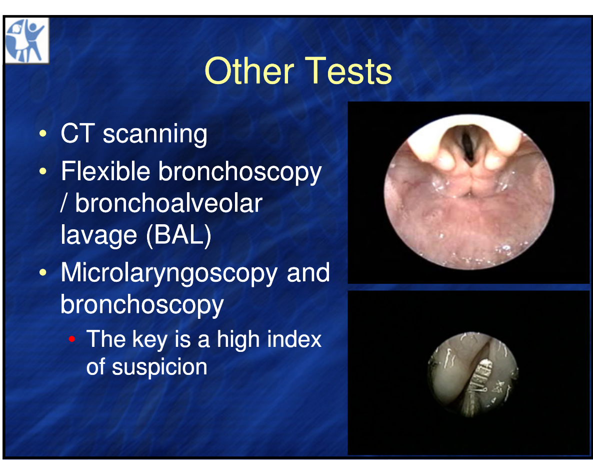

Symptoms
• Coughing / choking while feeding
• Wet sounding breathing (drowning sound!)
• May be silent!

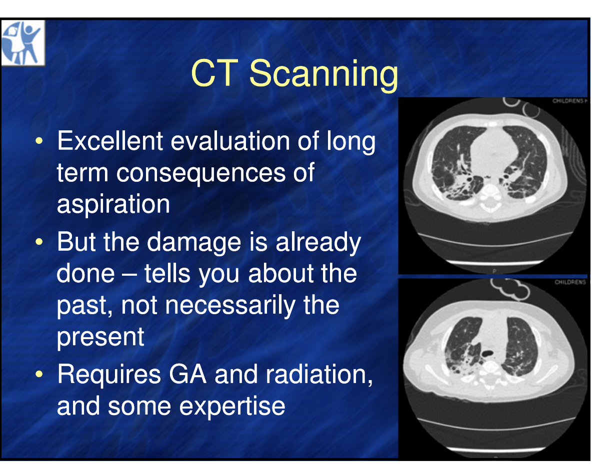

Consequences
Acute life threatening events
Recurrent pneumonia
Downward drift of baseline oxygen saturations
Progressive oxygen need
Bronchiectasis, progressive respiratory failure
Uncontrolled aspiration will have a marked impact on quality and quantity of life

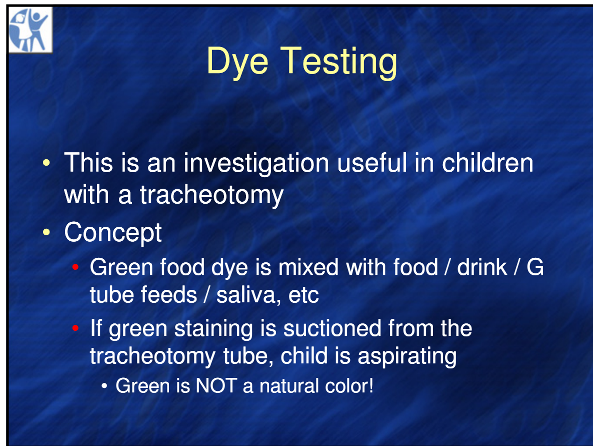
Food and Drink
Specific tests
Video swallow study (VSS)
Functional endoscopic evaluation of swallowing (FEES)
Limitations
A window in time
Non-physiological? (non-cooperation)
Interventions
Limit oral intake (eg thin fluids)
Gastrostomy tube

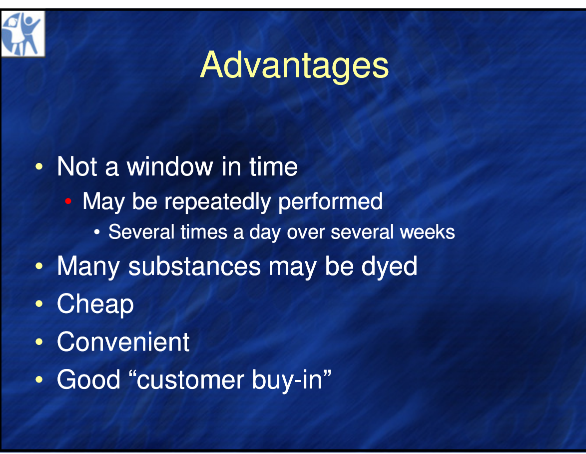

Saliva
Specific tests
Radionucleotide spit scan
Limitations
Window in time
Radiation?
Interventions
Glycopyrolate
Botox injection
Drool procedure

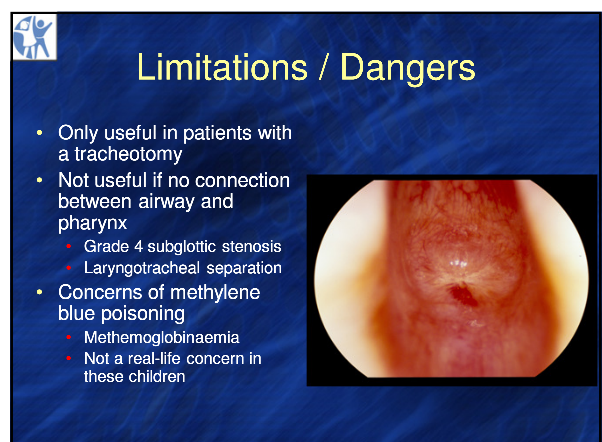

Gastroesophageal Reflux
GER vs GERD
Esophageal vs extra-esophageal
Specific tests
pH probe / impedance probe?
Barium swallow
Limitations
Window in time
Reflux does not necessarily mean aspiration
Interventions
Fundoplication
GJ feeding
NOT medication

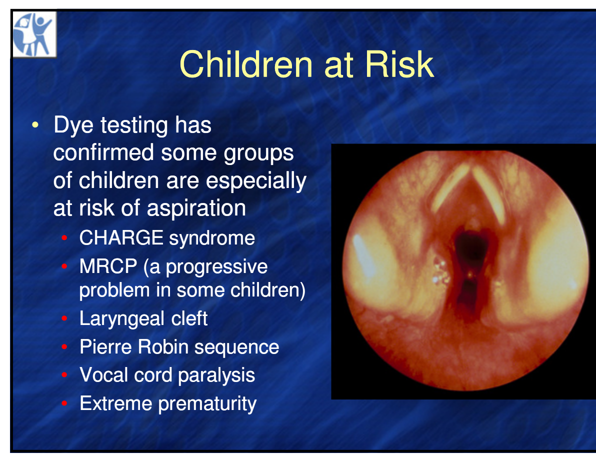

Other Tests
CT scanning
Flexible bronchoscopy / bronchoalveolar lavage (BAL)
Microlaryngoscopy and bronchoscopy
The key is a high index of suspicion

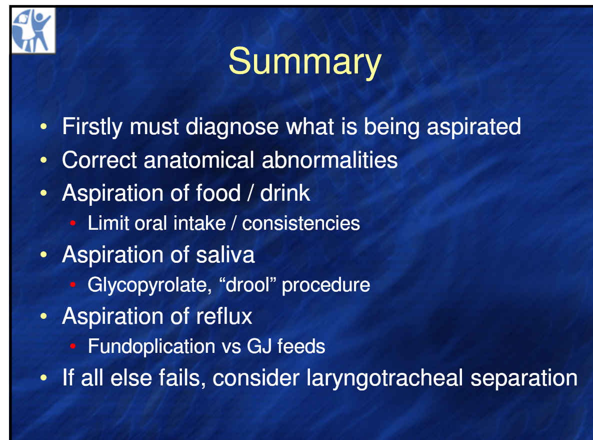

CT Scanning
Excellent evaluation of long term consequences of aspiration
But the damage is already done – tells you about the past, not necessarily the present
Requires GA and radiation, and some expertise

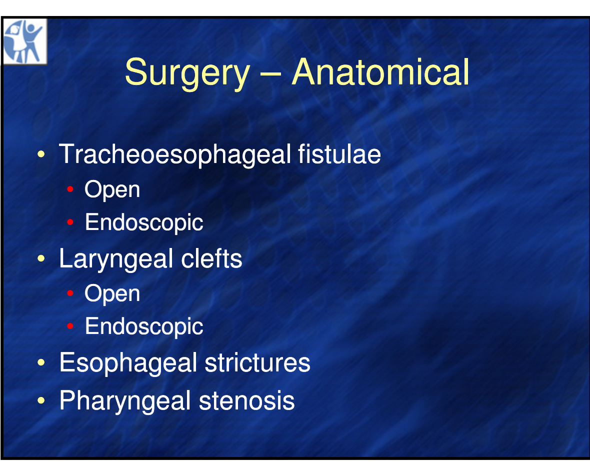

Dye Testing
This is an investigation useful in children with a tracheotomy
Concept
Green food dye is mixed with food / drink / G tube feeds / saliva, etc
If green staining is suctioned from the tracheotomy tube, child is aspirating
Green is NOT a natural color!

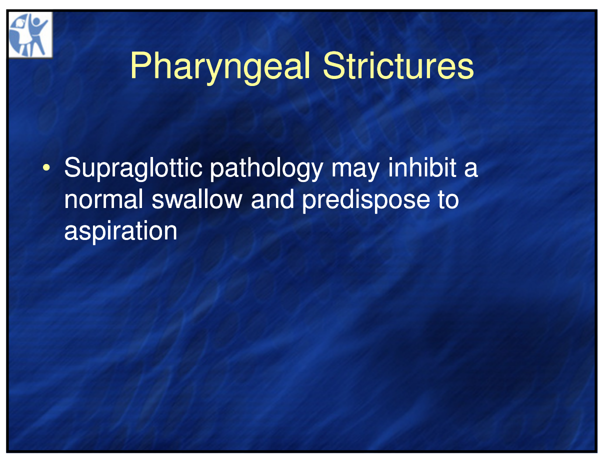

Advantages
Not a window in time
May be repeatedly performed
Several times a day over several weeks
Many substances may be dyed
Cheap
Convenient
Good "customer buy-in"

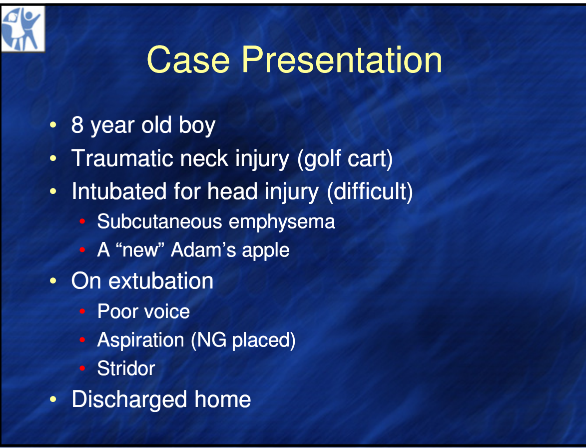

Limitations / Dangers
Only useful in patients with a tracheotomy
Not useful if no connection between airway and pharynx
Grade 4 subglottic stenosis
Laryngotracheal separation
Concerns of methylene blue poisoning
Methemoglobinaemia
Not a real-life concern in these children

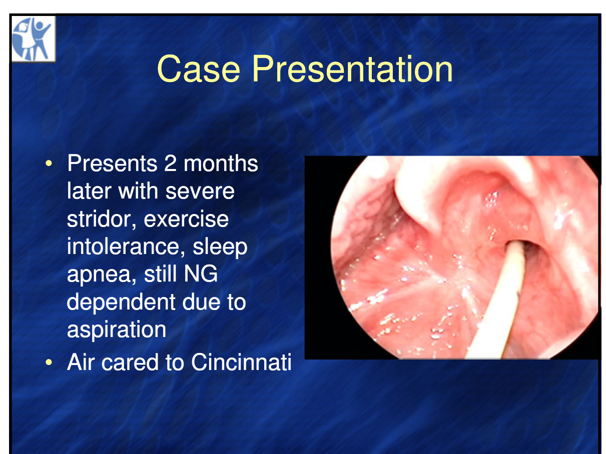

Children at Risk
Dye testing has confirmed some groups of children are especially at risk of aspiration
CHARGE syndrome
MRCP (a progressive problem in some children)
Laryngeal cleft
Pierre Robin sequence
Vocal cord paralysis
Extreme prematurity

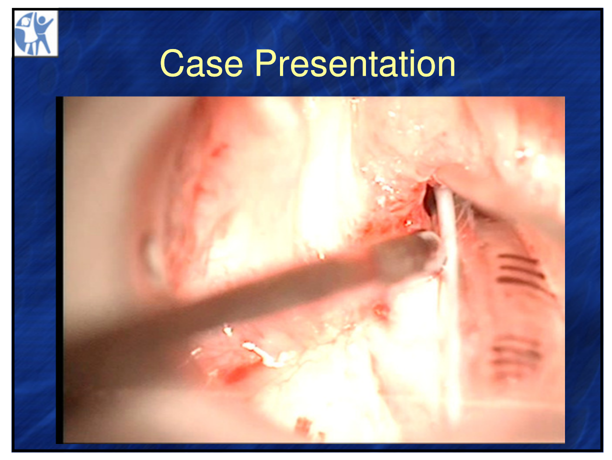

Summary
Firstly must diagnose what is being aspirated
Correct anatomical abnormalities
Aspiration of food / drink
Limit oral intake / consistencies
Aspiration of saliva
Glycopyrolate, "drool" procedure
Aspiration of reflux
Fundoplication vs GJ feeds
If all else fails, consider laryngotracheal separation

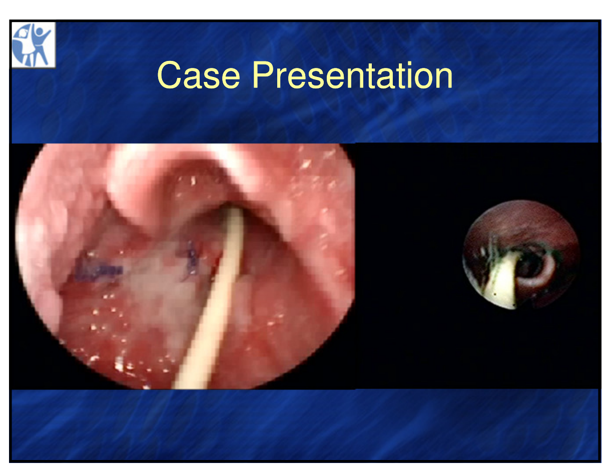

Surgery – Anatomical
Tracheoesophageal fistulae
Open
Endoscopic
Laryngeal clefts
Open
Endoscopic
Esophageal strictures
Pharyngeal stenosis

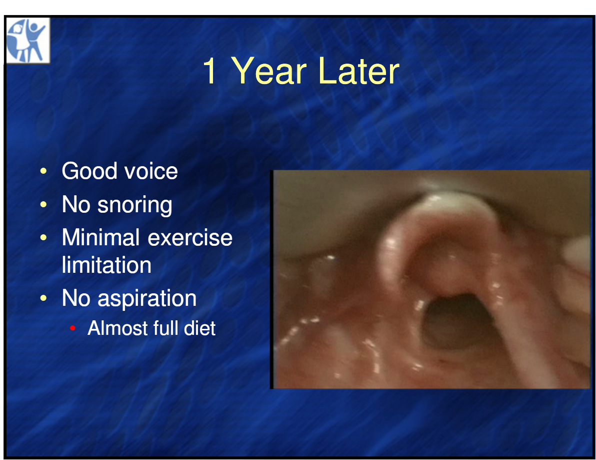

Pharyngeal Strictures
• Supraglottic pathology may inhibit a normal swallow and predispose to aspiration

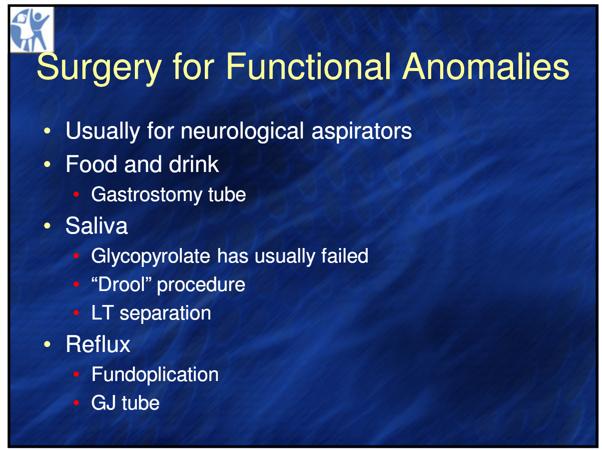

Case Presentation
• 8 year old boy
• Traumatic neck injury (golf cart)
• Intubated for head injury (difficult)
• Subcutaneous emphysema
• A "new" Adam's apple
• On extubation
• Poor voice
• Aspiration (NG placed)
• Stridor
• Discharged home

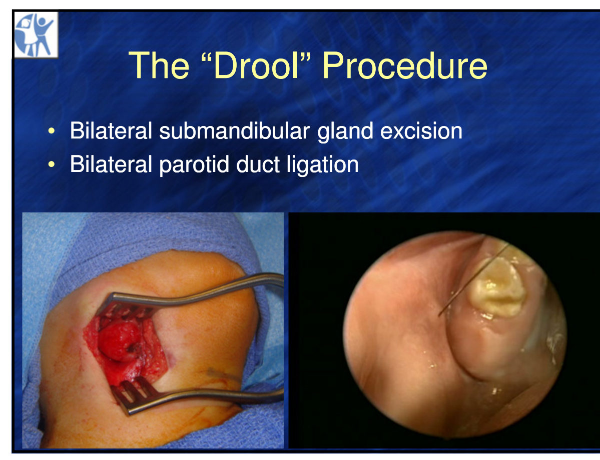

Case Presentation
• Presents 2 months later with severe stridor, exercise intolerance, sleep apnea, still NG dependent due to aspiration
• Air cared to Cincinnati

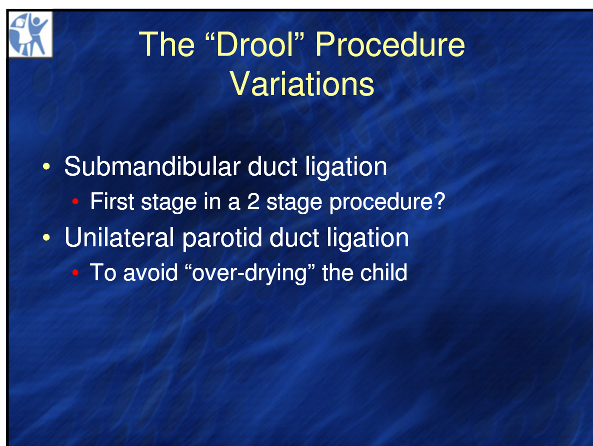

Case Presentation

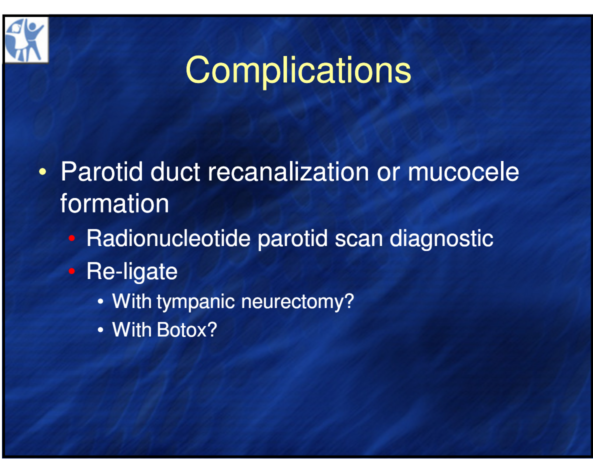

Case Presentation

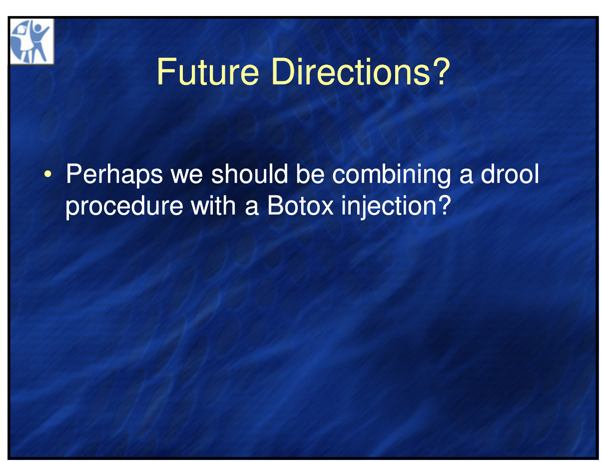

1 Year Later
• Good voice
• No snoring
• Minimal exercise limitation
• No aspiration
• Almost full diet

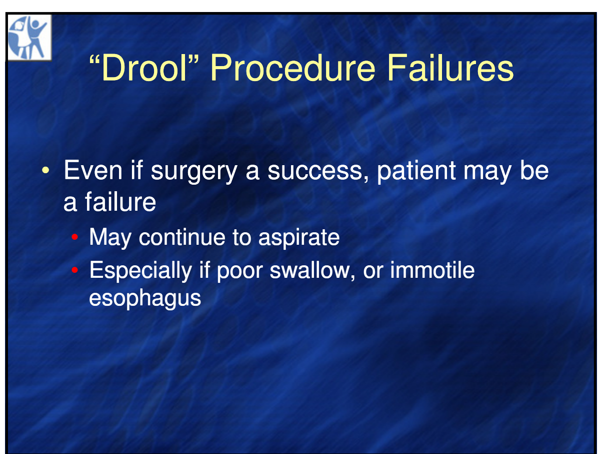

Surgery for Functional Anomalies
Usually for neurological aspirators
Food and drink
Gastrostomy tube
Saliva
Glycopyrolate has usually failed
"Drool" procedure
LT separation
Reflux
Fundoplication
GJ tube

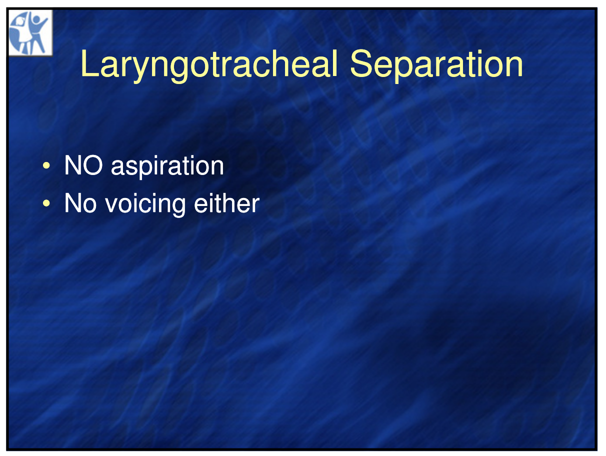

The "Drool" Procedure
Bilateral submandibular gland excision
Bilateral parotid duct ligation

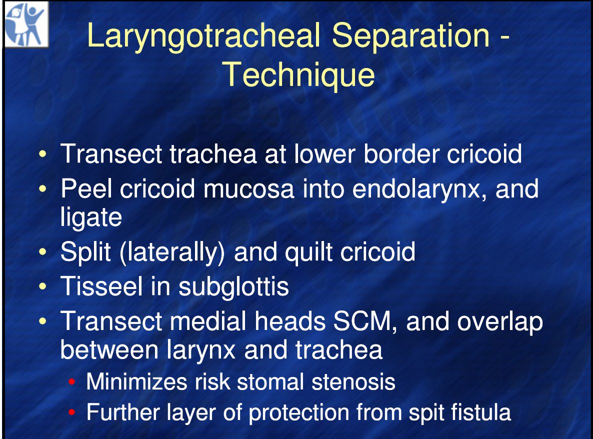

The "Drool" Procedure Variations
Submandibular duct ligation
First stage in a 2 stage procedure?
Unilateral parotid duct ligation
To avoid "over-drying" the child

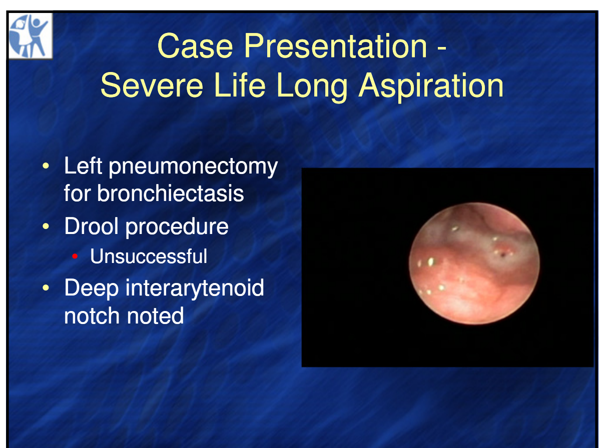

Complications
Parotid duct recanalization or mucocele formation
Radionucleotide parotid scan diagnostic
Re-ligate
With tympanic neurectomy?
With Botox?

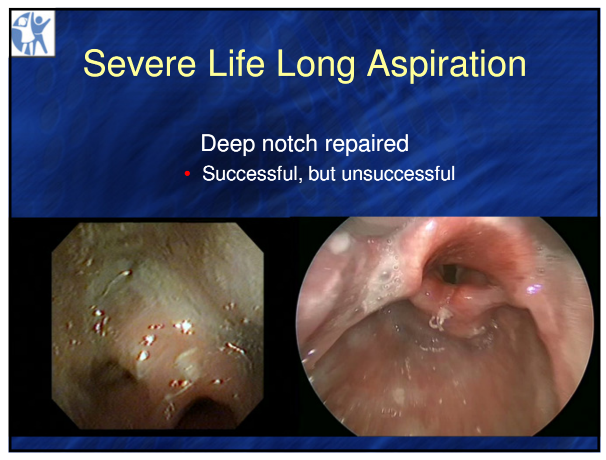

Future Directions?
Perhaps we should be combining a drool procedure with a Botox injection?


"Drool" Procedure Failures
Even if surgery a success, patient may be a failure
May continue to aspirate
Especially if poor swallow, or immotile esophagus

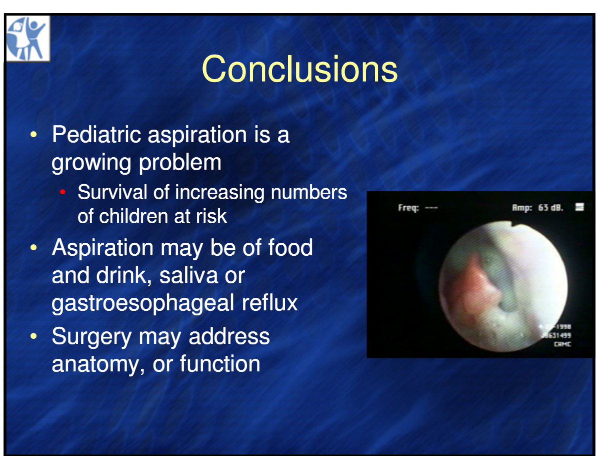

Laryngotracheal Separation
• NO aspiration
• No voicing either


Laryngotracheal Separation - Technique
• Transect trachea at lower border cricoid
• Peel cricoid mucosa into endolarynx, and ligate
• Split (laterally) and quilt cricoid
• Tisseel in subglottis
• Transect medial heads SCM, and overlap between larynx and trachea
• Minimizes risk stomal stenosis
• Further layer of protection from spit fistula


Case Presentation - Severe Life Long Aspiration
• Left pneumonectomy for bronchiectasis
• Drool procedure
• Unsuccessful
• Deep interarytenoid notch noted


Severe Life Long Aspiration
Deep notch repaired
• Successful, but unsuccessful

Severe Life Long Aspiration
LT separation
• Successful


Conclusions
• Pediatric aspiration is a growing problem
• Survival of increasing numbers of children at risk
• Aspiration may be of food and drink, saliva or gastroesophageal reflux
• Surgery may address anatomy, or function