

Incomplete Glottic Closure and Post-Swallow Residue are Associated with Aspiration in Cardiac Surgical Patients.

BACKGROUND:

- We have previously reported a high rate of aspiration in postoperative cardiovascular patients that is associated with increased length of hospital stay, cost of care, pneumonia, reintubation, and death.¹
- Currently, contributing physiologic mechanisms of unsafe swallowing are not known that hinder the development of targeted and effective interventions.

AIMS:

Identify contributing physiologic mechanisms aspiration in postoperative cardiac surgical patients.

Hypothesis: Post-swallow residue and vocal fold mobility impairment increase risk of aspiration in cardiac surgical patients.

METHODS:

- Design:** Single site prospective open-label study.
- Inclusion Criteria:** Adults post-cardiothoracic surgery, no history of dysphagia, extubated, off HF oxygen.
- Procedures:** Standardized fiberoptic endoscopic evaluation of swallowing (FEES) < 72 hours extubation.

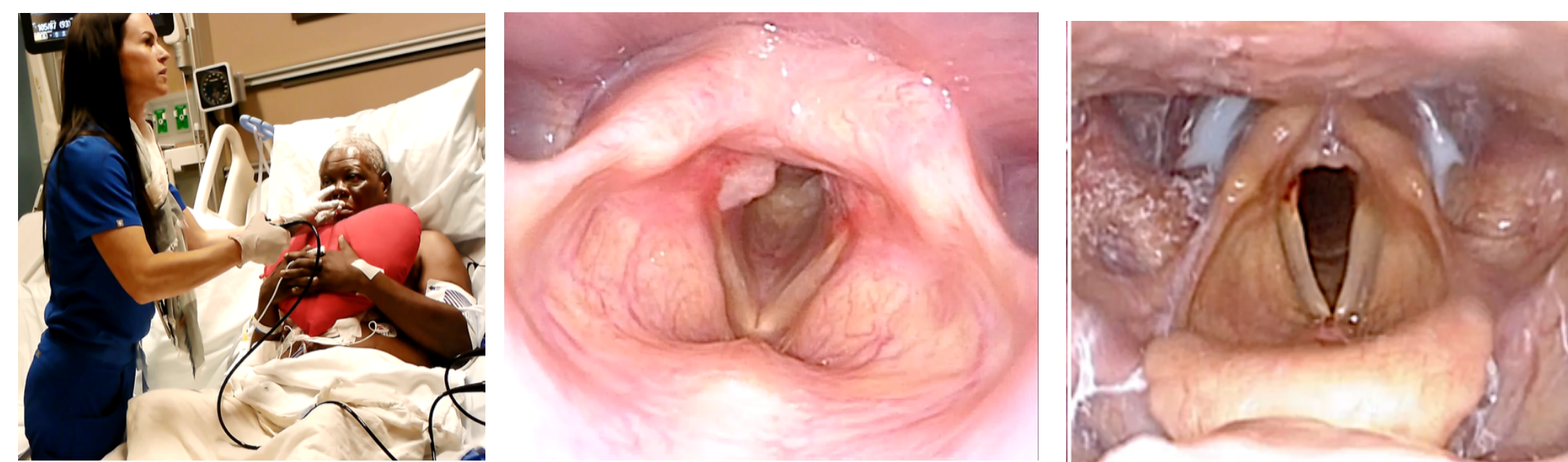


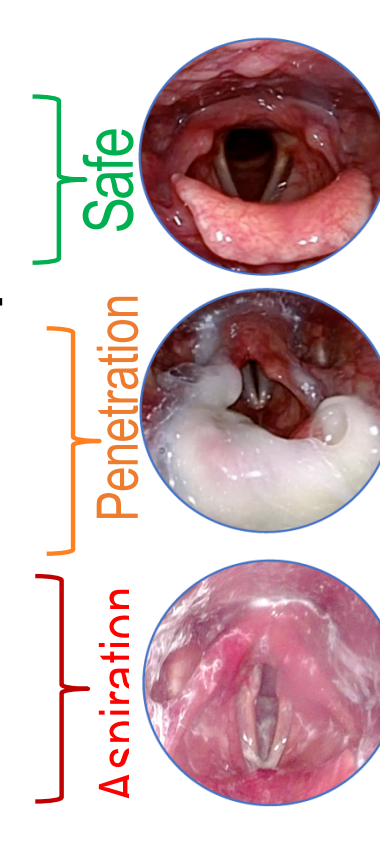
Fig 1. A bedside FEES was performed < 72 hours of extubation.

Swallowing Safety Outcome:

Independent duplicate penetration aspiration scale ratings were made for every elicited swallow in a blinded fashion. The worst PAS score was used for statistical analysis.

Table 1. Penetration Aspiration Scale.

PAS	Definition (airway invasion and response):
1	Material does not enter airway
2	Material enters airway, remains above vocal folds, is ejected from airway
3	Material enters airway, remains above vocal folds, not ejected from airway
4	Material enters airway, contacts vocal folds, is ejected from airway
5	Material enters airway, contacts vocal folds, is not ejected from airway
6	Material enters airway, passes below vocal folds, ejected from airway
7	Material enters airway, passes below vocal folds, not ejected despite effort
8	Material enters airway, passes below vocal folds, no effort made to eject



Aspiration was defined as a PAS score ≥ 6 .

Swallowing Efficiency Outcome:

Independent blinded ratings - Yale Residue Rating Scale
Pharyngeal Residue defined as YRRS: \geq mild at either site.

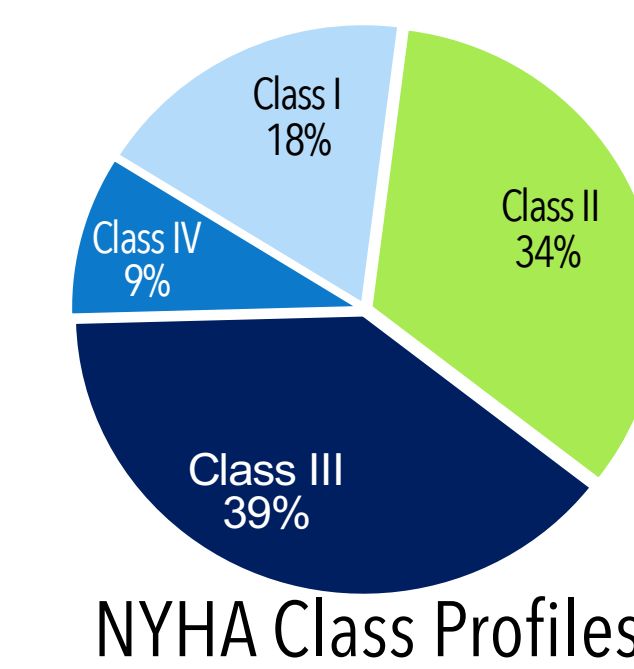
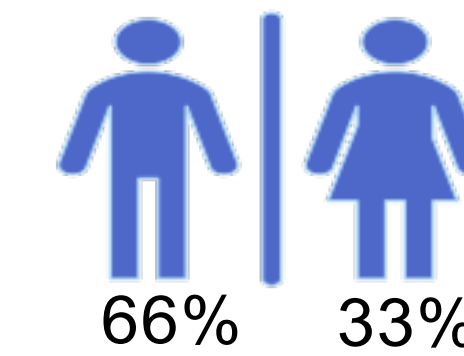
Statistical Analyses:

Independent t-tests, chi-squares and odds ratios (OR).

RESULTS:

Participant Demographics:

- 200 cardiac surgical patients participated.
- Mean Age: 62.7 (SD:12.2)
- Mean BMI: 29.9 (SD:6.4).
- Mean EuroSCORE II: 9.5 (SD:9.4).



Swallowing Safety Profiles:

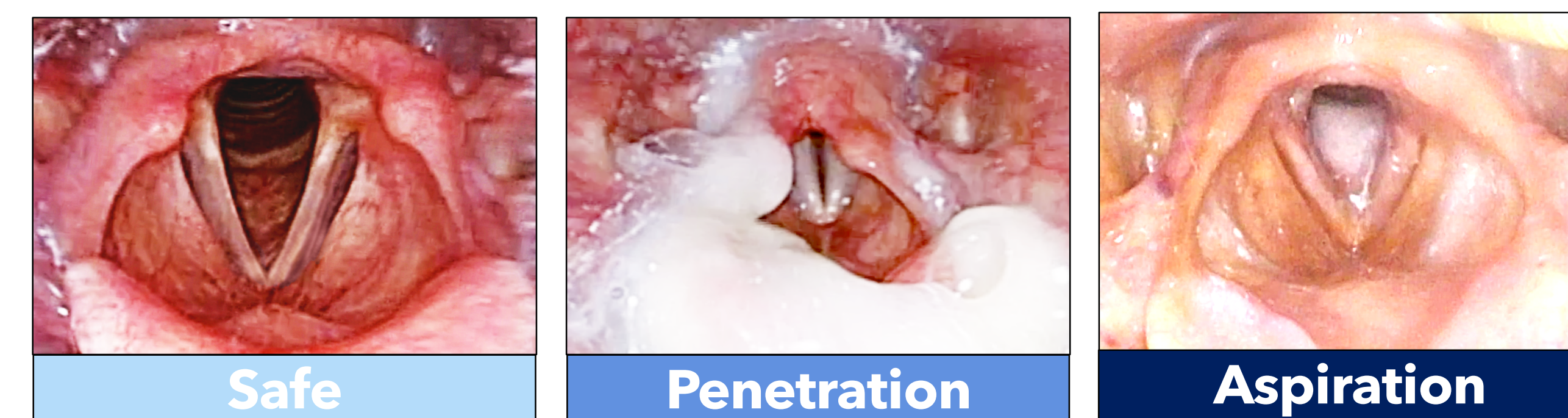
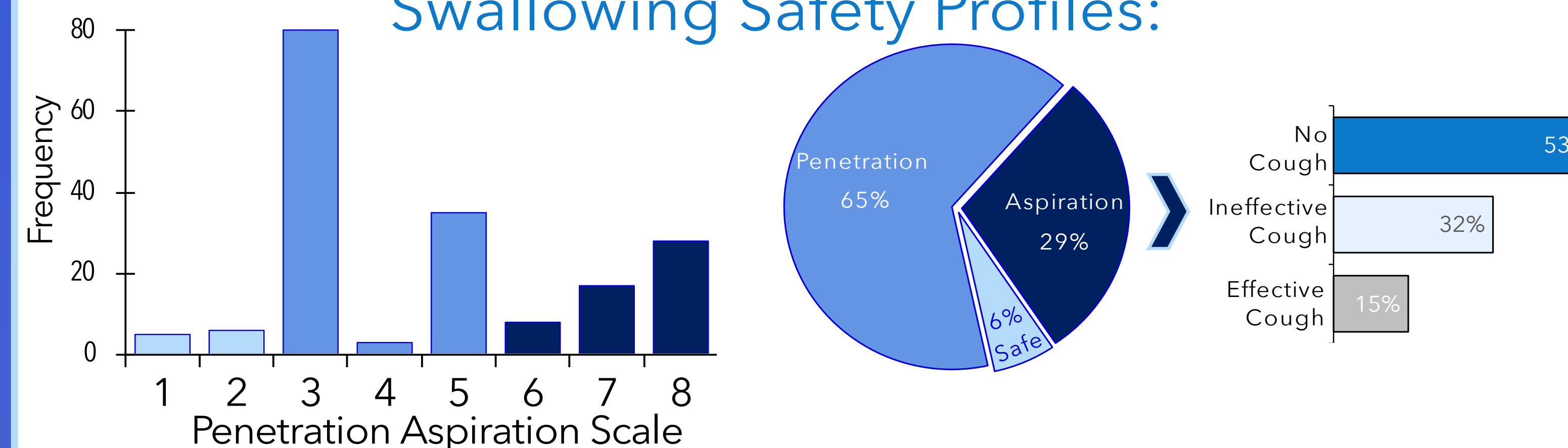


Fig 2. Swallowing Safety Profiles in 200 Cardiac Surgical Patients.

Swallowing Efficiency Profiles:

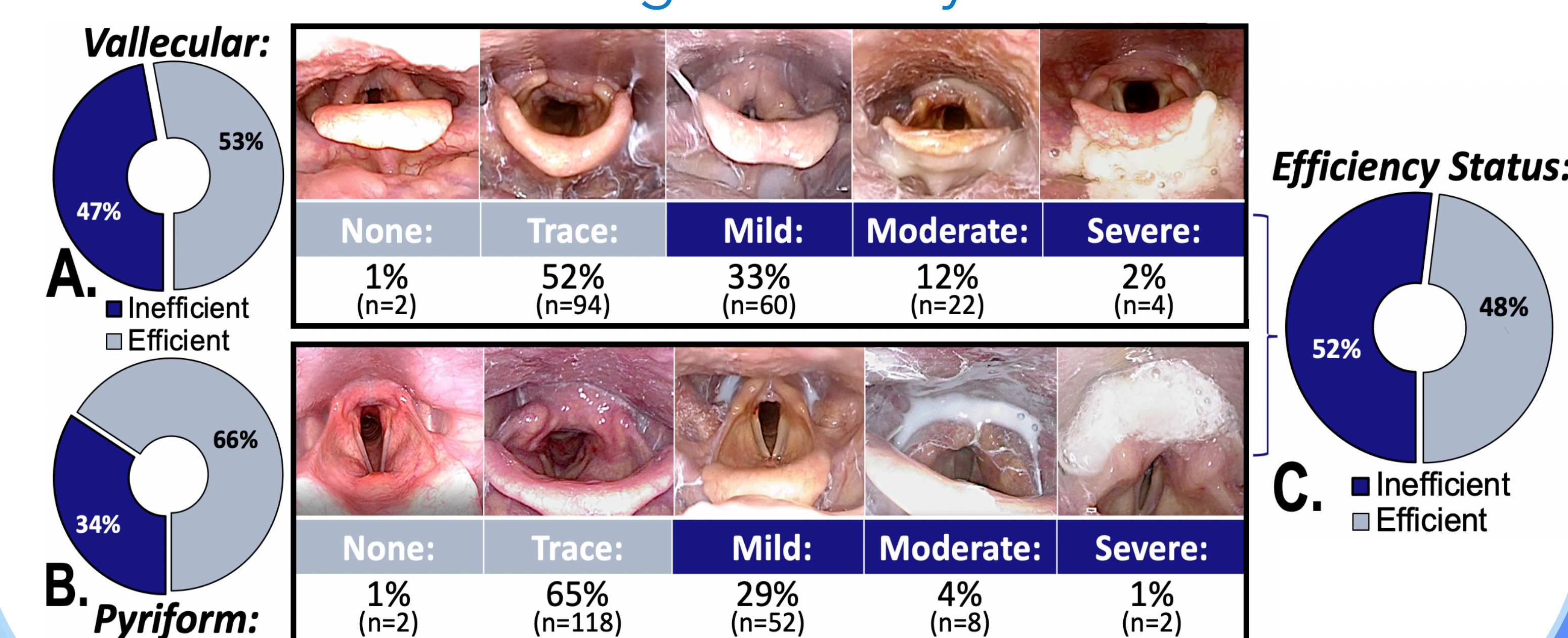
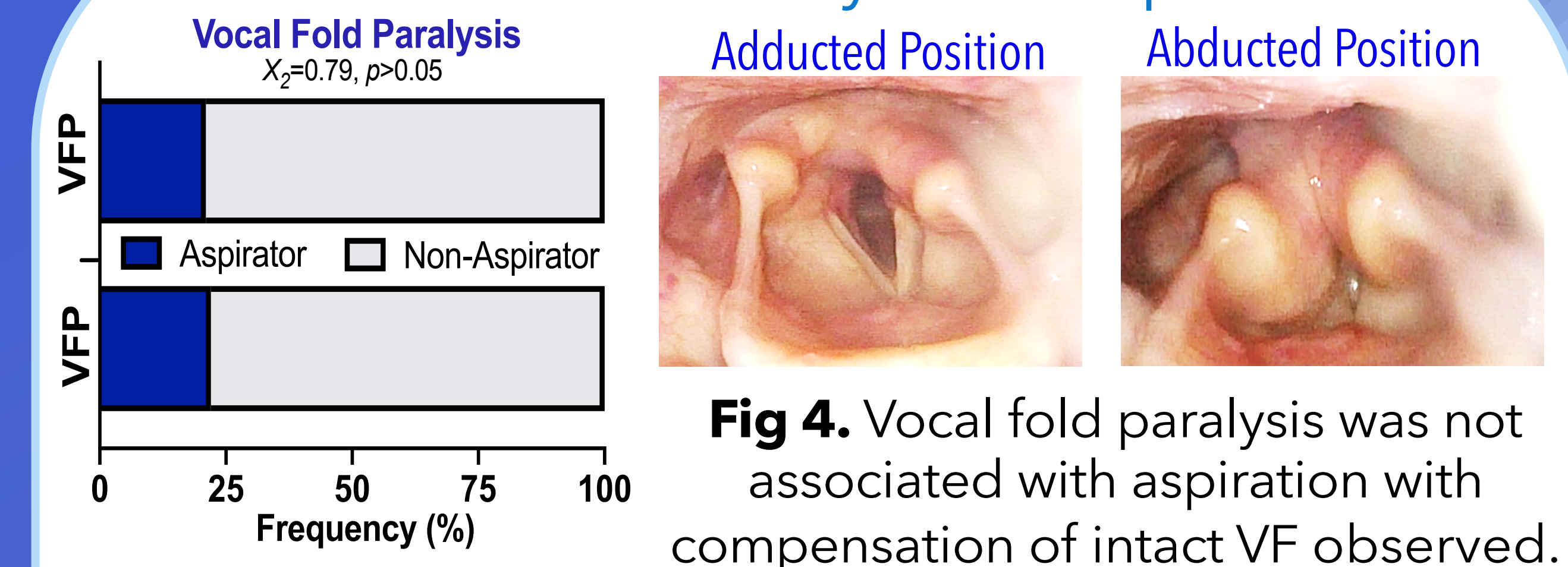
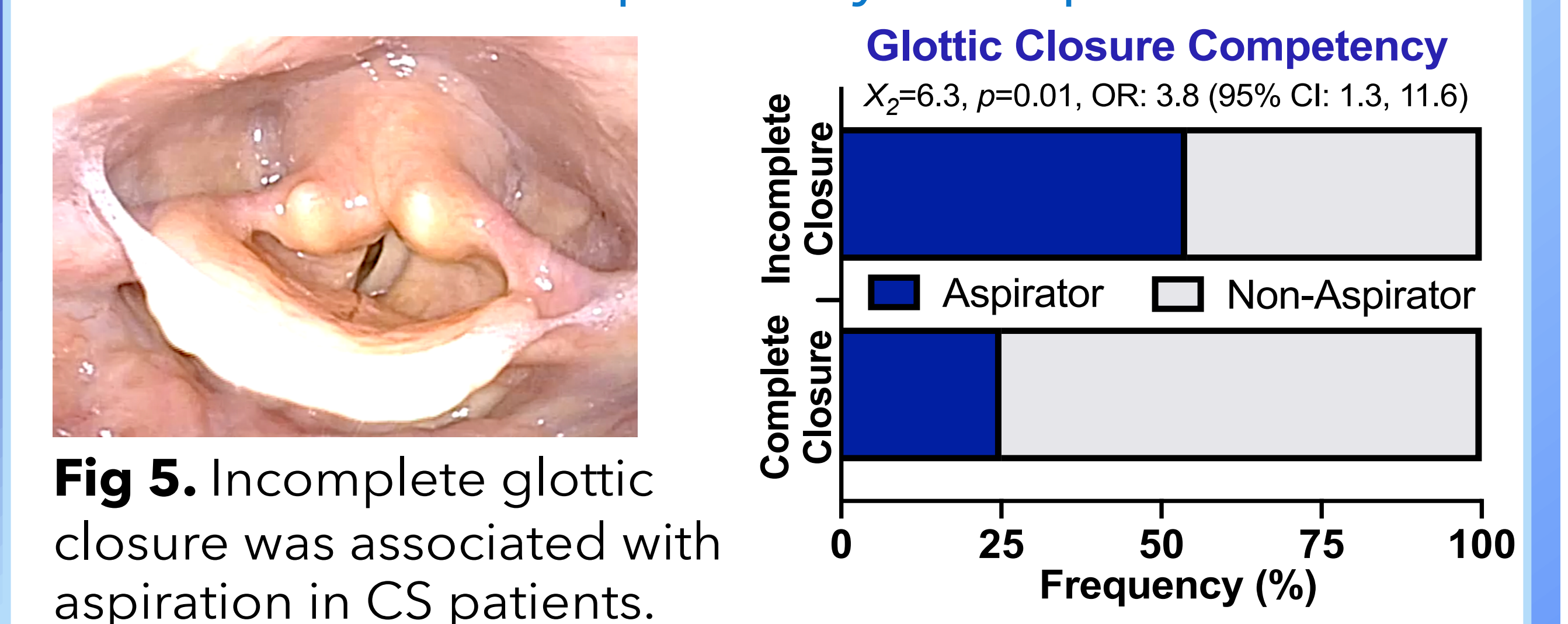


Fig 3. Summary of Swallowing Efficiency Profiles in 200 Cardiac Surgical Patients.

Vocal Fold Paralysis & Aspiration



Glottic Competency & Aspiration:



Post-Swallow Residue & Aspiration:

Table 2. Cardiac surgical patients with post-swallow pharyngeal residue had a 6.4 times higher odds of aspiration (95% CI: 3.1, 13.3).

	Non-Aspirator:	Aspirator:	(%)
Efficient:	89 (44.5%)	11 (5.5%)	50%
Inefficient:	56 (28%)	44 (22%)	50%
(%)	72.5%	27.5%	100%

CONCLUSIONS:

Inability to achieve glottic closure & presence of post-swallow residue were associated with aspiration. While the former mechanism relates to the ability to seal the true vocal folds for closure of the larynx, we believe the latter represents a secondary contributing mechanism increasing risk of aspiration on subsequent swallows. Presence of Vocal fold paralysis did not increase risk of aspiration.