

PHYSIOLOGICAL CHARACTERISTICS AND RECOVERY PATTERN OF DYSPHAGIA AND DYSPHONIA FOLLOWING INHALATION INJURY: A 10 YEAR REVIEW

Nicola A Clayton^{1,2,3,4}, Elizabeth C Ward^{4,5}, Rosalba R Cross³, Mark R Kol³, Peter K Maitz^{2,6}

¹ Speech Pathology Department, Concord Repatriation General Hospital, NSW Australia

² Burns Unit, Concord Repatriation General Hospital, NSW Australia

³ Intensive Care Unit, Concord Repatriation General Hospital, NSW Australia

⁴ School of Health & Rehabilitation Sciences, The University of Queensland, QLD Australia

⁵ Centre for Functioning and Health Research. Queensland Health, QLD Australia

⁶ Faculty of Medicine, University of Sydney, Sydney NSW Australia

Conflicts of Interest: None



THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA



Health
Sydney
Local Health District

STUDY BACKGROUND

Management of the burn patient with associated inhalation injury is complex

Inhalation injury associated with increased risk for morbidity and mortality¹

Potential complications associated with inhalation injury:

- Respiratory distress / airway compromise
- Need for intubation and mechanical ventilation
- Increased fluid resuscitation
- **Dysphagia**
- **Dysphonia**

STUDY BACKGROUND (CONT.)

Dysphagia can be significant and protracted following severe burn injury²⁻¹¹

Predictive factors for dysphagia have been identified & validated:¹²⁻¹³

- Head & neck burns
- **Inhalation injury**
- >18% TBSA burn
- ICU admission
- Intubation & mechanical ventilation
- Escharotomy

STUDY BACKGROUND (CONT.)

Current incidence of **dysphagia** - **11.18%** of all adult burn admissions – **with or without inhalation injury**¹⁵

BUT...

The incidence rate and clinical progression for **dysphagia** in those **specifically with inhalation burn injury** is **unknown**

STUDY BACKGROUND (CONT.)

Furthermore,

There is NO DATA on **incidence of dysphonia or clinical progression of vocal function** following inhalation burn injury

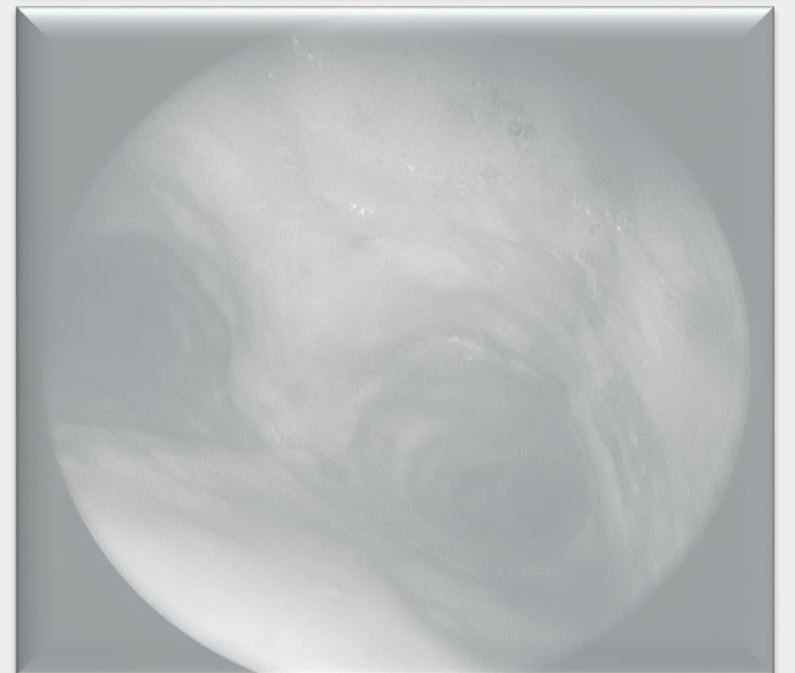
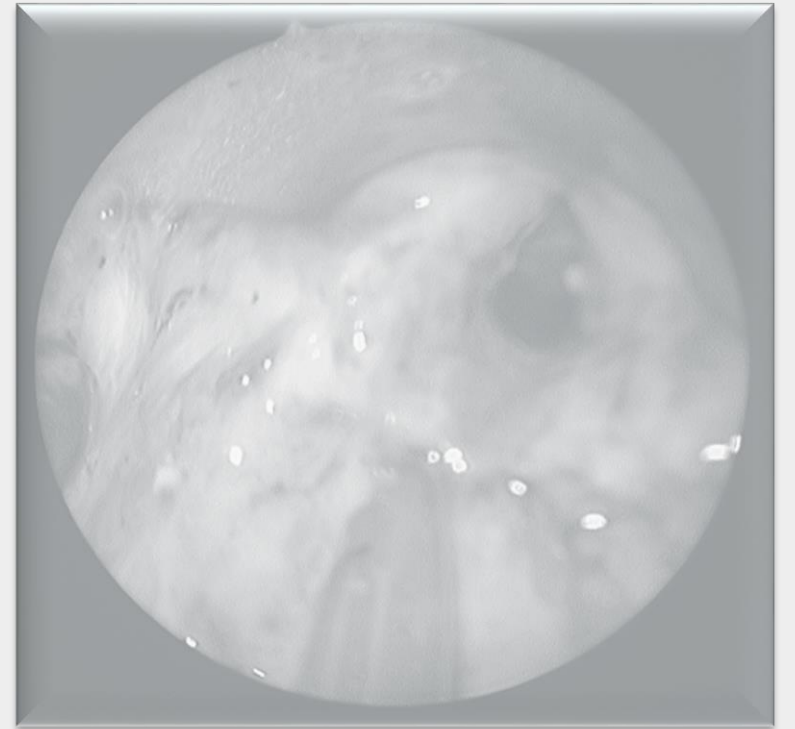


Health
Sydney
Local Health District

STUDY AIM

1. Describe the clinical profile of dysphagia & dysphonia
2. Describe the clinical pattern of recovery and outcomes of swallowing and vocal function

for a cohort of patients with confirmed inhalation burn injury



METHODOLOGY

Swallowing and voice assessments routinely provided for all burn patients admitted with suspected inhalation injury for treatment at CRGH

Study conducted over 10 year period:

January 2008- December 2017

Participants:

Inclusion criteria	Exclusion criteria
<ul style="list-style-type: none">Admitted to Burns Unit at CRGHInhalation burn injury confirmed on nasendoscopyICU and intubation may be part of treatment	<ul style="list-style-type: none">Pre-existing dysphagiaPre-existing dysphoniaPre-existing laryngeal pathologyPatients whose swallow and vocal function was not assessed due to poor prognosis for survival

OUTCOME MEASURES

Retrospective chart review conducted:

Demographic & Burn data	Swallowing & Voice data
Age	Functional Oral Intake Scale
Gender	Days to initiate oral feeding (DIOF)
% TBSA burns	Days to total oral feeding (DTOF)
Mechanism of burn	Days of enteral feeding
Anatomical location of burn	Presence of dysphonia
Past medical history	Ability to achieve premorbid voice
Days of mechanical ventilation	Days to recovery of premorbid voice
Length of Stay (LOS)	Laryngeal pathology
	Dysphagia and dysphonia rehabilitation details

RESULTS

Demographic & Burn Data:

- n=38 (144 suspected inhalation): 26 male, 12 female
- 100% H&N burns
- 100% flame/explosion as mechanism of injury

	n (%)	Range	Mean
Age	-	17-71	40.8
% TBSA burn	-	1-90	35.3
Length of stay	-	2-213	60.2
Mechanical ventilation	37 (97)	0-24	9.6
Tracheostomy	7 (18)	-	-

RESULTS (CONT.)

Swallowing data (n=38)

Dysphagia present = **89.47%** of patients

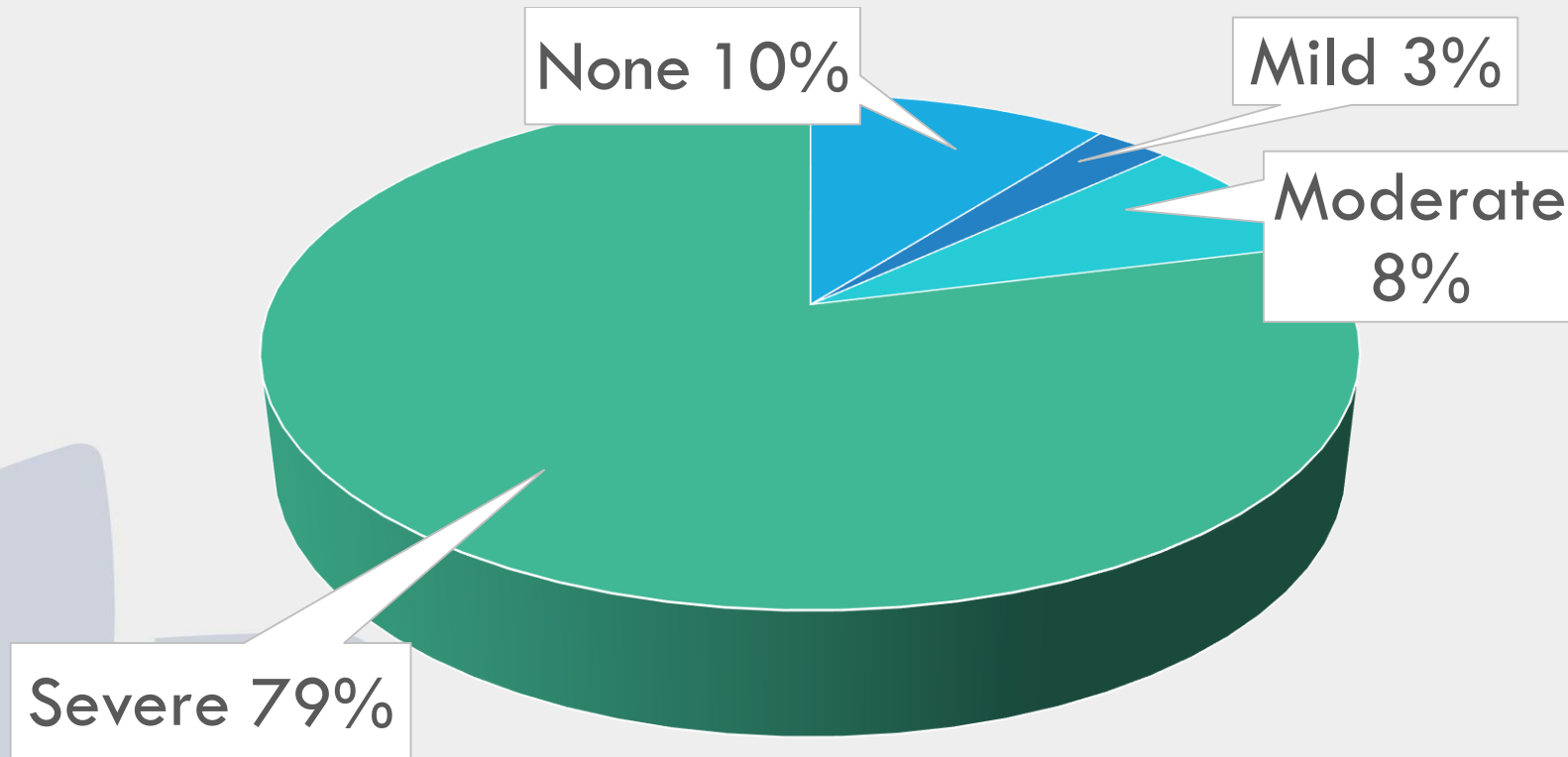
Days to initiate oral feeding = mean **24.69 days** (range 1-200 days)

Duration to total oral feeding = mean **42.85 days** (range 1-222 days)
(& resolution of dysphagia)

Duration of enteral feeding = mean **45.03 days** (range 0-200 days)

RESULTS (CONT.)

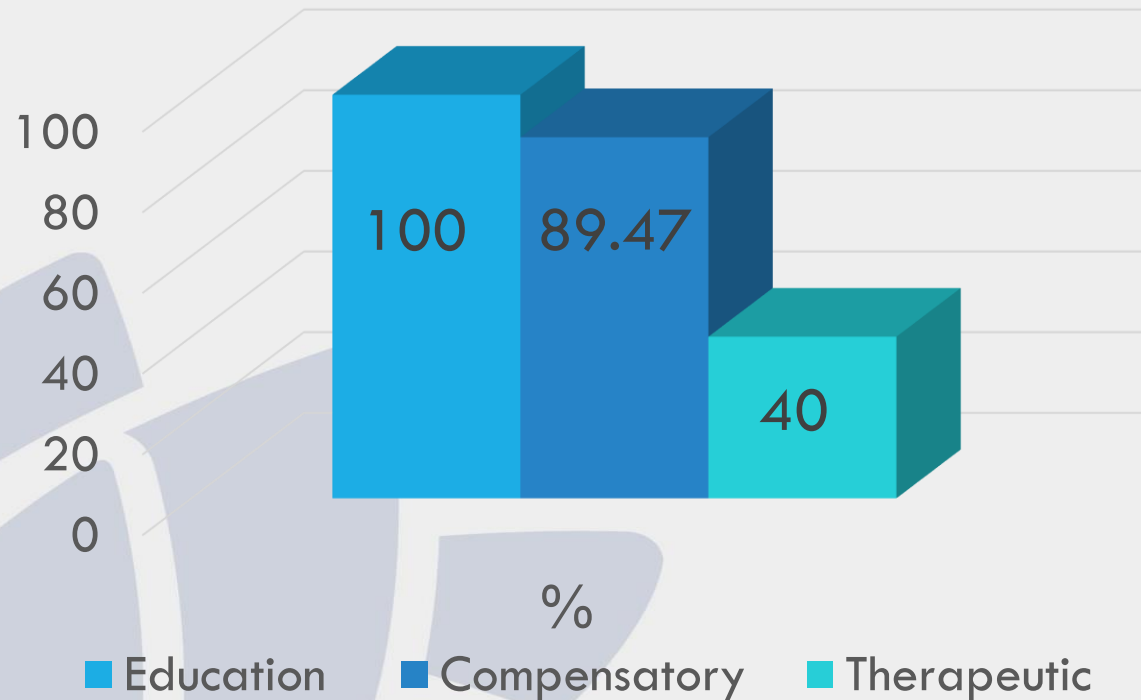
Severity of dysphagia on initial assessment (n=38)



Resolution of dysphagia achieved = **97.37%**

RESULTS (CONT.)

Swallowing rehabilitation (n=38)



Therapeutic rehabilitation strategies:

- Base of tongue strengthening
- Pharyngeal strengthening

RESULTS (CONT.)

Swallowing outcomes

compared to published data of Rumbach et al (2012)

	Current study	Rumbach et al 2012	P-Value
Dysphagia incidence	89.47%	11.18%	<0.001 (Chi:148.604)
Male	70.59%	83.67%	Not sig.
Female	29.41%	16.33%	Not sig.

RESULTS (CONT.)

Swallowing Data: comparison of dysphagic cohorts

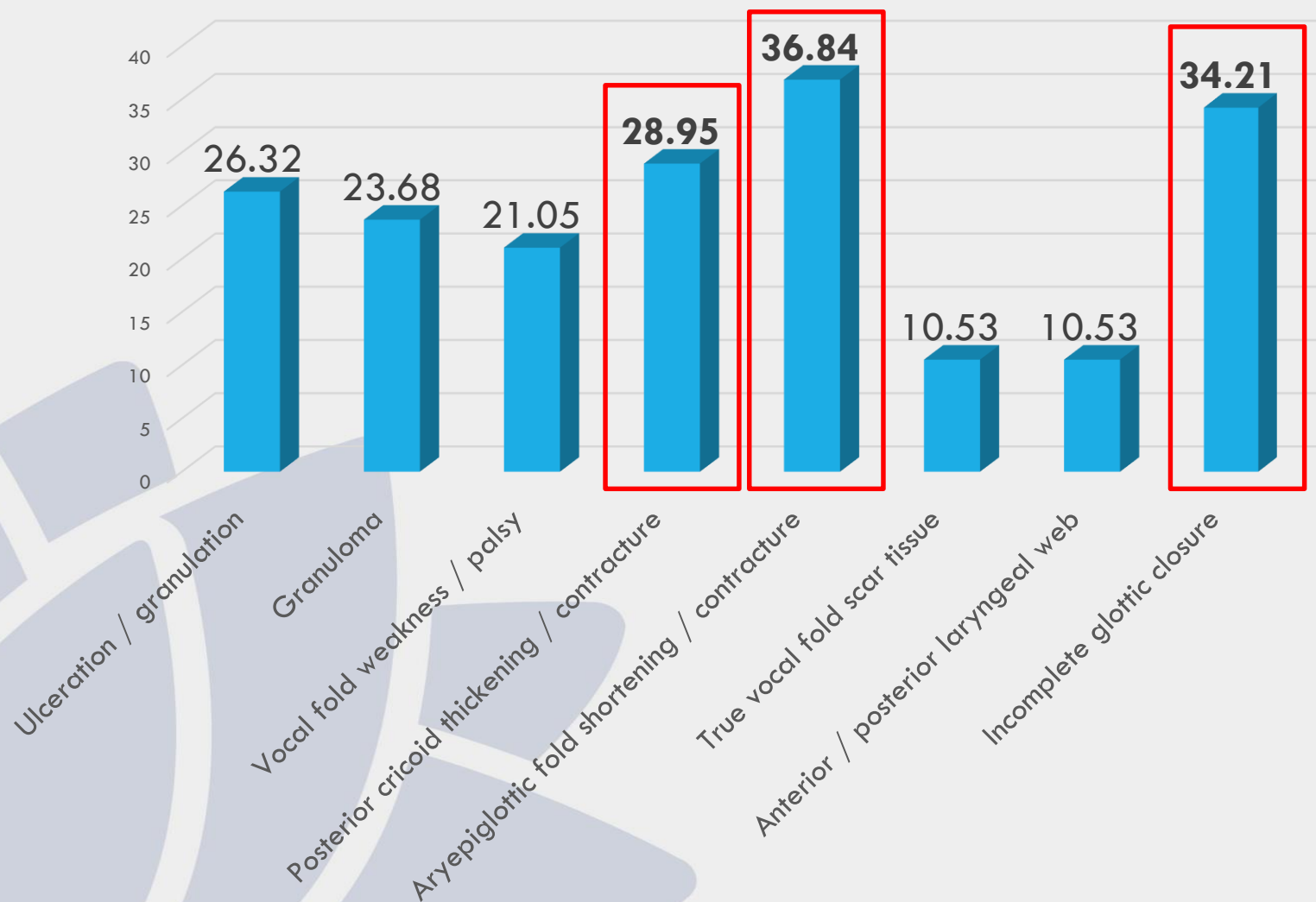
	Current study: Inhalation injury + Dysphagia (n=34) Mean days (range)	Rumbach et al 2012: Burn + Dysphagia (n=49) Mean days (range)
Days to initiate oral feeding	27.03 (3-200)	18.77 (0-116)
Days to total oral feeding (resolution of dysphagia)	52.13 (4-222)	33.55 (2-117)
Days of enteral feeding	49.55 (3-222)	34.23 (1-117)
Days of ETT	10.03 (3-24)	11.23 (1-24)
Length of stay (days)	64.5 (6-213)	56.45 (11-198)

RESULTS (CONT.)

Voice Data (n=38)

- Presence of dysphonia = **100%**
- Resolution of dysphonia at 6 months = **52.63%**
- Days to resolution = mean **65.05 days** (range 24-152 days)
- Active laryngeal rehabilitation = **71.05%**
 - laryngeal ROM X's
 - vocal hygiene
 - deconstriction
- Surgical treatment required = **10.53%**

RESULTS (CONT.)



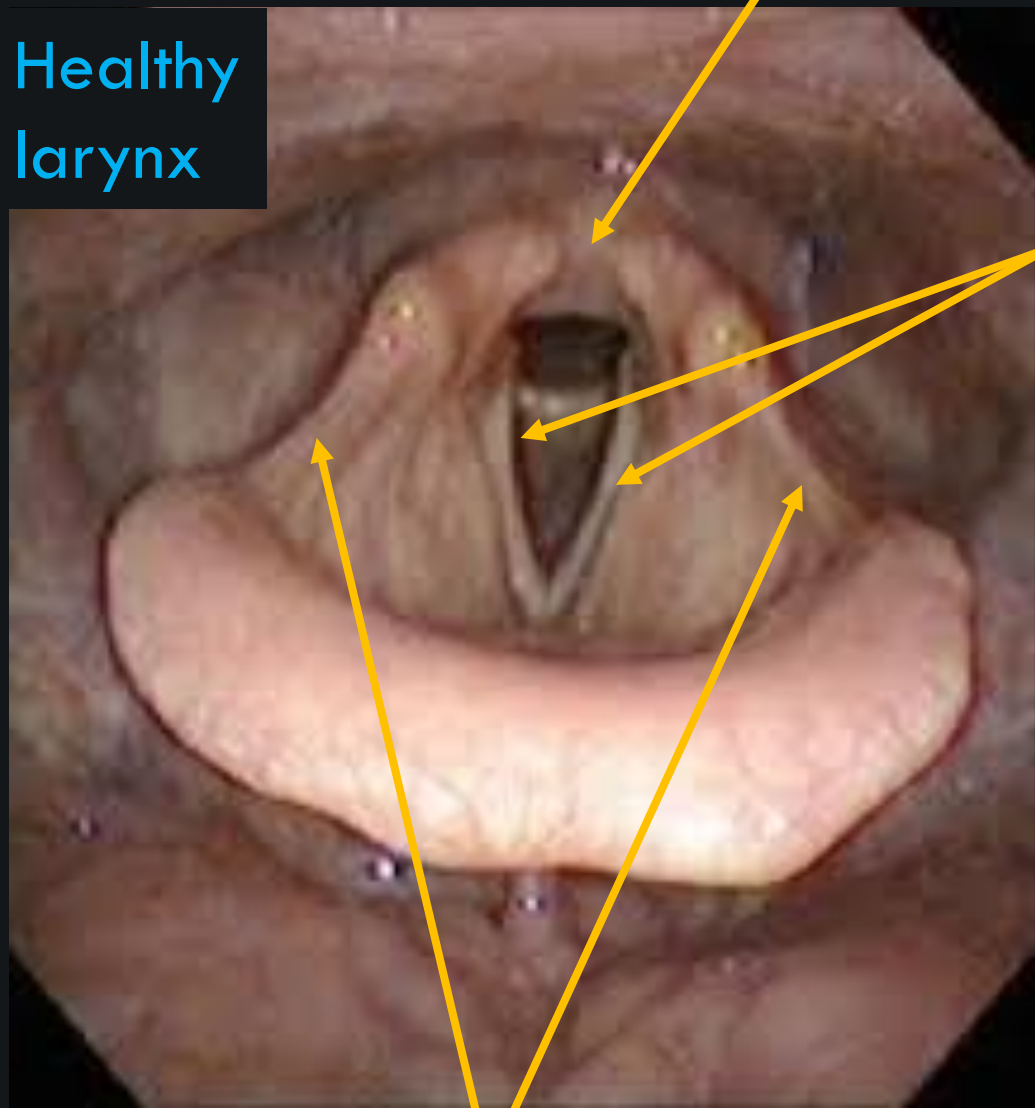
Voice Data

Persistent laryngeal
pathology = 47.37%

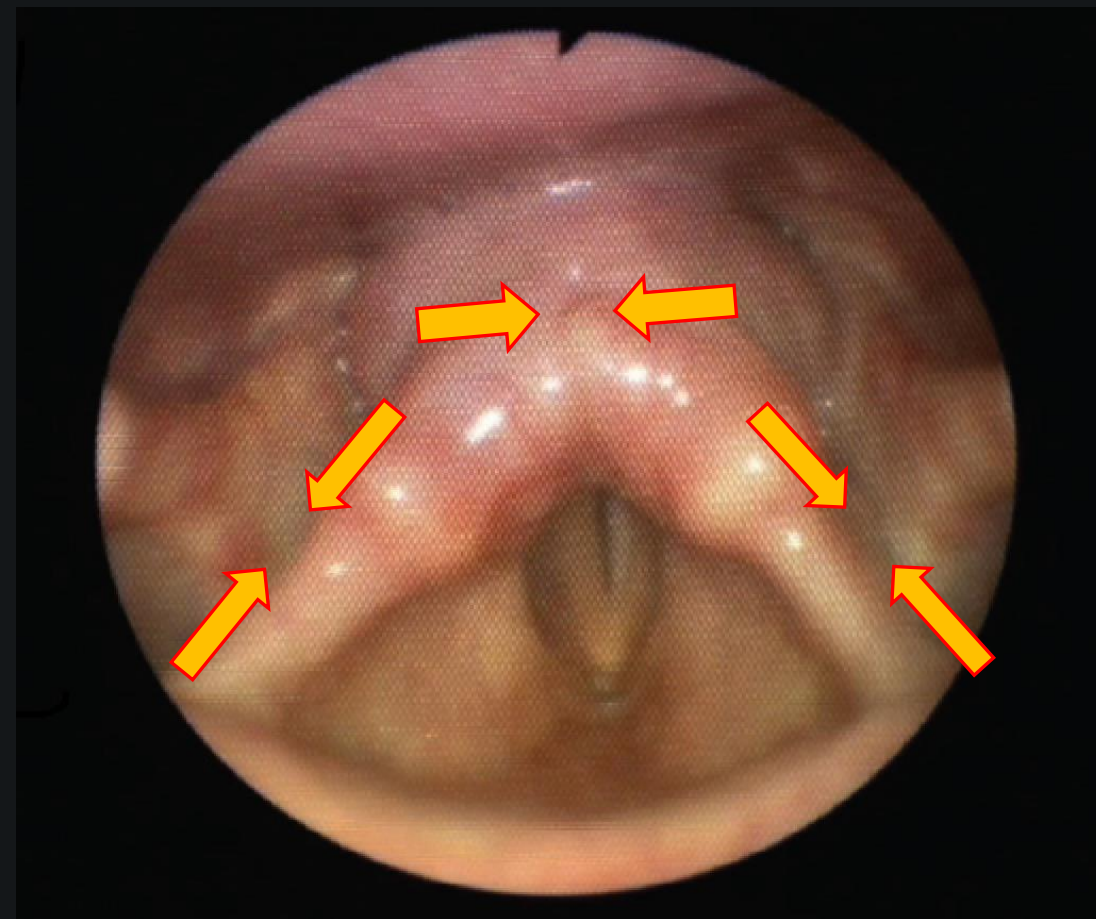
Healthy
larynx

Posterior cricoid

Vocal
folds



Aryepiglottic folds



Laryngeal contractures
post inhalation burn

RESULTS (CONT.)

Relationships between dysphagia, dysphonia & burn data :

No significant relationship identified between persistent dysphonia and:

- %TBSA burns
- Duration of mechanical ventilation
- Length of stay
- Duration to commencing oral intake
- Duration to dysphagia recovery
- Days of enteral feeding

Significant relationship present between persistent dysphonia and age

CONCLUSIONS

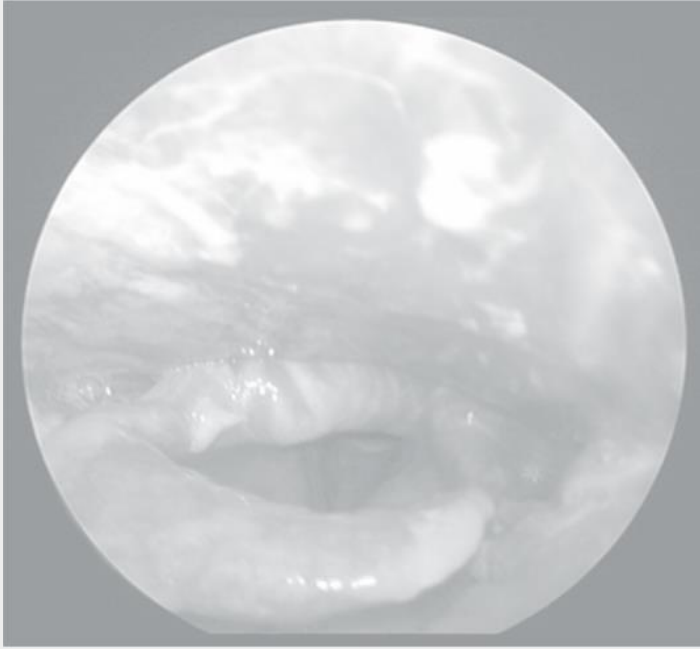
Incidence of dysphagia post inhalation injury is **8 times higher** than in the general burn population

The risk of persistent dysphonia post inhalation injury is high

No significant relationships (other than age) identified between burn characteristics, dysphagia and persistent dysphonia following inhalation burn injury



Health
Sydney
Local Health District



FUTURE DIRECTIONS

Describe optimal treatment programs to maximise functional swallowing and voice outcomes post inhalation injury

REFERENCES

1. Lundgren et al., *JBCR* 2009
2. Clayton & Kennedy, *Dysphagia* 2007a
3. Clayton et al., *Burns* 2010
4. Clayton et al., *Burns* 2017
5. Cheung et al., *IJSLP* 2013
6. Edelman et al., *JBCR* 2008
7. DuBose et al., *JBCR* 2005
8. Rumbach et al., *JBCR* 2009a
9. Rumbach et al., *Dysphagia* 2012a
10. Rumbach et al., *JBCR* 2012b
11. Ward et al., *JBCR* 2001
12. Rumbach et al., *JBCR* 2011a
13. Rumbach et al., *Burns* 2014



ACKNOWLEDGEMENTS

Anne Darton (NSW SBIS) – database interrogation

nicola.clayton@health.nsw.gov.au



**THE UNIVERSITY
OF QUEENSLAND**
AUSTRALIA



Health
Sydney
Local Health District