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

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Conflicts of Interest: None
STUDY BACKGROUND

Management of the burn patient with associated inhalation injury is complex

Inhalation injury associated with increased risk for morbidity and mortality

Potential complications associated with inhalation injury:

- Respiratory distress / airway compromise
- Need for intubation and mechanical ventilation
- Increased fluid resuscitation
- Dysphagia
- Dysphonia
Dysphagia can be significant and protracted following severe burn injury 2-11

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

- Head & neck burns
- Inhalation injury
- >18% TBSA burn
- ICU admission
- Intubation & mechanical ventilation
- Escharotomy
Current incidence of dysphagia - 11.18% of all adult burn admissions – with or without inhalation injury\(^\text{15}\)

BUT...

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

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

<table>
<thead>
<tr>
<th>Inclusion criteria</th>
<th>Exclusion criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admitted to Burns Unit at CRGH</td>
<td>Pre-existing dysphagia</td>
</tr>
<tr>
<td>Inhalation burn injury confirmed on nasendoscopy</td>
<td>Pre-existing dysphonia</td>
</tr>
<tr>
<td>ICU and intubation may be part of treatment</td>
<td>Pre-existing laryngeal pathology</td>
</tr>
<tr>
<td></td>
<td>Patients whose swallow and vocal function was not assessed due to poor prognosis for survival</td>
</tr>
</tbody>
</table>
OUTCOME MEASURES

Retrospective chart review conducted:

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

**Demographic & Burn Data:**

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

<table>
<thead>
<tr>
<th></th>
<th>n (%)</th>
<th>Range</th>
<th>Mean</th>
</tr>
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<tbody>
<tr>
<td>Age</td>
<td>-</td>
<td>17-71</td>
<td>40.8</td>
</tr>
<tr>
<td>% TBSA burn</td>
<td>-</td>
<td>1-90</td>
<td>35.3</td>
</tr>
<tr>
<td>Length of stay</td>
<td>-</td>
<td>2-213</td>
<td>60.2</td>
</tr>
<tr>
<td>Mechanical ventilation</td>
<td>37 (97)</td>
<td>0-24</td>
<td>9.6</td>
</tr>
<tr>
<td>Tracheostomy</td>
<td>7 (18)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
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)

- None: 10%
- Mild: 3%
- Moderate: 8%
- Severe: 79%

Resolution of dysphagia achieved = 97.37%
RESULTS (CONT.)

Swallowing rehabilitation (n=38)

Therapeutic rehabilitation strategies:
- Base of tongue strengthening
- Pharyngeal strengthening

Diagram showing percentages of different rehabilitation strategies: Education (100%), Compensatory (89.47%), Therapeutic (40%).
Swallowing outcomes compared to published data of Rumbach et al (2012)

<table>
<thead>
<tr>
<th></th>
<th>Current study</th>
<th>Rumbach et al 2012</th>
<th>P-Value</th>
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</thead>
<tbody>
<tr>
<td>Dysphagia incidence</td>
<td>89.47%</td>
<td>11.18%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Chi:148.604)</td>
</tr>
<tr>
<td>Male</td>
<td>70.59%</td>
<td>83.67%</td>
<td>Not sig.</td>
</tr>
<tr>
<td>Female</td>
<td>29.41%</td>
<td>16.33%</td>
<td>Not sig.</td>
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</table>
Swallowing Data: comparison of dysphagic cohorts

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

Aryepiglottic folds

Vocal folds

Healthy larynx

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.
FUTURE DIRECTIONS

Describe optimal treatment programs to maximise functional swallowing and voice outcomes post inhalation injury.
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13. Rumbach et al., Burns 2014
ACKNOWLEDGEMENTS

Anne Darton (NSW SBIS) – database interrogation

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