National Tracheostomy Safety Project

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‘It’s good to talk’
Above Cuff Vocalisation for trache patients

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11th Annual ECCRG Study Day, 24th May 2019

NHS National Institute for Health Research

NHS Manchester University NHS Foundation Trust

Introduction

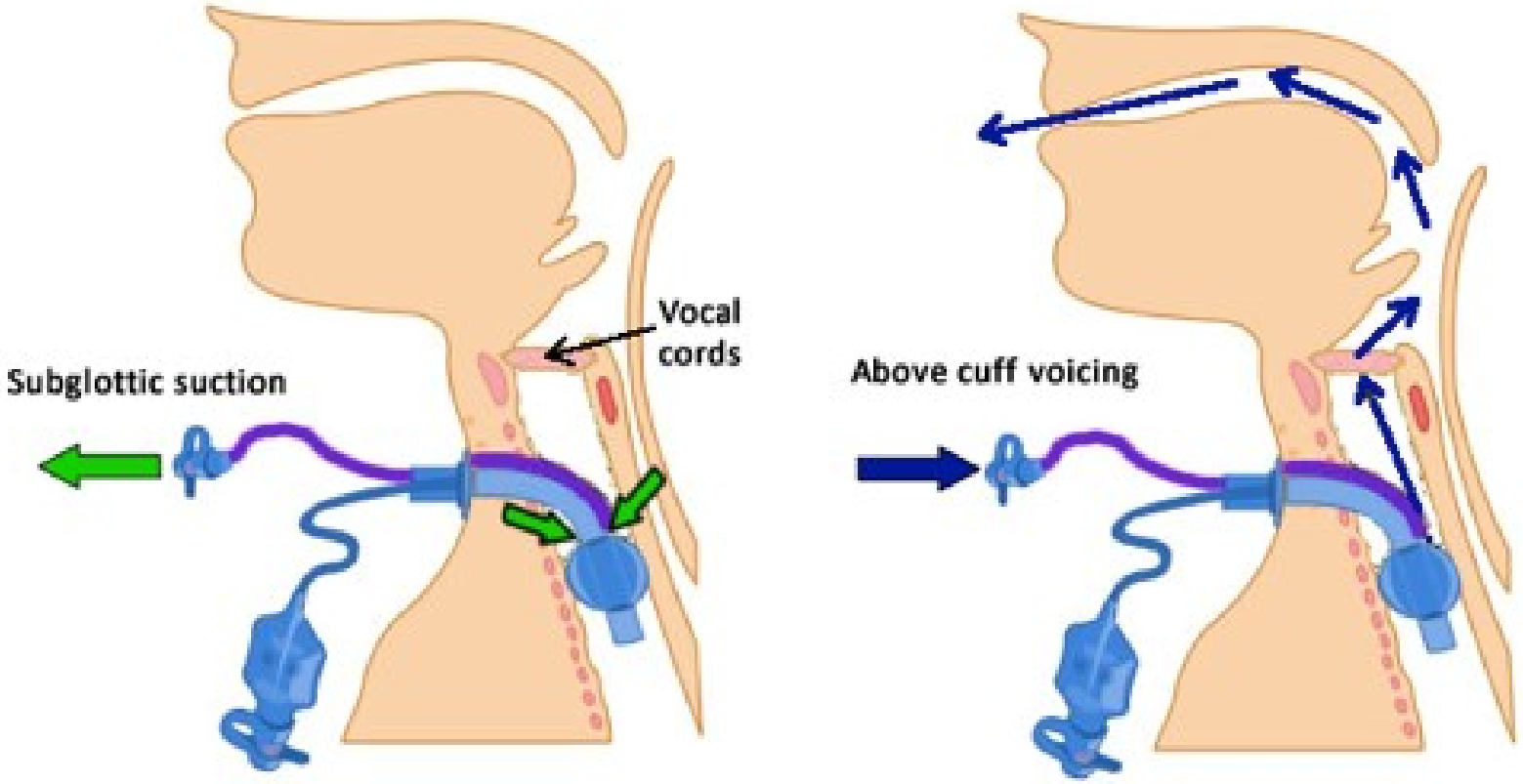
- What is Above Cuff Vocalisation (ACV)?
- Why critical care patients experience voice loss
- Impact
- Suitability for ACV, procedure
- Efficacy, benefits
- Safety and best practice

What is ACV?

- Method to enable vocalisation in cuff-inflated tracheostomised ventilated patients
- SGS tubes allow secretion removal from above cuff, help to reduce VAP *(Frost 2013)*
- Separate retrograde gas flow via subglottic port restores laryngeal airflow
- No disruption to ventilation

(Pandian 2014, McGrath 2015, Kothari 2017, McGrath 2018)

ACV



Why do critical care patients experience voice loss?

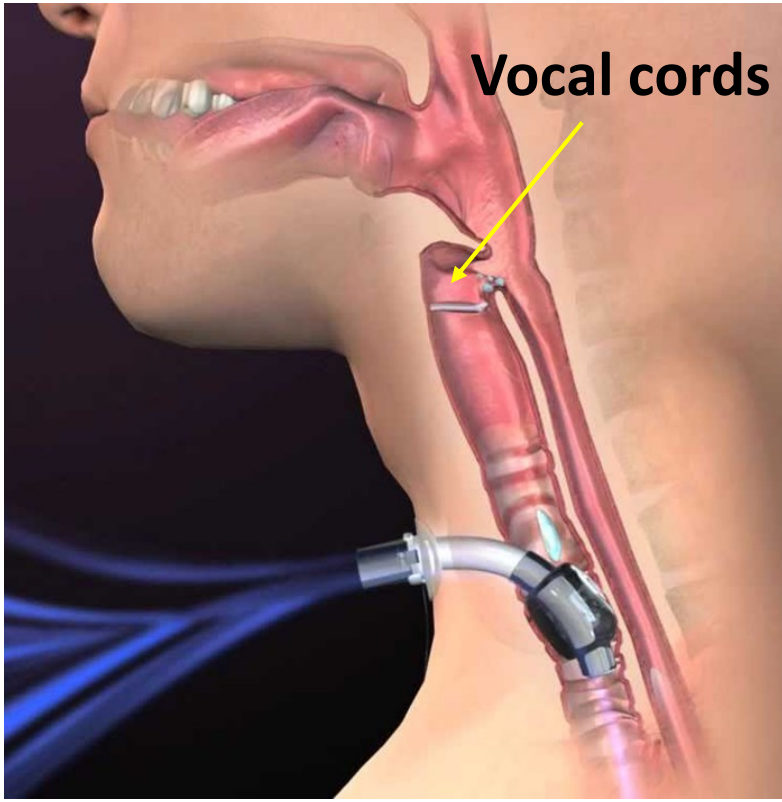
1. **Cuff inflation**

   Airflow bypasses larynx

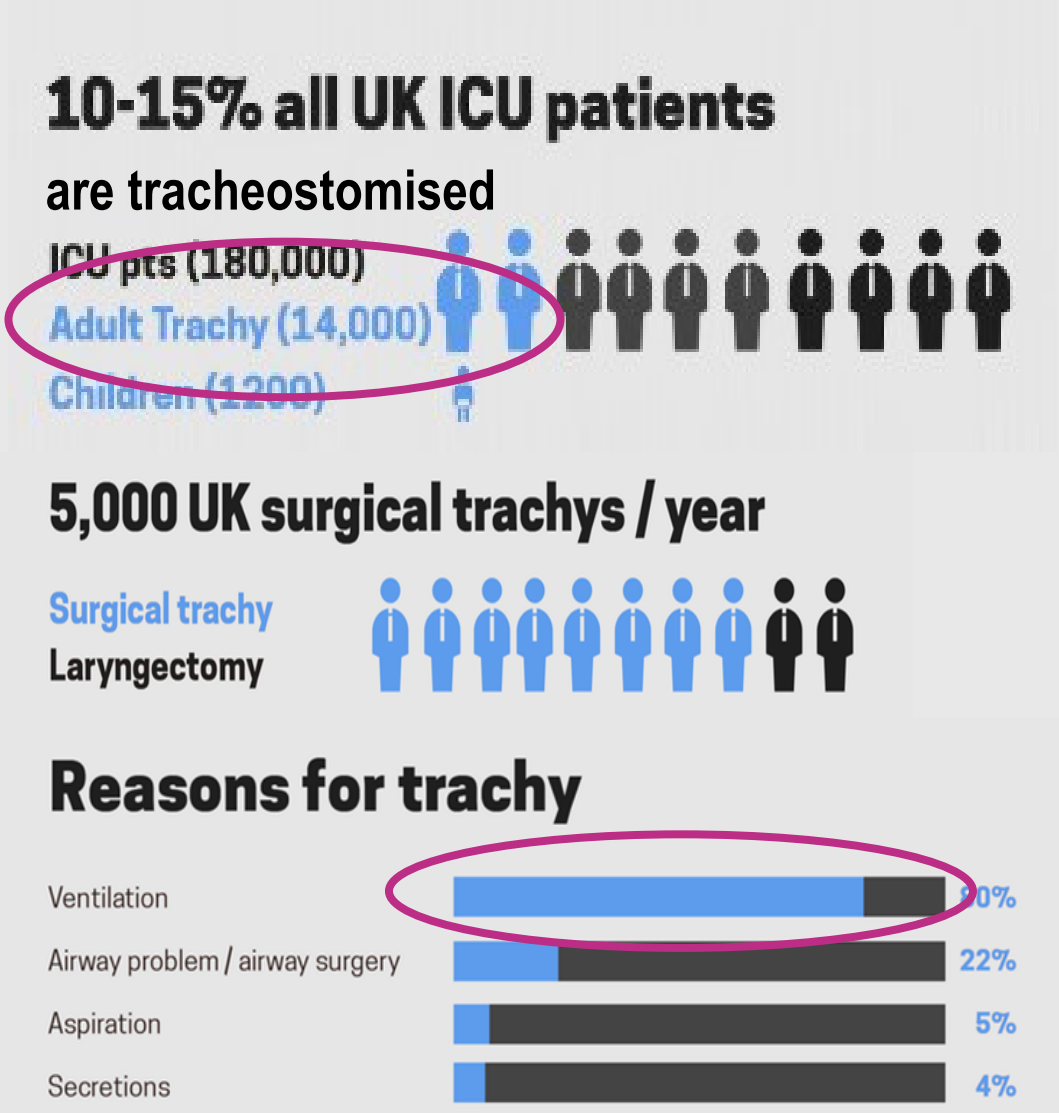
   Desensitisation

   Downregulation of swallow

   Loss of voice has a detrimental impact on recovery



How many patients does this affect?



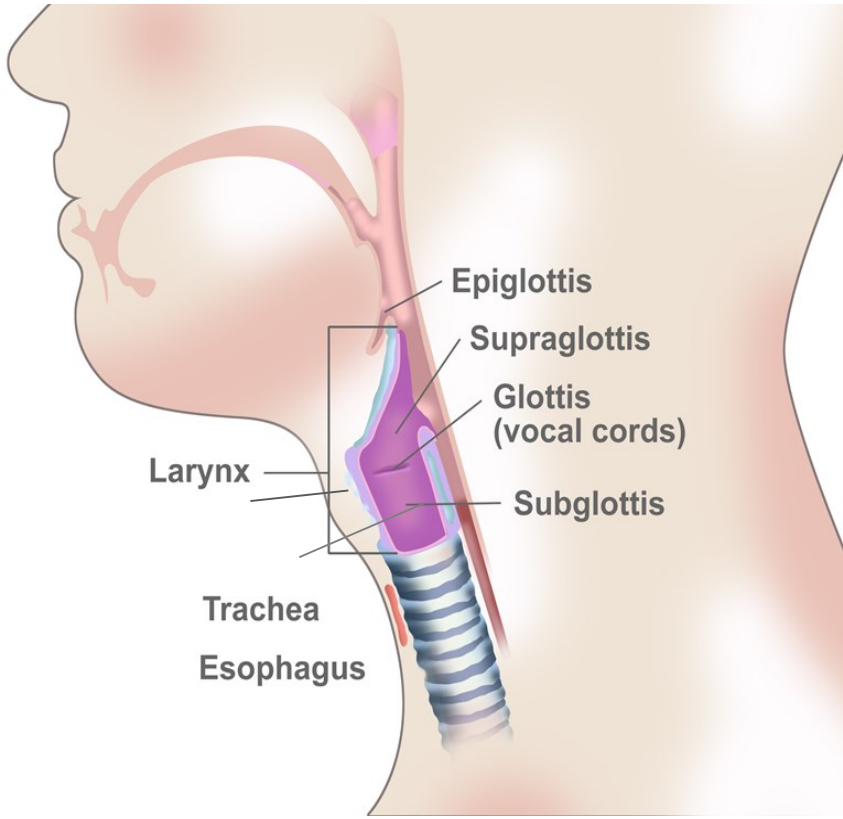
(Veenith 2008, Shah 2012)

Other causes of voice loss

1. **Critical illness myopathy, sedatives, ↓ reserve**
   Laryngeal weakness, vocal cord atrophy

2. **Vocal cord palsy**
   RLN injury, ETT cuff pressure
   CT / H&N surgery
   Bulbar impairment

3. **Laryngeal injury**
   Intubation, reflux

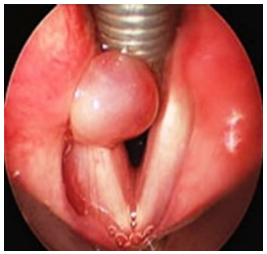


Laryngeal injury from intubation

- Up to 83% of ICU patients post extubation *(Brodsky 2018)*
- Throat pain, hoarseness, dysphagia
- Factors: Reintubation, age, duration, tube size, difficulty
- Vocal cord palsy, oedema, granuloma, stenosis
- Leads to silent aspiration, failed decannulation/wean

Left Vf palsy

Oedema

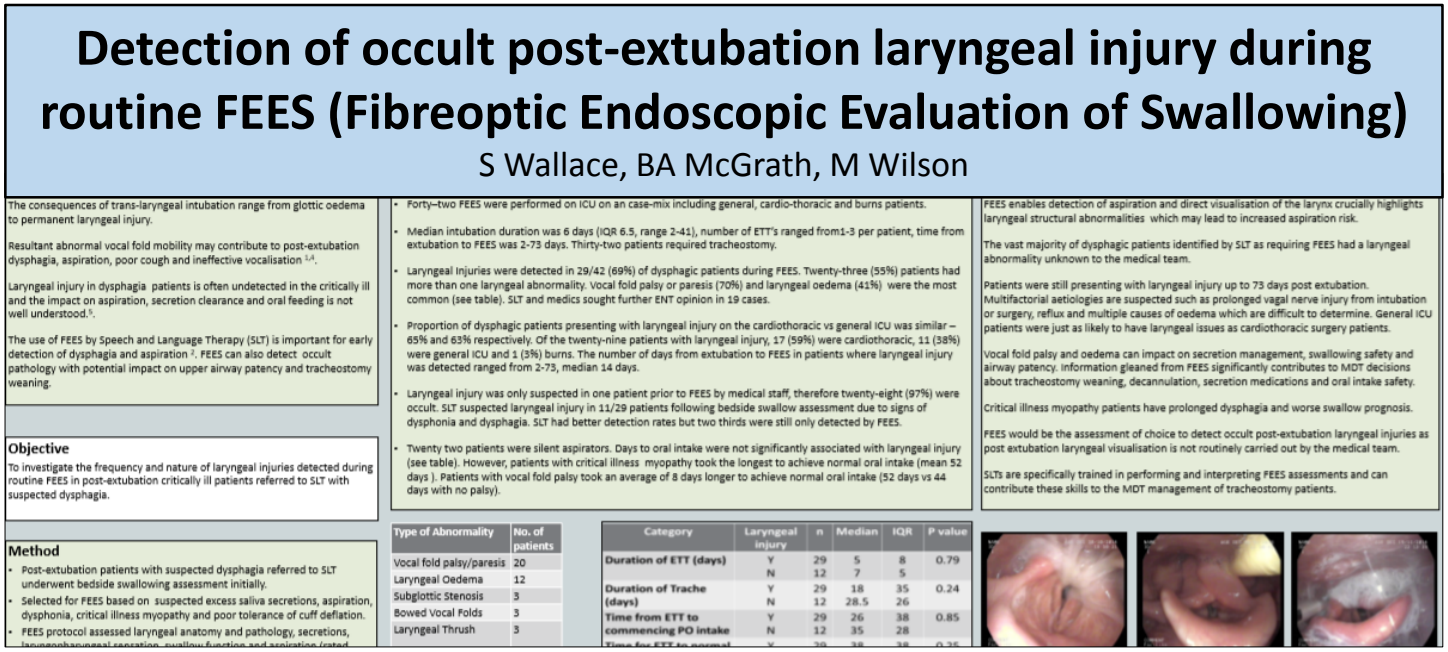


Granuloma

Fibreoptic Endoscopic Evaluation of Swallowing

A hidden complication

- Vocal cord palsy or oedema detected in 29/42 (69%) dysphagic ICU pts by SLT FEES
- Suspected pre FEES in 1 by medics and 11 pts by SLT
- Negative impact on communication, wean, swallow



Detection of occult post-extubation laryngeal injury during routine FEES (Fibreoptic Endoscopic Evaluation of Swallowing)

S Wallace, BA McGrath, M Wilson

The consequences of trans-laryngeal intubation range from glottic oedema to permanent laryngeal injury.

Resultant abnormal vocal fold mobility may contribute to post-extubation dysphagia, aspiration, poor cough and ineffective vocalisation [1,4].

Laryngeal injury in dysphagia patients is often undetected in the critically ill and the impact on aspiration, secretion clearance and oral feeding is not well understood.[5].

The use of FEES by Speech and Language Therapy (SLT) is important for early detection of dysphagia and aspiration [2]. FEES can also detect occult pathology with potential impact on upper airway patency and tracheostomy weaning.

Objective

To investigate the frequency and nature of laryngeal injuries detected during routine FEES in post-extubation critically ill patients referred to SLT with suspected dysphagia.

Method

- Post-extubation patients with suspected dysphagia referred to SLT underwent bedside swallowing assessment initially.
- Selected for FEES based on suspected excess saliva secretions, aspiration, dysphonia, critical illness myopathy and poor tolerance of cuff deflation.
- FEES protocol assessed laryngeal anatomy and pathology, secretions, laryngopharyngeal sensation, swallow function and aspiration (rated

- Forty–two FEES were performed on ICU on an case-mix including general, cardio-thoracic and burns patients.
- Median intubation duration was 6 days (IQR 6.5, range 2-41), number of ETT's ranged from1-3 per patient, time from extubation to FEES was 2-73 days. Thirty-two patients required tracheostomy.
- Laryngeal injuries were detected in 29/42 (69%) of dysphagic patients during FEES. Twenty-three (55%) patients had more than one laryngeal abnormality. Vocal fold palsy or paresis (70%) and laryngeal oedema (41%) were the most common (see table). SLT and medics sought further ENT opinion in 19 cases.
- Proportion of dysphagic patients presenting with laryngeal injury on the cardiothoracic vs general ICU was similar – 65% and 63% respectively. Of the twenty-nine patients with laryngeal injury, 17 (59%) were cardiothoracic, 11 (38%) were general ICU and 1 (3%) burns. The number of days from extubation to FEES in patients where laryngeal injury was detected ranged from 2-73, median 14 days.
- Laryngeal injury was only suspected in one patient prior to FEES by medical staff, therefore twenty-eight (97%) were occult. SLT suspected laryngeal injury in 11/29 patients following bedside swallow assessment due to signs of dysphonia and dysphagia. SLT had better detection rates but two thirds were still only detected by FEES.
- Twenty two patients were silent aspirators. Days to oral intake were not significantly associated with laryngeal injury (see table). However, patients with critical illness myopathy took the longest to achieve normal oral intake (mean 52 days). Patients with vocal fold palsy took an average of 8 days longer to achieve normal oral intake (52 days vs 44 days with no palsy).

Type of Abnormality	No. of patients
Vocal fold palsy/paresis	20
Laryngeal Oedema	12
Subglottic Stenosis	3
Bowed Vocal Folds	3
Laryngeal Thrush	3

Category	Laryngeal injury	n	Median	IQR	P value
Duration of ETT (days)	Y	29	5	8	0.79
	N	12	7	5	
Duration of Trache (days)	Y	29	18	35	0.24
	N	12	28.5	26	
Time from ETT to commencing PO intake	Y	29	26	38	0.85
	N	12	35	28	

FEES enables detection of aspiration and direct visualisation of the larynx crucially highlights laryngeal structural abnormalities which may lead to increased aspiration risk.

The vast majority of dysphagic patients identified by SLT as requiring FEES had a laryngeal abnormality unknown to the medical team.

Patients were still presenting with laryngeal injury up to 73 days post extubation. Multifactorial aetiologies are suspected such as prolonged vagal nerve injury from intubation or surgery, reflux and multiple causes of oedema which are difficult to determine. General ICU patients were just as likely to have laryngeal issues as cardiothoracic surgery patients.

Vocal fold palsy and oedema can impact on secretion management, swallowing safety and airway patency. Information gleaned from FEES significantly contributes to MDT decisions about tracheostomy weaning, decannulation, secretion medications and oral intake safety.

Critical illness myopathy patients have prolonged dysphagia and worse swallow prognosis.

FEES would be the assessment of choice to detect occult post-extubation laryngeal injuries as post extubation laryngeal visualisation is not routinely carried out by the medical team.

SLTs are specifically trained in performing and interpreting FEES assessments and can contribute these skills to the MDT management of tracheostomy patients.

ICS SOA 2016

Impact

"The worst thing about ICU was being unable to speak"

"So tired trying to communicate, I didn't want to do anything"

"No ability to reach out or be reached"

"Dehumanising"

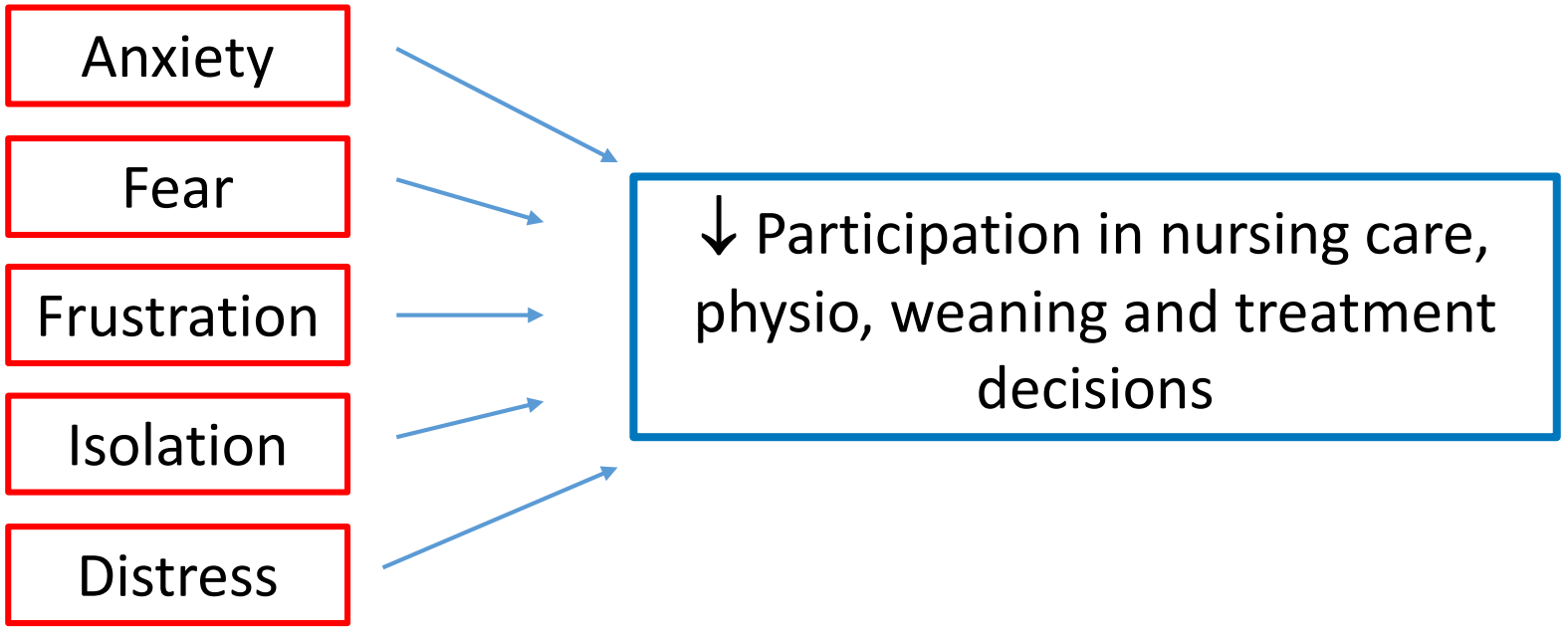
Losing your voice film

National Tracheostomy Safety Project

www.tracheostomy.org.uk


You are now reading this
in my voice

Inability to speak causes psychological harm



Even short-term voice loss causes lasting trauma

(Lohmeier 2003, Khalaila 2011, Breckenridge 2014)

Voice loss creates barriers to recovery

- Difficulty optimising pain relief, gaining consent
- 3x more likely to suffer adverse medical event
- Staff stressed by failed interactions

- **Restoring voice improves mood**
- **Helps differential dx of delirium, cognitive impairment, aphasia**

Restoring voice: Early cuff deflation

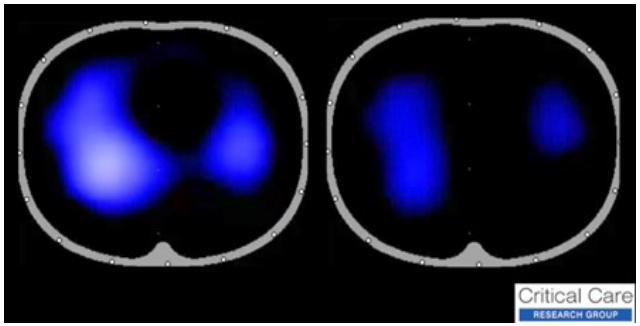
- ‘Laryngeal wean’
- Timing is institution dependent
- Implementing an early cuff deflation guideline*
  - ↓ Trache duration (mean 38±30 vs 16±9, p=0.015)
  - Earlier decannulation
  - ↓ ICU LOS (mean 45±28 vs 28±11 days, p=0.028)

**J Callon, C Lamont, S Dyson, L Poole, I Welters, Royal Liverpool Hospital*

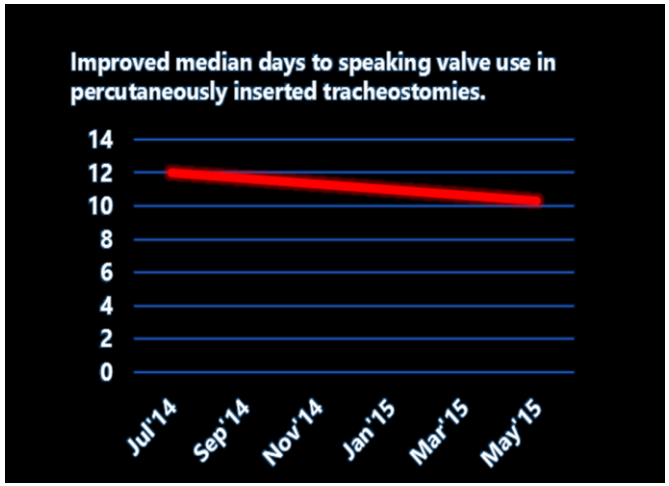
Passy Muir Valve

- Redirects airflow, restores subglottic pressure
- May help lung recruitment *(Sutt 2016)*
- Days to PMV reduced if SLT involved

End Expiratory Lung Volumes



With PMV **Without PMV**



Health Foundation SHINE report 2015

Barriers: access to a valve, staff training, pt tolerance

Restoring voice: ACV

Suitability

- SGS tube in situ, cuff inflated
- No upper airway obstruction / abnormality
- Healthy trache stoma, >48-72hrs post insertion
- Early cuff deflation ruled out **OR** transitioning to cuff ↓

Procedure

1. Subglottic suction
2. Connect oxygen, slowly turn to 2-5L flow rate
3. Yankeuer suction secretions blown up to oral cavity
4. Encourage voice
5. 10-15 mins hourly
6. Supervise closely, document trials

(ACV Protocol, Wythenshawe Hospital)

ACV film – NTSP

www.tracheostomy.org.uk

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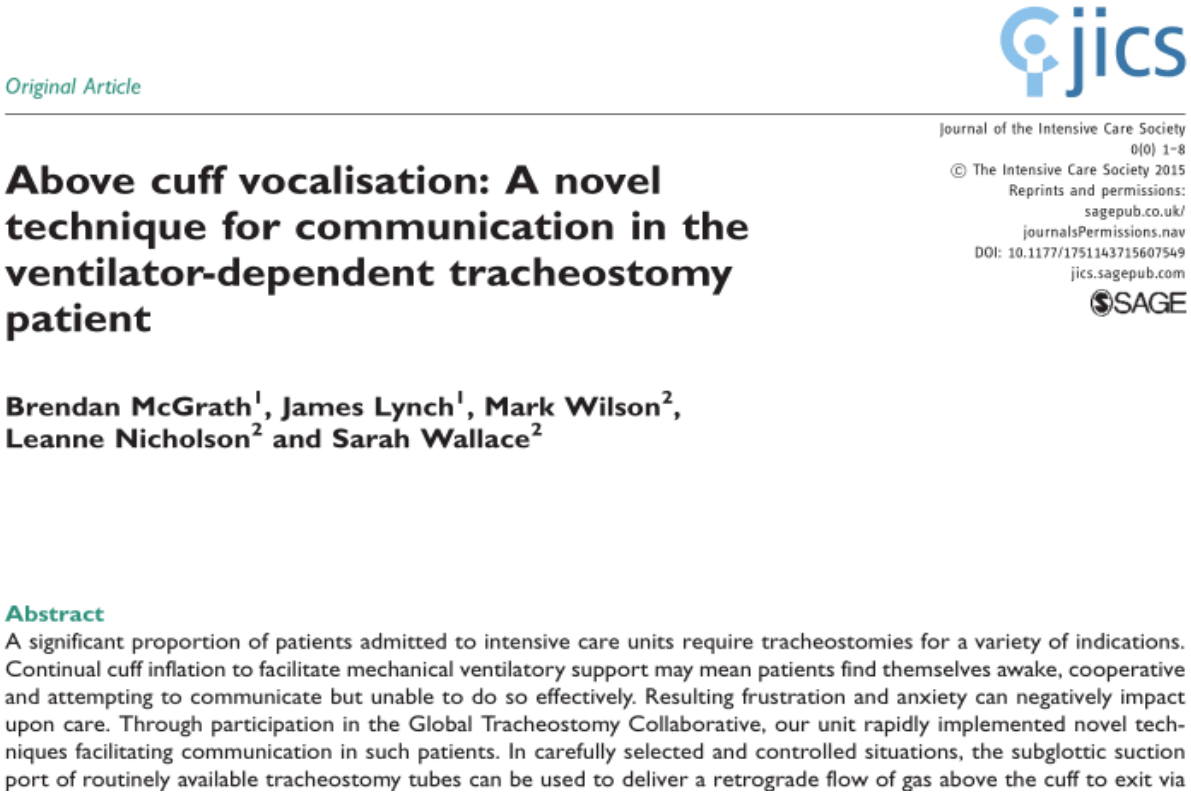
Evidence

- Pros/cons of ‘talking trache’ tubes *(Pandian 2014)*
- Case series described clinical benefits, MDT & SLT role



Original Article

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SAGE

Above cuff vocalisation: A novel technique for communication in the ventilator-dependent tracheostomy patient

Brendan McGrath[1], James Lynch[1], Mark Wilson[2], Leanne Nicholson[2] and Sarah Wallace[2]

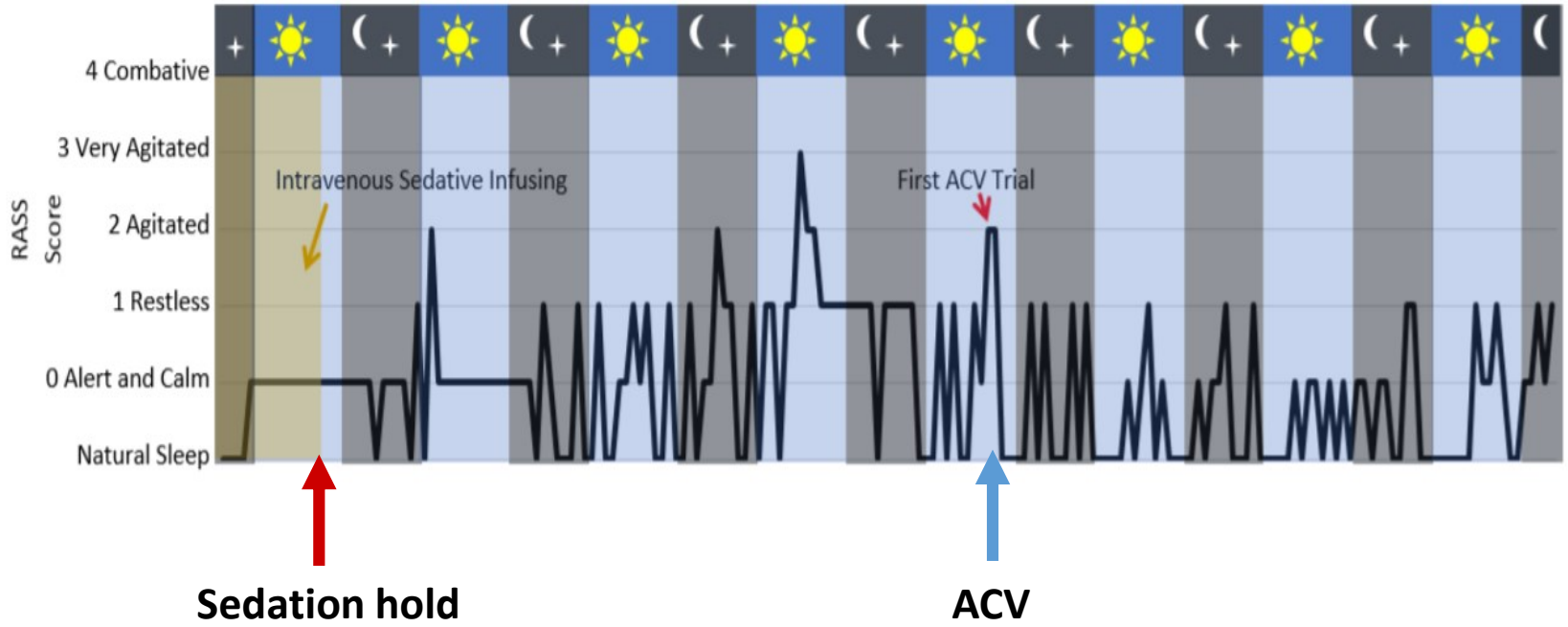
Abstract

A significant proportion of patients admitted to intensive care units require tracheostomies for a variety of indications. Continual cuff inflation to facilitate mechanical ventilatory support may mean patients find themselves awake, cooperative and attempting to communicate but unable to do so effectively. Resulting frustration and anxiety can negatively impact upon care. Through participation in the Global Tracheostomy Collaborative, our unit rapidly implemented novel techniques facilitating communication in such patients. In carefully selected and controlled situations, the subglottic suction port of routinely available tracheostomy tubes can be used to deliver a retrograde flow of gas above the cuff to exit via

Richmond Agitation Sedation Scale RASS pre & post ACV

Post ACV pts communicated more easily, were less agitated, had more prolonged periods of natural sleep

Figure 2: Patient's hourly documented RASS Scores for 7 days following the withdrawal of intravenous sedatives.



Evidence

Subglottic airflow (ACV) benefits low arousal brain injured patients (Kothari 2016)

- Swallow frequency increased
  (0.6-2.1 swallows per 5 mins)

- Subglottic secretion volume reduced
  (3.1-0.31 mls)

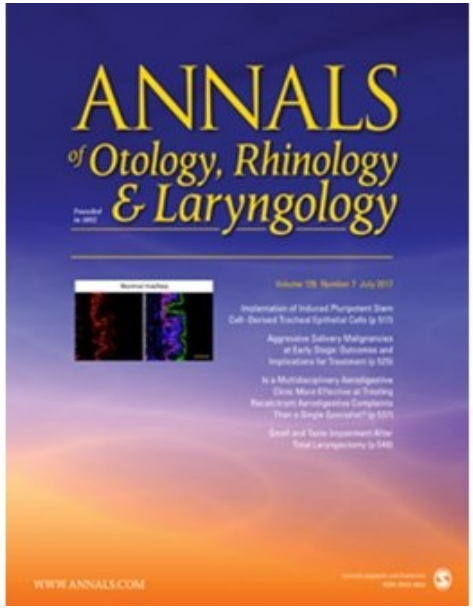


Table 2. Effectiveness and complications of ACV.

	Count	%
Patient asked to remove	1	1.1
Total	91	100.0

ACV: above cuff vocalisation.

Original article

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Safety and feasibility of above cuff vocalisation for ventilator-dependant patients with tracheostomies

Brendan A McGrath[1], Sarah Wallace[2], Mark Wilson[2], Leanne Nicholson[2], Tim Felton[1], Christine Bowyer[1] and Andrew M Bentley[1]

27.5%

Table 3. Scores assigned following FEES at first assessment, without and then with ACV.[a]

Scale	Paired comparisons made	Median values			Number of patients			Wilcoxon signed rank *p*
		Without ACV	With ACV	Median difference	Improved with ACV	Worse with ACV	No change	
SSRS (0 normal – 3 worse)	10	3	1	0.5	5	0	5	0.04[b]
APS (1 worse – 5 better)	8	3	3	0	2	0	6	0.18
Pen-Asp (1 better – 8 worse)	9	8	7	0	4	1	4	0.28
TOMS (0 worse – 5 better)	10	0	1	1	8	0	2	0.01[b]
ICU FCS (1 worse – 4 better)	10	2	3	1	6	0	4	0.02[b]
Unstimulated dry swallow frequency (per minute)	10	0	2	2	8	1	1	0.02[b]
Unstimulated cough frequency (per minute)	10	0	0.5	0.5	5	0	5	0.04[b]

ACV: above cuff vocalisation; APS: Airway Protection Scale; FCS: Functional Communication Scale; ICU: intensive care unit; Pen-Asp: Penetration-Aspiration Scale; SSRS: Secretion Severity Rating Scale; TOMS: Therapy Outcome Measure for Voice Impairment.

[a]Observed cough and swallow frequency (per minute) are also presented.

[b]Significant results are indicated by.

Benefits of ACV

- Speak earlier, less distress, enables delirium and communication ax
- Bridge to cuff deflation
- Timely SLT input, MDT collaboration

- ‘Kick start’ a dormant swallow

Translaryngeal airflow stimulates afferent nerves, evokes vocal cord adduction, swallowing and secretion management

RISKS of ACV

Dry, cold airflow
Neck, facial emphysema
Vocal cord hyperadduction
Lack of MDT

Limit duration

Minimum airflow

Supervise

FEES ax laryngeal integrity

IMAGING IN INTENSIVE CARE MEDICINE

Sudden appearance of neck and face emphysema during above cuff vocalisation

Italo Calamai, Romano Giuntini, Francesco Tomeo and Rosario Spina

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A 74-year-old man with community-acquired pneumonia underwent intubation and mechanical ventilation for severe respiratory failure. On day 4, a fiberoptic bronchoscopy guided dilatational tracheostomy was performed, and a cannula with a subglottic suction port was placed. As the trachea was deep for neck tissue thickness and kyphosis, it was not possible to insert the cannula more than 2 cm over the cuff. The suction port

Do I need an SLT to trial ACV?

YES because if ACV doesn't work…

A Continuing might be unsafe

B SLT can assess why it failed

3 good reasons….

1. SLT can assess laryngeal function, detect injury, assess effect of ACV on secretions, swallow, voice

2. SLTs should see ALL trache patients as soon as they are awake *(GPICS, NCEPOD)*

2. More effective and safer ACV trials

Final points

- Laryngeal impairment has serious consequences
- ACV is a safe and effective option for vocalisation if done properly as a team
- SLT should be involved in initial ‘assessment’ trial
- Consider training, protocol
- More research

NHS
National Institute for Health Research

Thank you

National Tracheostomy Safety Project www.tracheostomy.org.uk

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