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LETTER

Troubleshooting above cuff vocalisation

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Dear Editor,

Above cuff vocalisation (ACV) is one approach that can be used with patients with a tracheostomy to restore airflow above the inflated tracheostomy cuff. ACV involves the application of an airflow (medical air or oxygen) via the subglottic suction port of a tracheostomy tube (Fig. 1). This airflow exits above the cuff, passing through the larynx, and can allow patients to vocalise and may help to improve swallowing function and quality-of-life [1–3]. However, there is limited evidence available for ACV, and healthcare professionals have highlighted various issues that can occur during the application of ACV [4, 5]. Concerns about the potential complications that can occur during ACV application can lead to healthcare professionals restricting ACV use [5]. There is currently insufficient evidence for the development of clinical guidelines for ACV. Here, we aimed to collate and present issues that can occur with ACV and the suggested troubleshooting guidance that have been documented in research. These are clinical and expert opinions offering guidance, rather than a scientific consensus resulting in guidelines.

Potential issues and troubleshooting guidance were collated as part of three research studies: (1) a systematic review of ACV [1]; (2) an international survey of healthcare professionals [4]; and (3) a qualitative interview study with healthcare professionals [5]. We excluded problems that were related to specific tracheostomy tubes that are no longer in use (i.e., stomal site complications with the Communi-Trache I®).

Eighteen potential issues were identified and troubleshooting guidance were suggested for each (Table 1).

There are a wide range of potential issues that can occur during ACV application and concerns about these problems can lead to limitations in ACV use [5]. Potential issues range from the minor (e.g., patient and staff frustration) to the serious (e.g., subcutaneous emphysema). There are no clinical guidelines for ACV and limited clinical guidance available for healthcare professionals who are delivering ACV, and the guidance available is dispersed in different locations. This publication provides a collated resource for clinicians to consider when troubleshooting the potential issues that can arise during ACV application and may help to support wider use, safer practice, and limit any restrictions to usage. The guidance comes from research published from 1967 to 2024 and it is important to note that some of the troubleshooting

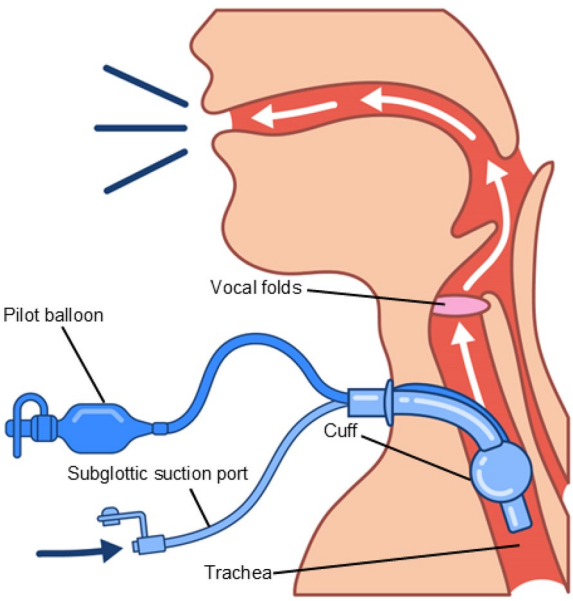

Fig. 1 Tracheostomy tube with subglottic suction port. The blue arrow indicates where the airflow is applied to the port for above cuff vocalisation. The white arrows indicate the direction of airflow through the vocal folds and exiting via the oral cavity

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Table 1 Potential issues with the application of above cuff vocalisation and troubleshooting guidance

Potential issue	Troubleshooting guidance	References
Concerns about adverse events i.e. air trapping/subcutaneous emphysema	Ensure two staff are present for initial assessment	Mills et al. [5]
	Ensure an experienced and competent multidisciplinary team and trained SLT are supervising the patient	McGrath et al. [6]; Mills et al. [4]
	Apply air to the subglottic port using a 10 ml syringe—resistance may indicate upper airway obstruction or poor positioning of the tracheostomy	Mills et al. [5]
	Avoid using with patients with airway obstruction	Pandian et al. [2]
	Wait for 48 h post-insertion	McGrath et al. [6]; Akhtar & Bell [7]; Safar & Grenvik [8]
	Wait for 72 h post-insertion	Whitlock [9]
	Use a pressure-relief valve in the airflow line	Whitlock [9]
	Endoscopy to assess airway patency	Mills et al. [4]
	Insert a tube with a subglottic port as the second tube to avoid using ACV with a fresh stoma	Pandian et al. [2]
Concerns regarding increased risk of ventilator associated pneumonia	Aspirate subglottic secretions before commencing the airflow	Husain et al. [10]
Tracheal dilation from misapplication of the airflow to the pilot balloon	Modify the tube to make connection to the pilot balloon impossible	Feneck & Scott [11]
	Provide pictorial guidelines for staff	Mills et al. [5]
	Place signage/guidance on the door	Mills et al. [5]
	Label the pilot balloon and subglottic port	Pandian et al. [2]
Drying or irritation of the laryngeal mucosa	Use a thumb port to allow intermittent flow	Feneck & Scott [11]; Mills et al. [5]
	Avoid prolonged use of non-humidified air	Naito et al. [12]
	Use humidified air/oxygen	Pandian et al. [2]; Levine et al. [13]; Kluin et al. [14]; Mills et al. [5]
	Use warmed, humidified air/oxygen	Whitlock [9]
	Turn off the airflow when the patient does not want to speak	Whitlock [9]
	Limit duration and rate of airflow (2–5 L/min, no specific guidance on duration)	Husain et al. [10]
	Ensure the thumb port is unoccluded when not being used by the patient	Pandian et al. [2]
Strained vocal quality	Use minimal airflow	Pandian et al. [2]
	Endoscopy to assess vocal folds	Pandian et al. [2]
Abdominal distension	Disconnect/turn off the airflow when the patient does not wish to speak	Pandian et al. [2]; Mills et al. [5]
	Do not leave the thumb port permanently in situ with airflow running with patients with cognitive deficits	Mills et al. [5]
	Position the tubing so that nothing can fall on it and occlude the thumb port	Mills et al. [5]
Discomfort	Use humidified air/oxygen	Levine et al. [13]
	Use individualised, appropriate airflow	Leder [15]
	Prepare patients for the airflow sensation first by letting them feel the airflow against their cheek	Mills et al. [5]
	Pause airflow during swallowing	Mills et al. [5]
	Use warmed and humidified air/oxygen	Safar & Grenvik [8]
	Encourage the patient to persevere as comfort levels can improve	Mills et al. [5]

Table 1 (continued)

Potential issue	Troubleshooting guidance	References
Blockage of subglottic port with secretions	Apply 1–2 ml of 10% acetylcysteine via the subglottic port once or twice per day to reduce the viscosity of secretions	Shinnick & Freedman [16]; Kluin et al. [14]
Air leak at stoma site	Manually adjust the ventilator tubing to optimise the tracheostomy position	Leder & Traquina [17]
	Apply gentle pressure to the tracheostomy to counteract the pull of the ventilator tubing	Sparker et al. [18]
	Wait for 48 to 72 h after the first tracheostomy insertion to allow healing of the stoma site	Safar & Grenvik [8]; Whitlock [9]
Air leak around the cuff (e.g. damaged cuff, poorly fitting tube)	Replace the tracheostomy tube	Sparker et al. [18]
Lack of synchronisation of vocal fold adduction with airflow	Daily rehabilitation with SLT to synchronise vocalisation and minimise vocal strain	Leder & Traquina [17]; Mills et al. [5]; Mills et al. [4]
	SLT to train the patient to speak only on expiration by following the breathing rhythm	Leder & Traquina [17]; Mills et al. [5]
Lack of vocalisation	Cough/throat clear exercises	Leder & Traquina [17]
	Replacement of the tracheostomy tube e.g., reducing tube size	Kluin et al. [14]; Mills et al. [4]
	Check the positioning of tube	Leder & Traquina [17]; Kluin et al. [14]; Mills et al. [4]
	Check the subglottic port is not blocked	Leder & Traquina [17]
	Endoscopy/FEES to exclude laryngeal pathology	Leder & Traquina [17]; Leder [15]
	Prevent kinking of airflow tubing	Leder & Traquina [17]
	Sit upright or out in a chair	Mills et al. [5]
	Change head position e.g., head turn	Mills et al. [5]
	Adjust position or posture	Mills et al. [4]
	Provide support and training	Mills et al. [5]; Mills et al. [4]
	Persevere	Mills et al. [5]
Poor connection of airflow line to subglottic port	Tape the tube to reduce airflow leak	Leder [15]
	Reduce the size of the valve tip	Leder [15]
Patient and staff frustration	Daily rehabilitation with SLT	Leder [15]; Leder & Traquina [17]
	Screen patients to select patients who will benefit and avoid disappointment	Sparker et al. [18]
Difficulties with independent use	Provide extra airflow tubing to improve the location of the thumb port for the patient (i.e., place thumb port further from tracheostomy tube)	Leder & Traquina [17]; Mills et al. [5]
	Use material around the thumb port hole to reduce the movement/dexterity needed for the patient to occlude the hole	Mills et al. [5]
	Use of devices or microswitches to allow the patient to control airflow	Whitlock [9]; Levine et al. [13]
Incorrect use	Daily/regular rehabilitation with SLT	Leder [15]; Mills et al. [4]
	Use good signage, handover, and staff education	Mills et al. [5]
Lack of use	Ongoing support from SLT to encourage and monitor ACV use	Sparker et al. [18]
	Staff and family to motivate, support and encourage patient	Leder [15]; Mills et al. [5]
Difficulty accessing thumb ports	Cut a hole in the green bubble tubing to act as a thumb port	Mills et al. [5]

statements contradict other statements. This guidance must be implemented cautiously and in the context of the published evidence for ACV and changing practice. Future research should ensure any issues in the application of ACV and information regarding any troubleshooting techniques used are recorded to ensure that this resource can be developed and extended as the evidence base for ACV grows, with the ultimate goal of developing clinical guidelines.

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Author contributions
CM, EM, CAB, CB, MB, and HS conceived the manuscript. CM collated the guidance and drafted the manuscript. CM, EM, CAB, CB, MB, and HS revised the manuscript for important intellectual content.

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Not applicable.

Code availability
Not applicable.

Declarations

Conflicts of interest
CM is a paid Consultant to Atos Medical UK, leading the development above cuff vocalisation safety guidelines. All other authors declare no conflict of interest in relation with this publication.

Ethical approval
Ethical approval was obtained from the School of Medicine Research Ethics Committee at the University of Leeds (05/02/2019/MREC 18-037) for the survey and qualitative interview studies.

Consent to participate
Informed consent was obtained from all individual participants included in the studies.

Consent for publication
All authors consent to publication.

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