

The Importance of Tracheostomy Progression in the Intensive Care Unit

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要旨

気管切開術からカニューレの抜去までの進め方は、カニューレが永続的に不必要と判断した場合である。まずは人工呼吸器からの離脱が条件となる。そして、カフを縮ませることで、発声の準備をしていく。評価としては10のポイントがあり、これらを促進し、不必要にカニューレを留置することがないようにするべきである。

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Table 1 Ten steps of tracheostomy progression to decannulation

Step	Action	Rationale
1. Ensure the hemodynamic stability of the patient	If the patient is hemodynamically stable, move to step 2 If not, reassess when patient is stable	Patients who do not have stable vital signs are not ready for tracheostomy progression
2. Assess if the patient been free from ventilator support for more than 24 hours	If yes, move to step 3 If no, reassess in 24 hours	Patients need time to stabilize after being on ventilator support
3. Assess whether the patient is able to protect his/her airway with a strong cough and swallow his/her own secretions	If yes, move to step 4 If no, reassess and consider: a. Formal swallowing evaluation b. Vigorous physical mobility	A bedside assessment of cough and swallow help determine aspiration risk Patients who have adequate cough and swallow mechanisms are a lower risk for aspiration
4. Assess if the patient can mobilize and manage his/her secretions	If yes, move to step 5. If no, reassess and ensure optimal hydration and humidification and coughing and deep breathing exercises	Patients who can manage their own secretions (cough, swallow) are a lower risk for aspiration Patients who can manage their own secretions often require less suctioning
5. Deflate cuff	If there are no signs or symptoms of aspiration or respiratory distress with cuff deflation, leave cuff deflated for 24 hours and move to step 6 If there are signs and symptoms of aspiration or respiratory distress with cuff deflation, reinflate cuff and reassess when appropriate	Cuff deflation minimizes long-term complications of an inflated cuff, such as tracheal stenosis or tracheomalacia Patients who do not tolerate cuff deflation may exhibit signs of continued coughing, desaturation, increased respiratory distress, etc
6. Change to cuffless or tight to shaft (TTS) tube	If the patient has tolerated cuff deflation for 24 hours or more, change to cuffless tube or TTS tube of the same or smaller size and move to step 7 Evaluate amount and consistency of secretions: those patients with large amounts of thick secretions may require a dual-cannula cuffless tube; those with minimal secretions may benefit from a single cannula cuffless tube	Patients who can tolerate prolonged cuff deflation are usually candidates for a cuffless tracheostomy tube Patients who continue to require intermittent positive pressure ventilation or bronchial hygiene maneuvers can benefit from a TTS tube (single cannula) Assessing volume and consistency of secretions will help determine the optimal tube to place (dual cannula vs single cannula)
7. Cap the cuffless or TTS tracheostomy tube	If the patient does not show signs or symptoms of desaturation, increased work of breathing and respiratory rate, stridor, and/or signs of obstruction, leave tube capped for 24-48 hours as tolerated and move to step 8 If the patient does show signs or symptoms of desaturation, increased work of breathing and respiratory rate, stridor, and/or signs of obstruction, remove cap, suction vigorously and return to tracheostomy collar Consider a smaller tube and/or airway evaluation before progressing to the next step	After the tube is changed to cuffless or TTS tube, it can be capped; DO NOT cap a standard low-pressure, high-volume tracheostomy tube; even with the cuff fully deflated, the bulk of the deflated cuff creates a risk of airway obstruction
8. Functional decannulation trial	If the patient is able to tolerate continuous prolonged capping for 24 hours or greater with no signs or symptoms or respiratory distress, move to step 9 If the patient is unable to tolerate continuous prolonged capping, return to step 7	Prolonged capping is a method to assess the patient's ability to function without the tube, ie, "functional decannulation" After the patient has tolerated a period of continuous capping, he or she can be evaluated for decannulation Patients who do not tolerate prolonged capping are not ready for decannulation and may require additional capping trials and/or physical therapy
9. Assess cough strength by checking vital capacity and/or peak cough flow	If the vital capacity is at least 15 mL/kg or if the peak cough flow is at least 160 L/min, move to step 10. If the vital capacity is not at least 15 mL/kg or if the peak cough flow is not at least 160 L/min, the patient will require continued capping trials and a physical therapy plan before progressing to step 10	Peak cough flow and vital capacity are measures to estimate the patient's cough strength (there will be a leak around a cuffless tube)
10. Decannulation	Remove tube and cover stoma with gauze dressing; keep stoma clean	Stoma will heal itself over the next 1 day to 2 weeks

- ① 血行動態が安定している
- ② 人工呼吸器に依存していない
- ③ 嚥下機能、咳嗽力があること
- ④ 喀痰能力があること
- ⑤ カフを虚脱させる
- ⑥ カフなしのカニューレに変更する
- ⑦ カニューレに蓋をする
- ⑧ カニューレオフのトライアルをする
- ⑨ 咳嗽力を評価する
- ⑩ カニューレを抜去する

Step 4 カフを虚脱することの意義

Table 2. Frequencies of significant changes in swallow physiology between cuff-inflated and cuff-deflated conditions.

Swallow physiology changes	Cuff inflated	Cuff deflated	Probability
Delayed oral initiation	0.043	0.014	.013
Reduced tongue manipulation	0.132	0.090	.226
Reduced tongue strength	0.069	0.042	.189
Slow oral transit	0.111	0.088	.851
Reduced chew	0.053	0.037	.525
Delayed pharyngeal triggering	0.268	0.202	.321
Reduced tongue base retraction	0.222	0.175	.692
Reduced laryngeal elevation	0.395	0.140	<.001*
Reduced laryngeal closure	0.079	0.093	.038
Reduced cricopharyngeal opening	0.019	0.008	.187
Aspiration before swallow	0.111	0.091	.973
Aspiration during swallow	0.037	0.051	.041
Aspiration after swallow	0.266	0.209	.572
Silent aspiration	0.226	0.072	<.001*

*Significant frequencies.

Ding R, Head Neck. 2005

- カフを拡張させた方が誤嚥リスクが低下するという神話がある。
- カフを拡張させると、かえって誤嚥リスクが高まる
- カフが拡張していると、気管を頸部前方に固定してしまうため、喉頭の動きを阻害し、食道を閉塞することになる。

Step 5 カフを虚脱させる

- カフリークテストと同様に、発声などを確認する

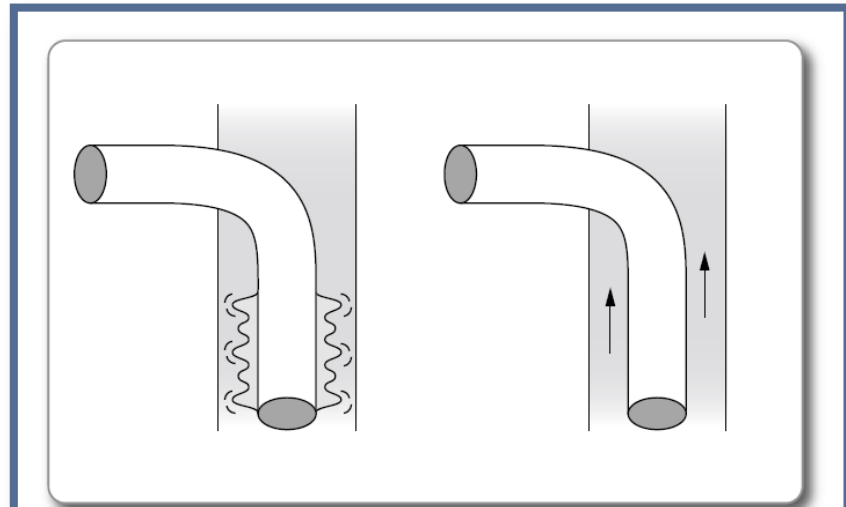
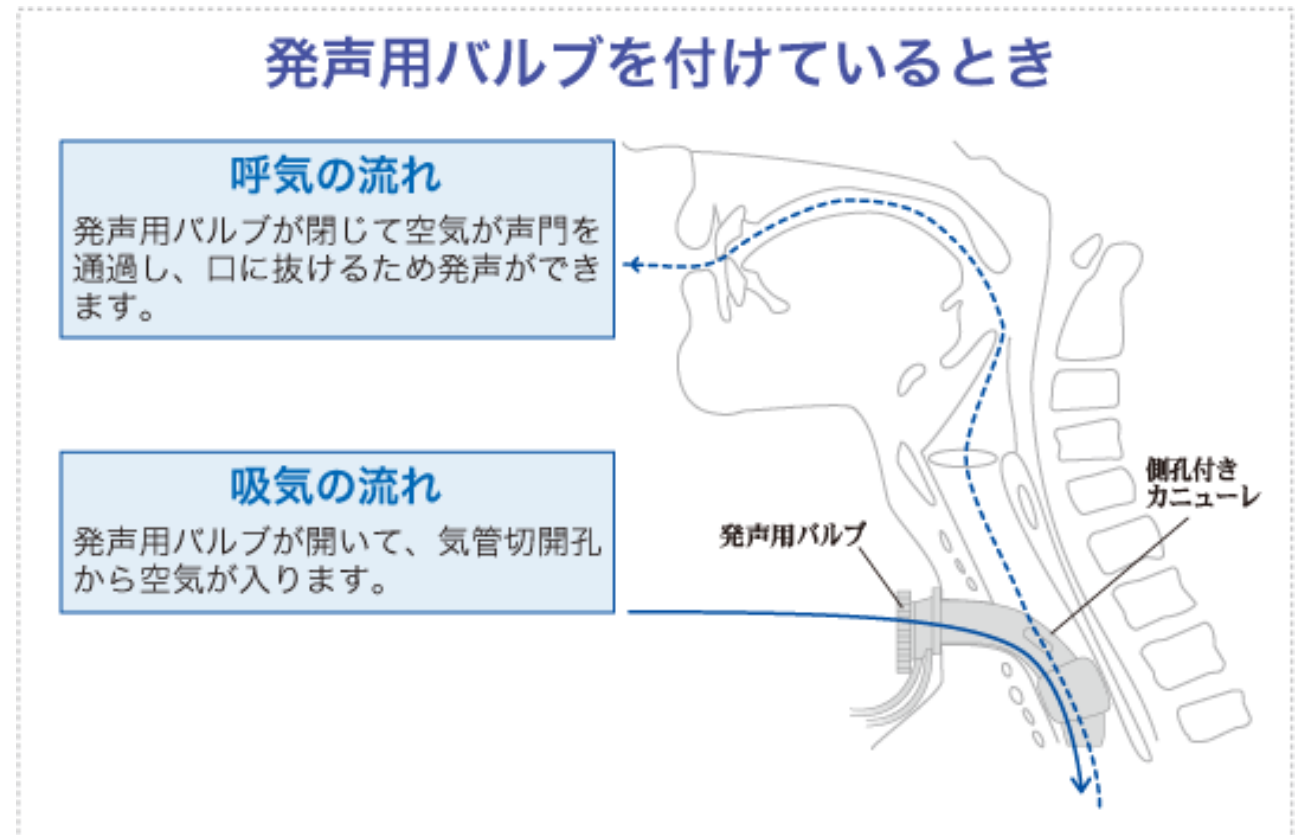
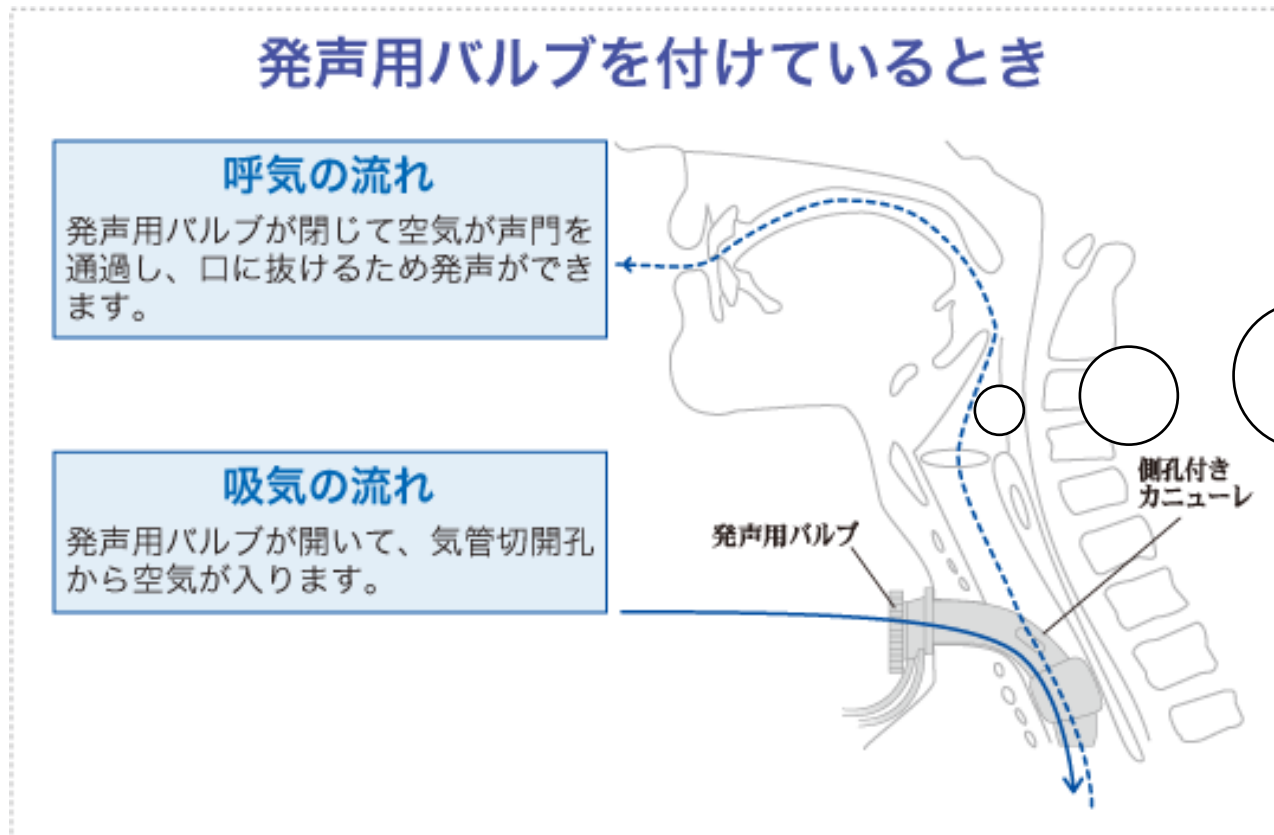


Figure 3 Deflated cuff of standard low-pressure, high-volume tracheostomy tube (left), compared with cuffless tube (right). On the left, note the bulk of the deflated cuff and the resistance to airflow around it, compared with laminar airflow around a cuffless tube.

From Morris,¹³ *Tracheostomies: The Complete Guide*, Linda L. Morris and M. Sherif Affi, Eds. Reproduced with the permission of Springer Publishing Company, LLC, New York, NY 10036.



Step 9 十分な咳嗽力の評価



痰を十分に喀出できるか否かを評価する。PCFは160L/min. 肺活量は15ml/kg以上が目安。

簡易的チェックリスト

Table 3 Tracheostomy progression checklist

Questions	Circle a response		Date completed
	Yes	No	
1. Is the patient free from ventilator support?	Yes	No	
2. Can the cuff be deflated?	Yes	No	
3. Can the tracheostomy be changed to cuffless or TTS?	Yes	No	
4. Does the patient tolerate prolonged capping of the cuffless (or TTS) tracheostomy?	Yes	No	
5. Is the vital capacity at least 1 L?	Yes	No	
6. Can the patient manage his/her own secretions?	Yes	No	
7. Has the initial need for the tracheostomy been resolved, with no further need for the tracheostomy?	Yes	No	

Abbreviation: TTS, tight to shaft.

質問	評価	
人工呼吸器に依存していないか？	Yes	NO
カフは虚脱させることができるか？	Yes	NO
カフレスのチューブまたはスピーチカニューレに変更可能か？	Yes	NO
カニューレの蓋をした状態、もしくはスピーチバルブで過ごせるか？	Yes	NO
肺活量が少なくとも1Lあるか？	Yes	NO
分泌物の管理に不安はないか？	Yes	NO
気管切開を行った理由を解決しているか？ 今後気管切開をする必要はないか？	Yes	NO