

The Breathe feature where we give you an expert and a topic, and you have the chance to ask them any questions you wish via [breathe@ersj.org.uk](mailto:breathe@ersj.org.uk)

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B. Schönhofer

Dept of Pneumology, Intensive and Sleep Medicine  
Klinikum Hanover  
Podbielskistrasse 380  
30659 Hanover  
Germany  
Fax: 49 5717680721  
E-mail:  
[bernd.schoenhofer@t-inline.de](mailto:bernd.schoenhofer@t-inline.de)

## Weaning difficulties

**Q** 1. How can bronchial infection be prevented during prolonged tracheostomy?  
R. Alchapar, Mendoza, Argentina

**A** In a kind of self-fulfilling prophecy, the prolonged use of an artificial airway *e.g.* tracheostomy, is itself the main cause of bronchial infection, and a prolonged stay in a weaning unit often leads to bronchial infection.

There is no evidence-based method to prevent bronchial infection in patients with tracheostomy. However, there are two main approaches to prevent bronchial infection during prolonged tracheostomy:

1) In general, follow published recommendations to prevent hospital-associated pneumonia and ventilator-associated pneumonia [1].

2) In particular, ensure effective clearance of secretions. As different mechanisms can be responsible for reducing airway clearance, it is important firstly to identify the problem and then to select the intervention(s) that may be appropriate. The early diagnosis of a weak cough is important for the timely start of existing and effective measures for improving the patient's capacity to eliminate secretions. Depending on the underlying pathophysiology (*e.g.* chronic obstructive pulmonary disease (COPD) or neuromuscular diseases), the broad spectrum of physiotherapy may help to improve secretion clearance. Interventions for increasing expiratory flow should be used to assist airway clearance if reduced expiratory force is contributing to ineffective forced expiration. Furthermore, manually or mechanically (*e.g.* using an insufflator-exsufflator) assisted cough may help to prevent bronchial infection in patients with tracheostomy [2].

**Q** 2. What is the role of noninvasive ventilation (NIV) in treating post-extubation respiratory failure in patients with acute COPD exacerbations?  
E. Panselinas, Athens, Greece

**A** Postextubation failure remains one of the major clinical problems in intensive care units (ICUs) and the incidence of post-extubation respiratory failure in patients ventilated in ICUs is relatively high. There is significant hospital mortality owing to the well-known complications associated with intubation. It may be helpful to differentiate between prevention and treatment of post-extubation failure. It has been shown that NIV prevents post-extubation failure in patients at risk, reducing reintubation rate and ICU mortality compared with the standard medical therapy. Furthermore, in patients who show signs of "incipient" respiratory failure, or even overt signs of post-extubation respiratory failure, the use of NIV has been suggested as an attempt to avoid endotracheal intubation. NIV improves the outcome of patients with COPD and post-extubation hypercapnic respiratory failure by reducing the need for endotracheal intubation, the mean duration of ventilatory assistance and the length of ICU stay when compared with matched subjects treated conventionally [3].

Patients with chronic respiratory failure who are difficult to wean from the ventilator and remain hypercapnic during spontaneous breathing may be stabilised by NIV/home mechanical ventilation, as shown in about 30% of patients who were discharged home from a weaning unit [4, 5].

Conversely in unselected patients (*i.e.* with a majority of non-COPD patients) who suffered respiratory failure after extubation, NIV did not prevent the need for re-intubation or reduce mortality [6].





**Q** 3. How should we choose the right time for extubation? Should stabilisation without continuous positive airway pressure (CPAP) or CPAP/augmented spontaneous breathing always come first?  
P. Heininger, Innsbruck, Austria

**A** To find the right or optimal moment for extubation is challenging. A broad spectrum of weaning predictors (*e.g.* breathing frequency, tidal volume, mouth occlusion pressure, maximal inspiratory pressure), but also multivariate indices (*e.g.* the Rapid Shallow Breathing Index or the Tension Time Index) may be helpful in forecasting the right time to extubate the patient. These parameters are measured during a "T-piece-trial", lasting ~30 min, when patients breathe spontaneously either with or without inspiratory pressure support at 7–10 cmH<sub>2</sub>O.

Crucially though, let me state that apart from all "objective" parameters, the most important factor that influences the moment of extubation remains the experience of the clinician in charge.

**Q** 4. What are the major considerations in preventing weaning failure?  
P. Heininger, Innsbruck, Austria

**A** Weaning failure may be based on a complex pathophysiology. From my point of view, at least in patients with respiratory diseases the most important causes of weaning failure are overloaded and/or weak respiratory muscles and/or reduced capacity of the respiratory muscles. Therefore, in our weaning strategy we aim to reduce the work of breathing as soon as possible in order to avoid late complications and prolonged mechanical ventilation (see [4]).

**Q** 5. Please advise us on the correct weaning protocol in myasthenia gravis (MG) patients after a crisis.

A. Halvani, Yazd, Iran

**A** As far as I know, there is no generally accepted weaning protocol for patients suffering from MG who are difficult to wean from mechanical ventilation.

However, based on the pathophysiology of MG I would recommend some steps. First, ask an experienced neurologist to assist the process. Optimise the pre-operative neuromuscular function including immunological therapy. Opt for lumbar epidural anaesthesia and light general anaesthesia if possible, and avoid muscle relaxants. Post-operative analgesia can be initially maintained with epidural hydromorphone, then therapy can be switched to patient-controlled *i.v.* morphine sulphate.

Apply the generally accepted criteria for weaning from mechanical ventilation (*i.e.* sufficient oxygenation (arterial oxygen tension >80 mmHg, arterial carbon dioxide tension ( $P_{a,CO_2}$ ) <50 mmHg,

pH >7.30, respiratory rate <30 breaths per min)). The criteria for extubation should include a vital capacity >10 mL per kg, and inspiratory pressure >30 cmH<sub>2</sub>O. If required, administer post-operative anticholinesterase therapy to avoid cholinergic crisis.

**Q** 6. I am a respiratory registrar in the UK. Although my hospital does not have a medical high-dependency unit, we undertake a considerable amount of NIV, primarily with COPD exacerbations. What policy would you suggest to wean someone from NIV in these circumstances? In our experience, many patients auto-wean, but we have recently been considering implementing a guideline to improve our service.

K. Carter (Aberdeen, UK)

**A** Here too there is no generally accepted guideline to wean patients from NIV after acute COPD exacerbations. I like your notion of "auto-weaning": exactly this happens in the broad majority of our patients. Particularly in the unspecialised normal ward – the location where NIV in acute exacerbations of COPD is performed – it is predominantly the patient's decision when to stop NIV, based on improved comfort and dyspnoea. Mostly this subjective appreciation is accompanied by objective parameters, in terms of decreased  $P_{a,CO_2}$  and resolving acidosis, representing improved ventilation. However, since we know the danger of so-called "late NIV failure" following an early NIV success is, implementing strategies on how to monitor especially in the period after weaning from NIV is more important. Bear in mind that even though patients may be breathing satisfactorily during the day, there may still be a significant degree of nocturnal hypoventilation. Owing to the variation between units, hospitals, and even regions, it is hard to develop a protocol dealing with this topic.

**Q** 7. It has long been taught that the oral route is the preferred mode of endotracheal intubation. I have noticed that in severe COPD patients who develop acute exacerbations (particularly those with high auto-positive end-expiratory pressure on the ventilator), oral tubes add to the distress and lead to excessive oral secretions, problems of synchronisation with the ventilator, increased irritability, raised probability of aspiration, higher need for sedation and eventually to delayed weaning.

In my experience, using the nasal route in these patients improves all of the above parameters. This leads to faster weaning and brings down the rate of nosocomial pneumonias, need for tracheostomy, and the duration of ICU stay.

I have not encountered too many problems with sinusitis as mentioned in the literature, perhaps due to the shorter duration of intubation.

I would like to know whether what I am seeing is anecdotal or whether there is evidence for it.

H. Dumra (Ahmedabad, India)

**A** To cut a long story short: based on the evidence you already mentioned, but also on my personal experience, we should follow the guidelines and go for oral intubation rather than the nasal route. Thus, there is limited exposure to this intubation technique in emergency medicine residency programmes. Nasotracheal intubation may be a useful alternative to oral intubation, particularly when oral access is compromised. While not the optimal approach, nasotracheal intubation is a valuable method for establishing an airway and should remain among the emergency physician's arsenal of intubation techniques.

#### References

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