To Wean or Not to Wean

The endotracheal tube may be the question

A 61-year-old male was admitted to the hospital with pulmonary edema and community-acquired pneumonia. He was intubated with a size 8 mm endotracheal tube and received mechanical ventilatory support (MV) consisting of FiO2 0.60, SIMV 12, TV 700 ml, PS 10 cm H2O and PEEP 5 cm H2O. The respiratory circuit was humidified with a heated wire circuit.

On day eight of MV, weaning was started. A pre-extubation trial was performed two days later. His negative inspiratory force was good, but he became tachypneic and showed signs of increased work of breathing (diaphoresis, tachycardia, use of accessory muscles, etc.) and was placed back on MV overnight.

The next morning, a moderate-size mucus plug was suctioned out of the ETT. His respiratory rate was up (high 20’s), and his spontaneous tidal volume was decreased (400 ml per breath). The therapist noticed some tactile fremitus from the ETT and encountered significant resistance to passing the suction catheter.

A CAM Rescue Cath™ (Omneotech®) was used, and a large mucus plug was removed from the ETT. The patient’s respiratory rate decreased to the mid-teens, and spontaneous tidal volume increased to 600 ml per breath. All vital signs abnormalities and signs of respiratory distress resolved completely within 20 minutes. The patient was successfully extubated that day.

This case illustrates two important clinical presentations of ETT secretion accumulation: ventilator weaning intolerance due to partial ETT obstruction and acute respiratory distress due to complete or near-complete ETT obstruction. Although these represent different severities of the same clinical process, they vary in their relative incidences, clinical presentations, and the degree to which the underlying cause is recognized.

ETTs that become completely or near completely obstructed by respiratory secretions (uncommon occurrence) typically manifest as respiratory distress, sounding vent alarms (high peak/normal plateau pressures), or inability to pass a suction catheter through the ETT. Any of these rapidly capture the clinician's attention and usually lead to a prompt diagnosis and intervention.

In sharp contrast, partial ETT obstruction due to accumulated secretions is a common occurrence and well-tolerated during MV, becoming clinically manifest only during the weaning process when MV is reduced to a level insufficient to offset the elevated work of breathing imposed by the narrowed ETT.

The ETT is the “highest resistor” in the breathing circuit, playing a critical role in the WOBImposed experience by spontaneously breathing patients. Secretion accumulation within the ETT occurs in a stealth fashion, and the resulting “silent” elevation in WOBImposed may be mistaken as weaning intolerance due to elevated disease-related work of breathing (unresolved pulmonary disease). This nearly ubiquitous process has been associated with MV weaning intolerance by several investigators.

Weaning intolerance is often managed by return to full MV, based on a sometimes erroneous assumption that the patient is not ready to wean due to unresolved pulmonary issues. In this case study, the patient was “rested” on the MV overnight. However, following removal of the ETT secretions, his respiratory distress resolved within 20 minutes, and he was liberated from MV that same day. Secretion accumulation within his ETT was a probable cause of his initial weaning failure. This patient benefited from intervention with the CAM Rescue Cath™, but could have done so at least one day earlier, further reducing his MV duration.

This interesting case sheds further light on ETT-related WOBImposed, an important but often underappreciated factor in the MV weaning process. Proactive weaning strategies can reduce exposure to ventilator-related complications and costs.

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