Difficulty in Removal of Tracheostomy Tubes

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Metal tracheostomy tubes have, to a large extent, been replaced by those constructed of polyvinylchloride. Advantages claimed are less tracheal damage at the end of the tube, molding of the tube at body temperatures, and disposability. We have recently encountered several cases of difficult removal of one type of these tubes (Portex Blue Line with large-volume, high-compliance cuff) from the trachea.

REPORT OF TWO CASES

Patient 1. A 39-year-old man with Guillain-Barré syndrome had a tracheostomy performed and a #36 Portex tracheostomy tube placed for protection of his airway and administration of positive-pressure ventilation. When attempts were made to change the tube after six days, considerable resistance was encountered when the cuff reached the stoma. Surgical intervention with partial excision and dilation of the stoma was necessary to remove the tube.

Patient 2. After a short period of endotracheal intubation, a 79-year-old man had a tracheostomy tube placed for long-term ventilatory care for paralysis secondary to botulism. His tube was changed after 24 hours, but such difficulty was encountered in passing the collapsed cuff portion through the stoma that dilation of the tracheal stoma was needed, resulting in bleeding and considerable discomfort for the patient.

DISCUSSION

Within two weeks we encountered five more cases of difficult extubation after Portex tracheostomy tubes had been in place for periods of four to seven days. In every case, removal was a lengthy process with extreme discomfort to the patient.

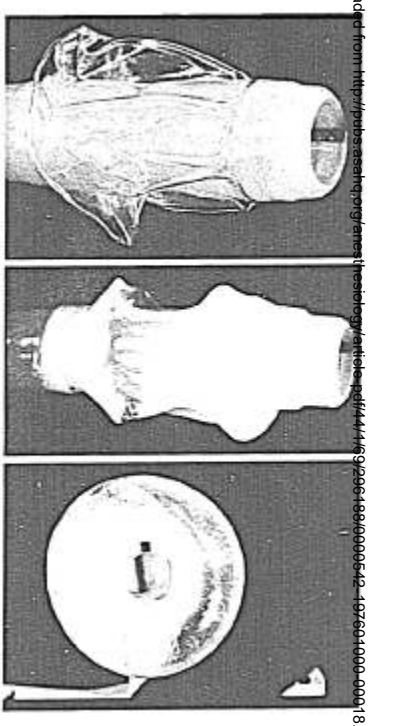

FIG. 1 (*top*). A Portex Blue Line disposable tracheostomy tube with large-volume cuff collapsed prior to insertion into the patient's trachea.

FIG. 2 (*middle*). A Portex Blue Line tracheostomy tube with cuff completely collapsed removed after six days in the patient's trachea. The stiff white "flanges" at the distal and proximal ends of the cuff made removal of the tube through the tracheostomy stoma extremely difficult.

FIG. 3 (*bottom*). An inflated high-volume cuff of a Portex Blue Line tracheostomy tube after incubation in a water bath at 37 C for 30 minutes.

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FIG. 4. An inflated high-volume cuff of an American Hospital tracheostomy tube after incubation in a water bath at 37 C for 24 hours.

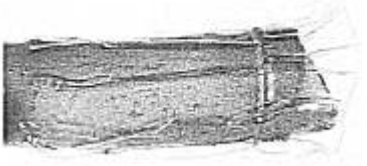

FIG. 5. An American Hospital tracheostomy tube with collapsed cuff removed after seven days in a patient's trachea. Note small diameter of collapsed cuff, with no formation of flanges shown in figure 2.

Prior to insertion, the collapsed cuff in the previously unused tube is soft and offers minimal resistance on insertion through the tracheostomy site (fig. 1). After a period of as little as 24 hours in a patient's trachea, the cuff turned white. On aspiration of air from the cuff, rigid circular structures were formed at both distal and proximal ends (fig. 2). It is these solid "flanges" that offer such resistance to passage through the stoma, whose fistula narrows to the diameter of the tube itself.

Tracheostomy tubes with inflated cuffs were incubated in a water bath at 37 C. Whitening of the cuff and formation of the dense circular areas occurred in approximately 30 minutes (fig. 3). After removal from the water bath (or patient), the cuff began to regain transparency in about 30 minutes. Other cuffed tracheostomy tubes (American Hospital, Shiley and latex cuffs) were tested in the same way. None of these showed the discoloration or "flange" formation seen with the Portex tube (fig. 4). An American Hospital tracheostomy tube with large-volume cuff was placed in a patient for a period of seven days. Removal at the end of that time was accomplished with relative ease. The collapsed cuff assumed a small diameter with no formation of "flanges" at either end of the cuff (fig. 5).

The cause of formation of these rings is unclear. This model of Portex tube has an extra layer of PVC at the distal and proximal cuff, apparently to prevent collapse of those areas of the cuff when in the trachea. The combination of moisture and body temperature may alter the rigidity of the thickened cuff material itself or the glue that binds the extra layers of PVC to the cuff. The resulting obstruction to the removal of the tracheostomy tube on deflation of the cuff has presented considerable discomfort and some potential danger in our patients with this type of tracheostomy tube in place. In one case surgical intervention was necessary. We will use another brand of tracheostomy tube until this design problem is remedied.

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