were found to be effective. To our knowledge, this is the first case of transcutaneous vessel occlusion to control bleeding from an intercostal artery aneurysm.

**References**


**Effect of Tracheal Dilatation and Rupture on Mechanical Ventilation Using a Low-Pressure Cuff Tube**

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We report the case of a 36-year-old woman who suffered tracheal dilatation and rupture despite careful monitoring of intracuff pressure. Surgical manipulation, postoperative mediastinitis, and bacterial staphylococcal tracheitis may be involved in the development of this complication.

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Persistent tracheal dilatation is an infrequently recognized complication of endotracheal intubation with a cuffed tube in patients requiring prolonged ventilatory support. The development of high-compliance, low-pressure, "soft" cuffs has markedly reduced the morbidity of prolonged intubation. Careful monitoring of intracuff pressure to maintain pressures near 20 mm Hg has been recommended to prevent cuff-related injuries.

We report the case of a patient with concomitant staphylococcal mediastinitis and tracheitis in whom tracheal dilatation was noted three days after intubation and was followed by tracheal rupture. This complication developed despite the maintenance of a low intracuff pressure.

**Case Report**

A 36-year-old woman was admitted to the ICU seven days after...
bronchi were also erythematous. A computed tomographic (CT) scan of the thorax performed five days after ICU admission (Fig 1) showed pneumomediastinum, extensive bilateral parenchymal consolidation, a right apical pneumatocele, and a marked dilatation of the trachea that was found to be 32 mm in diameter in the lower sections of the neck (Fig 2).

The intracuff pressure was maintained as low as possible by the minimal occluding-pressure technique. It was monitored several times a day with a manometer using a stopcock with four-way capabilities. Intracuff pressure never exceeded 30 cm H₂O (22 mm Hg) and peak inspiratory pressures were in the range of 32 to 36 cm H₂O after the first day. Eight days after ICU admission, gas leak through the cervical wound was noted and adequate ventilation could not be achieved. A second bronchoscopy was performed and an anterior longitudinal tracheal fissure, 4 cm above the carina, was visualized. A few hours after the procedure, the patient died.

**DISCUSSION**

Long-term undesired consequences of intubation, namely tracheal stenosis and, less frequently, dilatation, are due to ischemic necrosis.⁴ The reported incidence of persistent tracheal dilatation is low, 2 to 5 percent among patients requiring prolonged ventilatory support;⁴,¹ ³ usually it is a late complication. Low-pressure, high-compliance tube cuffs have a lower incidence of complications.⁸ A recent review⁹ describes tracheal rupture from pressure necrosis as a rare condition. It usually occurs at the posterior wall and develops slowly.

Capillary perfusion pressure of the tracheal mucosa approximates 25 to 30 mm Hg. Although cuff pressure exceeding these values for even short intervals is the most frequently cited cause predisposing to ischemic necrosis,⁹,¹⁰ undoubtedly, several clinical factors (eg, hypoproteinemia, poor perfusion states, hypoxemia) influence tissue response.⁴ Dobrin and Canfield⁹ demonstrated in vitro that compliant cuffs cause less ischemia.

Careful monitoring of cuff inflation pressure in mechanically ventilated patients maintaining pressures below 25 mm Hg is used to prevent damage to the tracheal mucosa.⁷ Tracheal dilatation is recognized radiographically in the vicinity of the cuff during mechanical ventilation; it can also be diagnosed by the need of increasing amounts of air inflation into the cuff to maintain a seal, and less frequently by a CT scan of the neck.⁴,¹⁴

In this case, tracheal dilatation developed precociously, at the third day of intubation, and was followed at the seventh day by tracheal rupture despite the use of a soft-cuff endotracheal tube. The patient received mechanical ventilation for respiratory failure following the development of infectious complications a week after a thyroidectomy with mediastinal node resection for thyroid carcinoma.

Some causes are considered in an attempt to explain the reason for tracheal dilatation and rupture in the presence of normal intracuff pressure: (1) weakness of the tracheal wall after thyroidectomy due to radical resection with mediastinal node excision and ischemic damage of muscular and elastic tissue; (2) weakness of the tracheal wall due to invasion by thyroid cancer; (3) postoperative mediastinitis that might affect the cartilaginous and membranous parts of the tracheal wall; and (4) infectious staphylococcal tracheitis that might increase the tracheal and bronchial wall compliance.

There was no pathologic evidence of malignant tracheal wall invasion in this patient.

The other three postulated causes cannot be excluded; they all could participate in the pathogenesis of the tracheal dilatation and rupture.

Infection of the tracheobronchial tree, particularly caused by S aureus, has been cited as a contributory factor in tracheal dilatation.¹⁰ Pneumothorax following airway damage in intubated patients suffering staphylococcal tracheitis has been reported.¹¹

In the presence of the mentioned conditions, tracheal rupture should be kept in mind to treat patients as soon as signs or symptoms develop, preventing fatality.

Previously suggested possible courses of action in similar conditions include the following: (1) placement of an uncuffed tube; (2) intermittent inflation of the cuff (both 1 and 2 would increase the risk of aspiration);¹¹ (3) replacement of the tracheal tube by a tracheostomy (this might cause the same complication but at a lower tracheal segment); and (4) high-frequency jet ventilation (although it also has been implicated as a causative agent of necrotizing tracheobronchitis).¹³

In conclusion, we found this case to be a dramatic example of a severe complication of endotracheal intubation despite using a low-pressure cuff-tube and the meticulous attention paid to the monitoring of intracuff pressure. Tracheal manipulation, mediastinitis, and perhaps more important, bacterial tracheitis predisposed this patient to the development of this consequence.

**REFERENCES**

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