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Tracheal Laceration Associated with Endotracheal Anesthesia

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Endotracheal intubation has undergone great refinements and has gained widespread use because of the added safety it provides in the conduct of anesthesia. The overall incidence of serious complications related to the procedure has fortunately been very low.†

Tracheal laceration has been reported to occur in association with vigorous repeated attempts at a difficult intubation,² tracheal abnormalities,³ and overdistention or rupture of endotracheal tube cuffs from overdistention.⁴–⁷ We report a case where a patient sustained laceration of the posterior tracheal wall during an apparently uneventful endotracheal anesthesia.

REPORT OF A CASE

A 59-year-old woman with rheumatoid arthritis of seven years' duration was admitted to the hospital for right total knee arthroplasty. She had received anesthesia twice uneventfully in the past, although a history of endotracheal intubation could not be ascertained. The only systemic abnormality included well-controlled mild essential hypertension. Results of laboratory examinations, electrocardiogram, and x-ray of the chest were unremarkable.

Anesthesia was induced with thiopental and tracheal intubation was performed following an adequate dose of succinylcholine with a Shiley low-pressure-cuff endotracheal tube, 8.00 mm ID, with stylet, without difficulty. The two sides of the chest showed equal expansion, and breath sounds were good. Anesthesia was maintained with nitrous oxide, oxygen, halothane and pancuronium. Ventilation was controlled. The intraoperative anesthetic course was uneventful.

On emergence from anesthesia the patient bucked and coughed on the endotracheal tube, which was gently removed after cuff deflation. A few minutes later, subcutaneous emphysema was noticed on both sides of the neck, extending to the upper chest, face and eyelids. Another Shiley 8 mm ID endotracheal tube was introduced without difficulty. The patient was given 100 per cent oxygen. No obvious injury to the pharyngeal or laryngeal mucosa could be seen during laryngoscopy. There was no clinical or x-ray evidence of pneumothorax at this time. In consultation with the thoracic surgeons, a tentative diagnosis of alveolar rupture with subcutaneous emphysema was made, and it was elected to observe the patient for a few hours in the recovery room. About three hours later, the subcutaneous emphysema had all but subsided, and ventilation appeared adequate. The trachea was then extubated. Within a few minutes, however, a marked increase in subcutaneous emphysema was noticed, and acute respiratory distress developed. The trachea was again intubated without difficulty. At this time it was decided to do fiberoptic bronchoscopy, which revealed a linear tear in the posterior tracheal wall about 5 cm proximal to the carina.

The patient was returned to the operating room immediately, anesthetized with thiopental, oxygen, halothane, and pancuronium, and through a low horizontal cervical incision a 4-mm longitudinal tear in the membranous portion of the trachea was repaired in a single layer. In the immediate postoperative period an x-ray of the chest revealed right pneumothorax, which was treated by inserting a chest tube. The patient's respiratory status improved progressively, and the trachea was extubated on the third postoperative day without complication.

On the fourth postoperative day, while sitting in bed, the patient suddenly collapsed. Severe bradycardia was evident on the EKG monitor, and she died in spite of attempts at resuscitation. A presumed diagnosis of massive pulmonary embolism was made. Request for autopsy was denied.

DISCUSSION

Reviewing the literature on tracheal and bronchial injuries, Hood and Sloan¹ reported that in only 30 of 90 cases for which information was available was the diagnosis of tracheo-bronchial laceration made in the first 24 hours. There were 37 patients in whose cases the times elapsing before diagnosis ranged from one month to 19 years. Since a tracheal laceration may not become symptomatic immediately,¹,³ it may be difficult to diagnose its etiology at a later stage.

The initial tracheal intubation in this patient was considered atraumatic. The stylet did not protrude beyond the tube tip and was withdrawn as soon as the tube went past the vocal cords. It is therefore unlikely that the initial intubation caused the tracheal tear.

An acute increase in airway pressure during the anesthetic course caused by a closed expiratory valve or by opening the oxygen-flush valve while the expira-
tory valve is closed could cause rupture of the airway. Such an incident did not occur during this case.

Blanc mentioned that the posterior membranous part of the trachea is friable and susceptible to tearing in the elderly, and that such an event is most apt to occur when patients whose tracheas are intubated are moved vigorously. Our patient was not moved after induction of anesthesia.

In addition to old age, tracheal abnormalities may increase the propensity to tear. Although there was no clinical or direct evidence of any tracheal abnormality in our patient, she was 59 years old, and the orthopedic surgeons had noticed during the operation that the collagen tissue around her knee was quite friable, probably as a result of chronic rheumatoid disease and steroid therapy in the past.

Nach and Rothman, in a collected series of subcutaneous ruptures of the trachea, describe instances in which rupture occurred when the head was suddenly thrown back during severe coughing in an attempt to expel a foreign body, as well as after other motions that tend to overstretch the trachea quickly. Although the coughing at the end of the operation in our case was not unusually strenuous, it cannot be ruled out as an etiologic factor.

Regardless of etiology, management of a tracheal laceration depends upon immediate, accurate diagnosis, determination of the size and site of the lesion, and associated conditions, e.g., pneumothorax. Thus, it is imperative to determine the source of the air leak, because if it is not repaired, a pharyngeal mucosal tear may lead to retropharyngeal abscess, and a tracheal laceration, when mistreated, may lead to mediastinitis or a tracheal stricture later.

Bronchoscopy offers the best means to define the exact location and extent of the lesion, and should be done whenever a tracheal laceration is suspected. While a small tear in the trachea may be treated with a tracheotomy, larger tears of the cervical or intrathoracic trachea need immediate repair. Since acute cardiorespiratory complications in patients who have tracheal injuries are most likely to be due to tension pneumothorax, one should be constantly on the watch for it. Even mild buckling and coughing on an endotracheal tube in an elderly individual may carry some risk, even though it is unavoidable at times. Nitrous oxide should be avoided in the presence of subcutaneous emphysema with or without associated pneumomediastinum, pneumothorax, or pneumoperitoneum, for well-known reasons.

REFERENCES