Extensive Linear “Blow-out” of the Thoracic Membranous Trachea with Innominate Artery Avulsion Secondary to Blunt Chest Trauma

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The successful management of extensive rupture of the entire intrathoracic membranous trachea and an avulsed innominate artery is presented. Taken separately, the two entities are in themselves rare following blunt trauma to the chest. Ventilatory and anesthetic control during repair of this injury is presented.

Tracheal “blow-out” poses an immediate threat to life. Delay in diagnosis and treatment can lead to certain death or a series of challenging surgical difficulties and complications.1 The problem is compounded when, as a result of severe blunt trauma to the chest, one can possibly have a major vascular injury.2 An extensive linear “blow-out” of the whole intrathoracic membranous trachea associated with an avulsed innominate artery following blunt chest trauma is reported. Membranous tracheal injury following blunt trauma is rare3 and the 13th repair of an avulsed innominate artery has just been reported.4 The combination of these two major rare entities is the first to be reported. The early recognition of the tracheal injury led to a life-saving tracheostomy which allowed an aortic arch study to be performed based on a pulseless right arm. Distal pulses were excellent and a widened mediastinum as seen on chest x-ray examination. The conduct during surgery and the method used to gain control of the respiratory and anesthesia problems are described.

Case Report

This 16-year-old Negro youth was brought to the City of Memphis Hospital emergency room following a deceleration injury to his anterior chest wall. He had bleeding orofacial wounds and an obviously contused chest wall with crepitus in his neck, cyanosis, and difficult respiration. His blood pressure was 200/90 mm Hg in the left arm and he had no pulse in the right arm. A tracheostomy was performed because of respiratory difficulty and suspicion of tracheal injury. Serosanguineous fluid in large quantities was aspirated via his tracheostomy. Blood gases drawn at the time of admission revealed a pH of 7.28, Pco2 of 50 mm Hg, Po2 of 47 mm Hg, and a 77 percent saturation. His condition stabilized after shunting in the right lung. A sterile plastic endotracheal tube was directed down the left main bronchus. The esophagus was slightly contused and there was swelling and ecchymosis in the area of the innominate artery but no active bleeding.

The incision was then extended medially to the center of the sternum and cephalad to the suprasternal notch. Blood gases at this time revealed a pH of 7.25, Pco2 of 65 mm Hg, Po2 of 53 mm Hg. It was obvious that there was excessive shunting in the right lung. A sterile plastic endotracheal tube was inserted in the right main bronchus, brought out through the operating field, and connected to another anesthesia machine (Fig 2). Ventilation improved and the repair of the trachea was carried out using interrupted 3-0 silk suture.

Following the tracheal repair, proximal and distal control was obtained of the innominate artery. Approximately 2 cm of damaged vessel was resected and an 8 mm Dacron graft was placed using 5-0 prolene suture. No shunt was used. Distal pulses were excellent after repair. The facial injuries were then repaired. During the first 24 postoperative hours he had marked pulmonary insufficiency requiring respirator support. Vigor-

[Figure 1: Aortogram showing complete obstruction of the right subclavian with partial obstruction of the common carotid artery from a torn innominate artery.]

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Most tracheal injuries are at right angles to the long axis of the airway. It has been shown in experimental dogs that it takes less force to tear the trachea transversely than longitudinally. Linear "blow-outs" are posteriorly located. The external force on the chest with a closed glottis leads to sudden increase in tracheal intraluminal pressure which results in an explosive-type rupture or blow-out.

The temporary control of ventilation to the right lung achieved by the introduction of a sterile plastic tube prevented further shunting. Cross-clamping the right main pulmonary artery was considered but was technically difficult under these circumstances. The use of dual anesthesia apparatus allowed unhurried repair of the trachea.

REFERENCES


1975 Alfred A. Richman Essay Contest

Undergraduate medical students with a special interest in cardiovascular and pulmonary diseases are invited to enter the 1975 Alfred A. Richman Essay Contest sponsored by the American College of Chest Physicians. The annual contest was created to encourage undergraduate medical students to explore and investigate problems relating to the disciplines of the chest.

Three cash awards will be presented: first prize, $1,000; second prize, $500; third prize, $250. Each winner will also receive a certificate of merit. The medical school attended by the first prize winner will be awarded a trophy inscribed with the winning student's name and the university to cite their accomplishment. The winning essay will be published in the College Bulletin.

All essays are coded and then judged by four physicians specializing in cardiovascular and pulmonary diseases. The judges will evaluate the essays on merit alone, with no knowledge of author or school.

Announcements of the winners will be made following the decision of the judges in May, and subsequently, awards will be presented at the Annual Meeting of the College to be held in Anaheim, California, October 28-30, 1975.

Suggested length of the essay is 2,000-2,500 words, and the deadline for submitting manuscripts is March 31, 1975. Application forms, including contest rules and regulations are now available from: Committee on College Essay, American College of Chest Physicians, 911 Busse Highway, Park Ridge, Illinois 60068.

Figure 2. Extensive tracheal injury posterior to the swollen ecchymotic superior mediastinal area. Two endotracheal tubes in place.