

Post-operative tracheomalacia after surgery on the thyroid and the aero-digestive tract

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Abstract

Tracheomalacia is exaggeration of the physiologic expiratory reduction in the antero-posterior diameter of the trachea causing tracheal obstruction, which results in respiratory embarrassment. This rarely documented problem occurs following surgery for large and long-standing goitres, primary tracheal resections, oesophagectomy and postoperative airway infection. A high index of suspicion is needed to diagnose the problem. Management varies depending on the severity. We discuss this problem while presenting three of the patients whom we diagnosed and treated.

INTRODUCTION

Tracheomalacia is exacerbation of the normal physiologic expiratory reduction of the antero-posterior and transverse diameters of the trachea brought about by a variety of causes resulting in airway distress¹²³⁴⁵. The commonest scenario for acquired tracheomalacia a few decades ago used to be surgery for massive goitres⁶, which are thankfully seen only rarely in these days. Infections, trauma including surgery on the upper aero-digestive tract and chronic airway diseases are more frequent causes of this rarely documented problem.

CASE REPORT

Patient I. A 48-year-old lady with a 7cm papillary carcinoma of the thyroid with multiple pulmonary metastases underwent total thyroidectomy. She developed respiratory distress on extubation. She was therefore re-intubated and shifted to the postoperative intensive care unit. When a second attempt at extubation was unsuccessful, a bronchoscopy was carried out which revealed the classic expiratory prolapse of the membranous trachea obliterating the tracheal lumen. The bronchi were normal. The endotracheal tube was retained and a tracheotomy carried out. A long tracheal tube was introduced to stent the trachea. Over the next 3 weeks, the malacic trachea gradually stopped prolapsing and she was successfully decannulated.

Patient II. A 30-year-old lady underwent a laryngopharyngo-oesophagectomy with bilateral neck dissection for hypopharyngeal cancer. A permanent tracheotomy was created. Tracheobronchoscopy for respiratory distress

postoperatively revealed malacia of the entire trachea and both bronchi. She was ventilated through a long tracheostomy tube in a CPAP – PEEP mode for 10 days, following which she was gradually weaned off. Serial bronchoscopy showed the prolapses of the membranous trachea gradually reduce.

Patient III: A 76-year-old lady underwent a total thyroidectomy with tracheal resection for a papillary carcinoma infiltrating the trachea causing airway obstruction. A bronchoscopic intubation was carried out and purulent retained secretions were sucked out of the trachea and bronchi before the surgery. She developed acute respiratory distress repeatedly following each of the two attempts at extubation. Bronchoscopy revealed tracheomalacia. The endotracheal tube was retained and the patient managed conservatively with antibiotics, humidification and vigorous chest physiotherapy. On the 17th postoperative day, she was successfully extubated.

DISCUSSION

The trachea and main bronchi undergo significant changes in length and diameter during respiration facilitated by the pliant elastic structure of the major airways. The length of the trachea increases during respiration and extension of the neck, while a reduction occurs during expiration, coughing and flexion of the neck. During coughing and forced expiration, the tracheal cartilages are compressed with a reduction in the transverse diameter of the trachea and a prolapse of the posterior membranous trachea into the

lumen. Exaggeration of these changes results in near obliteration of the tracheal lumen during expiration resulting in inadequate outflow with carbon dioxide retention and impaired clearance of tracheobronchial secretions predisposing to or aggravating a pre-existing infection¹²³⁴⁵. Over a period, the supporting tracheal cartilage becomes flaccid with loss of structural rigidity and the posterior membranous wall widens. These factors cause the posterior wall of the trachea to prolapse inside the lumen, especially during times of increased airflow such as coughing, crying, or feeding. The functional interference with ventilation causes expiratory flow obstruction, carbon dioxide retention and interferes with clearance of secretions predisposing to infections.

Tracheomalacia in adults is often part of or a result of another primary problem and is often not recognized or documented. It may be acute as in the post-operative setting or may be a chronic problem punctuated by acute exacerbations. The problem is often focal and may result from inflammation or cartilage degeneration caused by long-standing goitres, indwelling tracheostomy and endobronchial tubes, chest trauma, chronic tracheobronchitis, and other inflammations such as relapsing polychondritis. It may also be secondary to pulmonary resections, tracheal malignancy, radiation therapy and pulmonary infections⁴⁶⁷⁸.

Post operative tracheo/tracheo-bronchomalacia is encountered in four specific situations: a) following surgery for long-standing tracheal compression, especially long-standing goitres⁶⁹; b) following surgery in a patient with long-standing tracheal obstruction or chronic obstructive airway disease; c) after surgery resulting in resection of the trachea and/or the oesophagus; and d) consequent to prolonged intubation¹².

Tracheomalacia most commonly affects the distal third of the trachea. Functional impairment is proportional to the length of the involved segment and the degree of stenosis. Furthermore, kinking may occur at the transition between healthy tracheal wall and the indurated segment, as well as in the malacic segment. In diffuse tracheal disease, the trachea usually distends and collapses unevenly during inspiration and expiration, thus interfering with the tracheal function.

The typical manifestation of post-operative tracheomalacia is acute respiratory distress following extubation not explained by any other cause. This invariably necessitates prompt re-intubation or a tracheostomy, following which the distress is

promptly relieved. Anticipation of possible tracheomalacia helps in instituting preventive or prompt remedial measures.

Though a number of investigations have been mentioned in the literature, in a post-operative patient a high clinical suspicion and bronchoscopy form the bedrock for effective diagnosis and treatment. The airway is directly visualized during spontaneous respiration using a flexible bronchoscopy. The findings consist of the triad of loss of normal semicircular shape of tracheal lumen, forward ballooning of the posterior membranous wall and antero-posterior narrowing of the tracheal lumen¹⁰.

We recommend treating postoperative tracheomalacia expectantly. Mild variants, which may not be recognized post-operatively, may be managed with respiratory exercises. Mask ventilation using a CPAP mode may also be a useful adjunct. The majority will respond to conservative management, consisting of humidified air, chest physical therapy, slow and careful feedings to prevent aspiration, and control of infection and secretions with antibiotics.

Patients who are unable to maintain oxygen saturation with these measures may be managed with intubation for longer periods. Patients one and three in our case reports above had an endotracheal tube acting as a stent preventing expiratory collapse. In the case of patient two, the positive expiratory pressure ventilation averted the collapse and acted as a stent.

When extubation after about three weeks becomes a problem, a tracheostomy with a sufficiently long stem may be useful. The inflammatory response that sets in due to the indwelling tracheostomy or endotracheal tube leads to a stiffening of the tracheal wall thereby preventing the expiratory collapse. This is paradoxical since a long-standing tracheostomy tube can result in tracheomalacia because of pressure-related degeneration of the tracheal cartilages.

When tracheomalacia persists beyond four to six weeks, or there is tracheobronchomalacia, self-expandable metallic stents are a reliable option. These have rendered surgical tracheopexy obsolete.

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