Wire Stent for Tracheomalacia in a Five-Year-Old Girl

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A wire stent was used successfully to treat life-threatening tracheomalacia in a 5-year-old girl. Wire stents placed bronchoscopically are nonobstructing and have the potential for balloon expansion to accommodate growth.

(Wire stents have been recently applied to the management of adult airway stenoses due to malacia and malignant compression of the trachea and proximal bronchi [1-7]. We report successful use of a wire stent (Schneider Wallstent; Schneider USA Inc, Minneapolis, MN) for the treatment of life-threatening distal tracheomalacia in a child.

A 5-year-old girl with a chromosome 7 deletion presented during the second year of life with noisy respirations and shortness of breath. A patent ductus arteriosus was identified and ligated with temporary improvement in respiratory symptoms. At 4 years of age she had frequent episodes of stridor with respiratory distress. Bronchoscopy revealed distal tracheomalacia, and an aortopexy was performed with temporary improvement of symptoms. Seven months later she once again began having episodes of airway compromise and respiratory arrest requiring pulmonary resuscitation.

Physical examination revealed an abnormal chest contour with a narrow anteroposterior diameter and widened lateral dimension. Magnetic resonance imaging scan demonstrated a complete aortopexy and flattening of the distal tracheal lumen ending at the carina (Fig 1).

Bronchoscopy demonstrated tracheomalacia beginning 2 cm above the carina and continuing to the level of the carina with malacic changes extending into the proximal right and left main bronchi. A 10 X 20-mm wire stent (Schneider Wallstent) was placed through the rigid bronchoscope with simultaneous fiberoptic and fluoroscopic guidance. The stent was deployed at the level of the carina and expanded 2\(\frac{1}{2}\) cm proximally (Fig 2A). With expansion of the stent, the malacic segment of the distal trachea was restored to normal caliber and the proximal left and right main bronchi were suspended in a widely patent position from the distal end of the stent. The patient was extubated in the operating room, and subsequent observation in the hospital was unremarkable. Surveillance bronchoscopy and magnetic resonance imaging have revealed stable position of the stent. Four months postoperatively, granulation tissue formed at the distal stent margin. This has not progressed over the subsequent 6 months (Fig 2B).

Comment

Treatment options for focal tracheomalacia include tracheal resection, tracheostomy with positive-pressure ventilation, and endoluminal stenting. In this case, the...
Fig 2. (A) Postoperative anteroposterior chest roentgenogram with stent in the distal trachea. (B) Four months postoperative bronchoscope image demonstrating the stent within the distal trachea. The carina and the right and left main bronchi are suspended open by the stent, which ends Vi cm proximal to the carina. A small granulation is present on the wall at the distal end of the stent.

Tracheal narrowing was thought to be secondary to vascular compression related to the narrow thoracic cavity. Tracheal resection was therefore likely to be complicated by further malacia because relief of vascular compression was not possible. Tracheostomy combined with positive-pressure ventilation was not practical in this ambulatory but developmentally delayed 5-year-old girl. A wire stent was therefore considered the best option.

Wire stents are advantageous because the stent can be deployed via a small-diameter introducer, enabling passage across narrow strictures, and continued mucosal exposure through the mesh structure minimizes retention of secretions. With regard to pediatric patients, the minimal thickness of wire stents does not contribute to airway obstruction. In addition, they can be expanded with balloon dilation and thus accommodate growth.

Wire stents have the disadvantage of being difficult to reposition or remove, necessitating precise deployment. Migration of the stent can lead to erosion into adjacent pulmonary vasculature with life-threatening hemorrhage. In all airway stents, obstructing granulation tissue can form, and clinical or endoscopic observation is recommended for prompt debridement. Efforts to envelop wire stents with an inert coating may reduce erosion and allow for easier removal and repositioning.

Stent management of the malacic airway in infants and young children may be combined with surgical intervention. The small pediatric airway is easily compromised by postsurgical edema and secretions, making prolonged intubation a common necessity. Wire stents may provide a way to stabilize the postoperative airway. In addition, a wire stent could provide for effective palliation until the airway has grown sufficiently to allow safer resection and reconstruction. Congenital heart disease can coexist with tracheobronchomalacia, making surgical correction of either problem more hazardous. Wire stents could be used to stabilize the airway before correction of congenital heart disease. Finally, wire stent placement may provide relief of tracheobronchial obstruction after correction of congenital heart disease [8].

Use of wire mesh stents may offer an alternative to high-risk airway reconstruction or prolonged positive-pressure ventilation in infants and small children. In this case, life-threatening tracheomalacia was effectively relieved with a wire stent.

References