CASE STUDY

A Novel Laryngeal Stent in the Treatment of Subglottic Stenosis in Children

Nuevo stent laríngeo en el tratamiento de la estenosis subglótica en niños

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Case Report

We present a 3-year-old, preterm, male patient, who suffered bronchopulmonary dysplasia and was tracheostomised, giving rise to Cotton grade III subglottic stenosis (SS) secondary to prolonged intubation, which was subsequently treated by laryngotracheofissure with a posterior cricoid split and interposition of anterior costal cartilage and placement of a new suprastomal stent (Fig. 1).

The laryngeal stent employed was created from a number 8 T-shaped tube. After measuring the distance from the anterior commissure to the superior margin of the tracheal stoma, we cut the internal branch to the correct length, separating it from the rest of the T tube. The proximal and distal ends were covered with rounded silicone seals. The stent was placed in a suprastomal position by the laryngofissure and fixed by a double transfixing point at the level of the cricoid cartilage with a support of silicone buttons in the subcutaneous tissue of the neck. The correct position was confirmed by observation through the tracheal stoma and also orally (Fig. 2).

Next, we placed the anterior costal graft. This was closed by planes, leaving a number 5 Rusch tracheostomy tube.

The patient was admitted at the intermediate care unit for 5 days. We indicated antibiotic (amoxicillin), analgesic (ibuprofen) and antireflux (lansoprazole) treatment, as well as feeding through a nasogastric tube.

The stent was removed under general anaesthesia after 34 months. After removing the buttons through a small cervical incision, the stent was extracted transorally during the laryngoscopy. We carried out weekly endoscopies (for the first 3 weeks) to assess the location of the graft, calibre of the airway and formation of granulation tissue.

The prosthesis was well tolerated. Oral feeding was reintroduced 48 h after surgery. Aspiration was not reported. Decannulation took place 4 months after surgery.

The patient presented adequate ventilation, mild dysphonia and normal deglutition at 12 months after decannulation.

Discussion

Laryngeal stents are mainly used to maintain the airway expanded after its surgical reconstruction in cases of severe laryngeal stenosis. In the expansion technique through insertion of a cartilage graft they help to structurally support the graft in the correct position.

The decision to use an endoluminal prosthesis, as well as the type, length and permanence thereof, must be...
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Figure 1  (A) Cervical radiograph showing a suprastomal stent. (B) Stent with silicone seals in its ends.

individualised in each patient, depending on the severity and location of the stenosis. There is no ideal stent for the treatment of SS in children. The stent can act as a foreign body in the reconstructed airway and cause damage in the mucosa, ulcers, formation of granulation tissue and restenosis. Furthermore, it can cause difficulties for feeding and in voice production.

The characteristics of an ideal stent would include:

1. Availability in various sizes and shapes.
2. Sufficient rigidity to support the reconstructed area.
3. Resistance to compression, without causing pressure necrosis.
5. Allowing vocalisation.
6. Allowing feeding easily, without risk of aspiration.
7. Stable placement.
8. Simple to examine and remove.

The most widely used endoluminal prostheses are made of silicone, with T-shaped tubes being the best known. However, T-shaped tubes entail a risk of obstruction, especially when the inner diameter is small. Moreover, in children the upper end must be positioned over the false vocal cords, creating a risk of aspiration and dysphonia.

Figure 2  (A) Sutured stent in its correct position, supported by silastic buttons. (B) Endoscopic image of the stent.
Short suprastomal stents can be used when the stenosis does not affect the trachea. Its advantages include: enabling a change of tracheostomy tube when necessary and the absence of risk of trauma caused by the stent on the distal trachea.

In this patient we placed a short suprastomal stent which was created using the vertical portion of a T-shaped tube (Montgomery tube). It was made of silicone and was smooth and flexible. The ends were covered with solid and soft silicone seals, with rounded edges to prevent scraping neighbouring structures. It was easy to insert during the open surgery procedure. It could also be inserted into the airway after the endoscopic treatment of SS. It was easy to remove orally.

The stent was smooth in order to avoid pressure necrosis in the medial side of the arytenoids, and its rounded edges prevented the formation of granulation tissue. Furthermore, the seal covering the proximal end of the tube prevented aspiration. The rounded silicone cover of the distal edge prevented the possible formation of granulomas in the superior edge of the stoma and reinforced the strength of the stent at this level, thus preventing suprastomal collapse. This allows the stent to be left for more than 6 months in cases which require it, without a risk of damaging the reconstructed airway.\(^1\)\(^,\)\(^9\)

A stitch or silicone glue can be used to avoid the risk of losing the distal cover. Fixation with a non-resorbable stitch is required in order to prevent extrusion of the prosthesis.\(^9\)\(^,\)\(^10\)

In our patient, the silicone buttons which supported the stent were located in the subcutaneous tissue of the neck, but these can also be placed on the skin, in order to avoid another incision to extract them, washing the skin daily.

Among the advantages of this new stent we noted an absence of formation of granulation tissue, a short decannulation time and early reintroduction of oral feeding with no risk of aspiration. Another advantage was its accessibility, since T-shaped tubes are available in various sizes and can be cut to the required dimensions. Its main disadvantage was that it did not allow vocalisation. Often, patients with SS present aphonia, so a delay of some months until successful decannulation and voice production is acceptable.

We designed a short suprastomal stent made from the vertical portion of a T-shaped tube with the ends covered by silicone seals for the treatment of SS in a child. Although further experience in the treatment of SS using this stent is required, the results were promising. The treatment was successful, the resolution time was short and it enabled an early reintroduction of oral feeding. The smoothness and evenness of the prosthesis, with a rounded configuration of both ends, helped to prevent the formation of granulation tissue in the airway. We found this design quite safe and effective for the surgical repair of SS in children.

References