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Securing a paediatric airway with a nasal sucker for laser surgery

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Abstract
The administration of anaesthetic gases to an infant undergoing an endolaryngeal laser procedure can be difficult. We describe the use of a Magill's nasal sucker and an anaesthetic connector to maintain anaesthesia during laser surgery.

Key words: Larynx; Child; Airway Obstruction; Laser Surgery

Introduction

Anaesthesia for the examination and treatment of the paediatric airway requires close co-operation and understanding between the otolaryngologist and the anaesthetist. They collaborate in order to maximize exposure for the surgeon and to ensure adequate ventilation of the patient. Paediatric patients can present unique challenges to the use of lasers in the larynx because of these patients' smaller anatomy, limited accessibility, possibility of abnormal anatomy and potential for a deleterious oedema reaction following instrumentation.[1] We describe a method of administering volatile anaesthetic gases into an infant's airway through a nasal sucker whilst endolaryngeal laser surgery proceeds.

Method

The infant is anaesthetized, usually with a gas induction. Intravenous access is then gained. Anaesthesia is maintained using oxygen in nitrous oxide supplemented with a volatile anaesthetic agent (isoflurane). The patient is positioned supine as per usual for a rigid laryngoscopy. The operating table is angulated in an approximately 20° reverse Trendelenburg position. A shoulder roll is used to place the patient's neck in moderate extension.

Using a Jako–Pilling laryngoscope suspended with the Lewis apparatus, the larynx is exposed. The anaesthetic gases are delivered via a nasopharyngeal airway. Lidocaine (up to a maximum of 2 mg/kg of body weight) is used as a 1 per cent solution and is sprayed onto the epiglottis and larynx and between the vocal folds onto the upper trachea. A Portex anaesthetic connector with an internal diameter of 4.0 mm is attached to the suction end of a size-3 Magill's nasal sucker (Figure 1). This is then introduced from the outside of the laryngoscope by the anaesthetist through the mouth and positioned, by the surgeon, through the vocal folds and into the posterior half of the subglottis (Figure 2). In the presence of subglottic pathology, the end of the Magill's nasal sucker is positioned over the posterior half of the larynx. The connector is then attached to the anaesthetic circuit and anaesthesia maintained, with the child breathing spontaneously. Protection of the patient's eyes with multiple wet drapes, as well as protective eyewear for the operating room staff, is imperative.

Endolaryngeal laser surgery may now proceed. The CO_2 laser is coupled to an operating microscope with a 400 mm lens and a microspot manipulator.

Discussion

Use of the CO_2 laser in the paediatric airway has been a great advance in surgical technique.[2] It has been employed successfully in the treatment of a variety of lesions of the upper airway in paediatric patients, namely, laryngeal papillomatosis, subglottic stenosis and subglottic haemangioma.[3] The use of a laryngoscope with a wide proximal opening lessens the likelihood of inadvertently firing the laser outside the lumen.

A combination of general anaesthesia with local anaesthesia to the larynx virtually abolishes

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FIG. 1
A Portex 4.0 mm anaesthetic connector attached to a size-3 Magill's nasal sucker.

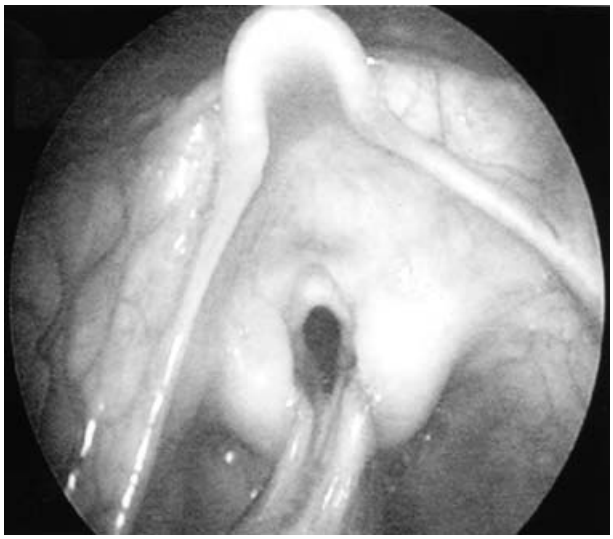

FIG. 2
The Magill's nasal sucker in position in an infant's airway prior to undergoing endolaryngeal laser surgery.

laryngeal spasm and lessens the possibility of breath-holding or coughing attacks during and after endoscopy.

The use of standard polyvinylchloride endotracheal tubes in laryngobronchoscopic laser surgery should be avoided because of the risk of combustion. Current laser-resistant tubes are bulky, with a greater external diameter than a standard tube of equivalent internal diameter, and therefore reduce the space available to the surgeon. Therefore, in infants, the tube with the smallest external diameter is of great advantage. The Magill's nasal sucker has a smaller diameter than any proprietary tube (internal diameter = 3 mm; outer diameter = 5 mm; length = 203 mm) and its rigid construction enables it to be placed easily into the infant's airway. The Mallinckrodt Laser-Flex (St Louis MO, USA) is the smallest of the currently available laser-resistant tubes and has an internal diameter of 3.0 mm and an outer diameter of 5.2 mm. The metallic Magill's sucker provides a secure airway and enables the anaesthetist to provide continuous positive airway pressure (CPAP) or intermittent positive pressure ventilation (IPPV) if required. The dimensions of the tube mean that the work of breathing may be increased, but this can be overcome by the use of CPAP and, if necessary, assisted ventilation. The dimensions of the tube may also increase deadspace but this has not appeared to cause a problem in clinical use.

Other techniques for managing the paediatric airway for laser surgery are jet ventilation (subglottic or supraglottic) and the use of a nasopharyngeal airway or a ventilating bronchoscope (for lasering endobronchial lesions).[4] However, none of these techniques secures the airway if problems arise. Some authors have suggested performing a tracheostomy prior to endolaryngeal laser surgery in a child.[4] Although this is the best method to secure the airway, we feel this management is too aggressive for a child without a pre-existing tracheotomy. Intermittent endotracheal intubation interspersed with CO_2 lasering has also been described.[5] The use of aluminium foil wrapped around a red rubber endotracheal tube has been published.[6] The disadvantage of this technique is that the foil increases the outer diameter in an already small larynx. The foil wrapping may also abrade the phonating surface of the vocal folds as the tube is positioned.

In the absence of suitable laser tubes for small infants, pharyngeal insufflation of anaesthetic gas mixtures has been the preferred method of anaesthesia. This technique will continue to be used widely, but the potential advantages of the technique described here are that it reduces the danger from the oxygen-enriched environment, reduces gas pollution for the operator and allows the anaesthetist to apply assisted ventilation without interfering with the operative field.

We recommend this technique because it provides a secure, laser-safe airway in infants. This method of administrating anaesthetic gases has mainly been used on infants younger than one year. In children above the age of one year, conventional laser-safe tubes are available.

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