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Technical note

How to perform endoscopy in paediatric otorhinolaryngology?



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ABSTRACT

Upper airway endoscopy in children is a high-risk procedure, which should only be performed by a well trained and fully equipped team. The sequence of procedures, at least at the beginning of the procedure, is always the same and must be performed very rigorously. Communication between the various operators, especially the surgeon, the anaesthetist and the operating room nurse, is essential before starting the procedure, as anticipation of sudden difficulties is the key to effective management. The authors report their experience and endoscopy practices.

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1. Introduction

Endoscopy is the reference technique and the examination of choice for investigation of the upper airways in children. No other examination currently allows such a precise functional, dynamic and morphological assessment. Endoscopy also allows a number of therapeutic procedures to be performed. It must be performed according to a particularly rigorous technique to ensure optimal safety conditions. It is the operator's responsibility to ensure that all of the necessary equipment is available and rapidly at hand, and that the immediate strategy has been clearly defined and discussed with the other members of the team, especially the anaesthetist. Complete endoscopy in children is performed according to a clearly defined protocol, described below.

2. Technique

The child is placed in the supine position in the operating room on a warming blanket. The upper part of the thorax is exposed to visualize respiratory movements at all times [1,2].

The objectives of endoscopy and the procedure are clearly described to all members of the team. The mode of anaesthesia (spontaneous or assisted ventilation, pressure mode, type of oxygenation, changing modes of anaesthesia during the procedure) is discussed with the anaesthetist. The endoscope is already prepared

on the table before the procedure. The equipment required in the event of a predictable or unpredictable problem is also available and immediately at hand (Table 1). The operating room nurse is also informed about the entire procedure. Ideally, two operating room nurses should be present, especially when endoscopy is likely to be difficult. The equipment must include at least a fiberoptic endoscope, a functional laryngoscope with an adapted blade and charged batteries, a rigid scope and suction equipment. The minimum emergency equipment includes a set of endotracheal tubes and laryngoscope blades, stylets, and adapted bronchoscopes with the available connections.

The entire procedure is recorded on a digital video tower (Figs. 1 and 2), allowing collegiate review of the images, comparison over time in the same patient, and creation of a teaching database.

The first step generally consists of endoscopy under local anaesthesia (or N₂O premedication) to visualize the nasal cavities, nasopharynx, base of the tongue, pharynx and pharyngeal tone, larynx and laryngeal tone as well as its global dynamics and vocal cord mobility. The endoscope must not be advanced beyond the vocal cords at this stage to avoid inducing laryngeal spasm. Upper airway endoscopy can be performed in the doctor's office, but it should preferably be performed in the operating room, where video recording is generally easier, and the good examination and safety conditions often allow longer and better quality visualization.

The endoscope diameter must be adapted to the child's nasal cavities to limit the pain induced by the procedure and to avoid inducing mucosal lesions, which can bleed and interfere with subsequent vision.

After performing endoscopy under local anaesthesia, endoscopy under general anaesthesia can begin. The first step consists of anaesthesia, generally by inhalation of halogenated anaesthetic

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Table 1
Indicative sizes of intubation tubes and bronchoscopes to be used in children according to age and weight [1].

Age	Weight (kg)	Probe	Bronchoscope
Premature	<1.5	2 or 2.5	2.5
Neonate	3	2.5	2.5
1 month	3–4.5	3 or 3.5	3
3 months	4.5–6	3.5	3
6 months	6–10	4	3.5
1 year	10–12	4	3.5
2 years	12.5–15	4.5	3.5
3 years	15–17.5	5	4
5 years	17.5–20	5.5	4
6 years	20–22.5	6	5
7 years	22.5–25	6.5	6
8 years	25–27.5	7	6
9 years	27.5–30	7	6
10 years	30–35	7	6
12 years	35–40	7.5	6 or 6.5
16 years	45–60	8	6.5–7.5

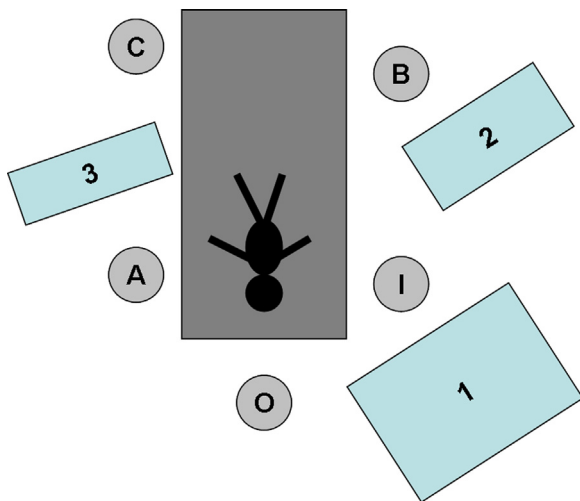


Fig. 1. Example of the positioning of personnel for paediatric endoscopy. O: operator; A: assistant; I: operating room nurse; B: anaesthetist; C: anaesthetic nurse; 1: operating table; 2: anaesthesia trolley; 3: video tower. The displays must be arranged so that all personnel can monitor anaesthesia data (heart rate, SaO₂, CO₂ curve), and almost all of the endoscopy images.



Fig. 2. Video tower with digital recorder, high definition screen, and ready-to-use endoscope.



Fig. 3. Local anaesthesia of the glottis by the surgeon (child tracheotomized).

gases. In most children, this inhalation rapidly induces sleep with preservation of spontaneous breathing. An intravenous line is inserted after induction by inhalation, ideally at the site that has been prepared at least one hour in advance by an anaesthetic cream patch (e.g., lidocaine + prilocaine). No subglottic investigation with a rigid endoscope should be performed without a secure venous access, which is essentially used to deliver analgesics and especially hypnotics to maintain anaesthesia as a complement to or instead of halogenated anaesthetics. In an emergency, atropine, adrenaline or, more rarely, muscle relaxants, can also be administered via this route.

The surgeon sits at the patient's head on a foot-adjustable stool. The surgeon and the anaesthetist insert a small tube via the nose, with the lower end placed in the nasopharynx or pharynx, in order to deliver oxygen and/or low-flow halogenated anaesthetics during the procedure.

Following induction with the child breathing spontaneously, local anaesthesia of the glottis is usually required (Fig. 3). This is an essential step, as it limits the risk of laryngeal spasm and facilitates introduction of instruments and therefore good conduct of the rest of the procedure. Local anaesthesia is performed by one or several puffs of lidocaine spray (maximum 2 mg/kg with particular caution in very young infants) and can be repeated during the procedure if necessary, in agreement with the anaesthetist. A first attempt of laryngoscopy can also be performed at this stage to evaluate the conditions of exposure and to check correct placement of the oxygen tube in the pharynx. The tube must not be placed too distally, in the lower part of the hypopharynx, as oxygen delivery would be less effective or even harmful when insufflated into the oesophagus (Fig. 4).

Laryngeal exposure in children is ideally performed with a Miller laryngoscope blade adapted to the child (00, 0, 1, 2) [3]. The gums must be protected by a wet compress (before eruption of the deciduous teeth) or by a mouthguard adapted to the child's dental arch. The tongue is entirely retracted towards the left and the tip of the laryngoscope blade is advanced in the glossotonsillar sulcus as far as the vallecula. The epiglottis must therefore be avoided due to the higher risk of postoperative oedema compared to adults, and must remain parallel to the laryngoscope blade. Due to the small dimensions of the child's neck, the operator is generally able to hold the laryngoscope and support the larynx with one, usually the left, hand.

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