



Rigid endoscope-assisted orotracheal intubation for vallecular cyst surgery in neonates and young infants

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ABSTRACT

Objectives: To investigate the outcomes of rigid endoscope-assisted orotracheal intubation (REI) in neonates and young infants with difficult airway conditions as an alternative intubation technique when more specific airway instruments are not available in most developing countries, and to evaluate the safety and advantages of this method.

Methods: Neonatal and young infantile patients undergoing vallecular cyst surgery with a Cormack-Lehane Grade 3 or 4 glottic view between June 2013 and June 2015 were studied. Fifteen patients were intubated using rigid endoscopic assistance. Fifteen other patients who were intubated using the conventional technique were selected from the previous consecutive cases and used as a matched control group.

Results: REI was successfully performed in all 15 patients in one intubation attempt. The anesthetic preparation duration for the REI group was 6 min (interquartile range 5–7 min), which was shorter than the anesthetic preparation duration for patients intubated using the conventional technique (15 min [interquartile range 10–20 min], $p < 0.001$). The time required for intubation with a rigid endoscope was 66.5 s (interquartile range 58–74 s). No volume reduction of cysts or tracheotomies was needed in the REI group, and no cysts were ruptured nor did laryngeal mucosa damage occur with this technique. Among patients of conventional group, one required a tracheotomy, and four required cyst volume reduction by needle aspiration. No residual lesions or recurrence were observed during one year of postoperative follow-up in the REI group, and two recurrences were observed in the conventional group.

Conclusion: REI, which used common pieces of equipment in an otolaryngology operating room, may be a safe and feasible alternative for intubation in neonatal and young infantile patients with vallecular cysts or other difficult airway conditions.

1. Introduction

Vallecular cysts are ductal cysts caused by mucus retention at the tongue base due to obstruction of the collecting ducts. The prevalence of vallecular cysts ranges from 1.82 to 5.3 cases per 100,000 live births [1,2]. Cysts present as airway obstruction or feeding difficulty in the neonatal population and can progressively lead to failure-to-thrive or

death. An elective operation during the first few months of life is necessary. However, anesthetic management of the upper airways of these patients can present a great challenge because their laryngeal morphologies (e.g., supraglottic location of cysts, small laryngeal cavities, etc.) make glottic exposure much more difficult [3–5]. In addition, these patients have usually suffered from respiratory distress for several days or weeks, which results in poor compensation capacity for anoxia;

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Fig. 1. MRI T2-weighted axial (A) and coronal (B) views. MRI revealed a cystic mass on the epiglottic vallecula and that the upper airway was narrowed. T, tumor; H, hypopharynx; E, epiglottis.

therefore, temporary hypoxemia occurs more frequently during intubation, and patients recover slowly with oxygen. All of these factors make intubation of these patients a difficult and high-risk procedure.

In the past, blind intubation by a senior anesthetist [6,7] or intubation after volume reduction of cysts [8–10] was performed commonly for these cases; however, these methods can induce laryngeal mucosal damage or cyst deformation and increase the difficulty of surgical resection [1,11]. Intubation performed with rigid endoscopic assistance has been reported in difficult cases of adult patients with epiglottic cysts [12] and in infants with Pierre-Robin syndrome [13]. This method had some advantages and is convenient in cases in which more specific advanced instruments are not available, generally in developing countries. Since June 2013, we have used rigid endoscopic-assisted orotracheal intubation (REI) in neonates and young infants with a Cormack-Lehane (C-L) Grade 3 or 4 glottic view. This article aims to present the outcomes of this technique in these difficult airway conditions, to evaluate its safety and advantages, and to compare it with other techniques.

2. Materials and methods

2.1. Patients

Fifteen consecutive neonatal and infant patients with symptomatic vallecular cysts between June 2013 and June 2015, who were intubated using rigid endoscopic assistance, were included in the study. The transoral microsurgeries used to treat these patients' vallecular cysts were performed by the same medical team. The surgical records, discharge summaries, anesthetic records and follow-up records were collected. When available, the radiologic reports regarding the cysts sizes

(the maximum diameter in coronal, sagittal or transverse planes) were also collected (Fig. 1). Ethical approval for this study was provided by the Ethical Committee of Xinhua Hospital, which is affiliated with Shanghai Jiao Tong University School of Medicine, Shanghai, China.

Due to the difficulty and high risk of intubating infants with upper airway obstructions, conventional intubation was not performed after the first successful case was intubated using rigid endoscopic assistance. For comparison, a matched control group was selected from previous consecutive patients who underwent conventional intubation during the similar time frame (seventeen months) (Table 1). The criteria for the control group were as follows: patients were treated by the same medical team (senior surgeon and senior anesthetist); were less than one year of age; and had complete medical records.

2.2. Endoscope system

Endoscopic visualization was achieved using a general rigid otolaryngology endoscope system (Karl Storz GmbH and Co. KG, Tuttlingen, Germany) including 0°, 30° or 70° angled endoscopes (4 mm in diameter and 175 mm in length). The 0° endoscope was used first, and the 30° or 70° angled endoscopes were substituted if the glottis could not be clearly exposed. This system was also subsequently used for the surgical resection of the vallecular cysts.

2.3. Intubation procedures

The airway conditions of all patients were evaluated prior to surgery, and their glottic views were assigned a C-L Grade [14]. The steps in the standard procedure for orotracheal intubation using endoscopic video visualization were as follows:

Table 1
Comparison between two techniques.

Intubation technique	Case (n)	Age at Surgery (days, median, [IQR])	Sex	Cyst Size (cm, median, [IQR])	Cormack-Lehane grading	Anesthetic preparation duration (min, median, [IQR])	Intubation duration (second, median, [IQR])	Intubation attempt (n, median, [IQR])	Volume reduction (n)	Tracheotomy (n)	Residual after 1 year (n)
REI	15	60 [34–70]	10 Male 5 Female	1 [0.95–1.5] ^a	3–4	6 [5–7]	66.5 [58.5–74.5]	1 [1–1]	0	0	0
Conventional technique	15	56 [40–80]	8 Male 7 Female	1 [0.88–1.5]	3–4	15 [10–20]	N/A ^b	3 [2–3]	4	1	4
p-value	–	0.881	–	0.636	–	< 0.001	–	< 0.001	–	–	–

IQR = interquartile range.

REI = rigid endoscope-assisted orotracheal intubation.

^a 13 cases with datas of images were included.

^b no datas for the cases of conventional technique.

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