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REVIEW

Bronchoscopy in children in South America

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Summary Bronchoscopy is an important tool in the study of the airway. Diagnostic and therapeutic uses are well described in the literature and standardisation of the technique is well defined. Most relevant publications on bronchoscopy come from Europe and the United States, and in some countries they are used as guidelines for local hospitals. In spite of the limited experience published from South America, and the scarcity of financial resources, important information and research pathways have been developed in paediatric bronchoscopy. The information in this review was compiled from local publications, case reports, review articles, brief reports and congress presentations to provide an overview and share the experience about bronchoscopy in South American children.

INTRODUCTION

The first bronchoscopy report, regarding a foreign body in the airway, came from Germany at the end of the nineteenth century (1897).[1] In 1969, Shigeto Ikeda introduced flexible bronchoscopy – a revolutionary way to explore the airway; this technique was introduced to paediatrics in 1978.[2] Since then, improvements in the technique and the equipment have allowed the development of high-quality, safe bronchoscopy in the paediatric population and bronchoscopy is now considered one of the most important diagnostic and therapeutic tools for children. It is used for investigation in immunocompromised patients, severe asthma, bronchiectasis, persistent and recurrent wheezing and stridor.[3,4]

Flexible bronchoscopy is not limited to the airway visualisation. Most adult procedures (e.g. endobronchial biopsy, transbronchial biopsy, selective bronchography) are performed in children with very few complications. Therapeutic procedures (laser treatment and the dilatation of damaged tissue – tracheal stenosis – tracheoesophageal and bronchopleural fistula occlusion, and airway stabilisation using stents) are also undertaken.[4]

This brief review contains most of the published information about rigid and flexible bronchoscopy in children in South America over the last 20 years, using databases listed in Medline, Pubmed, Lilacs, and Scielo. Some articles were written in Spanish or Portuguese with summaries in English, data from abstracts are also included. Some South American countries are not represented because no data were available. Our objective is to share reported experience about investigation pathways, diagnostic yield and relevant findings in paediatric bronchoscopy in children.

EPIDEMIOLOGY IN SOUTH AMERICA

Epidemiological information about bronchoscopy in South America is limited in terms of series, training information and educational medical programs. One publication contains the medical profiles of Brazilian bronchoscopists, which were made using a questionnaire/survey. According to this, most are between 30 and 50 years (79.3%), predominantly male (71.2%), and perform more than 100 bronchoscopies per year (56%). The limitation of this

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Table 1 Bronchoscopy indications in the general Argentinian population

Indications	Contraindications
Haemoptysis investigation	*A. Absolute contraindications*
Persistent atelectasis or pneumonia in the chest X-ray	Lack of parental consent for the procedure
Stridor or localised wheezing	Lack of adequate training in bronchoscopy
Unexplained unilateral phrenic paralysis	Lack of appropriate facilities for emergency situations
Unexplained superior cave vein syndrome or vocal cord paralysis	Severe hypoxaemia ($PaO_2 < 60$ mmHg, $SaO_2 < 80\%$)
Smear cytology positive or suspicious for malignancy	Malignant arrhythmia
Lung cancer staging	Uncorrected coagulation deficit (for biopsy)
Airway injury due to toxic inhaled substances	Unstable angina or recent heart attack
Airway broke up suspicion after thoracic trauma	*B. Relative contraindications*
Bronchopleural fistula study	Lack of cooperation for the study
Follow-up in lung and heart–lung transplant	Uncontrolled asthma in spite of regular treatment
Microbiologic study in opportunistic lung infections and community acquired pneumonia	Hypoxaemia
	Azothermia (for biopsy)
Immunocompromised host with new and persistent infiltrates in the chest X-ray	Unstable cardiac arrythmia
	C. High-risk conditions
Interstitial lung disease study	Massive haemoptysis
Difficult intubation or failure after extubation	Tracheal obstruction
Follow-up in prolonged intubation and tracheotomy	Pulmonary hypertension (for biopsy)
Unexplained chronic cough	Immunocompromised host
Lung cancer surgery follow up	Tracheal or bronchus biopsy in partial obstructive tumours
Treatment evaluation in non-surgical lung tumours	Interventional procedures (cryosurgery, laser, brachytherapy)
Oesophagus cancer staging	

study was the response rate of only 19.2%.[5] Most of the published information in South America is from Chile and Brazil, and dates back to the early 1990s. It is interesting that flexible bronchoscopy is performed widely in Chile, a lot of experience being tabulated in local publications and at local congresses.[4] In Brazil, most of the publications are related to rigid bronchoscopy, especially foreign body removal.[6] Information from other countries is scanty and access is limited.[7]

INDICATIONS

Indications for bronchoscopy are well standardised in the USA[8] and the UK.[9–11] Argentina has a consensus for indications, contraindications and high-risk conditions,[12] which are published as bronchoscopy guidelines in adults (Table 1). There is also a guideline for the most frequent indications and procedures in the paediatric population (Table 2).

FLEXIBLE BRONCHOSCOPY

Initially, bronchoscopy was performed with rigid equipment to ensure the child's ventilation, but evolution and innovations in flexible bronchoscopy – with its small diameter – have given optimal vision and safety for use in children. Anesthesia and sedation techniques include intravenous drugs, such as midazolam, fentanyl, ketamine and morphine, and sometimes inhaled general anesthesia (without neuromuscular blockade), with topical or nebulized 2% lidocaine to provide local anesthesia and minimize the risk of bradycardia, gagging and coughing.[13] In South America,

Table 2 Bronchoscopy indications in the paediatric population

More frequent study indications	More frequent therapeutic indications
Airway obstruction with no clear cause	Treatment of persistent atelectasis
Stridor (laryngeal, tracheal; congenital or acquired)	Foreign body removal
Congenital malformation of airway (with or without voice alteration, with or without deglutition disorder)	Secretion removal in patients with bronchiectasis
	Treatment of airway benign tumours
Tracheomalacia (primary or secondary)	Treatment of congenital tracheoesophageal fistula
Lung malformations	Treatment of tracheal abnormalities
Microbiological study (BAL) in immunocompromised patients	(stent placement, dilatation)

BAL, bronchoalveolar lavage.