ORIGINAL ARTICLE

Flexible fiberoptic bronchoscopy in Greek children

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Abstract

Background and aim: Flexible fiberoptic bronchoscopy (FFB) is one of the most important procedures in paediatric pulmonology. To the best of our knowledge there is no review – audit summarising the experience with FFB in children in Greece. We therefore analysed retrospectively all FFBs performed by the paediatric pulmonology team in our hospital in order to analyse indications for bronchoscopy in our population, explore diagnostic yield for each indication and highlight potential complications..

Material – Methods: Three hundred and sixteen (316) diagnostic FFBs performed in 305 children during a six years period were retrospectively analysed.

Results: Seventy five (75) % of bronchoscopies had a meaningful outcome. Diagnostic yield for individual indications ranged from 41% to 91%. Stridor was the most rewarding indication (91%). Fever was the most common side effect (7%). The rest of complications were in small numbers and easily reversible.

Conclusions: Bronchoscopy is a safe procedure and in our diverse population the overall diagnostic yield was 75%. Hippokratia 2011; 15 (4): 312-315

Key words: bronchoscopy; flexible bronchoscope; children; bronchoalveolar lavage.

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Flexible fiberoptic bronchoscopy (FFB) is one of the most important procedures in paediatric pulmonology[1,2]. FFB was first reported in children in 1978[3] and since then its use is constantly expanding[4-7]. To the best of our knowledge there is no review – audit summarising the experience with FFB in children in Greece. We undertook a retrospective analysis of all children bronchoscoped by the paediatric pulmonology team in a tertiary Paediatric Department during a 6 years period.

Material and methods

Data on all bronchoscopies performed by the paediatric pulmonology team in our tertiary university paediatric department are stored in a database and were retrieved for analysis. Database recordings included demographic characteristics, indications, endoscopic findings, bronchoalveolar lavage (BAL) analysis and complications. Parental informed consent was obtained for all children prior to bronchoscopy[8].

All examinations were performed for diagnostic indications between February 2003 and October 2009. During this period 316 FFBs were performed in 305 children (179 boys) aged 30 days to 15.5 years (median age 4.5 years). Two hundred and ninety five children were examined once, nine children were examined twice and one child was examined thrice.

FFB was performed in a designated bronchoscopy suite. All procedures were carried out according to international standards[1]. Fasting prior to the procedure lasted 4 – 8 hours, depending on the child's age. Premedication with midazolam was administered to children older than one year of age. Lignocaine was used for topical anaesthesia and intravenous propofol in combination with sevofluorane were administered by an experienced paediatric anaesthetist. During the procedure oxygen was supplemented via a face mask. Full cardiorespiratory monitoring was implemented throughout the procedure[9]. Two flexible fiberoptic bronchoscopes were used, PENTAX FB 10 (3.1.mm) and 15 (4.6mm). FFB was performed via the nasal route in 302 cases. All procedures were video recorded to enable us to review the findings.

BAL was obtained from the right middle lobe or lingula according to ERS guidelines[10]

Complications during bronchoscopy and the recovery period were recorded for all patients. Patients and family members were encouraged to discuss any concerns with the team. Following the procedure, the child was observed in the ward for 24 hours.

Analysis of the material was performed by dividing the subjects according to the clinical indication as re-

Table1: Indications for bronchoscopy and diagnostic yield

Indication for Bronchoscopy	Number of Patients	Diagnostic Yield	Diagnostic Yield (%)
Suspected foreign body (FB)	30	20	67
Chronic cough	39	16	41
Stridor	56	51	91
Recurrent/persistent infection	49	36	73
Wheezing unresponsive to treatment	18	14	77
Radiological abnormalities	31	24	77
Cystic Fibrosis	30	24	80
Chronic pulmonary disorders	29	25	86
Haemoptysis	7	5	
Tracheofibroma	1		
Haemangioma	4	4	
Immunocompromised oncology patient	10	6	
Pneumomediastinum post tonsillectomy	1		
Post tracheooesophageal fistula correction	5	5	
Possible Tuberculosis	5	4	
Lymphoid hyperplasia	1	1	
Sleep apnoea	3	3	
Difficult intubation	1	1	
Subcutaneous emphysema	1		
Chocking episodes	2	2	
Post thoracic trauma	1	1	
Total	324	242	75

A single patient may have had more than one indication to be bronchoscoped. A percentage for diagnostic yield has not been calculated for indications with less than 15 patients

corded in the referral letter or the report of clinic consultation prior to the investigation. When the diagnosis of foreign body was confirmed the patient was referred for rigid bronchoscopy straight away. Children with stridor were bronchscoped when there was a high index of suspicion for diagnosis other than laryngomalacia or when the patient experienced failure to thrive. Children with recurrent infection were bronchoscoped when they failed to respond to appropriate antimicrobial treatment. Persistent wheezing was an indication for bronchoscopy when it showed no response to anti-

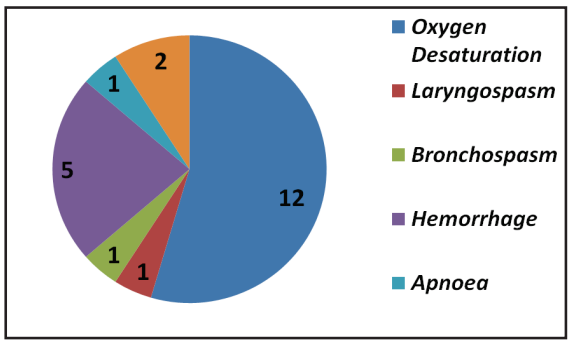

Figure 1: Complications during bronchoscopy and the recovery period in our patients. Please note that fever is not included

asthmatic medication and there was a high index of suspicion for alternative diagnoses such as foreign body inhalation or tracheomalacia. We opted not to group indications with fewer patients under the title "miscellaneous" in order to highlight the diversity of clinical presentations that may lead a child to the bronchoscopy suite. We looked into diagnostic yield for each indication as well as analysed positive endoscopic findings. Our experience with BAL has already been published[11] and therefore it will not be analysed further in the current paper.

Results

Indications for bronchoscopy and diagnostic yield are summarised in table 1 and abnormal findings on bronchoscopy in table 2. Complications during the procedure are depicted in figure 1. Fever post bronchoscopy was recorded in 7% of the children. Twelve patients experienced oxygen desaturation that required removal of the bronchoscope. One patient had laryngospasm and one patient had bronchospasm in the immediate postoperative period. Five patients had a minor haemorrhage that responded to suctioning and two had severe cough. Finally, one child had an episode of apnoea in the recovery room that was easily reversed with bag and mask ventilation.

Table 2: Abnormal findings on bronchoscopy

Abnormal finding on bronchoscopy	Number of patients
Upper airways	
Nasal polyps	2
Tongue oedema	1
Pharyngomalacia	4
Laryngomalacia	40
Vocal cord knobs	2
Laryngeal Cleft	1
Vocal Cord Paralysis	1
Vocal Cord Dysfunction	1
Laryngeal haemangioma	1
Subglottic Stenosis	8
Dislocation of left arytenoids	1
Tracheal Lesion	1
Tracheomalacia	10
Fistula or Tracheooesophageal fistula scar(post correction)	4
Tracheal or Bronchial Stenosis	37
Tracheal tumour	1
Lymphoid (adenotonsillar hyperplasia)	4
External compression of trachea / bronchi	11
Lower airways	
Pig bronchus	1
Bronchomalacia	12
Foreign Body(FB)	31
Haemorrhagic mucous	2
Agenesis of a bronchus / lung	4
Increased secretions – inflamed mucosa	105

Discussion

We undertook this review in order to analyse indications for bronchoscopy in our population, explore diagnostic yield for each indication and highlight potential complications. Similar reports come from other centres with variable numbers of procedures per annum and diverse populations[7, 12]. It is exactly this diversity in local practice and expertise as well as the difference in mix of patients and ages that makes comparisons between different centres problematic[13].

In our series 75% of bronchoscopies had a meaningful outcome. This is identical to the figure published recently by an Argentinean group[14] and very close to what Wood et al reported 25 years ago[15]. Raine et al concluded that bronchoscopic findings were related to the indication for bronchoscopy in 86% of cases[16], whereas Godfrey et al reported an overall abnormality on inspection in 67% of investigations in their series[13]. Pérez-Ruiz et al found underlying disease in 69% of the children that underwent bronchoscopy over a ten years period[17]. Kabra et at in a recent audit form India reported a lower diagnostic yield of 54%[12].

We looked into diagnostic yield for individual indications and found a range of 41-91% of abnormal findings. Stridor was the most rewarding indication. Laryngomalacia was the most common finding in this group similarly to what has been reported by a Spanish group recently[18]. The high diagnostic yield in this particular group resembles what Godfrey et al reported[13] and is higher to what Barbato et al published in a multi - centre European survey[7], probably due to differences in selection of patients. Foreign bodies were identified in 20 out of 30 patients that were bronchoscoped for this particular suspicion. Although there are papers that report successful extraction with the use of the flexible bronchoscope[19, 20], we strongly believe that FFB should not be used for foreign body removal. It is important to stress that 10 out of 30 children did not have a foreign body and FFB obviated the need for rigid bronchoscopy. We therefore propose that in cases where a diagnosis of foreign body inhalation is not certain, FFB should be the diagnostic modality of choise[21, 22].

Bronchoscopy was also performed in 18 children with wheezing unresponsive to antiasthmatic medication with a diagnostic yield of 77%. This is slightly lower to what Aslan et al reported[23], but still supports the notion that therapy-resistant wheezing should be evaluated bronchoscopically.

Bronchoscopy was performed in 30 children with cystic fibrosis (CF). In our unit children with CF are bronchoscoped in order to identify previously unrecognised respiratory pathogens. Abnormal findings included inflamed mucosa, abundant secretions and positive BAL cultures. The diagnostic yield was 80% justifying the indication for bronchoscopy and making us consider routine bronchoscopy for all children with CF[24]. Radiological abmornalities (e.g. persistent atelectasis or consolidation) had also a high diagnostic yield of 77%. Stenosis of a bronchus and abundant secretions with mucous plugging were common findings. Additionally, bronchoscopy gave us the opportunity for therapeutic suctioning and installation of recombinant DNAase that led to significant clinical improvement in most of the cases. Persistent infection was the reason for bronchoscopy in 49 patients with a diagnostic yield of 73%. Chronic cough was the indication with the lowest diagnostic yield. This is similar to findings of other investigators[7], but we strongly believe that a normal bronchoscopy can be very reassuring for the patient that coughs for a long time and especially for the parents.

The most common findings were increased secretions and inflamed mucosa. This can be attributed to the selection of our patients, which are patients with cystic fibrosis, chronic pulmonary diseases, chronic cough and persistent infection. Analysis of BAL for microbiologic diagnosis and cellular analysis can offer great help in patients with endobronchial inflammation[11].

It is also worth noting that out of the 31 FB identified, only in 20 of them the indication for bronchoscopy in the referral letter was “suspected FB” aspiration. In

the remaining 11 persistent infection and/or radiologic abnormalities such as atelectasis led to the decision to evaluate the children bronchoscopically. This finding highlights the need for a high index of suspicion for inhalation of FB, since this entity can mimic various pathologies[25]. Other important findings were the identification of congentital anomalies such as laryngomalacia and tracheomalacia and the finding of anatomic stenoses.

The analysis of complications shows that FFB is a safe procedure. Fever was the most common side effect, mainly in children that underwent BAL[10, 26]. The rest of the complications were in small numbers and easily reversible. Our findings are in accordance to what has previously been reported[7, 27]. However, since fatalities have been reported in the literature[28, 29], continuous vigilance and adherence to international standards are highly recommended[1, 30].

Conclusions

Bronchoscopy is a safe procedure and in our diverse population the overall diagnostic yield was 75%. The indication with the highest diagnostic yield was stridor and the indication with the lowest diagnostic yield was chronic cough.

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