Pediatric Flexible Bronchoscopy Under Conscious Sedation in an Endoscopy Suite – Is It Feasible, Safe and Yielding?: An Observational Study

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ABSTRACT

Introduction: The first description of bronchoscopy in pediatric practice was in 1978. Current study aimed to record the safety and diagnostic yield of performing fibre optic bronchoscopy (FB) in children under sedation and the rate of occurrence of serious adverse events.

Material and Methods: Bronchoscopy case records of 16 patients who underwent FB were accessed. 14 of them as intensivist supervised in a suite and 2 in the PICU. Baseline clinical characteristics including duration of symptoms, presence of fever, hypoxia, leukocytosis were recorded. Procedural complications and serious adverse events were noted. Microbial yield was compared with clinical and lab parameters.

Results: Most of the Pediatric bronchoscopy patients present with acute indications. Cough is a universal symptoms followed by fever (50%). Commonest radiological zone of involvement is right middle followed by right upper. Microbial yield from the broncho-alveoloar lavage was close to 60%. Serious adverse event happened in only one patient.

Conclusion: Pediatric bronchoscopy is a safe, high yielding procedure, which can be performed under conscious sedation under an intensivist's supervision.

Keywords: Pediatric, Flexible Bronchoscopy, Bronchoalveolar Lavage, Children, Outpatient, Short Sedation

INTRODUCTION

Pediatric flexible bronchoscopy (FB) has gained popularity both as a diagnostic and therapeutic procedure in children. Although at a nascent stage, bronchoscopies in children under short sedation are performed outside the milieu and safety of an intensive care unit.[1] Several gaps in our knowledge remain, especially with regard to the optimum sedation, diagnostic capabilities and complications. We share our experience of pediatric bronchoscopies in 16 patients with varied indications. The indications, diagnostic yield, therapeutic outcomes and safety profile are described.

METHODOLOGY

Our center, Rajagiri Hospital is one of the largest tertiary care hospitals in the state of Kerala with a 10-bedded PICU. We retrospectively analyzed from Electronic Medical records (EMR) of outpatients and manual data entry of all in-patients who underwent Pediatric flexible bronchoscopies from March 2017 to May 2018. The study was done with approval of institute ethics committee.

Patients were categorized into four based on their initial presentation. Clinical symptoms with and without radiological abnormalities, acute and persistent symptoms. "Persistent" was defined as symptom duration of minimum 2 weeks; symptoms were classified as "acute" if duration was less than 2 weeks. Radiological abnormalities included abnormal chest x-ray or computed tomography (CT) of chest wherever obtained. Radiological signs were classified depending on the radiological zone of involvement into upper, middle and lower zones on both sides. Clinical signs included hypoxia (saturation < 94% in room air and signs of respiratory distress in the form chest retractions. 14 elective bronchoscopies were done as an intensivist supervised deep sedation procedure in endoscopy suite. Intravenous Phenergan (1mg/kg) and Pethidine 1 mg/kg were given as pre-medications 15 minutes before the procedure. Midazolam 0.1mg/kg, and injection Ketamine 1mg/kg aliquot were given for all patients just before the procedure. Second dose of Ketamine 1 mg/kg was given for patients who were agitated and un-cooperative after 1st dose. Trans-nasal approach was used in all patients. Oxygen at 2 litres was administered by nasal prongs through the free nostril. Xylocaine 2% was used for local instillation. 2 bronchoscopies were done in intubated children in PICU. Pediatric bronchoscope "Olympus BF" was used with an external diameter of 3.6 mm. Broncho-alveoloar (BAL) lavage 5 ml for less than 10 kg and 10 ml for more than 10 kg was obtained and was sent for microscopy, cytology, culture and sensitivity, Acid- Fast-Bacilli (AFB), Genexpert and fungal culture for all patients with persistent symptoms. BAL was obtained from relevant anatomical lobes or from right middle lobe in cases with no radiological changes. Procedure was considered "successful" if completed with no hypoxia after obtaining BAL samples, "partially successful" if abandoned without obtaining samples due to desaturation and "unsuccessful" if both visualization and sampling could

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Patient characteristics	N= 16
Males (Females)	9(7)
Age(Mean)	5.7 years
Duration Acute Chronic	 8.4 days 54 days
Radiological Zone Right middle zone Right Upper zone	 8 5
Clinical Symptoms Cough Fever Hypoxia	 16 08 04
Investigations Leucocytosis BAL isolation Bacterial Fungal Tuberculosis	 04 07 04 01 01

Table-1:

not be done. Significant adverse event (SAE) was defined as either desaturation less than 90% or bradycardia less than 60/minute or both requiring bag and mask ventilation or intubation. Minor adverse event was defined as any desaturation, which required abandoning of procedure but no bag and mask ventilation.

STATISTICAL ANALYSIS

Microsoft Office Excel spread 2007 was used for tabulation and calculating the percentages. Descriptive statistics like mean and percentages were used for the analysis.

RESULTS

There were a total of 16 patients. The mean age of patients was 5.7 years, nine male and seven females. Most patients (66%) had symptoms less than 2 weeks, two of them were intubated and needed PICU care. Mean duration of symptoms of the remaining 8 patients in the "acute" category was 8.4 days. 5 patients with persistent symptoms had a median duration of symptoms 54 days. All patients had cough and the most common second reason for approaching the health facility was fever (50%). Leucocytosis was present in 25% of patients. The most common affected radiological area was right middle zone (8/15) followed by right upper. The important characteristics are summarized in table 1.

The same person did bronchoscopies. Procedure was completed successfully in 14 patients. Out of remaining 2, one had SAE and one required abandoning the procedure with out obtaining BAL. The child with SAE had significant post procedure laryngospasm and had to be monitored in PICU for 6 hrs. Most of the patients developed stridor in the immediate post procedure period, which was managed with adrenaline nebulization, and needed no HDU/PICU care.

Out of the 4 patients with leukocytosis one had hypoxia also at presentation and BAL was positive for both bacteria and fungus. One patient with aspergillus isolation had elevated IgE. Pseudomonas was the bacterial isolate in ¾ patients. Of the 2 intubated patients one had a bronchial blood clot of left main bronchus with complete lung collapse secondary to a road traffic accident and second a case of partial hanging was hypoxemic with right upper lobe collapse due to probable aspiration.

DISCUSSION

In the forthcoming years, the utilization rate of bronchosopy as a diagnostic and therapeutic tool will go up. In general, bronchoscopy aids in the visualization of the airway anatomy, the assessment of airway dynamics and treatment of obstructions (foreign body or mucus plugs), obtaining bronchoalveolar lavage, and brushing / biopsy for microbiology and histopathology.

Chronic cough lasting for more than 4 weeks is one of the important reasons for evaluating airways in children.[2] In our case series patients had cough as a universal symptom. We evaluated base line clinical characteristics like hypoxemia, fever at admission and leukocytosis.

The most common indication for performing Pediatric flexible bronchoscopy is persistent pneumonia or collapse.[3,4] Studies report close to 80% diagnostic and about 60% therapeutic yield in pediatric fibre-optic bronchoscopy.[5] A substantial number of them also include evaluation of a suspected foreign body and structural malformation.[6] In our experience the combined diagnostic and therapeutic yield was more than 90%. We were able to aerate a collapsed lung segment, which improved the clinical condition in 3 of our patients including an intubated patient with blood clot of left main bronchus. Most common infectious etiology identified from BAL was bacterial as in most other studies.[7] Effriti et al in their study had reported microbial isolation rates close to 20%.[8] The bacterial isolation rates from BAL in our study was significantly higher at 25% and in 3 of those cases a change in antibiotics led to improvement of patient condition. As reported previously form Indian population the commonest bacterial isolate was pseudomonas.[4] Only one of the isolate was positive for Acid-fast bacilli, which shows a paradigm shift of etiological agents in even developing countries.

Procedural desaturation rates have varied widely in different series, ranging from 1% to 21%.[9] Hypoxia is the greatest risk with FB. Various mechanisms may lead to hypoxia. It may be a consequence of laryngospasm, bronchospam or excessive coughing. The two most likely mechanisms are the partial or total obstruction of the airway by the bronchoscope and depression of the respiratory drive due to sedation. One of the largest series of pediatric FB performed under conscious sedation published in 2002 revealed a complication rate of 6.9% with a major complication rate of < 2%.[9] We also report significant desaturation in one of our patient requiring bag and mask ventilation. Minor fall in oxygen saturation happened frequently which improved on withdrawing the bronchoscope. Most cases of prolonged hypoxia occur due to laryngospasm. Studies also show that younger patients and patients with anatomical malformations of lung are more susceptible to desaturation.[9]

CONCLUSION

In our experience FB is a high yielding diagnostic and therapeutic procedure in children. It has to be considered considered in patients with no clinical improvement after suitable broad-spectrum antibiotics. The microbial isolation rates from a successful bronchoscopy can favorably help in choosing the right antibiotics. Some caution has to be exercised while performing the procedure in children with pre-existing oxygen dependency especially in younger age group.

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