

Original Research Article

# Outcome of pediatric non resolving pneumonias with the aid of pediatric flexible bronchoscopy

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## Abstract

**Background:** Studies are required to establish the utility and safety of use of the procedure of the flexible bronchoscopy under various circumstances and the various settings.

**Aim:** To study outcome of pediatric non resolving pneumonias with the aid of pediatric flexible bronchoscopy

**Material and Methods:** Present study was hospital based prospective study. We selected 100 cases in 1 year to 8 years age group, with radiological features persisting after 3 weeks of optimal antibiotics, their sputum for AFB, and gastric lavage for AFB was negative, sputum culture was sterile. We did pediatric flexible bronchoscopy (Olympus BF3C30, outer diameter of 3.2 mm), under short general anesthesia. All the procedures were uneventful, no reported morbidity or mortality after the procedure, Followed after the procedure till radiological shadows disappear.

**Results:** The most common finding of the flexible bronchoscopy was normal airway anatomy – with thick mucopurulent secretions was found in 55% of the cases. In the normal airway anatomy – with thick mucopurulent secretions, 20 showed TB gene positive. In the normal airway anatomy with thick mucus plug obstructing total lumen of affected air way was sterile in all 18 cases. Foreign body impacted in bronchus in 12 cases. Mediastinal lymph node compressing main stem bronchus was identified in 6 cases.

**Conclusion:** Paediatric flexible bronchoscopy is very useful investigation in non-resolving pneumonias.

## Key words

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Outcome, Pneumonia, Flexible bronchoscope, Radiological shadows.

## Introduction

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1978 was a revolutionary year for children as the flexible fiber optic bronchoscope was introduced for the first time. It was a revolution which changed the respiratory diseases management. While rigid bronchoscope was in use since 1897 and it was primarily used for removal of the foreign body from the bronchus and it was commonly used only for adults. Flexible bronchoscope has been in use since 1978 not only for diagnostic purpose but also for therapeutic purposes [1].

Bronchoscopy is used for multiple purposes. We can directly visualize the airway, we can see any pathology present in the airway, not only this, it is also used to treat obstructions present in the airway, it can also be used to collect samples for diagnostic tests like bronchoalveolar lavage, and we can also take biopsy. Medicines can be administered through it; it can also be used to guide in certain cases the occurrence of the intubation when it becomes difficult to intubate the patients [2].

There has been a very good progress in the field of pediatric pulmonology in last few decades. These advances have helped the specialists in this field to manage the pulmonary diseases in the children in a better way. Flexible bronchoscopy is one such development in this field. This can be used not only in children but also among the infants who are preterm. Bronchial tree can be directly seen with flexible bronchoscopy. Any obstructions in the airway can be seen and managed [3].

Samples can also be collected using flexible bronchoscope. Bronchoalveolar lavage can be performed and the sample can be sent for culture and sensitivity. This is a very useful tool in the conditions like chronic interstitial lung diseases. Foreign bodies can also be removed using the flexible bronchoscope. It can be used to perform

cryotherapy to treat foreign body granuloma in the airways. Other pathology like pulmonary alveolar proteinosis can be treated by using the therapeutic Bronchoalveolar lavage [4].

With all the benefits of the flexible bronchoscopy listed in the above it also carries certain risks that are inherent with any medical procedures. Thus flexible bronchoscopy is not free from risks. Flexible bronchoscopy has to be performed under general anesthesia and hence risk related to general anesthesia cannot be overlooked upon though it is becoming safer day by day. There can be desaturation associated with the procedure of the flexible bronchoscopy. There can be airway trauma sometimes associated with the procedure of the flexible bronchoscopy. There can be laryngeal spasm associated with the procedure of the flexible bronchoscopy [5].

Hence studies are required to establish the utility and safety of use of the procedure of the flexible bronchoscopy under various circumstances and the various settings. With this background present study was planned to study outcome of pediatric non resolving pneumonias with the aid of pediatric flexible bronchoscopy.

## Materials and methods

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**Study design:** Present study was hospital based prospective study.

**Study place:** Present study was carried out at Department of Pulmonary Medicine, Malla Reddy Medical College for Women, Quthbullapur, Medchal, Telangana, India.

**Study duration:** Present study was carried out over a period of one year from November 2017 to October 2018.

**Sample size:** During the study period of one year, it was possible to include 100 children of age 1-8 years as per the inclusion and exclusion criteria laid down for the present study.

### **Inclusion criteria**

- Children aged 1-8 years of age.
- Children with radiological features persisting after three weeks of optimal antibiotics.
- Parents of these children willing to include their children in the present study.
- Children with these features for the present study without any other serious ailment and not bed ridden.

### **Exclusion criteria**

- Children less than one year and more than eight year of age.
- Children without radiological features and less than three weeks of optimal antibiotics.
- Parents of eligible children not willing to include their children in the present study.
- Children with these features for the present study with any other serious ailment and bed ridden children.

### **Ethical considerations**

The study proposal was submitted to the scientific research committee for primary approval. After approval from the scientific research committee of the Institute, the study proposal was submitted to the Institutional Ethics Committee for approval. After due presentation of the study proposal, the study protocol was approved. During the actual study, after the children eligible for the study were identified, their parents were contacted for due informed consent and it was obtained.

### **Methodology**

Non resolving pneumonia is pneumonia persisting radiological features after 3 weeks of optimal therapy. We selected 100 cases in 1 year to 8 years age group, with radiological features persisting after 3 weeks of optimal antibiotics, their sputum for AFB, and gastric lavage for AFB was negative, sputum culture was sterile. We did pediatric flexible bronchoscopy

(Olympus BF3C30, outer diameter of 3.2 mm), under short general anesthesia. All the procedures were uneventful, no reported morbidity or mortality after the procedure, Followed after the procedure till radiological shadows disappear.

**Statistical analysis:** The data was analyzed using proportions.

### **Results**

Normal airway anatomy – with thick mucopurulent secretions was found in 55% of the cases. Normal airway anatomy with thick mucus plug obstructing total lumen of affected air way was seen in 18% of the cases. Foreign body impacted in bronchus was noted in 12% of the cases. Mediastinal lymph node compressing main stem bronchus was observed in 6% of the cases. Congenital anomalies of air ways was studied in 9% of the cases (**Table – 1**).

Normal airway anatomy – with thick mucopurulent secretions, were observed in 55 cases, through local lavage done with NS, bronchio-alveolar lavage sample (BAL Sample) collected, sample sent for TB gene X pert analysis and pyogenic cultures. Out of 55, 20 showed TB gene positive; with moderate load, no rifampicin resistance, treated with ATT, responded well, good radiological resolution in 1 month of therapy. 5 cases - pseudomonas was grown in BAL cultures, antibiotics changed according to sensitivity, they improved. 10 cases –streptococcus pneumonia grown in BAL cultures, responded well to culture sensitive antibiotics. 5 cases – Methicillin resistant staphylococcus grown in BAL cultures, responded well with 4 weeks of culture sensitive antibiotics. 5 cases – Klebsiella pneumonia grown in cultures, responded well with 3 weeks of antibiotics. 2 cases BAL culture showed aspergillus species growth, treated as invasive aspergillosis with IV amphotercin B, responded well. 8 cases BAL culture was sterile, they responded slowly with broad spectrum antibiotics over 2 weeks period (**Table – 2**).

**Table - 1:** Distribution of cases as per flexible thoracoscopic findings in children.

<b>Flexible thoracoscopic findings in children</b>	<b>Number</b>	<b>%</b>
Normal airway anatomy – with thick mucopurulent secretions	55	55
Normal airway anatomy with thick mucus plug obstructing total lumen of affected air way	18	18
foreign body impacted in bronchus	12	12
mediastinal lymph node compressing main stem bronchus	06	06
congenital anomalies of air ways	09	09
Total	100	100

**Table - 2:** Distribution of findings with Normal airway anatomy – with thick mucopurulent secretions (N = 55).

<b>Normal airway anatomy – with thick mucopurulent secretions</b>	<b>Number</b>	<b>%</b>
Tuberculosis gene positive	20	36.4
Pseudomonas positive	05	9.1
Streptococcus pneumonia positive	10	18.2
Methicillin resistant staphylococcus	05	9.1
Klebsiella pneumonia	05	9.1
Aspergillus species growth	02	3.6
BAL culture was sterile	08	14.5
Total	55	100

**Table - 3:** Distribution of findings with Normal airway anatomy with thick mucus plug obstructing total lumen of affected air way (N = 18).

<b>Normal airway anatomy with thick mucus plug obstructing total lumen of affected air way</b>	<b>Number</b>	<b>%</b>
BAL analysis positive	0	0
BAL analysis sterile	18	100
Total	18	100

**Table - 4:** Distribution of findings with findings of foreign body impacted in bronchus (N = 12).

<b>Type of foreign body impacted</b>	<b>Number</b>	<b>%</b>
Peanuts	2	16.6
Cashew nuts	3	25
Almond	2	16.7
Corn	2	16.7
Plastic caps of a pen	3	25
Total	12	100

**Table - 5:** Distribution of findings with Mediastinal lymph node compressing main stem bronchus (N = 6).

<b>Findings with Mediastinal lymph node compressing main stem bronchus</b>	<b>Number</b>	<b>%</b>
EPI tuberculosis	06	100
Any other finding	0	0
Total	06	100

**Table - 6:** Distribution of findings with Congenital anomalies of air ways (N = 9).

Findings with Congenital anomalies of air ways	Number	%
Right upper lobe bronchus	04	44.4
Sub glottic narrowing	02	22.2
Stricture in trachea	03	33.4
Total	09	100

Normal airway anatomy with thick mucus plug obstructing total lumen of affected air way was observed in 18 cases, mucous plug was removed with local N-Acetyl Cystin installation into bronchus, and BAL analysis was sterile. They improved well in 48 hours of procedure with good radiological clearance (**Table – 3**).

Foreign body impacted in bronchus in 12 cases—peanuts, cashew nuts. Almond, corn, plastic caps of a pen, was observed in various cases. All were radio lucent objects were identified, which could not be picked up in routine chest x rays. Procedure converted into rigid bronchoscopy and all the foreign bodies were removed. They improved in next 24 hours with good radiological clearance (**Table – 4**).

Mediastinal lymph node compressing main stem bronchus was identified in 6 cases, called EPI tuberculosis, responded well to ATT AND tapering doses of steroids (**Table – 5**).

4 cases were agenesis of right upper lobe bronchus. Radiologically showed right upper lobe collapse, which was benign condition, counseling given, X ray remains like that for life time 2 cases showed sub glottic narrowing which recovered with growth of baby in 1 year period. 3 cases showed strictures in trachea due to accidental inhalation of acid fumes, strictures were dilated with rigid bronchoscopy, responded well (**Table – 6**).

## Discussion

The most common finding of the flexible bronchoscopy was normal airway anatomy – with thick mucopurulent secretions was found in 55% of the cases. In the normal airway anatomy – with thick mucopurulent secretions, 20 were

showing TB gene positive. In the normal airway anatomy with thick mucus plug obstructing total lumen of affected air way was sterile in all 18 cases. Foreign body impacted in bronchus in 12 cases. Mediastinal lymph node compressing main stem bronchus was identified in 6 cases.

Bhat JI, et al. [6] in their study period of one year studied 52 cases of pneumonia which were not resolving. They found that the bronchoscopy was effective and safe and diagnostic accuracy was 30.7%. Various organisms were detected in 52.3% of the cases and five patients were detected with neglected kind of foreign bodies by bronchoscopy. They concluded that early bronchoscopy is to be done and important in cases of pneumonia which were not resolving.

Chen T, et al. [7] studied 57 pediatric cases that were having “congenital cardiovascular abnormalities” with pulmonary disease and all of them underwent flexible bronchoscopy. Median age of the children was 4 months. Mechanical ventilation and intubation was required in nine patients. Most common abnormalities of the airway detected by flexible bronchoscopy were airway narrowing, tracheobronchomalacia, and External compression of airways. Proper clinical management was possible in 26.3% of the cases. Only few cases reported mild and of shorter duration complications. The authors concluded that flexible bronchoscopy was safe and useful.

Hamouda S, et al. [8] carried out flexible bronchoscopy procedure in 365 cases where the mean age of the children was 46 months. 341 cases underwent diagnostic bronchoscopy and 24 cases underwent therapeutic bronchoscopy. The author found anatomical abnormalities in 8 cases. 71 cases showed obstruction in the bronchus and

it was due to the presence of the foreign body. 9 cases showed vascular anomaly. The authors noted that the diagnostic accuracy associated with flexible bronchoscopy was 74.8% and therapeutic efficacy was 100%. Thus they concluded that flexible bronchoscopy was effective for diagnostic and therapeutic purposes.

Terkawi S, et al. [9] in their study noted that the procedure of the flexible bronchoscopy was associated with desaturation, cough, bleeding in the mid airway as well as spasm. But these complications were very few and rare. Hence they concluded that flexible bronchoscopy a good tool to carry out the diagnostic as well as therapeutic procedures.

Pattishall EN, et al. [10] studied the utility of BAL using the flexible bronchoscopy among 14 pediatric cases that were found to be immunocompromised and also having pneumonia. BAL was found to be effective in 71% of the cases for diagnosis. 6 children showed presence of *Pneumocystis carinii*. 2 children were found to be affected by cytomegalovirus. Thus, authors recommended from the findings of their study that BAL using the flexible bronchoscopy can be used in pediatric cases that were found to be immunocompromised and also having pneumonia.

Schellhase DE, et al. [11] noted in their study of children with recurrent wheezing that 28 had positive diagnosis out of 30 children studied. 57% of the pediatric cases were with abnormalities of the airway. 11% have shown positive culture. They concluded that BAL using the flexible bronchoscopy is very effective.

Naguib ML, et al. [12] reviewed retrospectively 1947 flexible bronchoscopy procedures carried out among children for the year of 1988-2003. Mean age was 4.9 years. 46.6% of the cases were less than two years of age. Only 1.9% of the cases experienced the complications. 20.8% of the < 2 year children underwent flexible bronchoscopy due to the complaint of stridor. In these children, the common finding was laryngomalacia. 51.2% of the cases underwent

BAL. the authors concluded that flexible bronchoscopy was safe procedure.

## Conclusion

Paediatric flexible bronchoscopy is very useful investigation in non-resolving pneumonias.

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