

Fiberoptic Bronchoscopy in Unresolved Atelectasis in Infants

D VIJAYASEKARAN, NC GOWRISHANKAR, K NEDUNCHELIAN AND SARADHA SURESH

From the Department of Pediatrics and Pulmonology, Institute of Child Health, Egmore, Chennai, India.

Correspondence to:
Dr Vijayasekaran D,
No 4, Third Street,
Dr Subbarayan Nagar,
Kodambakkam, Chennai 600 024,
India. vijsekar@hotmail.com
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This retrospective analysis documents the usefulness of fiberoptic bronchoscopy in finding the etiology of 56 cases of unresolved atelectasis in infancy, over a two year period (June 2005 to May 2007). Fiberoptic bronchoscopy identified the etiology leading to a revised diagnosis and change in management strategy in 38 (67.8%) cases, which included congenital airway anomalies (46.4%), inflammatory changes (10.7%), mucus plugs (28.5%), hypoplasia (4%), endobronchial granulation tissue (3.5%) and foreign body (3.5%). Fiberoptic bronchoscopy plays an important role in diagnostic work up of infants with unresolved atelectasis.

Key words: *Fiberoptic bronchoscopy, Infants, Unresolved atelectasis.*

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Flexible bronchoscopy (FBS) is being increasingly used in pediatric and neonatal intensive care units for intraluminal evaluation of the lower airways and also for bronchoalveolar lavage (BAL)(1). Smaller sized bronchoscopes have made bronchoscopy feasible even in neonates. A normal bronchoscopic examination is of great value and the definitive exclusion of suspected problems (foreign body aspiration) is as important as a specific finding(2). The aim of our analysis was to document the role of fiberoptic bronchoscopy in the evaluation and management of unresolved atelectasis in infants.

METHODS

Fifty six infants who underwent fiberoptic bronchoscopy (FBS) for unresolved atelectasis in the Department of Pulmonology, Institute of Child Health, Chennai, from June 2005 to May 2007 were analyzed for clinical features, radiographic findings, FBS findings, complications and final diagnosis. Radiographic persistence of atelectasis for more than two weeks duration in spite of treatment was defined as “unresolved atelectasis” and included in the

analysis. Many authors have used different definitions like persistent atelectasis and acute severe atelectasis, as there are no accepted definitions(3). Two pediatric pulmonologists performed all the FBS procedures with mutual verification. 4% lignocaine jelly for the nostril and 2% lignocaine injection by “spray and proceed technique” were the topical anesthesia used(4). Supraglottic structures, glottis, subglottic region and tracheobronchial tree were methodically inspected. Examination is usually completed in the shortest possible time (<30 seconds)(5). All the procedures were recorded. Repeat procedure was done if there were abnormal findings. BAL was done with normal saline 5 mL/kg in infants with persistent atelectasis (documented by X-rays) for more than a month.

RESULTS

Of the 56 infants studied, 36 (64.2%) were less than six months of age, with the youngest one being twenty four days old. 61.5% were male infants with mean age of 5.2 months. Both right ($n=27$) and left ($n=29$) lungs were more or less equally involved. FBS was safely done in 4 sick infants with congenital

heart disease and 2 hemodynamically unstable infants. FBS demonstrated one or more positive findings in 38 (67.8%) children. These include congenital airway anomalies 26 (46.4%), mucus plugs occluding airway 16 (28.5%), mucosal inflammation 6 (10.7%), hypoplasia 4 (7.1%), foreign body 2 (3.5%) and endobronchial granulation tissue 2 (3.5%) (**Table I**).

Among 26 airway anomalies, tracheobronchomalacia 10 (17.8%) was predominant, with tracheomalacia 6 (10.7%), tracheobronchomalacia with severe laryngomalacia 4 (7.1%) and bronchomalacia 4 (7.1%) tracheomalacia with severe laryngomalacia 2(3.5%), accounting for the rest. All the children with severe laryngomalacia(6) had associated lower airway anomalies and none of mild laryngomalacia(18) was associated with lower airway anomalies.

BAL was done in 12 cases. Acid fast bacilli (AFB) were positive in one infant. FBS was therapeutically helpful in 4 cases wherein mucus plugs were removed by repeated suction and saline wash. Minor complications included fever, cough, and hypoxemia(2) in two children each and bleeding from posterior nostril during the procedure in one infant. FBS led to a revised diagnosis in 67.8% of the study population.

DISCUSSION

This study is unique in that only infants with unresolved atelectasis were studied and flexible bronchoscopy was done under topical

anesthesia(6,7). FBS was able to document positive findings in two thirds of the infants with unresolved atelectasis of which congenital airway anomalies constituted 46.4 %, emphasizing the role of FBS in the diagnostic workup of unresolved atelectasis. This is comparable with the study done by de Blic, *et al.*(8). Among the congenital airway anomalies, tracheobronchial anomalies (24.9%) were high followed by tracheal (14.2 %) and bronchial (7.1%) anomalies.

The therapeutic role of fiberoptic bronchoscopy in segmental atelectasis due to mucus plug occlusion in wheezing children has been documented(3). In our study, four of the 16 (28.5%) infants with mucus plug occlusion showed a resolution of the atelectasis after bronchoscopy. Intrabronchial administration of N-acetylcysteine along with repeated suctioning of secretion and bronchial washing to resolve the atelectasis has also been documented previously(9).

Foreign bodies in lower airway led to atelectasis in 3.5% of our study group, which has also been documented in other studies(10,11). Atelectasis due to endobronchial granulation was seen in 3.5% of infants. In tuberculosis endemic countries like India, endobronchial granulation tissue in pediatric age group is invariably due to tuberculosis and FBS has an important role in the diagnostic work up of tuberculosis by visual documentation in addition to bacteriology. The diagnosis of endobronchial TB revises the treatment protocol by addition of anti tuberculous therapy and steroid.

Hypoplasia was confirmed in 7.1% of the infants

TABLE I BRONCHOSCOPIC FINDINGS IN INFANTS WITH UNRESOLVED ATELECTASIS

Age	Total	Inflammatory changes	Mucus plugs	Congenital airway anomalies	Others	Etiologic diagnosis
0-3 mo	14 (25)	2 (3.5)	4 (7.1)	6 (10.7)	2 (3.5)	8 (14.2)
4-6 mo	22 (39.2)	2 (3.5)	8 (14.2)	12 (21.4)	2 (3.5)	14 (25.0)
7-9 mo	16 (28.5)	2 (3.5)	4 (7.1)	12 (21.4)	0	12 (21.4)
10-12 mo	4 (7.1)	0	0	0	4 (7.1)	4 (7.1)
Total	56 (100)	6 (10.7)	16*(28.5)	26 (46.4)	8 (14.2)	38 (67.8)

*Congenital airway anomalies include tracheomalacia = 6, tracheobronchomalacia=10, laryngotracheobronchomalacia=4 (7.1), bronchomalacia=4(7.1), and laryngotracheomalacia=2(3.5); Others include hypoplasia = 4, foreign body = 2, and endobronchial tuberculosis = 2; *Of 16 mucus plugs, 4 were removed.*

WHAT THIS STUDY ADDS?

- Fiberoptic bronchoscopy plays an important role in diagnostic work up of infants with unresolved atelectasis by detecting significant proportion of associated congenital airway anomalies.

with atelectasis, by documenting typical pruning of bronchial tree by FBS. Though combination of noninvasive techniques like contrast enhanced CT and MRI angiographies can diagnose hypoplasia, they will miss the associated airway anomalies which FBS will be able to identify. FBS was safely done in infants (7.1%) with congenital heart disease and hemodynamically unstable infants, which reinforces the utility of FBS in the investigatory workup infants in intensive care(12) with unresolved atelectasis.

Our findings suggest that infants, with unresolved atelectasis must be subjected for FBS as it not only diagnostic but also therapeutic by removing thick tenacious mucus plugs.

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