A Study of Applications of Rigid Bronchoscopy in Pediatric Patients

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Abstract The aim of the study was to analyse the various indications of rigid bronchoscopy in paediatric patient, the common clinical symptoms, radiological findings, and outcomes of the procedure. A retrospective study was conducted at ENT Department at M. P. Shah Govt Medical College, Jamnagar, and Gujarat, India from 2010 to 2012. Total 50 cases of pediatric age group less than 12 years of age on whom rigid bronchoscopy was performed were included in this study. The diagnosis was based on clinical history, thorough clinical examination and radiological assessment. The total duration of the study was 3 years which included 50 Pediatric cases, males (76 %) were more common as compared to females (24 %), the most common age group which underwent the bronchoscopy was 1–3 years of age. Most common indication for doing rigid bronchoscopy was foreign body aspiration in 84 % of cases ($n = 42$) followed by other indications like Sub-glottic stenosis (6 %), Mucous Plugs (4 %) and Broncho-alveolar lavage (4 %). Rigid bronchoscopy has been a saviour and an essential part of standard medical practices for both Therapeutic and Diagnostic purposes. Proper history taking is an cardinal requirement before the procedure, and it is always better to rely on clinical findings rather than radiological findings. It is sensible to perform a Check

Bronchoscopy in all cases to revisualise key areas and avoid missing any abnormality or foreign body.

Keywords Foreign body · Bronchoscopy · Pediatric · Rigid bronchoscopy

Introduction

Rigid bronchoscopy is a technique that visualizes the trachea and proximal part of bronchi, it has been extensively used in paediatric patients. The first bronchoscopy was performed by Gustav Killian in 1897 [1]. The procedure has evolved and changed through the decades yet the risk and uncertainties associated with working in the paediatric airway gives jitters to most of the surgeons. Obstruction of the airway by inhalation of foreign body, web lesion, mucous plug etc. is a life threatening condition and requires prompt measures for diagnosis and management, otherwise these conditions can prove fatal [2]. Paediatric cases are more difficult because of the anatomical differences from the adult larynx. The paediatric larynx is notably different from the adult larynx, apart from the smaller size, the larynx to tracheobronchial proportion is more as compared to adults, and epiglottis is more posterior and narrower. The infant larynx is positioned higher in neck i.e. the cricoid cartilage located at the 4th cervical vertebra as compared to 7th cervical vertebra in adults [3].

There are multiple applications of rigid bronchoscopy in paediatric patients which have been broadly divided into (1) Diagnostic i.e. airway obstruction (e.g. foreign body, stenosis), brushings for cytology/bronchoalveolar lavage, transbronchial biopsy for histology, Hemoptysis- site and cause and (2) Therapeutic [4] i.e. removal of foreign body, laser therapy, balloon dilatation and stent insertion in

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tracheal stenosis and suction of mucus plugs (e.g. in cystic fibrosis). The golden dictum says “The clinician should be prepared to undertake bronchoscopy on the basis of history alone” [5]. The aim of the study was to analyse the various indications of rigid bronchoscopy in paediatric patient, the common clinical symptoms, radiological findings, and outcomes of the procedure.

Materials and Methods

A retrospective study was conducted at ENT Department at M. P. Shah Govt Medical College, Jamnagar, Gujarat, India from 2010 to 2012. Total 50 cases of pediatric age group less than 12 years of age on whom rigid bronchoscopy was performed, were included in this study. All the cases had definite indications for bronchoscopy either on the basis of history of respiratory distress by foreign body aspiration or respiratory distress in spite of conservative treatment elsewhere and not responding to it. The diagnosis was based on clinical history, thorough clinical examination and radiological assessment. CT Scans were done only in those cases whenever there was sufficient time as per the stability of the patient's general condition. Symptoms included choking, sudden and severe spells of coughing, wheezing, breathlessness, decreased or unequal air entry. A well informed consent explaining the procedure, its indication, risk associated, and possible outcomes and complications was always taken from the patient's relatives before the procedure. Rigid bronchoscopy was performed in all cases under general anesthesia. Antibiotics were given preoperatively and post operatively, along with steroids and oxygen support in a few cases. All the children were kept in pediatric ICU post operatively. Chest X-ray was done in all the cases after 24 h. All patients were subsequently discharged after abatement of symptoms and improvement of respiratory functions. Regular follow up for 1 month was done for all cases.

Observations

Rigid bronchoscopy was performed in 50 cases in age group of 6 months to 12 years where the procedure was plausibly indicated. All the cases were done under general anesthesia. Majority of the cases belonged to lower socioeconomic class (88 %). The most common age group which underwent the bronchoscopy was 1–3 years of age (46 %, $n = 23$) although it is an insignificant statistics but males (76 %) were more commoner as compared to females (24 %), the probable explanation could be that male children are more unattended as compared to female children [6]. Most common indication for doing rigid bronchoscopy was foreign body aspiration in

84 % of cases ($n = 42$) followed by other indications like Subglottic stenosis (6 %), Mucous plugs (4 %) and Bronchoalveolar lavage (4 %). The patients with foreign body presented typically with sudden bouts of cough (100 %), breathlessness (80 %) and a definite history of foreign body aspiration (70 %). All the cases of acquired subglottic stenosis had history of prolonged intubation ($n = 3$) and presented with respiratory distress, stridor. Bronchoalveolar lavage was done in two cases for infectious agent identification. Tracheostomy was done in 12 cases (24 %) out of which one tracheostomy was done preoperatively, in seven cases tracheostomy were done peroperatively and four cases were tracheostomized post operatively. Radiological findings were significant in 46 % of the patients that included atelectasis, emphysema, pneumomediastinum etc. Organic foreign bodies (74 %, $n = 42$) were found more as compared to inorganic foreign bodies wherein peanut (45 %) and betel nut (17 %) being the commonest. Inorganic foreign bodies included pen clip, pen caps, beads, screws etc. were found in 26 % of cases. The site of foreign body impaction was most common in right main bronchus (48 %, $n = 42$) followed by left main bronchus (32 %) and trachea (20 %). The most common time of presentation in cases of foreign body ingestion was 1–7 days in 50 % ($n = 42$) of the cases only 14 % presented in first 24 h of aspiration. All the three cases of Subglottic stenosis were of acquired variety where serial dilatation with gum elastic bougie was done along with Mitomycin C application.

Discussion

Majority of the cases which are subjected to bronchoscopy in pediatric age group are of foreign body aspiration, followed by other indications like subglottic stenosis, unresolved lung infections. In our study males more commonly had history of foreign body aspiration as compared to females, wherein M:F ratio being 3:1 which is slightly higher than the previous study of Sinha et al. [6]. Age group 1–3 years was most common age group which is comparable to Massie et al. [7] as at this age children get acclimatized to solid food, there is uncoordinated swallowing reflexes and absent molar leading to improper chewing and in addition child has a habit of putting all objects in mouth to determine their taste and texture, along with the habit of crying, speaking and shouting while eating which makes them more prone to accidental aspiration. Majority of the cases belonged to lower socioeconomic strata families, which may be attributed to lack of health education and neglected children [6]. Tracheostomy was done in 12 cases (24 %, $n = 50$) of which one (2 %, $n = 50$) was done preoperatively where oxygen saturation fell below dangerous level, seven cases (14 %, $n = 50$)

were done peroperatively to remove large size foreign bodies which could not be extracted from the glottis space and four cases (8 %, $n = 50$) were tracheostomized post operatively because of the decreased saturation levels due to bronchial edema. Right main bronchus (48 %, $n = 42$) was found to be the most common site for the lodging of foreign body which is slightly more when compared to Ma et al. [8] (38.9 %) reason can be attributed to the anatomy of right main bronchus which is wider, shorter in length and more vertical when compared with the left main Bronchus [9]. Majority of cases of foreign body aspiration presented between day 1 and day 7 (50 %, $n = 42$) from the time of aspiration because most cases mimic as respiratory ailment initially and are referred to pediatrician for the same and subsequently referred to the ENT surgeon when the symptoms do not subside even after injectable antibiotics and steroids. Organic Foreign Bodies (74 %) were more commonly found as compared to inorganic foreign bodies (26 %). Peanut (45 %, $n = 42$) was the most commonest organic foreign body because it is most commonly grown nut in Saurashtra region of Gujarat, the findings are similar to Vikas Sinha et al. [10] (41 %) and Fazal-I-Wahid et al. [11] (45.25 %). Cough (100 % of cases) and wheeze (80 % of cases) were the most common clinical findings, in case of foreign body bronchus which is comparable to Fazal et al. [11]. CT scan was found to be highly sensitive and specific investigation and was performed whenever there was adequate amount of time and patient was stable. Only 14 % cases ($n = 50$) presented in first 24 h of aspiration in our study as compared to previous studies by Vikas Sinha et al. [10] (50 %) and Fazal-I-Wahid et al. [11] (92.67 %) this may be attributed to lack of awareness, failure to diagnose and prompt referral at primary health centre and community health centre level. In cases of Subglottic stenosis, post operative CT scan was performed to compare and assess the need of subsequent serial dilatations. In our study there was no mortality (0 %, $n = 50$) which is reasonable when compared to Hasdiraz et al. [12] (0.77 %).

Conclusion

“If I could put my eyes inside” is all an ENT surgeon wants when visualizing and treating closed spaces. Rigid bronchoscopy has been a saviour and an essential part of standard medical practices for both therapeutic and diagnostic purposes. It is a precarious procedure which should be carried out only after properly examining the patient and ruling out any other respiratory ailment which may simulate the symptoms. Proper history taking is a cardinal requirement before the procedure, and it is always better to rely on clinical

findings rather than radiological findings. Proficient Anesthetic management is an added advantage for the Surgeon, as the surgical domains is shared so a competent anesthetist will be able to buy more time for the surgeon in the operative field, with minimal trauma or hindrance to the airway. It is sensible to perform a Check Bronchoscopy in all cases to revisualise key areas and avoid missing any abnormality or foreign body. Post operative period is crucial and requires vigilant monitoring, with antibiotics, steroids and O₂ support. It is advisable not to hesitate in performing tracheostomy because it's a life saving procedure and can always be used in synchrony with rigid bronchoscopy. It is worthwhile to orient Pediatricians and General Practitioners about the need of early diagnosis and prompt referral of the needed cases. Health education regarding care of children should be emphasized in lower socioeconomic strata as foreign body aspiration is preventable by undertaking minimal precautionary steps. To conclude while doing Bronchoscopy a surgeon should “Be Brave Be Aware and BeWare.”

Conflict of interest None.

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