



ANAESTHETIC MANAGEMENT OF TRACHEOBRONCHIAL FOREIGN BODY ASPIRATION IN CHILDREN: AN ANALYSIS OF 55 CASES AT A TERTIARY CARE HOSPITAL - BANGALORE

Anesthesiology

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ABSTRACT

Aspiration of foreign body is a common problem in children around the world. Asphyxiation due to foreign body is a leading cause of death among children younger than 4 years of age.

AIM: To describe our experience with management of foreign body aspiration and review published literature.

Materials and methods: An observational retrospective study was conducted for a period of one year (2016-17), in Indira Gandhi institute of child health, Bangalore. 55 patients less than 12 years of age with foreign body aspiration were evaluated and the anaesthetic management reviewed.

Results: Out of the 55 patients assessed, 60% of the patients were below 3 years of age and 40% were above 3 years of age. Rigid bronchoscopy was done under general anaesthesia and 44 cases were positive for foreign body. The most frequently aspirated object was groundnut with cough being the most common symptom. In our study we found an almost equal incidence of foreign body in right (32.73%) and left bronchus (34.54%), contrary to several other studies followed by tracheal foreign body in 12.73%. Spontaneous ventilation was carried out in 4 patients with tracheal foreign body while controlled ventilation was carried out in the remaining cases. The most common complication was desaturation (36.36%), followed by intubation at the end of surgery for respiratory distress (14.55%) and laryngospasm (7.27%). Bronchospasm with reversal of shunt was seen in a case of Tetralogy of Fallot, with a tracheal foreign body and foreign body superimposed with asthma were some other challenges encountered.

Conclusion: The difference in tracheal bifurcation angles between adults and children below ten years of age explains the equal incidence of foreign body impaction in right and left bronchus in our study. Use of controlled ventilation with muscle relaxants provided adequate depth of anaesthesia with minimal complications and use of spontaneous ventilation is preferred in unstable patients with proximal foreign body.

KEYWORDS

Child, Foreign Bodies, General Anaesthesia, Retrospective Studies, Bronchoscopy

INTRODUCTION

Anaesthetic management for removal of airway foreign bodies involve many challenges as it is done as an emergency procedure in an unprepared, unassessed patient with sharing of the airway. The aim of this study was to describe our experience with management of foreign body (FB) aspiration and review published literature.

MATERIALS AND METHODS

In this observational retrospective study, 55 patients less than 12 years of age with FB aspiration were evaluated for a period of one year (2016-17). We observed the following parameters- age, gender, and definitive history of aspiration, signs and symptoms, findings of chest x-ray. Preoperative symptomatic treatment received by patient, details of anaesthesia and monitoring were recorded. Type of FB, location of FB, need for tracheostomy, complications and their management were also noted.

The study was approved by institutional review board and consent was obtained prior to the procedure. All patients were managed under general anaesthesia and ventilated through side arm of rigid bronchoscope.

After securing good iv access, all children were preoxygenated for 3 minutes, inj. atropine sulphate 0.02 mg/kg was administered iv to decrease secretions and to obtund autonomic reflexes during airway instrumentation. Children were induced with iv propofol 2 mg/kg or inhalational induction was done with sevoflurane. For cases with acute history iv succinyl choline 1.5 mg/kg was administered while iv atracurium 0.5mg/kg was given for cases with chronic history of FB impaction and topical lidocaine 3-4 mg/kg was sprayed before introducing the rigid bronchoscope. Intermittent positive pressure ventilation was continued through the side port of the bronchoscope. Anaesthesia was maintained with oxygen, air, isoflurane or with propofol infusion. Repeated doses of suxamethonium 0.25-0.5mg/kg with atropine 0.02mg/kg was given whenever needed. Succinyl choline 0.25-0.5 mg/kg was repeated whenever necessary with atropine sulphate 0.02 mg/kg. Spontaneous respiration with assisted ventilation was maintained in four cases of tracheal FB. Following removal of the foreign body, a check bronchoscopy was done to ensure full clearance of foreign body and impact site for trauma, bleeding and granulation. Inj. Dexamethasone (0.4-1 mg/kg) iv, humidified oxygen and bronchodilators were given in all the cases and nebulized racemic epinephrine whenever necessary. Patients were monitored continuously

by pulse oxymetry and ECG in the recovery room. Chest X-ray was repeated at 6 to 8 hours post bronchoscopy.

RESULTS

After analysing 55 case records we observed that 44 cases were positive for trachea-bronchial foreign body and 11 cases were negative for foreign body aspiration. 60 % of the patients were below 3 years of age while 40 % of the patients were above 3 years of age. (Table 1)

TABLE 1: Demographic details of children

Age	Gender	
	No of cases	Percentage
0-6 months	1	1.82
6-12 months	7	12.73
1-3 years	25	45.45
3-5 years	10	18.18
5-12 years	12	21.82
Total	55	100

Organic foreign bodies were found in 32 patients (72.73%) and non-organic foreign bodies were found in 12 patients (27.27%). Groundnut was the most common foreign body retrieved. (Table 2) Contrary to most studies, we found an almost equal incidence of foreign body impaction in right and left bronchus. (Table 3) History of foreign body aspiration was obtained in only 14 cases. The most common symptom was cough and most common radiological finding was emphysema. (Table 4 and 5)

TABLE 2: Nature Of Foreign Body

Foreign bodies	No of cases
Groundnut	19
Arecanut	4
Pen cap	6
Coconut piece	3
Custard seed	3
Led bulb	2
Others(whistle, needle, ear stud, lemon seed, maize ,rice bolus, bead)	1 each
Total	44

TABLE 3: Location Of Foreign Body

Location	No of cases	Percentage
Trachea	7	12.73
Right bronchus	18	32.73
Left bronchus	19	34.54
No Foreign body	11	20

TABLE 4: Symptoms And Signs

	No of cases		No of cases
History of foreign body aspiration	14	Breathlessness/Tachypnea	19
Cough	41	Stridor	5
Fever	24	Cyanosis	3
Wheeze/crepts/Rhonchi	20	Drowsy	3
Up rolling of eyes	2	Decreased unilateral breath sounds	24
Nasal flaring with chest retractions	8	Choking	4
Convulsions	3	Breath holding	1

TABLE 5: X-ray Findings

X ray findings	No of cases	Percentage
Collapse	7	12.73
Obstructive emphysema	22	40
Consolidation	2	3.64
Normal	14	25.45
No chest X-ray	10	18.18
Total	55	100

Spontaneous ventilation was carried out in 4 patients with tracheal FB while controlled ventilation was carried out in the remaining cases. The most common complication was desaturation (36.36%), intubation at the end of surgery for respiratory distress (14.55%) and laryngospasm (7.27%). (Table 6)

TABLE 6: Perioperative Complications

Complications	Prior/during induction	During bronchoscopy	Post bronchoscopy
Laryngospasm	1		3(7.27%)
Desaturation (>10%)	9	7	4(36.36%)
Bronchospasm		1 (with reversal of shunt in case of uncorrected tetralogy of fallot)	1
Severe Respiratory distress	9		8
No of cases who had to be intubated	9(16.36%)		8(14.55%)
Redo bronchoscopies			6 (10.91%)

DISCUSSION

Paediatric airway foreign body is associated with morbidity and mortality, especially in children less than three years of age and is most commonly seen in this age group.^[1,2,3] Our study also confirms the findings of other studies as 60% of our patients were below 3 years of age. Lack of molar tooth, curiosity to explore, playing while eating and lack of parenteral supervision are some of the reasons cited for the incidence of foreign body aspiration in this age group.^[4,5] Peanuts were the most commonly retrieved foreign body in our study similar to the other studies.^[2,6] Contrary to most studies, we found an almost equal incidence of impaction of FB in right and left bronchus. This is maybe due to the fact that tracheal bifurcation angles are wider in children less than 10 years of age and right bronchial angles get narrower as age increases.^[7]

The degree of clinical deterioration following FB aspiration depends on the location, duration of obstruction and the type of foreign body. It may range from partial obstruction (coughing, wheezing, and stridor, respiratory distress) to complete obstruction (cyanosis, hypoxia, impending cardiorespiratory arrest). Time since aspiration is also important because airway edema, granulation tissue and infection

maybe superimposed with other clinical findings. In our study, cough and unilateral diminished breath sounds were the commonest sign. The commonest radiological feature was obstructive emphysema. History of foreign body was given only in 14 cases and chest X-ray was normal in 14 cases. This illustrates the fact that a high degree of suspicion and prompt action is needed even in cases with normal findings.

Removal of FB is more important than adhering to the fasting guidelines. Preoperatively the patient can be symptomatically treated with bronchodilator, nebulisation, oxygen and antibiotics. The challenges encountered during anaesthetic management are sharing of airway, airway hyper-reactivity, emergency procedure, poorly assessed patients. Periods of hypoventilation, desaturation, cardiac arrhythmias, displacement of foreign body, coughing and other perioperative respiratory complications are also encountered.

The goals of anaesthetic management are adequate oxygenation, ventilation, maintaining deeper planes of anaesthesia, immobility, blunting cardiorespiratory reflexes, avoiding pulmonary aspiration and proper return of consciousness/ airway reflexes at the end of procedure. Various successful methods have been reported for anesthetizing children for bronchoscopy^[8]. The choice may be dependent upon one or more factors, including the condition of the patient, location of the foreign body, and personal preference of the anaesthesiologist or surgeon. The several techniques described are inhalational induction or iv induction with maintenance of spontaneous efforts, induction and maintenance with IPPV with short acting muscle relaxants. For successful bronchoscopy a close association and team work is essential to ensure safety of the procedure. An inhalational induction is preferred to maintain spontaneous efforts but may push FB distally into smaller airways leading to complete airway obstruction. Use of inhalational agents as a sole agent permits instrumentation but it is difficult to maintain depth of anaesthesia for prolonged period. Desaturation may need conversion to assisted ventilation.

Use of iv inducing agent propofol followed by suxamethonium is a popular technique. Thiopentone sodium or ketamine can be used for induction of anaesthesia^[3,4].

There are three techniques by which ventilation can be maintained during bronchoscopy- apnoeic ventilation, use of ventilating bronchoscope and use of jet ventilation.^[9] In our study we ventilated all the patients through the side port of ventilating bronchoscope. In proximal FB, preserving spontaneous efforts is preferred while for stable patients with distal FB controlled ventilation can be used. Spontaneous ventilation was maintained in 4 patients with tracheal FBs while controlled ventilation technique was used in the remaining 51 cases in our study. A review of 94 cases of paediatric foreign body aspiration suggested that there was no increased incidence of adverse events related to either spontaneous or controlled ventilation, but that prospective studies are needed to ascertain the outcomes related to each mode of ventilatory support.^[10] On completion of the procedure, the anaesthetist can resume bag and mask ventilation or intubate the patient to provide pulmonary toilet. The child should be observed in the recovery room for respiratory distress and administration of steroids, nebulisation, and humidified oxygen must be continued. A repeat chest X-ray should be performed to rule out pneumothorax or emphysema.

CONCLUSION

In summary, we reviewed our anaesthetic experience with airway foreign bodies in children. Proper preoperative assessment and good communication between anaesthetists and endoscopists is necessary to achieve good results. The difference in tracheal bifurcation angles between adults and children below ten years of age explains the equal incidence of foreign body impaction in right and left bronchus. Use of controlled ventilation with muscle relaxants provided adequate depth of anaesthesia with minimal complications and use of spontaneous ventilation is preferred in unstable patients with proximal foreign body.

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