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Foreign body in the bronchus in children: 22 years experience in a tertiary care paediatric centre

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ABSTRACT

Background: Our objective was to assess types, presentation, duration of symptoms and usefulness of rigid bronchoscopy for diagnosis and treatment of bronchial foreign body (FB) in children. **Materials and Methods:** Records of children with documented FB aspiration treated in Department of Paediatric Surgery from January 1991 to December 2012 were analysed retrospectively. Diagnosis was made on the basis of history, clinical examination, radiological evaluation and bronchoscopy. **Results:** A total of 196 children underwent emergency rigid bronchoscopy for suspected bronchial FB and in 173 cases FB was found. Out of 173 cases, 118 (68.21%) were males and 55 (31.79%) were females. Mean age was 3.7 years (range: 2 months-12 years) while mean duration of symptoms was 28 h (range: from 3 h to 4 months). Most common FB bronchus found was peanut 141 (81.50%). FB was localised to right bronchus in 112 (64.74%) cases while in 44 (25.43%) cases left bronchus was involved. In 17 (9.83%) cases FB was seen at carina only. Cough was the most common presenting symptom in 131 (75.72%) cases. The most common finding in chest X-ray was consolidation-collapse lung or emphysematous lung in 83 (47.97%) cases followed by the flattening of the diaphragm in 17 (9.83%) cases. In 35 (20.23%) cases chest X-ray was found to be normal. Pre-operative endotracheal intubation was done in 13 (7.51%) cases while 20 (11.56%) cases required post-operative mechanical ventilation. **Conclusion:** High index of suspicion should be kept for bronchial FB in children who present with suggestive history of FB ingestion even with normal physical and radiological evaluation.

Key words: Children, foreign body bronchus, bronchoscopy

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INTRODUCTION

Foreign body (FB) inhalation is a common serious problem often seen in children from 6 months to 06 years of age which if not treated in time can be life-threatening.[1-4] Most commonly aspirated FB includes peanut, beetle nut, vegetable seed, marbles, metallic and plastic toy wheels. Appearance of sudden respiratory distress or coughing/choking is a symptom of FB aspiration in an otherwise healthy child. Majority of cases is purely accidental, but can be occasionally homicidal especially when the child is a girl. Not only the nature and site of FB, but also the duration of symptoms plays a role in final survival outcome. FB bronchus seems to be more fatal than FB oesophagus in children. Operating surgeon should always keep in mind the need of urgent tracheostomy or thoracotomy with bronchotomy if rigid bronchoscopy fails to retrieve the FB and child becomes clinically unstable.

Our objective was to assess types, presentation, duration of symptoms and usefulness of rigid bronchoscopy for diagnosis and treatment of bronchial FB in children.

MATERIALS AND METHODS

We retrospectively analysed our data from January 1991 to December 2012 of 173 patients who underwent rigid bronchoscopy in emergency for FB aspiration in Department of Paediatric Surgery. At the time of presentation all patients were evaluated with a thorough history, clinical examination, chest X-ray and arterial blood gas. Stronger index of suspicion was kept in cases of sudden onset of symptoms with inappropriate history of FB aspiration or ingestion. Endotracheal intubation was done in unstable cases before shifting to operation theatre. Urgent bronchoscopy was performed with rigid bronchoscope under general anaesthesia. Mechanical ventilator support was provided for unstable patients. Single dose of antibiotics were given in pre-operative and post-operative period in all cases. Stable patients were discharged within 24 h of procedure.

RESULTS

A total of 196 patients with suspected FB aspiration were admitted to Department of Paediatric Surgery, from January 1991 to December 2012 and underwent rigid bronchoscopy. Out of 196 patients, FB in different parts of airway was found in 173 cases i.e., in 23 cases it was negative bronchoscopy. Out of 173 positive bronchoscopy cases, an over whelming majority was male 118 (68.21%) while 55 (31.79%) were female with male to female ratio of 2.1:1. The maximum incidents occurred at the age of 1-3 years [Table 1] with a value of cases 103 (59.54%). The most common site of FB was right main bronchus in 112 (64.74%) patients followed by left main bronchus in 44 (25.43%) and in 17 (9.83%) cases at carina. Most common presenting symptom in FB bronchus in our study was cough [Table 2], found in 131 (75.72%) cases. Organic foreign bodies (155 cases) were found most commonly than inorganic foreign bodies (18 cases). Peanut was most common FB bronchus seen in our study group in 141 (81.5%) cases [Table 3]. Consolidation-collapse or emphysematous lung was found in 83 (47.97%) cases followed by the flattening of diaphgram in 17 (9.83%) cases [Table 4]. Most of the patients with symptoms of FB bronchus reached our institute within 6-12 h [Table 5]. Mechanical ventilation was required in 13 (7.51%) cases in the pre-operative period and 20 (11.56%) cases in the post-operative period [Table 5]. Redo bronchoscopy was done in 7 (4.05%) cases for retained FB. Mortality was seen in 04 (2.31%) cases, 03 died pre-operatively while 01 died in the post-operative period. Posterolateral thoracotomy with bronchotomy was required in 05 (2.89%) cases while tracheostomy was required in 02 (1.16%) cases.

Most common presenting symptom in 23 negative bronchoscopy cases for suspected FB bronchus was cough (15 cases) followed by cough and fever (6 cases), fever and stridor (2 cases). On clinical examination, patients had increased respiratory rate and effort but air entry was equal in both sides of the chest. Chest X-ray was normal in 15 cases presented with cough only, showed increased bronchovascular markings with few air bronchograms in cases presented with cough, fever and stridor. In all cases despite normal imaging, bronchoscopy was done due to history and symptoms of suspected FB aspiration. In patients with fever and stridor, epiglottis and glottis was oedematous and in all other cases bronchoscopy was normal.

Table 1: Age of children with foreign bodies in airway

Age in years	Number of patients	Percentage
<1	39	22.54
1-3	103	59.54
3-5	22	12.72
>5	09	05.20
Total	173	100

Table 2: Presenting symptoms of foreign bodies in children

Symptoms	Number of patients	Percentage
Cough	131	75.72
Dysponea	20	11.56
Wheezing	11	6.36
Cynosis	04	2.31
Choking	03	1.73
Stridor	02	1.16
Unresolved pulmonary infection	02	1.16
Total	173	100

Table 3: Types of foreign bodies in children

FB bronchus	Number of patients	Percentage
Peanut	141	81.50
Seed (fruit/vegetable)	14	8.1
Stone	11	6.36
Plastic	04	2.31
Metallic	03	1.73
Total	173	100

FB: Foreign body

Table 4: Radiological signs in foreign bodies in children

Radiological signs	Number of patients	Percentage
Consolidation-collapse or emphysematous	83	47.97
Flattening of diaphragm	17	9.83
Atelectasis	17	9.83
Pneumonia	21	12.14
Normal	35	20.23
Total	173	100

Table 5: Durations of symptoms in tracheo-bronchial foreign bodies in children

Symptoms duration	Number of patients	Percentage	Mechanical ventilation pre-operative	Mechanical ventilation post-operative
<6 h	31	17.92	6	9
6-12 h	106	61.27	1	3
12-24 h	23	13.3	2	3
1-7 days	9	5.20	3	4
>7 days	4	2.31	1	1
Total	173	100	13	20

DISCUSSION

FB aspiration can present with a wide variety of symptoms. Although it is sometimes asymptomatic, mostly there exists cough, dyspnoea, haemoptysis and even respiratory arrest. Clinical history and radiological examinations are enough for the diagnosis but in some cases, it is difficult to diagnose even by bronchoscopy.

A high index of suspicion must be maintained when the child presents to a medical facility with symptoms related either to the respiratory or gastrointestinal tract. Respiratory distress is the most common manifestation of an FB in the oesophagus in neonates and it can lead to misdiagnosis of a respiratory disorder.[5] Despite the improvement in anaesthetic and endoscopical techniques, aspirated foreign bodies are responsible for significant morbidity and mortality in children. As they can mimic other pathological conditions like croup, pneumonia and asthma, it is sometimes mismanaged leading to further complications. The first systematic or elaborate study of foreign bodies in airway was attempted by Gross in 1854.[6] He emphasized the importance of clinical history, especially the first paroxysm, notably cough and a severe suffocation which occurred with the aspiration of foreign object. However, subsequent wheezing, cough, choking, and sudden onset of asthma point towards a possible FB aspiration. Recurrent or non-resolving pneumonia also indicates the possibility of a FB aspiration. In children, aspiration of foreign bodies lodged high in the tracheal airway mimics viral croup. However, recurrence of symptoms like stridor and wheezing after one successful treatment with antibiotics and steroids should alert one of a possible FB.[7] As reported in other series our study group also has male predominance.[8-12] FB was more in right main bronchus as reported by other authors earlier.[13] This is explained by the anatomical features of the right main bronchus, i.e., it is wider in diameter, shorter in length and has more direct extension of the trachea than the left bronchus.[11]

In our study group peanut outnumbered other various FB, an observation made by others as well[9,10] indicating that parents should be educated to abstain from feeding nuts and seeds to young children who do not have premolars or molars and cannot grind smaller inhalable pieces effectively. Furthermore, they have an immature protective reflex, compared with adults, as children have narrower airways. Hence, morbidity and mortality are higher in children.[14] The propensity of finding a peanut in airways of children is probably due to its availability and affordability when compared with other nuts in north India especially in winter. Our study showed a positive radiological findings in only of 83 (48%) cases, as compared to 62% each in two recent studies.[15,16] Chaterjee *et al.* in 1972 first described the X-ray findings in FB aspiration in children.[16] They also emphasized that the sensitivity can be improved if chest radiographs are taken in full expiration and inspiration. Fluoroscopy can still improve upon this by showing air trapping or mediastinal shift and can increase the ratio of accurate and early diagnosis.[15-18] Obstructive emphysema was the most common radiological sign. This is in agreement with various studies.[8,15,16] We used the rigid bronchoscope in all cases due to its ability to control and ventilate the airway, while removing the offending FB. Rigid bronschoscopy is the best modality of treatment in cases of FB is a universally accepted statement.[19-21] There are units who have claimed 80-90% of success in extracting foreign bodies from children's bronchial trees using the flexible bronchoscopy technique.[22] One of the unquestionable advantages of flexible bronchoscopes is the possibility of reaching bronchi of smaller diameter, the segmental and subsegmental ones. Divisi *et al.* believe that the diagnostic effectiveness of flexible bronchoscopy reaches 100%, whereas the effectiveness of object extraction amounts to only 10%.[23] Our experience with flexible bronchoscopy is limited as we always performed rigid bronchoscopy whenever doubt about FB aspiration exists. In our study group, the overall success rate was 97.6%. All positive bronchoscopy yielded FB and in 166 (95.9%) cases FB was removed in a single attempt. Repeat bronchoscopy is needed only if the first bronchoscopy is unsuccessful or when granulomatous reaction is seen at the time of removal of the FB or when there is persistent pneumonia. In our study repeat bronchoscopy was required in only 7 (4.0%) cases. In children with FB aspiration duration of symptoms were not directly related to the ventilatory requirement. Out of four mortality, two of our cases who expired without undergoing bronchoscopy had symptoms of <6 h duration while one of them had symptoms for 12 h. Remaining one who expired 14 days after bronchoscopy had symptoms for 72 h. Although serious complications such as mediastinal emphysema, atelectasis, pneumothorax, tracheoesophageal fistula and bronchiectasis, have been reported after bronchoscopy,[24] in our series we do not find any such complications.

In our study, diagnostic bronchoscopy did not reveal any FB in 23/196 (11%) cases. It is absolute that the presence of negative bronchoscopy findings is mandatory with a certain percentage, not to ignore the positive cases.

CONCLUSION

Diagnosis of FB in children is extremely challenging especially in the absence of clear history and normal physical examination, and because of its presentation which can be mistaken as asthma or respiratory tract infection, leading to delayed diagnosis and treatment, and can result in intrabronchial granuloma formation. Therefore, early

rigid bronchoscopy is very effective procedure for FB removal with fewer complications. High index of suspicion should be kept for bronchial FB in children who present with suggestive history of FB inhalation even with normal physical and radiological evaluation.

REFERENCES

1. Webb WA. Management of foreign bodies of the upper gastrointestinal tract: Update. Gastrointest Endosc 1995;41:39-51.
2. Cheng W, Tam PK. Foreign-body ingestion in children: Experience with 1,265 cases. J Pediatr Surg 1999;34:1472-6.
3. Hachimi-Idrissi S, Corne L, Vandenplas Y. Management of ingested foreign bodies in childhood: Our experience and review of the literature. Eur J Emerg Med 1998;5:319-23.
4. Panieri E, Bass DH. The management of ingested foreign bodies in children – A review of 663 cases. Eur J Emerg Med 1995;2:83-7.
5. Moskowitz D, Gardiner LJ, Sasaki CT. Foreign-body aspiration. Potential misdiagnosis. Arch Otolaryngol 1982;108:806-7.
6. Gross SD. A Practical Treatise on Foreign Bodies in the Air Passages. Philadelphia: Blanchard and Lea; 1854.
7. Rothmann BF, Boeckman CR. Foreign bodies in the larynx and tracheobronchial tree in children. A review of 225 cases. Ann Otol Rhinol Laryngol 1980;89:434-6.
8. Cohen SR, Herbert WI, Lewis GB Jr, Geller KA. Foreign bodies in the airway. Five-year retrospective study with special reference to management. Ann Otol Rhinol Laryngol 1980;89:437-42.
9. Swanson KL, Prakash UB, Midthun DE, Edell ES, Utz JP, McDougall JC, *et al*. Flexible bronchoscopic management of airway foreign bodies in children. Chest 2002;121:1695-700.
10. Mourtaga SM, Kuhail SM, Tulaib MA. Foreign body inhalations managed by rigid bronchoscope among children, in Shifa Hospital Gaza, Palestine. Ann Alquds Med 2005;2:53-7.
11. Gurpinar A, Kilic N, Dogruyol H. Foreign body aspiration in children. Turk Respir J 2003;4:131-4.
12. Black RE, Choi KJ, Syme WC, Johnson DG, Matlak ME. Bronchoscopic removal of aspirated foreign bodies in children. Am J Surg 1984;148:778-81.
13. Sersar SI, Rizk WH, Bilal M, El Diasty MM, Eltantawy TA, Abdelhakam BB, *et al*. Inhaled foreign bodies: Presentation, management and value of history and plain chest radiography in delayed presentation. Otolaryngol Head Neck Surg 2006;134:92-9.
14. Mu LC, Sun DQ, He P. Radiological diagnosis of aspirated foreign bodies in children: Review of 343 cases. J Laryngol Otol 1990;104:778-82.
15. Zerella JT, Dimler M, McGill LC, Pippus KJ. Foreign body aspiration in children: Value of radiography and complications of bronchoscopy. J Pediatr Surg 1998;33:1651-4.
16. Chatterji S, Chatterji P. The management of foreign bodies in air passages. Anaesthesia 1972;27:390-5.
17. Strome M. Tracheobronchial foreign bodies: An updated approach. Ann Otol Rhinol Laryngol 1977;86:649-54.
18. Cataneo AJ, Cataneo DC, Ruiz RL Jr. Management of tracheobronchial foreign body in children. Pediatr Surg Int 2008;24:151-6.
19. Jiaqiang S, Jingwu S, Yanming H, Qiuping L, Yinfeng W, Xianguang L, *et al*. Rigid bronchoscopy for inhaled pen caps in children. J Pediatr Surg 2009;44:1708-11.
20. Tomaske M, Gerber AC, Weiss M. Anesthesia and periinterventional morbidity of rigid bronchoscopy for tracheobronchial foreign body diagnosis and removal. Paediatr Anaesth 2006;16:123-9.
21. Zur KB, Litman RS. Pediatric airway foreign body retrieval: Surgical and anesthetic perspectives. Paediatr Anaesth 2009;19 Suppl 1:109-17.
22. Tang LF, Xu YC, Wang YS, Wang CF, Zhu GH, Bao XE, *et al*. Airway foreign body removal by flexible bronchoscopy: Experience with 1027 children during 2000-2008. World J Pediatr 2009;5:191-5.
23. Divisi D, Di Tommaso S, Garramone M, Di Francescantonio W, Crisci RM, Costa AM, *et al*. Foreign bodies aspirated in children: Role of bronchoscopy. Thorac Cardiovasc Surg 2007;55:249-52.
24. Cohen SR. Unusual presentations and problems created by mismanagement of foreign bodies in the aerodigestive tract of the pediatric patient. Ann Otol Rhinol Laryngol 1981;90:316-22.

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