PAEDIATRIC FOREIGN BODY ASPIRATION IN RURAL INDIA

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ABSTRACT

BACKGROUND

Aims- To evaluate the patient's characteristics, presentation, clinical features, role of radiology, treatment options, the site, type and frequency distribution of aspirated foreign bodies, and the occurrence of complications in children with diagnosis of foreign body aspiration from rural Kolar.

MATERIALS AND METHODS

All patients aged 14 years and below with a clinical diagnosis of foreign body aspiration that underwent bronchoscopy from the rural area of Kolar constituted the study. Detailed history, presenting symptoms and signs, clinical findings and investigations like blood examination and radiology were recorded. Bronchoscopic findings and post-operative complications were also recorded. Patient's health status was followed up for two months following bronchoscopy.

RESULTS

The majority of the patients with foreign body aspiration were between 1 and 3 years of age. Cough was the commonest symptom (76.4%), while a decreased breath sound on the affected side was the commonest sign. Lung collapse was the most common radiological finding in children with foreign body aspiration. Of the 140 cases, 90 cases underwent emergency bronchoscopy. The foreign bodies were most frequently of vegetative origin such as peanuts. They were most commonly aspirated into right principal bronchus. Complications occurred in about 9% of the cases following bronchoscopy.

CONCLUSION

History suggestive of foreign body aspiration is a definite indication for bronchoscopy. Each case tends to present different challenges and success depends on timely diagnosis and the skill of the bronchoscopist in extracting the foreign body.

KEYWORDS

Aspiration, Paediatrics, Bronchoscopy, Foreign Body.

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BACKGROUND

Foreign body aspiration is a life-endangering emergency frequently encountered in children. Amongst children, aspirated foreign body will continue to constitute a serious hazard so long as they use their mouth to explore their surroundings and are yet to develop risk-free food ingestion habits.^[1]

Diagnosis of an airway foreign body in children is still a challenge. A positive history of aspiration and particular clinical manifestations such as cough, wheeze, respiratory distress and decreased air entry are features in favour of a tracheobronchial foreign body.^[2]

The first bronchoscopic removal of a foreign body from the lower air passage is attributed to Gustav Killian in 1897.^[3,4]

The basic principles in management of these patients were set out by Jackson and Jackson in the United States of America by Negus in Britain and by Killian in Germany. The introduction of ventilating bronchoscope and various forceps with advancements in anaesthesia have made bronchoscopy a safe and life-saving procedure.

MATERIALS AND METHODS

This analysis is based on our study of 140 patients who underwent bronchoscopy for suspected foreign body aspiration from the rural area of Kolar. All patients aged 14 years and below with a clinical diagnosis of foreign body aspiration were included in this study. Patients presenting with features of cerebral hypoxia secondary to foreign body aspiration were excluded from the study. A detailed history, presenting symptoms and signs, clinical examination, investigations like blood examination and radiology were recorded. Bronchoscopy finding, any complications and outcome were also recorded for each patient. The patients were followed up for a period of two months after bronchoscopy.

Bronchoscopy was carried out in three phases under general anaesthesia. The first phase comprises careful inspection of the airway in order to locate the aspirated foreign body. A Macintosh laryngoscope was used to expose the laryngeal inlet and facilitate introduction of the bronchoscope. Proper sized bronchoscope was held in the surgeon's right hand in a pen-like fashion. Fingers of the left hand were used to retract the upper lip and guide the distal

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end (tip) of the bronchoscope. It was then inserted through the laryngoscope under direct visual control until the tip lies at the level of the false cords. From this point onwards, passage of the instrument was achieved by looking through the bronchoscope itself. The bronchoscope was rotated through 90°, so that the handle points directly to the right. The tip was moved laterally until the right vocal cord could be identified and is then moved medially until the left cord appeared. The scope was advanced through the glottis and subglottis with a 'screwing' motion returning the 'handle' to its original straight-ahead position. The laryngoscope was then removed.

Having passed the bronchoscope through the subglottis, it was advanced to the carina and the anaesthetic gas supply connected to the side arm. The scope was gradually advanced into each main bronchus in turn and the various segmental bronchi are inspected. The second phase involved the removal of the foreign body. The use of a pair of appropriately designed grasping forceps was a necessity. The third phase of the bronchoscopy was a final check bronchoscopy, to rule out any residual fragments or any trauma to the tracheobronchial tree and also to remove any endobronchial secretions trapped distal to an impacted foreign body. The entire procedure was completed in 20 minutes or less in order to avoid subglottic and laryngeal oedema after bronchoscopy.

Statistical Methods

All the values were expressed in the terms of proportions.

RESULTS

A total of 140 patients who presented with a history suggestive of foreign body aspiration and subsequently underwent bronchoscopy were considered for this study. This study involved children below 14 years of age. The common age of presentation was 1 - 3 years of age (Figure 1). Foreign body aspiration was seen more often among male children. History of foreign body aspiration was obtained in 98 (70%) cases (Table 1). The commonest symptom of presentation was coughing (76.4%) followed by breathlessness (66.4%). Majority of the cases presented with decreased air entry on the affected side of the lung, that is 112 (80%) cases followed by tachypnoea in around 106 (75.7%) cases (Table 2). Intercostal and subcostal retractions were seen in 54 (38.6%) cases. Stridor was noticed in 19 (13.6%) cases. Atelectasis was the commonest radiological finding that made up 36 (33.7%) cases followed by emphysema in 25 cases (Figure 2). Normal x-ray was found in 25 cases. Two cases showed radio-opaque foreign body on the x-ray. Emergency bronchoscopy was done in 90 (64.2%) cases, while 48 (34.3%) cases underwent an elective procedure. Tracheostomy had to be done in one case prior to bronchoscopy. Among the aspirated foreign bodies, vegetative matter constituted the majority. Peanuts were the commonest vegetative matter constituting 58 (49.1%) cases. Plastic in the form of a blowing whistle were found in 8 cases, being commonest among the non-vegetative matter. No foreign body was found in 22 cases. Right bronchus was the commonest site of foreign body lodgement, of which 52.5% of the cases showed foreign body in the right main bronchus (Table 3). Tracheal lodgement of foreign body occurred in 12.7% of the cases, while 9.3% of the cases had

foreign bodies in both bronchi. Out of the 140 cases studied, 127 cases had no complications. However, one case developed bronchospasm post-bronchoscopy while three cases went in for cardiac arrest, but were successfully revived. Death occurred in 9 (6.4%) cases.

Symptoms	Number of Cases	Percentage (%)
History	98	70
Choking	27	19.3
Coughing	107	76.4
Breathlessness	93	66.4
Wheeze	10	7.1
Fever	64	45.7
Unresolved LRTI	7	5
Haemoptysis	1	0.7
Stridor	6	4.3

Table 1. Clinical Symptoms

Signs	Number of Cases	Percentage (%)
Tachypnoea	106	75.7
Intercostal and Subcostal Retraction (ISR)	54	38.6
Decreased air entry on the affected side	112	80
Rhonchi	37	26.4
Crepitations	51	36.4
Stridor	19	13.6

Table 2. Clinical Signs

Site of Foreign Body Lodgement	Number of Cases	Percentage (%)
Trachea	15	12.7
Right bronchus		
Main bronchus	62	52.5
Upper lobe bronchus	1	0.8
Middle lobe bronchus	1	0.8
Lower lobe bronchus	2	1.7
Left bronchus		
Main bronchus	22	18.6
Upper lobe bronchus	0	0
Lower lobe bronchus	3	2.5
Both bronchi	11	9.3

Table 3. Site of Foreign Body Lodgement

Figure 1. Age and Sex Distribution of Patients with Aspirated Foreign Body

Figure 2. Pre-Operative Chest X-Ray showing Obstructive Emphysema of the Left Lung with associated Mediastinal Shift

DISCUSSION

Aspirated foreign bodies are responsible for a significant amount of morbidity and mortality in children. The aspiration of a foreign object into the airway may result in acute respiratory distress, chronic pulmonary infection, atelectasis and even death. As they mimic other pathological conditions such as asthma and pneumonia, the diagnosis is sometimes missed. These foreign bodies are best managed by rigid bronchoscopy, which in experienced hands is the most effective modality of treatment.

Our study confirmed the earlier findings of Banarjee et al^[5] and Rothman et al^[6] that the highest incidences of foreign body aspiration were in children below three years. Since these children lack molar teeth, edibles placed in the mouth are usually broken up but not chewed which they easily aspirate, especially if the child is running, playing or talking.^[7] This age group may also be involved due to immature co-ordination in the swallowing mechanism.

There was a male predominance in our study, which was similar to results reported by other authors.^[8,1] This may be attributed to the "more adventurous nature of male children."

History taking plays a vital role in diagnosing foreign body aspiration, which goes in line with other authors' works.^[9,10] A definite history of witnessed foreign body aspiration mandates an emergency bronchoscopy. History of foreign body aspiration cannot be obtained from younger children, so the surgeon mainly relies on that given by parents or older siblings. The drawback in this being, parents may not notice the incident or siblings may not mention it out of fear for negligence on their part. In our series 70% gave a positive history of foreign body aspiration compared to 80% in a study by Sinha.^[11]

In our study, the most common symptoms were cough and breathlessness. This might be attributed to the superadded lower respiratory tract infection, these children developed subsequent to foreign body aspiration. Tachypnoea and decreased breath sounds on the affected side were the commonest signs the children presented with. These findings were comparable with the findings of other authors.^[5,10]

In our study, the classical triad - cough, wheeze and decreased breath sounds mentioned by most authors^[12,13] were seen only in a few cases. A history of choking while feeding was the most reliable symptom of foreign body aspiration; validated by Tokar et al^[14] in his study. These children were initially treated with antibiotics and steroids that masked their symptoms and delayed their diagnosis. Most of the cases with a delayed diagnosis presented to us with unresolved lower respiratory tract infection. The time of presentation since aspiration has a bearing on the overall morbidity and mortality when the patient is being considered for bronchoscopy. As duration increases, the risk must be borne in the mind of the surgeon and adequately explained to the parents.

Atelectasis was the most frequent radiological finding in our study, which concurred with study done by Kaur et al^[12] while Banarjee et al^[5] reported obstructed emphysema was the commonest radiological finding. Most foreign bodies were radiolucent, only 1.9% of cases showed foreign bodies in our study. Normal chest x-ray was seen in 23.6% of our cases, while McGuirt's^[13] reported 11% in his work. Therefore, a normal x-ray does not rule out foreign body aspiration in cases with strong history or recurrent respiratory tract infection unresponsive to treatment, thus mandating a bronchoscopy.

Emergency bronchoscopy was undertaken in most of the cases (64.2%), once foreign body aspiration was diagnosed clinically or radiologically. Ventilating rigid bronchoscope was employed in all our cases, since ventilation to the opposite lung could be maintained during an attempt to remove the foreign body along with a better grasp of the foreign body. Flexible bronchoscopy was less suitable for children because of the small diameter of the trachea and glottis and also insufficient control of the instruments on the foreign body.^[1] Flexible bronchoscopy is largely restricted to diagnosis rather than extraction. The use of optical forceps in our cases assured a superior visualisation with magnification and precise extraction of foreign body from the site of lodgement.

General anaesthesia by an efficient anaesthesiologist provided a better control of airway, lowered the metabolic demand, was less traumatic and repeat examination was possible in all our cases. After endoscopic removal of the foreign body, a check bronchoscopy of the tracheo-bronchial tree was done routinely.^[15] A check bronchoscopy with suction clearance of endobronchial secretions aids in re-expansion of collapsed lung parenchyma.^[16]

Peanuts were the commonest foreign bodies aspirated (49.1%), which correlated with other studies.^[17,12,7] On the contrary in the Arab world, watermelon seeds were the commonest aspirated foreign body as Elhassani points out in his study.^[18] This difference is due to the eating habits of people in different countries. Aspirated vegetative foreign bodies absorb moisture from tracheo-bronchial tree and swell up. They also set up an inflammatory reaction of the bronchial mucosa called vegetal bronchitis.^[19] Hence, these foreign bodies cause complete obstruction earlier than inorganic foreign bodies. Their removal also creates a challenge, first due to their size and secondly depending on the duration of lodgement, and the likelihood of the foreign body to fragment or disintegrate. Non-vegetative foreign

bodies were less common in our study, a finding also reported by Steen et al.^[1]

It was observed in our study that majority of foreign bodies were found in the right bronchus as in the series of Zerrella et al.^[20] and Hughes et al.^[3] The fact that the right bronchus was wider, shorter and more vertical than the left bronchus was contributory to aspiration being more common on the right side. However, in a study by Vane et al.^[21] it was noted that the left main bronchus was the commonest site for foreign body lodgement. The incidence of foreign body in both bronchi was 9.3%, so this showed the importance of undertaking a check bronchoscopy.

In our study, the incidence of bronchoscopic complications was 9.2% compared to 5% in a study by Black et al.^[22] Persistent pneumonia, the most common complication^[13] did not occur in our study, concurring with the work done by Oguzkaya et al.^[10] One patient developed bronchospasm in the post-operative period, who responded to bronchodilator treatment. Three cases suffered cardiac arrest during the procedure, but were successfully revived. Death occurred in nine of our cases which were attributed to delay in presentation, poor general condition and peculiarity of lodgement of certain foreign bodies (pen cap with closed end distal), which enhanced the degree of mortality. Age appropriate bronchoscope within a limited time and minimal manipulation decreased the chances of post-bronchoscopic subglottic and laryngeal oedema.

CONCLUSION

Tracheo-bronchial foreign body aspiration is a serious and potentially fatal condition, especially when occurring in a small child. Foreign body aspiration should be strongly suspected in children presenting with a history of choking episode or with persistent or recurrent pulmonary infections. Even in the absence of clinical or radiological evidence, bronchoscopic evaluation in these patients may prove valuable. Emergency bronchoscopy is warranted in case the patient is in acute respiratory distress, otherwise an elective procedure with adequate preparation along with an efficient anaesthesiologist should be considered.

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