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Bronchoscopic extraction of aspirated foreign bodies in children in Harare Central Hospital, Harare, Zimbabwe

AA AHMED

SUMMARY

Fifty eight children underwent rigid bronchoscopy under general anaesthesia for suspected aspirated foreign bodies. There were 36 boys and 22 girls with a mean age of 18 months. Physical examination showed decreased breath sounds and wheezing over the affected site in 47 cases. CXR's were diagnostic in 11 cases showing a definite radio opaque shadow suggestive of aspirated foreign body in 35 (60 pc). Three patients had negative results at bronchoscopy (5,4 pc).

Extraction of foreign bodies was performed by forceps under direct vision at bronchoscopy in 55 patients. Two children had an intra-operative hypoxic arrest. Post endoscopic complications included mild to moderate croup in 15 patients, fever in four and pneumothorax in one. Rigid bronchoscopy of aspirated foreign bodies in children is a safe, effective and often life saving procedure. Morbidity is low and although mortality was 1,8 pc in this series zero mortality should be achievable.

INTRODUCTION

Aspiration of foreign bodies results in the death of more than 500 children per year in the United States.¹ Foreign body aspiration may be manifested by acute respiratory distress as well as insidious chronic pulmonary problems leading to diagnostic delay in some patients.^{2,3} This study describes the experience with 58 cases of foreign body aspiration in infants and children managed at Harare Central Hospital, Cardio-thoracic Unit in Harare, Zimbabwe.

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MATERIALS AND METHODS

The records of all patients with a diagnosis of foreign body aspiration in children at Harare Central Hospital, Cardiothoracic Unit, Harare, Zimbabwe from October 1986 to December 1992 inclusive were reviewed. In a total of 58 cases in this retrospective study, the following data were recorded: patient's age, sex, clinical history, physical and roentgenographic findings, initial diagnosis, time lag between aspiration and hospital admission, treatment given and complications arising from the course of management.

RESULTS

There were 36 boys and 22 girls. Their age ranged from seven months to 10 years with a mean age of 18 months (Table I). Seventy percent of the patients were less than two years of age.

Table I: Age and number of patients who inhaled a foreign body.

Age (years)	No. of Patients
< 1	6
1	14
2	10
3	9
4	6
5	2
6	2
7	1
8	1
9	2
10	2
> 10	3

Duration of symptoms after aspiration ranged from six hours to three weeks. Fifty five pc of the patients were symptomatic for less than 24 hours before admission; 30 pc were symptomatic for less than two weeks and in 15 pc symptoms were present for more than two weeks.

On physical examination decreased breath sounds and wheezing were detected over the affected lung in 47 children (81 pc). History suggested aspiration of a foreign body in 41 children (70 pc).

Postero-anterior and lateral chest X-rays were obtained in all children and were suggestive of a foreign body in 35 (60 pc). Obstructive emphysema, pneumonia and atelectasis were the three leading radiological

Table II: Clinical symptoms and signs.

Symptoms and signs	Number	pc
Dyspnea	44	76
Cough	57	65
Choking	24	42
Decreased air entry	47	81
Wheezes	41	70
Inspiratory stridor	9	15
Cyanosis	6	11
Fever	24	42

Table III: Radiological findings.

Radiological Finding	Number
Normal	11
Obstructive emphysema	15
Atelectasis	12
Pneumonia	8
Radio opaques foreign bodies	11

findings. In 11 children (20 pc) the study was diagnostic showing definite radio opaque shadows (Table III).

In 32 children intra-operative assessment of oxygen saturation was achieved by transcutaneous oxygen saturation (TCO₂ saturation) using a pulse oximeter. The majority of patients had evidence of impaired oxygenation in room air before bronchoscopy (TCO₂ saturation < 90 mmhg).

All 58 patients underwent rigid bronchoscopy while under general anesthesia. Balanced anaesthesia was employed and spontaneous respiration was maintained when possible. This was to avoid the possible complication of forcing the foreign body deeper into the respiratory tract by positive pressure ventilation.

Bronchoscopy was performed using a rigid bronchoscope with the inside diameter of 3,5; 4,0 and 5,0 mm. This also served to secure the airway and oxygenation was maintained intermittently.

In three children no foreign body was found (5,2 pc) and in the remainder the offending foreign body was extracted with the forceps passed into the trachea and bronchus through the channel of the bronchoscope. All manipulations were performed under direct vision.

The foreign body was drawn into a hollow at the tip of the bronchoscope. The latter, extracting instrument and the foreign body were then removed together. In those foreign bodies that tend to fragment, a number of

Table IV: Type of foreign body aspirated.

Type	No.
Maize seed	18
Metal piece (zip end, screw, drawing pin)	11
Peanut shell	7
Nut and nut shell	6
Ball point end	3
Mucous plug	3
Chicken bone	3
Melon seed	1
Popcorn	1
Piece of stone	1

passes of the forceps were required to extract the pieces in addition to intermittent sections. The foreign bodies aspirated were as follows: maize seeds in 18 patients; metal pieces in 11; peanut shell in seven; nut and nutshells in six; chicken bones in three; ball point end in three; mucous plug in three; piece of stone in one; melon seed in one and popcorn in one (Table IV). Thus organic foreign bodies accounted for 36 (62 pc) of the foreign bodies removed.

The location of the foreign bodies removed at the time of bronchoscopy were two (3,4 pc) in the trachea; 40 (70 pc) in the right side of the tracheobronchial tree, while 16 (28 pc) were in the left side. Two children had cardiopulmonary arrest during bronchoscopy. One was successfully resuscitated in the operating theatre but the other did not respond to resuscitation and died. Post bronchoscopy complications occurred in 20 children (34 pc). Fifteen developed mild to moderate croup which was treated with a mist tent, oxygen as necessary, dexamethasone and occasionally inhalation of a bronchodilator. Four children had post operative fever for which no cause could be ascribed and one developed post operative pneumothorax and was successfully treated with tube thoracostomy. Mortality for the series was one (1,8 pc) and the longest post operative hospital stay was seven days.

DISCUSSION

Foreign body aspiration in children has been well reviewed and is thought of as one clinical entity.¹² It occurs in every age group but in most series children predominate.^{2,4} This study supports the observation that aspiration of a foreign body occurs frequently in young children, and inhalation of organic material accounts for the majority of cases.^{2,10}

The diagnosis of foreign body aspiration can be correctly made in 84 pc of cases in the presence of a history of possible aspiration, significant physical finding and supportive roentgenographic evidence.⁵ In this series a careful clinical history and physical examination were strong indicators of the diagnosis of an aspirated foreign body in 76 pc of cases. This is consistent with the most common presenting symptoms and signs often referred to as the diagnostic triad which are cough, wheezing and unilateral decreased breath sounds.^{5,7,8}

Following clinical evaluation, all children in this series had chest roentgenographic examination. Abnormal CXR was seen in 20 pc of cases. The most common CXR findings are obstructive emphysema, atelectasis or pneumonia.^{6,7,9} Similar CXR findings were noted in our cases.

Approximately 50 pc to 70 pc of aspirated foreign bodies are correctly diagnosed within a week after aspiration.^{7,8,10} However, a high number 30 pc to 40 pc are diagnosed after "a latent period". This has been attributed to adaptation of surface receptors to prolonged pressure from the foreign body.⁷ The existence of a foreign body is then suggested only by secondary effects produced on the lungs. In this study 55 pc of the cases were diagnosed in less than 24 hours and 30 pc in less than two weeks. In 15 pc the diagnosis was established after two weeks.

The majority of aspirated foreign bodies continue to be radiolucent organic material^{4,10} (eg peanut and corn) and unusual foreign objects that small infants place in their mouths.^{12,13} Thirty three (57 pc) of the foreign bodies retrieved in this study were organic materials, mainly maize seeds and peanut shells.

In the present study the majority of foreign bodies were localised in the right tracheobronchial tree. This is in conformity with the observations suggested in other studies.^{5,7,10} Other authors, however, have noted left sided predominance as well as distribution in all parts of the tracheobronchial tree.^{5,12}

Removal of foreign bodies may be accomplished by a variety of techniques, but in the current era, rigid bronchoscopy is the procedure of choice for aspirated foreign bodies.⁶ This allows for safe ventilation and manipulation under direct vision. Ninety five pc of our cases had their foreign bodies successfully extracted with rigid scopes.

Intra-operative monitoring of children with foreign body aspiration has demonstrated that all suffer from some respiratory embarrassment as a result of the aspiration episode, despite the fact that some may appear clinically stable.¹⁴ In the 32 of our patients in whom oxygen measurement was performed the majority were detected as having impaired oxygenation before bronchoscopy. Our policy was to proceed expeditiously once a diagnosis of aspirated foreign body had been made.

Although bronchoscopic extraction of foreign bodies is usually successful, complications ranging from 2 pc to 8 pc have been reported.^{9,10,11} Most of these were related to foreign body reactions or subglottic oedema secondary to the endoscopic procedure and were easily managed with humidified air and steroids.¹⁰ In our series 26 pc developed mild to moderate croup that responded to humidified oxygen and steroids.

Cardiorespiratory arrest can occur during bronchoscopic removal of foreign bodies. This is attributed to a combination of hypoxia and reflex vagal stimulation associated with movement of the foreign body within the tracheobronchial tree.³ Cotton *et al* have described a degassing phenomenon in which a complete ventilating obstruction and cardiorespiratory arrest followed dislodgement of a large foreign body from one main bronchus to the other.¹⁵ In two other series cardiac arrest occurred in 1 pc to 2 pc of the children undergoing bronchoscopy for foreign body extraction; the mortality was 0 pc to 1,8 pc respectively in these series.^{2,16}

There were two cardiac arrests in this study most probably of hypoxic complication with a mortality of one (1,8 pc).

Although bronchoscopic extractions are usually successful, it is a procedure that requires a team effort. This team includes a skilled and experienced endoscopist, an anesthesiologist and scrub nurse. The entire procedure should be performed under controlled conditions with careful monitoring of the patient's blood pressure, pulse, electrocardiogram and oxygenation. Morbidity has been low and mortality should be zero. The procedure should remain an important skill in the surgeon's clinical training.

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