Foreign Bodies in the tracheohronchial tree

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Abstract Objectives: To present a number of cases with foreign body aspiration (FBA) and to analyze their presentation and management.

Methods: A retrospective study of patients with FBA in the tracheobronchial tree who were treated at King Abdul-Aziz University Hospital and Riyadh Armed Forces Hospital from 1984 to 1993.

Subjects: The study group comprised 136 patients (82 males and 54 females).

Results: Ages ranged from 6 months to 16 years with about 85% who were 4 years of age or less. Definite history of aspiration was present in about 65% of the patients. The mean period between inhalation and removal of the FB was 9 days. Chest examination was clinically unremarkable in 25.7% and radiologically free in 25% of the cases. Unilateral wheeze and diminished air-entry were the most common positive physical signs; and obstructive emphysema was the most frequent positive radiological sign. Organic materials, with watermelon seed predominant, were mostly the causative agents. Majority of FBs were removed by rigid bronchoscopy. There were no mortalities.

Conclusion: Prevention is the best means to prevent FBA hazards. On suspicion, endoscopy is the most effective diagnostic technique due to the shortcomings of the history, physical examination and radiology.

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Foreign body aspiration (FBA) is a common event especially among the pediatric population and continues to be an important cause of morbidity and mortality. It is considered as one of the most recognized causes of accidental death in many countries. The American National Safety Council listed FBA as the leading cause of accidental death in the home in children younger than 6 years.' In fact, choking on food has been the cause of between **2500 to 3900** deaths per year in the U.S.A.' Also. **in** the Netherlands (population 15 million), 19 mortalities were reported in 1987 as an **immediate** result of aspiration.'

In Saudi Arabia, as in many other countries, there are no available statistics regarding the contribution of FBA as a cause of death: because it is generally believed many patients succumb well before reaching medical attention. The purpose of this communication is to report some of the statistics of confirmed cases of foreign body (FB) in the tracheobronchial tree which have been treated at two Riyadb hospitals over a ten-year period.

Patients and methods All patients treated for FBs in the tracheobronchial tree at King Abdul-Aziz University Hospital and Riyadh Armed Forces Hospital from 1984.1993 inclusive entered the study. Data forms were completed to include demographic details. mode of presentation, lag period between aspiration and treatment, radiological signs, endoscopic findings, and postoperative complications. A total of 136 tracheobronchial tree foreign body cases were diagnosed and are the subject of this report.

Results The 136 total number of FBs in the tracheobronchial tree included 82 males (60.3%) and 54 females (39.7%). Ages ranged from six months to sixteen years; with 79 (58.1%) four years of age or younger. The age and sex distribution of the patients is shown in Table 1.

Eighty-eight (64.7%) patients were brought wirh a definite history of aspiration. The rest were endoscoped because of: persistent or recurrent chest infection, refractory cough, respiratory distress or bronchospasm (Table 2). Ten patients

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Table 1 - Age and sex distribution

AGE	MALE	FEMALE	TOTAL	PERCENTAGE
Below one year	7	5	12	8.8
1 - 2 years	13	10	23	16.9
2 - 3 years	14	10	24	17.6
3 - 4 years	12	8	20	14.7
4 - 5 years	9	6	15	11
6 - 7 years	8	6	14	10.3
7 - 8 years	5	3	8	5.9
8 - 9 years	5	2	7	5.1
9 years and above	9	4	13	9.6
Total (%)	82 (60.3)	54 (39.7)	13.6	100

Table 2 - Mode of presentation

PRESENTATION	NUMBER	PERCENTAGE
Definite history of aspiration	88	64.7
Persistent or recurrent chest infection	21	15.4
Intractable cough	14	10.3
Bronchospasm	8	5.9
Respiratory distress	5	3.7
Total	136	100.0

had previous unsuccessful attempts of FB removal at other institutes.

Physical examination of the chest was reported as normal in 34 patients (25%), while wheeze and diminished air-entry were the most frequent positive signs as shown in Table 3

Table 3 - Physical signs in isolation or combination on admission

SIGN	NUMBER	PERCENTAGE
Wheeze	48	35 3
Decreased air entry	41	30 1
Stridor	12	88
Fever	14	103
Cyanosis	11	8.1
Increased resonance	11	81
Normal	34	25

Obstructive emphysema was found to be the most frequent positive radiological finding. Table 4 displays the x-ray findings on the day of removal.

The lag interval between the inhalation (when known) and the endoscopic examination varied from a few hours to six months, with an average of nine days. Forty-one cases (30.1%) were recognized and removed within the first 24 hours.

Table 4 - Radiological findings in isolation or combination

FINDING	NUMBER	PERCENTAGE
Obstructive emphysema	52	38.2
Pneumonia	26	19.1
At electasis	20	14.7
Radio opaque objects	14	10.3
Normal	35	25

All, but 5 FBs, were extracted by rigid bronchoscopy under general anesthesia. Spontaneous expulsion of the FB occurred in 3 patients during the work-up period. Two patients required bronchotomy; both for removal of sharp metallic FBs embedded in the lung periphery. No tracheostomy or pulmonary resection was performed.

Most of the foreign bodies (89.654%) were organic; with 31.5% of them (28/89) watermelon seeds. Seven (5.1%) foreign objects were located in the trachea, 81 (59.6%) in the right bronchial tree and 45 (33.1%) in the left side. In three cases, pieces of aspirated material (food derivatives) were extracted from both bronchial trees.

The mean hospital stay following extraction of the FB was 4 days: with a range of one to 14 days. The only reported immediate postoperative complication was "croup" secondary to airway oedema. This occurred in 24 (17.6%) patients and all responded to simple measures. No post bronchoscopy infection was recorded; but on the contrary pre-operative infection related to the FB responded promptly once it had been removed. There was no mortality recorded.

Discussion Acute aspiration of the FB usually produces an episode of choking, coughing, gagging and cyanosis which is caused by the protective laryngeal reflexes. This may be followed by a relatively asymptomatic phase due to the fatigue of the cough reflex. The length of this asymptomatic period depends upon the mucosal reaction to the FB which is affected by the nature, morphological characteristics and the position of FB. Subsequently, different clinical pictures may develop according to the pattern of the bronchial

obstruction. By-pass valve obstruction produces wheeze; expiratory check valve causes obstructive emphysema and inspiratory check or stop valve produces atelectasis. Infection is a common event and, therefore, manifestations of lower respiratory tract infection are frequent presenting features.

FBA occurs mostly in infants and children? In this study, 58.1% of the patients were under 4 years of age; an observation which is not different from the literature. A review of more than 2000 laryngeal, tracheal and bronchial FB showed that 53 percent of the patients were under 4 years of age; while 10 percent were infants less than one year old." Children in this age group are more vulnerable to aspirate because they tend to place many objects in their mouths: in addition to their inability of proper mastication and inadequacy of control of deglutition. Carelessness may contribute to FBA in many ways: hasty eating and drinking habits, haphazard preparation of food, permitting children to play while eating. talking with food in the mouth, giving food such as peanuts to children who do not have proper molar teeth to chew them.'

The male patients (60.3%) in this study outnumbered the females. This predominance of males has been noted by other authors.[8] but no plausible reason has been proposed for this observation.

The nature of FBs removed reflect the range of the objects within the reach of childrens' mouths. Organic material, mostly food derivatives, comprised the majority (81.6%) of the objects. The same observation was reported by many authors.[4,5,6,8] In this series. however. watermelon seeds presented the majority of the organic material; because many people in this community have the habit of eating the inside meat of roasted seeds after breaking the outer hard shell with their teeth. The seeds may be picked by the children trying to imitate the adults introducing them into their mouths resulting in aspiration.

The majority of FBs of the bronchi (59.6%) were located in the right side which can be explained by the fact that the right bronchus is larger than the left and arises from the trachea at a less acute angle. Some authors, however. reported almost equal distribution between the right and left bronchial tree in children,[4,8,9] and this has been attributed to the symmetrical bronchial angles in children up to 15 years of age.'" In this study the average time lag between aspiration and FB recovery was 9 days. Although this is better than the 14-28 days reported in the literature,[3] it is, nevertheless, a disturbing figure. Delayed diagnosis is a major contribution to the many complications and to the high incidence of unnecessary morbidity. Esclamado and Richardson (1987) reported that the incidence of major complications of FBA was 45 percent; however, in patients with a delay in diagnosis of over 24 hours the complication rate was 67 percent." The delay in diagnosis of FBA is mainly due to the pitfalls of the history and of the physical and radiological examination. The history may not be forthcoming, especially if no adults were present at the time of the accident. As noted by other authors.' this study showed that the accident is neither observed or suspected in over one third of children. Moreover, the symptomless interval may give a false sense of security to the parents and, unjustifiably, to the clinicians. Similarly, physical examination of the chest has its pitfalls. A small inorganic FB may produce no physical abnormalities. In this study, twenty five percent of the patients had normal chest examination on the day of removal of the FB. On the other hand, most of the signs and symptoms of an FB merely represent a respiratory tract infection and are therefore not characteristic. In a study evaluating the value of pre-operative examination in 150 patients suspected of FBA, abnormal ausculatory findings were reported to have only 78% sensitivity and 50% specificity.'

Although radiological examination of the chest is an essential investigation for FBA; it is of no value for excluding the diagnosis and of limited value in confirming the presence of the FB. In this series, chest x-rays were normal in 25.7% of the cases. Likewise, Mu et al (1990) found 38 percent of 343 children with FBA had normal x-ray findings." They listed six factors influencing the positive x-ray finding of an organic FB, namely, the size and shape of FB; the site of its lodgement, the pattern of bronchial obstruction; the length of its sojourn in the airways: and the technique or radiographic evaluation used. The positive x-ray findings produced by aspiration FBs are: obstructive emphysema, mediastinal shift, at electasis. pneumonia, pneumothorax and visible FB. Like this study, most authors found obstructive emphysema to be the commonest radiographic finding.'[8,12]

Treatment of FB in the lower respiratory tract consists of prompt removal under conditions which ensure maximum safety. Postural drainage as

described by Burrington and Cotton in 1972[13] was found to be ineffective and dangerous by many authors.[14,15] Removal of the FB by rigid bronchoscopy under general anesthesia is the mainstay of treatment. Concomitant use of fluoroscopy and use of Fogarty balloon catheters have been employed for successful extraction of peripherally located FBs.[16] Also, flexible fiber optic bronchoscope may be used in patients over 10 years of age either under local or general anesthesia." In proper hands, and when done judiciously, bronchoscopic removal of FBs can be a relatively safe procedure with minimal morbidity and mortality.[9] We had no serious complications resulting from this procedure. Post manipulation oedema occurred in 17.6% of the patients and responded to simple measures (steroids and humidification).

Although endoscopic removal is usually successful, open surgical procedure may be required occasionally. Marks et al. (1993) reviewed 50 reports yielding 6393 cases of airway FBs and identified 2% of the patients requiring tracheostomy and 2.5% requiting thoracotomy (1.6% for bronchotomy and 0.9% for pulmonary resection).[18] The indication for the tracheostomies were: laryngeal oedema following bronchoscopy, to assist ventilation, as a conduit to introduce bronchoscopy and to assist in removing a large or obstructed tracheal FB.[18] Bronchotomy is indicated when the FB cannot be removed safely by experienced endoscopy staff. This may occur if the FB is embedded in the lung periphery (like the two cases in the study) or in impacted double pointed objects. The indication for pulmonary resection is irreversible changes in the distal lung parenchyma which is usually due to long-standing FB.

A disturbing finding in this study is the high number of cases having previous unsuccessful removal attempts at other institutes. This is most likely due to inadequate experience and instrumentation. Difficult cases are strongly encouraged to be referred early to well equipped centres.

There was no death attributed to FBA in this series. However. this does not reflect the true extent of mortality because it is generally believed a substantial number of patients succumb well before appropriate medical care can be arranged.

Preventive measures are the best means of protecting children from the hazards of FBA. Parents should be educated in the potential dangers of offering or making accessible food material to children who are unable to chew properly. Prompt, proper action by the medical staff is required to avoid unnecessary complications. A high index of suspicion is essential and the shortcomings of the history, physical examination and radiology in establishing or excluding the diagnosis should be realized. Endoscopy is the most effective diagnostic technique and should be applied in suspected cases.

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ملخص:

الأجسام الغريبة في الشجرة الرغامية الشعبية: التجربة السعودية.

يسري السيد، وسامي إسماعيل.

الأهداف: عرض عدد من الحالات التي عانت من دخول أجسام غريبة وتحليل ظواهرها وعلاجها.

الطرق: دراسة استرجاعية للمرضى ممن عانوا من دخول أجسام غريبة في الشجرة الرغامية الشعبية والذين تم علاجهم في مستشفى جامعة الملك عبدالعزيز ومستشفى القوات المسلحة بالرياض من عام ١٩٨٤م إلى عام ١٩٩٣م.

أفراد الدراسة: اشتملت مجموعة الدراسة على ١٣٦ مريضاً (٨٢ ذكرا و٥٤ أنثى).

النتائج: تراوحت الأعمار بين ستة أشهر وستة عشر عاما وكان ٨٥٪ من أفراد الدراسة في سن الرابعة أو أقل، وقد كانت سيرة الإصابة الواضحة مبينة بالنسبة لنحو من ٦٥٪ من المرضى، أما الفترة الوسطية بين دخول الجسم الغريب وإخراجه، فقد بلغت تسعة أيام، وقد تبين أن فحص الصدر لم تكن له أهمية من الناحية السريرية لدى ٢٥,٧٪ من الحالات، وتبين من الفحص بالأشعة أن الصدر خال من الأجسام الغريبة لدى ٢٥٪ من الحالات، ومن أكثر العلامات البدنية الأكثر شيوعا وجود أزيز في جانب واحد وانخفاض حجم الهواء الداخل، وكان الانتفاخ الرئوي من أكثر العلامات شيوعا كما ظهر في الفحص الشعاعي، وقد كانت المواد العضوية وأكثرها من بذور الحبحب (البطيخ الأحمر) هي العناصر المسببة لذلك، وقد تمت إزالة غالبية الأجسام الغريبة من خلال التنظير الشعبي بأنبوب قاسي ولم تحدث أي وفيات.

مفتاح الكلمات: استنشاق الأجسام الغريبة – الرياض.