



A Common Health Problem in Children: Tracheobronchial Foreign Body Aspirations

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ABSTRACT

Background: Tracheobronchial foreign body aspiration is serious health problem in children. In this paper, we aimed to present our experience in tracheobronchial foreign body aspirations and rigid bronchoscopy in children.

Methods: Between January 1990 and May 2015, 693 patients less than 17 years of age with presumptive diagnosis of tracheobronchial aspiration of foreign bodies were included this study. Patients records were retrospectively analysed according to age, gender, symptoms and physical findings, foreign body type and localization, radiologic findings and treatments.

Results: Three hundred fifty one of the patients were male (51%) and 342 patients were female (49%). All patients underwent rigid bronchoscopy procedure except six patients. Foreign bodies were found in 589 patients (85%). McGill clamp was used for removing of foreign bodies settled on vocal cords in six patients and subsequently, rigid bronchoscopy was performed for checking of tracheobronchial system. Thoracotomy was required in four patients (0.7%). The most common foreign bodies were nuts (n=373). The most frequent localization site of foreign bodies was right bronchial system (n=292). The chief radiologic finding was obstructive emphysema (n=296). Cardiopulmonary arrest occurred in 11 patients and 2 of them died (0.3%).

Conclusion: The gold standard in diagnosis and management of tracheobronchial foreign body aspiration is bronchoscopy, which can be performed with a low complication rate.

Keywords: Bronchoscopy; foreign body; obstructive emphysema.

INTRODUCTION

Tracheobronchial foreign body aspiration is a common and serious health problem in paediatric population. This vital problem may cause respiratory arrest and sudden death. This terrible incident is the one of the most common causes of accidental death at home in children (1,2). If not diagnosed and managed properly in the early period, irreversible pulmonary damage requiring resection may occur in later years (3). Although principal treatment option is bronchoscopy, surgery such as bronchotomy and pneumotomy may be required in some cases in acute phase (4). The type of aspirated foreign body in children is usually related to eating habits of the family (5). We aimed to present our experience in tracheobronchial foreign body aspirations and rigid bronchoscopy in childhood for 25 years in this paper.

PATIENTS AND METHODS

We analysed the hospital records of 817 patients with presumptive diagnosis of tracheobronchial aspiration of foreign bodies who were hospitalized at the Division of Thoracic Surgery of Ataturk University from January 1990 to May 2015. Patients

under seventeen-years-old were included in this study. Before the bronchoscopy procedure, a complete medical history was obtained, all patients were examined, and chest plains were taken. Rigid bronchoscope and various forceps were used under general anaesthesia in all patients. McGill clamp was used for removing of foreign bodies settled on vocal cords in six patients. The flexible bronchoscope and scopy with C-arm were used only when required. After bronchoscopic exploration, the foreign body was extracted by a suitable forceps or basket. Following the extraction of foreign body, both bronchial systems were irrigated with physiological saline and secretions were aspirated, then tracheobronchial system was examined, meticulously. When the bronchoscopic procedures failed, open surgery was performed.

RESULTS

Six hundred ninety three of the patients were under 17 years of age. All patients underwent rigid bronchoscopy procedure because of suspected aspiration of foreign body. Three hundred fifty one of the patients were male (51%) and 342 were female (49%), and the mean age was 5,3 years (40 days-16 years). Foreign bodies were found in 589 patients (85%).

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Peak incidence of foreign body aspiration occurred between 1-3 years, accounting for 41% of the total number (Table 1). The most common initial symptom was coughing (96.7%, n=670). Rhonchi (50%, n=346), diminished respiratory sounds (43.9%, n=304), dyspnoea (30.6%, n=212), cyanosis (17.6%, n=122,) and fever (7,4%, n=51) were the most common findings. Time interval of the symptoms ranged from thirty minutes to six months, with a mean of one day. Twenty one patients did not have a positive aspiration history (21,6%).

The chest plain showed obstructive emphysema in 299 (43.1%) patients, pneumonia in 47 (6,8%) patients, atelectasis in 36 (5,2%) and bronchiectatic changes in 10 (1,4%) patients (Figure 1). The metallic objects were confirmed by chest plain



Figure 1: A 3-years-old male patient, obstructive emphysema is seen on the left side in chest plain. Peanut was found in the left main bronchus

The locations of foreign bodies were trachea, the right bronchial tree, the left bronchial tree, both bronchial system and vocal cords in 98 (16,7%), 292 (49.6%), 182 (30,9%), 11 (1.8%) and 6 (1%) patients, respectively. One hundred and sixty five foreign bodies (28,1%) were in the right main bronchi (Table 2). Foreign body was not found in 104 (15%) patients. Nuts were the most common foreign bodies (n=373, 63.3%), and peanut alone accounted for 37.5% of the total (n=221). Needles and plastic objects accounted for 17.8% (n=105) and 12.6% (n=74), respectively (Table 3). Headscarf pin alone accounted for 16,4% of all foreign bodies (n=97). Nuts and needles constituted the majority in our series.

Bronchoscopy indications were the presence of aspiration history, physical examination findings that support the aspiration, direct and indirect radiologic findings, recurrent and/or resistant lung infection to medical treatment, as well absence of history. Foreign bodies were extracted by rigid bronchoscopy and McGill clamp under general anaesthesia in 579 and six patients, respectively. Although, foreign bodies were removed by McGill clamp in six patients, rigid bronchoscopy was also performed for control of tracheobronchial system and any

Table 1: Age distribution of patients

Age range	N	%
0-1	137	19.8
1-3	284	41
3-10	132	19
10-16	140	20.2
Total	693	100

in 118 (17,1%) patients (Figure 2). The chest plain was normal in 171 (24.7%) patients. Before bronchoscopy, routine chest plain was not taken in twelve patients because of severe respiratory distress.



Figure 2: A 3-years-old female patient. A metallic coil settled at the level of the vocal cords.

Table 2: Localizations of foreign bodies

Localization	N	%
Trachea	98	16,7
Right bronchial tree	292	49,6
Main	165	28,1
Upper	3	0,5
Intermedier	9	1,5
Middle	6	1
Lower	109	18,5
Left bronchial tree	182	30,9
Main	120	20,4
Upper	2	0,3
Lower	60	10,2
Both bronchial tree	11	1,8
Vocal cords	6	1
Total	589	100

foreign body was not seen in these patients. Thoracotomy and pneumotomy were performed because bronchoscopy failed in four patients and foreign bodies were removed. These extracted bodies were headscarf pins. The rupture of membranous part of left main bronchus occurred in a 1-year-old patient after bronchoscopy procedure. Thoracotomy and primary repair was performed. The extracted foreign body was sunflower seed in this patient. In 45 patients, rigid bronchoscopy was performed because of resistant and/or recurrent pulmonary infections. Foreign bodies were found in 25 of 45 patients. Intravenous steroid and aerosol therapies were applied when bronchoscopy procedure prolonged.

Table 3: Types of aspirated foreign bodies

Type	N	%
Nuts	373	63.3
Peanut	221	37.5
Hazelnut	65	11
Sunflowerseed	64	10.9
Roastedchickpea	19	3.2
Walnut	4	0,7
Needles	105	17.8
Headscarfpin	97	16,4
Officepin	8	1,4
Plasticobjects	74	12.6
Kidneybean	10	1,7
Metallicobjects	13	2.2
Eggshell	2	0,3
Others	12	2.1
Total	589	100

Hospitalization durations were 1 day, 2 days and longer than 2 days in 612 (88.3%), 34 (4.9%) and 47 (6.8%) patients, respectively. The longest hospital stay was 13 days and mean hospital stay was 1,2 days. Asphyxia and hypoxemia related to foreign body aspirations caused cardiopulmonary arrest in 11 patients in the pre-bronchoscopic period. Nine of these patients were intubated at the emergency department, the remaining two patients were intubated by paramedics in the ambulance before being transported to the emergency department. Foreign bodies were extracted in these patients but two of them died. The location of the foreign bodies was trachea in all patients. Extracted bodies were peanut, kidney bean and roasted chickpea in 7 patients, 3 patients and 1 patient, respectively.

DISCUSSION

Tracheobronchial aspirations of foreign body are seen usually in children, and the peak incidence is between the ages of 1 and 3 years (6). The aspirated foreign body types are usually related to eating habits of people, age, life style, sociocultural and socioeconomic situation (7,8). The most common aspirated foreign bodies are nuts in children, and peanuts accounted for the majority (2,9,10). However, plastic objects used in making toys have a greater ratio in industrialized countries (11,12). The children have high risk of foreign body aspiration because of high interest to their environment, inadequate chewing of foods, their desire to take into mouth objects and immature swallowing reflex (13).

In Turkey, especially in Eastern Anatolia region, the incidence of the foreign body aspiration is high in children. We found that the peak incidence of foreign body aspiration is between 1-3 years, with the rate of 41% of the total number in paediatric population in this geographic area. The causes of this high incidence are dietary habits and insufficient attention of parents. The most common aspirated foreign bodies were nuts in children, and peanuts accounted for the majority of

their in our region. These foods hold an important place in dietary habits in Eastern Anatolia region. Furthermore, in this geographic area, the incidence of the headscarf pin aspiration is high, too (n=97, 16,4%). Because, these metallic objects are used widely for secure the headscarf in young females in Muslim societies.

Clinical symptoms usually depend on type, location, bigness of foreign body and time interval after aspiration. Coughing is usually the first symptom, and decreases with time due to the moving of foreign body towards the distal airways (3). Dyspnoea and cyanosis are the most important symptoms in the foreign body aspiration and these symptoms are usually seen when the large foreign bodies located trachea or both main bronchus. Complete obstruction of tracheobronchial system with foreign body cause cardiopulmonary arrest. In such a situation, the foreign body should be pushed to the distal and the patient should be ventilated and resuscitated (3). After this maneuver, the foreign body should be removed, rapidly. Foreign body aspirations, if not diagnosed and managed properly in early period, fever, mucopurulent secretions and haemoptysis due to bronchiectasis and lung abscess may be seen afterward (4). In our series, coughing was present in 670 (96.7%) patients as the initial symptom in medical history. The most common physical findings were rhonchi (50%, n=346), diminished respiratory sounds (43.9%, n=304), dyspnoea (30.6%, n=212), cyanosis (17.6%, n=122) and fever (7,4%, n=51). Twenty five patients had recurrent and/or resistant pulmonary infections. Cardiopulmonary arrest occurred in 11 of 589 patients (1,8%). Nine of 11 patients were intubated in the emergency services, the other two patients were intubated by paramedics in the ambulance before being transported to the emergency services. Foreign bodies were extracted in these patients but two of them could not be saved. Patients, who died, were intubated by paramedics before being transported to the emergency department. Foreign bodies settled in the trachea in these 11 patients. Peanut, kidney bean and roasted chickpea were extracted in 7 patients, 3 patients and 1 patient, respectively.

Standard chest plains are the first diagnostic method in patient with history of foreign body aspiration, but this principal method does not always support the diagnosis. Radiopaque objects can easily be seen in the chest radiograph. The presence of non-opaque objects can be supported by indirect radiologic findings such as obstructive emphysema, atelectasis and consolidation. Nevertheless, even foreign bodies settled in the tracheobronchial system, chest plains might be normal. In this series, obstructive emphysema, pneumonia, atelectasis and bronchiectatic changes were seen in 299 (43.1%), 47 (6,8%) 36 (5,2%) and 10 (1,4%) patients, respectively. Chest plains showed metallic objects in 118 (17,1%) patients. Hundred and seventy-one (24.7%) patients had normal radiographs.

Although principal treatment option in the foreign body aspirations is rigid bronchoscopy, some authors recommend the flexible bronchoscopy (14). We believe that rigid bronchoscopy is safer, because the patient can be ventilated during rigid bronchoscopy procedure, the foreign body can be clearly seen and easily extracted through the large lumen of rigid bronchoscopy. Furthermore, pointed and sharp foreign body can be extracted by pulling into the lumen, thus reducing the perforation risk. Needles can move toward the distal airways and therefore, bronchoscopy procedures and scopy may not be sufficient. Open surgery is required in such cases. We used the flexible bronchoscopy and scopy in 17 patients who aspirated needle to determine the location of the foreign body. In thirteen of 17 patients, needles were extracted successfully. Thoracotomy and pneumotomy was performed in the remaining

four patients and foreign bodies were removed.

Foreign bodies in airways are usually located in right bronchial system, because it is like a continuation of the trachea. Most of the foreign bodies are settled proximal airways due to small calibre of tracheobronchial system, and nuts accounted for the majority of foreign bodies in children (4). In our patients, locations of the foreign bodies were trachea, the right bronchial three, the left bronchial three, both bronchial system and vocal cords in 98 (16,7%), 292 (49,6%), 182 (30,9%), 11 (1,7%) and 6 (1%) patients, respectively. Right and left main bronchus accounted for 28.1% (n=165) and 20.4% (n=120), respectively. Most common foreign body was peanuts in the right and left main bronchus.

Complications of foreign body extraction by bronchoscopy include pneumothorax, pneumomediastinum, laryngeal oedema, haemorrhage and cardiac arrest (15,16). The use of i.v corticosteroids in pre- and postoperative period is recommended to reduce the frequency of tracheotomy due to laryngeal oedema (13,17). We gave steroids to patients when bronchoscopy is prolonged. Tracheotomy was not required in

our paediatric patients. In a patient, membranous injury of left main bronchus was seen after the extraction of foreign body and primary repair was performed through thoracotomy.

Tracheobronchial aspirations of foreign bodies are important and serious problems in children. The gold standard in diagnosis and management is rigid bronchoscopy. Additionally, taking a detailed medical history, careful physical and radiological evaluation, and rapid intervention are sine qua non of the diagnosis and management of tracheobronchial foreign body aspirations. Rigid bronchoscopy can be applied safely in children and should be performed in all patients with suspected foreign body aspiration in the early period, even in the absence of history and radiologic findings. Keeping the children away from foreign bodies and immediately transporting to the emergency services in case of aspiration are life-saving precautions outside the hospital. Therefore, family education about this topic is the basic principle to reduce the frequency of foreign body aspirations and mortality related to this terrible incident in childhood.

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