Original Article

Sharp Foreign Bodies in Laryngotracheobronchial Airway of Children: Our Experiences at a Tertiary Care Teaching Hospital

Santosh Kumar Swain, Nibi Shajahan

Department of Otorhinolaryngology, IMS and SUM Hospital, Siksha "O" Anusandhan University, Bhubaneswar, Odisha, India

Abstract

Background: Sharp foreign bodies (FBs) are rarely found in the laryngotracheobronchial (LTB) tree which may cause threatening to the life. **Objective:** The aim of this study is to evaluate or study the clinical details of the inhaled sharp FBs and its management in children. **Methods:** This is a retrospective descriptive study done in between April 2015 and May 2020. There were 22 children with inhaled sharp FB in the airway enrolled in this study. The diagnosis was done from proper history taking, clinical examination, and the X-ray of the neck, chest, and abdomen of the children. All of them underwent rigid bronchoscopy with grasping forceps for the removal of these sharp FBs. **Results:** Out of the 22 children, 13 were boys (59.09%) and 9 were girls (40.90%). Out of 22 cases, 4 FBs were found in the proximal part of the airway and 18 were seen in distal airways. The most common clinical presentation was chocking sensation with cough. **Conclusion:** Early diagnosis and prompt rigid bronchoscopy are required for preventing inhalation of the sharp FB in the LTB. Proper education to the caregivers or parents is very helpful to prevent this critical clinical entity.

Keywords: Children, laryngotracheobronchial airway, rigid bronchoscopy, sharp foreign bodies

Introduction

Foreign bodies (FBs) in the laryngotracheobronchial (LTB) tree are always mystified and puzzled to the clinicians. FB inhalation is a common accidental clinical entity found among children. However, the sharp FB in the LTB tree is uncommon and hazardous to the life of a child. There are several types of sharp FBs available which may enter into LTB airway. The FBs have different sizes and shapes. The FBs may be sharp needles, iron nail, safety pin, paper pin or alpin, and scarf pin.[1] The absence of normal reflexes such as sudden inspiration while eating, laughing, and playing may aggravate the entry of FB into the LTB airway. These types of hazardous accidents are often seen in children. When the size of the FB is greater than tracheal lumen, it stays at the trachea or in case of the sharp FB, easily enters into the lower airway such as bronchus and bronchioles. The sharp and penetrating FBs are often concern for clinician as of their potential nature to perforate the air passage and leads to possible complications. The sharp FBs are likely to be found in the aerodigestive tract such as airway or esophagus which should be confirmed before removal.[2] The clinical presentations are based on the site of the FB in the LTB tree.[3] The clinical presentations of the sharp FB in the LTB tree are somewhat different. Removal of the sharp FB from LTB tree is often challenging to the clinician and it need special attention. For the removal of the sharp FB, the key point is to locate the sharp end of the FB first.[4] This requires prompt diagnosis and immediate treatment, otherwise it may lead to life-threatening complications. In this study, the details of the different types of the sharp FBs in LTB airway with its clinical presentations and management are analyzed.

Methods

This retrospective study was conducted at the otorhinolaryngology department of a tertiary care teaching hospital between April 2015 and May 2020. This study was approved by the Institutional Ethic Committee (IEC) with reference number IEC/IMS/SOAU/February 12, 2015. Data

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Address for correspondence: Prof. Santosh Kumar Swain, Department of Otorhinolaryngology, IMS and SUM Hospital, Kalinga Nagar, Bhubaneswar - 751 003, Odisha, India. E-mail: santoshvoltaire@yahoo.co.in

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were collected from the otorhinolaryngology department registration book and ward admission records. In this study, clinical parameters such as age, gender, clinical presentations, investigations, types of the FB, and site of the FB and removal of the FB are taken into considerations. The children included in this study were in the age range of below 16 years. The inclusion criteria of this study were children with a history of sharp FB at the LTB tree those required intervention for its removal. Those children with no history of FB insertion in LTB airway but found sharp FB during examining the children were also included in this study. Children with suspected FBs in the LTB airway but no such FB found after proper examination under general anesthesia were excluded from this study. All the participant children were evaluated thoroughly with proper history taking and complete otorhinolaryngological examination. Radiographs of the neck, chest, and abdomen were done in all the cases. X-ray of the neck, chest, and abdomen helped the diagnosis of this sharp metallic FB in the airway. There was no delay in the diagnosis of the sharp FB in the airway because of the fear of the parents of the children from its sharp nature. After confirmation of the FBs by imaging, a rigid bronchoscopy was planned immediately. All the cases were managed as per our standard protocol of FB aspiration. All the cases underwent rigid bronchoscopy in the operating room under general anesthesia. We utilized ventilating rigid bronchoscope (Storz, Germany) along with help of the optical forceps. Then, the sharp end of the FBs was grasped with forceps and removed from the LTB airways without injury to the surrounding structures. FBs were removed successfully in all the cases except one. After the rigid bronchoscopy, the postoperative period was uneventful. The data were analyzed on the basis of the descriptive fashion.

Results

During this 5-year study period, 22 children with sharp FBs in the LTB tree were visited the hospital. There were 13 boys (59.09%) and 9 girls (40.90%) with a male-to-female ratio of 1.4. The age of the participating children was ranged from 0 to 16 years with a mean age of 4.33 years. The highest incidences of sharp FBs in LTB tree were found in the age group of 0–5 years (63.63%). This is followed by children with 6–10 years (22.72%) and 11–16 years (13.63%) [Table 1]. Needle (30.81%) was the most common FB found in this study, followed by head scarf pin [Figure 1], alpin (bell pins), paper pin, safety pin [Figure 2], and iron nail [Figure 3 and Table 2]. Out of 22 cases, nine cases showed FB in the left bronchus, eight cases showed FB in right bronchus, 2 FB in trachea, 2 FB in larynx, and 1 FB in left posterior segment of the lungs [Table 3]. Out of 22 cases, 4 children (18.18%)

Table 1: Sharp foreign bodies of laryngotracheobronchial tree

Age (years)	*n* (%)
0-5	14 (63.63)
6-10	5 (22.72)
11-16	3 (13.63)
Total	22 (100)

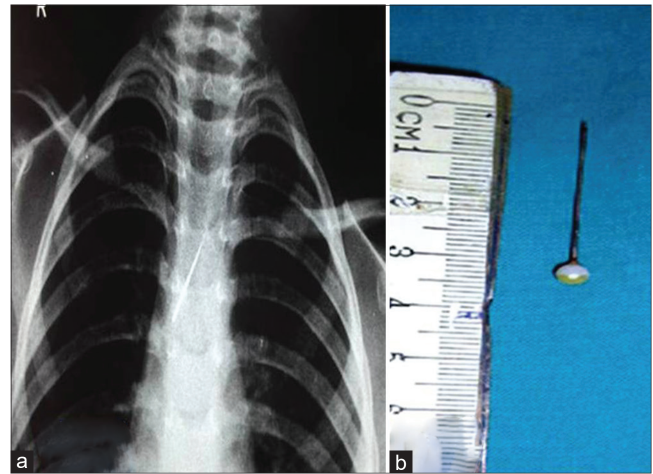

Figure 1: (a) X-ray of chest showing a sharp radiopaque long FB in tracheobronchial airway; (b) Head scarf pin removed from the right bronchus

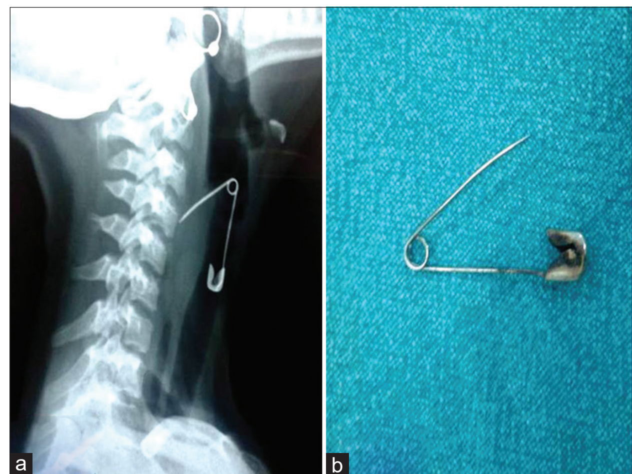

Figure 2: (a) X-ray of the soft tissue of neck (lateral view) showing an open safety pin; (b) an open safety pin removed from the larynx

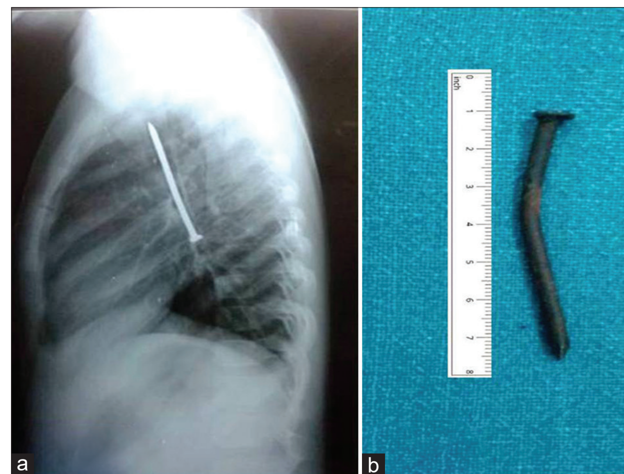

Figure 3: (a and b) X-ray chest showing a sharp elongated FB in the trachea; (b) an iron nail removed from the trachea

showed FBs in the proximal part of the airway such as larynx and trachea, whereas in 18 cases (81.81%), FBs were seen in distal airways. The most common clinical presentation among participating children was cough. The most common symptom was persistent cough (81.81%), followed by chocking sensation, change in voice, dyspnea, cyanosis, and hemoptysis [Table 4]. All the FBs were confirmed by the X-ray of the neck, chest, and abdomen. All the children with LTB FBs underwent rigid bronchoscopy under general anesthesia. The sharp ends of the FBs were grasped by grasping forcep. Out of 22 cases, 21 showed successful removal of the sharp FBs. In three cases, initial trial of the rigid bronchoscopy was not successful, and a second trial of bronchoscopy was done and become successful. In one patient with sharp FB at the left posterior segment thoracotomy was done for removal of the sharp pin after failure of the two bronchoscopic procedures.

Discussion

A FB is a substance or an object foreign to the site where it is seen.[5] FBs in the LTB tree can be seen in all the age groups, however, this is common in the pediatric age. It has significant risk for morbidity and mortality.[6] FB at the LTB airway, especially in the pediatric age, may cause airway obstruction and even lead to death. FB inhalation is often seen below 3 years of the age because of the physiologic and anatomical factors associated with swallowing mechanism along with tendency to explore anything by putting in the mouth.[7] The absence of the molar teeth in the children and tendency for oral exploration and play at the time of eating with poor coordination during swallowing may lead to FB aspiration.[8] In this study, majority (63.63%) of the sharp FBs were found in the age group of 0–5 years. Food products or food are common FBs found in the LTB tree, and the reported data being as high as approximately 70% of all types of the FBs.[9] Uncommon LTB airway FBs include beads, metallic objects, and sharp metallic objects. The rare types of FBs are broken tracheostomy tubes and hypodermic needles.[10,11] In this study, the sharp FBs found are needle, head scarf pins, alpin/bel pin, paper pin, safety pin, and iron nail. Laryngeal FB is rare as majority of them inhaled into the bronchus. In this study, two cases of safety pin found in the larynx. A FB in the larynx may cause laryngospasm and even complete airway obstruction. In this study, no such clinical manifestations were happened. Metallic FBs are usually inert in comparison to the vegetable FBs. However, the metallic FBs can cause clinical manifestations if obstruct the airway. Chevalier Jackson described 113 cases of the sharp pins in the tracheobronchial tree in 1932 where he documented the carelessness of the adults such as keeping the pins in the mouth so children may imitate to this is the most important cause for putting these FBs in the airways.[12] This description of the Chevalier Jackson is still valid today. Majority of the FB in LTB airway comes to stay at the right main bronchus because of its wider lumen than left but in young child, there is almost equal distribution of FB between the two sides of the bronchi. In this study,

Table 2: Types of foreign body found in the laryngotracheobronchial

Types of foreign body	Number of foreign bodies (%)
Needle	7 (31.81)
Head scraf pin	6 (27.27)
Alpin/bell pin	3 (13.63)
Paper pin	3 (13.63)
Safety pin	2 (9.09)
Iron nail	1 (4.54)
Total	22 (100)

Table 3: Locations of the sharp foreign body in the laryngotracheobronchial tree

Location	*n* (%)
Left bronchus	9 (40.90)
Right bronchus	8 (36.36)
Tracheal	2 (9.09)
Larynx	2 (9.09)
Left posterior segment of lungs	1 (4.54)

Table 4: Clinical presentations of foreign bodies in laryngotracheobronchial tree

Clinical presentations	*n* (%)
Persistent cough	18 (81.81)
Chocking sensation in throat	7 (31.81)
Hoarseness of voice	5 (27.72)
Dyspnea	4 (18.18)
Cyanosis	1 (4.54)
Hemoptysis	1 (4.54)

majority of FBs were found in the left bronchus followed by the right bronchus, trachea, larynx, and deeper segment of the lungs. Although there are several types of the sharp FBs found in the LTB tree in children, many cases head scarf pins are found. Head scrap pins show a specific pattern of the FB inhalation.[13] These head scarf pins are approximately 3–4 cm in length with a pearl blunt head and pointed sharp end. In many times, girls wear a head scarf in the early adolescent period. Girls are usually habituated to fix the scarf around the head, and at that time, they used to hold the pins in the mouth and use one by one for fixing the scarf. Lack of concentration at this time may lead to aspiration. These sharp pins often held between the lips and the pointed end stay outside which explains the position of these FBs in the tracheobronchial tree with pointed end to superiorly. The blunt end of the sharp FB usually go down which does not resist during the inhalation and fall in small segmental bronchi which difficult to remove by bronchoscopy. It may need several trials for removing such FBs. This happens in two cases of this study where the patient underwent thoracotomy for removal.

All of the children with LTB airway FBs had no alarming symptoms. The clinical presentations depend on the location of

the FB in the LTB tree.[14] The symptoms of the FB inhalations include coughing, hoarseness of voice, chocking, cyanosis, gagging, dyspnea, and chest pain.[15] However, the clinical presentations due to sharp FBs in the airway are somewhat different. The clinical presentations of the FB aspiration range from the acute airway obstruction to features of the complications such as bronchiectasis and recurrent pneumonia. FB inhalation classically passes through the three phases of clinical presentations. Initially, the patients present with chocking, paroxysm of the cough, or obstruction of the airway. Then, the patient present with quiescent stage where the patient is asymptomatic. If this situation is neglected, the patient may land in the clinical phase of the complications.[16] They were comfortable and did not have any respiratory distress. In this study, majority of the children presented with persistent cough after inhalation of the FB into LTB tree.

It needs urgent diagnosis for prompt treatment. The delay in the diagnosis may occur because of the paucity of the symptoms. It is always necessary for screening and perform X-ray in every cases those admitted with a history of the having swallowed an object and suddenly develop cough or breathing difficulty.[17] X-ray of the neck, chest, and abdomen was done in all the participating cases to rule out the FB at the LTB airway.

The LTB FBs should be removed without delay once the diagnosis is made. This can be done either by rigid bronchoscopy or thoracotomy. However, the rigid bronchoscopy is the gold standard treatment for the removal of the FBs from the LTB FBs under direct vision. All the sharp FBs were removed with help of the rigid bronchoscopy under general anesthesia.[18] The removal of the sharp FBs from the LTB airway is often challenging and requires special attention.[19] For successful removal of the FB, the important step is to locate the sharp end of the FB.[4] Grasping the sharp end of the FB allow the extraction of it inside the bronchoscope. Once the FB is grasped, all the three such as bronchoscope, grasping forcep, and FB are removed simultaneously from the patient as a unit. At the time of removal of FB, every attempt should be made to maintain visual contact to the FB by keeping it in center of the airway. The grasping forcep was used to remove the sharp FBs by grasping the point enseathing the whole length into bronchoscope by proximally pulling for avoiding complications. Check bronchoscopy revealed no reaction or disruption at the mucosal lining of the LTB airway. The fiberoptic endoscopy has limited role for removing the sharp FBs. Majority of the inhaled FBs are removed safely without complications. The commonly found complications of inhaled FBs in the LTB include atelectasis, pneumonia, spasms of the airway, laryngeal edema, pulmonary edema, and retention of the fragments of the FB.[20] The use of Hopkins rod telescope with a video camera helps excellent visualization of the airway for bronchoscopist and also others like students and residents. In all the cases of the study, FBs were removed successfully by rigid bronchoscopy except one case where child underwent thoracotomy for removal of the FB. The fiberoptic bronchoscope has limited role for removing the sharp FBs from LTB tree. Present bronchoscopic technique and better visualization by Hopkins telescope make successful removal of the sharp FBs from the LTB tree without complications are documented in this study. The use of the grasping forceps helped grip firmly the sharp end of the FB during rigid bronchoscopy for preventing the injury to the mucosa. Some use magnetic extractor for the removal of the metallic sharp FB from the LTB tree. The magnet helps to attach the FB rapidly to the sharp end in easy and safer way of removal. However, such magnets are contraindicated in patients with heart pacemakers, intracranial aneurysm, and cochlear implant.[21] If the LTB airway FBs dislodged and enter into bronchioles and deeper part of the lungs can lead to lung abscess, recurrent pneumonia, bronchiectasis, infiltrations, and effusion.[22] However, in this study, no such complications found although one sharp FB entered into the deeper part which was removed by thoracotomy. The inhalational FB is a preventable mishap. It can be reduced or prevented by giving proper education to the public and parents. They should be explained about the dangers of this inhalation of the sharp FB in the LTB tree. Optimum care should be given to the mentally retarded children for preventing sharp FB aspiration to the airway.

Conclusion

Inhaled FBs in LTB tree continue to present a challenging situation for the clinicians. Accurate diagnosis, prompt, and safe removal of the FB is considered as major issue for clinicians. The clinical features and the potential complications of the FB depend on its size, shape, and nature and exact location at the LTB tree. The rigid bronchoscopy along optical forcep under the general anesthesia is the treatment modality. Removal of the sharp FBs of the LTB tree is usually done with grasping of the sharp and pointed end of the FB. The entry of the sharp FBs in the LTB tree is truly preventable. This mishap need health education to the public regarding sits complications. Education to the parents or public is the best preventive measures for reducing the incidence of the harp FBs in the LTB tree.

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Conflicts of interest

There are no conflicts of interest.

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