

## Inhaled Foreign Bodies in Erbil, Experience with 72 Patients from 2007-2013

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### Abstract

**Background and objectives:** The aim of this study was to report on commonest inhaled foreign bodies in Erbil and challenging in diagnosis of rare foreign bodies and how to manage these cases properly to avoid serious complications. **Methods:** This is a prospective study of seventy two patients with history of inhalation of foreign bodies seen in otolaryngology clinic in Erbil between January 2007 and May 2013. Data of patients including age, sex, and occupations were recorded and saved. Presenting symptom of choking, cough, dyspnea etc. were recorded. All patients with suspected foreign bodies' inhalation were sent for chest X-ray imaging. Patients with positive finding and highly suspicious for inhaled foreign bodies underwent rigid bronchoscopy for diagnosis and therapy. The type of foreign body removed was recorded. **Results:** Out of 72 cases, sixty patients were under 10 years old. Forty six patients were males and 26 females. In more than 94% positive physical findings were recorded. Diminished breathing sounds were the commonest. Plain chest film were normal in 56 (78%) of cases. Radio opaque FBs was only reported in 5 cases (7%). Sixty five patients (90%) managed by rigid bronchoscopy and 7 cases (10%) refused the procedure. A foreign body was detected in sixty patients (92%) while the bronchoscopy was negative in 5, (8%) of cases. No serious complication was recorded. **Conclusions:** It is advisable that rigid bronchoscopy be performed under general anesthesia in: all cases of highly suspicious for inhaled foreign bodies, Cases with chronic cough not responding to medical treatment, and children with wheezy chest which has started recently and does not response for medical therapy. The procedure must be done by a surgeon having good skill in rigid bronchoscopy.

**Keywords:** Inhaled foreign bodies; foreign bodies in airways.

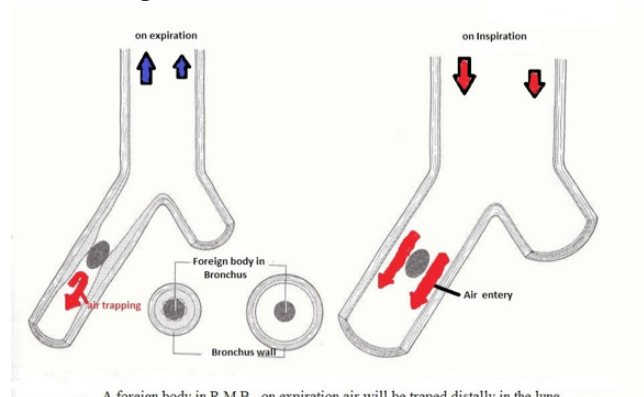
### Introduction

Foreign body (FB) inhalation is life threatening emergency and it is common in children under age of 5 years<sup>1</sup>. Commonest Foreign bodies (FBs) to be inhaled was reported to be portion of nut, seeds and food particles<sup>2</sup>. To inhale an object, the FB must be in the mouth or the nasal cavity. Inhalation occurs with the sharp intake of a deep inspiration after coughing, crying or laughing with the presence of the FB in the mouth.

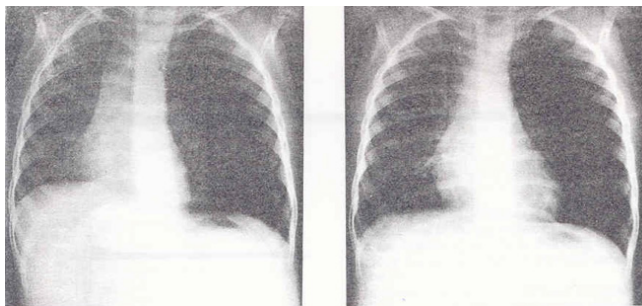
Foreign bodies lodge in the Larynx if they are: too large to pass through glottis, if they are of an irregular in shape and or if they are sharp and pointed. Once the FB passes through the larynx, it descends into the trachea or into one of the main bronchus.

In most of the cases there is definite history of choking followed by paroxysmal coughing which then ceases. Ninety percent of patients with FB inhalation has one symptom of triad – coughing, choking, and wheeze in the chest<sup>3</sup>. However FB may be symptom free and discover during routine diagnostic and therapeutic bronchoscopy for other conditions<sup>4</sup>. In majority of inhaled FBs clinical examination may reveal some positive signs such as unilateral diminished breathing sounds, lung collapse, mediastinum and

tracheal shift<sup>5</sup>. Obstructive emphysema is produced by volvulus obstruction of the expiratory air stream due to presence of FB in the lumen of one of the main bronchus. The air passage dilates during inspiration and contracts during expiration. Thus on each respiration cycle, a small volume of air is trapped beyond the obstruction and leads to hyper emphysema. There will be mediastinum shift during expiration towards the unobstructed side of the chest, in inspiration the mediastinum may return to the midline, Figures 1 and 2.



**Figure (1):** Mechanism by which obstructive emphysema and mediastinum shift occur by a foreign body in right main bronchus.



A. Expiration, mediastinum shift to the right, obstructive emphysema left side  
 B. Inspiration, mediastinum back to the midline

**Figure (2):** FB left main Bronchus: A. On expiration: Obstructive emphysema left lung due to a FB left main bronchus. Mediastinum shift to the right. B. on Inspiration: Mediastinum back towards the midline again.

Patients with chronic symptoms may have been diagnosed as having asthma or chronic bronchitis. Young children and patients with neurologic or psychiatric disorders are at increased risk for aspiration but they might not be able to describe symptoms or to report choking episodes and the case may be misdiagnosed<sup>6</sup>.

Physical finding of inhaled FB related to the size of the FB, types of the FB and duration of inhalation of the FB until it is diagnosed.

A large FB may cause acute respiratory distress and cyanosis due to impaction of the object in the larynx or subglottic region and even causes sudden death.

In first few hours after inhalation one can detect audible click, due to movement of FB up & down in the trachea, or fluttering noise due to oscillation of FB in the air stream. Latter on unilateral expiratory wheeze and unilateral diminished breathing sounds can be detected due to the FB been lodged in one of the main bronchus. Obstructive emphysema with mediastinum shift during expiration because of valvular obstruction of the main bronchus by the F B is also latter presentation<sup>7</sup>.

After 24 hours pneumonic signs supervene with fever, persistent paroxysm of cough, or even hemoptysis<sup>7</sup>.

The symptoms and signs are more sever and rapidly appear with vegetable FB than with inert or metallic one due to rapid swelling of the vegetable FBs which enhance airway obstruction and inflammation<sup>8</sup>. After several weeks or month and in neglected FBs, lung abscess may supervene which lead to unusual complications such as septicemia or brain may abscess<sup>8</sup>.

Majority of inhaled FBs are radio translucent and radiology imaging of chest is negative<sup>9</sup>. Radiological

imaging of chest should be taken in anterior-posterior view during both inspiration and expiration. This will be completed with a lateral view if needed. Majority of inhaled FBs are non-opaque on imaging, %20-10 of patients has negative radiology evidence of FB during first 24 hours after inhalation based on various studies<sup>9</sup>.

The best management for these cases with clinical suspicious of inhaled FB is rigid bronchoscopy under GA, which should be done by a surgeon with high skill in endoscopy to avoid serious complications<sup>10</sup>.

**Patients and methods**

This is a prospective study of seventy two patients with history of inhalation of FBs were seen in our otolaryngology clinic in Erbil between Jan 2007 to May 2013. This prolonged period was selected to have enough time to collect the highest possible numbers of cases. All patients were attended ENT department for management. History and clinical assessment of ears nose throat and chest examination to assess air entry were done by an ENT surgeon.

Data of patients including age, sex, and occupations were recorded and saved on PC for future analysis. Presenting symptom of choking, cough, dyspnea etc. were recorded. The physical finding of wheezing, unilateral, bilateral and or localized, diminished breathing sounds, localized crepitation or click and presence of sign of mediastinum shift all recorded prospectively.

All patients with suspected FB inhalation were sent for chest X-ray imaging. The finding of normal, hyper emphysema, collapse of lung, presence of radiopaque FBs and any mediastinum shift were recorded, see Table 1.

Patients with positive finding and highly suspicious for inhaled FB advised and underwent rigid bronchoscopy for diagnosis and therapy. The type of the FB and site of impaction of the foreign bodies removed were recorded. Complications if any was recorded and managed accordingly.

**Results**

Total 72 patients were recorded and their data analyzed. Age ranged from 18 months to 21 years. Sixty patients (%83) were under 10 years. Forty six patients were males and 26 females. Plain chest films were normal in %78) 56) of patients. The other findings are recorded in Table 1.

**Table (1):** Radiological findings on plain chest x-ray films

Radiological findings on plain X-ray films	No. of patients
Normal chest x ray	56
Opaque foreign bodies	5
Collapse part of lung	3
Obstructive emphysema and mediastinum shift	4
Segmental atelectasis or consolidation	3
Bilateral partial segmental collapse	1
<b>Total</b>	<b>72</b>

Commonest physical finding was unilateral diminished breathing sounds in 57, (79%) of cases, normal finding in 5, (7%) and in 10, (14%) patients had other findings such as crepitation, click sound on breathing, unilateral expiratory rhonchi and bilateral diminished breathing sounds and wheezing, Table 2.

**Table (2):** Commonest physical findings in inhaled foreign bodies

Physical finding on examination	No. of patients	Percentage
Normal finding	5	7%
Unilateral diminished breathing sounds	57	79%
Bilateral diminished breathing sounds	2	2.8%
Click sound on breathing	2	2.8%
Mediastinum shift and hyperemphysema	3	4.2%
Wheezing	2	2.8%
Crepitation	1	1.3%

Out of total 72 cases of aspirated FBs, sixty five of them under went rigid bronchoscopy under general anaesthesia (G A). Seven cases refused endoscopy and lost in follow up and therefore their bronchoscopy findings neither could be recorded nor not included in analyses.

In 65 patients underwent rigid bronchoscopy under GA, FBs found in 60 patients and in five cases no FB was found. Majority of FBs were found in the right main bronchus. Table 3 shows the site of impaction of the FBs as recorded during bronchoscopy.

**Table (3):** Site of impaction of foreign bodies

Site of impaction of the foreign body	No. of patients
Right main bronchus	45 (75%)
Left main bronchus	10 (17%)
Trachea	1 (1.5%)
Bilateral	1 (1.5%)
Larynx	3 (5%)
<b>Total</b>	<b>60</b>

The types of FBs found and removed are recorded in Table 4. Seeds were found to be the commonest inhaled FBs.

No serious complication was recorded in this series.

One patient underwent bronchoscopy twice within a week. In this child his symptoms were not resolved after the first bronchoscopy and during the second procedure a part of the FB (peanut) was found which was left behind during the first procedure.

**Table (4):** Types of inhaled foreign bodies removed with rigid bronchoscopy

Type of foreign bodies	No. of patients
Sunflower seeds	23
Water melon seed	14
Peanuts	9
Plastic toys	5
Rubber pencil eraser	3
Needles	2 photo 1
Metal clips	2 photo 2
Screws	1 photo 3
Chocolate sweet	1
<b>Total</b>	<b>60</b>

### Discussion

Foreign body aspiration can be a life-threatening emergency. An aspirated solid or semisolid object may lodge in the larynx or trachea. If the object is large enough to cause nearly complete obstruction of the airway, asphyxia may rapidly cause death<sup>11</sup>. Lesser degrees of obstruction or should the object passes beyond the subglottic region, its location would depend on the patient's age and physical position at the time of the aspiration. Because the angles made by the main stem bronchi with the trachea are identical until age of 15 years, therefore foreign bodies are found with equal frequency on either side in this age group<sup>12</sup>. In the older age group, majority of FBs will lodge in the right main bronchus<sup>13</sup>. In our series also 75% of FBs were found in the right main bronchus, and 17% in the left main bronchus and the rest lodged in the larynx, Table 3.

Many aspirated foreign bodies are unexpectedly discovered, go undetected, or are misdiagnosed<sup>14</sup>. Children especially those aged 1-3 years are at risk for foreign body aspiration because of their tendency to put everything in their mouths and because of inadequate way they chew<sup>15</sup>. Young children chew their food incompletely with incisors before their molar teeth eruption therefore objects or fragments of food may be propelled posteriorly and triggering process of inhalation<sup>16</sup>. In our cases 60 (83%) of patients were under 10 years.

Adults who undergo oropharyngeal procedures, have

various oral appliances, become intoxicated, receive sedatives, or may have neurological or psychiatric disorders are at increased risk of aspirating foreign bodies<sup>17</sup>. In our series only one patient inhaled a screw while he was working.

Common presentation of inhaled FBs is a sudden choking sensation followed by paroxysmal coughing which then ceases. Ninety percent of patients with FB inhalation have one symptom of triad – choking, coughing, and wheeze in the chest<sup>18</sup>. However choking sensation may have been forgotten and patients will present with chronic cough and or with lower respiratory tract infection which resists treatment<sup>19</sup>.

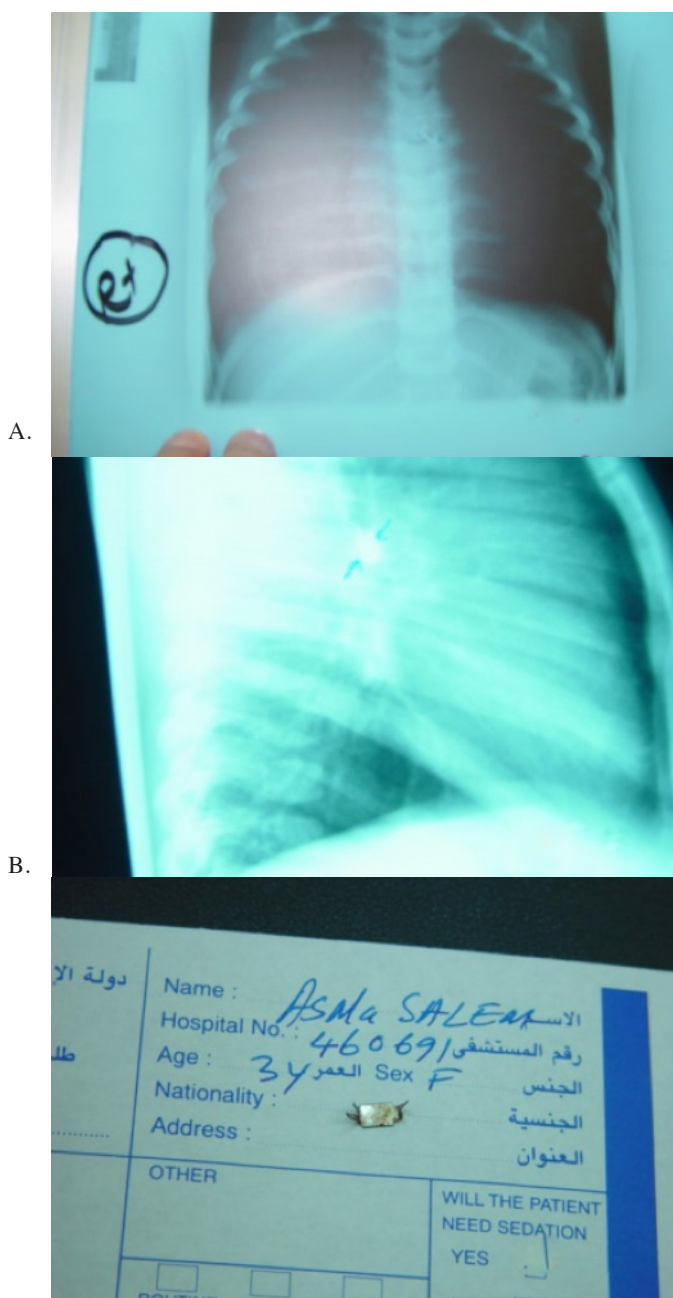
Sudden onset of wheeze in a child, not known to have asthma, especially if the wheeze is predominantly unilateral, is highly indicated for an inhaled FB.

Foreign body must be excluded also in unexplained persistent fever associated with respiratory symptoms cough wheezing etc., or recurrent lobar pneumonia<sup>20</sup>. Six percentage of acute respiratory distress may be due to foreign body in the larynx, large oesophageal FB compressing trachea, or sharp and long standing esophageal FB which is causing fistula between trachea and oesophagus.

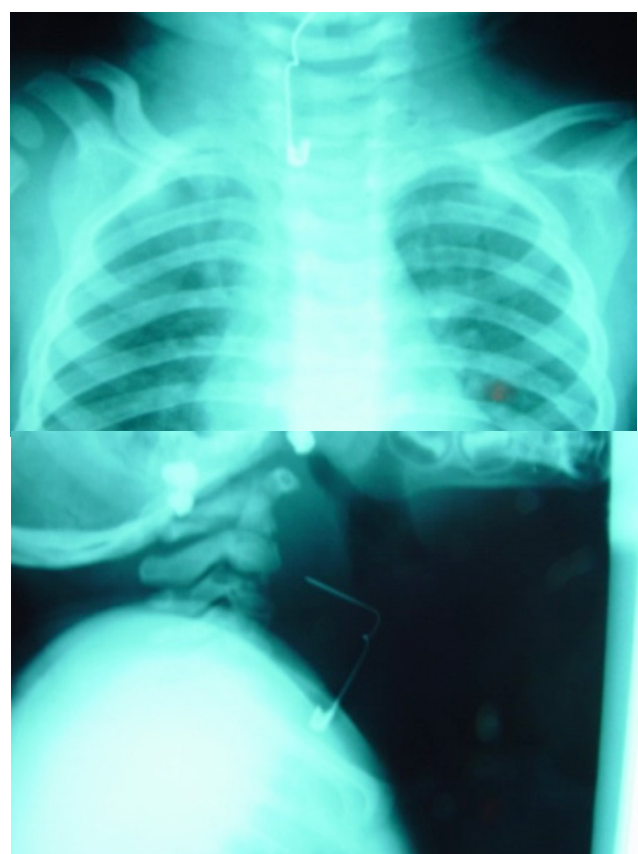
In our cases only 4 patients (5.5%) with FBs in larynx and trachea had respiratory distress. Sixty-three (87.5%) of our patients presented with definite choking and persistent cough; meanwhile 5 patients (7%) of cases denied any choking history. Foreign bodies lodge in larynx if they are sharp pointed or they are

larger than glottic diameter and impact in the larynx. Foreign bodies pass glottic region majority of them will lodge in right main bronchus due to anatomical facts that the right main bronchus is wider than left and the inclination of the right main bronchus is more than the left. In young children below 15 years this difference is less, hence FB are equally distributed between left and right main bronchi<sup>21</sup>. In our cases 45 patients (75%) FBs were in right main bronchus, 10 patients (17%) had FBs in left main bronchus, Table 3. Radiological findings in patients with inhaled foreign bodies include: Normal chest x-ray, obstructive emphysema, opaque foreign body, atelectasis, medi-

astinum shift and pneumonia with collapse and consolidations. Finding on imaging depends on the duration of attendance after inhalation. The first few hours chest imaging may be normal. The more the delay of presentation the more positive finding will be detected<sup>22</sup>. In our series 56 patients (78%) had normal chest x ray on admission; five cases (7%) had opaque FBs. The remaining cases presented late and showed other signs on chest imaging, Table 1. Opaque foreign body such as metallic foreign bodies can be localized in main bronchus. Sharp and pointed FB can be seen in larynx and trachea, Figures 3, 4, and 5.



**Figure (3):** A, B, C shows metallic clips in left main bronchus .



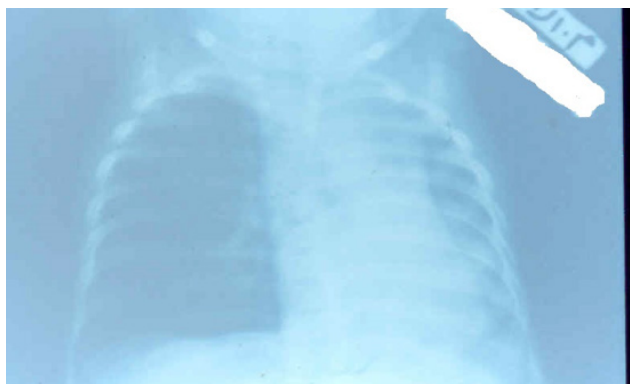
**Figure (4):** Safty pin in larynx.



**Figure (5):** A needle in the left main bronchus.

Small opaque FB may be undetected and chest imaging may be reported normal, especially if the FB is lodged in the left side and overlapped by heart or mediastinum shadows.

The lung collapses and mediastinum shifts towards the obstructed side of the chest and mediastinum remaining shifted during both inspiration and expiration, Figure 6.



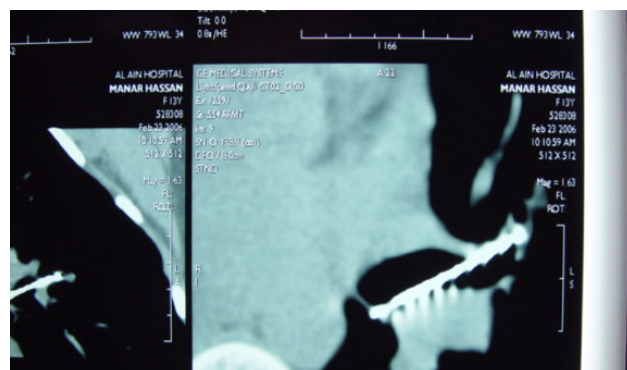
**Figure (6):** Foreign body in left main bronchus with collapsed left lung.

Obstructive emphysema by volvulus obstruction due to presence of FB in the lumen of one of the main bronchus is another radiological finding. The air is trapped beyond the obstruction during breathing and leads to hyper emphysema. There will be mediastinum shift during expiration towards the unobstructed side of the chest, in inspiration the mediastinum may return to the midline, Figures 1, 2.

Fluoroscopy of the chest can be performed to observe diaphragmatic and mediastinum shifting of air trapping, while the patient is breathing or if the diagnosis is in doubt and if the patient is not cooperate<sup>23</sup>. In our series this procedure was not done.

CT scanning of the chest may show the object or may identify localized air trapping. The presence of a foreign body and its exact anatomic site (in larynx, trachea, main, lobar or segmental bronchus), shape, composition, size may be well defined. However the foreign body may be missed if it is of a color that would camouflage it from the surrounding mucosa (e.g carrot, rubber or pencil eraser) or if it is completely engulfed by granulation tissue<sup>24</sup>.

In our cases only one patient sent for CT. The patient aspirated a needle which lodged in left main bronchus, but she had neither respiratory symptom nor gave and history of choking. The definite location of the FB could not be made, however CT localized the FB to be in the left main bronchus, Figure 7.



**Figure (7):** CT chest of a needle in left main bronchus.

The use of CT scanning in managing the child with a foreign body in the airway has recently been questioned. CT imaging should be done only if diagnoses are not clear from history, physical finding and chest plain imaging. Children should not be exposed for unnecessary excessive radiation<sup>25</sup>. Management of inhaled foreign bodies is an emergency and should not be delayed to avoid complications.

Acute choking, with acute respiratory distress associated with tracheal or laryngeal foreign body obstruction, may be successfully treated at the scene with the Heimlich maneuver, back blows, or abdominal thrusts<sup>26</sup>.

A FB in respiratory tract whether suspected or diagnosed radiologically, must be removed endoscopically under general anesthesia using rigid bronchoscope and variable tools.

The procedure must be performed as an emergency if the air way is compromised. However in absence of respiratory distress the procedure shall be done as an elective procedure.

Most of aspirated foreign bodies are radiolucent. The presentation may be delayed, and the patient may have been unsuccessfully treated for other conditions. Therefore even in nonemergency situations, expeditious removal of tracheobronchial foreign bodies is recommended. If the history and physical findings are diagnostic, no workup is needed. The child should immediately be referred for rigid bronchoscopy<sup>27-28</sup>.

Although a flexible bronchoscopy is useful in detecting a foreign body, removing most foreign bodies using the currently available flexible bronchoscopes and their attachments is difficult. If the possibility of foreign body is significant but has not been diagnosed by physical examination or radiographic studies, flexible bronchoscopy should be strongly considered.

If the diagnosis is known or confirmed, rigid bronchoscopy is the procedure of choice. However, removal using a fiberoptic bronchoscope has been re-

ported<sup>29</sup>.

The flexible bronchoscope can provide access to subsegmental bronchi beyond that provided by the rigid bronchoscope. The flexible fiberoptic bronchoscope offers a limited capability to visualize, grasp, and remove certain foreign bodies of appropriate size, shape, and position. Moreover flexible bronchoscopy can expose the patient to a greater risk of bleeding, shattering of the object, and losing the object in the subglottic area or more distal bronchus. This makes airway obstruction or even asphyxiation worse & even subsequent extraction more difficult<sup>30</sup>. Also if a foreign body is detected upon flexible bronchoscopy, the child should undergo rigid bronchoscopy to remove the material. Despite its limitations, use of the flexible fiberoptic bronchoscope may be necessary in patients with maxillofacial or cervical trauma in whom rigid bronchoscopy is not feasible<sup>31</sup>.

Whichever technique is used, it is essential to determine that the foreign body is totally been extracted. Objects not successfully removed may fragment and become impacted in the distal bronchi. Therefore careful examination of the removed FB for the complete integrity should be done. Second inspection of the tracheobronchial tree again after removal of the FB for fragments or other unsuspected foreign bodies is necessary<sup>32-33</sup>.

Almost all aspirated foreign bodies can be extracted by bronchoscopy. If rigid bronchoscopy is unsuccessful patient must be referred to chest surgeon for possible surgical bronchotomy or segmental resection which ever may be necessary. Chronic bronchial obstruction with bronchiectasis and destruction of lung parenchyma may require segmental or lobar resection<sup>34</sup>.

In our series, out of 65 patients, in sixty of them a FB was found. All patients have the FBs removed by rigid bronchoscopy procedure under GA with full relaxation. We did not use flexible bronchoscope as we believed has limitation with foreign body extraction. No serious complication was recorded. One patient underwent bronchoscopy twice within a week; this child had his symptoms not resolved after the first bronchoscopy. During the second procedure a part of the FB (peanut) was left behind or undetected during the first procedure and removed in this second procedure.

## Conclusions

Commonest FBs inhaled accidentally are food particles or objects or part of toys the child putting them in the mouth cavity. Almost on clinical examination

of chest some positive findings is detected such as diminished unilateral breathing sounds. Chest plain x-ray is essential however, normal chest imaging does not exclude presence of FB, as majority of inhaled FBs are radiolucent. Once inhaled FB is diagnosed or highly suspected rigid bronchoscopy must be done for diagnosis and treatment preferably by a skill surgeon in endoscopy.

Following endoscopic removal of a FB, it is essential to inspect the FB to see if it has been fragmented or complete. Have a second look to exclude a second FB might have been left behind in the bronchus! Tracheobronchial tree shall be washed with normal saline solution; to wash away any small pieces of FB particle might have been left behind.

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