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REVIEW / DERLEME

Foreign body aspirations with rigid bronchoscopy and esophagoscopy in children

Çocuklarda rijit bronkoskopi ve özofagoskopi ile yabancı cisim aspirasyonları

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ABSTRACT

Foreign body aspirations and esophageal foreign bodies are life-threatening conditions. Sometimes they or their complications can cause severe morbidity and even mortality. Their exact incidence is unknown. Foreign body aspirations and esophageal foreign bodies are most commonly observed in the pediatric age group. While interventions are generally required for the removal of respiratory tract foreign bodies, the majority of esophageal foreign bodies come out spontaneously. Removal of foreign bodies that block the lumen of the organ to a great extent, react with the mucosa such as battery magnets, and can cause poisoning, sharp-edged objects, and swellable foreign bodies such as legumes, should be done acutely. In the removal of foreign bodies, endoscopic methods (flexible/rigid bronchoscope) are used in the respiratory system. Other methods used in esophageal foreign bodies are follow-up and pushing and pulling maneuvers with equipment, and at times, open surgical procedures can be applied. The success of the procedures is high, and patients can be discharged in the early postoperative period. Their incidence can be decreased by raising awareness on the subject, parents can be prevented from making wrong applications in these cases, and clinicians can keep these conditions in mind in differential diagnosis. In this article, the clinical features and diagnosis and treatment methods of foreign body aspiration and esophageal foreign bodies will be discussed separately.

Keywords: Esophageal foreign body, foreign body aspiration, rigid bronchoscopy

ÖZ

Yabancı cisim aspirasyonları ve özofagus yabancı cisimleri hayatı tehdit eden durumlardır. Bazen kendileri bazen oluşturdukları komplikasyonlar ciddi morbiditeye hatta mortaliteye neden olabilirler. Kesin insidansları bilinmemektedir. Yabancı cisim aspirasyonları ve özofagus yabancı cisimleri en sık pediatrik yaş grubunda görülmektedir. Solunum yolu yabancı cisimlerinin çıkartılması için genel olarak müdahaleler gerekirken özofagus yabancı cisimlerinin çoğunluğu kendiliğinden çıkmaktadır. Pasajı büyük ölçüde tıkayan, pil mıknatıs gibi mukozada reaksiyon gösteren zehirlenme yapabilen, keskin uçlu cisimler, bakliyat gibi şişebilen yabancı cisimlerde yabancı cismin çıkartılması akut yapılmalıdır. Yabancı cismin çıkartılması işleminde solunum sisteminde tama yakın olmak üzere endoskopik yöntemler (fleksibl/rijit bronkoskop) kullanılmaktadır. Özofagus yabancı cisimlerinde bunun dışında takip ve bazı ekipmanlarla itme çekme gibi yöntemler de kullanılabilmekte, zaman zaman ise açık cerrahi işlemler uygulanabilmektedir. İşlemlerin tedavi başarıları yüksek olup genel olarak işlem sonrası erken dönemde hastalar taburcu edilmektedir. Konu ile ilgili farkındalık artırılarak insidansları azaltılabilir, ebeveynlerin yanlış uygulama yapmaları engellenebilir ve klinik hekimleri ayırıcı tanıda bu durumları akıllarında tutabilir. Makalemizde yabancı cisim aspirasyonu ve özofagus yabancı cisimleri klinik özellikleri ve tanı ve tedavi yöntemleri ayrı ayrı ele alınacaktır.

Anahtar sözcükler: Özofagus yabancı cismi, yabancı cisim aspirasyonu, rijit bronkoskopi

TRACHEOBRONCHIAL FOREIGN BODIES

Tracheobronchial foreign bodies are frequently seen in the childhood age group, particularly in the first three years of life, and constitute an important part of accidental deaths in this age group.[1-5] The exact incidence is not known.[6] The incidence rate in the pediatric age group is estimated to be 29.9 per 100,000, and the mortality rate is estimated to be 0.6 per 100,000.[3,7] While the out-of-hospital mortality rate is 36.4%, the hospital mortality rate is between 0.26-13.6%.[2,8,9] It is thought that the reasons

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for its frequent occurrence in this age group are the active mobility of children, crying and laughing during meals, efforts to recognize objects with their mouths, coordination disorders during swallowing, and dental structures.[10] In addition to these, some other risk factors have been reported, such as giving age-inappropriate foods (e.g., nuts), inappropriate toy selection, lack of parental education, and lack of attention and care.[11] Although it is mostly observed in males, it is also reported to be more common in females by some authors.[1,5,8,12-14] While it is expected to be more frequently encountered in the right bronchial system in adults, it is observed at a similar rate in both respiratory tracts in the pediatric age group in contrast to adults.[12,15,16]

The nature of the aspirated foreign body varies according to the environment, season, socioeconomic status, cultural habits, and religious beliefs.[17,18] In the clinic, foreign bodies can be classified into two classes: organic and inorganic. In the younger age group, more organic food aspirations, particularly nuts, are encountered,[5,12] whereas inorganic foreign body aspirations, such as needles, toy parts, thumbtacks, pencil bows, and pencil caps, are encountered in older age groups.[19] In our country, nuts, pulses, and toy parts are frequently aspirated in the pediatric age group.[10,11,16,17]

Most of the time, the children are admitted to the healthcare center with a similar story. While playing or crying, a child who has food in their mouth may suddenly experience respiratory distress and cyanosis, followed by a period of relief, and then wheezing. In some children, the diagnosis is suspected with a chest radiograph taken after several visits to a physician. It may be difficult to take patient history due to the child's inability to express themselves, the parents not witnessing the event from time to time, and the inability to give an appropriate anamnesis due to anxiety in the persons taking care of the child. Sometimes concurrent upper and lower respiratory tract infections may make the diagnosis more complicated.

Cases may be asymptomatic or may present with clinical pictures as severe as respiratory arrest. Factors such as the nature of the foreign body, the size, localization, whether it is displaced or not, the time elapsed since the event, the size of the respiratory tract, the reactions of the foreign body on the respiratory tract mucosa, and infection conditions are effective in the clinical course. In the acute phase, the patient may be asymptomatic, but the main symptoms and physical examination findings are feeling of suffocation, dyspnea, cyanosis, wheezing, cough, hoarseness, agitation, decreased participation of one hemithorax in respiration on inspection, decreased unilateral respiratory sounds, pathological respiratory tract sounds, such as stridor and wheezing, intercostal retractions due to respiratory failure, and participation of the abdomen in respiration. In the chronic period, symptoms related to atelectasis, pneumonia, bronchiectasis, granulation tissue in the respiratory tract, mediastinitis, lung abscess, fistula, and pneumothorax may be observed. Since the symptoms observed are not specific to the case, patients may be followed up and treated for a long time with different respiratory system diseases.

Radiological images can provide important information in terms of diagnosis. However, it should be kept in mind that chest radiography may be normal in 35-38% of foreign body aspirations.[3,8] Radiological imaging methods may help to make the diagnosis directly and indirectly. The radiopaque foreign body itself can be observed directly. Considering all foreign body aspirations, it is estimated that radiopaque and X-ray-detectable foreign bodies constitute 26% of all foreign body aspirations.[20] In nonradiopaque foreign bodies, findings such as atelectasis, air trapping, and mediastinal shift in the early period (Figure 1) or bronchiectasis and pneumonia infiltration-consolidations in the late period support the diagnosis. In proximal radiopaque foreign bodies, it may not be clearly distinguished whether the foreign body is in the esophagus or respiratory tract on plain thorax radiography. In such cases, lateral radiography will help determine the localization of the foreign body. Although there are publications recommending the use of low-dose tomography due to it being less invasive than diagnostic bronchoscopy for diagnostic purposes, particularly in cases where

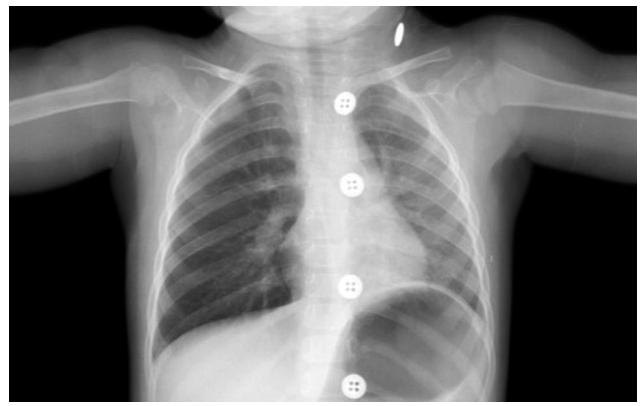

Figure 1. An early finding in chest radiographs, air trapping.

the clinical suspicion of a foreign body is low,[9] its use in practice is limited.

Although anamnesis, physical examination, and radiological imaging may provide an indication for the endoscopic procedure, bronchoscopic procedures are often needed to confirm the diagnosis. The false negative rate in bronchoscopic procedures is reported to be 14.5%.[21]

The important thing in all stages of treatment is to ensure airway patency. In areas outside the hospital, the Heimlich maneuver is performed in emergency life-threatening situations that completely obstruct the airway. Rigid bronchoscopy is the golden method for the removal of foreign body at a hospital in more stable clinical situations other than such situations. Although there are recent studies[3,7,18] reporting success with flexible bronchoscopy due to some advantages, rigid bronchoscopy is still the most effective method in treatment. Rigid bronchoscopy has a very high success rate, low complication rate, and allows intervention with complications that may occur due to a foreign body.[14] Minor complications are reported as 14%, major complications as 1%, and mortality rate as 0.42-0.8%.[9,10] The main complications include low oxygen and high carbon dioxide levels and related organ damage, respiratory tract spasm, trauma-related airway laceration/perforation, pneumothorax, pneumomediastinum, and cardiac arrest. In cases where the entire respiratory tract cannot be evaluated due to residual foreign body or granulation tissue, the procedure may sometimes need to be repeated. The timing of the procedure is controversial, but the consensus is that it should be performed early, particularly in sharp foreign bodies, substances such as batteries that may react with the mucosa, and in foods such as chickpeas or other legumes that may expand and cause airway rupture. In cases where the foreign body cannot be removed by rigid bronchoscopy due to the large size of the foreign body, in foreign bodies that have advanced to the lung parenchyma, or in late complications, such as bronchiectasis and abscess, surgical procedures can be performed.

From time to time, while informing the patient's relatives, informing them that the procedure will be performed under general anesthesia and that there is a risk of complications may cause stress on these people, and families may refuse the procedure for this reason. In these cases, it is important for the physician to act in accordance with the current legislation to protect themselves and the patient.[10] Training should be given on foreign body aspiration and awareness should be raised. Consequently, applications to a health institution will be made earlier, parents will take an appropriate approach at the time of the incident, and thus the number of cases will decrease, and more complicated cases can be prevented. Another issue is to determine the production standardization of the products and to ensure that they are sold in accordance with the age limit, which will make the packaging of some toys and foods less dangerous.

ESOPHAGEAL FOREIGN BODIES

Esophageal foreign objects may be swallowed intentionally or accidentally, they may be swallowed with food, or they may remain in the esophagus as food pieces due to neurological diseases and esophageal diseases. It is more common in childhood, particularly in the first five years of life and in males.[22-25] Although the most commonly observed esophageal foreign body in the pediatric age group is a coin, other commonly observed esophageal foreign bodies are chicken/fish bones, needles, food particles, pins, buckles, buttons, batteries, and toy parts.[22,23,26,27] Foreign bodies are mostly observed in the anatomical/physiological/pathological stenosis areas of the esophagus.[24] In children, the majority of them are observed in the cricopharyngeal area at the upper end of the esophagus.[22,25,28,29]

Patients are usually noticed by family members or caregivers and admitted to the health institution or diagnosed at the time of admission to the health institution for a different reason. It may not give any obvious symptoms or may be very noisy. Symptoms mainly occur due to obstruction and perforation. Factors such as the nature of the foreign body, size, localization, time elapsed since the event, and age play a role in symptom formation.[22-24,26-28] The main symptoms are dysphagia, retching, stinging sensation in the throat, sore throat, stridor, hypersalivation, chest pain, and respiratory distress.[29] Respiratory tract symptoms may be caused by direct neighborhood with the respiratory tract and inflammatory processes.[26] Apart from obstruction and perforation, significant complications, such as mucosal damage, fistula, mediastinitis, and major vascular injury, may be encountered. In the late period, severe clinical conditions, such as malnutrition, aspiration pneumonia, protrusion out of the lumen, and pseudodiverticulum, may be observed.[23] Considering the neighboring organ relations, anatomical structure of the localization, vascularity, and its own two-story structure, a perforation complication that may occur may have a mortal course. Physical examination may be completely natural, or there may be respiratory sounds such as stridor and wheezing due to pressure on the neighboring airways, as well as tenderness

and crepitation on palpation in the neck region due to perforation.

Radiological examinations play an important role in the diagnosis. In addition to plain thorax radiography, cervical radiography and even abdominal radiography should be performed in some cases. The foreign body may be directly observed on radiographs (Figure 2), or indirect findings, such as an air-fluid level, mediastinal emphysema, and pneumothorax, may present themselves. Failure to detect the foreign body by radiological methods does not rule out the diagnosis of an esophageal foreign body as in respiratory tract foreign bodies. It has been reported that qualitatively thin, small-sized foreign bodies can be missed in X-ray with a rate of 85%.[29] Computed tomography can be used for diagnostic purposes and to observe possible complications.[29]

It has been reported that most of esophageal foreign bodies are excreted with feces without the need for intervention.[6,22,30] The choice of the treatment method depends on factors such as the nature and localization of the foreign body and the time elapsed since the event.[28] In the removal of the foreign body, observation is at times sufficient. Otherwise, a Foley catheter can be used, it can be withdrawn, it can be pushed with a spark plug, intravenous glucagon can be used to relax the lower sphincter, the penny pincher technique can be used, rigid esophagoscope can be used, Magill clamp can be used, and open surgery can also be performed.[26,27,30] If endoscopy is available, it is recommended to perform endoscopy first due to the risk of perforation and respiratory aspiration in pushing and pulling procedures.[22] Large, sharp foreign bodies, batteries, magnets, or foreign bodies that can cause total luminal obstruction should be removed early.[29] If these foreign bodies are not removed in a short time, they may cause significant morbidity and mortality. Rigid esophagoscopy is a diagnostic and therapeutic method with high success rate and low complication rate. After anesthesia, some foreign bodies may pass into the stomach as a result of relaxation of the sphincters.[24] It has been reported that minor and major complications may be encountered with a rate of 3.1-15% in procedures related to foreign body removal in children.[25,26] Complications of the procedure that mostly affect the pulmonary system also include mucosal injury, hemorrhage, rupture, mediastinitis, empyema, and pneumohemothorax. The rate of procedure-related esophageal rupture has been reported to be 0.1-1.9%.[24] Open surgery is mostly planned for foreign bodies that are sharp/piercing that can cause complete laceration, foreign bodies that cannot be removed endoscopically, and complications that may occur due to the foreign body.[29] The necessity of surgical treatment has been reported as 1-18%.[24,29]

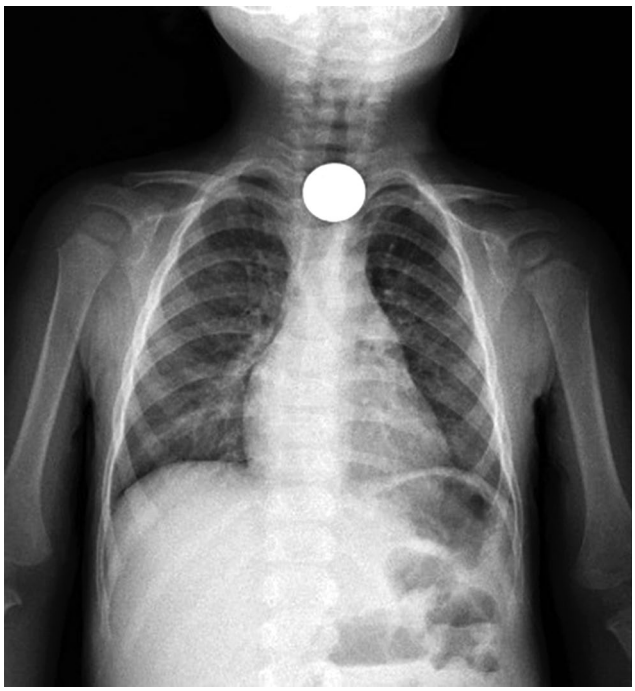

Figure 2. Esophageal foreign body (coin).

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