

Ultrasonographic Visualization of an Aspirated Foreign Body in Lung Tissue

Akciğer Dokusunda Aspire Edilen Yabancı Cismin Ultrasonografi ile Görüntülenmesi

Nalan Kozacı¹, Mustafa Avcı¹, Muharrem Özkaya²

Abstract

Ultrasonography is widely used for diagnostic purposes in emergency departments. The visualization of an aspirated foreign body and the surrounding inflammation using lung ultrasonography is described in this case report.

Key words: Lung ultrasonography, foreign body, aspiration.

Özet

Acil servislerde ultrasonografi tanısal amaçlı yaygın olarak kullanılmaktadır. Bu olgu sunumunda aspire edilen yabancı cisim ve etrafında oluşturduğu inflamasyonun akciğer ultrasonografi ile görüntülenmesi anlatılmıştır.

Anahtar Sözcükler: Akciğer ultrasonografisi, yabancı cisim, aspirasyon.

Foreign body (FB) aspiration is an important cause of morbidity and mortality, especially in children. Posteroanterior (PA) and lateral chest radiographs should be performed when FB aspiration is suspected. Lung ultrasonography (LUS) is an alternative to direct radiographs in emergency departments to visualize lung pathologies (1-4). In this case report, the visualization of aspirated foreign body (FB) and surrounding inflammation by LUS is described.

CASE

A 2-year-old girl was brought to the pediatric emergency department by her family. According to the information provided by the mother, the child had a cough and fever, and had been examined by a family physician and given paracetamol for a few days, but the complaints continued to increase. On admission, the patient's general appearance was good and she had no respiratory distress.

¹Department of Emergency Medicine, Antalya Education and Research Hospital, Antalya, Turkey

²Department of Thoracic Surgery, Antalya Education and Research Hospital, Antalya, Turkey

¹Antalya Eğitim Araştırma Hastanesi, Acil Tıp Kliniği, Antalya

²Antalya Eğitim Araştırma Hastanesi, Göğüs Cerrahisi, Antalya

Submitted (Başvuru tarihi): 08.05.2017 **Accepted (Kabul tarihi):** 27.06.2017

Correspondence (İletişim): Nalan Kozacı, Department of Emergency Medicine, Antalya Education and Research Hospital, Antalya, Turkey

e-mail: nalankozaci@gmail.com



Her respiratory rate was normal and she was not cyanotic. The patient's vital signs were as follows: axillary temperature: 38.5°C, respiratory rate: 25 breaths per minute, and pulse oximeter oxygen saturation: 99%. The physical examination was normal, except for low frequency rales in a small area at the base of the right lung.

The laboratory results were as follows: white blood cell count: $12.3 \times 10^3/\text{mm}^3$, hemoglobin: 11.3 g/dL, red blood cell count: $5 \times 10^6/\text{mm}^3$, platelet count: $346 \times 10^3/\text{mm}^3$, and C-reactive protein level: 75 mg/dL.

A 38-mm long, needle-like FB was detected in the right lower lung lobe on a chest radiograph of the patient (Figure 1). The family was asked about possible FB aspiration, but they said they did not know how or when the aspiration happened. It was noted that the mother of the child wore a headscarf secured with pins.

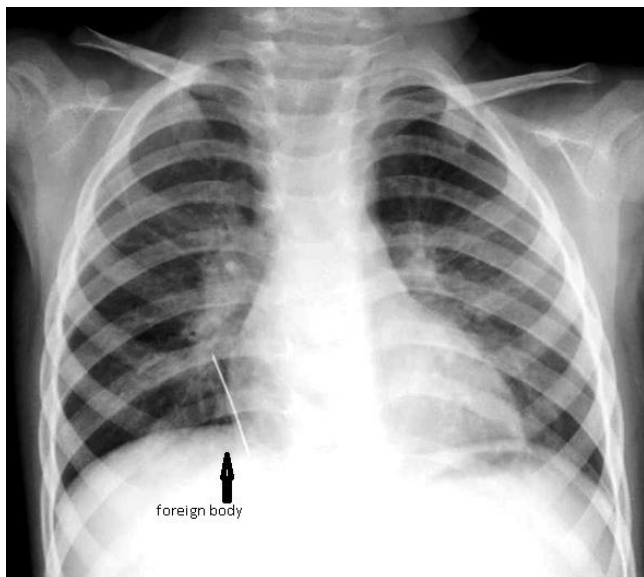


Figure 1: Needle-like foreign body image in chest radiograph

Bedside LUS was performed by the emergency physician to assess the patient's cough and fever, as well as the appearance of the FB in the lung tissue. A 7.5 MHz linear probe of the Mindray M5 portable ultrasonography device (Shenzhen Mindray Bio-Medical Electronics Co., Ltd., Shenzhen, China) was used for imaging. Lung tissue was visualized on the right and left sides of the chest, longitudinally and transversally on the midclavicular and midaxillary lines at 4 points. Ultrasonography revealed a FB in the right lower lung lobe (Figure 2). It was seen that the FB was embedded in the lung tissue. In addition, an area of infiltration was observed in the lungs near the FB. The fever and cough were linked to reactive infiltration around the FB. The patient was consulted to the department of thoracic surgery for the removal of the FB. The thoracic

surgeon assessed the ultrasonography images with direct X-ray. The patient was taken to the operating room for a bronchoscopy under general anesthesia. Rigid bronchoscopy revealed a fixed FB in the bronchial orifice of the right lower lung lobe. The FB stuck in the lung tissue could not be removed on the first attempt, but the second attempt was successful. It was seen that the extracted FB was a pin surrounded by granulation tissue. The patient was monitored for 2 days and discharged healthy.

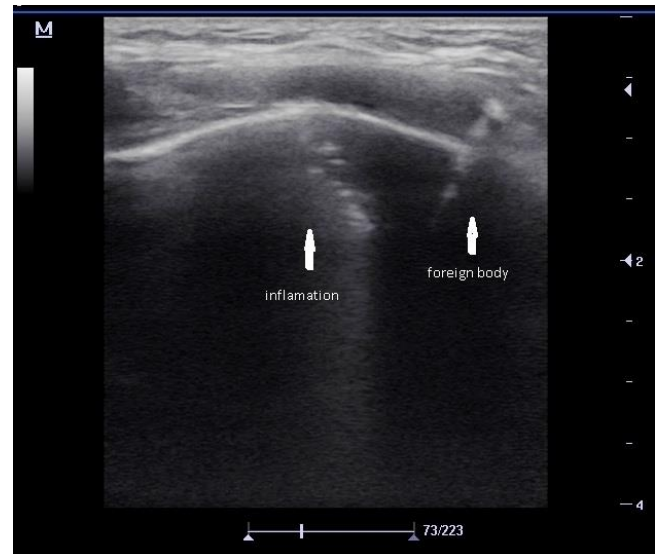


Figure 2: Needle-like foreign body and inflammation image in lung ultrasonography

DISCUSSION

FB aspiration is an important cause of morbidity and mortality, especially in children under 3 years of age. Early identification and treatment of FB aspiration is important because of the significant complications that may develop. However, since FB aspiration can mimic other respiratory problems, management can be difficult (1,2,5). The findings change according to the location of the FB. The majority are located in the right lung and main bronchi; FBs in the trachea are relatively rare, but categorically life-threatening. Symptoms include stridor, wheezing, shortness of breath, and sometimes hoarseness. A FB located in the lower respiratory tract causes very little acute distress after the first asphyxia period has passed. If the diagnosis of FB is delayed, complications such as inflammation and infection can develop in the airways days and weeks later. Fever and other symptoms of pneumonia can occur. If there is no history of asphyxia, FB is not suspected. Fever, dry cough, dyspnea, wheezing, and recurrent pneumonia may develop (1,5).

PA and lateral chest radiographs should be performed when FB aspiration is suspected. Radiopaque particles in

the trachea can be distinguished on PA and lateral cervical radiographs. Radiographs also show other inflammatory lung problems. Endoscopy is the gold standard for the diagnosis and removal of FB. Rigid bronchoscopy, rather than flexible, can be performed in cases with an unknown diagnosis or with a known diagnosis but unknown localization (1,5).

Computed tomography (CT) is another diagnostic option for stable patients with normal radiographs but ongoing suspicion of FB (6).

LUS is an alternative to direct radiographs in emergency departments to visualize lung pathologies. It is used to confirm endotracheal tube placement and for visualization of pneumothorax, alveolar pathologies, lung consolidation, and pleural effusion (7). Studies have shown that LUS is superior to direct radiographs in visualizing alveolar pathologies (3,4).

Ultrasonography studies have been performed to visualize FBs located in different parts of the body. Ultrasonography was demonstrated to be successful in detecting and localizing FBs (8,9). There are no LUS studies, but there are case reports for FBs aspirated into the respiratory tract (10,11). In one case report, atelectasis and pneumonia due to FB were visualized with LUS (11).

In the present case, the FB was detected incidentally on a chest radiograph in a patient with complaints of cough and fever. Although the direct X-ray showed a FB, the infiltration area could not be distinguished, so it was not clear whether the event was acute or chronic. The FB was visualized using a bedside LUS device. The images showed that inflammation had developed around the FB. The presence of inflammatory areas led to the conclusion that the FB aspiration was chronic. It was also thought that the removal of the FB might be difficult as the object was stuck in the lung tissue, and in fact, it was difficult to remove the FB by bronchoscopy. It was also understood that the phenomenon was chronic based on the presence of granulation tissue around the FB once removed. When compared with a direct X-ray, LUS provided more detailed information about the FB. It also has the advantages of allowing for repetitive evaluations, avoiding radiation exposure, and being performed bedside.

In conclusion, LUS can be used as an alternative imaging method to supplement radiographs in emergency departments in the visualization of FBs and the reactions that develop in the lung tissue.

CONFLICTS OF INTEREST

None declared.

AUTHOR CONTRIBUTIONS

Concept - N.K., M.A., M.Ö.; Planning and Design - N.K., M.A., M.Ö.; Supervision - N.K., M.A., M.Ö.; Funding - N.K., M.A., M.Ö.; Materials - F.C.; Data Collection and/or Processing - N.K.; Analysis and/or Interpretation - N.K.; Literature Review - N.K., M.A.; Writing - N.K., M.A., M.Ö.; Critical Review - N.K., M.A., M.Ö.

YAZAR KATKILARI

Fikir - N.K., M.A., M.Ö.; Tasarım ve Dizayn - N.K., M.A., M.Ö.; Denetleme - N.K., M.A., M.Ö.; Kaynaklar - N.K., M.A., M.Ö.; Malzemeler - F.C.; Veri Toplama ve/veya İşleme - N.K.; Analiz ve/veya Yorum - N.K.; Literatür Taraması - N.K., M.A.; Yazıyı Yazan - N.K., M.A., M.Ö.; Eleştirel İnceleme - N.K., M.A., M.Ö.

REFERENCES

1. Sultan TA, van As AB. Review of tracheobronchial foreign body aspiration in the South African paediatric age group. *J Thorac Dis* 2016; 8:3787-96. [\[CrossRef\]](#)
2. Parida PK, Shanmugasundaram N, Gopalakrishnan S. Clinico-radiological parameters predicting early diagnosis of foreign body aspiration in children. *Kulak Burun Bogaz İhtis Derg* 2016; 26:268-75. [\[CrossRef\]](#)
3. Subramaniam S, Chao JH. Comparison of lung ultrasonography and chest radiography for diagnosis of childhood pneumonia: pediatric emergency medicine physicians viewpoint. *Indian Pediatr* 2016; 53:1011.
4. Pereda MA, Chavez MA, Hooper-Miele CC, Gilman RH, Steinhoff MC, Ellington LE, et al. Lung ultrasound for the diagnosis of pneumonia in children: a meta-analysis. *Pediatrics* 2015; 135:714-22. [\[CrossRef\]](#)
5. Safari M, Manesh MR. Demographic and clinical findings in children undergoing bronchoscopy for foreign body aspiration. *Ochsner J* 2016; 16:120-4.
6. Yang C, Hua R, Xu K, Hua X, Ma P, Zheng JN, et al. The role of 3D computed tomography (CT) imaging in the diagnosis of foreign body aspiration in children. *Eur Rev Med Pharmacol Sci* 2015; 19:265-73.
7. Francisco MJ Neto, Rahal A Junior, Vieira FA, Silva PS, Funari MB. Advances in lung ultrasound. *Einstein (Sao Paulo)* 2016; 14:443-8. [\[CrossRef\]](#)
8. Aras MH, Miloglu O, Barutçugil C, Kantarci M, Özcan E, Harorli A. Comparison of the sensitivity for detecting foreign bodies among conventional plain radiography, computed tomography and ultrasonography. *Dentomaxillofacial Radiology* 2010; 39:72-8. [\[CrossRef\]](#)
9. Davis J, Czerniski B, Au A, Adhikari S, Farrell I, Fields JM. Diagnostic accuracy of ultrasonography in retained soft

tissue foreign bodies: a systematic review and meta-analysis. *Acad Emerg Med* 2015 Jul; 22:777-87. [\[CrossRef\]](#)

10. Weerdenburg KD, Kwan CW, Fischer JW. Point-of-care ultrasound findings associated with foreign body aspira-

tion in the pediatric emergency department. *Pediatr EmergCare* 2016; 32:486-8. [\[CrossRef\]](#)

11. Bourcier J.E, Babinet M, Garnier D. Lung ultrasound leading to a diagnosis of bronchial foreign body. *Austin J Pulm Respir Med* 2016; 3:1044.