

The Impact of COVID-19 Pandemic on Pediatric Bronchoscopy Performed for Foreign Body Aspiration

Covid-19 Pandemisinin Yabancı Cisim Aspirasyonlarında Pedyatrik Bronkoskopi Üzerine Etkisi

Yeliz Kart[®], Emine Bilaloğlu[®], Muhammed Akif Ertuğrul[®], Levent Duman[®], Mustafa Çağrı Savaş[®]

Cite as: Kart Y, Bilaloğlu E, Ertuğrul MA, Duman L, Savaş MÇ. The impact of COVID-19 pandemic on pediatric bronchoscopy performed for foreign body aspiration. Northwestern Med J. 2021;1(2):42-7.

ABSTRACT

Objective: Foreign body aspiration is a common airway emergency in the pediatric population. As the number of COVID-19 cases has grown exponentially around the world, elective surgical operations have been reduced in many centers. However, it is obvious that bronchoscopy performed due to foreign body aspiration in children cannot be delayed. The aim of this study is to investigate the effects of the COVID-19 pandemic on bronchoscopic procedures in children with suspected foreign body aspiration.

Method: Sixty-three patients who were admitted to our hospital with suspected foreign body aspiration between January 1, 2016 and December 31, 2020 were included in the study. The patients were divided into two groups according to admission date as those admitted before and after March 10, 2020, when the first case of COVID-19 were reported in Turkey. Patients' age, gender, history, physical examination findings, thorax radiography and computed tomography findings, the time period between admission to the hospital and bronchoscopy, presence of foreign body detected in bronchoscopy and complications were evaluated retrospectively from medical records.

Results: The study included a total of 63 patients, of whom 48 were in Group 1 and 15 in Group 2. Foreign body aspiration was more commonly seen in boys in both groups. The mean age of the patients was 38.35 (± 37.08) months in Group 1 and 27.06 (± 38.18) months in Group 2. When the two groups were compared in terms of the presence of a foreign body history, physical examination findings, thorax radiography findings and post-procedural complications, any significant intergroup difference was not found. The time period between admission to the hospital and bronchoscopy was 10.45 (± 19.66) hours in Group 1 and 35.93 (± 32.53) hours in Group 2. This period was significantly longer in Group 2 when compared to Group 1.

Conclusion: Foreign body aspiration in children continues to occur during the COVID-19 pandemic. Bronchoscopy can be performed safely in these patients by taking necessary precautions.

Keywords: Foreign body, aspiration, children, COVID-19

Öz

Amaç: Yabancı cisim aspirasyonu, pediyatrik popülasyonda sık görülen bir hava yolu acil durumudur. COVID-19 vaka sayısı dünya çapında katlanarak arttığından, birçok merkezde elektif cerrahi operasyonlar azalmıştır. Ancak çocuklarda yabancı cisim aspirasyonu nedeniyle yapılan bronkoskopinin geciktirilemeyeceği aşikardır. Bu çalışmanın amacı, yabancı cisim aspirasyonu şüphesi olan çocuklarda COVID-19 pandemisinin bronkoskopik işlemler üzerindeki etkilerini araştırmaktır.

Yöntem: 1 Ocak 2016 ile 31 Aralık 2020 tarihleri arasında şüpheli yabancı cisim aspirasyonu ile hastanemize başvuran 63 hasta çalışmaya dahil edildi. Hastalar başvuru tarihine göre Türkiye'de ilk COVID-19 vakası bildirilen 10 Mart 2020 öncesi ve sonrasında başvuranlar olarak iki gruba ayrıldı. Hastaların yaşı, cinsiyeti, öyküsü, fizik muayene bulguları, toraks grafisi ve bilgisayarlı tomografi bulguları, hastaneye başvuru ile bronkoskopi arasında geçen süre, bronkoskopide yabancı cisim varlığı ve komplikasyonları tıbbi kayıtlardan geriye dönük olarak değerlendirildi.

Bulgular: Çalışmaya 48'i grup 1'de ve 15'i grup 2'de olmak üzere toplam 63 hasta dahil edildi. Yabancı cisim aspirasyonu her iki grupta da erkeklerde daha sık görüldü. Hastaların ortalama yaşı Grup 1'de 38.35 (± 37.08) ay, Grup 2'de 27.06 (± 38.18) aydı. Yabancı cisim öyküsü varlığı, fizik muayene bulguları, göğüs radyografisi açısından iki grup karşılaştırıldığında bulgular ve işlem sonrası komplikasyonlar, önemli bir farklılık bulunmadı. Hastaneye başvuru ile bronkoskopi arasındaki süre grup 1'de 10.45 (± 19.66) saat, grup 2'de 35.93 (± 32.53) saattir. Bu süre grup 2'de grup 1'e göre anlamlı olarak daha uzundu.

Sonuç: COVID-19 salgını sırasında çocuklarda yabancı cisim aspirasyonu oluşmaya devam etmektedir. Bu hastalarda gerekli önlemler alınarak bronkoskopi güvenle yapılabilir.

Anahtar kelimeler: yabancı cisim, aspirasyon, çocuk, COVID-19

Received: 19.03.2021

Accepted: 17.07.2021

Publication date: 03.09.2021

Corresponding Author:

Yeliz Kart

Süleyman Demirel University,
Faculty of Medicine, Department of
Pediatric Surgery, Isparta, Turkey
✉ yelizkart@yahoo.com

ORCID: 0000-0003-4282-6540

E. Bilaloğlu 0000-0003-0916-9534

M.A. Ertuğrul 0000-0002-1225-8506

L. Duman 0000-0001-5315-8192

M.Ç. Savaş 0000-0001-6454-5323

Süleyman Demirel University,
Faculty of Medicine, Department of
Pediatric Surgery, Isparta, Turkey



INTRODUCTION

Foreign body aspiration (FBA) is one of the common pediatric emergencies and it is an extremely mortal accident. Complete occlusion of the larynx and trachea in FBA may result in death and the obstruction of the bronchial tree can cause pulmonary atelectasis or emphysema.(1,2) In the majority of cases, FBA is seen in children between 1 and 3 years of age, and it is less common in the newborn period and school age.(3,4) The treatment of this life-threatening condition is removal of the foreign body using rigid bronchoscopy under general anesthesia.(1,5) The procedure should be done without delay, as it is an emergency that can cause serious morbidity or mortality.

Corona virus disease 2019 (COVID-19) was first seen in 2019 in Wuhan City of China, and it is a condition caused by coronavirus-2, which leads to the development of severe acute respiratory illness.(5,6) Although COVID-19 disease is mostly transmitted by droplets, aerosol transmission has also been demonstrated.(7) In the clinical setting, aerosol generating medical procedures (AGMP) such as intubation, suction and bronchoscopy result in the emission of aerosolized viral fragments that can be inhaled and also cause peripheral pollution of surfaces, posing the greatest risk to healthcare professionals for COVID-19 transmission.(5,6,8)

The bronchoscopy procedure for foreign body aspiration is an AGMP and is often performed under very urgent conditions. For this reason, there is usually no such thing as doing the COVID-19 test before the procedure and waiting for the results.(8) There is a small number of data on how the preparation process works before bronchoscopy in children with suspected FBA, and whether it causes delay in the diagnosis and treatment.(5,8) The aim of this study is to investigate the effects of the COVID-19 pandemic on bronchoscopic procedures performed in children with suspected FBA.

MATERIALS AND METHODS

Ethical approval

Permission from the institutional review board was obtained before the study (IRB approval

number:2020-26/380). Consent forms were obtained by informing the families of the patients.

Study design

All patients younger than 18 years who were admitted to our hospital with suspected FBA between January 1, 2016 and December 31, 2020 were included in the study. The electronic medical records of the patients were retrospectively analyzed for demographics, medical history (presence of foreign body aspiration, sudden onset of cough, bruising, etc.), physical examination findings (aeration difference, rales, rhonchus, wheezing), thorax radiography and computed tomography (CT) findings (aeration difference, mediastinal shift, atelectasis, infiltration), the time period between admission to the hospital and bronchoscopy, presence of foreign body in bronchoscopy and its postoperative outcomes. The patients with missing data were excluded from the study.

The patients were divided into two groups according to admission date as those admitted before (Group 1) and after (Group 2) March 10, 2020, when the first case of COVID-19 has been reported in Turkey. The indications for bronchoscopy were the suspect history of an FBA and/or the clinical examination and the radiologic findings suggestive of FBA. Bronchoscopy was performed by the help of general anesthesia in children for suspected FBA using rigid bronchoscope, optical forceps, camera and vision system (Karl Storz SE & Co. KG, Germany). Before the patient was brought into the operating room, bronchoscopic equipment and other materials were prepared by a surgical nurse and assistant. The size of the bronchoscope was selected according to the weight and age of the patients. After the patients were anesthetized with intravenous drugs, the bronchoscope was inserted into the trachea with the help of the laryngoscope. After this stage, the patient's oxygenation was maintained with the help of bronchoscope.

After the onset of COVID-19 pandemic, all bronchoscopic procedures were performed in the operation rooms reserved for pandemic patients. In order to protect from droplet infection, patients were taken to the operating room wearing standard

surgical masks. All healthcare professionals working in the operating room used a surgical mask over an N95 mask, and also wore water impermeable gown, disposable gloves, disposable cap, goggles, face shield and shoe covers (Figure 1).



Statistical Analysis

Data were analyzed using SPSS 22.0 (IBM Inc., Chicago, IL, USA). Chi-square test was used to compare nominal variables. The odds ratio was used in order to evaluate other data. In all analyses, $P < 0.05$ was considered as statistically significant.

RESULTS

The study included a total of 63 patients, of whom 48 were in Group 1 (20 girls, and 28 boys) and 15 in Group 2 (5 girls, and 10 boys). FBA was more commonly seen in boys in both groups. The mean age of the patients was $38.35 (\pm 37.08)$ months in Group 1 and $27.06 (\pm 38.18)$ months in Group 2. There were no significant differences in terms of gender and age distribution between the groups (Table 1).

When the two groups were compared in terms of the presence of a foreign body history, physical

Table 1: Comparisons of the groups in terms of FBA history, physical examination, x-ray findings and complication rates.

	GROUP 1		GROUP 2		TOTAL		P
	n	%	n	%	n	%	
Gender							
Female	20	41.7	5	33.3	25	39.7	0.731
Male	28	58.3	10	66.7	38	60.3	0.640
Age (months)	38.35±37.08		27.06±38.18		35.66±37.34		0.310

Table 2. Comparisons of the groups in terms of FBA history, physical examination, x-ray findings and complication rates.

	GROUP 1		GROUP 2		P
	n	%	n	%	
FBA History	47	97.9	15	100	0.887
Physical examination					
Normal	25	52.1	6	40	0.594
Aeration difference	13	27.1	4	26.7	0.987
Rales-rhonchi	3	6.2	1	6.6	0.988
Wheezing	7	14.6	4	26.7	0.622
X-ray findings					
Normal	16	33.3	4	26.7	0.801
Aeration difference	25	52.1	7	46.7	0.806
Infiltration	7	14.6	4	26.7	0.622
Complications	2	4.2	1	6.7	0.925

FBA: foreign body aspiration

examination findings, thorax radiography findings and post-procedural complications, any significant intergroup differences were not found (Table 2).

COVID-19 PCR test was performed on 15 patients in Group 2 before bronchoscopy. All patients had a negative COVID-19 test result. Positive test results were expected in four patients, including two patients with COVID 19 in their family members and two patients whose clinics were suspicious. The other 11 patients were taken to bronchoscopy without awaiting for the test results.

Thirty-four of 48 patients underwent bronchoscopy in Group 1. Fourteen patients did not undergo bronchoscopy. Of these, 10 patients were followed up only with physical examination and x-ray findings, and discharged because no positive findings were observed during their follow-up, and other 4 patients were discharged after foreign body suspicion was ruled out by thorax CT. Thorax CT was performed in 5 patients in Group 1. Of these, bronchoscopy was performed in only 1 patient due to the presence of lung infiltration on thorax CT. Bronchoscopy was performed in all 15 patients in Group 2. Thorax CT was not performed in any of the patients in Group 2.

The time period between admission to the hospital and bronchoscopy was 10.45 (\pm 19.66) hours in Group 1 and 35.93 (\pm 32.53) hours in Group 2. This time interval was significantly longer in Group 2 when compared to Group 1 ($p=0.02$).

Foreign body was detected and removed during bronchoscopy in 25 (73.5%) of 34 patients in Group 1, while it was detected and removed in 9 (60%) of 15 patients in Group 2. There was no significant difference between the two groups in terms of negative bronchoscopy.

Complications including hypoxia and pneumothorax occurred in two patients in Group 1. Pneumothorax developed in one patient in Group 2.

DISCUSSION

The presence of a foreign body anywhere in the airways after aspiration is a serious condition and an airway emergency in children.(8,10) As generally described in the literature, our routine procedure in cases of FBA is the removal of foreign objects using a rigid bronchoscope and optical forceps. (1,8-10) Bronchoscopies performed in cases of foreign body aspiration are AGMP and mostly performed to save lives under very urgent conditions.(8)

Despite the COVID-19 pandemic, airway emergencies continue to occur in children, and pediatric surgeons often have to act without waiting for COVID-19 test results in these emergencies.(8)

Since bronchoscopy is an extremely risky procedure, COVID-19 tests should be performed in all patients before the procedure. However, foreign body aspirations are mostly urgent, and the test result should not be awaited. We waited for the test results of our 4 patients, including two patients with COVID 19 in their family members who were in contact and two patients whose clinics were suspicious. The other 11 patients were taken to bronchoscopy without waiting for test results. The COVID-19 pandemic is a challenging time for respiratory teams to protect their patients and staff. Since foreign body aspiration is a life-threatening condition; the test result cannot be awaited in most patients. In our study, all patients were considered suspicious for COVID-19 disease and necessary precautions were taken. We complied with the measures stated in the literature. Accordingly, the patient was taken in the operating room reserved for suspected patients for COVID-19, the entire healthcare team in the operating room worked with protective equipment (N95 mask and surgical mask on it, water impermeable gown, disposable gloves, disposable cap, goggles, face shield and shoe covers) and video laryngoscope and optical forceps were used during the procedure. In order to reduce potential risks, all necessary equipment should be available in the operating room before starting the procedure.(5,8)

In our study, the time from admission to the hospital to bronchoscopy was significantly longer in patients after the onset of COVID-19 pandemic (Group 2). We attributed prolongation of this period to the fact that; all patients were tested for COVID-19 and the results were awaited. Besides, in some patients, preparation of the operating room, wearing protective equipment and the preparation of the surgical team took time.

Before the onset of COVID-19 pandemic, suspicious patients were hospitalized, observed and evaluated with CT, while after the emergence of pandemic, bronchoscopy was performed in each patient who applied with the suspicion of foreign body aspiration after evaluation in the emergency department. CT was performed in 5 patients with suspected FBA before the onset of COVID-19 pandemic. Bronchoscopy was performed in only one of these patients when an area of infiltration was observed. In this patient, no foreign body was found in bronchoscopy. Korlacki et al.⁽³⁾ reported in their study that CT was not useful in patients suspected of a foreign body aspiration as a result of their history, examination findings and thorax radiography findings. They reported that rigid bronchoscopy was the first choice in diagnosis and treatment in these patients. After the onset of pandemic, we did not use CT for other indications because of the intensive use of CT to patients with suspected COVID-19, both due to the intensity and the risk of COVID-19 transmission to our patients.

Before the outbreak of COVID-19 pandemic, foreign body was not found in 9 (26.5%) of 34 patients who underwent bronchoscopy for suspected foreign body aspiration, whereas foreign body was not found in 6 (40%) of 15 patients after the onset of pandemic. Although the rates of negative bronchoscopies were relatively higher after the onset of pandemic, any statistically significant difference was not found between Groups 1 and 2. Studies with larger series are needed. However, our overall positive bronchoscopy rate (69.3%) was consistent with the literature data.^(1,11-12)

In conclusion, bronchoscopy for foreign body

removal will be a rare but essential procedure for pediatric surgeons to perform during the COVID-19 pandemic. Bronchoscopy can be performed safely in these patients by taking necessary precautions. Although, the time interval between admission to the hospital to bronchoscopy was significantly longer, this prolongation had no effect on mortality and morbidity.

Ethics Committee Approval: Süleyman Demirel University Faculty of Medicine Clinical Research Ethics Committee (27.11.2020 / 380)

Conflict of Interest: None

Funding: None

Informed Consent: Informed consent was obtained from one of the parents of each patient before the study.

REFERENCES

1. Skoulakis CE, Doxas PG, Papadakis CE, Proimos E, Christodoulou P, Bizakis J G, et al. Bronchoscopy for foreign body removal in children. A review and analysis of 210 cases. *Int J Pediatr Otorhinolaryngol.* 2000;53(2):143-148. [https://doi.org/10.1016/S0165-5876\(00\)00324-4](https://doi.org/10.1016/S0165-5876(00)00324-4)
2. Black RE, Choi KJ, Syme WC, Johnson DG, Matlak ME. Bronchoscopic removal of aspirated foreign bodies in children. *Am J Surg.* 1984;148(6):778-781. [https://doi.org/10.1016/0002-9610\(84\)90436-7](https://doi.org/10.1016/0002-9610(84)90436-7)
3. Korlacki W, Korecka K, Dzielicki J. Foreign body aspiration in children: diagnostic and therapeutic role of bronchoscopy. *Pediatr Surg Int.* 2011;27(8):833-837. <https://doi.org/10.1007/s00383-011-2874-8>
4. Cataneo AJ, Cataneo DC, Ruiz RL Jr. Management of tracheobronchial foreign body in children. *Pediatr Surg Int.* 2008;24(2):151-156. <https://doi.org/10.1007/s00383-007-2046-z>
5. Goussard P, Van Wyk L, Burke J, Malherbe A, Retief F, Andronikou S et al. Bronchoscopy in children with COVID-19: A case series. *Pediatr Pulmonol.* 2020;55(10):2816-2822. <https://doi.org/10.1002/ppul.25015>
6. Soma M, Jacobson I, Brewer J, Blondin A, Davidson G, Singham S. Operative team checklist for aerosol generating procedures to minimize exposure of healthcare workers to SARS-CoV-2. *Int J Pediatr Otorhinolaryngol.* 2020;134:110075. <https://doi.org/10.1016/j.ijporl.2020.110075>
7. Bourouiba L. Turbulent Gas Clouds and Respiratory Pathogen Emissions: Potential Implications for Reducing Transmission of COVID-19. *JAMA.*

- 2020;323(18):1837-1838.
<https://doi.org/10.1001/jama.2020.4756>
8. Leitaó DJ, Jones JLP. Pediatric rigid bronchoscopy and foreign body removal during the COVID-19 pandemic: case report. *J Otolaryngol Head Neck Surg.* 2020;49(1):66.
<https://doi.org/10.1186/s40463-020-00464-z>
 9. Aslan N, Yıldızdaş D, Özden Ö, Yöntem A, Horoz Ö, Kılıç, Ş S. Çocuk yoğun bakım birimimize yabancı cisim aspirasyonu nedeniyle yatan olgularımızın değerlendirilmesi: Tek merkez deneyimi. *Türk Pediatri Arşivi*, 2019; 54(1), 44-48.
<https://doi.org/10.14744/TurkPediatriArs.2019.60251>
 10. Lima JA, Fischer GB. Foreign body aspiration in children. *Paediatr Respir Rev.* 2002;3(4):303-307.
[https://doi.org/10.1016/S1526-0542\(02\)00265-8](https://doi.org/10.1016/S1526-0542(02)00265-8)
 11. Shlizerman L, Mazzawi S, Rakover Y, Ashkenazi D. Foreign body aspiration in children: the effects of delayed diagnosis. *Am J Otolaryngol.* 2010;31(5):320-324.
<https://doi.org/10.1016/j.amjoto.2009.03.007>
 12. Mohammad M, Saleem M, Mahseeri M, Alabdallat I, Alomari A, Za'atreh A et al. Foreign body aspiration in children: A study of children who lived or died following aspiration. *Int J Pediatr Otorhinolaryngol.* 2017;98:29-31.
<https://doi.org/10.1016/j.ijporl.2017.04.029>