

# The foreign bodies in lower respiratory tract in pediatric patients treated in referral academic department of pediatric otolaryngology

Ciała obce w dolnych drogach oddechowych u dzieci leczonych w referencyjnym laryngologicznym ośrodku akademickim

Department of Pediatric Otolaryngology, Medical University of Warsaw, Poland  
Head of Department: Lidia Zawadzka-Głos, MD, PhD

## KEYWORDS

foreign body in airways, lower respiratory tract, children, pediatric patient, bronchoscopy

## SUMMARY

**Introduction.** Foreign bodies in lower respiratory tract for many years are big challenge for otolaryngologists. These objects could present variability of clinical symptoms. Increase of infection and mortality due to delay of accurate diagnosis. Interview is the most important part of examination of patient with suspected foreign body in airways. Any suspicion of aspiration is qualification to diagnostic bronchoscopy.

**Aim.** This paper refers occurrence assessment, clinical course, diagnostic process and treatment of the pediatric patients with suspected foreign body in lower respiratory tract hospitalized in referral Academic Department of Pediatric Otolaryngology.

**Material and methods.** Retrospective analysis of 74 patients with suspected foreign body in lower respiratory tract, who were hospitalized in Clinical Department of Pediatric Otolaryngology in Warsaw Medical University in 2016-2018. Analysis includes demographic data, occurrence frequency, localization and the type of foreign body, diagnostic process and treatment.

**Results.** This study includes 42 boys (57%) and 32 girls (43%) in age of 8 months to 16-year-old. The episode of choking occurs in interview in 71 patients (96%). Foreign bodies in lower respiratory tract were confirmed and evacuated in bronchoscopy procedure in 44 cases (59.5%). In 30 cases (40.5%) there were any foreign body in airways. The most common group of patients admitted to Clinic with suspected foreign body in airways was children in age between 1 to 3-year-old, which accounted for 22 cases (50%). Coughing was the most commonly reported symptom (54.5%), wheezing (27.5%) and dyspnea (15.9%). Twenty-three patients were presenting wheezing and whirring in physical examination. Air trap found in thorax x-ray were in 22 patients (45%). The right main bronchus was the most common place of foreign body retention – 22 patients (50%). The organic foreign bodies were in 32 cases (72.7%) and non-organic in 12 (27.3%). The nuts were the most common foreign body aspirated to airways.

**Conclusions.** Foreign body aspiration should be suspected in every patient, not only those with choking episode but also with patients who presents ambiguous change in physical examination and x-ray scan.

In pediatric patient with suspected foreign body in lower respiratory tract, in every time the bronchoscopy is needed to be done, even in patients with no abnormalities in physical examination and x-ray scan.

## SŁOWA KLUCZOWE

ciała obce dolnych dróg oddechowych, dzieci, bronchoskopia

## STRESZCZENIE

**Wstęp.** Ciała obce dolnych dróg oddechowych od wielu lat pozostają wyzwaniem dla laryngologów. Ciało obce w dolnych drogach oddechowych może prezentować znaczną zmienność objawów klinicznych. Opóźnienie rozpoznania wiąże się ze zwiększeniem za-

chorowalności i śmiertelności. Dokładny wywiad jest bardzo ważny w diagnostyce ciała obcego. Każde podejrzenie aspiracji kwalifikuje pacjenta do diagnostycznej bronchoskopii. **Cel pracy.** Celem pracy była ocena występowania, przebiegu klinicznego, diagnostyki oraz sposobu leczenia dzieci z podejrzeniem aspiracji ciała obcego w materiale akademickiego referencyjnego oddziału laryngologii dziecięcej.

**Materiał i metody.** Analizą retrospektywną objęto 74 pacjentów z podejrzeniem ciała obcego w dolnych drogach oddechowych, którzy byli hospitalizowani w Klinice Otolaryngologii Dziecięcej Warszawskiego Uniwersytetu Medycznego w latach 2016-2018. Analizie poddano dane demograficzne, częstość występowania, lokalizację i rodzaj ciał obcych, postępowanie diagnostyczne oraz zastosowane leczenie.

**Wyniki.** Do badania włączono 42 chłopców (57%) i 32 dziewczynki (43%) w wieku od 8 miesięcy do 16 lat. Epizod zakrztuszenia się w wywiadzie występował u 71 (96%) pacjentów. U 44 dzieci (59,5%) stwierdzono ciała obce w dolnych drogach oddechowych, które zostały usunięte. U 30 osób (40,5%) nie stwierdzono ciał obcych. Najczęściej ciała obce stwierdzono u dzieci w wieku 1-3 lat, co stanowiło 22 przypadki (50%). Najczęstszymi dolegliwościami były: kaszel (54,5%), świszczący oddech (27,2%) i duszność (15,9%). U 23 (43,2%) pacjentów stwierdzono świsty i furczenia w badaniu przedmiotowym. Rentgen klatki piersiowej wykazywał cechy pułapki powietrznej u 22 (45%) przypadków. Najczęstszym miejscem zalegania ciała obcego było oskrzele główne prawe (22; 50%). Organiczne ciała obce obecne były w 32 (72,7%) przypadkach, a nieorganiczne ciała obce – w 12 (27,3%). Najczęściej aspirowanymi przedmiotami były fragmenty orzeszków.

**Wnioski.** Aspiracja ciała obcego powinna być podejrzewana u każdego dziecka nie tylko z epizodem zakrztuszenia się w wywiadzie, ale także z niejednoznacznymi zmianami w badaniu przedmiotowym i radiologicznym.

U dziecka z podejrzeniem ciała obcego w drogach oddechowych należy wykonać bronchoskopię, nawet jeśli nie stwierdzono odchyień w badaniu przedmiotowym i badaniu radiologicznym.

## INTRODUCTION

Foreign bodies in lower respiratory tract for many years are great diagnostic and therapeutic challenge for otolaryngologists (1). The foreign bodies are most often found in patients of age 1 to 3-year-old, rarely in infants or older children at school age (2, 3). Very important indicator of aspiration the foreign body to airways is occurrence of episode of sudden choking after which appears severe cough in children during eating or having fun (4).

Foreign body in lower respiratory tract could be presenting a significant variability of clinical symptoms, from minimal, often unnoticeable to very severe, in some cases lethal due to acute respiratory failure (1, 3, 5). Symptoms depends of localization, size, consistency and time of retention of foreign body (1, 3, 5). Morbidity and mortality are directly related to diagnosis delay (6). Thorough interview is very important because in some cases patient are not presenting any symptoms in physical examination (6). In pediatric patients admitted with suspected foreign body in lower respiratory tract the result of thoracic x-ray scan can be normal or can present abnormalities unusual to aspiration of foreign body (7). Any patient suspected of foreign body aspiration should be qualified to diagnostic bronchoscopy (8). Rigid bronchoscopy is preferred method of foreign body removal in pediatric patients (9-11).

## AIM

This paper refers occurrence assessment, clinical course, diagnostic process and treatment of the pediatric patients

with suspected foreign body in lower respiratory tract hospitalized in referral Academic Department of Pediatric Otolaryngology.

## MATERIAL AND METHODS

Retrospective analysis of 74 patients up to 16-year-old with suspected foreign body in lower respiratory tract, who were hospitalized in Clinical Department of Pediatric Otolaryngology in Warsaw Medical University in 2016-2018. Analysis includes demographic data, occurrence frequency, localization and the type of foreign body, diagnostic process and treatment.

## RESULTS

This study includes 42 boys (57%) and 32 girls (43%) in age of 8 months to 16-year-old (avg. 3.3 y.o.  $\pm$  3.34 y.; med. 2.25). Patients were qualified to bronchoscopy on the basis of choking episode in subject examination, presenting clinical symptoms and radiological examination – thorax x-ray scan. In 3 cases there were no choking episode noticed by parents, however presented symptoms and no improvement after conservative treatment caused qualification for further diagnostic in direction of foreign body in airways. All the patients were subjected to rigid bronchoscopy in general anesthesia. In 44 cases (59.5%) there were foreign body in lower respiratory tract which have been removed. In the remaining 30 patients there were no foreign body found in bronchoscopy.

In occurrence of choking episode (98 vs. 93%) and changes in radiological examination (68 vs. 63%) there were no significant differences found in the comparison of patient groups with and without foreign body found in bronchoscopy. However, it was more frequent with abnormalities in physical examination (80 vs. 37%,  $p < 0.00019$ ) (fig. 1).

Patients with foreign body in lower respiratory tract were subjected to further analysis in terms of age, sex, delay in admitting to the hospital, clinical symptoms, results of radiological examination, type and localization of foreign body.

From 44 patients the most numerous group are children in age between 1 to 3-year-old which was 22 cases (50%). The youngest patient was 8 months old and the oldest have 16-year-old. The boys in this case were 29 cases (65,9%), girls were 15 cases (34,1%) (tab. 1).

The fastest time from choking episode to admission to hospital was 6 hours, but the latest after 24 days. The delay between choking episode and admission time was presented in table 2.

On admission to hospital patients presented varied symptoms. The most common was coughing, presented 24 times (54.5%), 6 patients (13.6%) were asymptomatic (tab. 3).

Wheezing and whirring were noticed in 23 patients (43.2%) during physical examination, 12 patients has reduced bubble murmur on the side of aspirated foreign body. In 9 cas-

Tab. 2. Time between choking episode and admission to hospital

Time (days)	Number of cases	Percent
1	16	36.4
2	18	40.9
3-6	4	9.1
7-10	2	4.5
11-20	3	6.8
> 20	1	2.3

es (20.5%) the patients were without any abnormalities in physical examination.

Thorax x-ray scan in most cases showed the features of an air trap, in 20 cases (45%). The results of radiological examination are shown in figure 2.

The right main bronchus was the most common place of foreign body retention – 22 patients (50%), next place where the foreign bodies were found is the left main bronchus – 18 cases (40.9%). Trachea were partially obstructed in 4 cases (9.1%).

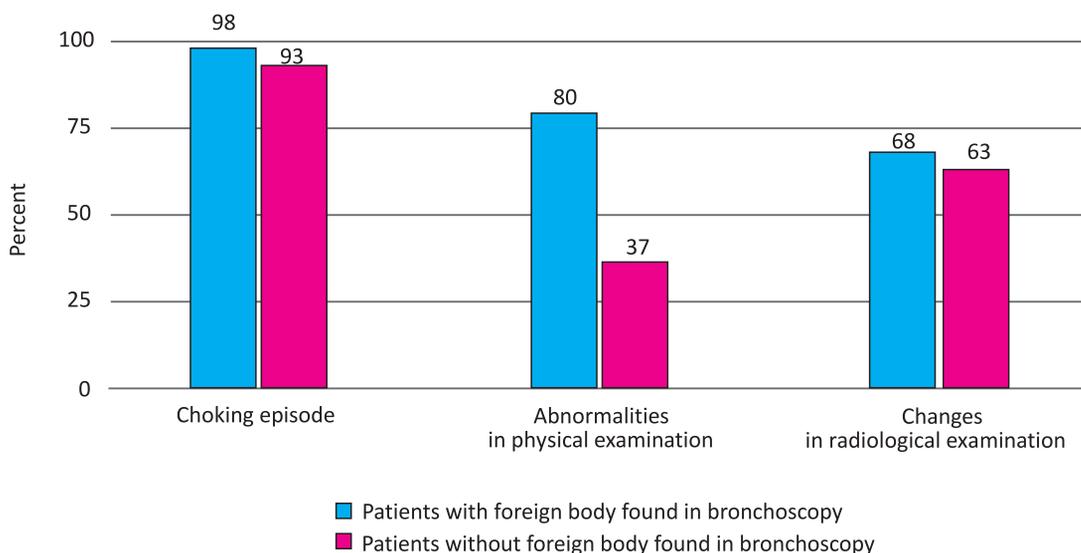


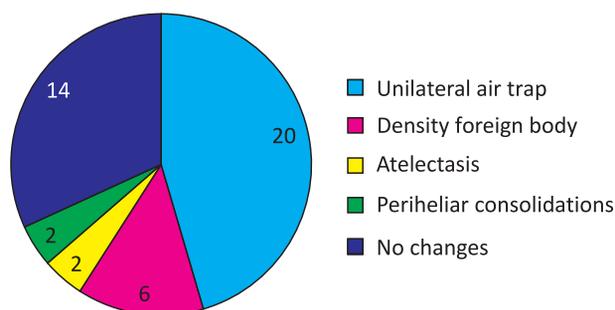
Fig. 1. Comparison of indications to bronchoscopy with division into patients with and without foreign bodies in lower respiratory tract

Tab. 1. Table with demographic data of patients of group with foreign body found in lower respiratory tract

Sex\Age (y)	8/12-1	1-3	3-6	6-9	9-16	Total
Boys	6 (13.6%)	12 (27.3%)	7 (15.9%)	1 (2.3%)	3 (6.8%)	29 (65.9%)
Girls	2 (4.6%)	10 (22.7%)	3 (6.8%)	-	-	15 (34.1%)
Total	8 (18.2%)	22 (50%)	10 (22.7%)	1 (2.3%)	3 (6.8%)	44

**Tab. 3.** Symptoms presented on admission

Symptoms	Number of patients	Percent
Cough	24	54.5
Wheezing	12	27.2
Dyspnea	7	15.9
Retrosternal pain	4	9.1
Asymptomatic	6	13.6



**Fig. 2.** Results of radiological examination – thorax x-ray scan

Organic foreign bodies were found in 32 patients (72.7%), in the rest 12 cases (27.3%) have been removed inorganic foreign bodies (tab. 4).

## DISCUSSION

Cough, shortness of breath and cyanosis may manifest in various degrees as a result of foreign body aspiration into lower respiratory tract. The best way to put accurate diagnosis is to thoroughly collect the interview with patient. Diagnostic difficulties are elevating due to poor information from patient parents or legal guardian about the situation preceding the symptom presentation. They can be unnoticed, forgotten or neglected. This paper shown that choke episode is the best indicator of presence of foreign body in airways – 98%. However, it also was presented in group of patients without foreign body found in bronchoscopy in 93%. Presence of abnormalities in physical examination were significant more often (80%) in patients with foreign body found in bronchoscopy. The most numerous group of patients with foreign body presence in lower respiratory tract was group of patients aged between 1 to 3-year-old. This group takes 50% of all patients with positive bronchoscopy procedure, also it is confirmed in other papers (2, 3). Tendency putting objects to mouth, not fully-grown teeth and also immature coordination of breathing are the main causes of such a big number of aspirated foreign bodies in children of this age (4, 12). Boys are more active than girls so in our study the boys were more frequent (65.9%) than girls (34.1%) (12, 14). Admission in first day after aspiration

**Tab. 4.** Types of foreign bodies divided into organic and inorganic

Type of foreign body	Number	Percent
Organic	32	72.7
Piece of peanut	18	40.9
Piece of almond	2	4.5
Piece of apple	2	4.5
Piece of sunflower seed	2	4.5
Piece of cauliflower	3	6.8
Piece of mandarin stalk	1	2.3
Popcorn	1	2.3
Rice seed	1	2.3
Piece of meat	1	2.3
Piece of food	1	2.3
Inorganic	12	27.3
Piece of plastic toy	4	9.1
Sharp shaped piece of plastic	1	2.3
Pin	1	2.3
Block	1	2.3
Screw	1	2.3
Piece of metal	1	2.3
Drawing pin	1	2.3
Pen tip	1	2.3
Piece of foil	1	2.3

was only in 36,4% of cases and it is very similar to other studies (4). Rest of the children were admitted to hospital in later days which could be caused by neglecting parents or misdiagnosed by general practitioner who did the first examination of patient after choking. Cough (54.5%), wheezing (27.2%), dyspnea (15,9%) this was the most presented symptoms by patient on admission to hospital. In more than half (52.3%) of all patients admitted with suspected foreign body in lower respiratory tract in physical examination there were wheezing and whirring, the same situation was noticed by others (1, 3). In other diseases like inflammation of the respiratory tract and asthma patient takes drugs like corticosteroids and antibiotics. This type of treatment can mask all abnormalities in physical examination and could be cause of misdiagnosis (1, 3).

In radiological examination, thorax x-ray scan, the most common result is the characteristics of an air trap in 45.5% of cases. Density of foreign body was shown in only 13.6%. The result of x-ray scan with no abnormalities was in 31.8%.

This sort of radiological examination has great diagnostic significance in diagnostics of foreign body in lower respiratory tract, however negative result of x-ray scan does not exclude the presence of foreign body in air ways (8, 14).

In our experience the right main bronchus was the main place of retention of the foreign body in half of all patients with positive bronchoscopy (22 – 50%), with 40.9% patients the left main bronchus was the location of foreign body. This result is similar to other papers (4, 15), but some others analysis shown that the left main bronchus was the main location (8, 16).

This paper take under analysis the type of foreign body, organic and inorganic, this first one were much more times

evacuated from lower lateral tract and the peanuts (40.9%) were the one of most numerous, others also present this type of foreign body as the most common (1, 2, 17).

## CONCLUSIONS

Foreign body aspiration should be suspected in every patient, not only those with choking episode but also with patients who presents ambiguous change in physical examination and x-ray scan.

In pediatric patient with suspected foreign body in lower respiratory tract, in every time the bronchoscopy is needed to be done, even in patients with no abnormalities in physical examination and x-ray scan.

## CONFLICT OF INTEREST KONFLIKT INTERESÓW

None  
Brak konfliktu interesów

## CORRESPONDENCE ADRES DO KORESPONDENCJI

\*Lidia Zawadzka-Głos  
Klinika Otolaryngologii Dziecięcej  
Warszawski Uniwersytet Medyczny  
ul. Żwirki i Wigury 63A  
02-091 Warszawa, Polska  
tel.: +48 (22) 317-97-21  
laryngologia@spdsk.edu.pl

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