

Lavreshin Peter Mikhailovich, MD, PhD, Professor, Head of the General Surgery Department; tel.: +79280075502; e-mail: v_lin@mail.ru

Vladimirov Vladimir Ivanovich, MD, PhD, doctor-surgery, oncologist;
tel.: +79624014209; e-mail: vla3788@yandex.ru; <https://orcid.org/0000-0002-7375-8950>

Pechenkin Evgeny Vladimirovich, MD, Associate Professor of the Department of faculty surgery with a course in urology;
tel.: +79624019450; e-mail: pevgeny@inbox.ru

Korablina Sofia Sergeevna, PhD, Assistant of the General Surgery Department;
tel: +79624478458; e-mail: Korablinas27@gmail.com; <https://orcid.org/0000-0002-5113-2543>

Grigorova Alina Nikolaevna, PhD, Associate Professor of the Department of pediatric surgery, Assistant of the Department of histology;
tel.: +79633877244; e-mail: alina.mashchenko@mail.ru; <https://orcid.org/0000-0001-5020-232X>

Korkmazov Ilyas Khamzatovich, Assistant of the Department of surgical diseases with the course of topographic anatomy;
tel.: +7(8782)29-35-01; e-mail: korkmaz@gmail.com; <https://orcid.org/0000-0001-7134-0289>

Machukova Mariam Nyurchikovna, Assistant of the Department of surgical diseases with the course of topographic anatomy;
tel.: +7(8782)293501; e-mail: machukova.mariyam@bk.ru; <https://orcid.org/0000-0002-0669-474>

© Group of authors, 2022

UDC 616.211-003.6

DOI – <https://doi.org/10.14300/mnnc.2022.17032>

ISSN – 2073-8137

IMPROVEMENT OF SURGICAL CARE FOR CHILDREN WITH FOREIGN BODIES IN THE AIRWAYS

Shamsiev A. M., Shamsiev J. A., Ruziev J. A., Shakhriev A. K., Mahmudov Z. M.

Clinic of the Samarkand Medical Institute, Uzbekistan

СОВЕРШЕНСТВОВАНИЕ ХИРУРГИЧЕСКОЙ ПОМОЩИ ДЕТЯМ С ИНОРОДНЫМИ ТЕЛАМИ ДЫХАТЕЛЬНЫХ ПУТЕЙ

А. М. Шамсиев, Ж. А. Шамсиев, Ж. А. Рузиев, А. К. Шахриев, З. М. Махмудов

Клиника Самаркандского медицинского института, Узбекистан

An analysis was made of 1355 children with a suspected foreign body of the respiratory tract (FB RT), treated in the 2nd clinic of the Samarkand Medical Institute over the past 20 years. Of these patients, 948 patients were diagnosed and were divided into two subgroups according to the method of treatment. In the first subgroup of 478 patients with FB RT, from 2000 to 2009, the removal of FB was performed using rigid bronchoscopy. In the second subgroup of 470 patients treated from 2010 to 2019, the removal of FB was conducted by video bronchoscopy. The use of video bronchoscopy contributed to a clear visualization of all departments of the AP RT, made it possible to easily and quickly remove the latter, significantly improved the course of the post-bronchoscopy period, and reduced the development of late complications.

Keywords: foreign body, respiratory tract, children, video bronchoscopy

Произведен анализ 1355 детей с подозрением на инородное тело дыхательных путей (ИТ ДП), пролеченных во 2-й клинике Самаркандского медицинского института за последние 20 лет. Из этих больных у 948 пациентов диагноз был подтвержден, и по методу лечения они были разделены на две подгруппы. В первой подгруппе – 478 пациентов с ИТ ДП, в период с 2000 по 2009 год, удаление ИТ проводилось при помощи жесткой бронхоскопии. Во второй подгруппе 470 пациентов, пролеченных в период с 2010 по 2019 год, удаление ИТ проводилось методом видеобронхоскопии. Применение видеобронхоскопии способствовало четкой визуализации всех отделов ДП и ИТ, позволило легко и быстро проводить удаление последнего, значительно улучшило течение постбронхоскопического периода и уменьшило развитие поздних осложнений.

Ключевые слова: инородное тело, дыхательные пути, дети, видеобронхоскопия

For citation: Shamsiev A. M., Shamsiev J. A., Ruziev J. A., Shakhriev A. K., Makhmudov Z. M. IMPROVEMENT OF SURGICAL CARE FOR CHILDREN WITH FOREIGN BODIES IN THE AIRWAYS. *Medical News of North Caucasus*. 2022;17(2):130-134. DOI – <https://doi.org/10.14300/mnnc.2022.17032>

Для цитирования: Шамсиев А. М., Шамсиев Ж. А., Рузиев Ж. А., Шахриев А. К., Махмудов З. М. СОВЕРШЕНСТВОВАНИЕ ХИРУРГИЧЕСКОЙ ПОМОЩИ ДЕТЯМ С ИНОРОДНЫМИ ТЕЛАМИ ДЫХАТЕЛЬНЫХ ПУТЕЙ. *Медицинский вестник Северного Кавказа*. 2022;17(2):130-134. DOI – <https://doi.org/10.14300/mnnc.2022.17032>

BALF – broncho-alveolar lavage fluid
CCG – clinical comparison group
FB – foreign body
MCG – the main clinical group

MSCT – multislice computed tomography
RT – respiratory tract
TBT – tracheobronchial tree

FBs of the trachea and bronchi are an emergency pathology that often manifests itself as acute respiratory failure and requires urgent medical intervention [1–4]. The annual percentage of hospitalization of children with RT inhalation with all children who are on inpatient treatment ranges from 2.7 % to 14.3 % [5, 6]. Aspiration of FB in the vast majority of cases, occurs in childhood (66.1–97.2 %). Among patients with FB RT, most are children aged 1 to 5 years [7, 8]. The relevance of this pathology in children is also due to anatomical and physiological features that contribute to the rapid development of severe, often irreversible, changes in the respiratory system [9–12].

The study aimed to improve the treatment results of children with foreign bodies of the respiratory tract based on the optimization of the treatment and diagnostic program and bronchoscopic technologies.

Material and Methods. From January 2000 to June 2019, 1355 patients with suspected FB RT were treated in the Department of Thoracic Surgery. Of these, 407 children (30.0 %) with an excluded diagnosis constituted a CCG, which is necessary to determine the sensitivity of the diagnostic methods used, and 948 (70.0 %) patients with FB RT constituted the main clinical group. To study the effectiveness of the proposed tactics for treating the pathology under study, MCG was divided into two subgroups (Fig. 1).

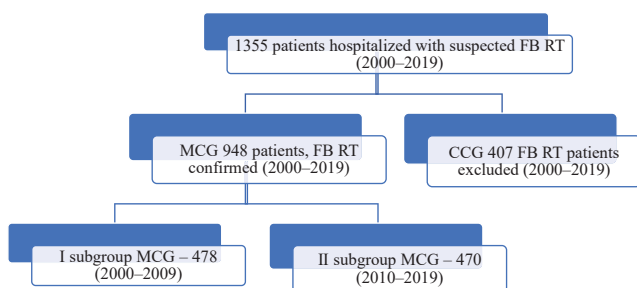


Fig. 1. Study Design

Young children prevailed – 56.3 %, of which 190 (46.6 %) were from the clinical comparison group and 573 (60.4 %) from the main clinical group. In second place in terms of the number were patients aged 3 to 7 years (Table 1).

Table 1

Distribution of patients according to the age and groups

Age	Clinical group		Total
	MCG	CCG	
Up to 1 year	92 (22.6 %)	53 (5.6 %)	145 (10.7 %)
1–3 year	190 (46.6 %)	573 (60.4 %)	763 (56.3 %)
3–7 year	80 (19.7 %)	212 (22.4 %)	292 (21.6 %)
7–12 year	35 (8.6 %)	92 (9.7 %)	127 (9.4 %)
12–15 year	8 (2.0 %)	13 (1.4 %)	21 (1.5 %)
15–18 year	2 (0.5 %)	5 (0.5 %)	7 (0.5 %)
Total	407 (100 %)	948 (100 %)	1355 (100 %)

As can be seen from Table 1, among all patients, young children prevailed in 763 (56.3 %), 190 (46.6 %) in the CCG, and 573 (60.4 %) in the MCG. There were 292

(21.6 %) patients in the age group of 3–7 years, with 80 (19.7 %) children in the CCG and 212 (22.4 %) in the MCG.

There were almost two more boys than girls – 63.3 % and 36.7 %, respectively. There were 4.5 times more children from rural areas than from urban areas. In 14.2 % of cases, patients were admitted in severe, extremely severe or in a state of clinical death.

To achieve this goal, an anamnesis was taken, clinical, radiological, bronchological research methods, cytological, and BALF were used. When collecting an anamnesis, the main task was to record the fact of FB aspiration. The circumstances of the delayed diagnosis of aspiration of a foreign body during its long stay in the RT were studied. According to indications, bronchography, MSCT, and virtual bronchoscopy was performed.

The statistical analysis was performed on the SPSS Statistics package (IBM, USA). We examined a number of variables for their association with the duration of hospitalization. Variables that had prognostic potential on univariate analysis were subjected to multivariate analyses with the Cox proportional hazards regression model. All P values were two-sided, and a $p < 0.05$ was adopted as the threshold for statistical significance.

Results and Discussion. When analyzing the anamnesis of 948 MCG patients, it was revealed that in 902 (95.1 %) children, the parents recorded the moment of FB aspiration. Of these, only 355 (37.4 %) patients sought medical help in the first 24 hours, and the remaining 547 (60.6 %) – later than the first day (Fig. 2). It should be noted that doctors with other diagnoses treated more than 50 % of them.

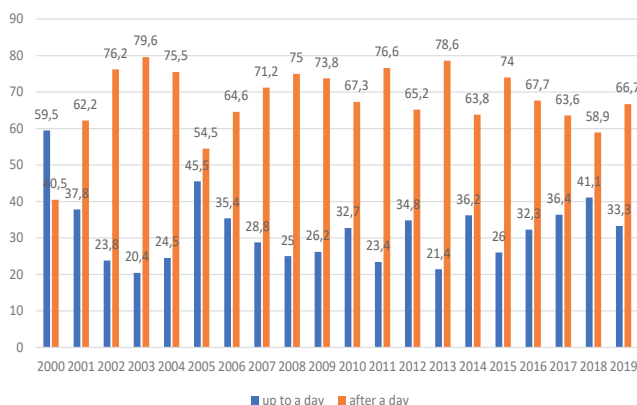


Fig. 2. Diagram of the number of children admitted to the hospital on the first day and after the day after FB aspiration by years of observation

The leading complaints at admission in patients with a duration of FB stay in the RT up to a day were: cough – in 355 (100 %) patients; change in breathing (noisy, difficult, stridor breathing, shortness of breath) – in 334 (94.1 %) children.

In 593 (62.6 %) children admitted later than a day after the aspiration of FB, the main complaints were: cough, often wet, in 593 (100 %) patients, respiratory change in 570 (96.1 %) children.

Organic FB was in 776 (81.9 %) children, non-organic – in 172 (18.1 %). The most frequent organic FBs were various seeds and nuts, accounting for 58.1 % of cases. Among inorganic FB, plastic items were the most common – 103 (59.8 %) cases.

The primary localization of aspirated FBs in children (Table 2) is the bronchi (85.5 % of cases); much less often, they remain in the larynx 34 (3.6 %) and the trachea 61 (6.5 %). In the bronchi of the right lung, foreign bodies were found more often, 486 (51.3 %), than in the bronchi of the left lung, 284 (30.0 %). FBs were located in both main bronchi in 41 (4.3 %) patients. In 56 (12.8 %) cases, simultaneous aspiration into different parts of the TBT was noted, which significantly worsened the condition of the children and their treatment.

Table 2

Localization of aspirated foreign bodies in the respiratory tract depending on their nature (n=948)

Sections of the tracheobronchial tree	Organic FB RT	Not organic FB RT	Total
Larynx	30 (3.9 %)	3 (1.7 %)	33 (3.5 %)
Larynx and bronchi	1 (0.1 %)	–	1 (0.1 %)
Trachea	34 (4.4 %)	13 (7.6 %)	47 (5.0 %)
Trachea and bronchi	14 (1.8 %)	–	14 (1.5 %)
Both bronchi	34 (4.4 %)	7 (4.1 %)	41 (4.3 %)
Right main bronchus	383 (49.3 %)	76 (44.2 %)	459 (48.4 %)
Right lower lobe	7 (0.9 %)	5 (2.9 %)	12 (1.3 %)
Left main bronchus	162 (20.9 %)	41 (23.8 %)	203 (21.4 %)
Left lower lobe	65 (8.4 %)	16 (9.3 %)	81 (8.5 %)
Undefined	46 (5.9 %)	11 (6.4 %)	57 (6.0 %)
Total	776 (100)	172 (100)	948 (100)

$\chi^2=9.609$; critical value $\chi^2=14.067$ ($p<0.05$); $p>0.05$

Most of the aspirated organic FBs were chewed – 439 (57.7 %); that is, multiple FBs fell into the RT.

On chest radiographs, the following signs were revealed: increased lung pattern in 582 (75.4 %) patients and increased pneumatization on the FB side in 336 (43.5 %) patients. Hypoventilation of the lung – in 268 (34.7 %). In 172 (17.7 %) children, direct and indirect signs of FB RT were absent on chest radiographs.

MSCT of the chest organs was performed in 49 patients. Of these, in 22 (44.9 %), FB RT was subsequently removed, and in 27 (55.1 %), this diagnosis was excluded. In 22 (44.9 %) patients, the presence of FB in the RT (MCG) was noted, and in 27 (55.1 %) children (CCS), there were no foreign objects in the TBT. In MSCT of 49 patients with suspected FBRT in 20 (40.8 %) cases, a positive conclusion was obtained on the proposed diagnosis. Confirmation of this diagnosis during a bronchoscopy was obtained in 22 (44.9 %) of these patients. There were 2 (4.1 %) false-negative conclusions on MSCT. A negative finding on the diagnosis of FB RT according to MSCT data occurred in 26 (53.1 %) cases. Of the indicated number of patients with an excluded diagnosis, subsequently, no FB was found in all children; that is, MSCT data turned out to be true negative. However, there was one false positive case (2.0 %). With MSCT of the RT, diagnostic errors, presented as erroneous negative and false positive conclusions, were made in 3 (6.1 %) cases. Calculations were performed to obtain the following performance indicators of MSCT in FB RT: the latter's sensitivity was 90.1 %, the specificity was 96.3 %, and the diagnostic accuracy was 93.9 %.

Of the 948 patients with MCG, 914 (96.4 %) underwent bronchoscopy, based on which the state and nature of changes in the mucous membrane of the TBT, as well as the prevalence of the inflammatory process caused by the presence of FB in the trachea or bronchi, were stu-

died. With the duration of FB stay for one day, the frequency of bronchopulmonary complications was 77.8 % of cases, due to catarrhal forms of endobronchitis – 72.4 %. When FBs were in the RT for more than a day, the frequency of complications was 91.8 % of cases, and purulent forms of endobronchitis predominate here – 66.3 %. The frequency of bronchopulmonary complications is due mainly to FB of organic origin – 81.9 % of cases. In 6.8 % of cases, complications were not observed, or bronchoscopy was not performed.

According to the classification, V. Lemoine (1971) limited (local) endobronchitis was observed in 414 (43.7 %) children, of which unilateral in 401 (42.4 %), bilateral – in 13 (1.3 %) patients. Diffuse partial endobronchitis was diagnosed in 398 (42.0 %) patients, of which unilateral in 359 (37.9 %), bilateral – in 39 (4.1 %). Diffuse endobronchitis was noted in 20 (2.1 %) cases, unilateral – in 7 (0.7 %), bilateral – in 13 (1.4 %).

Bacteriological cultures of bronchial washings for flora were performed in 253 patients (26.7 % of cases); flora was found in 132 (52.2 %) children and was not found in 121 (47.8 % of cases). The main microorganism was: *Staphylococcus Aureus* – in 98 children (38.7 %).

Cytological examination of BALF was carried out using a video microscope equipped with a video camera and a computer. Cytological characterization of BALF was performed in 274 (20.2 %) of 1355 patients. Cytologically proven stages and prevalence of endobronchitis caused by the presence of FB RT (Table 3).

Table 3

Conclusion of the cytological study of BALF by groups

The degree of change in the walls of the respiratory tract	n=470		n=407	
	abc	%	abc	%
Catarrhal changes (endobronchitis)	129	52.0	11	42.3
Purulent endobronchitis	95	38.3	9	34.6
Purulent-fibrinous endobronchitis	2	0.8	0	0
Without changes	22	8.9	6	23.1
Total	248	100	26	100

The value of the χ^2 criterion is 5.376; the critical value of χ^2 at the significance level $p<0.05$ is 7.815; the relationship between factor and performance characteristics is not statistically significant, significance level $p>0.05$; significance level $p=0.147$

In our work, we used two main methods to remove FB RT, so MCG patients were divided into two clinical subgroups. From 2000 to 2009, in the thoracic department, 478 children with FB RT were hospitalized, which made up the first subgroup of the MCG of our study. In 44 (9.2 %) patients, self-removal of FB was observed.

To remove FB RT in children of this subgroup, a respiratory bronchoscope with proximal illumination of the Friedel system (Germany) was used. In 19 (4.0 %) patients of the described group, bronchoscopy was not performed; in 459 (96 %) patients, 649 bronchoscopies were performed.

Since 2010, we have begun to use the EndoPik respiratory video bronchoscope (South Korea) to remove FB RT in 470 children of the II subgroup of MCG. In this subgroup, during bronchoscopy, the TBT was washed with ozonized saline, and at the end, an acetylcysteine solution was injected. In 55 (11.7 %) of them, self-discharge of FB was noted, bronchoscopy was not performed in 15 (3.2 %) children, and 455 (96.8 %) patients underwent 532 bronchoscopies.

When assessing the quality of the TBT view when using the Friedel bronchoscope and video broncho-

scope, the preference of surgeons was on the latter's side. So, when considering the quality of the review of the trachea, main bronchus, lobar bronchi, and segmental bronchi, the good value of these indicators in the II subgroup of the MCG was 100 % for each department of the TBT, while in the I subgroup of the MCG they were 46.2 %, 17.9 %, and visualization was null in the lobar and segmental bronchi. This means that it was more accessible, convenient, and, most importantly, more informative to perform bronchoscopy using a video bronchoscope.

When removing FBs from the TBT, the average value of the «number of attempts to capture FBs» was estimated, when using a video bronchoscope, it was 3.46 ± 0.04 points, and when using a Friedel bronchoscope – 1.82 ± 0.04 ($p=0.000000$). Comparative analysis of the «FB traction» indicator revealed a significant difference in favor of the video bronchoscope, the average score in subgroup I and subgroup II was 2.72 ± 0.02 and 3.96 ± 0.01 , respectively. The average value of the indicator «injury to the bronchi walls» when using a video bronchoscope was 3.61 ± 0.03 versus 2.38 ± 0.032 for the Friedel bronchoscope.

The average manipulation time when using the Friedel bronchoscope to remove FB RT was 21.39 ± 0.4 minutes, and in the video bronchoscopy subgroup – 14.45 ± 0.1 minutes.

The conducted intraoperative comparison of bronchoscopy techniques shows the advantage of the video bronchoscope in all evaluation criteria.

The Friedel respiratory bronchoscope provides not quite an adequate visualization and detailing of the surgical field and gives a vague idea of the size, shape, and structure of FB in the TBT. The introduction of forceps significantly worsens the view and makes it challenging to capture FB accurately.

In terms of one-stage removal of a foreign body from the respiratory tract, the advantage was on the side of video bronchoscopy. In all patients, during video bronchoscopy, the airways were sanitized entirely, and specific indications were set for repeated medical-sanitation bronchoscopy. And in the subgroup of patients with the Friedel bronchoscope in 12 (2.5 %) children, it was impossible to remove the FB entirely, or it was not found during the first manipulation.

In the II subgroup of the MCG, a single video bronchoscopy was performed in 81.7 % of patients, while in the I subgroup of the MCG, this figure was 62.4 %. In subgroup I, indications for repeated therapeutic bronchoscopy were made based on clinical data (Table 4).

In the subgroup of video bronchoscope use, a decrease in the duration of clinical manifestations in the postoperative period was noted; namely, the time of the cough period decreased by 2.5 days, the period of recovery of breathing – by 3.5 days, the duration of wheezing by three days.

In 6 (1.26 %) patients of subgroup I of the main clinical group, FB was removed promptly. The postoperative period in these patients was uneventful. No surgeries were performed in subgroup II of the main clinical group.

A good immediate result of treatment was stated in 288 (60.3 %) patients of subgroup I. In 434 (92.3 %) patients of subgroup II MCG, satisfactory in 173 (36.2 %) in subgroup I and 36 (7.7 %) – in subgroup II, and unsatisfactory results were 17 (3.5 %) and 0 (0.0 %) patients in subgroups I and II, respectively.

Long-term results of treatment of patients were studied in terms of 2 to 20 years after discharge from the hospital in 1111 (81.2 %) patients out of 1355 children, including 307 (75.4 %) patients of the clinical comparison group and 804 (84.8 %) from the main clinical group of 400 (83.7 %) people from the I subgroup and 404 (86.0 %) from the II subgroup of the MCG.

The treatment results in the acute period of the disease in subgroup II of the main clinical group contributed to a significant reduction in complications in the long-term period. So, in the I subgroup of the MCG, 29 (7.3 %) out of 400 patients complained of a cough of a periodic nature and frequent treatment of inflammatory diseases on an outpatient basis. In the II subgroup of 404 patients, this figure was only 9 (2.2 %) ($p<0.01$). We observed the same ratio for another complication of the long-term period – relapses of chronic bronchitis – 22 (5.5 %) and 5 (1.2 %), respectively. The improved technique in MCG subgroup II made it possible to completely exclude repeated bronchoscopy in the long-term period, while in MCG subgroup I, they were performed in 6 (1.75 %) cases. Among the subgroup patients, I of the main clinical group 1 (1.0 %) called for a follow-up examination, and the child underwent surgery: Videothoracoscopic pneumonectomy.

Among 323 children with foreign bodies of the respiratory tract and digestive tract in children from 4 months to 17 years old, children under three years old prevailed – 211 (57.5 %). The terms of hospitalization in the surgical hospital ranged from 3 hours to 2 weeks. The authors developed an optimal treatment and diagnostic algorithm that helped improve treatment outcomes [13].

According to the materials of the MONIKI clinic. M. F. Vladimirov successfully removed foreign bodies of the respiratory tract of the lower respiratory tract using various types of bronchoscopes in 76 children [11]. Foreign bodies in children were different objects, having such dimensions that allow them to penetrate through the glottis.

In the study, endoscopic retrieval of aspirated FBs was successful in 184 (98.9 %) patients [14]. Rigid and fibrobronchoscopy were used to diagnose and extract FB. More over the combined bronchoscopy technique was used in 137 (73.7 %) patients.

Conclusions

1. Most of the patients with FB RT are children of early age (1–3 years) of life (60.4 %). Male children predominate (63.5 %), from rural areas (82.3 %), in whom organic foreign bodies got into the respiratory tract (81.9 %), of which chewed multiple FBs are more common – 57.7 %.

2. Clinical signs in children with FB RT depend on the nature, size, and location of the aspirated material and vary from asymptomatic to severe respiratory failure. Virtually no distinctive clinical manifestations allow diagnosing or excluding FB RT.

**The frequency of bronchoscopy
in one patient in MCG subgroup**

Table 4

The frequency of bronchoscopy	MCG Subgroup I 478 patients (459)*	MCG Subgroup II 470 patients (455)*
Once	298 (62.4 %)	383 (81.7 %)
Twice	134 (28.0 %)	68 (14.5 %)
Three times	25 (5.2 %)	3 (0.6 %)
Four times	2 (0.4 %)	1 (0.2 %)
Not carried out	19 (4.0 %)	15 (3.0 %)
Total bronchoscopies	649	532
$\chi^2=50.722$; critical value χ^2 ($p=0.01$) =13,277; $p<0.001$		

Note: * – in subgroup II MCG, out of 470 patients, bronchoscopy was performed in 455 (15 children with self-terminated FB TR showed no indications for bronchoscopy); ** – in subgroup I MCG, out of 478 patients, bronchoscopy was performed in 459 patients (19 children after self-removal of FB RT did not undergo bronchoscopy due to lack of indications).

3. Video bronchoscopy allows assessing the state, nature, and prevalence of the inflammatory process of the walls of the TBT, the degree of obstruction of the lumen of the bronchus, as well as the size, shape, and structure of the FB. The sensitivity, specificity, and diagnostic accuracy of the method is 100 %. MSCT in FB RT showed high sensitivity (90.1 %), specificity (96.3 %), and diagnostic accuracy (93.9 %).

4. The frequency of formation of purulent endobronchitis sharply increases with FB of organic nature on the first day and with an increase in the prescription of being in the RT, regardless of the nature of the foreign agent. Purulent forms of endobronchitis in the presence of FB for up to one day are observed in 5.4 % of cases, and with a duration of more than one day – in 66.3 % of cases, this is confirmed cytologically.

Disclosures: The authors declare no conflict of interest.

References

1. Na'ara S., Vainer I., Amit M., Gordin A. Foreign Body Aspiration in Infants and Older Children: A Comparative Study. *Ear. Nose Throat. J.* 2020;99(1):47-51. <https://doi.org/10.1177/0145561319839900>
2. Boufersaoui A., Smati L., Benhalla K. N., Boukari R., Smail S. [et al.] Foreign body aspiration in children: experience from 2624 patients. *Int. J. Pediatr. Otorhinolaryngol.* 2013;77(10):1683-1688. <https://doi.org/10.1016/j.ijporl.2013.07.026>
3. Qiu W., Wu L., Chen Z. Foreign body aspiration in children with negative multi-detector Computed Tomography results: Own experience during 2011–2018. *Int. J. Pediatr. Otorhinolaryngol.* 2019;124:90-93. <https://doi.org/10.1016/j.ijporl.2019.05.031>
4. Kogure Y., Oki M., Saka H. Endobronchial foreign body removed by rigid bronchoscopy after 39 years. *Interact. Cardiovasc. Thorac. Surg.* 2010;11(6):866-68. <https://doi.org/10.1510/icvts.2010.243097>
5. Rusetsky Y. Y., Spiranskaya O. A., Chernyshenko I. O. Foreign bodies at the lower respiratory tract in children: contemporary diagnostic and therapeutic approaches. *Journal of Pediatrics.* 2015;94(4):30-35.
6. Shamsiev J. A., Ruziev J. A., Zayniev S. S., Isakov A. M. Inorodnie tela dixatel'nix putey u detey. *Science and practice: implementation to modern society.* 2020:378-383.
7. Ding G., Wu B., Vinturache A., Cai C., Lu M. [et al.] Tracheobronchial foreign body aspiration in children: A retrospective single-center cross-sectional study. *Medicine (Baltimore).* 2020;99(22):e20480. <https://doi.org/10.1097/MD.00000000000020480>
8. Huankang Z., Kuanlin X., Xiaolin H., Witt D. Comparison between tracheal foreign body and bronchial foreign body: a review of 1,007 cases. *Int. J. Pediatr. Otorhinolaryngol.* 2012;76(12):1719-25. <https://doi.org/10.1016/j.ijporl.2012.08.008>
9. Cutrone C., Pedruzzi B., Tava G., Emanuelli E., Barion U. [et al.] The complimentary role of diagnostic and therapeutic endoscopy in foreign body aspiration in children. *Int. J. Pediatr. Otorhinolaryngol.* 2011;75(12):1481-1485. <https://doi.org/10.1016/j.ijporl.2011.08.014>
10. Kuchmayeva T. B., Shcheglov V. V. The role of bronchoscopy in the differential diagnosis of bronchial obstruction syndrome. *Medical News of North Caucasus.* 2014;9(4):384-386. <https://doi.org/10.14300/mnnc.2014.09110>
11. Dongol K., Neupane Y., Das Dutta H., Raj Gyawali B., Kharel B. Prevalence of Foreign Body Aspiration in Children in a Tertiary Care Hospital. *JNMA J. Nepal Med. Assoc.* 2021;59(234):111-115. <https://doi.org/10.31729/jnma.5393>
12. Babich I. I., Bagnovskii I. O. Results of the clinical use of a new method for surgical treatment of weapon injuries of parenchymatous abdominal organs in children. *Medical News of North Caucasus.* 2019;14(4):606-609. <https://doi.org/10.14300/mnnc.2019.14151>
13. Mustafayev J. M. O., Svistushkin V. M. Unusual foreign bodies of the respiratory tract. *Russian Sklifosovsky Journal of Emergency medical care.* 2012;(3):72-74.
14. Drobayazgin E. A., Anikina M. S., Sudovych I. E., Chikinev Yu. V., Arkhipov D. A. Endoscopic techniques in the diagnosis and treatment of pediatric patients with foreign bodies of the lower respiratory tract. *Endoscopic Surgery.* 2020;26(2):13-18. <https://doi.org/10.17116/endoskop20202602113>

About authors:

Shamsiev Azamat Mukhitdinovich, MD, PhD, Professor of the Department of 1st pediatric surgery; tel.: +998979254500; e-mail: shamsiyevja@mail.ru; <https://orcid.org/0000-0001-8482-7037>

Shamsiev Jamshid Azamatovich, MD, PhD, Professor, Head of the Department of pediatric surgery, anesthesiology and resuscitation of the Faculty of Postgraduate Education; tel.: +998979100041; e-mail: shamsiyevja@mail.ru

Ruziev Jasur Aslidinovich, Head of the Department of thoracic surgery; tel.: +998979217098; e-mail: jasur1204@gmail.com

Shakhriev Abdukodir Kamalbayevich, PhD, Associate Professor of the Department of pediatric surgery; tel.: +998979241220; e-mail: shakhrievabdikodir@mail.ru; <https://orcid.org/0000-0003-1186-443X>

Makhmudov Zafar Mamadzhonovich, PhD, Assistant of the Department of pediatric surgery, anesthesiology and resuscitation of the Faculty of Postgraduate Education; tel.: +998979134689; e-mail: zafarebox@mail.ru; <https://orcid.org/0000-0002-7058-932X>