

**THE ROLE OF MULTISPIRAL COMPUTED TOMOGRAPHY IN
THE DIAGNOSIS OF FOREIGN BODIES OF THE RESPIRATORY
TRACT IN CHILDREN**

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According to the WHO, "... The annual percentage of hospitalization of children with foreign bodies of the respiratory tract in relation to all children in hospital treatment ranges from 2.7% to 14.3%, most of them are children aged 1 to 5 years. This problem contributes to the rapid development of severe, often irreversible changes in the respiratory system and the development of bronchopulmonary complications." Foreign bodies of the tracheobronchial tree in childhood continue to be a very serious problem that requires emergency care with appropriate medical and diagnostic equipment and highly qualified personnel. The incidence of patients with the disease in question, the percentage of complications as a result of untimely diagnosis, continue to remain quite high, not having a tendency to decrease.

In the world medical literature, there are a number of studies aimed at studying the causes of the development of this pathology, prevalence, methods of diagnosis and treatment. The high percentage of complications after aspiration of a foreign object into the respiratory tract has become an incentive for the widespread introduction of virtual and video bronchoscopy into clinical practice, to improve diagnosis and treatment outcomes. These manipulations have shown high efficiency. However, there is no consensus among pediatric surgeons regarding the optimal tactics for managing this category of patients.

This problem is relevant in children due to anatomical and physiological features that contribute to the rapid appearance and development of difficult changes in the respiratory system that appear when IT enters the tissues of the

tracheobronchial tree, and as a result of the appearance of impaired conduction of the TD, the development of complications of the bronchopulmonary tract [8, 11, 47, 51, 76].

Keywords. Improving the results of diagnosing children with foreign bodies of the respiratory tract. Multispiral tomography. Foreign bodies of the respiratory tract. Aspiration. Respiratory failure.

Objective. Improving the results of diagnosing children with foreign bodies of the respiratory tract using multispiral computed tomography (MSCT) of the chest organs.

Materials and methods. For the period from January 2000 to June 2019, 1355 children with suspected IT DP were treated and examined in the Department of Thoracic Surgery of the clinic.

Among 1355 patients who were hospitalized with a diagnosis of IT DP, 407 (30.0%) excluded this disease, and 948 (70.0%) had a confirmed diagnosis.

MSCT of the chest organs was performed on tomographs Bright Speed General Electric (USA) 64 slice, Optima CT520 General Electric (USA) 32 slice and Siemens Definition AS (Germany) 128 slice (minimum thickness up to 1 mm). MSCT does not require preliminary preparation, it is carried out in a supine position, with arms raised, at inhalation height.

Patients tolerated MSCT well, no complications were observed. In 32 (3.4%) cases, the study was carried out without additional medications, 10 (20.4%) patients underwent sedation, and only 9 (18.4%) of the youngest patients used medication sleep.

Data indicating the presence of IT on MSCT: visualization of IT at axial scanning and reconstruction at frontal and sagittal projections as a formation (substrate) with different density against the background of the bronchus airlumen.

In MSCT, the shapes, sizes, contours, structure and density of IT are established. The location of IT in the walls of the bronchi, the density of closure of the bronchus lumen, and the condition of the bronchial tree are determined.

Indirect data for IT: bronchus conduction disorders depending on the degree of its stenosis. Minor bronchus stenosis is expressed by hypoventilation of the affected part of the lung, lobe, segment. MSCT picture of the presence of areas of reduced pneumatization in the form of "ground glass". Significant narrowing of the bronchus lumen during inhalation, the airflow enters the lung due to the increase in the diameter of the bronchus, during exhalation, the bronchus narrows, and the airflow cannot go in the opposite direction. Emphysema appears. MSCT picture: enlargement of the patient's lung in volume (lobe or segment), increased transparency, impoverishment of the pulmonary pattern, reduction of the diaphragm dome on this side. Complete obturation of the bronchus lumen, the conduction of air in the corresponding part of the lung ceases with the occurrence of atelectasis. MSCT data reduce the volume with intensive compaction of the affected part of the lung, displacement of the mediastinum to the diseased side and high location of the diaphragm dome.

Results. MSCT of the chest organs was performed in 49 patients. Among these patients, in 22 (44.9%) cases, IT DP was subsequently removed, and in 27 (55.1%) this diagnosis was excluded.

In 20 (40.8%) cases, data for IT DP was detected. In slight stenosis, hypoventilation of the lung, lobe, or segment occurs on MSCT as the presence of part of the opacity on the side of the lesion, often low-intensity focal indurations in the periphery of the lung due to lobular atelectasis.

In 26 (53.1%) cases, no data on IT-DP were revealed on chest MSCT. A normal CT picture of LDP in children was visualized.

Table 1 presents the indicators of the diagnostic effectiveness of MSCT in relation to IT DP.

Table -1

Effectiveness of multispiral computed tomography for foreign bodies of the respiratory tract

Conclusion of the MSCT on the availability of IT DP	Conclusion of the MSCT on the absence of IT DP
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There is an IT DP	TP 20	There is an IT DP	FP 1
No IT DP	FN 2	No IT DP	TN 26
total		total	
22		27	

***Note:** TP – true positive result; FP– false positive result; FN – false negative result; TN – true negative result.

Table 1 shows that 22 (44.9%) patients had IT in the DP, and 27 (55.1%) children did not have foreign objects in the tracheobronchial tree. In 49 patients with suspected IT DP, a positive conclusion on the presumptive diagnosis was obtained in 20 (40.8%) cases. Confirmation of this diagnosis during bronchoscopy was obtained in 22 (44.9%) of these patients. There were 2 false negative conclusions on MSCT (4.1%). A negative conclusion on the diagnosis of IT DP according to MSCT data occurred in 26 (53.1%) cases. Of this number of patients with a excluded diagnosis, no IT was found in all children in the future, that is, the MSCT data turned out to be truly negative. However, there was 1 false-positive case – (2.0%). In MSCT DP, diagnostic errors presented as false negative and false positive conclusions were made in 3 (6.1%) cases. Calculations were made to obtain the following indicators of MSCT efficiency in IT DP: the sensitivity of the latter was 90.1%, specificity was 96.3%, and diagnostic accuracy was 93.9%.

Conclusion. MSCT in IT DP showed high sensitivity (90.1%), specificity (96.3%), and diagnostic accuracy (93.9%). In complex diagnostic cases, it is recommended to perform chest MSCT, which has high diagnostic efficiency.

The use of modern imaging methods (MSCT) makes it possible to accurately diagnose and determine the localization of IT in the DP. We have proven that MSCTs have extremely high sensitivity and specificity, and also significantly affect treatment tactics, allow you to avoid unreasonable manipulations, and if it is necessary to perform bronchoscopy, plan the technical details of the operation and facilitate its implementation.

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