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RISK AND MANAGEMENT OF CHILDREN WITH A FOREIGN BODY IN THE LOWER RESPIRATORY TRACT

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ABSTRACT

Introduction: Foreign bodies in the lower respiratory tract are a serious problem in medical practice, often leading to death.
Material and methods: The authors analyzed the risks and difficulties of treatment of 675 children with foreign body in the lower respiratory tract treated for the period 1995-2014 in the ENT clinic at the University Hospital "Queen Joanna-ISUL" Sofia and Children's Clinic at the University Hospital "Alexandrovska" Sofia, comparing them with data from the national statistics on the number of children with a foreign body in the lower airways dead before receiving medical care.
Results: In this period the treatment is successfully completed at 663 children aged 0-3 years, but at 59 children more of one endoscopic procedure was performed. 12 children have continued the treatment at the Clinic Thoracic Surgery due to the inability of endscopic extraction of foreign bodies from the lower respiratory tract.
Discussion: Foreign bodies in the lower respiratory tract in children, especially to 1 year of age are extremely dangerous because of the anatomical features of the respiratory system of children. They require more attention, experience in the diagnosis and good collaboration between pediatricians, bronchoscopy specialist, trained anesthesiologist and thoracic surgeon to avoid complications and death.

INTRODUCTION

Foreign bodies (FB) in the lower respiratory tract are a serious problem in otorhinolaryngology and pediatric practice, often leading to death. (Perenovska *et al.,* 2005, Tzolov *et al.,* 1986, Tzolov *et al.,* 1999, Black *et al.,* 1994, Cataneo *et al.,* 1997)
For a "foreign body" is taken each object from exogenous and endogenous origin, capable of partially or completely block the lumen on a part of the respiratory system - nasal passages, larynx, trachea and bronchi.

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Difficulties in diagnosis of FB in the lower respiratory tract and its adequate treatment are mainly due to the immaturity of the respiratory system, as well as certain anatomical structures in children. The length of the trachea in newborns is 4 cm (in adults - 10-12 cm) and width 0.5 – 0.6 cm (adults – 1.3 - 2.2 cm). The width of the right main bronchus in infants is 0.5 – 0.6 cm (adult - 1.5-1.6 cm) and the left – 0.4 – 0.5 cm (adult – 1.0 - 1.1 cm). The right main bronchus is wider and is almost a direct continuation of the trachea, which explains the more frequent detection of foreign objects in it. The clinical signs in children with aspirated FB in the lower respiratory tract, especially in the absence of inspiratory incident in early childhood often resemble a respiratory infection, long standing

allergies or asthma attack. In some cases this is the reason for incorrect or delayed diagnosis endangering the child's life, as well as in sometimes leading to subsequent surgery. Aspiration of a FB in the majority of cases is accompanied by very dramatic moments for both, patients and medical staff. Get in the airways together with "respiratory drama" that has always aimed to look at the preliminary case history by GP, pediatrician, and ENT specialist. Another important symptom is coughing, but it also is not always mandatory.

Breakthrough cough and symptoms of "flapping flag" are important guiding signs for in non-fixed FB in the trachea. Aspirated FB, if not removed immediately, remains fixed in one of the departments of the respiratory system. Most patients who have acute symptoms of dyspnea, coughing and cyanosis gradually reduce and disappear - occurs during the „false prosperity". (Tokar *et al.,* 2004) Only in a small part of patients the complaints quickly progress and leads to death before specialized medical care or during surgery - large and swelling foreign bodies located mostly in the area of the bifurcation of the trachea. Often parents and relatives of young children "forget" to mention episodes of respiratory incident, not to be blamed for poor care of the child, and reassured by the fact that cough and breathlessness are gone and the child remains in good condition. This period of „false prosperity" has a different duration, directly depending on the origin, size and localization of the foreign body and the degree of functional disorders.

It is followed by the stage of inflammatory changes in the tracheobronchial system and lung tissue. In the clinical picture they are manifested as chronic bronchitis, chronic pneumonia, bronchiectasis, empyema, lung abscess, etc., thus sometimes requiring resection of the lung parenchyma. This is so-called "chronic foreign body" in children. Any such event requires broad clinical experience of the clinician. (Martinot *et al.,* 1997). The majority of FBs have food origin. For children aged up to three years, they fall into the airways most often during the eating or a game, especially when accompanied by laugh, talk, cry or cough. Located in the oral cavity FBs or food particles are carried away by the airflow and easily pass through glottal slit if not very large. (Cataneo *et al.,* 1997, Metrangolo *et al.,* 1999, Dehghani et Ludemann, 2008, Rimell *et al.,* 1995). The aim of the study is to shed light on both the risks and difficulties in treatment by the analysis of actual ratio between the number of removed foreign bodies and that of the children dead before receiving medical care for a period of 20 years (1995-2014).

MATERIALS AND METHODS

The hospital records of 675 children diagnosed with "foreign body" in the lower respiratory tract for 20 years (1995-2014) treated in the ENT Clinic at the University Hospital "Queen Joanna-ISUL" Sofia and the Children's Clinic of the University Hospital "Aleksandrovska "Sofia are analyzed. In each patient after an accurate medical history taken, an inspection, percussion and auscultation of the chest is performed. At the beginning of the examination respiratory excursions of the two halves of the thorax are compared looking for asymmetry. Almost always on the side of the FB is seen less or greater dullness or tympany, while auscultation - to varying degrees weakened breathing, rhonchi, rales and local and generalized wheeles. By full face and profile radiography of the chest and, if possible CT of the lungs with contrast the shape, size and location of the foreign body is determined. (Appelgate *et al.,* 2001, Ayed *et al.,* 2003, Banerjee *et al.,* 1988, Ciftci *et al.,* 2003, Lima et Fisher, 2002, Silva *et al.,* 1998) In the case of complete bronchial obstruction - atelectasis, symptoms of Holzknecht-Jacobson and at valve type – emphysema is observed. For all children rigid tracheobronchoscopy with rigid bronchoscopes company "Friedel" and "Karl Storz" Germany with injecting ventilation is conducted under general anesthesia. (Lima, 1989, Mu *et al.,* 1991, Dehghani et Ludemann, 2008) To achieve maximum coverage in the surface of the foreign body without crushing, different types of clips are used.

Measurements of pH, pO_2 and pCO_2 in arterial blood samples are made. In the differential diagnostic aspect pneumonia, bronchial asthma, and lately pulmonary tuberculosis in the Roma ethnic group must be rejected. When extracting, crushing the FB is necessary only in the case of very swollen bean with the aim to push it into one of the main bronchi and to improve lung ventilation. Then the bean is removed piece by piece. In mucosal edema of the bronchi and included foreign body in order to reduce edema a solution of epinephrine 1:1000 is applied. The similar procedure assures the extraction of a chronic FB covered by granulation. When the FB passes through the lumen of bronchoscopy tube, it can be removed without changing the position of the tube, with a view to easier revision of the place. If the FB is larger than the lumen of the tube it is drawn up to its opening and, together subtracted. This hides the inconvenience of reintubation for revision and prolongs the duration of the intervention. (Burton *et al.,* 1996, De Bildering *et al.,* 2001, Mu *et al.,* 1990, Silva *et al.,* 1998, Zaytoun *et al.,* 2000).

Data on the number of dead children on grounds “Foreign body” in the pharynx, larynx, trachea, bronchus and lung in Bulgaria during the period 1995 – 2013 are obtained from the Bulgarian National Statistical Institute (BNSI). Detailed statistics on deaths by single causes are available in Information System Demography from 1995. The statistical studies of deaths by cause in Bulgaria are carried out in compliance with the requirements of the International Classification of Diseases of the World Health Organization. Until 2004, Bulgaria has implemented ICD - IX revision. Since 2005 is applied ICD - X revision with 4-digit code classification introduced by 01.01.2013. The study complies with the ethical principles of the Declaration of Helsinki and is conducted following the approval of the Ethical Committee in University Hospital “Tsaritsa Yoanna“.

RESULTS

During the study period (1995-2013) a total of 675 children, aged 0-3 years have been treated with FB with boys to girl’s ratio of 1.17 (310 boys and 365 girls). The data obtained from BNSI show that during the same period 276 children dead before receiving adequate medical aid. (Fig. 1) Within the group of deceased children, those of 0-11 months, have the largest relative share. The next figure show ratio of children with removed FB into the lower respiratory tract compared to the number of dead children by cause FB in larynx, trachea,

bronchus and lung in Bulgaria during periods 1995 – 2004 and 2005 – 2013 (Fig. 2). Both periods are significantly different and distinct age groups, and total ($p < 0.05$). In the second period, an increase in the proportion of children with a foreign body removed at the expense of reducing the deceased. Data shows that the first year of age is critical for the diagnostic and treatment.

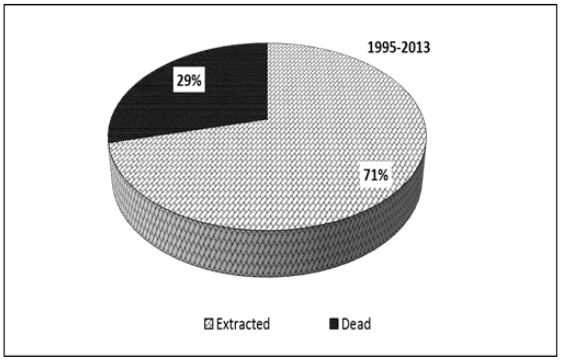

Figure 1. Overall number of patients aged 0-3 years with a foreign body in the airways for the period 1995-2013

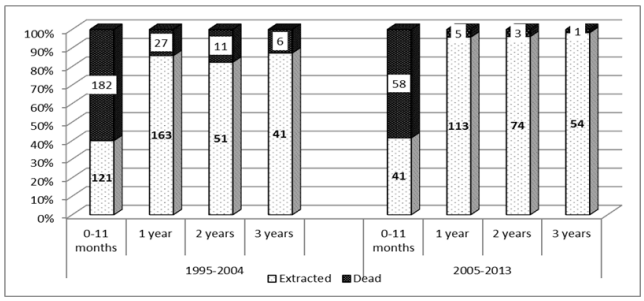

Figure 2. Patients with foreign bodies in the airways of children aged 0-3 years for the periods 1995-2004 and 2005-2013

Against the background of about twofold reduction in the number of children with FB in the trachea and bronchi in the second period - 2005-2013 (602 vs. 349 cases), there is also a clear trend towards reducing deaths and relatively increasing number of children with FB removed at a ratio of 0.61 for the period 1995-2004 and 0.23 for the period 2005-2013. This is mainly due to the improved awareness and clinical work of GPs and specialists in primary health care. In 382 of the cases the extracted FBs are localized in the right main bronchus, in 238 in the left main bronchus, in 37 in the trachea and in 22 cases bilaterally (Fig. 3).

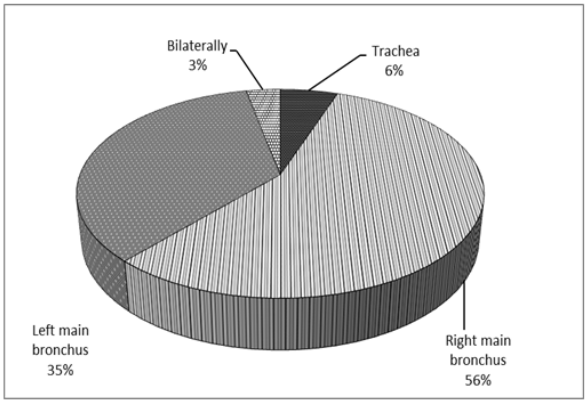

Figure 3. Location of the removed foreign bodies

In 51 patients or 7.5% of a population, a chronic foreign body is observed. The extracted FBs were of various origins: plant (seeds, nuts, grains, classes of grasses etc.), with inorganic origin (metal, glass and plastic items), of animal origin (bones, meat) and teeth, crowns or dental materials and instruments. In some severe lung diseases - pneumonia, cystic fibrosis, in post-traumatic complications of chest trauma and postoperative complications are observed so-called "endogenous foreign body" in the airways. To him the thick secretions or pathological clot block the lumen of the airways. In these cases, the removal of this "plug" is imperative and survival.

The more frequent FBs removed are sunflower seeds - 22.3% (151), followed by those of groundnuts - 20% (136) and in walnuts - 17.5% (119). The fraction of the removed beans is only 2.5% (18) but must be boldly noted that this is one of the most dangerous foreign objects, generally leading to death if not treated. It should not be forgotten that in neonates and infants up to 6 months duration of the manipulation should not be longer than 20 minutes and in older children (3 years) up to 30 minutes. At monitored period the treatment is successful for 663 children, while 59 children have application to more than one endoscopic procedure, respectively repeated hospital stays in ENT and Children's clinics. In very few patients - 0,59% (4) due to asphyxia because of large FB in the trachea first a tracheotomy has been made, followed by lower bronchoscopy.

Gas exchange abnormalities are found in most of the cases and are reflected in alterations of pH, pO_2 and pCO_2 in arterial blood samples. Due to the inability of endoscopical extraction (wedge or penetrated the lung parenchyma FB) in 12 children the treatment has continued at the Clinic for Thoracic Surgery. Despite careful handling equipment, although in rare cases, postoperative complications are observed - 1.2% (8). In two of the children (0.3%) after removal of the FB difficulty in breathing and atelectasis are detected thus requiring continuing treatment in hospital intensive care.

DISCUSSION

Foreign bodies in the lower respiratory tract in children, especially in the first year of life are extremely dangerous because of the anatomical features of the respiratory system of children and require more attention and experience in diagnosing them to avoid death. Accurate history taking and knowledge of the capabilities of the various diagnostic methods, bronchoscopic examination performed with rigid or flexible bronchoscopy and qualifications of the team allow in most cases early removal of the foreign body. The delay can result in chronic pneumonia, empyema, lung abscess parenchyma sometimes requiring resection of the affected part. Foreign bodies require attention, experience in the diagnosis and better collaboration between pediatrician, endoscopy specialist (ENT or pulmonologist), trained anesthesiologist with experience in working with children and thoracic surgeon to avoid complications and death.

Our clinical experience shows that it is necessary to conduct tracheobronchoscopy if presence of a foreign body to the lower airways is suspected. It corresponds to international

experience that there are no absolute contraindications to perform therapeutic tracheobronhoscopy at reasonable doubt foreign body. To avoid postoperative complications, gravely threatening the lives of children, it is necessary seriously strengthens GP's awareness-raising and preventive work in their patients – especially parents of younger children. Awareness raising campaigns for the general population is also thus inclusion of non-governmental organizations in this work is of exclusive importance. Only improving a public awareness and diagnostic and clinical competencies of GPs and specialist in primary health care might minimize these incidents and therefrom the possibility of death.

Conflict of interest

The authors declared no conflict of interest.

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REFERENCES

Appelgate, K.E., Dardinger, J.T., Leiber, M.L., *et al.,* 2001. Spiral CT scanning technique in the detection of aspiration of LEGO foreign bodies. *Pediatr Radiol*. 31; pp. 836-840

Ayed, A., Jafar, A.M, Owayed A. 2003. Foreign body aspiration in children: Diagnosis and treatment. *Pediatr Surg Int*; 19, pp. 485-488

Banerjee, A, Rao, K.S., Khanna, S.K., Narayanan, P.S., Gupta, B.K., Sekar, J.C., Retnam, C.R., Nachiappan, M. 1988. Laryngo-tracheo-bronchial foreign bodies in children. *J Laryngol Otol.* 102, pp.1029-1032

Black, R.E., Johnson, D.G., Matiak, M.E. 1994. Bronchoscopic removal of foreign bodies in children. *J Pediatr Surg.* 29, pp. 682-684

Burton, E.M., Brick, W.G., Hall, J.D., Riggs, W. Jr, Houston C.S. 1996. Tracheobronchial foreign body aspiration in children. South Med J.89, pp. 195-198

Cataneo, A.J., Reibscheid, S.M., Ruiz Junior, R.L., Ferrari, G.F. 1997. Foreign body in the tracheobronchial tree. *Clin Pediatr.*36, pp. 701-706

Ciftci, A.O., Bingol-Kologlu, M., Senocak, M.E., et al. 2003. Bronchoscopy for evaluation of foreign body aspiration in children. *J Pediatr Surg*. 38, pp. 1170-1176

De Bilderling, G., Mathot, M., Bodart, E. 2001. Asthma in the young child: when should inhaled foreign body be suspected? *Rev Med Liege*. 56, pp. 759-763

Dehghani, N., Ludemann, P. 2008. Aspirated foreign bodies in children: BC Children's Hospital emergency room protocol Issue: *BCMJ,* 50, 5, pp. 252-256

Even, L., Heno, N., Talmon, Y., Samet, E., Zonis Z., Kugelman, A. 2005. Diagnostic evaluation of foreign body aspiration in children: a prospective study, J. Ped. Surg. 40, pp. 1122–1127, http://dx.doi.org/10.1016/j.jpedsurg. 2005.03.049

Lima, A.B., Fischer, G.B. 2002. Foreign body aspiration in children. *Paed Resp Rev*.3, pp. 303-307

Lima, J.A. 1989. Laryngeal foreign bodies in children: a persistent, life-threatening problem. Laryngoscope.99, pp. 415-420

Martinot, A., Closset, M., Marquette, C.H., et al. 1997 Indications for flexible versus rigid bronchoscopy in children with suspected foreign-body aspiration. *Am J Respir Crit Care Med.* 155, pp. 1676-1679

Metrangolo, S., Monetti, C., Meneghini, L., Zadra, N., Giusti, F. 1999. Eight years' experience with foreign-body aspiration in children: What is really important for a timely diagnosis? *J. Pediatr Surg*., 34, pp. 1229-1231

Mu, L., He, P., Sun, D. 1991. Inhalation of foreign bodies in Chinese children: a review of 400 cases. Laryngoscope.101, pp. 657-660

Mu, L.C., Sun, D.Q., He, P. 1990. Radiological diagnosis of aspirated foreign bodies in children: review of 343 cases. *J Laryngol Otol*.104, 778-782

Pasaoglu, I., Dogan, R., Demircin, M., Hatipoglu, A., Bozer, A.Y. 1991. Bronchoscopic removal of foreign bodies in children: retrospective analysis of 822 cases. *Thorac Cardiovasc Surg.*39, 95-98

Perenovska, P., Tzolov, T., Tomova, M., Kabakchieva, R., 2005. Heterogeneous foreign bodies in the airways in children. *Otorhinolaryngology*, C, IX, 1, pp. 51-4

Rimell, F.L., Thome, A., Jr, Stool, S., Reilly, J.S. Rider, G., Stool, D., Wilson, C.L. 1995. Characteristics of objects that cause choking in children. *JAMA.* 274, pp. 1763-1766

Silva, A.B., Muntz, H.R., Clary, R. 1998. Utility of conventional radiography in the diagnosis and management of pediatric airway foreign bodies. *Ann Otol Rhinol Laryngol.*107, pp. 834-838

Steen, K.H., Zimmermann, T. 1990. Tracheobronchial aspiration of foreign bodies in children: a study of 94 cases. Laryngoscope.100, pp. 525-530

Svedstrom, E., Puhakka, H., Kero, P. 1989. How accurate is chest radiography in the diagnosis of tracheobronchial foreign bodies in children? *Pediatr Radiol.*19, pp. 520-522

Tokar, B., Ozkan, R., Ilhan, H. 2004. Tracheobronchial foreign bodies in children: importance of accurate history and plain chest radiography in delayed presentation. *Clin Radiol.*59, pp. 609-615

Tzolov, T., Melnicharov, M., Krutilin, F., Simeonova, T., 1986. Diagnostic difficulties in foreign bodies in the airways in children. Coll. Res. IV National Congress of ENT, Sofia, Oct 24-26; pp 78-80

Tzolov, T., Melnicharov, M., Perenovska, P., Krutilin, F. 1999. Foreign bodies in the airways in children, diagnostic and therapeutic problems. Surgery, 5, pp. 33-34

Zaytoun, G.M., Rouadi, P.W., Baki, D.H. 2000. Endoscopic management of foreign body in tracheobronchial tree: Predictive factors for complications. *Otologryngol. Head.Neck. Surg.* 123(3), pp. 311-316

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