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THE IMPACT OF HABITUAL ASPIRATION ACCIDENTS ON RESPIRATORY SYSTEM IN CHILDREN

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SUMMARY

Key words: pulmonology, foreign body, aspiration, bronchoscopy.

Actuality. Injury due to foreign body aspiration (FBA) is a common and serious pediatric emergency, requiring prompt recognition and early treatment to minimize the potentially serious and sometimes fatal consequences. FB aspiration continues to be a cause of childhood morbidity and mortality, usually in pre-school children.

Materials and methods. A cohort study includes 106 patients hospitalized during 2011-2016 in Pneumology, Mother and Child's Institute, diagnosed with FBA, confirmed via bronchoscopy. Foreign body extraction was carried out by means of rigid bronchoscopy after thorough aspiration and prevention of mucosal bleeding.

Results. The average age (aa) is $1,9 \pm 0,17$ years. The lot was divided into 3 groups according to childhood stages: the most frequent FBA was estimated in toddlers - 88,9%: 95 CI, 81,1-94 cases, aa $1,57 \pm 0,06$ years; in children >3y.o. - 8,5%: 95CI, 4-15,5 cases, aa $6,4 \pm 1,1$ years; and rarely in infants - 2,8%: 95CI, 0,6-15,5 cases, aa $0,76 \pm 0,11$ years (F statistic = 93,5; $p < 0,0001$).

The majority of foreign bodies were found in bronchial tree 89,6%: 95CI, 82,2-94,7; without designation - in 6 children - 5,7%: 95CI, 2,1-11,9; in trachea and larynx 2 and 3 cases (1,9%: 95CI, 0,2-6,6 and 2,8%: 95CI, 0,6-8).

Conclusion. FBA predominates in girls - 57,5%: 95CI, 47,6-67,1 cases. The most vulnerable age is from 1 to 3 y.o. when children are more often exposed to habitual accidents (F statistic = 93,5; $p < 0,0001$). There are evidences of a critical situation in countryside, comparative with urban localities. By localization the most frequent lodgement of foreign bodies was in bronchi.

REZUMAT

IMPACTUL ACCIDENTELOR HABITUALE DE ASPIRAȚIE ASUPRA SISTEMULUI RESPIRATOR LA COPII

Cuvintele cheie: pneumologia, corp străin, aspirație, bronhoscopie.

Actualitatea. Leziune datorată aspirației de corp străin (ACS) este o urgență pediatrică majoră și serioasă, ce necesită identificarea promptă și tratamentul precoce pentru a minimiza consecințele potențiale grave dar uneori și fatale. Aspirația de corp străin continuă să fie cauza morbidității și mortalității infantile, mai ales a copiilor de vârstă antepreșcolară și preșcolară.

Materiale și metode. Studiul de cohortă include 106 pacienți internați în perioada anilor 2011-2016 în secția Pneumologie, IMSP Institutul Mamei și Copilului, diagnosticați cu aspirație de corp străin, confirmată bronhoscopic. Corpurile străine au fost îndepărtate prin intermediul bronhoscopiei rigide după aspirația minuțioasă și profilaxia hemoragiei din mucoasa bronșică.

Rezultate. Vârsta medie a pacienților este $1,9 \pm 0,17$ ani. Lotul a fost divizat în 3 grupe după perioadele copilăriei: cel mai frecvent ACS a fost evidențiată la antepreșcolari - 88,9%: 95 CI, 81,1-94 cazuri, vârsta de $1,57 \pm 0,06$ ani; la copii cu vârsta mai mare de 3 ani - 8,5%: 95CI, 4-15,5 cazuri, $6,4 \pm 1,1$ ani; și rar la sugari - 2,8%: 95CI, 0,6-15,5 copii cu vârsta $0,76 \pm 0,11$ ani (F statistic = 93,5; $p < 0,0001$).

Majoritatea corpurilor străine au fost depistați în arborele bronșic 89,6%: 95CI, 82,2-94,7; fără precizare - la 6 copii - 5,7%: 95CI, 2,1-11,9; în trahee și laringe 2 și 3 cazuri respectiv (1,9%: 95CI, 0,2-6,6 și 2,8%: 95CI, 0,6-8).

Concluzie. ACS predomină la fete - 57,5%: 95CI, 47,6-67,1 cazuri. Cea mai vulnerabilă vârstă este cuprinsă în intervalul 1-3 ani când copiii sunt predispuși accidentelor habituale (F statistic = 93,5; $p < 0,0001$). Există dovezi de situație critică în localități rurale comparativ cu cele urbane. După localizare mai frecvent a fost depistat sediul corpurilor străine în bronhii.

Introduction.

Tracheobronchial foreign bodies are defined as a solid or liquid body, with external (rhino-pharyngeal) origin that reached tracheobronchial tree of organic or non-organic genesis or with internal provenience from lung or mediastinum (blood, pus, caseum tuberculosis) [2].

Injury due to foreign body aspiration (FBA) is a common and serious pediatric emergency, requiring prompt recognition and early treatment to minimize the potentially serious and sometimes fatal consequences. FB inhalation continues to be a cause of childhood morbidity and mortality, usually in preschool children [1]. According to the literature, pediatric tracheobronchial FBA consists approximately 31,02% from medical emergencies among the whole population [3].

The statistics shows us that during 2000, ingestion or aspiration of a foreign body (FB) was responsible for more than 17,000 emergency department visits in children younger than 14 years in the United States [4]. Approximately 80 percent of pediatric FBA episodes occur in children younger than three years, with the peak incidence between one and two years. At this age, most children are able to stand, are apt to explore the world via the oral route and are more susceptible to FB injuries due to their lack of molar teeth, and poor swallowing coordination [1, 5].

Onset of symptoms is predominantly sudden. These presenting complaints depend widely on the location where the body lodged. Nasal objects tend to cause unilateral, offensive, and chronic discharge that is usually unexplained. Inhaled foreign objects induce prompt gagging, choking, and distress as they pass down through the vocal cords and epiglottis. Tracheal bodies have this clinical triad: asthmatoïd wheeze, audible slap from the rubbed trachea, and palpable thud. Penetration syndrome, i.e. choking and intractable coughing followed by vomiting characterizes endobronchial bodies [6].

Diagnosis of AFBs is a real dilemma. Recently, Heyer et al. developed diagnostic criteria. Two out of the following three are considered diagnostic and recommend bronchoscopy for confirmation: foal hyperinflation on Rx, witnessed choking crisis, leukocytosis $>10\ 000$ [6].

Bronchoscopy is invariably indicated on the basis of reliable history alone even when symptoms are minimal, and imaging studies are negative. Secondary bronchoscopy should be done in patients with persistent signs and symptoms to rule out overlooked organic foreign body particles or to remove persistent granulation tissue to avoid long-term complications necessitating lobectomy. The long duration of the procedure, presence of dense granulation tissue, and type of foreign body are important predictors of complications. Bronchoscopy should be regarded as an expert procedure and done with great care to avoid a lot of serious (up to lethal) complications [7].

Materials and Methods.

Purpose of the study was to assess the cases of FBA in children based upon age, gender, locality and level of respiratory tract lesion. We made a cohort study which included 106 patients hospitalized during 2011 - 2016 in Pneumology, Mother and Child's Institute. The diagnosis of a FBA was confirmed via fibro- or rigid bronchoscopy performed with general inhalative anesthesia and manual assisted respiration. The extraction of the foreign body executed by means of an appropriate forceps through rigid bronchoscopy after thorough aspiration and prevention of mucosal bleeding with solution of aminocaproic acid. Statistics has been calculated in EpiInfo software.

Discussions and results.

It was established that pediatric FBA in respiratory tract is more frequent among girls 57,5%: 95CI, 47,6-67,1 cases (61 girls) and 42,5%: 95CI, 32,9-52,4 cases (45 boys) (fig. 1).

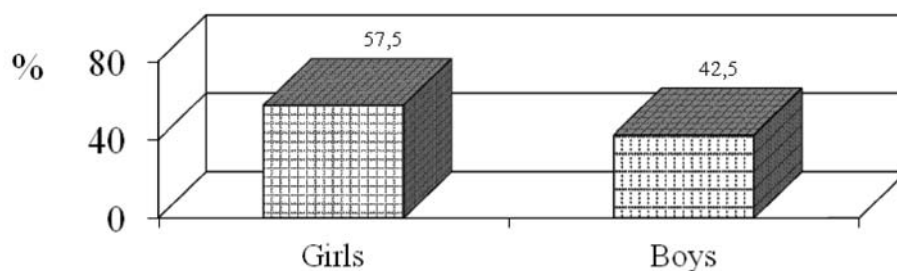


Fig. 1. Gender distribution of pediatric foreign body aspiration

Despite this fact the most international studies present male sex predominance as a characteristic feature of this condition. In a meta-analysis study Alaaddin shows male to female ratio from 1,4:1,0 up to 1,7:1,0 [6, 8, 9].

This discordance can not be explained by prevalence of female-children in Republic of Moldova. According to the National Statistics Office of Republic of Moldova during last 10 years male to female ratio of new-born children was constantly showing the pre-

dominance of male children (approximately 1,05:1,0).

The average age (aa) is $1,9 \pm 0,17$ years, variation 0,6–14 years. The lot was divided into 3 groups according to childhood stages: the most frequent FBA (88,9%: 95 CI, 81,1–94) is estimated in toddlers, aa $1,57 \pm 0,06$ years; minimal age – 1 year, maximal age – 3 years, media – 1,5787 years, moda – 1 year; in

children >3y.o. – 8,5%: 95CI, 4–15,5 cases, aa $6,4 \pm 1,1$ years; minimal age – 3 years, maximal age – 14 years, media – 6,4444 years, moda – 5 years; and rarely in infants – 2,8%: 95CI, 0,6–15,5 cases, aa $0,76 \pm 0,11$ years (F statistic = 93,5; $p < 0,0001$); minimal age – 0,6 years, maximal age – 0,9 years, media – 0,7667 years, moda – 0,6 years (fig. 2).

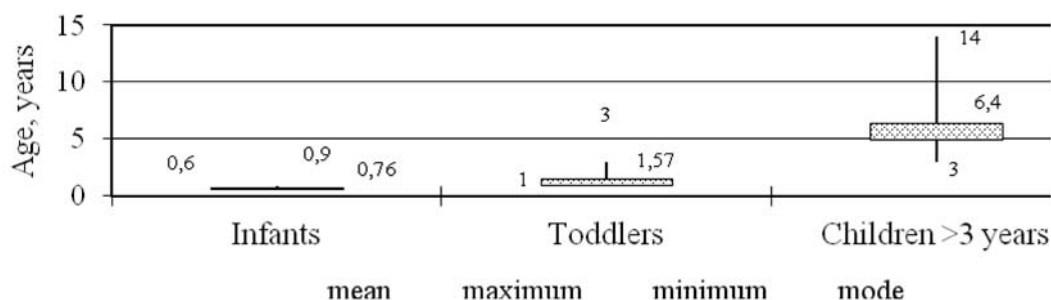


Fig. 2. Age distribution of patients with FBA diagnosis according to the childhood stages.

A lot of authors published basically the same statistical data: more than 80% of cases are below 3 years, of which the peak frequency occurs in 1–2 years age group [7, 10].

There is a prevalence of accidental FBA in children from countryside – 67%: 95CI, 57,2–75,8 cases, less often this event occurs in children from cities – 24,5%: 95CI, 16,7–33,8 and episodically – in children from municipalities (8,5%: 95CI, 4–15,5).

The majority of foreign bodies were found in the bronchial tree 89,6%: 95CI, 82,2–94,7; without designation – in 6 children – 5,7%: 95CI, 2,1–11,9; in trachea and larynx 2 and 3 cases (1,9%: 95CI, 0,2–6,6 and 2,8%: 95CI, 0,6–8).

Some other studies show localization of the foreign bodies in the right main bronchus in 55,1% patients followed by left main bronchus in 18,8%, trachea in 17,1%, vocal cord in 7,4% and both bronchus in 16 1,6%, not found during bronchoscopy in 8,7% cases [10].

Clinical case.

Patient D.A., female 2 years old, hospitalized in the Pneumology Department, Mother and Child's Institute Chişinău, Republic of Moldova. Patient's condition was severe, caused by a suspected foreign body in the bronchial tree. Patient's complains: rare semiproductive cough, subfebrility $37,2^{\circ}\text{C}$, FR - 32 resp./min, FCC -110/min., T/A - 95/60 mm Hg, SaO_2 - 96%. The condition started for 3 weeks with febrile temperature ($38,5^{\circ}\text{C}$).

Aspiration scenario (without acrocyanosis, but with cough) with food particles, (biscuits) in the respiratory tract two days prior to the elevation of body temperature. Was being treated for three days with ceftriaxon solution intra muscular, then with Prefix suspension per os without positive dynamics. Past life history: patient is

second born, second pregnancy (first child healthy girl 7 y.o). The pregnancy went through without complications. The baby was delivered at 42 weeks of gestation naturally, body mass - 2940 grams, height 49 cm. The patient was breast dead for the first 2 weeks, afterwards was transferred on artificial baby formula Belact. The introduction of other foods was at 6 months. Previous medical history: D.A was diagnosed with pneumonia at 5 months, 1 year, 1.5 years and underwent successful antibacterial treatment with no further complications. Risk factors: patient is a passive smoker (father smokes); high humidity in the apartment. During general examination was discovered: pale skin, adipose tissue diffusely reduced, pink mucosa. Physical development with body mass deficiency II grade and high posture (body mass 10.3 kg (p_{3-10}), height 89 cm (p_{90-97})). Nutritional disorder I-II grade. Malnutrition II grade: IP - 0,85; IN -0,83; IMC - 13 (p_{0-3}); D% = 14.87%.

While examining the respiratory system free nasal airflow is observed. Inspection: respiratory rate 32 per minute. Percussion: tympanic sound on the upper right part of the right hemithorax and right medio-basal submatity. During auscultation vesicular murmur is medially decreased; during superficial desparation were detected bilateral diffuse dry sibilant exploratory rales that disappeared during deep breathing and after cough. During deep breathing in the region of the right hilum were detected dry rales with a low tonality.

Blood pressure: 95/60 mm/Hg (N 95-50 mm/Hg). Cardiac sounds are rythmic, loud, heart rate 110/min. Oral mucosa is wet, rose, furred tongue (whitish tint). Adipose tissue diffusely reduced. Abdominal palpation was painless, anterior abdominal wall was soft. Liver is localized +1 cm below right ribs. Defecation: 1 – 2 per 24 hours. Nephro-urinary system was without pathologies.

In order to establish a presumptive diagnosis was performed a differential diagnosis with 2 main pathologies that have a clinical presentation that is similar to our case: lobar pneumonia and an obstruction Syndrome. Presumptive diagnosis was established: Acute respiratory infection. Segmental pneumonia S4-S5 on the right side in the stage of incomplete resorption. Acute obstructive bronchitis. Foreign body in the bronchial tree? Respiratory failure I grade. Moderate malnutrition. Hereditary bronchia-pulmonary disease? A typical infection (TORCH)?

We developed a personalized diagnostic algorithm: general blood test, biochemical blood testing (ALAT, ASAT, bilirubin, lipase, Cl), fecal matter cytological analysis, microscopical and microbiological examination of the sputum, abdominal ultrasound, chest X-ray, bronchoscopy, bronchoscopic lavage with a bacteriological examination, sweat test.

After obtaining the test results blood and biochemical testing was in the normal range. Results: Hb 120 g/l, Leu- $6,9 \times 10^9/l$, ESR - 8mm/h; ALAT - 15 UI/ml, ASAT - 38 UI/ml, Urea - 3,3 mmol/l, Creatinin - 47 $\mu\text{mol/l}$, Total bilirubin - 8,1 mmol/l, α -amilaza - 47 UI/ml, Cl results could be appreciated as negative below 40 mmol/ml: nr. 1- 20,1 mmol/ml; nr. 2 - 29,26 mmol/ml, nr. 3- 10,1 mmol/ml.

During abdominal and chest ultrasound were discovered hepatomegaly which does not exclude the presence of a hepatic inflammatory process and a reactive pancreatitis. Free liquid in thoracic cavity was not found.

On the chest X-ray (fig. 3) was observed an accentuated vascular net, hila are overrating with the mediastinal opacity. An atelectasis of the medium lobe on the right side was detected. On the left side the lung is transparent, CTI=0,53.

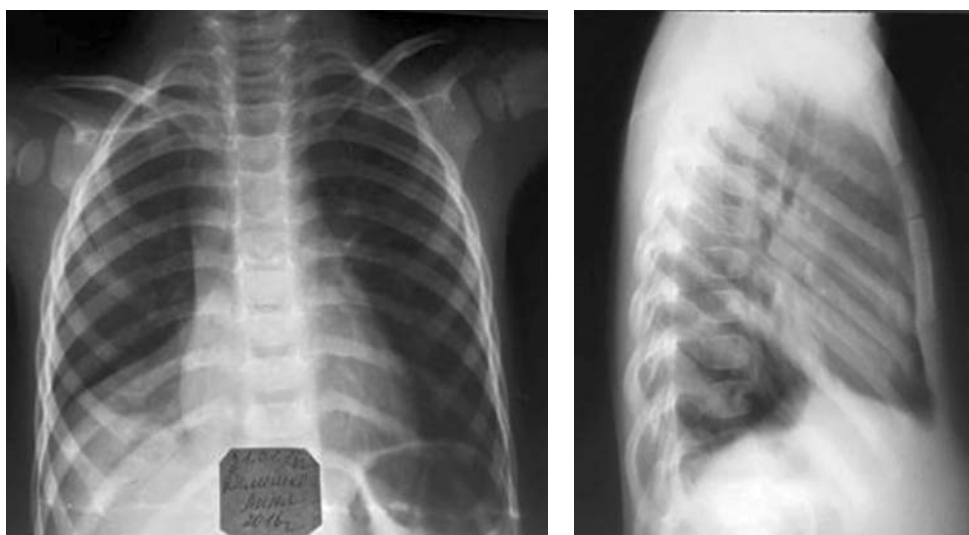


Fig. 3 Patient's chest X-Ray 2 days after aspiration scenario (with biscuits)

After 3 weeks of ambulatory treatment at home, followed by treatment in hospital on the repeated chest X-Ray (figure 4) was found pneumonic infiltration with expiation among right medium lobe. Diaphragm was net, sinuses were free. There was established a positive dynamic.

Positive dynamics (figure 5) after successful extraction of the foreign body was radiologically confirmed: resorption of the pulmonary infiltration and free sinuses were found.

Microbiological examination with an antibiogram resistance test was performed and were detected: *Streptococcus viridans* 10^6 , *Staphylococcus aureus* 10^6 (sensible to: oxacilini, ampicilini, cefazoloni, cefamed, gentamicini, claritromicini, azitromicini).

While performing the rigid bronchoscopy in the right medium lobar bronchus was identified and extracted fragments of the suspected foreign body (particles of nuts) (figure 6) localized between masses of

granular tissue. A bacteriological imprint and a lavage with aminocaproic acid was effected. The left side was clean with no deregulation of airflow. Foreign body in the right medial lobar bronchus which was extracted. Bilateral purulent endobronchitis.

Second endoscopic control showed circular fibrin plates in the part where the foreign body was discovered which were extracted. Lavage with aminocaproic acid was effected. Fibrinous endobronchitis on the right side II grade.

After paraclinical examinations was established a final diagnosis: Segmentary pneumonia right S4-S5 complicated with atelectasis, acute evolution. Acute respiratory failure I grade. Foreign body in the right bronchial tree (organic - fragments of nuts). Bilateral purulent/fibrinous endobronchitis. Patient was treated with combined antibacterial medication (semi synthetic penicilines and aminoglycosides, because patient was treated at home with cefalosporins II and III



Fig. 4. Chest X-Ray during hospitalization



Fig. 5 Chest X-Ray after successful extraction of the foreign body

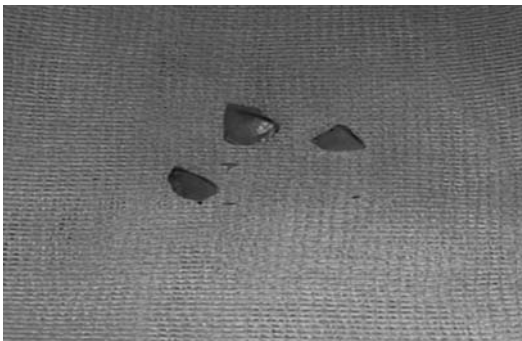


Fig. 6 Fragments of nut-shell similar to identified and extracted ones.

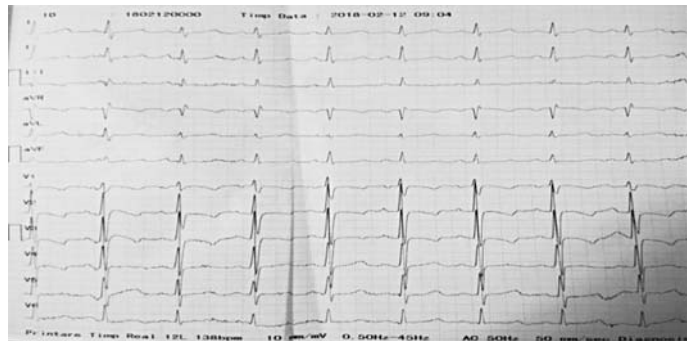


Fig. 7 ECG – Sinusal rhythm, HR 130/ min, electric axis 60-90°.

generation) and anti-inflammatory steroid treatment with a positive dynamic.

Patient was released from the hospital in a good condition. Chest X-Ray after 10 days is recommended. Even though child's mother describes aspiration scenario as running with biscuits, bronchoscopy findings show us some fragments of nut-shell. That is why parents should be alerted and ensure a proper alimentary and habitual regimen to prevent aspiration of foreign bodies.

In order to prevent FBA we should take into account some advices: a child requires continuous supervision, parents should be educated by family doctors and peditres avout riscs of wrong alimentation of toddlers with sunflower seeds, grapes, nurs, pop-corn, small candies etc. Toys with small dimentions are forbidden to small children. While eating, small children are recommended to avoid other activities. [11;12]

Conclusion.

FBA predominates in girls – 57.5%: 95CI, 47.6-67.1 cases. The most vulnerable age is from 1 to 3 y.o. when children are more often exposed to habitual accidents (F statistic = 93.5; $p < 0,0001$). There are evidences of a critical situation in countryside, comparative with ur-

ban localities. By localization the most frequent lodgement of foreign bodies was in bronchi, more frequently is affected the right bronchus then the left one. A child requires continuous supervision, parents should be educated by family doctors and peditres avout riscs of wrong alimentation of toddlers with sunflower seeds, grapes, nurs, pop-corn, small candies etc.

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A.E. Dubchak*, **, A.V. Milevskiy*, N.N. Obeid***
ORGAN-PRESERVING SURGERY ON UTERINE APPENDAGES IN WOMEN WITH INFERTILITY AND FUNCTIONAL ACTIVITY OF THE OVARIES

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SUMMARY

Key words: infertility, surgical treatment, appendages of the uterus, ovarian reserve.

The article presents data on the status of functional activity of the ovaries in women with infertility after organ-preserving operations on the pelvic organs.

The aim of the study was to analyze the organ-saving operations on the uterine appendages in women with infertility and to study their effect on the ovarian functional activity.

Materials and methods. A total of 120 women of childbearing age with a tubal peritoneal infertility factor and benign ovarian formations, an ectopic pregnancy, who underwent surgical treatment for uterine appendages, were divided into groups: I group - 76 (63.7%) women, surgical treatment was carried out in the planned order on the ovaries (group 1a) and on the fallopian tubes (group 1b), 44 (36.7%) to the patients (group II) - surgical treatment was performed urgently on the ovaries (group 2a) and on the fallopian tubes (group 2). OV The ovarian reserve was studied on the basis of the definition of antimüllerian hormone, the level of FSH, counting the number of antral follicles, determining the volume of ovaries.

Results. Operative interventions in the tubal peritoneal factor of infertility inhibit the OR within the first month after the operation, which is manifested by a decrease in the concentration of AMH in all groups. It was revealed that in the 2nd group after urgent surgery the value of this hormone was 2.2 times lower than in group 1 in patients, the operation was carried out in a planned order ($2.1 \pm 0.1 \text{ ng/ml}$), ($p \leq 0.05$) and the volume of ovaries decreased to $5.9 \pm 0.4 \text{ cm}^3$ due to cystectomy and ovarian resection. A decrease in the AF was found to be 4.6 ± 0.2 . In group 2b, in patients with urgent surgery performed on the fallopian tubes and ovaries, the concentration of AMH ranged from 1 to 1.5 g/ml, averaging $1.1 \pm 0.2 \text{ ng/ml}$. The data obtained correspond to the ultrasound parameters of the assessment of the ovarian reserve. In the 2nd group, the volume of the ovaries decreased to $5.9 \pm 0.4 \text{ cm}^3$ due to cystectomy and ovarian resection. There was a decrease in AF to 4.6 ± 0.2 , a decrease in AMH to $1.6 \pm 0.3 \text{ ng/ml}$.

The conclusion. The functional condition of the ovaries in women with infertility after organ-preserving operations on the uterine appendages largely depends on the planned surgical treatment and the concomitant volume of surgical intervention.