International Journal of Advanced Dental Sciences and Technology (IJADST)
ISSN: 2582-757X (Online), Volume-1 Issue-3, October 2021

Morphofunctional State of the Maxillary Sinus Mucosa in Patients After Endoscopic Infundibulotomy

Djuraev J.A., Makhsitaliev M.I.

Abstract: ***The work carried out made it possible to substantiate the need to apply a method for studying the frequency of beating of cilia of the mucous membrane of the nasal cavity and paranasal sinuses in patients with chronic rhinosinusitis when choosing treatment tactics in an ENT hospital. Analysis of the study of data on the functional and morphological state of the mucous membrane of the nasal cavity and maxillary sinus allows us to judge the severity of the pathological process before surgery, which is the fundamental factor in the algorithm for the treatment of chronic rhinosinusitis.***

Keywords: Analysis of the study of data on the functional and morphological state of the mucous membrane of the nasal cavity and maxillary sinus allows us to judge the severity of the pathological process before surgery,

I. INTRODUCTION

Improving the effectiveness of treatment of chronic rhinosinusitis (CRS) is a priority task of modern otorhinolaryngology, not only domestic, but also foreign. This interest in the problem is due to the widespread prevalence of this pathology. In different countries, the criteria for accounting for the incidence, algorithms for the diagnosis and treatment of rhinosinusitis differ significantly, and for CRS these differences are more pronounced than for acute [1,2]. A retrospective analysis of the structure and prevalence of diseases of the ENT organs according to inpatient observations over 5 years showed that chronic diseases of the nose and paranasal sinuses (PNS) occupied a priority place among hospitalized patients (45.8 ± 0.9% and 55.5 ± 1 , 0%). In the structure of the main diseases of PNS, the largest share in the adult population is occupied by inflammation of the maxillary sinus (MP), in which there is an annual increase in the incidence of 1-1.5%, the second most frequent is inflammation of the ethmoid labyrinth cells, then the frontal and sphenoid sinuses [3 , 4,5,6]. According to domestic and international guidelines (EPOS), rhinosinusitis, as a rule, does not occur in the form of an isolated lesion of SNP, other sinuses and the nasal mucosa (NM) are also involved in the pathological process.

Manuscript received on September 20, 2021.
Revised Manuscript received on September 23, 2021.
Manuscript published on October 10, 2021.

* Correspondence Author

Djuraev Jamolbek Abdukakharovich*, PhD, Associate Professor of The Department Otolaryngology and stomatology, Tashkent Medical Academy, Republic of Uzbekistan, E-mail: drdjuraev@mail.ru

Makhsitaliev Mukhammadbobur Ibrokhimovich, Resident of Magistracy of The Department Otolaryngology and Stomatology, Tashkent Medical Academy, Republic of Uzbekistan, E-mail: dr_makhsitaliev@mail.ru

The indication for surgical treatment is the ineffectiveness of conservative therapy for more than 12 weeks. Surgical treatment often requires correction of intranasal structures in addition to intervention within one affected sinus [7, 8]. The development of new technologies in diagnostics and surgical approaches in CRS allows a different approach to the issue of managing patients with this pathology [9,10,11]. To date, the most common method of treatment for CRS is functional endoscopic rhinosinus surgery (FESS), which makes it possible to open all affected PNSs in the least traumatic and gentle way, remove pathologically contents from them and, at the same time, create conditions for adequate drainage and aeration. The main task of FESS is to restore the mucous membrane of the PNS and its functional activity [12]. At the same time, it is known that not all cases when using the methods of functional surgery lead to a positive result, which makes it necessary to study the causes of failures, to look for ways to improve the methods of diagnosis and treatment of chronic diseases of PNS. It should also be noted that functional rhinosurgery is economically more costly, because requires expensive equipment, which is not always equipped with district hospitals. Despite the development of new technologies, classical surgical approaches in rhinosurgery have not lost their relevance. So it was proved that in chronic alterative, hyperplastic and mixed forms of CRS, changes in PNS are irreversible, which requires its complete removal [13]. In such cases, functional surgery, firstly, is not justified, and secondly, the surgical approach does not always allow to completely remove the altered mucous membrane of the affected sinus, taking into account the existing anatomical features (multichamber sinuses, hypergenesis, ostiomeatal complex formation) and radical surgical tactics are required. But at the stage of examination, it is impossible to assess the reversibility of the pathological process (morphological state) of PNS and to clearly define the criteria for choosing the tactics of surgical treatment. After any surgical intervention on the MS, the regeneration of the mucous membrane begins at the point of contact of the granulation tissue with the epithelium. The direction of evacuation of secretions from the VSP directly depends on the ways of epithelialization of this sinus: after a radical operation, the ciliated epithelium of the nasal cavity grows through an artificial fistula from the lower nasal passage into the MS; after functional surgical interventions, epithelialization of the sinus occurs through the natural anastomosis [14].

Histological studies have proven the safety of complete removal of the affected mucous membrane, as well as improved treatment results with minimal relapse. In general, a radical Caldwell-Luke operation is an effective method of surgical treatment of MS in primary surgery of certain clinical forms of chronic maxillary ethmoiditis, and after an unsuccessful endoscopic sinusitis, the surgeon's choice should remain in favor of a more radical intervention on MS. [15]. This circumstance became the goal of our study, forced to look for methods of differential diagnosis of the morphofunctional state of SNP in CRS at the stage of examination. In accordance with the above, the goal of our study was to increase the effectiveness of the treatment of chronic rhinosinusitis, based on the differential diagnosis of the morphofunctional state of the mucous membrane of the nasal cavity and paranasal sinuses before surgery..

II. MATERIAL AND METHODS

In accordance with the designated goal and formulated research objectives, we examined and treated 105 patients with CRS. The control group consisted of 20 volunteers who did not suffer from diseases of the nasal cavity and PNS. All patients complained of nasal congestion and difficulty in nasal breathing, drainage of mucopurulent discharge from the nose and through the nasopharynx, decreased sense of smell up to anosmia. Complaints of discomfort in the area of the MS projection, headache. History of repeated courses of systemic antibiotic therapy in combination with puncture treatment. The age of the patients ranged from 17 to 65 years. In the vast majority of patients in 83 (51.8%) cases, the disease developed from 31-45 years.

III. RESULTS AND THEIR DISCUSSION

After surgery, the patients of the comparison groups were divided into subgroups, depending on the morphological changes in the mucous membrane:

1a subgroup 76 (42.2%) patients without metaplasia of the mucous membrane of the MS tract after endoscopic infundibulotomy;

1b subgroup of 29 (16.1%) patients with mucosal metaplasia and fibrosis of the submucosal layer of the mucous membrane of the MS tract after endoscopic infundibulotomy.

Chronic rhinosinusitis without metaplasia of the epithelium of the nasal cavity and MS after endoscopic infundibulotomy group 1a, n = 76

Endoscopic examination of the nasal cavity was performed on day 3. Patients who underwent an operation in the volume of endoscopic infundibulotomy in the area of the enlarged natural anastomosis and the middle turbinate had hemorrhagic clots and fibrin deposits. On examination at 6 and 12 months in 70 (92.1%) cases, the mucous membrane of the maxillary sinus had a pink color, without signs of inflammation. The area of expanded natural anastomosis with clear contours, is completely epithelialized (see Figure 1). In two cases, there was a narrowing of the natural anastomosis due to the formed cicatricial membrane without signs of impaired aeration of the maxillary sinus. The mucous membrane of the maxillary sinus had a light pink color without pathological discharge.

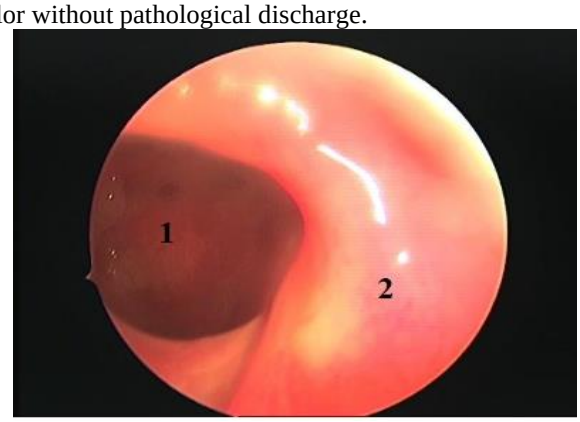

Figure 1. Condition after endoscopic sinusitis in chronic rhinosinusitis, 6 months after surgery (1- maxillary sinus; 2- middle turbinate)

The transport capacity of the MS mucosa 6 months after endoscopic infundibulotomy MCT - 32 ± 1.5 minutes, cilia beating frequency (CBF) - 5.7 ± 0.2 Hz. After 12 months - MCT - 25 ± 1.5 minutes, CBF - 6.9 ± 0.4 Hz (see Figure 2).

Figure 2 Mucociliary transport of the mucous membrane of MS subgroup 1a before and after endoscopic infundibulotomy in dynamics (n = 76)

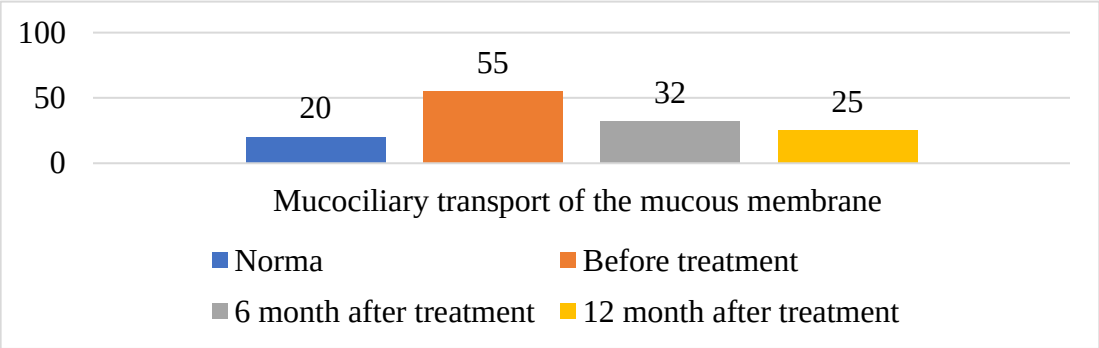

Figure 2. Mucociliary transport of the mucous membrane of MS subgroup 1a before and after endoscopic infundibulotomy in dynamics (n = 76)

Retrieval Number:100.1/ijadst.C1006101321
DOI:10.54105/ijadst.C1006.101321
Journal Website: www.ijadst.latticescipub.com

Published By:
Lattice Science Publication (LSP)

Frequency of beating of cilia of the mucous membrane of MS subgroup 1a before and after endoscopic infundibulotomy in dynamics (n = 76).

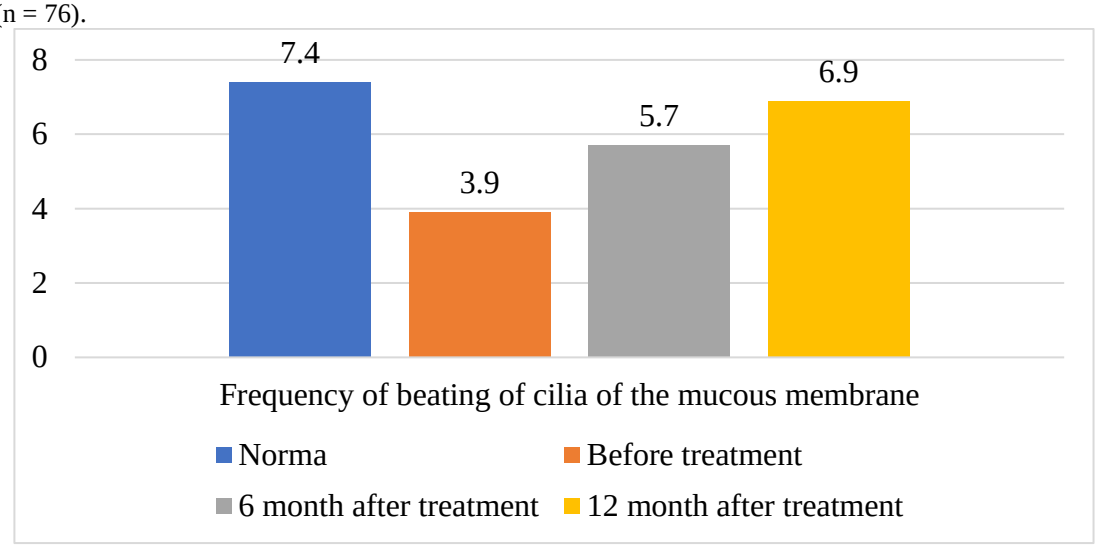

Figure 3. Frequency of beating of cilia of the mucous membrane of MS subgroup 1a before and after endoscopic infundibulotomy in dynamics (n = 76)

According to the results of histological examination of the MS mucosa, after endoscopic infundibulotomy in subgroup 1a after 12 months in 76 (100%) cases, a single-layer multilayer cylindrical ciliated epithelium was determined, leukocyte infiltration in 11 (14.4%) cases, while in 8 (10, 5%) cases, the integrity of the ciliated ciliated epithelium is impaired, fibrosis of the submucosal layer was detected in 4 (5.2%) cases, hyperplasia of the own glands in 27 (35.5%) cases, hyperplasia of the ciliated epithelium in 36 (47.3%) cases (see Figure 4).

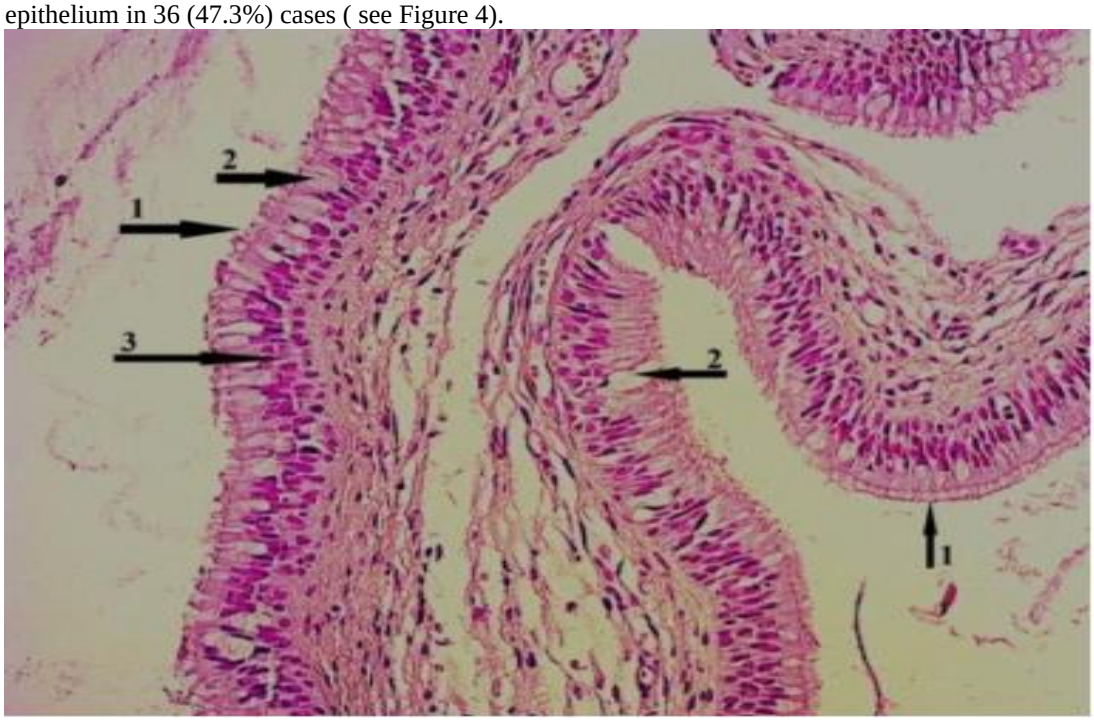

Figure 4. MS mucosa after endoscopic infundibulotomy 12 months later (staining with hemotoxylin-eosin, x200). 1- multilayered unilamellar cylindrical ciliated epithelium; 2 - goblet cells of the ciliated epithelium; 3- ciliated cells of the ciliated epithelium.

Thus, the calorific status of SOSN is not reliable (p> 0.05) in comparison with the norm, both before and after endoscopic infundibulotomy, in which there is an improvement in all functions that were statistically reliably detected. The absence of a significant difference between the heating capacity of SOSN indicates the reversibility of the functional state of the MS mucosa, which is confirmed by the data of histological examination of the MS mucosa.

Chronic rhinosinusitis with metaplasia of the epithelium and fibrosis of the submucosal layer of SOSN and MS after endoscopic infundibulotomy group 1b, n = 29.

The transport capacity of the MS mucosa 6 months after surgery for MS was MCT - 49.2 ± 1.7 minutes, CBF - 3.8 ± 0.4 Hz. After 12 months - MCT - 44.1 ± 1.7 minutes, CBF - 4.1 ± 0.4 Hz (see Figure 5.6).

Mucociliary transport of the mucous membrane of MS subgroup 1b before and after endoscopic infundibulotomy in dynamics, p <0.05 (n = 29)

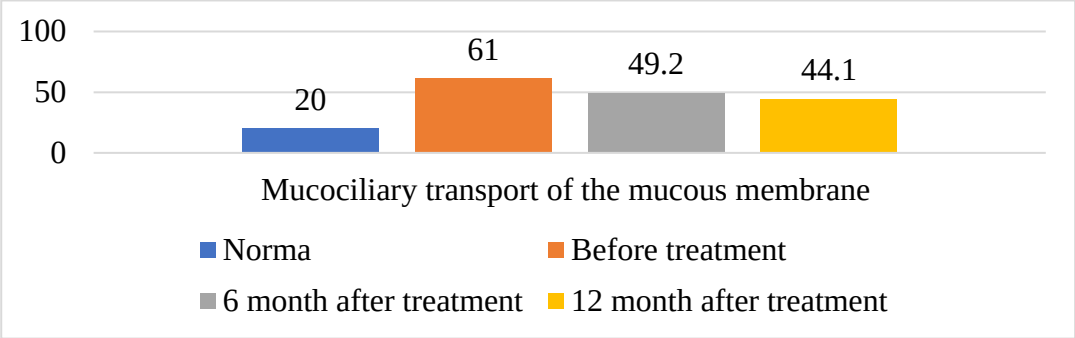

Figure 5. Mucociliary transport of the mucous membrane of MS subgroup 1b before and after endoscopic infundibulotomy in dynamics (n = 29)

Frequency of beating of cilia of the mucous membrane of MS subgroup 1b before and after endoscopic infundibulotomy in dynamics (n = 29).

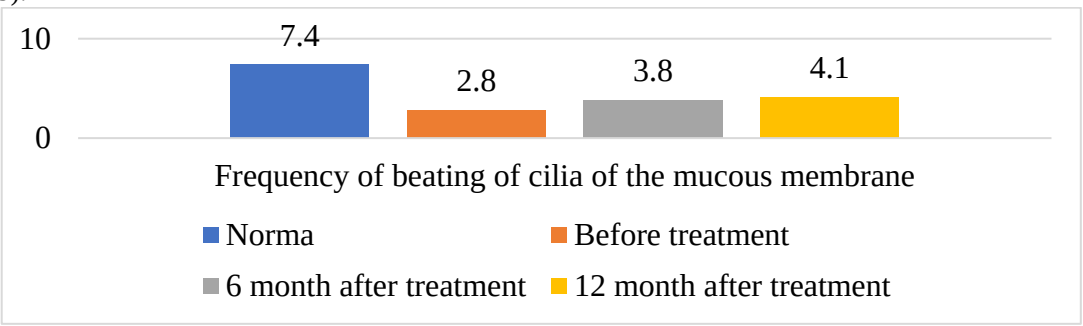

Figure 6. Frequency of beating of cilia of the mucous membrane of MS subgroup 1b before and after endoscopic infundibulotomy in dynamics (n = 29)

As can be seen from the above results, in patients of this group, CBF MS did not recover after 1 year and T was significantly reduced in relation to the norm, both before and after surgery ($p < 0.05$), but in the postoperative period the difference in indicators between three points remains , where the temperature formula was t1 <t2> t3. 12 months after endoscopic infundibulotomy in subgroup 1b morphologically, in 29 (100%) atrophy, detachment and deformation of the cilia of the multilayer single-layer columnar epithelium, in 22 (75.8%) cases, fibrosis of the submucosal layer, in 7 (24.1%) cases hyperplasia of the own glands (goblet cells), hyperplasia of the ciliated epithelium in 26 (89.2%) cases, in 6 (20.6%) cases, an increased content of inflammatory cells (lymphocytes, leukocytes), which is characteristic of an exacerbation of a chronic inflammatory process (see. Figure 7).

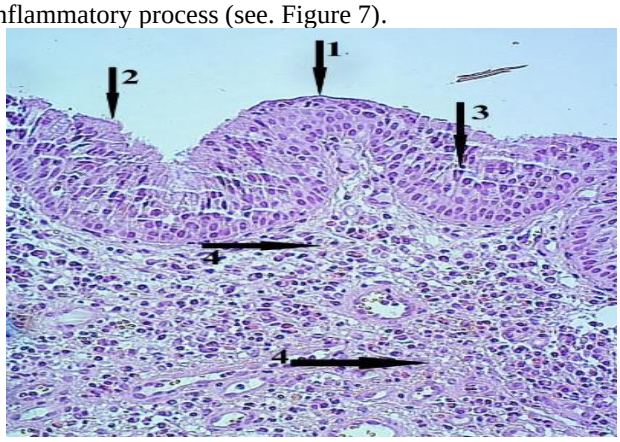

Figure 7. Histological examination of the MS mucosa 12 months after endoscopic infundibulotomy (1- metaplasia of unilamellar ciliated multi-row columnar ciliated epithelium; 3- pronounced hyperplasia of the ciliated epithelium; 4- fibrosis of the submucosa (hemotoxylin-eosin staining, x100).

According to computed tomography data in group 1 after endoscopic infundibulotomy MS is airy, the thickness of the mucous membrane 12 months after surgery in an absolute number of patients, 83 (97.3%), was 3 mm or less, an expanded natural anastomosis is visualized, freely passable, in Thickening of the mucous membrane was noted in 3 (2.7%) patients, mainly in the area of the alveolar bay.

IV. CONCLUSION

Analysis of the obtained results of functional indicators of the state of the ciliary epithelium of the mucous membrane of the nasal cavity and maxillary sinus before and after minimally invasive surgery shows the effectiveness of using the determination of the calorific state of the nasal mucosa before surgery for choosing the tactics of surgical intervention. Functional endoscopic rhinosurgery is indicated only in the absence of irreversible changes in the nasal mucosa, which corresponds to normal temperature values of the nasal mucosa ($t_1 < t_2$), and where the beat frequency of the cilia of the paranasal sinuses is more than 3.2 Hz.

REFERENCES

1. Aimetti M. et al. Maxillary sinus elevation: the effect of macrolacerations and microlacerations of the sinus membrane as determined by endoscopy //International Journal of Periodontics & Restorative Dentistry. – 2001. – Т. 21. – №. 6.
2. Testori T. Maxillary sinus surgery: Anatomy and advanced diagnostic imaging //Journal of Implant and Reconstructive Dentistry. – 2011. – Т. 3. – №. 1. – С. 18-25.

3. Schneider A. C. et al. Characteristics and dimensions of the sinus membrane in patients referred for single-implant treatment in the posterior maxilla: a cone beam computed tomographic analysis //International journal of oral & maxillofacial implants. – 2013. – T. 28. – №. 2.
4. Lee K. C. et al. Medial fracturing of the inferior turbinate: effect on the ostiomeatal unit and the uncinate process //European archives of oto-rhino-laryngology. – 2009. – T. 266. – №. 6. – C. 857-861.
5. Maroldi R. et al. Paranasal sinus imaging //European journal of radiology. – 2008. – T. 66. – №. 3. – C. 372-386.
6. Alekseeva V. V. et al. A METHOD OF COMPLEX EVALUATION OF MORPHOLOGICAL STRUCTURE OF OSTIOMEATAL COMPLEX COMPONENTS, LOWER WALL OF MAXILLARY AND FRONTAL SINUSES //Wiadomosci Lekarskie (Warsaw, Poland: 1960). – 2020. – T. 73. – №. 12 cz 1. – C. 2576-2580.
7. Eggesbø H. B. Radiological imaging of inflammatory lesions in the nasal cavity and paranasal sinuses //European radiology. – 2006. – T. 16. – №. 4. – C. 872-888.
8. Kim S. et al. Ancestry-based variation in maxillary sinus anatomy: Implications for health disparities in sinonasal disease //The Anatomical Record. – 2021.
9. Pronina O. M. et al. Current view on the structure and function of the frontal sinus: literature review. – 2018.
10. Despotov S. O., Petrova Lukwasa N. P. Endonasal Infraturbinal Fenestration of the Maxillary Sinus //Comptes Rendus de l'Academie Bulgare des Sciences. – 2000. – T. 53. – №. 12. – C. 12: 121.
11. Abbritti R. V. et al. Endoscopic endonasal odontoidectomy and posterior fusion in a single-stage surgery: description of surgical technique and outcome //New Trends in Craniovertebral Junction Surgery. – Springer, Cham, 2019. – C. 197-207.
12. Neimane L. Morphoradiological Evaluation of Maxillary Alveolar Bone in Dental Implant Patients. Summary of the Doctoral Thesis. – 2014.
13. Alieksieieva V. Anatomical predictions of development of rhinosinusitis and its complications. – 2020.
14. Naveau A., Bou C., Sharma A. Evolution of Topics in Maxillofacial Prosthetics Publications //International Journal of Prosthodontics. – 2018. – T. 31. – №. 6.
15. Neimane L. et al. Radiodensitometric Analysis of Maxillary Sinus-Lift Areas Enforced with Bone Substitute Materials Containing Calcium Phophate //Acta Chirurgica Latviensis. – 2012. – T. 12. – №. 1. – C. 41.

AUTHOR PROFILE

Djuraev Jamolbek Abdukakharovich – PhD, associate professor of the department Otolaryngology and stomatology, Tashkent Medical Academy, Republic of Uzbekistan, e-mail: drdjuraev@mail.ru

Makhsitaliev Mukhammadbobur Ibrokhimovich – 3rd year resident of magistracy of the department Otolaryngology and stomatology, Tashkent Medical Academy, Republic of Uzbekistan, e-mail: dr_makhsitaliev@mail.ru,