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METHODS OF DIAGNOSTICS OF FRONTITIS (LITERATURE REVIEW)

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Abstract

Inflammatory diseases of the paranasal sinuses (PNS) are the most common among the upper respiratory tract pathologies and account for 87% of all visits to an otolaryngologist. In recent years, there has been an increase in this group of diseases, despite new methods of diagnosis and treatment. In the Russian Federation, about 10 million people suffer from acute rhinosinusitis (RS) annually. Among RS, frontal sinusitis occupies a significant place, which can manifest itself in edematous infiltrative or exudative forms and be aggravated by orbital and intracranial complications. The increase in the number of inflammatory diseases of the PNS is associated with urbanization, an increase in the number of acute respiratory viral infections, inhaled allergens, a decrease in the resistance of the mucous membrane of the upper respiratory tract, an increase in the resistance of microflora to antibiotics, and irrational antibiotic therapy. Clinical signs of frontal sinusitis cannot always help in making a diagnosis. The leading clinical sign – local pain symptom in the superciliary region – may be absent in a significant proportion of patients. The disappearance of local pain does not always indicate recovery of patients. Previously (before 2001) it was described that local headache both in acute frontal sinusitis and in exacerbations of the chronic process is an absolute indicator in the diagnosis of the disease. In recent years, this thesis has been significantly questioned, diagnostic positions have been revised. In 28–30% of patients, the leading clinical sign – local headache – was absent or was expressed very weakly.

Keywords Frontal sinusitis, frontal sinus, rhinosinusitis, paranasal sinuses.

INTRODUCTION

Inflammatory pathology of ENT organs accounts for 87% of all visits to an otolaryngologist [1], in the last decade the incidence of paranasal sinusitis (PNS) has increased, and the proportion of hospitalized patients with this pathology increases almost 3-fold annually. The problem of timely diagnosis and treatment of PNS is currently quite relevant [2], despite the emergence of new modern methods of conservative and surgical treatment.

According to various authors [3, 4], PNS currently rank first among inflammatory diseases of ENT organs. The paranasal sinuses (PNS) are a single morphological and functional system [5] with similar etiological factors and mechanisms of disease development [6], therefore, when studying the epidemiology of PNS, it is necessary to assess the prevalence of diseases of not only each sinus separately, but also their combined lesions. S. Z.

Piskunov and G. Z. Piskunov believe that the ONP are unique anatomical formations that are reserve protective elements of the upper respiratory tract, eye socket and brain [7]. This protective function should be understood in the broadest sense of the word, taking into account the mucociliary system, temperature constancy, aerodynamic patterns and other factors.

The primary focus of the lesion of the middle nasal passage, as a rule, are changes in the anterior and middle cells of the ethmoid sinuses, causing a violation of ventilation and mucociliary cleansing of the maxillary and frontal sinuses. In the anterior sections of the middle nasal passage, the inhaled air changes its direction, which contributes to the deposition of suspended particles here, including microbes and allergens, and when any obstacles appear in the area of the ostiomeatal complex, it disrupts all these functions and forms a primary focus of the inflammatory process. A special area is the North Caucasus, which is the most unfavorable in terms of climatic conditions and, due to the formation of secondary immunodeficiency in many residents [8], is characterized by an increased level of exposure to harmful factors of the external urbanized environment on humans, which is also revealed in other industrial zones [9,10]. These factors contribute to an increase in the number of PNS [11, 12]. Of all the ONPs, the inflammatory process most often develops in the frontal sinuses and manifests itself in many patients with severe pain in the area of the eyebrows and, somewhat less often, nasal discharge. Anatomical prerequisites for the formation of frontal sinuses are not only changes in the area of the ostiomeatal complex, but also structural features of the frontal sinuses themselves [13]. Analysis of spiral computed tomograms conducted on a large group of patients showed that the prerequisites for the formation of frontal sinusitis are the anatomical features of the frontal sinuses [14], which coincides with the data of our objective studies of the structural parameters of radiographs of people of different age groups [15]. Frontal sinuses with the absence of frontoethmoid cells, having a large number of bays and semi-septa, reduce the likelihood of frontal sinusitis. At the same time,

deformation or abnormal development of the structures of the ostiomeatal complex often leads to narrowing of the frontonasal canal and, as a consequence, to the formation of frontal sinusitis [16].

In the etiology of acute rhinosinusitis, the leading role is currently played by *Streptococcus pneumoniae*, *Hemophilus influenzae*, *Staphylococcus epidermidis*, *Streptococcus pyogenes*, *Moraxella catarrhalis*. In the development of chronic frontal sinusitis, *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Hemophilus influenzae*, *Moraxella catarrhalis* predominate [17]. The etiology of modern frontal sinusitis has changed significantly in favor of the formation of various associations of microorganisms, which were first described by A. E. Essel et al. [18]. In the last two decades, the clinical picture of modern frontal sinusitis has begun to change towards the appearance of latent and latent forms of the disease. Local pain symptom in frontal sinusitis often loses its leading clinical significance, and the data of additional research methods give an error in 20-30% of cases for various reasons [19]. In doubtful cases, additional diagnostic methods are necessary, such as rheofrontography, flowmetry, thermography, etc.

The main tasks in the treatment of uncomplicated frontal sinusitis:

- rapid relief of local pain;
- restoration of normal functioning of the frontal nasal canal;
- removal of pathological contents from the lumen of the frontal sinus;
- stimulation of reparative processes of the mucous membrane of the sinus.

In the treatment of inflammatory diseases of the frontal sinuses, some clinicians [20] use only conservative treatment, based on the assumption of "gravitational" drainage of the sinuses - under the influence of gravity, they independently empty themselves of pathological contents. This theory raises significant doubts, especially in the presence

of a block of the frontal nasal canal in one of its sections or in the frontal pocket. Some confusion is caused by the statement that control radiography of the OPN, performed on the 5th-7th day of treatment, revealed “restoration of pneumatization” of the sinuses, which occurred in 48 out of 50 patients. Probably, we are talking about restoration of transparency of the sinus images, but it is known that restoration of transparency of the sinus affected by the inflammatory process on the radiograph occurs no earlier than 30-35 days after the start of treatment [21, 22].

One of the elements of complex gentle treatment of frontal sinusitis we previously considered probing of the inflamed frontal sinuses, which was carried out with curved catheters of our design [23]. Later we doubted the effectiveness of this method, taking into account the fact that the mucous membrane of the frontonasal canal is one of the thinnest mucous membranes in humans and has a significant tendency to scarring. Many clinicians agree with this position, considering probing contraindicated for the treatment of frontal sinusitis [24, 25]. A number of authors disagree with this position [26–28] and successfully use probing to treat inflammatory diseases of the frontal sinuses. The principle of a gentle attitude towards the operated organs and tissues, professed by our teachers [29, 30] in matters of diagnosis and treatment of ENT pathology, has been supported in the Rostov ENT Clinic throughout its entire existence [31–33]. Our desire to maintain a gentle treatment of frontal sinusitis has led to the use of trepanopuncture (FS). FS of the frontal sinus is the most gentle operation in the treatment of uncomplicated frontal sinusitis, which excludes injuries to the mucous membrane of the frontonasal canal and, in particular, the most vulnerable secretory formations at its mouth [34–36]. Extranasal FS is considered as the creation of a small-diameter hole in the anterior or lower walls of the frontal sinus with subsequent constant drainage of its lumen through the trepanation canal [37]. FS of the frontal sinuses with the overwhelming majority of devices is carried out in several stages:

- - creating an opening in the wall of the frontal sinus;
- - removing a drilling instrument from it;
- - installing an adapter into the formed bone trepanation canal;
- - inserting a device for long-term drainage of the frontal sinus through the adapter into the lumen of the frontal sinus - a cannula.
- FS refers to an instrumental method of treating a disease in which devices for performing an intervention and draining the cavity play a significant role. As science and technology progressed, devices for performing FS of the frontal sinuses were also improved. After the refusal to treat patients using probing, the intervention was carried out by a device for FS produced by the domestic industry [38], in which we made various technical improvements.
- Most of the devices for FS produced in different countries have common shortcomings in the production of the intervention:
 - - multi-stage operation;
 - - penetration of purulent exudate into the diploic layer of the bone of the anterior wall of the sinus or into the soft tissues of the frontal region, which leads to the formation of osteitis, subperiosteal abscess, and also osteomyelitis of the frontal bone;
 - - penetration of bone chips formed during trepanation into the lumen of the frontal sinus [39].
- We have developed and introduced into practice an original device for FS of the frontal sinuses [40], which ensures:
 - - rigid fixation of the instrument on the bone wall of the frontal sinus, preventing it from shifting;
 - - one-stage and quick intervention;
 - - patient safety due to the technical features of the cannula, limiting the depth of trepanation;
 - - isolation of the pathological contents of the frontal sinus from the tissues of the frontal region by forming a thread on the walls of the trepanation canal and their adhesion, while the diploic layer of

the bone is sealed;

– – removal of bone chips formed during trepanation. The design and use of this device prevent all possible intra- and postoperative complications described in the literature, and the complex of devices has been improved by us over many years [41].

Therapeutic effects on the inflamed mucous membrane of the frontal sinus were achieved through a cannula by introducing drugs into the lumen of the sinus, very often in combination with physiotherapeutic procedures - direct exposure to laser irradiation and dialysis of drugs [37] - restoring the patency of the frontonasal canal on the 2nd-3rd day after FS. Some clinicians have experimentally proven that the effect of introducing a drug that is absorbed by the mucous membrane inflamed by the frontal sinus is more than 100 times greater than the effect of parenteral administration of the same amount of this drug [40]. This has been confirmed by a number of studies and is consistent with the opinions of other authors expressed in different years and completely unrelated to each other [41]. The duration of postoperative treatment is also of no small importance, which does not exceed 5-7 hospital days, after which the patient returns to normal social life, without further treatment for this disease. We [18] made an attempt to evaluate the nature of the improvement of the instrumentation and methodology for performing FS of the frontal sinuses based on significant experience in treating patients with uncomplicated frontal sinusitis. It was clearly shown that over the past 30–40 years, progress in improving the devices and methodology for performing FS has been extremely insignificant and even in some cases [28] complicated and extremely traumatic. However, a positive trend in the treatment of uncomplicated frontal sinusitis is also noted by combining FS with sanitizing endonasal interventions, which gives a positive therapeutic effect [39]. Relapses of the disease during the treatment of patients with uncomplicated acute and chronic frontal sinusitis FS using the device of our design in the ENT Clinic of Rostov State Medical

University over more than 35 years of observation amount to less than 0.001% of the entire group of patients [40], which is incomparable with the rather significant figures cited by a number of clinicians [25, 31]. Since 1994, we have had no complications or relapses of diseases after treatment of patients with frontal sinusitis (FS).

It should be noted once again that the possibility of complications during FS associated with the penetration of the drill into the anterior cranial fossa with damage to the tissues inside the skull, which are often referred to by European authors [38], is excluded when using the instrument of our design.

A minor cosmetic defect of the soft tissues in the brow area after FS becomes barely noticeable after 6-7 months, the trepanation canal in the anterior wall of the frontal sinus in a large proportion of patients is filled with newly formed bone tissue after 1-1.5 years (depending on age).

FS is the most effective and gentle of all surgical methods for the treatment of uncomplicated frontal sinusitis. The basis for this statement is the experience of about 2500 interventions in compliance with the specified principles and using the instruments of our design. It should be noted that none of the works, starting from 1921 to the present, devoted to the treatment of patients with frontal sinusitis using FS, has analyzed such a number (in the works of some authors, no more than 300 cases were analyzed) of patients treated with any devices with a number of complications and relapses of the disease. A large number of works are devoted to the optimization of surgical treatment of the PNS and their complications using endonasal endoscopic surgery techniques, but at the same time R. R. Orlandi, D. W. Kennedy believe that inflammation of the frontal sinus after a functional endoscopic intervention can become a permanent, iatrogenic disease due to insufficient skills and technical errors of surgeons in a narrow frontal pocket. R. Weber and R. Keerl indicate that the total duration of the healing process in the nasal cavity after endonasal interventions ranges from several weeks to months or more.

The literature describes a fairly large number of complications after endonasal surgical interventions, including frequent bleeding from vessels of various calibers and locations, liquorrhea, meningitis, intraorbital hematomas, orbital emphysema, and blindness. Rare complications include carotid-cavernous fistula, brain damage, intracranial hemorrhage, pneumatocephalus, brain abscess, malignant hyperthermia, and death due to cardiac arrhythmia caused by general anesthesia [41].

CONCLUSION

In our opinion, trepanopuncture eliminates various complications of frontal sinusitis and is the most gentle type of surgical intervention on the frontal sinuses in the absence of organic changes in the area of the mouth or in the frontal nasal canal itself.

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