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## Research Article

# SURGICAL METHODS FOR THE TREATMENT OF CHRONIC PURULENT RHINOSINUSITIS: A REVIEW OF THE LITERATURE

Submission Date: January 07, 2022, Accepted Date: January 17, 2022,

Published Date: January 27, 2022 |

Crossref doi: <https://doi.org/10.37547/TAJMSPR/Volume04Issue01-03>

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## ABSTRACT

Inflammatory pathology of the ENT organs accounts for 87% of all visits to the otorhinolaryngologist, in the last decade the incidence of paranasal sinusitis (PNS) has increased, and the proportion of hospitalized patients with this pathology has increased almost 3 times every year. The problem of timely diagnosis and treatment of PNS is currently quite relevant, despite the emergence of new modern methods of conservative and surgical treatment. According to various authors, PNS currently ranks first among inflammatory diseases of the upper respiratory tract. The paranasal sinuses (SNS) are a single morphological and functional system with similar etiological factors and mechanisms for the development of diseases, therefore, when studying the epidemiology of the PNS, it is necessary to assess the prevalence of diseases not only of each sinus separately, but also of their combined lesions.

## KEYWORDS

Inflammation, rhinosinusitis, paranasal sinuses, sinusitis.

## INTRODUCTION

S.Z. Piskunov, G.Z. Piskunov believe that SNPs are unique anatomical formations that are reserve protective elements of the upper respiratory tract, eye

socket and brain [1-3]. This protective function must 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 SNP lesions, 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 particles suspended in it, including microbes and allergens, and if any obstacles appear in the area of the ostiomeatal complex, it disrupts all these functions and forms the 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 human exposure to harmful factors of the external urbanized environment, which is also detected in other industrial zones [9, 10]. These factors contribute to an increase in the number of PNS, including frontal sinusitis with complications, in the Rostov Region and the Stavropol Territory [11, 12]. Of all SNPs, the inflammatory process most often develops in the frontal sinuses and manifests itself in many patients with severe pain in the brow area and, somewhat less frequently, nasal discharge. The 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].

An analysis of spiral computed tomography performed in a large group of patients showed that the anatomical features of the frontal sinuses are the prerequisites for the formation of frontal sinusitis [14], which coincides with the data of our objective studies of the structural parameters of radiographs of people of different age groups [15]. The frontal sinuses lack frontoethmoidal cells and have a large number of bays and semi-partitions, reducing the possibility 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 result, to the formation of frontal sinusitis [16]. *Streptococcus pneumoniae*, *Hemophilus influenzae*, *Staphylococcus epidermidis*, *Streptococcus pyogenes*, *Moraxella catarrhalis* currently play a leading role in the etiology of acute rhinosinusitis. The development of chronic frontal sinusitis is dominated by *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Hemophilus influenzae*, *Moraxella catarrhalis* [17]. The etiology of modern PNS has changed significantly in favor of the formation of various associations of microorganisms, which were first described by A. E. Essel et al. [eighteen]. In the last two decades, the clinical picture of modern frontal sinusitis began to change towards the appearance of erased and latent forms of the course of the disease. The 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, it is necessary to conduct additional diagnostic methods, such as rheofrontography, flowometry, thermography, etc.

The main tasks in the treatment of uncomplicated frontal sinusitis:

- Rapid relief of local pain;
- Restoration of the normal functioning of the fronto-nasal canal;
- Removal of pathological contents from the lumen of the frontal sinus;
- Stimulation of reparative processes of the sinus mucosa.

In the treatment of inflammatory diseases of the frontal sinuses, some clinicians [18] use only conservative treatment, based on the assumption of

"gravitational" drainage of the sinuses - under the influence of the earth's gravity, they empty themselves from pathological contents. This theory raises considerable doubts, especially if there is a block of the fronto-nasal canal in one of its sections or in the frontal pocket. Some bewilderment is the assertion that the control radiography of the SNP, carried out on the 5-7th day of treatment, revealed a "recovery of pneumatization" of the sinuses, which occurred in 48 out of 50 patients. Probably, we are talking about the restoration of the transparency of the images of the sinuses, but it is known that the restoration of the transparency of the sinus affected by the inflammatory process on the radiograph occurs no earlier than 30–35 days after the start of treatment [7-15].

We previously considered probing of the inflamed frontal sinuses, which was performed using curved catheters of our design, as one of the elements of the complex sparing treatment of frontal sinusitis. Subsequently, the effectiveness of this method was doubted, taking into account the fact that the mucous membrane of the fronto-nasal canal is one of the thinnest human mucous membranes and has a significant tendency to scarring. Many clinicians agree with this statement, considering probing to be contraindicated for the treatment of frontal sinusitis. A number of authors do not agree with this provision and successfully use probing for the treatment of inflammatory diseases of the frontal sinuses. The principle of a sparing attitude to operated organs and tissues, professed by our teachers in the diagnosis and treatment of ENT pathology, has been maintained in the Rostov ENT Clinic throughout its existence. Our desire to preserve the sparing nature of the treatment of frontal sinusitis has led to the use of trepanopuncture (TP).

LT of the frontal sinus is the most sparing operation in the treatment of uncomplicated frontal sinusitis, which excludes trauma to the mucous membrane of the frontonasal canal and, in particular, the most vulnerable secretory formations at its mouth. Extranasal LT is considered as the imposition of a small-diameter hole in the anterior or lower walls of the frontal sinus, followed by constant drainage of its lumen through the burr canal [16]. TP of the frontal sinuses by the vast majority of devices is carried out in several stages: - the imposition of a hole in the wall of the frontal sinus; - extraction of a drilling tool from it; - installation of an adapter into the formed bone burr canal; - introduction through the adapter into the lumen of the frontal sinus of a device for its long-term drainage - a cannula. TP refers to an instrumental method of treating a disease, in which devices for intervention and cavity drainage play a significant role.

With the progress of science and technology, devices for performing TP of the frontal sinuses have also been improved. After refusing to treat patients with probing, the intervention was carried out by a device for LT produced by the domestic industry, in which we made various technical improvements. Most devices for LT produced in different countries have common shortcomings in the production of intervention: - multi-stage operation; - penetration of purulent exudate into the diploetic 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, as well as osteomyelitis of the frontal bone; - entry of bone chips formed during trepanation into the lumen of the frontal sinus. We have developed and put into practice an original device for LT of the frontal sinuses, which provides: - rigid fixation of the instrument on the bone wall of the frontal sinus, preventing it from moving; - one-stage and rapid intervention; - patient safety due to the technical



features of the cannula, which limit the depth of trepanation; - isolation of the pathological contents of the frontal sinus from the tissues of the frontal region by the formation of threads on the walls of the burr canal and their adhesion, while filling the diploetic layer of the bone; - 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 we have been improving the complex of devices for many years [17]. The therapeutic effect on the inflamed mucous membrane of the frontal sinus was performed through a cannula by introducing drugs into the lumen of the sinus, very often in combination with physiotherapy procedures - direct exposure to laser irradiation and with dialysis of drugs [18] - restoring the patency of the fronto-nasal canal by 2–3rd day after TP. Some clinicians have experimentally proven that the effect of administering a drug that is absorbed by the mucous membrane of an inflamed SNP is more than 100 times greater than the effect of parenteral administration of the same amount of this drug. This is confirmed by a number of studies and is consistent with the opinion of other authors expressed in different years and completely unrelated to each other. Of no small importance is the period of postoperative treatment, which does not exceed 5-7 bed-days, after which the patient returns to a normal social life, without further treatment for this disease.

We [39], on the basis of significant experience in the treatment of patients with uncomplicated frontal sinusitis, made an attempt to assess the nature of improving the instrumentation and methods of performing LT of the frontal sinuses. It has been clearly shown that over the past 30–40 years, progress in improving the devices and methods for performing LT is extremely insignificant and even in some cases is

complicated and extremely traumatic. But, there is also a positive direction in the treatment of uncomplicated frontal sinusitis by a combination of LT with sanitizing endonasal interventions, which gives a positive therapeutic effect [19].

Relapses of the disease in the treatment of patients with uncomplicated acute and chronic AFL frontitis using a device of our design in the ENT clinic of Rostov State Medical University for more than 35 years of observation are less than 0.001% of the entire group of patients, which is not comparable with the rather significant figures given by a number of clinicians. Since 1994, we have not had complications or recurrence of diseases after treatment of patients with frontal sinus LT. Once again, it should be noted that the possibility of developing complications in LT associated with the penetration of a drill into the anterior cranial fossa with damage to tissues inside the skull, which European authors often refer to [20], is excluded when using a tool of our design.

A minor cosmetic soft tissue defect in the brow area after LT becomes hardly noticeable after 6–7 months, the burr canal in the anterior wall of the frontal sinus in most patients is filled with newly formed bone tissue after 1–1.5 years (depending on age). LT is the most effective and sparing of all surgical methods for the treatment of uncomplicated frontal sinusitis. The basis for such a statement is the experience of carrying out about 2500 interventions in compliance with these principles and using instruments of our design. It should be noted that none of the works, from 1921 to the present, devoted to the treatment of patients with frontal sinusitis with the help of LT, analyzes such a number (in the works of some authors no more than 300 cases are 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

optimizing the surgical treatment of PNS and their complications using endonasal endoscopic surgery, but at the same time, RR Orlandi, DW Kennedy [12] believe that inflammation of the frontal sinus after functional endoscopic intervention can become permanent, iatrogenic disease due to insufficient skills and technical errors of surgeons in a narrow frontal pocket. R. Weber and R. Keerl [60] 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 surgery, including frequent bleeding from vessels of various sizes and locations, liquorrhea, meningitis, intraorbital hematomas, orbital emphysema [20], and blindness. Rare complications include carotid-cavernous fistula, brain damage, intracranial hemorrhage, pneumatocephalus, brain abscess, malignant hyperthermia, and death as a result of cardiac arrhythmias caused by general anesthesia [21].

## CONCLUSION

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

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