International Journal of Medical Sciences And Clinical Research (ISSN – 2771-2265)
VOLUME 02 ISSUE 07 Pages: 13-20
SJIF IMPACT FACTOR (2021: 5. 694) (2022: 5. 893)
OCLC – 1121105677 METADATA IF – 5.654
Publisher: Oscar Publishing Services

Journal Website: https://theusajournals.com/index.php/ijmscr

Research Article

MODERN VIEW ON DIAGNOSTICS AND TREATMENT OF MAXILLARY SINUSES DISEASES

Submission Date: July 15, 2022, Accepted Date: July 25, 2022,
Published Date: July 30, 2022
Crossref doi: https://doi.org/10.37547/ijmscr/Volume02Issue07-03

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ABSTRACT

The paper describes the etiological factors of iatrogenic nature that contribute to the occurrence of maxillary sinusitis, its pathogenesis, features of the clinical course and modern diagnostics. A comparison of surgical techniques that are used for surgical treatment is given, and the tactics of managing patients in the rehabilitation period are described. The necessity of developing new methods of complex treatment and methods of rehabilitation of patients with maxillary sinusitis is substantiated.

KEYWORDS

Maxillary sinusitis, surgery, CT.

INTRODUCTION

Maxillary sinusitis is one of the most common and often recurrent diseases. At the same time, the frequency of sinusitis of odontogenic origin varies, according to various sources, from 2-6 to 24-50% of all

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diseases of the paranasal sinuses [15]. The frequency of perforative forms in recent years has increased to 41-77% of all inflammatory processes of the maxillary sinus of odontogenic origin [13].

Features of the development of the inflammatory process in this area are closely related to the anatomical and physiological structure of the maxillary sinus [5]. Its size and shape are characterized by great individual and age variability. Its growth is spasmodic, which is due to the time of teething in the upper jaw [16]. In adults, the maxillary sinus is the largest paranasal sinus, with a volume ranging from 5 to 23 cm3.

The mucous membrane of the maxillary sinus serves as a continuation of the nasal mucosa. It consists of ciliated epithelium and includes many mucous glands. The mucus that covers the surface of the upper respiratory tract protects the cells of the mucous membrane from drying out. The normal mucous membrane of the sinus has a high local resistance to infections, as a result of which the resulting inflammation can disappear without a trace when the cause is eliminated [12]. The qualities of viscosity and elasticity are of paramount importance for mucociliary transport. Only in those cases when their indicators are within certain values, the purification mechanism can effectively operate. If they are lower or higher, the transport stops.

Mucociliary activity depends both on the frequency of cilia beating and on the viscosity and elasticity of the mucous secretion. In addition, wave-like oscillations can be observed only if the amount of periciliary fluid allows the cilia to "reach out" to the surface layer. A good correlation between such activity and the rate of mucociliary transport has been noted by a number of researchers. Early diagnosis of immobile cilia syndrome is extremely important. Timely appointment of mucoregulators and physiotherapeutic methods can prevent the development of maxillary sinusitis.

Etiology and pathogenesis of maxillary sinusitis. Depending on the etiology of the disease, rhinogenic, odontogenic, traumatic and allergic maxillary sinusitis are distinguished. This division is arbitrary, since sinusitis of rhinogenic etiology, which developed against the background of an acute respiratory disease, can lead to exacerbation of the periapical focus of chronic odontogenic infection and secondary infection of the sinus mucosa [4]. The leading infectious agents in odontogenic and rhinogenic sinusitis are coagulase-negative staphylococci (36%), Staphylococcus aureus (25%), Streptococcus viridans (8.3%), Corynebacterium (4.6%), anaerobes (6.4%) [14].

A predisposing factor for odontogenic sinusitis is the presence of a periapical inflammatory process. The mechanism of development of the pathological process comes into action under the influence of focal odontogenic infection. Maxillary sinusitis in most cases is reversible, however, the exudate accumulating in the periapical region can play the role of a non-specific irritant and allergen that can cause sensitization of the organism and the sinus mucosa, weakening local tissue immunity when a natural fistula block occurs and the so-called vicious circle appears [1].

Common causes of maxillary sinusitis are errors in the treatment and extraction of teeth in the upper jaw. There are patients in whom the tops of the roots of the distal group of teeth of the upper jaw are at the level of the bottom of the maxillary sinus or protrude into its cavity. When such teeth are removed, there is a high probability of the appearance of an oroantral anastomosis. In 64.3%, the resulting perforation is a consequence of the inflammatory process around the root of the tooth or in the sinus. 90% of odontogenic sinusitis occurs due to perforation of the wall of the

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maxillary sinus during tooth extraction or surgical intervention on the alveolar process of the upper jaw, and in 10% the inflammatory process develops in the presence of a focus of chronic infection in the immediate vicinity of the sinus [18].

In recent years, there has been a significant increase in maxillary sinusitis caused by fungal flora [24]. It is known that fungal infections of the paranasal sinuses are most often caused by fungi of the genus Aspergillus, Penicillium, Alternaria, Mucor, Candida. The causative agent Aspergillus fumigatus needs heavy metal salts such as zinc oxide and barium sulfate, which are contained in root canal filling materials, for proliferation and metabolism.

In vitro studies have shown that zinc oxide solution promotes the growth of Aspergillus fumigatus, while eugenol, one of the most commonly found components of zinc oxide-eugenol sealers, inhibits it. The inhibitory effect of eugenol decreases with time, which explains the development of sinus mycoses years after the removal of the filling material into the sinus [2].

In the pathogenesis of the development of odontogenic mycosis of the paranasal sinuses, much attention is paid to local dysfunction of the ciliated epithelium of the sinus due to the emerging inflammatory and toxic alteration in the area where a foreign body is located - a filling material containing salts of heavy metals and tissue toxic components: parapharmaldehyde and eugenol [1]. Given the relatively high prevalence of the disease, special attention should be paid to odontogenic etiological factors that contribute to the occurrence of most maxillary mycoses.

Features of the clinical course and diagnosis of maxillary sinusitis. Maxillary sinusitis should be considered not as a local lesion of one or more paranasal sinuses, but as a disease of the whole organism. In particular, the general reaction of the body to inflammation in the sinus is manifested by malaise, weakness, headache, and fever.

Odontogenic maxillary sinusitis is characterized by unilateral isolated localization of the inflammatory process, the presence of an odontogenic source of infection or autoinfection of the oral cavity through perforation. The characteristic symptoms of odontogenic perforated maxillary sinusitis are pain and a feeling of heaviness in the region of the upper jaw, passage of air from the oral cavity into the nasal cavity, and hypertrophy of the turbinates. In some cases, perforated sinusitis is asymptomatic, which can be associated with a good outflow of secretions from the sinus.

Acute catarrhal odontogenic maxillary sinusitis is characterized by a predominance of symptoms of perforation over symptoms of inflammation. On the survey radiograph, in most cases, there is a normal, barely noticeable decrease in the airflow of the sinuses.

In acute purulent maxillary sinusitis, patients complain of headaches, purulent discharge from the nose or fistula. Symptoms of inflammation predominate over symptoms of perforation. The fistulous tract is usually covered with granulations, an admixture of pus is noted in the washing liquid. The X-ray shows intense homogeneous or near-wall darkening. In chronic purulent maxillary sinusitis, patients complain of the passage of air, fluid from the oral cavity into the nasal cavity, general weakness, malaise, fatigue, drowsiness, discharge from the nasal cavity and fistulous tract, difficulty in nasal breathing. Plain radiographs often show intense homogeneous, less often parietal darkening.

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Local manifestations of odontogenic maxillary sinusitis are not always bright, especially in the presence of oroanthral anastomosis. It is not difficult to find the communication of the oral cavity with the maxillary sinus. The patient's sensations in the oral cavity change, there may be changes in the timbre of the voice, rhinolalia. With a fresh perforation, foamy blood begins to stand out from the hole when inhaling through the nose, and when exhaling, there is a feeling of air in the mouth. Tests with puffing out of the cheeks are typical: "oral" and "nasal". From the corresponding nasal passage, blood or pus may be released, and later, when eating, patients note the ingress of water and food into the nose. In the presence of chronic odontogenic maxillary sinusitis, the occurrence of a perforation defect after tooth extraction, as a rule, leads to an exacerbation of the inflammatory process in the sinus.

Auxiliary research methods are of great importance in the diagnosis of odontogenic maxillary sinusitis: radiography of the paranasal sinuses, orthopantomography, endoscopic examination, CT, etc. Endoscopic examination, as well as CT and MRI, are of particular informative value in recognizing the pathology of the maxillary sinuses. Their efficiency is higher than that of X-ray methods. With the help of CT, it is possible to accurately determine not only the nature and prevalence of the pathological process, but also the degree of involvement of the bone and soft tissues of the border areas. In patients with diseases of the nose and paranasal sinuses, CT allows you to see the full picture of the disease and correctly plan treatment [8].

The endoscopic research method is advanced in the diagnosis of diseases of the maxillary sinus. It makes it possible to assess the state of the mucous membrane, identify edema, cicatricial and polyposis changes, and make a decision on the extent and need for surgical treatment. Sinusoscopy allows to reduce the volume of surgical intervention. There are several endoscopic approaches for interventions in the sinus cavity, however, each of them achieves a strictly defined field of view. Methods of treatment and rehabilitation of patients with maxillary sinusitis. Existing methods of complex treatment of patients, according to most authors, do not always allow achieving good results, preventing the development of postoperative complications, reducing economic costs and need to be further improved [7, 4]. The choice of anesthesia for surgical interventions on the maxillary sinus and structures of the nasal cavity remains unspecified: is it necessary to perform general anesthesia in minimally invasive interventions and increase the risk of surgical treatment? It is known that the structures of the nasal cavity and maxillary sinus are richly supplied with blood, and in predicting intraoperative bleeding, at least the use of endoscopic techniques should be abandoned and, at a maximum, surgical treatment should be postponed [10]. To address this problem, surgeons increase the risk of intervention by using controlled hypotension during general anesthesia. This allows the use of endoscopic technique [6] or a combination of general anesthesia and blockade of the area of the surgical field with local anesthesia with vasoconstrictors [9]. With the skillful use of modern anesthetics, minimally invasive surgical interventions are possible without general anesthesia using local anesthesia, which significantly reduces the risk of bleeding due to the content of adrenaline in the local anesthetic and does not increase the risk of surgical treatment.

Despite the development of endoscopic methods of surgical technique on the maxillary sinus, access is made through its anterior wall with the treatment of the sinus mucosa, in severe lesions - without

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endoscopic control. This provides complete visualization and sanitation of the sinus, and reduces the likelihood of disease recurrence compared to endoscopic approaches [6]. Sinusotomy options in the region of the middle or lower nasal passage have recently become the "gold standard": these approaches are considered the least traumatic compared to approaches through the anterior wall of the sinus [5]. However, if access to all or most parts of the sinus is required, expansion of access through the nasal wall is required. It may consist in a significant (more than 5 mm) expansion of the natural anastomosis in the area of the middle nasal passage or the creation of a large perforation window in the area of the middle and inferior passage due to complete or partial resection of the anterior or posterior part of the inferior turbinate [11].

There is a combination of endoscopic approaches through a natural fistula with a middle nasal passage and the anterior wall of the maxillary sinus, when the control and management of surgical treatment is carried out through an expanded fistula with a middle nasal passage and a puncture hole in the area of the "canine" fossa. All approaches and their combinations are aimed at complete sanitation of the sinus and removal of foreign objects: fungal colonies, filling material, implants, cysts, altered areas of the mucous membrane. The key to long-term success and the absence of relapses in the postoperative period is the restoration of ventilation of the maxillary sinus. If the patency of the natural anastomosis is not disturbed and the integrity of the ostiomeatal complex is preserved for the functioning of physiological sanitation and aeration of the maxillary sinus, it is not recommended to expand the anastomosis, since with an increase in the aeration of the sinus, the epithelium of the nasal cavity and sinus is damaged. Therefore, it is necessary to know the anatomical features of each area of endoscopic access and conduct its preoperative planning depending on the location of the pathological focus or foreign body. In order to improve the technique of the operation, achieve good results and reduce complications, it is recommended in the preoperative period to perform a computer reconstruction of the midface with a virtual simulation of endoscopic sinus surgery, with a tactile interface for controlling a virtual endoscope that simulates various configurations of surgical stages. This allows to reduce the time of surgical treatment, improve its quality and familiarize the patient in more detail with the upcoming operation and its complications. During operations with access through the anterior wall, it must be taken into account that in the postoperative period, the soft tissue component is introduced into the cavity of the maxillary sinus, which can cause disruption of the mucociliary transport and thereby provoke congestion in the sinus cavity, excessive cicatricial changes in exit area of the second pair of the trigeminal nerve, clinical manifestations of neuritis. Therefore, if possible, it is necessary to restore the anterior wall of the sinus [3].

In the postoperative period, immunocompetent patients who underwent sinusotomy with removal of the Aspergell fungus colony without invasive growth do not require specific antifungal therapy [4]. The diagnosis is reliably confirmed by the data of histological examination.

During the extraction of teeth, the tops of the roots of which stand in the cavity of the maxillary sinus or the bone gap between the top of the tooth root and the sinus is destroyed by the pathological focus, an oroantral fistula appears, which in a short time epithelizes and becomes resistant. This complication is often encountered by maxillofacial surgeons. The choice of method for closing fistulas depends on many

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factors: their number and condition of the surrounding tissues, the size and position of the defect, the presence of infection, and the age of occurrence of the anastomosis. In the first 24 hours, the oroantral anastomosis can be closed with polyurethane foam [7]. In case of a persistent fistula, various combinations of flaps are used: fistula closure with a PLGA-beta-TCP composite, the defect with a buccal flap; PRP membrane and buccal flap; xenograft, membrane and buccal flap. The most commonly used tamponade of the oroanthral fistula is Bish's fat pad with overlapping buccal or a combination of buccal and palatal flaps [19].

Surgeons often have difficulty closing large perforations (more than 5 mm in diameter). In these cases, recurrence of the oroanthral anastomosis occurs in 16% [12] and in 10.4% - relapses from the total number of operations to close the anastomosis [2]. Therefore, it is necessary to develop new methods of plastic surgery of the oroanthral anastomosis, which can reduce the number of relapses of the disease.

Placement of dental implants in the area of the maxillary sinus floor in patients with a history of sinusotomy usually requires bone augmentation in the distal parts of the maxilla, which can be a complete rehabilitation. The development of augmentation methods in the area of the sinus floor directly during surgical treatment is an urgent task: it is possible to transplant a bone block in this area. The authors suggest that during surgical treatment, if necessary, conduct guided bone tissue regeneration in the area of the sinus floor by creating an endoscopic access through the lower nasal passage and removing the mucous membrane of the lower part of the sinus. A year later, according to CT data, the average increase in bone tissue is 7.6 mm [3].

In the postoperative period, in addition to traditional broad-spectrum antibiotic therapy, it is necessary to use steroid drugs to reduce postoperative edema, restore mucociliary transport and sinus aeration. Local muco-regulators should also be used. However, this is not enough: it is necessary to search for new methods of rehabilitation, possibly with the use of the administration of drugs, the carriers of which are medical textile napkins. The original technology for applying drugs to textile material has already been developed: the drug enters the wound in strictly defined doses for a long time.

In modern literature on dentistry, maxillofacial surgery and otorhinolaryngology, there are many reports on the experience of treating sinusitis of various origins and removing foreign bodies in the maxillary sinus both endoscopically and through its anterior wall. The effectiveness of surgical treatment is high, and, of course, the use of optics to detect foreign bodies is necessary. In most rhinological clinics, the technique of such interventions is well developed [5]. It consists in expanding the natural anastomosis in the region of the middle nasal passage, diagnostic endoscopic examination through the created anastomosis and, if necessary, sinus sanitation (removal of cystic formations and foreign bodies, fungal mycelium, biopsy of neoplasms). Rhinologists consider this approach to be the most physiological, since in this case there is no disturbance of mucociliary transport, and the drainage function of the natural fistula is improved due to its expansion. However, a number of authors, on the basis of experimental and clinical data, proved that intervention on the osteomeatal complex with a physiological ratio of its anatomical structures may cause excessive aeration of the nasal cavity and maxillary sinus, which, in turn, will lead to degeneration ciliated epithelium in flat style. This will negatively affect the patient's quality of life [17].

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Recently, more and more often the cause of the odontogenic etiology of the disease is the removal of foreign bodies into the cavity of the maxillary sinus (tooth roots, filling material, instrument fragments, implants). Their localization is different parts of the sinus floor, and in order to create access to them through the middle nasal passage, it is necessary to completely resect it or expand the perforation window to the lower nasal passage, which is no longer a minimally invasive operation on the maxillary sinus, even with combined access through the natural fistula and the anterior wall of the sinus.

Due to the fact that the cause of the majority of maxillary sinusitis is either odontogenic etiology, the growth of which over 5 years was 8%, or combined with a violation of the anatomical structures of the internal nose [2], and the isolated rhinogenic cause of sinusitis occupies 39%, when compiling and the development of treatment methods should take into account, first of all, the opinions of maxillofacial surgeons and dentists.

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