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Clinical and Morphological Substantiation of Treatment of Odontogenic Cysts of the Maxilla.

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ABSTRACT

In the course of histopathological and morphological study, we have examined the structural features of adjacent, pushing and penetrating juxtahilar cysts in relation to the maxillary sinus. The findings obtained in the histological study served as a basis for developing a new method of treatment, the use of which allows creating no fistula with lower nasal passage, and preserving the integrity of all the major anatomical structures of the maxillary sinus, and ensuring the preservation of all unmodified areas of sinus mucosa. A complete removal of cyst and its contents is carried out, bleeding is prevented, and full antiseptic wound cleaning is provided. Total 49 patients were operated. Postoperative complications such as bleeding, edema, inflammation, postoperative pain, partial reduction and complete loss of sensitivity of the upper jaw was 4.08%.

Keywords: maxillary sinus, juxtahilar cyst, endoscopic technique, cystectomy.

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INTRODUCTION

According to some authors, juxtahilar maxillary cysts occur much more frequently than the mandibular ones [1, 2, 5, 8]. Juxtahilar cysts located in close proximity to the maxillary sinus have a different relation to it depending on the location and size [4, 6, 7, 8]. This fact must be taken into account when examining the patients and selecting an adequate treatment [5, 9, 10, 12].

Group of authors has proposed a “work grouping of relations of juxtahilar cysts with the maxillary sinus” [1] based on clinical and radiographic examination and treatment of 182 patients, as well as analysis of archival material clinic for 10 years (309 histories), which we adhered in our study.

The authors proposed to divide the juxtahilar cysts into adjacent, pushing and penetrating, in relation to the maxillary sinus. A juxtahilar cyst, which is located within the alveolar ridge and the body of the maxilla from the canines to the molars and is next to bone bottom of the maxillary sinus, without changing its contours, is considered to be adjacent. Dimensions of the adjacent cysts are small and occupy area of no more than 1-3 teeth in projection. Despite the small size, the cyst, increasing, deforms the alveolar bone of the upper jaw. Bulging is often determined on a facial side, and more rarely on the hard palate. Complaints of patients and clinical manifestations depend on the presence or absence of inflammation in the cyst [3-5, 8, 12].

A cyst, which displaces the bone bottom of the maxillary sinus and causes its deformation, is called pushing cyst. Clinic of pushing cysts has some features in comparison with that of the adjacent cysts.

Penetrating cysts include juxtahilar cysts, which penetrate with the dome in the maxillary sinus at different levels [1]. Bone tissue is absent between the cysts envelope and mucosa of sinus floor.

The last group is the most difficult in the surgical treatment because surgery involves a large amount of surgical trauma in complex topographic and anatomical conditions.

The objective of research is to improve the efficiency of operational assistance to patients with localized odontogenic cysts in the maxilla through clinicomorphological substantiation of the method of surgical treatment.

Technique

Juxtahilar cysts were treated with common method of cystectomy, which was carried out simultaneously with the operation on the maxillary sinus. While removing pathological tissues and a cyst envelope in the maxillary sinus a standard technique was used for visual control: rigid endoscopes with a viewing angle of 0⁰ and 30⁰, straight and angled Blakeslee forceps, micro raspatory and electric pump.

Fragments of the maxillary sinus mucosa and cysts, as well as bone fragments removed during the operation were fixed in 10% neutral formalin, decalcified in Trilon B, and were normally histologically processed with potting in paraffin. Sections of 8-10 mm thick were stained with hematoxylin-eosin, according to Van Gieson and Mallory methods.

Total 49 patients were operated, at the age of 19 to 63 years old, 27 females and 22 males. The basis for surgical intervention were objective and radiological data [2], as well as patients' complaints. The latter were often complaining of mild swelling on the transitional fold of the vestibule of mouth in the upper jaw to the right or to the left, and more rarely in the area of the hard palate. Patients noticed a feeling of heaviness in the corresponding side of the upper jaw, and sometimes difficulty in nasal breathing and a slight serous discharge from nasal passage. In addition, some of patients (suffering from rhinogenous sinusitis in the period from 1 to 10 years) noticed frequent exacerbation of sinusitis in atypical time of year (summer).

Main Body

The pathohistological study of juxtahilar cysts adjacent to the maxillary sinus has revealed a connective tissue of various maturity, from granulation to coarse fiber with the fiber hyalinosis. In this study group, morphological signs of inflammation in the wall of the cysts were absent. A small percentage of observations had perivascular globo-cellular infiltrates. The cyst inside is lined with stratified squamous epithelium in the form of a thin layer without obvious signs of epithelium layers growing into the adjacent connective tissue. Rearrangement of bone structures is determined in the bone tissue located between the cyst envelope and the vestibule of mouth. Degree of bone rearrangement depends directly on the cyst size - the larger the cyst, the more expressed the rearrangement. Due to bone resorption and new bone formation in the form of osteoid tissue, superposed on mature bone plates, the morphological rearrangement of the bone manifested as a total extension of medullary spaces (Fig. 1).

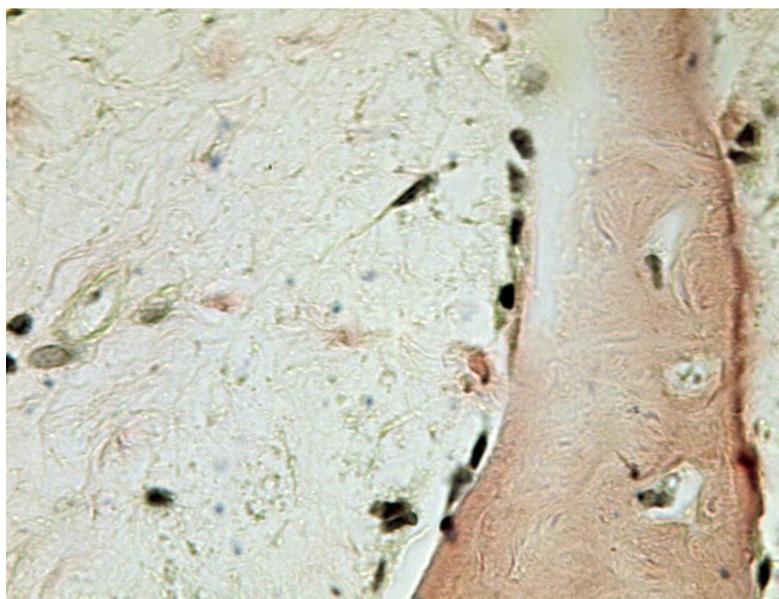


Figure 1: Bone lysis with periosteum exfoliating. Van Gieson staining. Ok. 10, o6. 20

The envelope of cysts adjacent to the maxillary sinus, with clinical signs of purulent or serous-purulent inflammation, had a chronic productive inflammation in the exacerbation phase. The envelope of cysts in this group is thickened, the wall of connective tissue had a diffuse inflammatory infiltrate of lymphocytes and plasma cells. As a result of the proliferation of endothelial and perithelial cell the blood vessels had the thickened walls. There are epithelial strands growing from the cyst into the multilayered epithelium lining a sinus wall. On the background of a chronic inflammatory process, the growth has a reactive nature with desquamation of the epithelial layer (Fig. 2) and is accompanied by congestive edema in the proper mucous plate (Fig. 3).

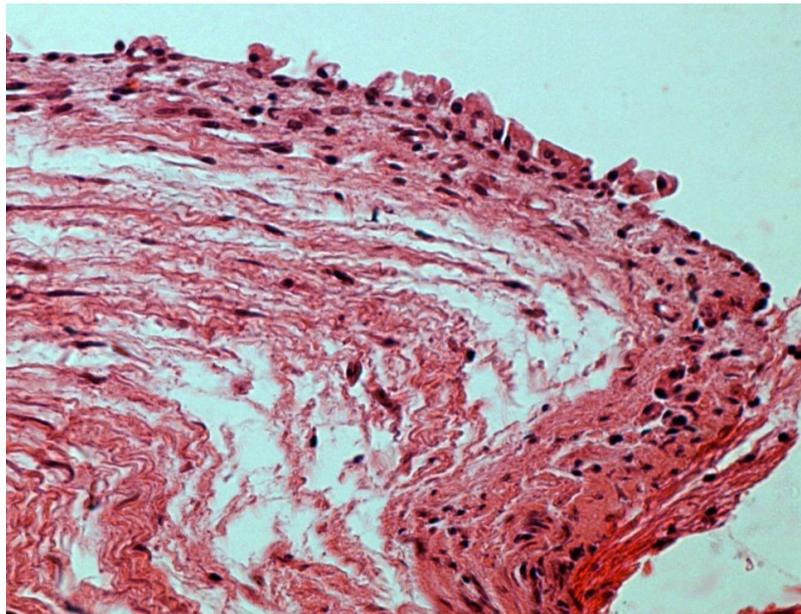


Figure 3: Desquamation of the epithelial layer. Hematoxylin and eosin staining. Ok. 10, o6. 20

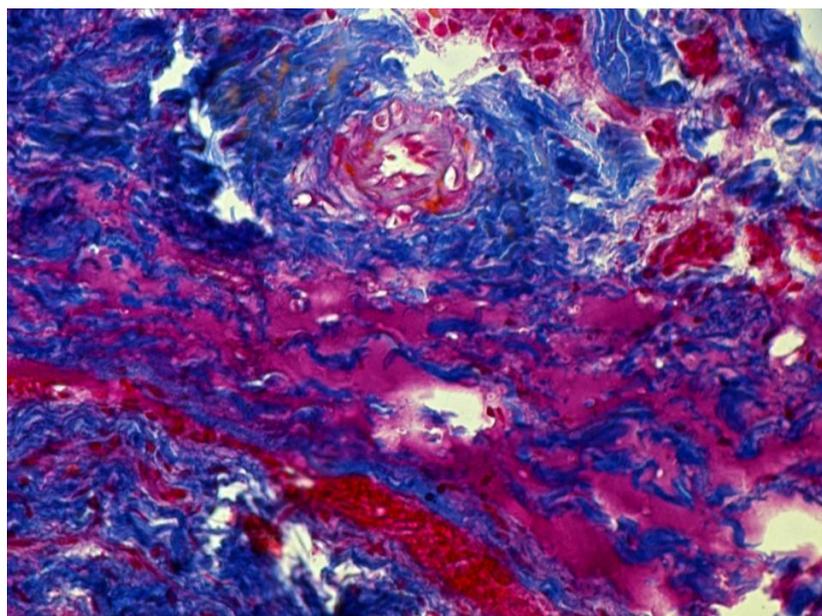


Figure 3: Congestive edema in the proper mucous plate. Mallory staining. Ok. 10, o6. 40

Epithelial layer in the areas of direct contact of the cyst wall with mucosa had a view of a multilayer with intense lymphocyte infiltration. Single ciliated epithelial cells in atrophy state. There were pattern of necrobiosis in the degenerative epithelial cells, in particular karyolysis and cytolysis and ballooning degeneration. Activation of muco-ciliary apparatus was observed peripherally from the areas of developing histopathological process in the mucosa, characterized by the location on the surface of ciliated epithelial cells of viscous secretion, known as periciliary fluid. An accumulation of mucin was observed in goblet epithelial cells (Fig. 4).

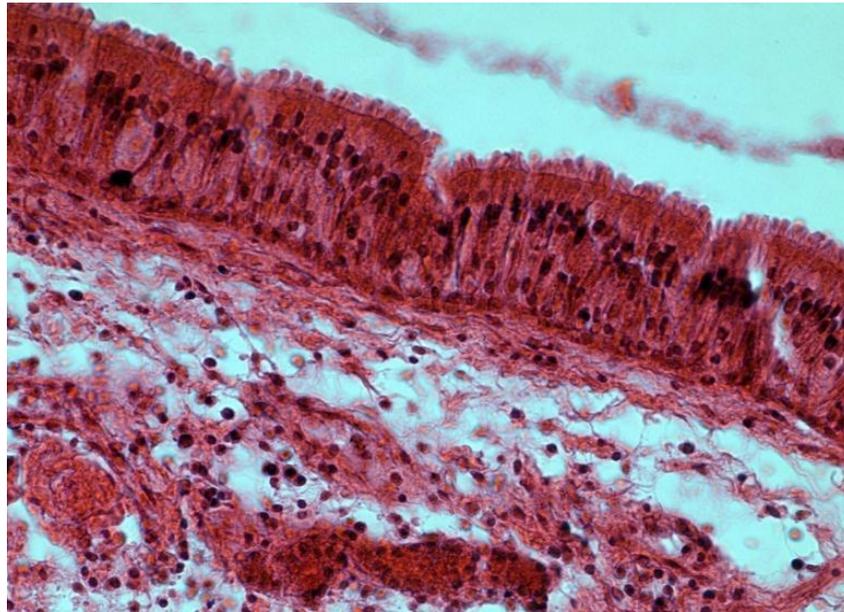


Figure 4: Activation of the muco-ciliary apparatus of mucosa of the maxillary sinus adjacent to the wall of the juxtahilar cyst. Hematoxylin and eosin staining. Ok. 10, o6. 20

Histopathological study of the wall of juxtahilar cysts pushing the maxillary sinus showed resorption of bone tissue located between the bottom of the sinus and the dome (wall) of the juxtahilar cysts, regardless of the presence or absence of inflammatory process. Pathological changes were also noted in sinus mucosa. Thus, the nature and the degree of morphological changes in bone and mucosa of the maxillary sinus depend on the juxtahilar cysts and the inflammatory process. The rearrangement is determined in the bone tissue with the preponderance of osteoclastic resorption over formation of new bone structures, resulting in thinning of the bone between the developing cyst and the maxillary sinus.

Morphological study of the wall of juxtahilar cysts, penetrating into the maxillary sinus, showed that bone tissue between the wall of the cyst and sinus is usually crushed into pieces, completely absorbed or retained in the form of a narrow bridge represented by immature bone newly formed of wide-meshed osteoid tissue (Fig. 5).

Processes of necrobiosis and lysis are clearly visible in the pieces of bone trabecula. There is a predominating vacuolar degeneration in the osteoblasts, changing into ballooning degeneration. Most of cells are damaged (Fig. 6). Pre-bone matrix is partially homogenized, partially visible in the form of bundles of sclerous connective tissue. The pattern of chronic sinusitis was observed in mucosa of maxillary sinus, often with exacerbation of the

inflammatory process. Chronic inflammatory process was completed with the formation of polyps or diffuse sclerosis of the mucosa.

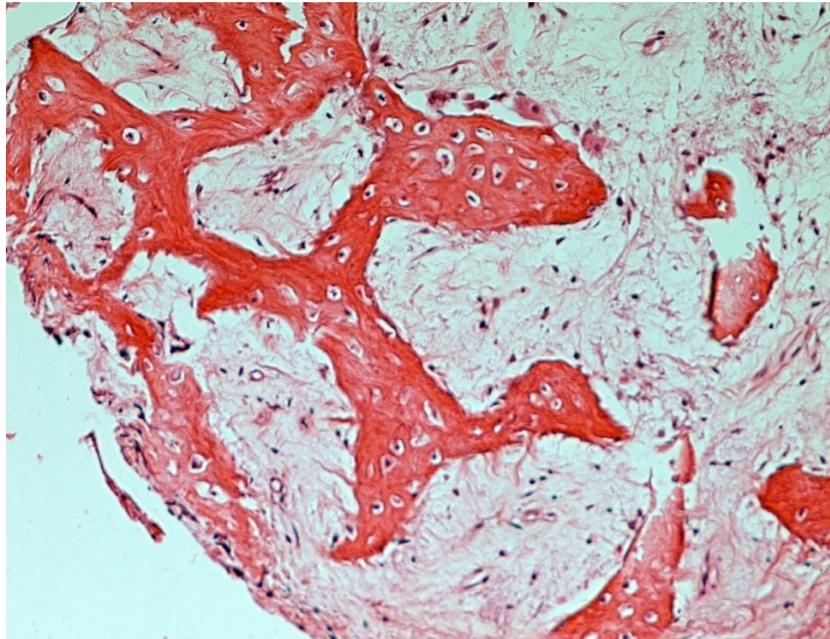


Figure 5: Crushing into pieces and partial absorption of bone trabecula. Hematoxylin and eosin staining. Ok. 10, o6. 10

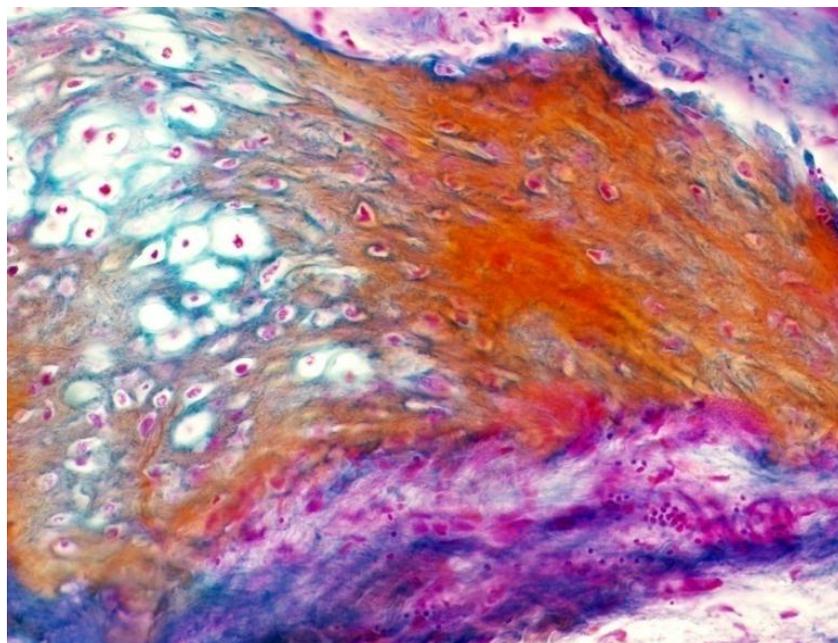


Figure 6: Ballooning degeneration with the homogenization of the trabecula bone matrix. Mallory staining. Ok. 10, o6. 20

On the background of a long-term existing chronic inflammation in the mucosa of the maxillary sinus the dysplastic processes were developing in the surface epithelium in the

form of hyperplasia and metaplasia of the columnar epithelium changing it to the multirowed epithelium with growth into underlying tissue of individual layers.

The findings obtained in the histological study served as a basis for developing a new method of treatment.

Problem of injuries and unreasonably extended scope of surgery in the maxillofacial region is of particular importance. Cuts of mucoperiosteal flaps in the oral cavity and mucous membranes of the maxillary sinus made in radical maxillary sinusotomy are accompanied with excessive bleeding, and lead to the formation of rough scars. There is an obvious need in reducing surgical trauma, as well as the risk of complications during surgery and in the postoperative period. It is virtually impossible to solve these problems within the traditional surgical techniques. One of prospective lines is endoscopic surgery, which is characterized by a wide range of operational techniques, the possibility to the surgeon to visualize clearly the complex topographic and anatomical features of the maxillofacial area, and the small volume of surgical trauma.

A method of treating maxillary sinusitis is known [12]. The essence of the intervention lies in connection of the maxillary sinus with a cyst cavity and junction of a single cavity formed with the lower nasal passage. The front wall of the upper jaw is cut out by the drilling machine, exposing the cyst and removing its envelope, and a cyst cavity is connected to the maxillary sinus by removing the bony bridge between them. Polypous parts of the sinus membrane are removed and a fistula with the lower nasal passage is created. As an antiseptic treatment, an iodoform wick drain may be put into the sinus fistula with low nasal passage. The operation is completed with wound suturing on the vestibule of mouth.

Advantages of the method are complete removal of the entire cyst envelope with its content, and a rapid epithelialization of the lower part of the joint cavity lined with cyst envelope.

Disadvantages: the operation by the above procedure is accompanied with an operative trauma large in volume of tissues involved, as a result, the lower part of the cavity formed bares its bone wall, the wound bleeds and granulates for a long time and epithelialized only partially. Hemostasis is accomplished by putting a changable iodoform wick drain into the cavity, however, it is difficult to carry out full antiseptic treatment. There are phenomena of hypo-and paresthesia along the marginal branches of the n. maxillaris.

A method of endoscopic cystectomy in the maxillary sinus has been developed to provide an adequate visualization of the maxillary sinus, which allows to remove the cyst envelope with the lowest operating injury, with timely bleeding control and antiseptic treatment of the sinus cavity, prevention of postoperative complications and acceleration of the rehabilitation period [15].

The method is as follows. After X-ray study and determining a precise localization of odontogenic cysts in relation to the maxillary sinus with an ultrasonic device "Piezosurgery" the osteotomy is performed in the form of circular window of 1-2 cm diameter. The

contents of the cyst is partially evacuated through the opening made in the front wall of the sinus, its envelope collapses, becomes less prone to rupture, allowing a sufficient vision for the endoscopic examination of all parts of the maxillary sinus, as well as the necessary manipulations are performed with endoscopic surgical instruments under visual control. An empty polypropylene bottle, which is activated by a syringe injection of an antiseptic solution - 0.02% chlorhexidine, is introduced into the newly created window (Fig. 1).

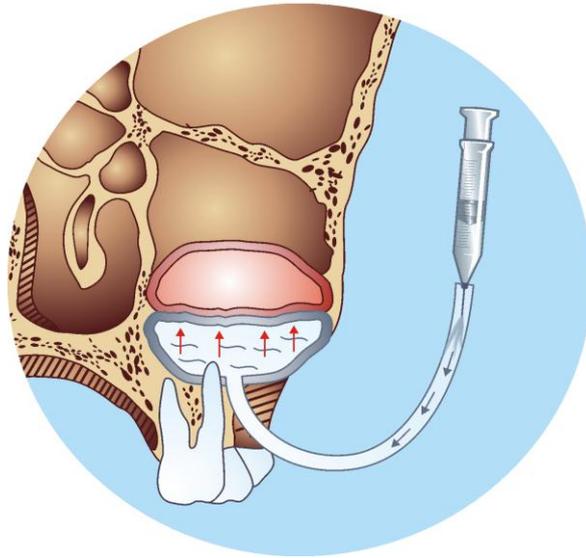


Figure 1

Hydropreparation with the balloon increasing in size ensures a uniform scaling of cyst envelope from sinus mucosa even in remote places such as bony prominences and cavities. This allows minimizing bleeding, since the surface of the cylinder fits tight to the mucosa on the one side, and to the bone wall of the sinus on the other, which prevents bleeding from both bone blood vessels, and the well-vascularized sinus mucosa.

Time of balloon exposure is adjusted to the balloon results of preliminary laboratory studies taking into account the individual characteristics of the patient (blood clotting time, platelet system activity). After removing the balloon, the scaled part of the cyst envelope is removed. Further, the remains of pathological content of sinus, the mass lesions, parts of polypous, cystic and parietal-hyperplastic mucosa are removed under endoscopic control.

Advantages of the endoscopic cystectomy method developed. No fistula is created with lower nasal passage, the integrity of all the major anatomical structures of the maxillary sinus, including its medial wall, as well as all unmodified areas of sinus mucosa are preserved, which promotes its rapid regeneration, a complete removal of cyst and its contents is carried out, bleeding is prevented, and full antiseptic wound cleaning is provided.

CONCLUSION

Total 49 patients have been operated by the method described above, the postoperative complications such as bleeding, edema, inflammation, postoperative pain,

partial reduction and complete loss of sensitivity of the upper jaw were 4.08%. Long-term results of the method of endoscopic cystectomy developed were followed for 2 to 5 years in 40 (81.6%) of 49 patients.

SUMMARY

The method of endoscopic cystectomy developed on the basis of clinical and morphological study allows improving the efficiency of operational assistance to patients with localization of odontogenic cysts penetrating into the maxillary sinus, as well as reducing the number of postoperative complications and rehabilitation period.

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