



Article

Specific Characteristics of Use of Modern Osteoplastic Materials in Odontogenic Jaw Cysts (Literary Review)

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Abstract: As a result of timely diagnosis and treatment of odontogenic cysts, purulent inflammation of the cyst, deformation of the jaws, loss of teeth, pathological fracture of the jaws and even the development of malignant tumors of the jaw from the epithelium of the cyst wall have been observed. The search and use of biocompatible, bioinert bone grafts that stimulate bone regeneration, which can be used in the field of maxillofacial surgery, plastic and reconstructive surgery to eliminate these defects, is one of the urgent tasks today. The BOSS osteoplastic material, made on the basis of a combined xenograft, finds its place in clinical practice due to a number of advantages. The experiment studied the morphological features of reparative regeneration of bone tissue in the defect area as a result of treatment of odontogenic jaw cysts with BOSS osteoplastic preparations, which led to an acceleration of metabolism in the defect area and the formation of lamellar bone tissue.

Keywords: Bone graft, autotransplant, allograft, xenograft, hydroxyapatite, β -tricalcium phosphate, osteoinduction, osteoconduction, biodegradation.

Citation: Abduvalievich Y. A., Kahramonovich S. M. Specific Characteristics of Use of Modern Osteoplastic Materials in Odontogenic Jaw Cysts (Literary Review). Central Asian Journal of Medical and Natural Science 2026, 7(3), 463-469.

Received: 10th Mar 2026

Revised: 11th Apr 2026

Accepted: 19th May 2026

Published: 10th Jun 2026



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Introduction

According to the authors, among odontogenic cysts in children, cysts of an inflammatory nature are more common (radicular - 49.4% and tooth-containing - 37.7%). Odontogenic cysts are equally common in boys (54.9%) and girls (45.1%), with a predominant localization on the lower jaw. Children with radicular cysts sought inpatient surgical care at the age of 12–18 years (87.5%), with dental cysts – at 6–11 years (86.9%), with follicular cysts equally often at the age of 6–11 and 12–18 years (47.6 and 52.4%)[1,2,3]. Due to the widespread prevalence of jaw cysts of odontogenic etiology, an urgent problem in maxillofacial surgery is the improvement of methods for treating this pathology, as well as the presence of significant damage to the structures of the jaw bone, complicated by premature loss of teeth, impaired chewing function, jaw deformation and the threat of a pathological fracture[4,5]. Suppuration of odontogenic cysts is often complicated by the development of sinusitis of the upper jaw, osteomyelitis of the jaw bones, abscesses and phlegmons, which pose a threat to the patient's life. The development of central jaw cancer is discussed, since the epithelial lining of the cyst becomes malignant. The problem is relevant because the lack of reliable information about the effectiveness of various methods of surgical intervention makes it difficult to develop precise recommendations for the use of methods of surgical treatment of odontogenic cysts of the jaws[6,7,8].

The main condition for a successful postoperative period in patients with jaw cysts is the restoration of regional blood circulation in the wound tissues after the incision in order to provide access to the cyst of the mucous membrane, periosteum and detachment of the mucoperiosteal flap.

According to some authors, keratocysts of the jaw bones make up from 5.4 to 17.4% of all odontogenic cysts. Sometimes keratocysts with congenital pathology are included in the symptom complex (Gorlin syndrome, Marfan syndrome). A characteristic feature of the keratocyst clinic is that these formations do not have clear symptoms that allow them to be accurately diagnosed before surgery. Only in those cases, when the cyst reaches a large size, symptoms appear in the form of impaired teething or their displacement, jaw deformation. Small keratocysts are sometimes localized in the periapical tissues, as well as perihilar inflammatory cysts surrounding the tissue of an unerupted tooth, similar to a follicular cyst (dental-containing). It is a known fact that many years after surgery, keratocysts of the jaws tend to recur. In the histological classification of odontogenic tumors, keratocysts are classified as tumors and are called "benign keratocystic odontogenic tumor" [9,10]. Pathohistological examination of diagnostic surgical material is crucial in making a diagnosis, but sometimes previous operations and / or a characteristic sign - suppuration - make pathohistological verification difficult, since their characteristic epithelial lining is destroyed. There is also no consensus regarding the treatment of keratocysts. Different authors offer different methods of treatment: cystectomy, treatment of the cystic cavity with chemicals, with cryodestruction, etc. Some authors, given the tendency of keratocysts to recur, prefer a radical approach to treatment - resection of the jaw bone. According to M. Azimov[11], patients with odontogenic maxillary sinusitis accounted for 4-6% of all patients under treatment. L.M. Emelianenko[12] and Kozlov V.S.[13] provide data on the annual increase in the number of patients in this category, which is 1-2%. Despite the large increase in the disease, the results of surgical treatment of patients with odontogenic maxillary sinusitis cannot be considered optimal.

Materials and methods

This study was conducted as a theoretical and analytical literature review devoted to the assessment of modern osteoplastic materials used in the treatment of odontogenic jaw cysts. The source base consisted of scientific publications, monographs, clinical recommendations, dissertation materials, and review articles dedicated to odontogenic cysts, bone regeneration, osteoplastic materials, and reconstructive methods in maxillofacial surgery.

The literature search was performed using scientific databases including PubMed, Scopus, Google Scholar, ResearchGate, and national medical journals. Publications published between 2007 and 2024 were selected. Special attention was given to studies investigating the clinical effectiveness of autografts, allografts, xenografts, hydroxyapatite-based materials, β -tricalcium phosphate, composite osteoplastic materials, and modern biomaterials used for bone defect reconstruction after cystectomy.

The inclusion criteria comprised publications describing clinical, radiological, histological, and experimental outcomes of bone regeneration following surgical treatment of odontogenic cysts. Studies lacking sufficient methodological information, duplicate publications, and papers unrelated to osteoplastic reconstruction were excluded from the review.

The methodological framework included comparative analysis, systematic review, and descriptive synthesis of available scientific evidence. Comparative analysis was applied to evaluate the advantages and disadvantages of different osteoplastic materials according to their osteoconductive, osteoinductive, osteogenic, and biodegradation properties. Special attention was paid to the regenerative potential of combined xenogenic graft materials, including BOSS osteoplastic material.

Radiological, clinical, and morphological findings reported in the literature were analyzed to determine the effectiveness of various bone grafting approaches in restoring jaw bone defects. The collected data were systematized and interpreted from the perspective of contemporary maxillofacial surgery and regenerative dentistry.

The study was conducted in accordance with the principles of evidence-based medicine and aimed to summarize current scientific knowledge regarding the use of modern osteoplastic materials for the treatment of odontogenic jaw cysts and optimization of postoperative bone regeneration.

Results and discussion

This information is confirmed by the data of M.M. Solovyov, P.Ya. Shimchenko[14] - 32% of patients in the long term after radical sinusotomy according to Caldwell-Luke have the following complaints: a feeling of heaviness, a feeling of fullness, sometimes twitching pain in the area of the operated upper jaw; purulent nasal discharge; lacrimation, numbness of the upper lip, nose.

The above symptoms occur due to the fact that after removal of the pathologically altered mucous membrane of the sinus, its stable regeneration does not occur, and this leads to prolongation of the chronic inflammatory process. Palchun V.T. et al.[15] and can lead to carcinoma. Painful symptoms also arise due to the fact that during sinusotomy according to Caldwell-Luke, part of the anterior wall of the sinus is removed along with the mucous membrane, in this case the total area of the defect in the sinus mucosa increases significantly and reappears conditions for its poor regeneration. Thirdly, the long-term existence of chronic foci of odontogenic infection in the periodontium of the lateral group of teeth in the upper jaw leads to destruction of the bone structures of the sinus floor and damage to its mucous membrane.

Works by G.B. Troshkova and V.A. Kozlova[16] demonstrated that the severity of the process and its prevalence depend on the period of appearance of the oroantral communication that occurs after tooth extraction, before its surgical elimination. Some patients who have undergone the classic Caldwell-Luc sinusotomy operation have complaints of paresthesia of the tissues of the infraorbital region; these are explained by the traumatic nature of the intervention and the inflammatory process in the zone of innervation of the infraorbital nerve.

To prevent retraction of the soft tissues of the cheek and the formation of cicatricial adhesions G.B. Troshkova[17] proposed replacing the sinus wall defect with an allogeneic demineralized bone graft. In order to improve the results of treatment of patients with odontogenic maxillary sinusitis, it is necessary to implement immediate measures, which include the sanitation of foci of odontogenic infection of the upper jaw; prevention of the occurrence and timely elimination of oroantral communication that occurs after tooth extraction, minimizing the morbidity of surgical intervention for surgical treatment of maxillary sinusitis of odontogenic etiology. Cavity formations in the jaw bones are discovered by chance on radiographs taken for another purpose; some of them provoke the appearance of symptoms in the clinic: painful and painless swelling, which has a probable tendency to grow. Differential diagnosis of medium and small cysts of dysontogenetic origin is difficult, since the odontogenic cyst "grows" slowly over many months or even years and does not bother the patient.

Long-term experience shows that the X-ray picture of large cavity formations does not always make it possible to establish a preliminary diagnosis accurately and correctly, since cavity syndrome can be a consequence of various pathological conditions: radicular cysts, keratocysts, follicular cysts, ameloblastomas, ameloblastic fibromas, neoplasms of various histological structures, this predetermines and aggravates the future fate of patients. Many works are devoted to the X-ray diagnosis of diseases of cysts of the maxillary sinuses. The diagnosis of perihilar cysts is most significantly represented by the following studies. Literary data still show that diagnostic errors occur quite often.

This fact is due to some features of the clinical course of jaw cysts and their insufficient radiological semiotics. A significant percentage of cysts occur with complications in the form of inflammation of the cystic cavity and sinus, thinning deformation of the walls of the maxillary sinus, growth into the nasal cavity, which necessitates a more accurate and objective diagnosis in order to provide optimal treatment. Thus, an objective assessment of the nature and dynamics of development of such odontogenic cysts is complex and insufficiently studied. At the same time, in identifying the nature of the occurrence of odontogenic cysts, assessing their course, as well as the characteristics of reparative osteogenesis in the postoperative period, radiation research methods occupy a significant place.

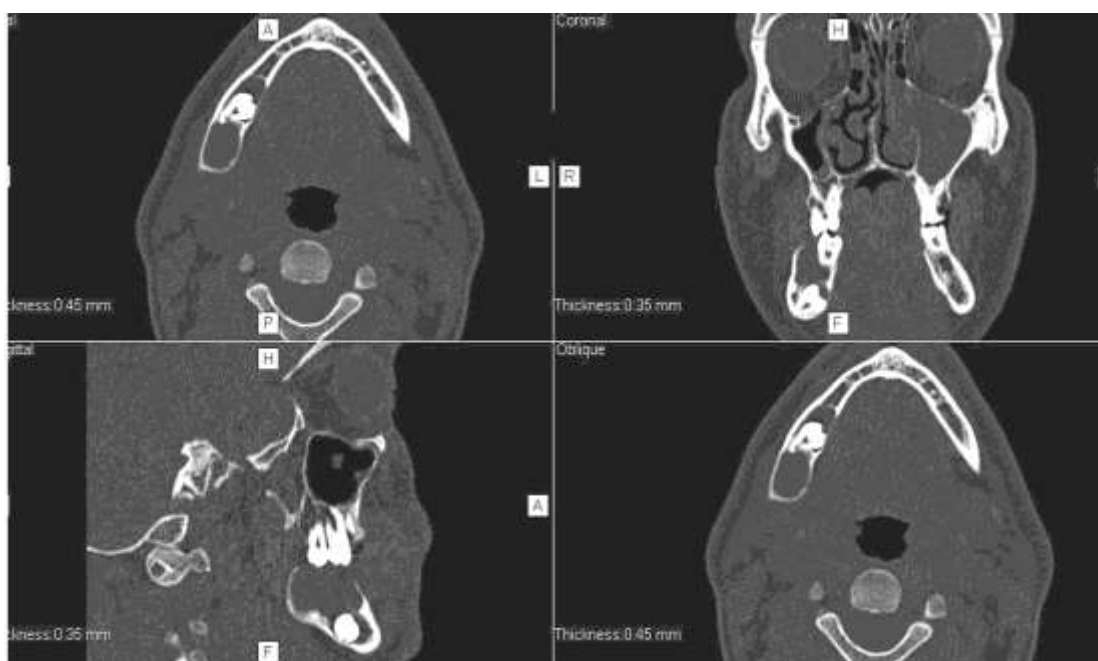


Figure 1. Follicular cyst of the lower jaw on the right with the presence of homogeneous soft tissue contents and a formed tooth. MSCT

Computed tomography is carried out to determine the size, contours and depth of cyst growth into adjacent soft tissues; this study makes it possible to determine the listed parameters layer by layer and accurately (Fig. 2)

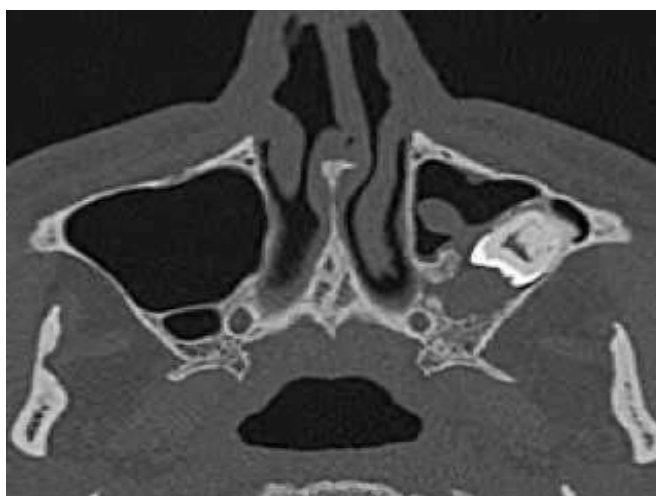


Figure 2. Computed tomography, odontogenic cyst on the left, nasomental projection.

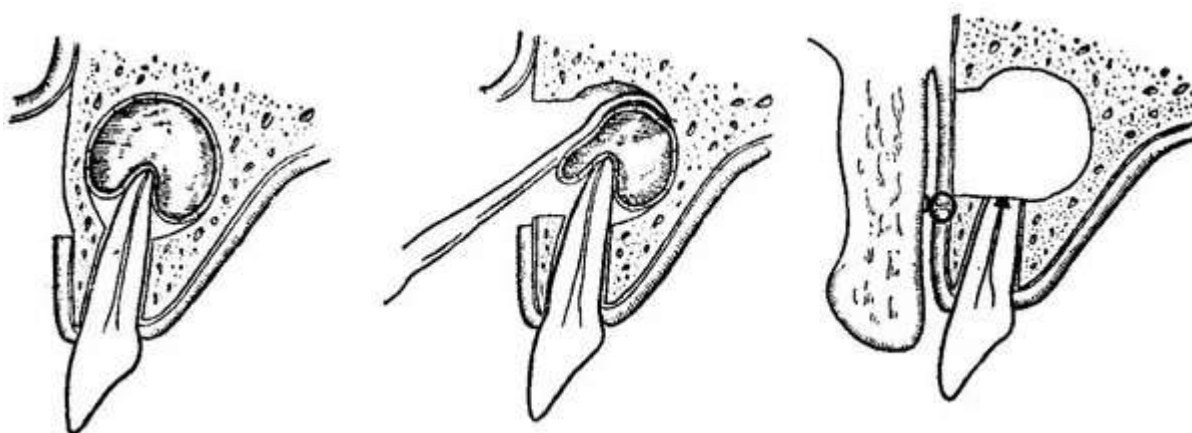
However, the final decisive preference when making a diagnosis is mandatory pathohistological examination. The importance of X-ray contrast examinations in children in the diagnosis of odontogenic cysts, which undoubtedly provide valuable information about the distribution and location of cysts (Fig. 3), has not been sufficiently detailed.

In the literature we studied, a small proportion of clinical and radiological characteristics of surgical treatment for long-term results of odontogenic cysts of the upper jaw and their consequences are reflected. Meanwhile, such information is extremely important for clinical practice.



Figure 3. X-ray. Radicular radicular cyst of the mandible.

Until now, there is no uniform approach to the treatment of large odontogenic cystic formations of the jaw bones and some types of benign tumors. The main reason for this is the high rate of relapse of the disease. The value of the relapse rate, according to the literature, for keratocysts varies depending on the chosen technique from 0 to 63.5%. Upon completion of cystectomy (Fig. 4), the relapse rate can be 18.9% and even 54.5%, while the relapse index is 0- 2% (Zhao Y.F. et al., Kolokyta et al. 2017) was obtained after block resection of the jaw and decompression (cystotomy) [16].



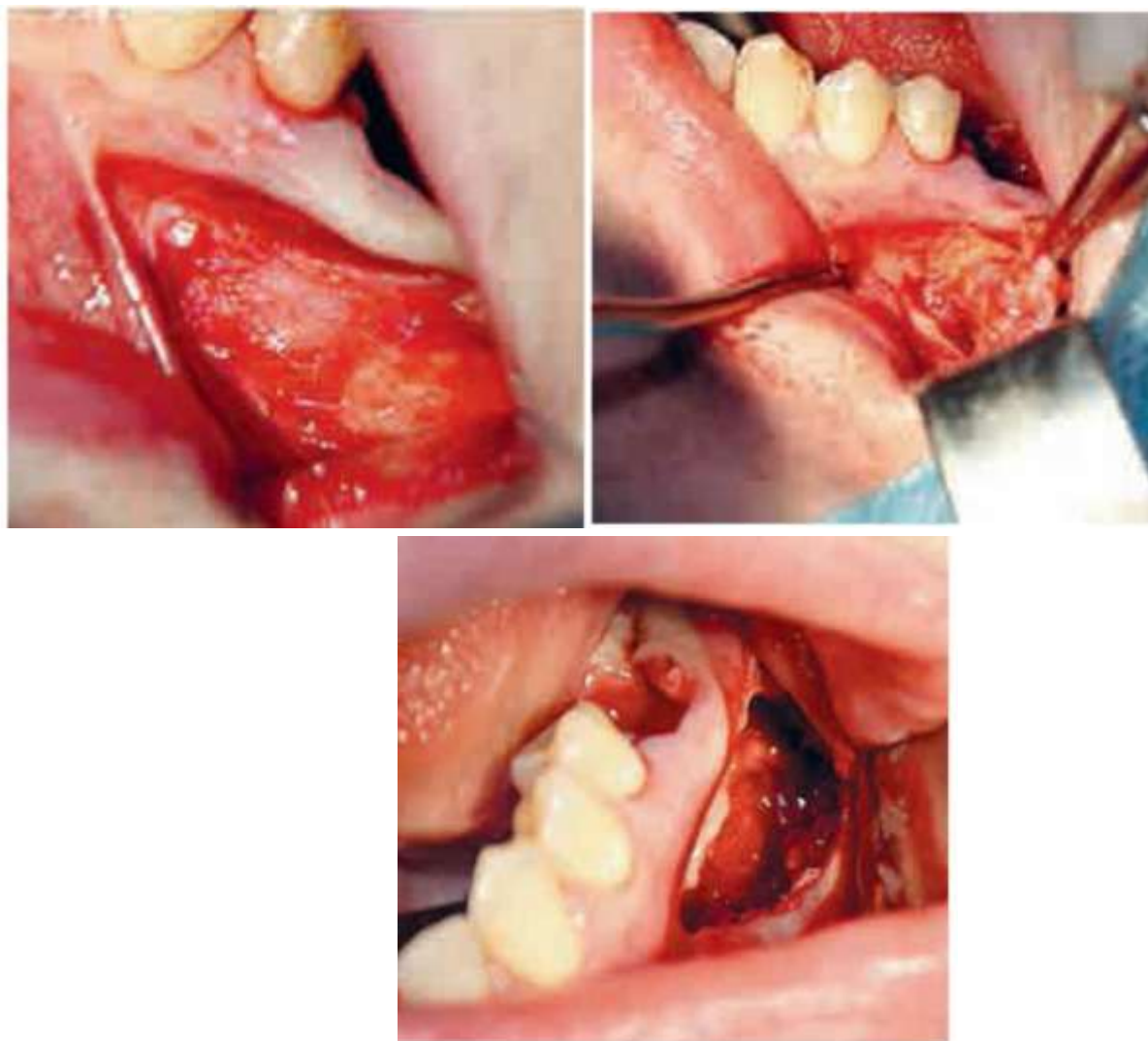


Figure 4. Cystectomy.



Figure 5. Odontogenic cyst of the left half of the upper jaw.

The largest number of maxillofacial surgeons prefer radical resection techniques for operations on large jaw cysts and benign tumors, which are often crippling and require a multi-stage rehabilitation period. In the socio-economic conditions of our

time, patients prefer outpatient treatment to hospital stay and a reduction in the period of disability associated with surgical intervention. Therefore, the dental surgeon must simultaneously offer an effective, least traumatic and affordable method of treatment.

Conclusions

Summarizing the above, it follows that currently the urgent task of surgical dentistry and maxillofacial surgery is to improve diagnosis and select the optimal method of treatment for extensive odontogenic cystic lesions and benign neoplasms of the jaws, based on the most complete clinical and radiological picture.

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