

Peculiarities of Surgical Methods of Prevention of Inflammatory Complications and Recurrence during the Operation "Cystectomy" in the Area of the Jaws

Hanna Krynychnykh^{1*}, Sergey Shuvalov¹, Ihor Matusyak¹, Leonid Zalevskiy¹

1. National Pirogov Memorial Medical University, Department of Surgical Stomatology and Maxillo-Facial Surgery; Department of Human Anatomy, Vinnytsya, Ukraine.

Abstract

The prevention of inflammatory complications and recurrence after surgical treatment of jaw cysts is an actual problem today. Suppuration, separation of sutures is the result of impaired blood clot formation, its insufficient volume to fill the bone cavity.

The volume of the postoperative bone cavity, its size and shape are important influencing factors on the effectiveness of the formation and complete filling of them with a blood clot. This became the main factor that prompted us to develop a technique for the formation of bone cavities after cystectomy and tactics for the management of postoperative bone wounds.

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Introduction

Periodontal disease is the most prevalent chronic inflammatory disease in humans, and it is considered the most urgent oral health concern.¹ In turn, inflammatory processes in periapical tissues are the cause of the development of cysts and other pathological lesions. Operations for treating jaw cysts are one of the most frequent surgical manipulations performed in the maxillofacial area.^{2,3,4,5} The technique of carrying out the operation "Cystectomy" in the area of the jaws is described by various authors in many sources of specialized literature.^{6,7,8}

However, the issues of prevention of inflammatory complications and recurrence in these types of operations are insufficiently described.^{9,10,11} The development of inflammatory postoperative complications is most often associated with a violation of the formation of a blood clot, insufficient volume of it to completely fill the bone cavity, which leads to suppuration and separation of sutures. To solve this problem, curettage is most often recommended, which,

with a pronounced cortical plate of the bone wall of the cystic cavity, turns out to be insufficient.^{12,13} More radical is the proposal of D.L. Korytny (1972) - to make a series of incisions within the compact plate, deepening to the spongy layer, which is quite traumatic, but definitely contributes to the formation of a blood clot and the prevention of suppurations.¹³

The effectiveness of the formation and complete filling of the postoperative bone cavity with a blood clot also depends on its volume, size and shape. Thus, according to D. Sabo (2005), a blood clot forms and fills the cavity completely with cysts with a diameter of up to 2 cm, according to Y. I. Bernadskyi (1998) - up to 1.5 cm.^{3,14} In extensive cavities, after contraction, the clot occupies only a small part of the volume of the bone cavity, which contributes to its suppuration. In this connection, it is necessary to develop the technique of forming bone cavities after cystectomy and the tactics of managing postoperative bone wounds.

Another, no less important and difficult, complication of cystectomy is the recurrence of cysts, and in some cases their malignancy. Systematized data on the recurrence of cysts are few in the literature, and some works note the possibility of their malignancy (1.5-2% of cases).^{2,15,16,17,18,19}

The degree of proliferation and the phenomenon of malignancy, as a rule, are established during pathohistological and

*Corresponding author:

Hanna Krynychnykh,
Department of Surgical Stomatology and Maxillo-Facial Surgery, National Pirogov Memorial Medical University, Vinnytsya, 21008, Ukraine.
E-mail: popik.anna@gmail.com

histochemical studies of postoperative preparations.^{20,21,22} This is, of course, an infallible way of diagnosis, however, in clinical practice, most surgeons perform the "Cystectomy" operation as the first stage of treatment.^{22,23} Immunohistochemical studies of the epithelium of cysts according to the degree of their proliferative activity and tendency to recurrence are carried out only selectively, not for all species. In connection with this, it is necessary to develop more radical methods of treatment and formation of a bone wound after cystectomy, which will be effective both for the purposes of prevention of postoperative inflammatory complications and recurrence.

To improve the results of treatment of cysts of the incisive part of the upper jaw.

1. To develop tactics of surgery and management of postoperative bone wounds depending on the volume of bone cavities.

2. To work out method of management of the bone cavity after cystectomy, which includes a method of deepening the cystic wall and compactosteotomy (by making perforation holes).

3. Check postoperative results.

Materials and methods

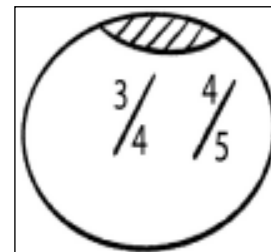
At the clinical base of Vinnytsia National Medical University named after M.I. Pirogova in the Department of Maxillofacial Surgery of the Vinnytsia Regional Clinical Hospital named after M.I. Pirogov it was identified and operated 24 patients with cysts of embryonic fissures of the incisive and globulo-maxillary areas of the upper jaw. Cysts of the globulo-maxillary region accounted for 19 cases, of the incisive canal - 5. Women accounted for 10 cases (41.6%), men - 14 cases (58.3%).

The average age of the majority of patients was between 10 and 20 years - 4 cases (16.6%), 20-45 years - 12 (50%), 46-55 years - 8 (33.3%). According to the histological structure, the distribution of cysts was as follows: cysts of the incisive canal - 5 cases (20.83%), from the group of cysts of the globulo-maxillary area - 19 cases (79.16%): radicular cysts - 9 (47.4%), periapical granulomas - 4 (21.05%), periodontal lateral cysts - 2 (10.52%), glandular odontogenic cysts - 2 (10.52%), keratocysts - 2 (10.52%).

Results

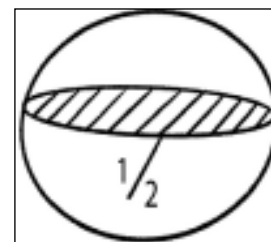
Analyzing the results of the healing of bone cavities of the jaws after cystectomy, both the primary volume of the bone cavity and the volume and location (mostly vertical or mostly horizontal) were taken into account. As a result of observing the healing of bone wounds, we formed some principles and recommended the following approaches to the tactics of managing such bone cavities:

1. If the entrance to the bone cavity is narrow and only $\frac{1}{4}$ or $\frac{1}{5}$ of its volume is removed, then such a bone wound should be treated only under a tampon, and if possible, the area of the entrance hole should be increased to $\frac{1}{2}$ of the outer wall (Graph 1).



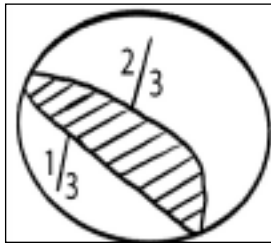
Graph 1. Entrance $\frac{1}{2}$ of the outer wall.

$\frac{1}{2}$ part of its volume is removed above the cyst cavity, then it should be carried out under a tampon or by marsupialization with the lining of the mucous membrane on the bottom. The position of this cavity is in $\frac{1}{2}$ part of the bone defect, horizontal (Graph 2).



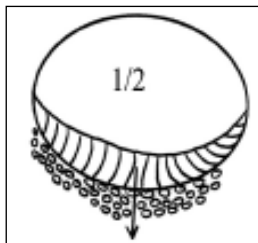
Graph 2. Cavity in $\frac{1}{2}$ part of the bone defect, horizontal

3. If the bone wound is $\frac{1}{3}$ of its volume cyst cavity, then the edges of the wound above the cyst cavity, filled with a blood clot, can be sutured (Graph 3).



Graph 3. Bone wound $\frac{1}{3}$ of its volume cyst cavity.

4. If the lower edge of the cyst cavity is at the level of its base, that is, the bottom of the cavity is practically absent, then the wound can be sutured by placing the mucous membrane on the wall of the defect. The position of this cavity - in $\frac{1}{2}$ part of the bone defect - is vertical (Graph 4).



Graph 4. Cavity in $\frac{1}{2}$ part of the bone defect vertical.

If these recommendations were followed, there were no cases of suppuration of postoperative cystic cavities of the jaws.

In a large number of embryonic fissure cysts (82%), rims of dense bone (compact plate) were radiologically detected. This fact is probably related to the long term of its formation. Such bone cavities are not filled with blood after removal of the cyst lining, have a slow tendency to be replaced by granulation and bone tissue, and often suppurate. Therefore, the dense structure of the cyst walls requires their perforation to the spongy substance, which contributes to the formation of granulation tissue and blood clots.

Thus, the main principle of cystic cavity formation is the reduction of the "bone pocket" after "cystectomy". Undoubtedly, these principles are most important during operations on the lower jaw, but they must also be applied during operations on the upper jaw, even when the volume of bone cavities is less than 1.5-2 cm.

In order to prevent postoperative inflammatory complications and recurrence in 12 patients, we developed and applied the following tactics for treating the bony walls of cystic

cavities. After cystectomy, thorough curettage of bone walls was performed. Then the bone cavity was deepened with a cutter, removing the compacted layer of bone to a depth of 1 mm, without damaging the periodontium of the adjacent teeth, nasal cavities and maxillary sinuses, which, in our opinion, ensures the prevention of relapses. Perforating holes were made with a surgical bur with a diameter of 2.3 mm and 1.6 mm in the areas of the most voluminous location of the spongy substance, thus causing bleeding of the bone and filling the bone cavity with blood and the formation of a blood clot.

The method of applying perforation holes is indicated for cysts larger than 1.5-2 cm, as well as for a pronounced rim of a compacted sclerosed bone of cystic cavity.

In all cases, when using the deepening-perforation method, suppuration of bone cavities was not observed, wound healing by primary tension was noted.

During observation of patients after 1-2 years, recurrence of cysts was not observed.

Based on the analysis of the results of our own observations and data from the literature, we established differences in the tendency to recurrence and proliferation of cyst tissue. Thus, odontogenic keratocysts and glandular - odontogenic cysts are classified as cysts with high proliferative activity, in which the method of deepening the bone wall of the cyst is indicated.

Discussion

Postoperative complications, infections, recurrences after surgical treatment of jaw cysts are an unsolved problem of surgical dentistry.⁹ Prediction variables for the occurrence of postoperative complications are age, sex, concomitant diseases, anatomical localization, patho-histological diagnosis, preoperative infection, previous marsupialization, and the use of bone grafts.^{9, 11} According to the results of our research, violation of the formation of a blood clot, and as a result its insufficient volume to fill the bone cavity is a significant factor in the development of inflammatory postoperative complications. In turn, the size and localization of the bone defect after cystectomy are key factors when choosing tactics for managing bone cavities. Therefore, taking into account all the above factors, it is necessary to develop the

tactics of the operation, methods of treatment of the bone cavity after surgical treatment and management of postoperative bone wounds. Various treatment modalities have been described in the literature.¹⁰

Initial approach still remains conservative surgery with primary closure defect (less than 4 cm), which reduces the morbidity of aggressive surgeries. Marsupialisation is considered as the most common option for the treatment of large cystic lesions, when cases are carefully selected.^{10,12}

We offer methods for surgical treatment of jaw cysts, which are as follows: bone cavities with a narrow entrance and only ¼ or 1/5 of its volume can be removed only under the tampon. Under the tampon with the lining of the mucous membrane on the bottom, we can conduct bone cavities if half of its volume is removed above the cyst cavity, or there are suppuration phenomena, the close location of the germs of the teeth, the maxillary sinus. Suturing the edges of the wound above the cyst cavity filled with a blood clot is carried out if the bone wound is 1/3 of its cavity. Suturing of the wound with laying of the mucous membrane on the wall of the defect is carried out in the case of an almost absent cavity bottom.²²

It is recommended to use the method of perforation holes for cysts larger than 1.5-2 cm and in the presence of a pronounced rim of a compacted sclerosed bone cystic cavity, and to prevent recurrence - the method of deepening the walls.²² For treatment of patients with cysts with high proliferative activity (odontogenic keratocysts and glandular-odontogenic cysts), preference should be given to the method of deepening the bone wall.^{15,22} After using these methods of treatment, suppuration of bone cavities and recurrences were not noted.

Conclusions

1. The tactics of managing bone cavities after cystectomy depends on the volume and location of the bone defect.
2. It is advisable to adhere to our schemes of management of bone cavities. If the size of the cysts is more than 2 cm in diameter, it is worth striving to surgically reduce the volume of the postoperative bone cavity by 1/3 - ½ of their original size, taking into account their vertical or horizontal location on the upper or lower jaws.
3. Embryonic fissure cysts in many cases

have a pronounced compact layer of dense bone, with insufficient blood supply, which is adjacent, so that in order to completely fill the cavity with a blood clot, improve the conditions of bone regeneration and prevent suppuration, it is necessary to apply the method of applying perforation holes with a drill with a diameter of 2.3 mm or with a 1.6 mm drill and deepening of the cyst walls.

4. Glandular-odontogenic cysts, keratocystic cysts should be considered the most prone to recurrence of jaw cysts odontogenic tumors.
5. In order to prevent the recurrence of cysts, it is necessary to use the method of deepening the bone cavity by 1-2 mm.
6. The combination of the method of applying perforation holes and deepening the bone cavity is effective for the prevention of recurrence of cysts and suppuration of postoperative cystic cavities.

Declaration of Interest

The authors report no conflict of interest.

References

1. Wulansari LK, Kaboosaya B, Khan M, Takahashi M, Nakata H, Kuroda S, Aoki K, Kasugai S. Beneficial effects of fasting regimens on periodontal tissues in experimental periodontitis mice model. *Journal of International Dental and Medical Research*. 2018; 11(2):362-369.
2. Shear M, Speight PM. *Cysts of the Oral and Maxillofacial Regions*. Blackwell Munksgaard; 2007:228.
3. Bernadskyi Y. *Fundamentals of maxillofacial surgery and surgical stomatology*. Belmedknyga; 1998:416.
4. Berkovitz BK, Holland GR, Moxham BJ. *Oral Anatomy, Histology and Embryology* 4th Edition. Mosby; 2009:408.
5. Avetikov DS, Yatsenko IV, Sokolova NA. Regarding the issue of ordering the classification of jaw cysts. *Bukovynsky medical bulletin*. 2012; 16 (3): 173-176.
6. Timofiev OO. *Maxillofacial surgery*. *Medicine*; 2022:792.
7. Malanchuk VO, Kopchak AV. Benign tumors and tumor-like lesions of the maxillofacial region of the neck. *K: Askania*; 2008:320.
8. Miloro M, Ghali GE, Larsen PE. *Peterson's Principals of Oral and Maxillofacial Surgery* 2 Vol. *J Oral Maxillofac Surg*; 2019; 77 (9):1823-1831.
9. Hanbin L, Shin-Jae L, Byoung-Moo S. Investigation of postoperative complications of intrabony cystic lesions in the oral and maxillofacial region. *J Oral Maxillofac Surg*. 2019; 77 (9): 1823-1831.
10. Nyimi BF, Yifang Z, Liu BJ. The Changing Landscape in Treatment of Cystic Lesions of the Jaws. *Int Soc Prev Community Dent*. 2019; 9 (4):328-337.
11. Lim HK, Kim JW, Lee UL, Kim JW, Lee HJ. Risk Factor Analysis of Graft Failure With Concomitant Cyst Enucleation of the Jaw Bone: A Retrospective Multicenter Study. *Oral Maxillofac Surg*. 2017; 75(8):1668-1678.
12. Zhao YF, Liu B, Jiang ZQ. Marsupialization or decompression of the cystic lesions of the jaws. *Shanghai Kou Qiang Yi Xue*. 2005; 14 (4):325-9.
13. Korytny DL. *Dental cysts*. *Alma-Ata: Kazakhstan*; 1972:142.
14. Sabo D. *Surgery of the oral cavity and maxillofacial area*. *Kniga*

plus; 2005:226.

15. Brannon RB. The odontogenic keratocyst : A clinicopathological study of 312 cases. Part II. Histological features. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*; 1977; 43(233)-55.
16. Blanas N, Freund B, Schwartz M, Furst IM. Systematic review of the treatment and prognosis of the odontogenic keratocyst. *Oral Surg Oral Pathol Oral Radiol Endod*. 2000;90(5):553-8.
17. Cawson RA, Binnie WH, Eveson JW. *Colour Atlas of Oral Disease: a clinicopathologic correlations*. 2nd Edition. England: Wolfe Mosby; 1994. Periodontal radicular cysts; pp. 5.9–5.13.
18. Scheer M, Koch AM, Drebbler U, Kübler AC. Primary intraosseous carcinoma of the jaws arising from an odontogenic cyst—a case report. *J Craniomaxillofac Surg*. 2004; 32 : 166–9.
19. Jain M, Mittal S, Gupta DK. Primary intraosseous squamous cell carcinoma arising in odontogenic cysts: an insight into pathogenesis. *J Oral Maxillofac Surg*. 2013 ;71 : 7-14.
20. Jabbarzadeh M, Hamblin MR, Pournaghi-Azar F, VakiliSaatloo M, Kouhsoltani M, Vahed N. Ki-67 expression as a diagnostic biomarker in odontogenic cysts and tumors: A systematic review and meta-analysis. *J Dent Res Dent Clin Dent Prospects*. 2021;15 (1):66-75.
21. Mustansir-Ul-Hassnain S, Chandavarkar V, Mithilesh NM, Pavan MP, Bhargava D. Histopathologic and immunohistochemical findings of odontogenic jaw cysts treated by decompression technique. *J Oral Maxillofac Pathol*. 2021;25 (2):272-278.
22. Shuvalov S. Applied topographical anatomy of the head and neck. *Vinnytsia oblastnaya typography*; 2020: 116.
23. Tosios KI, Kakarantza-Angelopoulou E, Kapranos N. Immunohistochemical study of bcl-2 protein, ki-67 antigen and p53 protein in epithelium of glandular odontogenic cysts and dentigerous cysts. *J Oral Pathol Med*. 2000;29: 139-44.