International Journal of Biology and Life Sciences
ISSN: 2957-9511 | Vol. 3, No. 3, 2023

Research Progress of Maxillary Sinus Cyst and Maxillary Posterior Dental Region Implantation

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Abstract: The loss of single or multiple teeth in the maxillary posterior region usually leads to alveolar bone resorption, atrophy, and maxillary sinus cavity gasification, resulting in insufficient vertical bone height of the maxillary posterior alveolar bone, which brings great difficulties to tooth implantation. Maxillary sinus floor lifting is an important method to solve the posterior maxillary bone mass deficiency, which can be divided into internal lifting and external lifting. In order to avoid the occurrence of complications such as maxillary sinus mucosa perforation and facilitate the selection of surgical methods, it is particularly important to accurately understand the anatomical characteristics of maxillary sinus before surgery. Maxillary sinus cyst is the most common benign disease of maxillary sinus. It has always been considered as an absolute contraindication for maxillary sinus floor elevation bone grafting, which seriously restricts the possibility of maxillary sinus bone increment. This article reviews the research progress of maxillary sinus cyst and maxillary posterior dental implantation at home and abroad.

Keywords: Radical Operation of Maxillary Sinus; Maxillary Sinus Cyst; Plant; Bone Height; Alveolar Ridge Height.

1. Introduction

The maxillary posterior dental region has always been a hot area for implantation, and tooth loss here can be caused by a variety of factors, such as osteoporosis caused by trauma, tumor, physiological or pathological factors, and congenital dysplasia, etc. (1, 2). Because the bone of the maxilla is more porous than that of the mandibular bone and the biting force here is larger, and the adjacent maxillary sinus greatly increases the technical difficulty of implantation here. In the 1980s, Tatum (3) first proposed the method of maxillary sinus floor lifting to solve the problem of insufficient bone mass in the maxillary posterior dental region, but the maxillary sinus is often plagued by inflammation, cysts and other problems, which makes the operation more complicated. This review will focus on the research progress of maxillary sinus cyst and maxillary posterior dental region implantation.

1.1. Anatomic Structure of Maxillary Sinus

The maxillarysinus (maxillarysinus) is located within the maxilla and resembles a transverse cone, consisting of five faces and a cusp, if the lateral wall of the nasal cavity is regarded as the basal face of the maxillarysinus, the tip is toward the zygomatic process. Inside the maxillary sinus, it can be described as four walls: the anterior wall, which corresponds to the anterior and external sides of the maxilla when viewed from the outside; The posterior wall, corresponding to the posterior external surface of the maxilla, which usually turns through the zygomatic alveolar ridge: the superior wall, corresponding to the orbital surface of the maxilla; The inferior wall, corresponding to the superior alveolar process, commonly referred to as the "maxillary sinus floor" refers to this area, and is usually 1.5 mm lower than the nasal floor. Lateral wall fenestration the maxillary sinus floor is raised to the anterior wall of the maxillary sinus (that is, the anterior lateral wall of the maxillary jaw), and the maxillary sinus floor is raised to the inferior wall of the maxillary sinus through the alveolar ridge. The maxillary sinus opens in front of the base (i.e., the lateral wall of the nasal cavity) at the semilunar hiatus, which is located in the middle nasal canal. The size and shape of the maxillary sinuses can vary greatly, and even the left and right sides of the same person can be significantly different. The volume of the maxillary sinus ranged from 9.5-20ml, with an average of 14.75 ml. The maxillary sinuses average 36-45mm in height, 25-35mm in width, and 38-45mm in length (6). in most cases, the maxillary sinus can reach the root of the premolars, and sometimes even extend to the root of the cusp. Laterally it may reach or even enter the zygomatic process; Reaches the posterior wall of the maxilla backward; Up to the orbital floor; Descending to the alveolar process. It is common in the clinic for the root of the maxillary molar to protrude into the floor of the maxillary sinus, which sometimes forms a separate protrusion with many small depressions called alveolar recesses. In most cases, the lowest depressions are located in the first and second molar areas. The position of maxillary sinus base gradually increased, and the height of alveolar bone in the sinus base gradually increased. With age, the degree of maxillary sinus gasification increases, and the scope of maxillary sinus will increase. The maxillary sinus bone wall has no important muscle attachment, and its most important functional stimulation mainly comes from masticatory pressure. The physiological function of the antrum is not fully defined, but it is generally believed that it has resonance, insulation, secretion of mucus, moistening of the nasal cavity, reducing the weight of the skull, and increasing the humidity and temperature of the inhaled air.

1.2. Maxillary Sinus Lift Bone Grafting

Maxillary sinus lifting bone graft was first proposed by Tatum in the 1980s. (3) As a routine implant operation, maxillary sinus mucosa is lifted after being removed from the sinus floor, and bone graft materials are implanted between the sinus floor mucosa and the sinus floor bone, thus effectively increasing the bone height and meeting the needs of dental implantation. As a conventional bone increment method for maxillary posterior dental region bone mass deficiency, this operation has been widely used in clinical

practice, and is currently the most effective and reliable method for solving maxillary posterior dental region bone mass deficiency, with a high success rate and predictability. According to statistics, about 40% of patients with tooth missing implants in the maxillary posterior region need maxillary sinus lifting bone grafting. The main operation methods used are maxillary sinus external wall lifting and maxillary sinus internal lifting, and the postoperative healing conditions of different operation methods are also different. External lifting has larger damage, wide operation scope, high cost and heavy postoperative reaction, and is mostly used in patients with maxillary implant bone height less than 5mm, while internal maxillary sinus lifting has less trauma, small operation scope, slight postoperative reaction and low cost. Patients are more receptive. However, the maxillary sinus is often due to anatomical variation, inflammation, cysts and other factors, which makes this operation more complicated and there is a certain risk. Perforation of mucoperiosteal of maxillary sinus was the most common complication, followed by hemorrhage (4,5). With the continuous progress of clinical research, maxillary sinus lifting technology has been continuously improved, which can more effectively improve the bone mass and height of the maxillary posterior dental area, providing a strong guarantee for subsequent implant treatment.

1.3. Maxillary Sinus Cyst

Maxillary sinus cyst is the most common benign disease of maxillary sinus. It grows slowly, most patients have no obvious clinical symptoms, and a few patients may have headaches, nasal congestion, facial numbness and other symptoms (7). In severe cases, maxillary sinus ostium obstruction will cause infection. According to its biological characteristics and clinical behavior, it can be divided into four categories: maxillary sinus mucocele, retention cyst, false maxillary sinus cyst and postoperative cyst. Among them, pseudomaxillary sinus cyst was caused by periodontal infection or odontogenic infection, and the local mucosal hyperemia exosmotic swelling was shown as circular cystic lesions on X-ray images. The location of the cyst was extremely thin from the bone wall of the alveolar process, and the alveolar breakthrough and bad absorption caused by periodontal disease periapical disease could be clearly seen.

1.4. Influence of Cyst on Maxillary Sinus Lifting Bone Grafting

The key of maxillary sinus lifting bone grafting is to completely peel and elevate the sinus floor mucosa. However, due to the presence of cysts, the an anatomical morphology of maxillary sinus is changed, so the maxillary sinus mucosa may be damaged during the operation, resulting in mucosal rupture and maxillary sinusitis and other complications. In addition, the presence of maxillary sinus cysts changes the physiologic state of natural drainage of maxillary sinus. Even if no mucosal perforation occurs, lifting the sinus floor mucosa below the cyst will aggravate the interference with natural drainage of maxillary sinus cavity, resulting in postoperative drainage obstruction and maxillary sinus inflammation.

1.5. Dental Implantation with Maxillary Sinus Cyst

Maxillary sinus cyst was once considered as a contraindication for maxillary posterior dental region implantation. With the deepening of the understanding of maxillary sinus, the existing literature studies show that false maxillary sinus cyst is no longer a contraindication for implantation. Treatments for patients with maxillary sinus cysts are also emerging. Some scholars have proposed complete removal of the cyst by Caldwell-Luc (11) or endoscopic (12) to prevent recurrence, and then maxillary sinus floor lift bone grafting after 6 months of healing, and dental implant surgery at the same time or delay. However, the overall treatment cycle of this regimen is longer. Studies have shown that concurrent maxillary sinus cyst curettage with external maxillary sinus elevation can achieve good therapeutic effects (8,9), shorten the treatment cycle and reduce the number of operations, and improve the comfort of patients. 6 months after surgery, implants can also achieve good bone union. Tang ZH et al. (10) found that: Pseudo maxillary sinus cysts were treated with maxillary sinus elevation and implantation of implants, resulting in good repair results. After six months of follow-up examination, the cyst volume decreased. Guo Qi et al. selected 11 cases of maxillary posterior teeth implantation with maxillary sinus cysts, all of which were treated and implanted with 15 implants during the same period of maxillary sinus external elevation surgery. All of them achieved good bone union results after surgery.

1.6. Conclusion

Maxillary sinus cyst is not an absolute contraindication for maxillary sinus floor lifting. The treatment plan is usually determined before surgery according to the type of cyst, whether there are clinical symptoms, and the location and size of the cyst. In maxillary sinus floor lifting, cyst removal and bone increment are the most ideal method. In addition, the correct use of assistive technologies, such as oral endoscopic technology, hydraulic technology, PRF, etc., can reduce the risk of complications. There are many clinical treatment methods for false cyst of maxillary sinus, including removal of maxillary sinus cyst first and deferring elevation of maxillary sinus base; The maxillary sinus cyst was removed, and the maxillary sinus base was lifted or the maxillary sinus base was lifted directly. No matter what procedure is used, the principle should be followed: relieve symptoms, eliminate lesions, reduce risks, and reduce complications. In conclusion, in the maxillary sinus floor lifting operation, the appropriate treatment of maxillary sinus cyst can obtain good clinical effect of implant repair.

Acknowledgments

This work was funded by the Hebei Provincial Health Commission Project (20191103).

References

[1] Lee YC, Chan YH, Hsieh SC, Lew WZ, Feng SW. Comparing the Osteogenic Potentials and Bone Regeneration Capacities of Bone Marrow and Dental Pulp Mesenchymal Stem Cells in a Rabbit Calvarial Bone Defect Model. Int J Mol Sci. 2019 Oct 10;20(20):5015. doi: 10.3390/ijms20205015. PMID: 31658685; PMCID: PMC6834129.

[2] McGovern JA, Griffin M, Hutmacher DW. Animal models for bone tissue engineering and modelling disease. Dis Model Mech. 2018 Apr 23;11(4):dmm033084. doi: 10.1242/ dmm. 033084. PMID: 29685995; PMCID: PMC5963860.

[3] Tatum H Jr. Maxillary and sinus implant reconstructions^]. Dent Clin North Am, 1986, 30 (2): 207-229.

[4] Fu Tianming, Zhou Maoxin, Liu Zheng. Application of maxillary sinus lifting in oral implantation [J]. Contemporary Medicine, 2011,17(26):56. (in Chinese).

[5] Wang Xinyu, Di Ping, Li Jianhui, et al. Clinical study of secondary approach bone grafting after excision of maxillary sinus cyst [J]. Chinese Journal of Stomatology,2015,50(9):515-521. (in Chinese).

[6] Pjetursson BE,Tan WC,Zwahlen M,et a1.A systematic review of the SIIGCeSS of sinus floor elevation and survival of implants inserted in combination with sinus floor elevation.Part I:Lateral approach[J].J Clin Periodontol,2008,35(8 Suppl): 216-240.

[7] Kang SJ,Shin SI,Herr Y,et a1.Anatomical structures in the maxillary mnus related to lateral sinus elevation:a cone beam computed tomographic analysis[J].Clin Oral Implants Res,201 1,24(A100):75-81.

[8] Su Yucheng. Oral implantology 2nd edition [M]. Beijing: People's Medical Publishing House, 2014:554,563,570. (in Chinese).

[9] osau M,Rink D,Driemel O,et a1.Maxillary sinus anatomy: a cadaveric study with clinical implications [J].Anat Rec (Hoboken), 2009,292(3):352-354.

[10] WANG Qiuzi, Xu Pu, Lu Liying et al. A case of maxillary sinus cyst treated with external maxillary sinus lift [J]. Hainan Med, 2017, 28(14):2391-2393.

[11] Zhou Lei. Research progress of maxillary sinus floor lifting. International Journal of Stomatology, 2011,38:1.

[12] Yang Guangdong, Ling Dan, et al. Analysis of 27 cases of simple maxillary sinus cyst treated by fenestration of the anterior wall of maxillary sinus combined with nasal endoscopic surgery. Chinese Journal of Otolaryngology of Integrated Traditional and Western Medicine, 2010, 18:2.

[13] Kuang Yiyuan, Wu Hanjiang. Research progress of maxillary sinus lifting for dental implantation. Journal of Stomatology, 2007, 27:10.

[14] Lm Y, Hu X, Metzmacher AR, et a1.Maxillary sinusaugmentation following rem oval of a maxillary sinuspseudo cystafler a shortened healing period[J].J Ora IMaxillofacialSm'g,201 O,68(1 1):2856-2860.

[15] Lin Ye, Hu Xiulian, et al. Maxillary sinus cyst removal and maxillary sinus bone grafting. Chinese Journal of Dental Implantology, 2008, 3.3.

[16] Ye Lin. et al.Sinus floor augmentation Following Removal of a Maxillary Sinus Pseudocyst After a Shortened Healing Period J Oral Maxillofac Surg 2010, 68:2856-2860.

[17] Michael A. Pikos, DDS Maxillary Sinus Membrane Repire: Update on Technique for Large and Complete Perforations. Implant Dentistry Volume17 Number 1.2008.

[18] Tang ZH, et al.Implants placed simultaneously wish maxillary sinus floor augmentations in the presence of antral pseudocysts:a case report,Int J Oral Maxillofac Surg (2011) , doi:10.1016/j.ijom.2011, 02.037.

[19] Beaumont C, Zafiropoulos GG, Rohmann K, Tatakis DN. Prevalence of maxillary sinus disease and abnormalities in patients scheduled for sinus lift procedures. J Periodontol. 2005 Mar; 76(3):461-7. doi: 10.1902/jop.2005.76.3.461. PMID: 15 857082.

[20] Timmenga NM, Raghoebar GM, van Weissenbruch R, Vissink A. Maxillary sinus floor elevation surgery. A clinical, radiographic and endoscopic evaluation. Clin Oral Implants Res. 2003 Jun;14(3):322-8. doi: 10.1034/j.1600-0501. 2003. 140310.x. PMID: 12755782.

[21] Guo Qi, Gao Gongjie. External maxillary sinus elevation with maxillary sinus cyst: a clinical summary of 11 cases [J]. Chinese Journal of Oral Implantology,2018,23(04):190-192. (in Chinese).