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SINUS LIFTING SURGERY WITH SIMULTANEOUS SANATION OF THE LOWER SECTIONS OF THE MAXILLARY SINUS

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SUMMARY

This article presents a new method of reconstruction of the atrophied distal alveolar process of the maxilla in patients with chronic polyposis sinusitis that we have developed and introduced into clinical practice. The method provides for bone grafting using open sinus inlay technique with simultaneous removal of polyps from the maxillary sinus and immediate or delayed placement of dental implants. Previously, the presence of extranasal sinus polyps was a contraindication to sinus lifting surgery. Treatment required an additional stage of the sinus sanation, which is possible only in the in-patient department, prolongs the rehabilitation time for patients with tooth loss, and extends the prosthetics period for dental implants. Moreover, it is not always possible to predict the exact time of the in-patient stage of treatment because of the individual characteristics of the body and the risk of possible complications, which in turn can increase the total period of surgical treatment. The developed method makes it possible to exclude the stage of in-patient treatment involving sanation of the maxillary sinus in this category of patients and thus reduces the duration of surgical treatment by 3–4 months.

KEY WORDS: *bone grafting, reconstruction, distal maxillary process, bone atrophy, maxillary sinus, sinus lifting surgery, chronic polyposis maxillary sinusitis, dental implantation.*

CONFLICT OF INTEREST. *The authors declare no conflict of interest.*

Introduction

Reconstruction of the alveolar process of the maxilla (APM) is performed to eliminate bone atrophy before denture supported by dental implants [1, 2, 3, 4–8, 9]. This method of prosthodontic treatment is modern and up-to-date and allows a fundamentally new level of quality of life and complete rehabilitation of patients with partial or total loss of teeth [1, 2, 4–8, 9].

It has been clinically established that in 35 % of patients, dental implantation is not possible without prior reconstructive surgery to restore bone volume in the alveolar process of the upper jaw. In 65 % of patients, a sinus lift is needed to restore the height and in 20 %, both the height and width of the alveolar process in the distal upper jaw are increased [2].

Sinus lifting surgery (SL) is the basic method of reconstruction in cases of insufficient bone volume in the lateral regions of the APAJ [1, 2, 4–8, 9–11].

Chronic polyposis maxillary sinusitis (MS) is a contraindication for sinus lifting surgery. If a patient has this pathology, the perinasal sinuses are preliminarily sanitized, followed 3–4 months later by SL surgery and, if indicated, additional reconstruction of the maxillary alveolar process, which increases the patient's rehabilitation time, but makes subsequent dental implantation (DI) possible [1–3, 6–8, 10–12].

The most important factor determining the positive outcome of subantral augmentation and subsequent or simultaneous dental implantation after maxillary sinus sanation in chronic polyposis maxillary sinusitis is the anatomical feature of the «key» area of the nasal cavity, namely the ostiomeatal complex (OMC), which determines the patency of the natural maxillary sinus junction [8–11].

Studies of the structures of the ostiomeatal complex show numerous anatomical variations, which confirms Messerklinger's concept of chronic sinusitis pathogenesis, according to which the presence of narrow gaps and spaces formed between the anatomical structures included in the OMC, when an inflammatory process occurs, promotes the contact of swollen opposing mucosa areas, disruption of mucociliary transport and blockage of sinus arteries. This leads to the reduction and termination of their aeration, impaired secretion evacuation, decreased partial oxygen pressure in the sinus, development and transition of the inflammatory process to the chronic one [13]. In this regard, sanation of the paranasal sinuses is recommended for all patients with possible dysfunction of the natural axillary artery before the sinus floor elevation operation [4–10].

Thus, the problem of increasing the bone volume of the distal maxillary alveolar bone with maxillary sinus pathology remains relevant.

The aim of the study was to improve the surgical treatment of patients with tooth loss complicated by maxillary distal atrophy and limited inflammatory changes in the maxillary sinus floor by simultaneous sinus sanation and bone grafting to improve rehabilitation using dental implants.

Patients, materials and methods

The study was conducted at the clinical base of the State budgetary health care institution of Nizhny Novgorod Region Municipal Clinical Hospital № 39 (Nizhny Novgorod), Centre of dental and maxillofacial implantology of the Clinical Diagnostic Centre of the Federal State Autonomous Educational Institution of Higher Education «Peoples' Friendship University of Russia» (Moscow), The North-Caucasus Medical Training and Methodological Centre» Ltd. (Stavropol).

28 patients, including 18 women and 10 men aged 32 to 56 years, with tooth loss in the lateral maxilla and bone atrophy were enrolled in the study and were scheduled for SL surgery and dental implants.

The patients underwent a standard preoperative examination. A cone beam computed tomography (CBCT) of the upper jaw with the inclusion of an osteomeatal complex was performed. The examination revealed limited inflammatory changes in the mucosa of the maxillary sinus (MS) in the form of cysts and/or polyps; the patency of the natural MS artery (osteomeatal complex) was not compromised.

Chronic polyposis maxillary sinusitis, which occupies the lower third of the sinus volume was diagnosed in 16 patients, retention cysts of the mucous membrane of the lower wall of the maxillary sinus were found in 8 patients, foreign bodies (root apex migrated into the sinus cavity during tooth extraction; filling material taken out earlier during endodontic treatment of teeth) were found in 4 patients. The height of the alveolar process in the projection of the missing teeth was between 2 mm and 6 mm.

Delayed dental implantation is performed when the height of the alveolar bone is less than 3 mm. After sanation of the MS and subantral augmentation, the surgical wound is sutured. After 6 months, dental implants are placed in the reconstruction area and after another 7 months, prosthetics are fitted. Statistical data processing methods were applied to estimate the level of marginal bone resorption around the implant neck and to evaluate the results of volumetric reconstruction of the alveolar bone. The correlation of measurement results was determined using Pearson's correlation coefficient. Implementationhas been carried out in Python, SciPy library.

Results

All patients underwent surgery according to the proposed method: open sinus lifting surgery, sanation of the inferior maxillary sinus, and anthroplasty. At the initial height of more than 3 mm, sufficient for primary stabilisation of the implant, direct dental implantation was performed in 17 patients. Delayed implant placement was performed in 11 patients. There were no complications in the early postoperative and long-term period (follow-up period of 3 years). The average level of cervical resorption around the implants over 3 years was 0.5 mm (standard deviation 0.234, median 0.5, confidence interval: 0.030–0.522). No implant loss was observed.

Clinical case

Patient D., 45 years old, came to the CDMI RUDN University Clinical Diagnostic Centre of the Medical Centre (Moscow) with the diagnosis: partial tooth loss (K08.1), atrophy of the adentulous alveolar ridge (K08.2).

Examination of the oral cavity: teeth 2.5, 2.6, 2.7, 2.8 are missing; mucosa is without signs of inflammation in the area of the missing teeth. Distance from the alveolar ridge to the

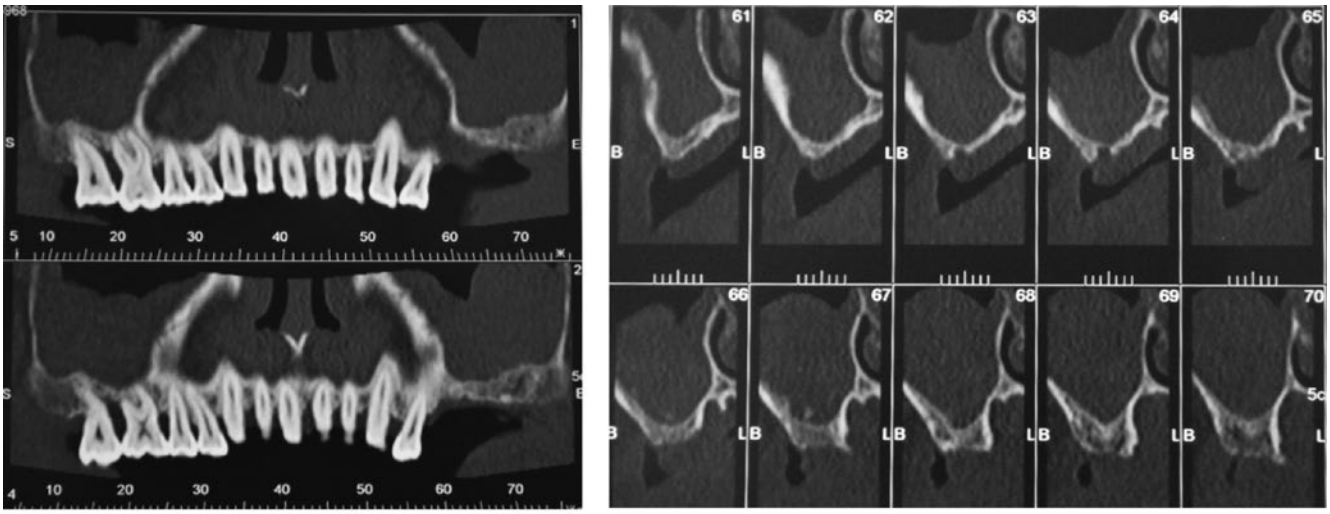

Fig. 17. CT scan of patient D., right and left maxillary alveolar process atrophy and polyp of the maxillary sinus are visualised.

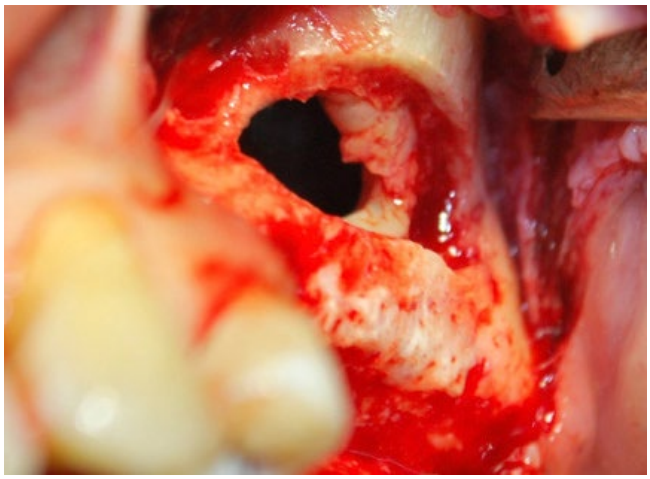

Fig. 24. Surgical step. A sinus lifting surgery was performed and a polyp was extracted through an incision in the MS mucosa. Visualisation of the mucosal defect with measures of 12 x 5 mm.

Fig. 25. External view of the polyp.

floor of the maxillary sinus in the area of missing teeth 2.5, 2.6 is not more than 2.5 mm. A preoperative CBCT scanning revealed a polyp in the region of the lower wall of the left sinus with measures of 18 x 24 mm.

The patient was proposed to correct the defect with dental implants. Informed consent to the operation was obtained. The patient underwent maxillary sinus resection and reconstruction of the maxillary alveolar process on the right side using a sinus lifting surgery and intercortical splitting, followed by delayed dental implantation using a two-stage protocol (Fig. 17–35).

A CT control scanning of the surgical procedure was performed. After 6 months, there were no complaints and

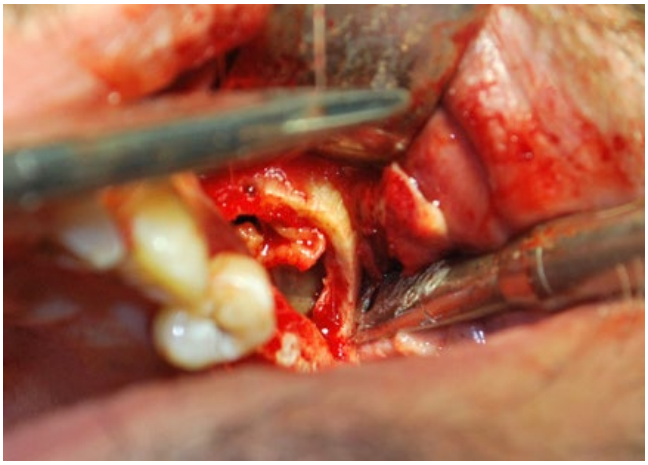

Fig. 26. The mucosa of the MS is mobilised and fixed with the nodular suture Vicryl 6–0 to the upper bone wall. The mucosal defect is closed.

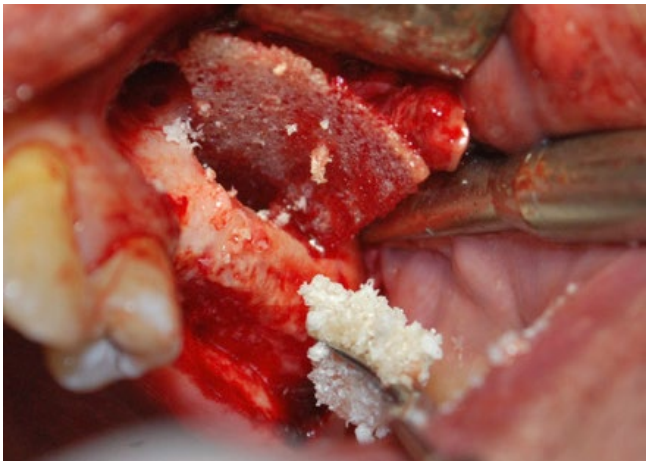

Fig. 27. The mucosa of the MS is additionally isolated with collagen membrane «Osteoplast».

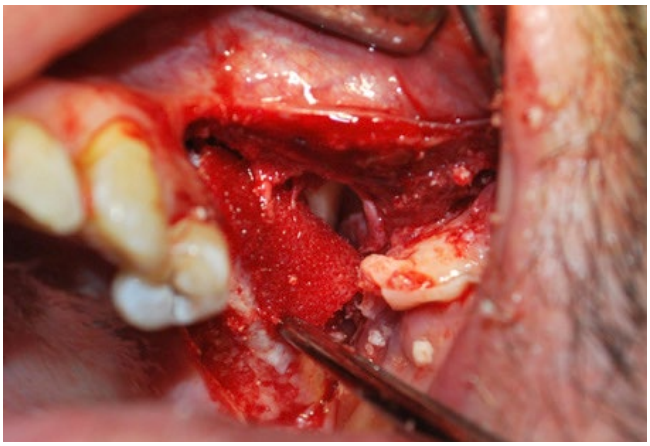

Fig. 28. «BioplastDent Deproteinised» osteoplastic material for filling the cavity in the area of the sinus floor.

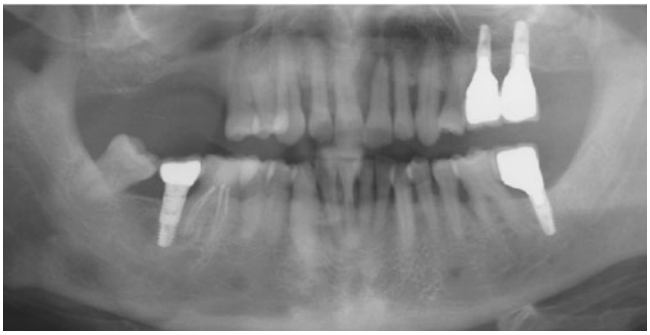

Fig. 34. One-year OPTG after prosthetics.

Fig. 35. 7-years OPTG after prosthetics.

nasal breathing was free. A CT scanning confirmed new bone formation in the area of the reconstruction: bone height 13.7 mm and width 7.1 mm.

Four «Friadent Xive» implants were placed in 6 months after surgery: in teeth areas 2.4 and 2.5 with diameter 3.8 mm and length 11.0 mm; in teeth areas 2.6 and 2.7 with diameter 4.5 mm and length 11.0 mm. Gingival shapers were placed 6 months after implantation and prosthodontic treatment commenced after another 1 month.

Thus, the developed method allows to carry out complex treatment of patients with tooth loss and atrophy of the distal alveolar process of the maxilla in chronic polyposis maxillary sinusitis. This increases the efficiency of bone grafting of the maxilla, prevents possible complications, reduces the treatment period, expands indications for dental implants and allows to achieve a complete dental rehabilitation with application of prosthodontic constructions fixed on dental implants.

The developed method is recommended for using in other diseases of the maxillary sinus, especially cysts and foreign bodies, such as tooth roots, filling material, brought into the sinus cavity.

Discussion

The presence of maxillary sinus wall polyps used to be a contraindication to sinus lifting surgery and required an additional step of sinus sanation, which increased the rehabilitation time of patients with tooth loss and extended the period of prosthesis on dental implants.

In this study, we presented the results of our study, which suggests that the proposed technique allows us to reduce the treatment time of patients with tooth loss in the distal parts of the upper jaw and cope not only with the elimination of bone volume deficit, but also to perform sanation of the lower sections of the maxillary sinus.

In the available literature there are different opinions on how to deal with this issue. The traditional approach involves the classical Claudoed-Luc surgery, which according to modern concepts is undesirable in terms of further open sinus lifts [6, 14].

An alternative approach to radical maxillary sinus surgery that reduces damage to the healthy sinus mucosa is revision of the maxillary sinus through the inferior nasal passage [13].

Maxillary microsinusotomy using a trocar has also been suggested to reduce the volume of the operation and the resulting defect of the sinus mucosa [15, 16].

Developments in endoscopic techniques have also made it possible to minimise trauma to the maxillary sinus during revision. Many papers have been written on the removal of cysts, polyps and foreign bodies using the endoscopic method [6, 13, 16, 17, 18, 19]. It should be noted that endoscopic surgeries are performed under the narcosis.

However, all these works describe methods of revision of the maxillary sinus, without increasing the height of the maxillary alveolar process. Therefore, our proposed method of bone grafting has the following advantages. Firstly, it makes possible to sanitise the lower sections of the maxillary sinus through a small incision of the maxillary sinus mucosa and then restore the integrity of the mucosa and perform anthroplasty. If the height of the alveolar bone is 3 mm and more, dental implants can also be inserted. The proposed method is performed as an outpatient procedure under balanced anaesthesia. The authors received a patent for the method of maxillary distal alveolar process plastic surgery in chronic polyposis maxillary sinusitis (RU 2714169) [21].

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