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RESEARCH ARTICLE

TUBERO-PTERYGOID IMPLANT AS MEANS OF REHABILITATION OF PATIENT WITH ADENTIA AND ATROPHY OF DISTAL MAXILLARY ASPECT.CASE REPORT

***Yan Vares and Yaryna Gudzan**

Department of Surgical Dentistry and Maxillofacial Surgery, The Danylo Halytsky Lviv National Medical University, Lviv, Ukraine

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ABSTRACT

Today, despite the application and constant improvement of various techniques such as sinus floor elevation, vertical and horizontal augmentation of the alveolar ridge, the use of zygoma and extra-short implants etc, the issue of functional and aesthetic rehabilitation of distal maxillary defects with dental implants persists. Unsatisfactory quantitative and qualitative parameters of bone tissue in this anatomical site considerably complicate, and at times even make it impossible to install dental implants. Moreover, they often require additional surgical interventions aimed at increasing the volume of bone tissue, significantly extending the terms of the final prosthesis. The progressive method of rehabilitation of patients with dental loss in distal upper jaw is the use of the technique of so-called tubero-pterygoid implantation proposed by J.F. Tulasne in 1985, the main feature of which is placement of dental implants in cortical areas of the pterygoid process of the sphenoid bone and the pyramidal process of the palatine bone. Given study presents a clinical case of successful rehabilitation of a patient with acquired adentia and atrophy of the distal upper jaw with tubero-pterygoid implant. The study identifies the main factors that may complicate implantation in distal maxillary aspects and looks at the advantages and disadvantages of tubero-pterygoid implants by comparison with traditional crestal implants.

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INTRODUCTION

It is a well-known fact that distal upper jaw is one of the most difficult locations for placement of dental implants, due to the topographic proximity of important anatomical structures, in particular, maxillary sinus, as well as low density of bone tissue, which requires a number of additional surgical interventions aimed at improving quantitative and qualitative parameters of osseous tissue in the specified segments (Vares *et al*, 2015). The most common pre-implantation interventions used for the above purpose are horizontal or vertical augmentation of the alveolar ridge and sinus lift (Summers, 1994; Szabo *et al*, 2001). According to the experts (Silva *et al*, 2016), the 5-year survival rate of dental implants after elevation of the maxillary sinus floor constitutes 96-99%, however this method significantly increases the cost of treatment and extends the period of patient's rehabilitation. An alternative method for placement of dental implants in distal upper jaw is the use of cortical skeletal structures located behind the maxillary tuberosity.

****Corresponding author:*** **Yan Vares,**
Department of Surgical Dentistry and Maxillofacial Surgery, The Danylo Halytsky Lviv National Medical University, Lviv, Ukraine.

This technique does not require any pre-implantation preparations, bone tissue augmentation or elevation of the maxillary sinus floor, since the tubero-pterygoid implants are placed in dense cortical areas of the pterygoid process of the sphenoid bone and the pyramidal process of the palatine bone (Scortecci, 1999;Rodriguez *et al*, 2008;Ihde, 2009; Shan *et al*, 2013). Moreover, involvement of the aforementioned anatomical sites provides excellent initial stability of implants, therefore allows them to be loaded with temporary or permanent prosthetic structures almost immediately after implantation.

CLINICAL CASE

Patient P., born in 1970, was admitted to the Department of Maxillofacial Surgery and Surgical Dentistry at the Lviv Regional Clinical Hospital on December 14, 2017 with complaints of pain in the area of tooth 24, partial adentia on the upper jaw on the left side, difficulty in eating and aesthetic problem. According to the anamnesis, there was a gradual loss of teeth. Objectively, in the area of the upper jaw on the left side - a metal-ceramic bridge supported by 23 and 24 teeth and a 25-tooth cantilever.

The bridge prosthesis was made 8 years before the case, its current fixation was found unsatisfactory. Cone-beam computed tomography of the maxilla revealed some periapical changes in the projection of the root of tooth 24, the defect of the maxillary dentition in the form of the absence of 25,26,27,28 teeth (Fig. 1). The height of the alveolar ridge bone tissue in the projection of the indicated teeth was 4,2,2 and 5 mm respectively. For the purpose of prosthetic rehabilitation, we recommended the following: extraction of tooth 24, sinus floor elevation on the left side, followed by (after 8-10 months) installation of 3 two-stage cylindrical dental implants in the area of missing 25.26,27 teeth; after 6-8 months: installation of implant-supported metal-ceramic bridge prosthesis. As an alternative treatment plan, it was proposed to remove tooth 24, to install 3 cortical (strategic) implants, namely, 2 compression screw implants anteriorly to the maxillary sinus in the projection of teeth 24,25 and a tubero-pterygoid implant as a distal support posteriorly to the maxillary sinus. In this case a sinus floor elevation was not required and implants could be immediately loaded with temporary metal-acrylic bridge prosthesis. Considering the possibility of immediate restoration of functional and aesthetic status under the conditions of use of cortical implants, the patient preferred the latter.

According to the principles of bioethics, the patient was informed about the advantages and disadvantages of the method, access and course of the operation, the feasibility of preoperative preparation and local anesthesia, and signed a written consent for surgical treatment. On 16.12.2017 under local anesthesia, with pre-medication, extraction of the root of tooth 24 was performed. Implants were placed in the maxilla on the left side, in the area of missing 23,24,27 teeth (Figure 2). As a distal support, a tubero-pterygoid implant TPG® (Ihde Dental AG, Switzerland) with a diameter of 4.1 mm and a length of 19 mm was used. In front of the maxillary sinus an implant TPG® (Ihde Dental AG, Switzerland) with a diameter of 4.1 mm and a length of 8 mm in the projection of the missing tooth 25 and a compression screw implant KOS® X (Ihde Dental AG, Switzerland) with a diameter of 3.7 and a length of 15 mm were installed. Immobilization of the mucoperiosteal flap and wound suturing with Glycolon® 4.0 (Resorba, Germany) were performed. After suturing the wound, the transfers were used for transfer molding; the silicone mass Speedex (Coltene, Switzerland) was used for impressions/working cast to make a temporary metal-acrylic bridge. In the postoperative period, the patient was administered an antibacterial (Dalacin C 300 mg 3 times a day for 3 days), anti-edema (Dexamethasone 4 mg 2 times daily for 2 days) and analgesic (Dexalgin 0.25 mg if needed) therapy and oral rinsing with chlorhexidine solution.

RESULTS

In the early postoperative period, complications were not detected. There was a slight swelling and hyperemia of the mucous membrane in the vicinity of the surgical wound the day after implantation. Given the volume of surgery, the patient consumed soft and liquid meals within 3 days after the operation, in order to prevent functional loading of the upper jaw and postoperative wound. Five days after the operation, the sutures were removed and a temporary metal-acrylic bridge prosthesis with combined fixation - a screw on the TPG® implants and a cement on the KOS® X implant (Figure 3) - was installed.

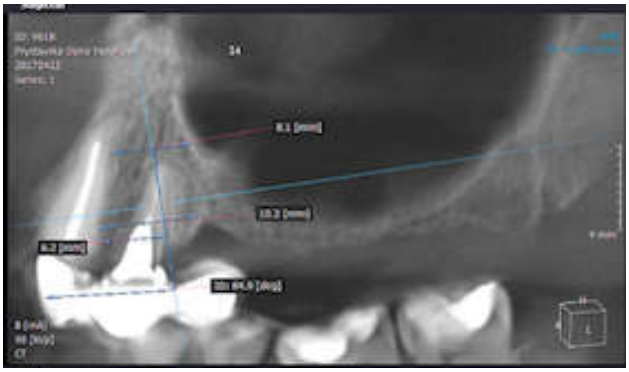

Fig. 1. CT image, patient P., 1970. Diagnosis: "Periodontitis 24. Partial adenia of the distal upper jaw on the left side"

Fig.2. Intraoral image of the patient P. Tooth 24 extraction. Installation of cortical implants in the projection of teeth 24,25,28

Fig. 3. Intraoral image. Installation of the temporary metal-acrylic cement-and-screw retained bridge, implant-supported, 5 days after the surgery

Fig. 4 Orthopantomogram image, 8 months after surgery. Bicortical fixation of 3 implants No maxillary sinus complications

Fig. 5. Intraoral image. Cement-and-screw retained permanent metal-ceramic bridge, implant-supported

Follow up examinations were conducted in the period of 1,3 and 6 months after the surgery. Control X-ray 8 months after the surgery confirmed successful osteointegration of all 3 implants, complications from the upper maxillary sinus on the left side were not detected (Fig. 4). The temporary metal-acrylic bridge prosthesis was removed, silicone mass of Speedex (Coltene, Switzerland) was used to obtain impressions. Following this, a permanent metal-ceramic bridge prosthesis was installed with support on screws and cement Fuji® Plus (GC, Japan) (Fig. 5). The patient was advised on hygiene care and at-home maintenance of implant-supported prosthesis.

DISCUSSION

The issue of optimizing the restoration of distal maxillary defects has been a cause of concern for dental implantologists over the course of many decades. While the efforts of some researchers aimed at developing various methods for increasing the volume of bone tissue by sinus floor elevation, bone augmentation or transplantation (Kahnberg *et al*, 1999; Stella *et al*, 2000; Szabo *et al*, 2001; Raviv *et al*, 2010; Silva *et al*, 2016), other scholars were advocates of the existing potential of bone tissue, in particular its cortical elements. The presence of cortical and resorption resistant pterygoid process of the sphenoid bone and pyramidal process of the palatine bone which articulate with the maxillary tuberosity, and the possibility of their use as sites for dental implants have long attracted implantologists (Khayat *et al*, 1994; Balshi *et al*, 2006; Peñarrocha *et al*, 2009; Ridell *et al*, 2009). So, back in 1972, L. Linkow proposed to exploit a pterygoid process of the sphenoid bone for additional support of sub-periosteal implants of his own design(Linkow, 1972). In 1985, J.F. Tulasne first installed a screw implant in the vicinity of maxillary tuberosity with perforation of its posterior wall and fixation of the apical part of the implant in the cortical bone of the pterygoid process, thus achieving excellent primary stability. Subsequently, the original author's technique was described in a number of publications (Tulasne, 1989,1992), and such terms as "tubero-pterygoid aspect" and "tubero-pterygoid implant" have become widely used in professional literature.

Despite the rather complicated technique for installation of tubero-pterygoid implants associated with the anatomical and topographic proximity of important anatomical formations (maxillary artery, palatal artery and nerve, pterygoid venous plexus, maxillary sinus, etc.), this idea has gained wide popularity, as evidenced in particular, by a large number of published clinical trials that demonstrate extremely high rates of 5 and 10-year implant survival (Valeron *et al*, 2007; Rodríguez *et al*, 2012; Marcelat, 2014). In order to minimize the potential risks of damage to adjacent anatomical structures, such auxiliary tools as computer visualization, planning and navigation technology aimed at facilitating the installation of tubero-pterygoid implants have been commonly implemented into practice in recent years (Balshi *et al*, 2006; Grecchi *et al*, 2013). Among the main advantages of tubero-pterygoid implants, there is not only no need for additional pre-implantation interventions aimed at improving the quantitative parameters of bone tissue of distal maxillary aspects, but, above all, the possibility of their immediate loading due to the excellent primary stability which is achieved with fixation of implants in cortical bone of the pterygoid process of the sphenoid bone and the pyramidal process of the palatine bone (Valeron *et al*, 2007; Ihde S, 2009; Anandakrishna *et al*, 2012).

Conclusion

As demonstrated by our clinical case and the results of the publications cited above, tubero-pterygoid implants may become a serious alternative to traditional crestal implants with their numerous additional surgical pre-implantation procedures and have a high (up to 95.0% over 10 years) survival rate. Installation of tubero-pterygoid implants does not require general anesthesia, maintains the integrity of the sinus, ensures not only the aesthetic but also the functional completeness of treatment, significantly improving the quality of patient's life.

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