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Retrospective Analysis of 20 Cases of Atrophic Jaws Treated with Extra-Sinus Zygomatic Implants and Conventional Implants - Control 3 to 6 Years

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1. Abstract

Zygomatic implants are an excellent alternative for the rehabilitation of atrophic maxilla, but many cases have limitations in relation to the prosthetic positioning of the fixation. The extra-sinus technique allows better placement of these implants and consequently lower prosthetic compensation. Twenty consecutive cases of patients treated with two zygomatic implants and at least two previous conventional implants were evaluated. The survival of the conventional and zygomatic implants and the surgical and prosthetic complications were observed over the course of at least 22 months. Forty zygomatic implants and 42 conventional implants were installed. Two zygomatic implants and two conventional implants were lost, resulting in survival rates of 95.00% and 95.23% for the zygomatic and conventional implants, respectively. The prosthetic complications encountered were the loss of screw torque and infection caused by leakage of moulding material into the incision. The implant survival rate and reported prosthetic complications were similar to those of intra-sinus techniques though but were not observed sinus complications.

2. Introduction

Treatment of atrophic maxilla is one of the greatest challenges in implantology. Edentulism causes a reduction in masticatory function and facial changes [1, 2] that limit social interactions, decrease the patient's self-esteem and possibly lead to depression [3, 4]. For this reason, functional restoration alone often cannot be considered representative of treatment success [5].

Most edentulous patients experience severe atrophies that prevent the installation of implants using conventional techniques [6]. One of the main forms of treatment of these atrophies is the use of large bone grafts from extraoral donor sites [7-13]. Although they have proven successful, these treatments involve longer treatment times, high morbidity and impaired functions during the graft ossification and implant osseointegration period [12, 14].

Zygomatic implants are an excellent alternative for the treatment of these severe maxillary atrophies [4, 5, 15-18]. Initially, the technique was performed with fixations that crossed the maxillary sinus [19] and were inserted apically into the zygomatic bone. However, this position increased sinus complications and caused prosthetic emergence in the most palatal position and relative to the alveolar ridge, thereby increasing prosthetic compensation [5, 20, 21]. Despite its short evaluation period, the technique involving the installation of extra-sinus zygomatic implants has produced high success rates regardless of whether it is associated with conventional implants [5, 20, 21].

The objective of this study is to present a series of 20 cases of atrophic maxilla treated with zygomatic implants. The zygomatic implants were installed using the extra-sinus technique associated with conventional implants subjected to immediate loading. Monitoring was performed over a period of 22 to 59 months of use.

3. Methodology

3.1. Study design

This retrospective study was conducted at two postgraduate implantology centres from November 2006 to April 2010 (Ethics Committee for UNOESC, Brasil authorization no. 071/2008). The study included 20 consecutive patients

aged between 51 and 72 years (mean 55.55 years). The patients included 10 males and 10 females.

The study included totally edentulous patients and patients with remaining teeth for whom maxillary tooth extraction was indicated and where insertion of at least four conventional implants to perform the all-on-4 technique was impossible but installation of at least two conventional fixations at least 10 mm in length was possible in the anterior region of the jaw. Patients with systemic contraindications, those who did not accept the proposed procedure and those who did not exhibit primary stability of the conventional or zygomatic implants of at least 30 Ncm were excluded.

The patients underwent cone beam computed tomography and prosthetic rehabilitation planning with mounting on a semi-adjustable articulator.

3.2. Surgical and prosthetic technique

The surgeries were performed under general anaesthesia or under local anaesthesia using 4% articaine with 1:100,000 epinephrine (DFL, Rio de Janeiro, Brazil) with intravenous sedation depending on the patient's choice. A total of 1 g of cephalexin and 10 mg of dexamethasone were introduced intravenously. Initially, the conventional fixations were installed in the anterior maxilla, and later, the zygomatic implants were installed in the posterior maxilla (Conexão Sistema de Prótese, Arujá, São Paulo, Brazil) . Straight micro-unit abutments or those with 17° of angulation were installed in the conventional implants. Zygomax internal hexagon system micro-unit abutments were installed in the zygomatic implants (Conexão Sistema de Prótese, Arujá, São Paulo, Brazil). All abutments were subjected to a torque of 20 Ncm with a specific prosthetic torque wrench.

Sutures were made with 5-0 Vicryl thread (Ethicon), and mouldings were made with a multifunctional guide and added silicone (3M-Express). All patients were rehabilitated with screwed dento-gingival prostheses supported by a laboratory-cast infrastructure and acrylic teeth. After the infrastructure and teeth aesthetics were tested, the prostheses were installed with at most three days after surgery. Occlusal adjustment was performed on the day of installation and after four, seven and 10 days.

3.3. Clinical Evaluation

Patients were evaluated after 30, 60 and 120 days and six and 12 months. At the six and 12 month consultations, the prostheses were removed, the component and prosthetic screw torques were checked and panoramic radiographs were taken. Controls were performed every six months by clinical examination with removal of the prosthesis, torque control on the abutments and panoramic radiographs.

4. Results

Of the 20 patients treated using the extra-sinus-installed zygomatic implant technique, 18 were treated with two conventional anterior implants and two with three conventional implants. Six had antagonist occlusion with natural teeth and removable partial dentures, five had natural teeth only, six had natural teeth and posterior prostheses on the implants, and three had dental-gingival implants with acrylic teeth (Table 1).

Only four patients were smokers, and no surgical or prosthetic complications were observed in any of these cases.

Two conventional implants failed, resulting in a 95.23% implant survival success rate (Table 2). Two of the 40 zygomatic implants also failed, resulting in a cumulative success rate of 95% (Table 3) (Figure 1, 2).

One of the zygomatic implants exceeded the zygomatic bone limit; therefore, it was possible to feel the apex by digital pressure. The patient had no complaints, and for this reason, no intervention was performed.

The prosthetic complications were minor in nature (Table 1). In case 02, the patient had painful sensitivity on the fifth day after surgery; during exploratory surgery, remaining moulding material was found and removed. In case 03, the prosthesis was moving slightly in the right posterior region at the 30-day control. After removal of the prosthesis, we observed that the intermediate abutment had lost torque. Torque of 20 Ncm was reapplied to the abutment screw, and the prosthesis was once again installed with no recurrent loss of stability. In case 16, the patient had intense pain that started two days before the instalment of the prosthesis. During the consultation, we observed that the prosthesis was loose and that the patient had not attended the previous two controls. After removal of the prosthesis, severe abrasions were observed in the alveolar ridge mucosa (Figures 3, 4). The prosthetic abutments were subjected to 20 Ncm torque, thereby ensuring the integrity of osseointegration of the four implants. The prosthesis was reinstalled, and after 10 days, the mucosa was completely healed.

Figure 1: Immediate postoperative radiograph of the case 1. Observe the normal anatomic structures and the good positioning of the implants.

Figure 2: Radiographic control case 1 after installing another zygomatic implant and other conventional implant to repair the failure of conventional implants.

Figure 3: Clinical control of the case 16 after 34 months of function. Observe mucosal healing after abrasion that was located in the alveolar ridge between the left of the implants.

Figure 4: Radiographic control of the case 16 after 34 months of function. Observe the normal anatomical structures and the maintenance of peri-implant bone.

Table 1: Description of the 20 cases to patient data, installed implants, occlusion of antagonist arch, complications and time control.

Case	age/Sex	Antagonistic arch	Implants					Surgery complications	Prosthetic complications	Control
			Z1	C1	C3	C2	Z2			
1	59/F	Natural teeth + posterior PPR	40 × 4,0	10 × 4,0	–	10 × 4,0	45 × 4,0	failure of two conventional implants	No	72 months
2	53/F	Natural teeth + posterior PPR	42,5 × 4,0	10 × 4,0	–	10 × 4,0	40 × 4,0	No	infection caused by debris molding material	72 months
3	52/M	Natural teeth	42,5 × 4,0	11,5 × 3,75	–	11,5 × 3,75	40 × 4,0	No	less component of the torque	72 months
4	55/F	Natural teeth + ceramics upon posterior implants	47,5 × 4,0	11,5 × 3,75	–	11,5 × 3,75	45 × 4,0	Bone implant out of the face	No	69 months
5	49/F	Natural teeth + ceramics upon posterior implants	40 × 4,0	11,5 × 3,75	–	11,5 × 3,75	42,5 × 4,0	No	No	66 months
6	58/M	Natural teeth + ceramics upon posterior implants	42,5 × 4,0	10 × 4,3	–	11,5 × 4,3	40 × 4,0	No	No	58 months
7	71/F	Natural teeth + acrilic upon posterior implants	45 × 4,0	11,5 × 4,3	–	11,5 × 4,3	42,5 × 4,0	No	No	54 months
8	53/M	Acrylic protocol	45 × 4,0	13 × 4,3	–	13 × 4,3	45 × 4,0	No	No	54 months
9	59/M	Natural teeth + posterior PPR	45 × 4,0	10 × 4,3	–	10 × 4,3	40 × 4,0	No	No	53 months
10	51/M	Natural teeth	45 × 4,0	13 × 4,3	–	13 × 4,3	42,5 × 4,0	No	No	53 months
11	67/M	Natural teeth + posterior PPR	40 × 4,0	11,5 × 4,3	–	11,5 × 4,3	42,5 × 4,0	failure of a zygomatic implant	No	50 months
12	61/F	Natural teeth + ceramics upon posterior implants	40 × 4,0	10 × 4,3	–	11,5 × 4,3	42,5 × 4,0	No	No	50 months
13	68/M	Acrylic protocol	45 × 4,0	10 × 4,3	–	11,5 × 4,3	42,5 × 4,0	No	No	50 months
14	58/F	Natural teeth	40 × 4,0	10 × 4,3	–	10 × 4,3	40 × 4,0	failure of a zygomatic implant	No	49 months
15	54/F	Natural teeth	42,5 × 4,0	11,5 × 4,3	–	11,5 × 4,3	35 × 4,0	No	No	49 months
16	55/F	Natural teeth + posterior PPR	40 × 4,0	11,5 × 4,3	–	13 × 4,3	45 × 4,0	No	mucosal abrasion	48 months
17	72/M	Natural teeth	45 × 4,0	11,5 × 4,3	13 × 4,3	13 × 4,3	47,5 × 4,0	No	No	44 months
18	61/M	Acrylic protocol	40 × 4,0	11,5 × 4,3	11,5 × 4,3	13 × 4,3	45 × 4,0	No	No	43 months
19	58/M	Natural teeth + posterior PPR	42,5 × 4,0	11,5 × 4,3	–	10 × 4,3	40 × 4,0	No	No	37 months
20	58/F	Natural teeth + ceramics upon posterior implants	42,5 × 4,0	11,5 × 4,3	–	11,5 × 4,3	42,5 × 4,0	No	No	36 months

Table 2: zygomatic implants installed in 20 cases as size and survival rate

Implant	Number	(Failed/(survival rate
4,0 × 35,0	1	0
4,0 × 40,0	11	0
4,0 × 42,5	13	(92.30%)1
4,0 × 45,0	12	0
4,0 × 47,5	3	(66.66%)1
total	40	(95.00%)2

Table 3: conventional implants installed as size and success rate

Implant	Number	(Failed/(survival rate
3,75 × 11,5	6	0
4,0 × 10,0	4	(50%)2
4,3 × 10,0	8	0
4,3 × 11,5	16	0
4,3 × 13,0	8	0
total	42	(95.23%)2

5. Discussion

The use of zygomatic implants is an excellent alternative for the treatment of atrophic maxilla [4, 5, 15-21]. Despite the excellent results of bone grafts for this treatment, zygomatic implants have the advantage of the possibility of immediate loading, a shorter treatment time and especially lower morbidity [5, 18, 20, 21].

Several studies have shown success rates exceeding 95% with the use of zygomatic implants and have demonstrated that patients exhibit high levels of satisfaction with this treatment [4, 5, 15-21].

The modification of positioning of the fixation outside of the maxillary sinus decreases the risk of sinus complications and improves the emergence positioning of the implant platform, thereby decreasing prosthetic compensation [5, 20, 21]. In this study, the success rate of implants installed using the extra-sinus technique was 95%. Only two of the 40 implants installed were lost. These data are similar to those of studies using the extra-sinus technique.

Of the implants lost, in one case, the zygomatic implant showed initial stability of slightly over 30 Ncm, and the zygomatic bone had only a small area for insertion of the fixation. During the three and six month controls, the patient experienced sensitivity during checking of the component torque in this implant; eight months after installation, the patient returned to the clinic with the prosthesis moving. While attempting to re- establish the torque of the right zygomatic implant abutment, we observed that it was loose, and therefore, the implant was removed. Maxillary sinus lifting was performed with installation of a conventional implant, and a new prosthesis was made.

In the other case of failure, the patient did not experience painful symptoms or movement of the prosthesis. At the 18-month control, the implant showed movement while checking the abutment torque and was removed and replaced with a short implant installed in the posterior maxilla. After osseointegration of this implant, a new prosthesis was made. Correct positioning of the conventional implants in the anterior region is essential for the appropriate distribution of load on the working prosthesis [22]. Two of the 42 implants evaluated in this study were lost, resulting in a cumulative rate of 95.23% survival. The two implants failed in the same patient 30 days after installation. The cause of this failure may be related to the patient's diet being incorrect based on information from the family. This case was retreated with an anterior conventional implant and a zygomatic implant posterior to that installed during the first surgery. Although some studies have reported that smoking is a contraindication [5, 17, 21] [15, 17, 26] to the installation of conventional and zygomatic implants, none of the smokers experienced surgical or prosthetic complications. The prosthetic complications were of lesser magnitude and did not require changes to the initial treatment plan. The use of fewer fluid moulding materials decreased the risk of material leakage into the flap. After the change in viscosity, this occurrence was not observed in any case. During the controls, few components showed significant torque loss, which may explain the increase in the control interval from six months to 12 months.

Three of the 20 cases had major complications requiring treatment changes, and four other cases had minor complications that did not involve risk in terms of the treatment performed.

6. Conclusion

Despite the study limitations, the results observed in this work and in the literature lead us to believe that the use of zygomatic implants is a predictable technique with a high success rate in longitudinal controls. Was also concluded that the implant survival rate and reported prosthetic complications were similar to those of intra-sinus techniques though but were not observed sinus complications.

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