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## EVALUATION OF ZYGOMATIC IMPLANTS THAT HAD BEEN INSTALLED FOR PERIODS RANGING BETWEEN 7 AND 12 YEARS: A STUDY WITH HUMAN BEINGS

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### ABSTRACT

The atrophic maxilla has characteristics, that can make it difficult to perform rehabilitation with osseointegrated implants. One of the ways to rehabilitate this patient is placement of zygomatic implants in the posterior region of the maxilla, which would support a total prosthesis. Although this technique has been used since the 1990s, the literature has shown few data on the preservation of these implants. The objective of this study was to conduct a study of the preservation of zygomatic implants installed in the period between 2006 and 2012. For this purpose, 13 patients, with 25 zygomatic implants were evaluated by means of a questionnaire, clinical and image examinations (panoramic radiography). The results of this research showed that 28% of zygomatic implants were lost. Implants that were not lost, continue to function and have no mobility. After clinical evaluation of the zygomatic implants, plaque was observed. The levels of gingival inflammation were mild, probing depth revealed shallow grooves in 08 patients, with no gingival recession. In the assessment of panoramic radiographs, absence of bone lesions was observed. The present study could be concluded that: zygomatic implants had lower success rates than those described in the literature, with a considerable loss of implants.

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## INTRODUCTION

Zygomatic implants emerged as a treatment for atrophic maxillae, in which it was not possible to install conventional implants due to lack of bone in the posterior region of the maxilla. Subsequently, this procedure was presented as an alternative to bone grafting because it was a less traumatic technique and allowed for shortening the treatment time (Saad, 2005; Wang, et al., 2018). This is not a recent technique as these implants have been used effectively since the 1990's (Esposito, 2013). Literature contains a wide variety of studies related to zygomatic implants (Bedrossian, et al., 2002; Malevez et al., 2004; Ahlgren et al., 2006; Appearance, et al., 2006; Candelmarti, et al., 2012; Chrcanovic, et al., 2016), but few of these studies have reported the problems related to the use of this technique (Tuminelli, et al., 2017; Chvartszaid, 2018). Some of the technical issues were reported by (Tuminelli, et al., 2017), such as inflammation of the soft tissue around the implant and abutment, and difficulty with cleaning. Whereas other authors (Bedrossian and Bedrossian, 2018), have reported that problems could occur during surgery or after zygomatic implant installation surgery, such as orbital involvement; intracranial penetration; infraorbital nerve paresthesia; subperiosteal infection; apex of the implant extends beyond the perforation of the zygomaticus; vestibular dehiscence; failure and

fracture of the zygomatic implant; and maxillary sinus infection. Despite being a technique used for over 30 years (Esposito, 2013), the question about how these implants behave in the long term after their activation still remains. There is also uncertainty about whether (implant supported) dental prostheses installed over these implants cause patient satisfaction. In view of the fact that the reports found in the literature contain insufficient data to guide dentists relative to what to expect in terms of complications arising in the zygomatic implant technique, we decided to study the preservation of these implants after a minimum period of 7 years after installation, with the objective of evaluating the periodontal situation of these zygomatic implants; if there was loss of these implants; if there was oroantral communication, and the degree of patient satisfaction.

## MATERIAL AND METHODS

This study was submitted to the Research Ethics Committee of the University of Santo Amaro (UNISA) and approved under the CEP number: 2,951,705. Data were collected from 13 patients (8 women and 5 men aged between 57 and 87 years) who were operated on in Recife (PE) and Maceió (AL), by the same team of dentists, and who were submitted to the zygomatic implant technique with immediate

loading, in the period from 2006 to 2012. In these patients, zygomatic implants (1 right and/or 1 left) were installed, associated with implants in the canine-to-canine region. Twelve patients received bilateral zygomatic implants and 1 patient received a zygomatic implant on the right side, totaling 25 zygomatic implants. As regards implants placed in the premaxilla, 12 patients received 3 implants and 1 patient received 4 implants, totaling 40 conventional implants. The methodology was limited to the analysis of 25 zygomatic implants. In all surgical procedures, the prostheses were installed 2-3 days after implantation. Relative to the antagonist arch, in 7 patients this was composed of teeth and implants, 5 patients by using the mandibular protocol and 1 patient with teeth and removable partial dentures. Prior to placement of the implants, all patients underwent panoramic radiography and computed tomography exams, as well as a prototype, in which all the surgical planning was carried out, including the installation of replicas of the zygomatic /implants?. The surgical technique used was the simplified Stella technique, in which a sinus cleft is made, which is closed by the zygomatic implant itself after its installation (Stella and Warner, 2000). The dentures were removed in a period lasting from 7 to 13 years after installation, and the following parameters were observed during this removal: implant loss, buccal sinus communication and data related to oral hygiene, gingival inflammatory state, and periodontal supportive condition. For the clinical evaluation, three methods were used, such as the visible plaque index of (Silness and L e, 1964), the gingival index of (L e and Silness, 1963) and periodontal probing, in which the sulcus depth was analyzed. In the visible plaque index, each implant was clinically divided into four sides: buccal, palatal, mesial and distal, with a score ranging from 0 to 3. The absence of plaque deposits in the cervical region received a score of 0; the visualization of plaque by means of its removal with the modified Williams periodontal probe (Neumar Instruments Cir urgicos Ltda., Caieiras/SP) when sliding it along the gingival margin, was recorded as, 1; plaque clinically visible to the naked eye; due to the presence of a thin and moderate layer of plaque in the gingival region, recorded as 2; and abundant plaque, with heavy accumulation of soft matter, whose thickness filled the niche produced by the gingival margin and implant surface, recorded as 3. These scores were added and divided according to the number of implants and surfaces evaluated (Migliato, *et al.*, 2008).

(severe inflammation - marked redness and hypertrophy; spontaneous bleeding; and tendency to ulcerate). Bleeding on probe was considered to be present if it was positive within 20 seconds after passage of the probe. Relative to the detection of the plaque index, the gingival index was obtained by means of an average, where the implant was clinically divided into four surfaces, with the scores on each surface being added and further divided according to the number of zygomatic and implantsurfaces to be analyzed (Migliato, *et al.*, 2008). The depth of the sulcus was also investigated by means of probing, which was performed with the aid of a modified Williams periodontal probe (Neumar Instruments Cir urgicos Ltda., Caieiras/SP), in six sites located around each zygomatic implant: distobuccal, vestibular, mesiobuccal, distopalatal, palatal, and mesiopalatal, rather than the four areas that were used in the other indices (mesial, distal, vestibular, and palatal). Thus, no implant/periodontal surface area went unnoticed during the examination. From the values obtained by probing each patient, their mean sulcus depth was calculated. This value, together with the data collected by means of the other exams, allowed the examiner to describe whether the individual was in a condition of peri-implant health. Probing depths were further categorized into shallow (1 to 2 mm probing), moderate (3 to 4 mm) and deep (> 5 mm) pocket depths. After clinical management, the patients were referred for panoramic radiography to evaluate the zygomatic implants and related anatomical structures. The present study was observational, with a convenience sampling power, in which 13 patients were evaluated, therefore, descriptive statistical analysis was performed, showing the percentages of lost and functioning implants, as well as the mean and standard deviation of the parameters analyzed. In radiographic examinations, only qualitative analyses were performed.

## RESULTS

The follow-up time of patients ranged between 7 and 13 years, according to table I. The total number of implants was 25 implants in 13 patients. Among the 25 implants installed, 7 were lost (28%), and 3 patients lost the implants bilaterally, and 1 patient lost an implant on only one side.

**Table 1. Number of Patients, number of implants in function and lost, divided by year of surgery**

N�o of patients	Follow-up time (years)	Total Implants	In function (number of implants)	Lost (No. of implants)	year of surgery
two	13	4	two	two	2006
3	12	6	4	two	2007
two	11	3	3	0	2008
3	9	6	6	0	2010
3	7	6	3	3	2012

**Table 2. Answers of patients who had implants in the mouth (total of 10 patients)**

Answers	Yes	No
Prosthesis in function	10	0
Eating well	10	0
Some pain	0	10
Mobility	0	10
Bad taste	0	10
Bruxism	3	7
Patch use	3	7

**Table 3. Mean and standard deviation (SD) of visible plaque index, gingival index and pocket depth**

Visible license plate index		Gingival Index		Pocket Depth (mm)	
Average	DP	Average	DP	Average	DP
0.69	0.60	1.10	0.36	2.37	0.71

For the analysis of the gingival index, a modified Williams periodontal probe (Neumar Instruments Cir urgicos Ltda., Caieiras/SP) was used in the gingival margin. Inflammatory signs were collected using the following scores: 0 (absence of gingival inflammation); 1 (mild inflammation - small change in color, texture, no bleeding on probing); 2 (moderate inflammation - moderate brightness, redness, edema, and hypertrophy; bleeding on probing); 3

In the patient who lost 1 zygomatic implant, it was replaced by an inclined implant and a new prosthesis was made. In cases of failure, no patient had systemic alteration or oroantral communication. The 10 patients who had implants in the mouth, answered the questionnaire and were clinically evaluated. Table II shows a summary of the patients' responses to the questionnaire. All patients reported that they were chewing normally, without any pain, mobility

or unpleasant taste. Among the 3 patients who had bruxism, one did not use a myorelaxant patch. Table III presents the mean and the standard deviation of the visible plaque index, gingival index and groove depth measured, of the 18 implants evaluated. Among the patients, 8 had shallow pockets and only 2 had moderate pockets. Panoramic radiographs, taken after clinical examination, demonstrated the absence of bone lesions, demonstrating only the presence of zygomatic and conventional implants without any type of abnormality.

## DISCUSSION

The present study observed the behavior of zygomatic implants in patients who were submitted to this technique in the period between 2006 and 2012, reported their current status, with data obtained by application of a questionnaire, followed by clinical and radiographic examination. The literature consists of a wide variety of studies related to zygomatic implants, but few of these articles report the problems related to the use of the technique (Tuminelli, *et al.*, 2017). In our retrospective clinical study, convenience sampling was performed, and 25 zygomatic implants in 13 patients were evaluated. Patients were evaluated in a period ranging from 7 to 13 years after surgery, with a success rate of 72% (Bedrossian, *et al.* 2002), conducted a clinical study with a similar design, in which zygomatic implants were used in conjunction with conventional premaxillary implants for reconstruction of the resorbed edentulous maxilla. A total of 44 zygomatic implants were evaluated in 22 patients, and a success rate of 100 % was obtained. A possible justification for the rate found may have been the follow-up period, which was 34 months. If it had been a longer period this rate would perhaps have been lower. The literature shows different success rates, ranging from 76% to 100% (Jensen, *et al.*, 1998; Bedrossian, *et al.*, 2002; Hirsch, *et al.*, 2004; Malevez, *et al.*, 2004; Ahlgren, *et al.*, 2006; Aparicio, *et al.*, 2006; Bedrossian, *et al.*, 2006; Duarte, *et al.*, 2007; Urgell, *et al.*, 2008; Bedrossian, 2010; N6ia, *et al.*, 2010; Candel-marti, *et al.*, 2012; Yates, *et al.*, 2014; Chrcanovic, *et al.*, 2016). The success rate found in the present study (72%) may have been due to the design of the study itself, as it was a retrospective study with convenience sampling, with a low sampling power, as only 13 patients were evaluated. On the other hand, the time of evaluation of the present study was longer, when compared with the studies described in the literature, as it evaluated implants installed for periods ranging from 7 to 13 years. In the present study, the most frequent problems found were sinusitis and loss of the zygomatic implant. These same complications have been reported by (Bedrossian, 2010), in a prospective study with a period of 7 years of follow-up. Maxillary sinusitis was considered the most frequent complication by (Candel-marti, *et al.*, 2012).

To avoid these complications, the surgeon must have: anatomical knowledge, surgical capacity and expertise in the technique (Branemark, 1998; Urgell, *et al.*, 2008). Periodontal health is of fundamental importance, as it is directly related to the durability of treatment with dental implants and can never be ignored. To obtain an overview of periodontal tissues, a clinical evaluation was performed, in which the visible plaque index by Silness & L6e (1964), gingival index by L6e & Silness (1963) were determined and sulcus probing was performed. Plaque was visualized by means of removing it with a periodontal probe. The levels of gingival inflammation were mild, the probing depth showed shallow in 08 patients and moderate pockets in 02 patients, with no gingival recession or exposure of the threads of zygomatic implants that were in function (Tuminelli, *et al.*, 2017) conducted a systematic review to report the results of treatment and complications related to zygomatic implants with immediate loading. Among other problems found, some authors reported inflammation of the soft tissue around the implant and abutment, and difficulty with cleaning. In the present study, only patients with functional zygomatic implants answered the questionnaire and were clinically evaluated. All patients reported that they were chewing well, without any pain, mobility or unpleasant taste. The 3 patients who lost their implants bilaterally had their implants removed by the

ENT due to acute sinusitis. In the patient who lost the implant on the left side because it did not integrate, an oblique implant was installed to replace it and a new prosthesis was made. Some patient contacted refused to participate in this research. Panoramic radiographs, taken after the clinical evaluation of the patients, showed the absence of bone lesions, and demonstrated only the presence of zygomatic and conventional implants, not observing any type of abnormality. This general analysis of the bone framework of the middle third of the face, using the panoramic radiography technique, is considered a good resource, and was applied in the postoperative radiographic follow-up phase. (Miglioranca, 2008) Due to the small sample, there may be a risk of bias and thus further longitudinal studies are recommended to clarify this issue.

## CONCLUSION

Based on the results obtained, taking into account the limitations of this study, we could conclude that: zygomatic implants had lower success rates than those described in the literature, with a considerable loss of implants. Therefore, zygomatic implants should be indicated with caution and considered as an alternative treatment for the rehabilitation of atrophic maxillae.

## REFERENCES

- Ahlgren, F., Storksen, K. and Tornes, K. (2006) A study of 25 zygomatic dental implants with 11 to 49 months' follow-up after loading. *Int J Oral Maxillofac Implants.* 21, n. 3, pp. 421-425.
- Aparicio, C., Ouazzani, W., Garcia, R., Arevalo, X., Muela, R. and Fortes, V. (2006) A prospective clinical study on titanium implants in the zygomatic arch for prosthetic rehabilitation of the atrophic edentulous maxilla with a follow-up of 6 months to 5 years. *Clin Implant Dent Relat Res.* 8, n. 3, pp. 114-122.
- Bedrossian, E. (2010) Rehabilitation of the edentulous maxilla with the zygoma concept: a 7-year prospective study. *Int J Oral Maxillofac Implants.* 25, n. 6, pp. 1213-1221.
- Bedrossian, E. and Bedrossian, E. (2018) A Prevention and the Management of Complications Using the Zygoma Implant: A Review and Clinical Experiences. *Int J Oral Maxillofac Implants.* 33, n. 5, pp. 135-145.
- Bedrossian, E., Rangert, B., Stumpel, L. and Indresano, T. (2006) Immediate function with the zygomatic implant: a graftless solution for the patient with mild to advanced atrophy of the maxilla. *Int J Oral Maxillofac Implants.* 21, n. 6, pp. 937-942.
- Bedrossian, E., Stumpel, L. 3<sup>RD</sup>, Beckely, ML and Indresano, T. (2002) The zygomatic implant: preliminary data on treatment of severely resorbed maxillae. The clinical report. *Int J Oral Maxillofac Implants.* 17, n. 6, pp. 861-865.
- Branemark, PI. (1998) *Surgery and Fixture Installation: Zygomatics Fixture.* Clinical Procedures Gotenborg, Sweden: Nobel Biocare AB.
- Candel-marti, E., Carrillo-garcia, C., Penarrocha-oltra, D. and Penarrocha-diago, M. (2012) Rehabilitation of atrophic posterior maxilla with zygomatic implants: review. *J Oral Implantol.* 38, n. 5, pp. 653-657.
- Chrcanovic, B. R., Albrektsson, T. and Wennerberg, A. (2016) Survival and Complications of Zygomatic Implants: An Updated Systematic Review. *J Oral Maxillofac Surg.* 74, n. 10, pp. 1949-1964.
- Chvartszaid, D. (2018) Thematic Abstract Review: Complications with Zygomatic Implant Treatment. *Int J Oral Maxillofac Implants.* 33, n. 6, pp. 1193-1197.
- Duarte, L. R., Son, H. N., Francischone, C. E., Peredo, L. G. and Branemark, PI. (2007) The establishment of a protocol for the total rehabilitation of atrophic maxillae employing four zygomatic fixtures in an immediate loading system--a 30-month clinical and radiographic follow-up. *Clin Implant Dent Relat Res.* 9, n. 4, pp. 186-196.

- Esposito, M. W. H. (2013) Interventions for replacing missing teeth: dental implants in zygomatic bone for the rehabilitation of the severely deficient edentulous maxilla.
- Hirsch, J. M., Ohmell, L. O., Henry, P. J., Andreasson, L., Brånemark, P.I., Chiapasco, M., Gynther, G., Finne, K., Higuchi, K. W., Isaksson, S., Kahnberg, K.E., Malevez, C., Neukam, F. W., Sevetz, E., Urgell, J. P., Widmark, G. and Bolund, P. (2004) A clinical evaluation of the Zygoma fixture: one year of follow-up at 16 clinics. *J Oral Maxillofac Surg.* 62, n. 9 Suppl 2, pp. 22-29.
- Jensen, O. T., Shulman, L. B., Block, M. S. and Lacono, V. J. (1998) Report of the sinus consensus conference of 1996. *International Journal of Oral and Maxillofacial Implants.* 13, pp. 11-32.
- Löe, H. and Silness, J. (1963) Silness and Loe and O'leary plaque index in bacterial plaque detection. *Acta Odontol Scand.* 21, pp. 533-551.
- Malevez, C., Abarca, M., Durdu, F. and Daelemans, P. (2004) Clinical outcome of 103 consecutive zygomatic implants: a 6-48 month follow-up study. *Clin Oral Implants Res.* 15, n. 1, pp. 18-22.
- Migliato, K. L., Mendes, E. R., De Souza, L. Z., Cortellazzi, K. L., *et al.* (2008) Evaluation of a preventive-educative program development between Uniararas and Usina São João of Araras, SP. 13, pp 14-18.
- Migliorança, R. M. (2008) Rehabilitating edentulous atrophic maxillae without bone grafts. São Paulo: Quintessence. pp. 17-46.
- Noia, C. F., Ortega-lobes, R., Rodríguez-chessa, J. G., Chaves-netto, H. D. D. M., *et al.* (2010) Complications in zygomatic fixations: literature review and retrospective analysis of 16 cases. *ImplantNews.* 7, n. 3, pp. 381-385.
- Saad, P., A. Jorge, R., Fallopa, F., Bottino, M. A. and Vasconcelos, D.K. (2005) Zygomatic fixations: new concepts and proposal for a new design. VHL Regional Portal, 2005. Available online at <http://pesquisa.bvsalud.org/portal/resource/pt/biblio-872829>.
- Silness, J. and Löe, H. (1964) Periodontal disease in pregnancy II. Correlation between oral hygiene and periodontal condition. *Acta odontologica scandinavica.* 22, n. 1, pp. 121-135.
- Stella, J.P. and Warner, M.R. (2000) Sinus slot technique for simplification and improved orientation of zygomatic dental implants: a technical note. *Int J Oral Maxillofac Implants.* Nov-Dec, 15(6) pp. 889-93. PMID: 11151591.
- Tuminelli, F. J., Walter, L. R., Neugarten, J. and Bedrossian, E. (2017) Immediate loading of zygomatic implants: A systematic review of implant survival, prosthesis survival and potential complications. *Eur J Oral Implantol.* 10 Suppl 1, pp. 79-87.
- Urgell, J. P., Gutierrez, V. R. and Escoda, C. G. (2008) Oral Medicine, Oral Pathology and Oral Surgery. 13, n. 6, pp. 3630-3370.
- Wang, F.; Bornstein, M.M.; Hung, K.; Fan, S.; Chen, X.; Huang, W. and Hu, Y. (2018) Application of Real-Time Surgical Navigation for Zygomatic Implant Insertion in Patients With Severely Atrophic Maxilla. *J Oral Maxillofac Surg.* 76, n. 1, pp. 80-87.
- Yates, J. M., Brook, I. M., Patel, R. R., Wragg, P. F., Atkins S. A., Bakri, I. and Bpl, R. (2014) Treatment of the edentulous atrophic maxilla using zygomatic implants: evaluation of survival rates over 5-10 years. *Int J Oral Maxillofac Surg.* 43, n. 2, pp. 237-242.

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