



Zygomatic implant: major considerations in the COVID-19 pandemic

Steven López^{1,4,5*}, Orley Alvarez^{2,4,5}, Carlos Sánchez^{3,4,5}, Elias Naim Kassis^{4,5}

¹ Clínica Dental STY. Av. 9 de Octubre y Av. Ignacio de Veintimilla. Torre B sexto piso Quito – Ecuador.

² Centro Odontológico Odan Dental, Edificio City Office piso 9 oficina 933, Av Benjamín Carrión Mora & Dr Emilio Romero Menéndez, Guayaquil - Ecuador.

³ Clínica Integral y Estética. Av. Diego de Vázquez N64-85 y calle San Carlos. Cotacollao. Quito – Ecuador.

⁴ UNORP - University Center North Paulista - Sao Jose do Rio Preto, Sao Paulo, Brazil.

⁵ UNIPOS - Post graduate and continuing education, Sao Jose do Rio Preto, Sao Paulo, Brazil.

*Corresponding author: Steven López, Clínica Dental

STY. Av. 9 de Octubre y Av. Ignacio de Veintimilla.

Torre B sexto piso Quito–Ecuador.

E-mail: drstylopez@gmail.com

DOI: <https://doi.org/10.54448/mdnt22S102>

Received: 10-10-2021; Revised: 12-11-2021; Accepted: 12-14-2021; Published: 03-28-2022; MedNEXT-id: e22S102

Abstract

Introduction: The dissemination of COVID-19 has presented significant challenges for dentistry. In this context, dental care during the pandemic is challenging due to the high risk of infection. In this scenario of infections and the COVID-19 pandemic, there are huge concerns in dental implant procedures, especially zygomatic implants (ZI), which need to be performed for several reasons, mainly to improve the quality of life of patients. **Objective:** The present study performed a brief systematic review of zygomatic implantation in the context of the COVID-19 pandemic, to highlight the main challenges and guideline-based safety strategies.

Methods: The research was carried out from May 2021 to June 2021 and developed based on Scopus, PubMed, Science Direct, Scielo, and Google Scholar, following the Systematic Review-PRISMA rules. The quality of the studies was based on the GRADE instrument and the risk of bias was analyzed according to the Cochrane instrument. **Results:** European guidelines and expert opinion showed on the control and prevention of infections in dentistry during the pandemic. As the guidelines were not based on solid evidence, they were supplemented by expert opinion on the control and prevention of infections in dentistry. The type of personal protective equipment provided by the dental team must be appropriate for the procedure and the risk of infection. the American Academy of Implant Dentistry (AAID) points to the issues listed as “What constitutes a dental implant-related emergency?; How should patients be screened and screened?; What personal protective equipment is needed?; How should operators be equipped?; What equipment should be used?; What,

when, and how can procedures be performed?”

Conclusion: In this current context of general care with dental procedures, especially with ZI, clinical studies show how these safety measures against COVID-19 are important, as ZI involves important surgical management.

Keywords: Zygomatic Implant. Implants. Dental care. Pandemic. COVID-19. Guidelines.

Introduction

The dissemination of COVID-19 has presented significant challenges for dentistry. The risk of nosocomial transmission meant that routine dental care was temporarily suspended in several countries. In this sense, several measures were proposed by national and international guidelines to minimize the risk of infection. Another approach to collecting evidence was to carry out expert surveys, which allow for fast, high-quality data collection. Given the urgent need for credible recommendations, research gaps could be filled by asking for the opinion of international frontline experts [1].

In this context, dental care during the pandemic is challenging due to the high risk of infection. In this regard, certain dental appointments cannot be postponed, so eligible precautions must be implemented quickly to ensure safety. To date, there are few controlled clinical trials of COVID-19 in dentistry. Furthermore, the transmission risk for non-aerosol procedures in dental offices was considered low or neutral by approximately 55% of specialists, while for aerosol-generating procedures, the vast majority (93%)

agreed that the risk was high [2].

In this scenario of infections and the COVID-19 pandemic, there are huge concerns in dental implant procedures, especially zygomatic implants (ZI), which need to be performed for several reasons, mainly to improve the quality of life of patients. In this sense, the lack of bone in the alveolar crest represents a major problem in aesthetic recovery in patients who have suffered from dentoalveolar traumas, traumatic extractions, pathologies of congenital tooth absence involving the maxilla and mandible, and the possibility of deformity [3]. In this context, tooth loss negatively affects the quality of life, compromising aesthetic functions, chewing, and speech [3].

In this aspect, the ZI is an alternative when there is bone loss [4-6]. The ZI is long, threaded, oxidized, and moderately rough, with lengths ranging from 30 to 52.5 mm. They have an inclined head, designed to allow the placement of the prosthesis 45 along the axis of the implant, providing an excellent ability to retain, support, and stabilize the prosthesis [7-10]. ZI is also applied when there are poor bone quality and quantity [11-15].

In this context, contact and implant bone are referred to as BIC (bone-implant contact) and are correlated with implant survival [16-18]. An important variable that alters the zygomatic BIC is the angle at which the implant is placed [19]. Thus, Branemark et al. [20] introduced a technique called zygomatic fixation. The objective was to reach these new implants with a fixation on the dense zygomatic bone and, thus, rehabilitate these areas, combined or not with other types of implants. Thus, the ZI provides anchorage, when crossing the maxillary tuberosity, passes through the pyramidal process of the palatal bone, and is part of the pterygoid process of the sphenoid bone, making the implants successful [21].

Therefore, the present study performed a brief systematic review of zygomatic implantation in the context of the COVID-19 pandemic, to highlight the main challenges and guideline-based safety strategies.

Methods

Study Design

This was followed by a systematic literature review model, according to the PRISMA rules [22].

Data sources and research strategy

The search strategies for this review were based on the descriptors: "Zygomatic Implant. Implants. Dental care. Pandemic. COVID-19. Guidelines". The research was carried out from May 2021 to July 2021 and developed based on Google Scholar, Scopus,

PubMed, Scielo, and Cochrane Library. Also, a combination of the keywords with the Booleans "OR", "AND", and the operator "NOT" were used to target the scientific articles of interest.

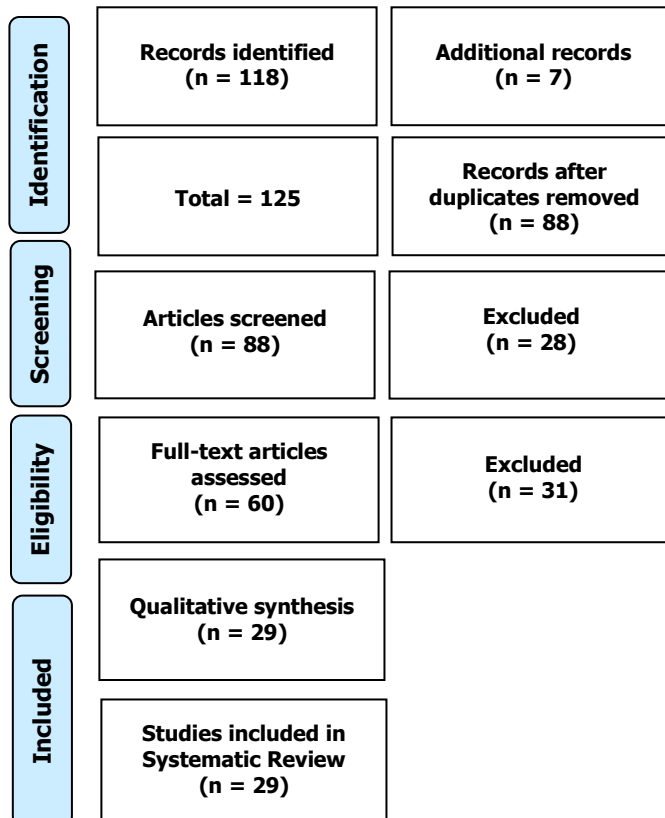
Study quality and risk of bias

The quality of the studies was based on the GRADE instrument [23], with guidelines, randomized controlled clinical studies, prospective controlled clinical studies, and studies of systematic review and meta-analysis listed as the studies with the greatest scientific evidence. The risk of bias was analyzed according to the Cochrane instrument [24].

Results and Discussion

After the selectivity of articles and literary findings through the following descriptors *zygomatic implant, implants, dental care, pandemic, COVID-19 and guidelines*, 125 studies were analyzed, with only 29 medium and high-quality studies selected, according to GRADE rules, and with risks of bias that do not compromise scientific development, based on the Cochrane instrument (Figure 1).

Figure 1. Flow chart.



After analyzing the main studies and guidelines on the safety of dental procedures, such as performing the ZI, in the COVID-19 pandemic, it was found that to help

protect patients from acquiring COVID-19 from a dental office nosocomial infection, many state or local governments have classified dental treatments as non-essential. Dentists were instructed to perform only procedures designated as emergencies. In this sense, dentistry is making great strides in improving oral health through the prevention of dental emergencies.

In this regard, the American Academy of Implant Dentistry (AAID) discusses how COVID-19 impacts dental care, presents guidelines for dentistry in general and treatments related to dental implants. Thus, the AAID points to the issues listed in **Table 1** [25].

Table 1. Issues about dental care in the COVID-19 pandemic.

What constitutes a dental implant-related emergency?
How should patients be screened and screened?
What personal protective equipment is needed?
How should operators be equipped?
What equipment should be used?
What, when, and how can procedures be performed?

Furthermore, European guidelines and expert opinion showed on the control and prevention of infections in dentistry during the pandemic. The dynamics of the pandemic had an impact on rapidly published and frequently updated national guidelines in Europe. As the guidelines were not based on solid evidence, they were supplemented by expert opinion on the control and prevention of infections in dentistry. Dental care must be guaranteed during the pandemic, but in case of suspicion or confirmation of COVID-19 disease, treatment should be postponed, if possible [26].

Also, remote screening and patient-related measures were recommended as the most effective in reducing the transmission of SARS-CoV-2. The type of personal protective equipment provided by the dental team must be appropriate for the procedure and the risk of infection. It is important to continuously update dental guidelines, considering the evolution of the pandemic and new scientific evidence available. Thus, a study evaluated the opinion of European experts on the control and prevention of infections in dentistry during the second wave of the pandemic. A total of 26 experts participated in the survey. The overall risk of transmission in dental settings was scored lower compared to the initial survey, although the risk associated with aerosol-generating procedures (AGP) was still high. The use of PPE was less frequently recommended for non-AGP, while most experts still recommended FFP2/ FFP3 masks (80.8%), face shields or goggles (88.5%), lab coats (61.5 %), and caps

(57.7%) for AGP. Most specialists also considered the mouthwash to be relevant (73.1%) and reported using it before treatment (76.9%). No uniform opinion was found regarding the relevance of the COVID-19 test for staff and patients [26].

Besides, a study gathered experiences and recommendations from frontline clinical experts on critical aspects of providing dental care during the pandemic. The risk of SARS-CoV-2 transmission in dental settings for aerosol-generating procedures was considered high. For non-aerosol procedures and aerosol generators, more than 80% of experts recommended face shields and caps for each treatment. For aerosol generation procedures, additional measures (FFP2/FFP3 masks and aprons) were suggested by the vast majority of experts. Therefore, limiting aerosol-generating procedures together with the use of adequate personal protective equipment was considered crucial to protect dental health professionals and patients [27].

In this current context of general care with dental procedures, especially with ZI, clinical studies show how these safety measures against COVID-19 are important, as ZI involves important surgical management. As proof of this, a randomized study compared the clinical outcome of immediately loaded cross-arch maxillary prostheses supported by ZI versus conventional implants placed in the enlarged bone. In total, 71 toothless patients with severely atrophic jaws without sufficient bone volume to place dental implants or when it was possible to place only two implants in the previous area (minimum diameter of 3.5 mm and length of 8 mm) and less than 4 mm diameter bone height substantially, were randomized according to a parallel group design to receive ZI (35 patients) to be loaded immediately versus grafted with a xenograft, followed after 6 months of graft consolidation by placing six to eight conventional dental implants submerged for 4 months (36 patients). For immediate loading, the ZI had to be inserted with an insertion torque greater than 40 Ncm. Temporary prostheses in metal-reinforced acrylic, screwed on, were provided to be replaced by permanent prostheses Procera Implant Bridge Titanium (Nobel Biocare, Gothenburg, Sweden), with ceramic or acrylic veneer 4 months after the initial loading. Patients were followed up for 1 year after loading. Therefore, preliminary data from one year after loading suggest that immediately loaded ZI was associated with statistically significant fewer prosthetic failures (one versus six patients), implant failures (two versus eight patients), and time required for functional loading (1.3 days versus 444.3 days) when compared to augmentation procedures and conventionally loaded dental implants. Even though more complications were reported for ZI, they proved to

be a better form of rehabilitation for severely atrophic jaws. Long-term data are necessary to confirm or contest these preliminary results [28].

A segment of the same study also compared the clinical outcome of immediately loaded cross-arch maxillary prostheses supported by ZI versus conventional implants placed in enlarged bone [29]. A total of 71 toothless patients with severely atrophic jaws, who did not have sufficient bone volume to place dental implants or when it was possible to place only two implants in the frontal area (minimum diameter of 3.5 mm and length of 8 mm) and less than 4, 0 mm bone height subantrally, were randomized according to a parallel-group design. They (35 patients) received zygomatic implants to be loaded immediately versus grafted with a xenograft, followed, after 6 months of graft consolidation, by placing six to eight conventional dental implants, submerged for 4 months (36 patients). To be loaded immediately, zygomatic implants needed to be inserted with an insertion torque greater than 40 Ncm. Patients were followed up for 4 months after loading. No augmentation procedure has failed. Three patients dropped out of the augmentation group. Therefore, preliminary data from four months after loading suggest that zygomatic implants were statistically significantly associated with fewer prostheses (one versus six patients) and implant failures (one patient lost three implants versus 35 implants in eight patients), as well as the time required for functional loading (1.3 versus 444.3 days) when compared to augmentation procedures and conventionally loaded dental implants. Even if more complications were reported for ZI, which resolved spontaneously or could be manipulated, ZI proved to be a better rehabilitation modality for severely atrophic jaws [29].

Another study compared the result of preparing the cancer site for ZI using conventional preparation with rotary drills or piezoelectric surgery with dedicated inserts for the placement of two ZI per zygoma. Twenty toothless patients with severely atrophic jaws without sufficient bone volume to place dental implants and less than 4 mm bone height subantrally had their Hemi-jaws randomized according to an open-mouth design in preparing the implant site with conventional rotational preparation or piezoelectric surgery. In two patients, drills were also used on the side of the piezoelectric surgery to allow the preparation of the implant sites. An implant for the group of conventional drills did not reach an insertion torque greater than 40 Ncm, as it fractured the zygoma. No patient gave up and two distal cancer implants failed in the same patient (one per group), who was not prosthetically rehabilitated. Six complications occurred in perforated sites and three in piezoelectric

surgery sites (two patients had bilateral complications), the difference is not statistically significant (P (McNemar's test) = 0.375; odds ratio = 4.00; 95% CI of odds ratio: 0.45 to 35.79) The implant placement with conventional drills took an average of 14.35 ± 1.76 min and with piezoelectric surgery 23.50 ± 2.26 min, with the implant placement time being significantly shorter with the conventional perforation (difference = 9.15 ± 1.69 min; 95% CI: 8.36 to 9.94 min; $p < 0.001$) Postoperative hematomas were more frequent in the perforated sites ($p = 0.001$), and 16 patients considered the two techniques equally acceptable, while four preferred piezoelectric surgery ($p = 0.125$). Both drilling techniques achieved similar clinical results, but conventional drilling required 9 minutes less and could be used in all cases, although it was more aggressive. These results can be system-dependent, so they cannot be generalized to other zygomatic systems with confidence [30].

Based on recent studies, new challenges have been presented. The management of patients with a severely atrophic or ZI-resected maxilla can be a surgical challenge. This retrospective cohort study assessed the percentage of survival of ZI placed over a period of 18 years. In total, 88 ZI were placed in 45 patients aged 42-88 years. Of the 88 implants, 54 were immediately loaded. The implant survival rate was 94.32%, with five implants failing during the study period. Failures were not significantly associated with gender, surface finish, implant length, classification of the zygomatic approach guided by the anatomy or position of the implant ($p > 0.05$). All failed implants were fitted with fixed prostheses. Failures occurred between 6 months and 15 years after placement. This study of ZI placed in patients with severely atrophic and resected maxilla confirms that this approach is a predictable method to support fixed or removable prostheses up to 18 years, demonstrating high survival rates [31].

Added to this, a meta-analysis study included sixty-eight studies, comprising 4556 ZI in 2161 patients with 103 faults. The accumulated survival rate at 12 years was 95.21%. Most of the failures were detected within the post-surgical period of 6 months. Studies ($n=26$) that exclusively assessed load showed a statistically lower ZI failure rate than studies ($n=34$) assessing loading protocols ($p=0.003$). Other studies ($n=5$) evaluating ZI for the rehabilitation of patients after maxillary resections presented lower survival rates. Postoperative complications were as follows: sinusitis, 2.4%; soft tissue infection, 2.0%; paraesthesia, 1.0%; and oroantral fistulas, 0.4%. However, these numbers may be underestimated because many studies have not mentioned the prevalence of these complications. Therefore, ZI presents a high survival rate accumulated

in 12 years, with most failures occurring in the initial stages postoperatively. The main complication observed related to ZI was sinusitis, which may appear several years after implant surgery [32].

Conclusion

In this current context of general care with dental procedures, especially with ZI, clinical studies show how these safety measures against COVID-19 are important, as ZI involves important surgical management.

Acknowledgement

Not applicable.

Funding

Not applicable.

Data sharing statement

No additional data are available.

Conflict of interest

The authors declare no conflict of interest.

Similarity check

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