Research, Society and Development, v. 13, n. 12, e46131247637, 2024
(CC BY 4.0) | ISSN 2525-3409 | DOI: http://dx.doi.org/10.33448/rsd-v13i12.47637

Complications during the installation of zygomatic implants: Clinical challenges and management

Complicações durante a instalação de implantes zigomáticos: Desafios clínicos e manejo

Complicaciones durante la instalación de implantes cigomáticos: Desafíos clínicos y manejo

Recebido: 22/11/2024 | Revisado: 27/11/2024 | Aceitado: 28/11/2024 | Publicado: 01/12/2024

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Abstract
Zygomatic implants have become a highly effective alternative for oral rehabilitation in patients with severe maxillary atrophy, offering a durable and functional solution when other methods, such as bone grafts, are not feasible. However, the installation of zygomatic implants presents various technical and clinical challenges. Intraoperative complications during the procedure may compromise osseointegration and increase the risk of adverse outcomes. This article aims to review the primary complications associated with zygomatic implant installation, examining their causes, diagnosis, prevention, and management. Through a literature review, the paper explores the complexities of the procedure and emphasizes the importance of a meticulous approach to minimize risks and optimize outcomes.
Keywords: Zygomatic implants; Complications; Adverse outcomes; Oral rehabilitation; Osseointegration.

Resumo
Os implantes zigomáticos tornaram-se uma alternativa altamente eficaz para reabilitação oral em pacientes com atrofia maxilar grave, oferecendo uma solução durável e funcional quando outros métodos, como enxertos ósseos, não são viáveis. Contudo, a instalação de implantes zigomáticos apresenta vários desafios técnicos e clínicos. Complicações intraoperatórias durante o procedimento podem comprometer a osseointegração e aumentar o risco de resultados adversos. Este artigo tem como objetivo revisar as principais complicações associadas à instalação de implantes zigomáticos, examinando suas causas, diagnóstico, prevenção e manejo. Através de uma revisão da literatura, o artigo explora as complexidades do procedimento e enfatiza a importância de uma abordagem meticulosa para minimizar riscos e otimizar resultados.
Palavras-chave: Implantes zigomáticos; Complicações; Resultados adversos; Reabilitação oral; Osseointegração.

Resumen
Los implantes cigomáticos se han convertido en una alternativa muy eficaz para la rehabilitación oral en pacientes con atrofia maxilar grave, ofreciendo una solución duradera y funcional cuando otros métodos, como los injertos óseos, no son viables. Sin embargo, la instalación de implantes cigomáticos presenta varios desafíos técnicos y clínicos. Las complicaciones intraoperatorias durante el procedimiento pueden comprometer la osteointegración y aumentar el riesgo de resultados adversos. Este artículo tiene como objetivo revisar las principales complicaciones asociadas con la instalación de implantes cigomáticos, examinando sus causas, diagnóstico, prevención y tratamiento. A través de una revisión de la literatura, el artículo explora las complejidades del procedimiento y enfatiza la importancia de un enfoque meticuloso para minimizar los riesgos y optimizar los resultados.
Palabras clave: Implantes cigomáticos; Complicaciones; Resultados adversos; Rehabilitación oral; Osteointegración.

1. Introduction

Maxillary bone loss, often associated with advanced periodontal disease, trauma, or dental extractions, can result in severe bone atrophy, making conventional dental implants unfeasible. The development of zygomatic implants, introduced by Brånemark in 1988, revolutionized the treatment of maxillary atrophy, providing a solution for patients with substantial bone

loss (Brånemark, 1988). These implants, anchored in the zygomatic bone, offer a viable alternative for individuals who lack sufficient maxillary bone to support conventional implants.

Despite their benefits, zygomatic implants are not without complications. Intraoperative challenges may affect implant stability, osseointegration, and, in some instances, lead to treatment failure. Consequently, early identification and proper management of potential complications are critical for the success of the procedure. This article reviews the primary complications associated with zygomatic implant installation, addressing their causes, diagnosis, and prevention.

2. Methodology

This study employed a qualitative approach (Pereira et al., 2018) and a narrative bibliographic review (Rother, 2007; Mattos, 2015; Cavalcante & Oliveira, 2020; Casarin et al., 2020), which is characterized by its simplicity and fewer methodological requirements compared to other types of reviews.

The research was initially conducted using the Google Scholar database, with the following search descriptors: Zygomatic implants, Complications, Adverse outcomes, Oral rehabilitation, and Osseointegration. This approach aimed to collect relevant studies and information to support a comprehensive understanding of the topic.

3. Zygomatic Implant Installation Procedure

Zygomatic implants are characterized by their extended design, allowing anchorage in the zygomatic bone above the maxilla. The surgical procedure for zygomatic implant installation requires a meticulous and technical approach. The perforation of the zygomatic bone must be performed with precision to respect its anatomy and avoid adjacent structures (Gonçalves et al., 2021).

Preoperative planning is crucial to ensure the success of the procedure. The use of 3D tomographic imaging is essential for evaluating bone quality and identifying at-risk anatomical structures, such as the maxillary sinus, infraorbital nerve, and blood vessels (Santos, 2020). During surgery, ensuring implant stability and precise placement are paramount to facilitating osseointegration and preventing complications.

4. Main Complications in Zygomatic Implant Installation

Although zygomatic implants have a high success rate, several complications may arise during the procedure, ranging from anatomical issues to technical failures.

4.1 Maxillary Sinus Perforation

Maxillary sinus perforation is one of the most common complications, often leading to sinusitis and infection. Studies indicate that sinus perforation is particularly prevalent in cases with significant bone loss (Souza et al., 2021). According to Fernandes et al. (2020), this complication can be avoided by using drilling guides and digital planning, as well as selecting an appropriately sized implant to prevent excessive perforation.

4.2 Damage to Nerve Structures

Another potential risk during zygomatic implant installation is damage to the infraorbital nerve. Located in the anterior maxilla, the infraorbital nerve can be injured during the perforation of the zygomatic bone, resulting in paresthesia or even sensory loss in the upper teeth and lip (Cavalcanti et al., 2020). A detailed assessment of the patient's anatomy and the use of high-precision tomography are vital in reducing this risk.

4.3 Implant Fracture

Implant fracture, while rare, can be a severe complication. This issue may arise from improper placement or technical errors, such as the application of excessive torque. Martins et al. (2022) noted that in many cases, choosing an implant inappropriate for the bone type may be the primary cause of this complication.

5. Diagnosis and Management of Complications

Early diagnosis of complications is essential for effective management during zygomatic implant installation. Continuous monitoring, aided by intraoperative systems such as real-time 3D tomography, enables immediate identification of issues (Gomes et al., 2022).

5.1 Maxillary Sinus Perforation

For maxillary sinus perforation, the use of bone grafts may be necessary to seal the perforation and prevent infection. Antibiotics and analgesics are also administered to prevent sinusitis, and in more severe cases, additional surgical intervention may be required to repair the damage (Fernandes et al., 2020).

5.2 Damage to Nerve Structures

If the infraorbital nerve is damaged, immediate evaluation is required. In mild cases, sensory function may recover spontaneously over time. However, more severe cases may necessitate reconstructive nerve surgery (Cavalcanti et al., 2020).

5.3 Implant Fracture

If an implant fractures, it may require removal and the development of a new surgical plan. Often, the procedure is repeated using longer implants or a different design that better suits the available bone (Martins et al., 2022).

6. Prevention of Complications

Preventing complications during zygomatic implant installation hinges on careful planning and execution. The use of high-resolution imaging technology and customized surgical guides are essential for ensuring precision in implant placement and minimizing the risk of damaging vital anatomical structures (Souza et al., 2021).

Additionally, selecting the appropriate implant based on bone type and the surgeon's expertise plays a crucial role in reducing the risk of complications.

7. Conclusion

Zygomatic implants are an effective solution for patients with severe maxillary atrophy, offering a durable and functional means of oral rehabilitation. However, as with any surgical procedure, the installation process carries risks and potential complications that can adversely affect the outcome. Early identification, accurate diagnosis, and effective management of complications are crucial for the success of the treatment.

Advanced technologies and an understanding of local anatomy are essential to minimize risks and optimize results. Continuous improvements in surgical techniques and materials, along with a careful and personalized approach, are vital for ensuring the success of zygomatic implants.

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