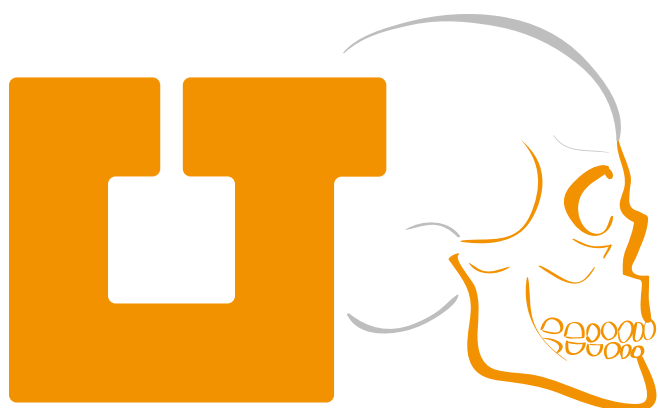


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XXVII Brazilian Congress of Oral and Maxillofacial Surgery and Traumatology (COBRAC)



Adriano Rocha Germano

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Dear members, as you all know, the XXVII Brazilian Congress of Oral and Maxillofacial Surgery and Traumatology (COBRAC) will take place in the capital of Rio Grande do Norte, Natal/RN, from August 26 to 28, 2026. Given the interest already shown by exhibiting companies, scientific societies, and attendees, a large audience and an excellent scientific and commercial networking environment are expected. Under the theme “Scientific Evidence in the Digital Age,” the congress will bring together the leading names of the specialty in Brazil, as well as renowned international speakers.

This edition will feature many new elements that will make the commercial exhibition even more attractive, as it will include an integrated environment of scientific activities and com-

mercial opportunities. The **Hands-On** space will be a major highlight, allowing participants to practice many available techniques directly at the exhibition, enhancing their skill set as oral and maxillofacial surgeons. The **Commented Video Surgery** sessions will give professionals the opportunity to deepen their understanding of topics of great interest to the specialty, in addition to **Clinical Case Discussions** and the “**My Worst Case**” sessions.

The event will repeat successful formats from previous editions, such as **Crossfire** and the traditional **Four-Sided Arena**, now with innovations designed to make the congress an environment capable of keeping participants engaged even when they are not attending lectures, actively involving them in all scientific settings.

The selection of themes, scientific activities, and discussions will allow participants to navigate the full scope of the specialty, including controversial topics and areas still lacking consensus.

It is worth highlighting the significant interest shown by international speakers in participating in the COBRAC, which demonstrates the strength of the event and its importance on the global stage. Traditional specialty associations and societies from related professions will also be present, greatly enriching scientific discussions in a harmonious, multidisciplinary environment.

However, we must not forget that the congress is also a opportunity for socializing. The local committee has prepared a special program filled with music and moments of relaxation, from the opening cocktail reception to themed happy hours, including the traditional Residents' Night and the Speakers' Dinner.

Additionally, the CBCTBMF headquarters is preparing a broad environment for debate on the specialty, involving key sectors of society, so that regulations, guidelines, and resolutions can advance for the benefit of the profession.

The new generation of surgeons will also have a place of prominence at the event, with the **Leagues Challenge**, the **Residency Meeting**, scientific forums, free-paper presentations, and electronic posters, providing opportunities for everyone.

Therefore, we will make Natal/RN, through the COBRAC 2026, the capital of Oral and Maxillofacial Surgery and Traumatology. We are committed to ensuring a great event not only for participants and exhibitors, but also for accompanying family members, as the cuisine of Rio Grande do Norte and its natural beauty are remarkable and will be within everyone's reach.

We welcome you with open arms and are certain that we will offer the very best in scientific activities, innovation, a standout commercial exhibition, professional opportunities, gastronomy, leisure, and well-being. And in the spirit of health and wellness, the COBRAC is introducing an innovation by incorporating the **10 Beach Duathlon** into its activities. It will officially open the event with a run along the congress area, showcasing the natural landscape and initiating a competition that will certainly inspire healthy rivalries and lively participation.

Don't miss out! Register and follow us on social media (Instagram: @congresso.cobrac | Website: congressocobrac.com.br), as the COBRAC is a unique and unforgettable event.

A big hug to all, and we will see you at the XXVII COBRAC in August 2026.



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The turning point of Oral and Maxillofacial Surgery and Traumatology



Dr. Belmiro Vasconcelos

President 2025/2026

Brazilian College of Oral and Maxillofacial Surgery and Traumatology

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We are experiencing a period of great challenges, but also of unique opportunities for Oral and Maxillofacial Surgery and Traumatology. The historical tensions surrounding our specialty — lack of definition of professional boundaries, institutional recognition, and economic appreciation — are real and persistent. However, the current board of the Brazilian College of Oral and Maxillofacial Surgery and Traumatology (CBCTBMF) has focused precisely on these obstacles with firmness, coherence, and concrete results.

In recent months, the CBCTBMF has intensified institutional dialogue with the main regulatory and professional institutions. With the National Supplementary Health Agency, we have advanced with actions focused on the defense of technical autonomy and full professional practice of oral and maxillofacial dental surgeons.

This Agency restated fundamental principles of supplementary health-care, recognizing that the oral and maxillofacial surgeon is responsible to define the most appropriate diagnostic and therapeutic approach for the patient, including the request of complementary exams and hospital admissions related to their area of expertise. We also maintained close ties with the Brazilian Federal Dental Council, strengthening our defense of quality training and the ethical practice of the specialty.

The College has also expanded its presence and influence by projects that reinforce the leading role of Oral and Maxillofacial Surgery and Traumatology in society and the scientific community. The PROEC and PAER are maintained as examples of initiatives that combine continuing education and excellent practice, preparing new generations of specialists based on technical rigor and actual hospital experience.

In the scientific field, the consolidation of the Journal of the Brazilian College of Oral and Maxillofacial Surgery (JBCOMS, ISSN 3085-9484) and the recent advancement in its indexing represent fundamental milestones. This achievement raises the national scientific production to an international level of visibility, consolidating the Brazilian contribution to the global debate on Oral and Maxillofacial Surgery.

These results are not only the result of the board's work, but also the mobilization of a class that is beginning to understand that unity is our greatest instrument of change. Each individual action, either in teaching, research, or hospital practice, is strengthened when connected to a collective purpose, which is represented by the CBCTBMF.

This is time for changes. Today, we have a solid foundation, growing recognition, and an institutional scenario more open to dialogue and paradigm shift. The identity of Oral and Maxillofacial Surgery and Traumatology must no longer be considered a dilemma between Dentistry and Medicine, but rather as a unique and indispensable synthesis: the professional who works at the interface between both, with the highest degree of technical complexity and hospital responsibility.

The future of our specialty will be defined by the clarity with which we state who we are — and how we are willing to work together to consolidate this recognition.

We remain steady, united, and on the move.

Prof. Dr. Belmiro Cavalcanti do Egito Vasconcelos

» President 2025/2026 of the Brazilian College of Oral and Maxillofacial Surgery and Traumatology

An interview with Antenor Araujo



Antenor Araujo

- » PhD and Postdoctoral in Dentistry from São Paulo State University Júlio de Mesquita Filho (São José dos Campos/SP, Brazil).
- » Fellowship at Southwestern Medical School (Dallas/TX, USA).
- » Author of the books “*Cirurgia Ortognática*” (1999), “*Manual de Orientação aos pacientes com vista à Cirurgia Ortognática*” (2005) and “*Aspectos atuais da cirurgia e traumatologia buco-maxillo-facial*” (2007).

1. Professor Araujo, you are recognized as a notable professional in Oral and Maxillofacial Surgery, with a distinguished career characterized by excellence, innovation, and dedication to education. Since your family has a background in Dentistry, could you tell us how you decided to pursue this career?

Indeed, my family includes numerous dentists in various specialties, but the field that most attracted my attention was Oral and Maxillofacial Surgery, particularly Orthognathic Surgery. With that goal in mind, I sought proper training, and early on I observed and learned from outstanding surgeons of that time. That was when my dedication to Oral and Maxillofacial Surgery truly began.

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2. Could you describe the state of Oral and Maxillofacial Surgery and Traumatology in Brazil at the onset of your career? What were the main challenges you faced during that time?

When I began my career, there was still much to learn, and only a few surgeons were practicing in the field. Our specialty often overlapped with otorhinolaryngology and plastic surgery. We had to fight for recognition, gradually improving professional relationships and consolidating our specialty, marking the beginning of a new era in surgery.

3. During your fellowship in Dallas, you had the opportunity to observe the development of established orthognathic surgical techniques. How did this experience impact the advancement of your academic education and professional practice?

At that time, orthognathic surgery was still in its early stages. However, during my fellowship in Dallas, I gained a global perspective of our specialty. Spending two years in that environment, exposed to the best available techniques and professionals, significantly broadened my horizons and strengthened my involvement in orthognathic surgery.

4. You have made significant scientific contributions through published articles, interviews, and three books on orthognathic surgery. Would you be open to sharing insights on the creation of these publications and the reasons that prompted you to write them?

When I started, there were almost no publications on orthognathic surgery in Brazil or Latin America. I had the privilege of working alongside renowned surgeons such as Dr. Robert Walker, Dr. William Bell,

Dr. Larry Wolford, Dr. Bruce Epker, and Dr. César Guerrero. This experience inspired me to gather material and knowledge to help disseminate orthognathic surgery throughout Latin America, this was my main motivation for developing these works.

5. Having performed over 1,750 orthognathic surgeries, you have observed significant developments in clinical practice. From your perspective, what do you consider to be the most important advancements in surgical techniques and patient care over the past decades?

Along with the evolution of orthognathic surgery, fixation techniques also advanced significantly, from rigid fixation with plates and screws for orthognathic and trauma surgery to increasingly refined methods. Patient care has also evolved, with a growing focus on safety, predictability, and postoperative well-being.

6. Over the years, you have mentored several generations of surgeons. What importance do you attribute to teaching in your career development?

Beyond the academic titles I have earned, which I am very proud of, the most rewarding aspect has been training numerous professionals through hospital residencies and academic programs. Many outstanding surgeons have been trained here, and this has been one of the greatest achievements of my career.

7. Beyond technical expertise, which competencies do you consider essential for the contemporary oral and maxillofacial surgeon?

Undoubtedly, proper training through residency programs is essential, along with continuous participation in congresses and specialized courses, to stay updated with the latest developments in the field.

8. You have observed the transition from conventional surgical planning using physical models and articulators to virtual three-dimensional planning. How did you experience this transformation, and how has it affected your clinical practice?

The impact was enormous. Virtual planning has revolutionized surgical protocols and became indispensable in many techniques. Today, it plays a central role in improving precision, predictability, and surgical outcomes.

9. Fixation techniques in orthognathic surgery and concerns regarding postoperative stability have long been subjects of discussion in the specialty. Having performed over 1,700 orthognathic surgeries, could you share your insights on this matter?

With the evolution of fixation systems, we have achieved greater postoperative stability. New plate designs, combined with advanced surgical techniques, have led to improved outcomes and long-term results for our patients.

10. Postoperative stability remains a fundamental pillar of orthognathic surgery. How do you assess the development of fixation

techniques throughout your career and their influence on clinical outcomes?

One of our greatest concerns in orthognathic surgery has always been stability. I first encountered fixation plates at a rigid fixation launch event in Davos, Switzerland. The first plates were made of steel, later replaced by titanium and resorbable materials. These developments, together with screws and new accessories, have brought remarkable progress to our specialty.

11. Do you believe minimally invasive techniques and accelerated recovery protocols will play a central role in the future of orthognathic surgery? How do you see the specialty changing over the next decade?

There are several techniques continuously evolving in search of better results. It would be presumptuous to predict the future, but the evolution is constant. We are at a very good point today, and artificial intelligence is already emerging as a promising tool.

12. Professor, looking back on your distinguished career and the legacy you have established in the education of oral and maxillofacial surgeons, what advice would you offer to early-career professionals? Moreover, what message would you like to share with future generations of surgeons and students aspiring to follow a similar journey?

My life has always been dedicated to training highly qualified professionals. Once you decide to pursue orthognathic surgery, it is time to study, study and study again. Today, there is a wealth of literature for surgeons to learn and teach. Enrolling in a residency program should be part of every aspiring surgeon's plan. You can always count on us for guidance and support.

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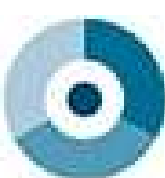


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Retrospective analysis of orofacial cleft in Sergipe (Brazil)

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ABSTRACT

Introduction: Orofacial clefts (OC) are congenital malformations resulting from the lack of merging between the embryonic facial processes and the palatal processes, which occurs between the fourth and twelfth weeks of intrauterine life. It represents not only an esthetic problem, but also causes functional and psychosocial disorders. **Objective:** The objective of this epidemiological study was to verify the prevalence of OC in the state of Sergipe (Brazil), between 2010 and 2023, and to compare the quality of notifications with previously published data. **Method:** Retrospective survey of the population of live births with OC in the state of Sergipe, registered in DATASUS from 2010 to 2023. **Results:** Among the 463 registered cases, it was observed that 44.7% of anomalies were “Non-specified Cleft Palate” type; 79.9% were of admixed descent; and 97.6% of records were of singleton pregnancies. Information on sex was only available for the years 2011 to 2013 and, among the 85 cases, 56.5% were females. **Conclusion:** the prevalence rate was 1 individual with OC for every 994 live births in Sergipe between 2010 and 2023, and when comparing the quality of these notifications with previously released data, from 2003 to 2014, it was possible to observe a delay in updating the information in the system.

Keywords: Cleft lip. Epidemiology. Prevalence.

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Introduction

Orofacial clefts (OC) are congenital malformations resulting from the lack of merging between the embryonic facial processes and the palatal processes, occurring between the fourth and twelfth weeks of intrauterine life. Infants born with OC may have difficulties in feeding and breathing, and are at increased risk of developing speech difficulties in early childhood. Therefore, it is not only an esthetic condition, but also causes functional and psychosocial disorders.^{2,3} Treatment is essential and requires specialized multidisciplinary collaboration, including oral and maxillofacial surgery, plastic surgery, clinical dentistry, orthodontics, nursing, speech therapy, physical therapy, psychology, social work, among others.^{3,4}

Epidemiologically, it is possible to state that OC are among the most common congenital defects and the most frequently observed craniofacial malformation in humans.⁵ The estimated global incidence is approximately 1.4 per 1,000 live births. Populations with higher rates of live births with OC per 1,000 individuals are the Native Americans (2.62‰), followed by Japanese (2.14‰), Chinese (1.45‰), and Caucasoid (1.05‰). Black people present the lowest prevalence (0.58‰). Continentally, the highest rates were observed in Asia (1.57‰), North America (1.56‰), and Europe (1.55‰), contrasting with lower values in Africa (0.57‰) and South America (0.99‰).⁶

In Brazil, a study conducted on data from the SUS Information Technology Department (DATASUS) from 1999 to 2020 demonstrated a prevalence of 4.24 new cases of OC per 10,000 live births. The epidemiological profile consisted of white males born in hospitals with

gestational age ≥ 37 weeks by cesarean section. The most common cleft type affected the lip and palate. The most affected regions by mean prevalence were the South and Southeast, while the least affected were the Northeast and North.⁷

In the Northeast, some cases in the states of Pernambuco, Ceará, and Sergipe contributed to regional knowledge. In Pernambuco, Coutinho et al.⁸ analyzed a sample of 1,216 patients aged 10 years or younger, registered in the database of the Center for Care to Individuals with Facial Defects (CADEFI). Among the 1,216 patients studied, there was a slight predominance of males (57.4%); most children came from the Metropolitan Region of Recife (42.8%); approximately half of the sample (48.9%) was 24 months or older at the first consultation. Regarding the cleft diagnosis, almost half of the sample presented cleft lip and palate (48.7%), the majority (66.2%) with complete extent, and there was predominance (49.2%) of clefts on the left side.⁸

In Ceará, Cymrot et al.⁹ conducted a retrospective study on patients diagnosed with cleft lip and/or palate undergoing surgical treatment at Albert Sabin Children's Hospital (HIAS) in Fortaleza, between June 2008 and February 2010. Among the patients, 53% were males. Complete unilateral cleft lip and palate was the most common (47.9%), followed by complete bilateral cleft lip and palate (24.7%) and complete cleft palate (23.2%).⁹

In Sergipe, the study of Luiza et al.⁴ analyzed 350 medical records of patients treated at the Specialized Society for Care to Individuals with Clefts of the State of Sergipe (SEAFESE) between 2003 and 2007. The demographic profile of the study population was males

(54.0%), of admixed ethnicity (47.2%), aged 0 to 14 years (77.4%), and living in rural areas (58.0%). Data also showed higher prevalence of cleft lip and palate (52.3%). Regarding prenatal care, almost half of the sample received prenatal care, while 7.0% reported receiving no prenatal care.⁴

A more recent epidemiological study in Sergipe revealed that, between 2003 and 2013, the prevalence estimated by DATASUS was 1 case per 2,049 live births. During the same period, the records of SEAFESE indicated a prevalence of 1 case per 1,201 individuals.¹ For the period 2013-2014, an active search conducted by the study indicated an incidence of 0.78 new cleft cases per 1,000 live births, while data from the Live Birth Information System (SINASC) indicated 0.54 new cases per 1,000 live births.¹

The availability of updated and clear data on orofacial clefts allows to identify the groups in which this pathology occurs, the associated factors, and the population's adherence to services that provide support for these cases. This enables the specialized community to develop treatment protocols that better adapt to the specificities of most cases.

Thus, the main objective of this study was to collect numerical data from DATASUS (National Health Registry) on the registration of newborns with orofacial clefts in cities from Sergipe, between 2010 and 2023, to determine the prevalence rate recorded in the state for this period and which groups are affected. The study also aimed to compare the quality of reports with previously published data.

Methodology

Study design

This retrospective observational study followed the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines, and was conducted on the population of individuals born with OC in the state of Sergipe (Brazil), registered in DATASUS between 2010 and 2023. The prevalence rate of OC in Sergipe was estimated based on DATASUS records for the study period.

This study was exempt from approval by an Institutional Review Board because it collected data from a public database from a Brazilian information system¹⁰, not identifying the sample subjects.

Context

Data were collected between November and December 2024, concluding in the month when the DATASUS platform performed its first and, to date, only update of data for the year 2023. The prevalence of OC in Sergipe was assessed from data recorded in the Live Birth Information System (SINASC) of the Ministry of Health/National Health Foundation/National Center for Epidemiology (MS/FUNASA/CENEPI), available by DATASUS. The geographic area of the research was the state of Sergipe, considering that, in this context, DATASUS collects data from all units treating patients with OC.

Participants

The study included all individuals with OC liveborn in the state of Sergipe, registered in DATASUS between 2010 and 2023, totaling 463 cases (N = 463). No exclusion criteria were applied; all records available in the database were considered.

Selection of variables

The variables selected for the study included the type of OC, based on the International Classification of Diseases (ICD), available in DATASUS; ethnicity/skin color; sex; maternal age and educational level; length of pregnancy; type of pregnancy; type and site of birth; prenatal consultations; and city of birth.

Potential biases and strategies for control

Despite the use of an official, publicly accessible database, the possibility of underreporting bias or inconsistency in SINASC records is recognized, especially in cities with less health surveillance infrastructure. Coding or data entry errors may also occur, which can impact the accuracy of prevalence estimates. No statistical corrections were applied for these biases, but the analysis considered the inherent limitations in the use of secondary data.

Data analysis and interpretation

The results were subjected to descriptive analysis and presented in tables, created in Microsoft Excel, containing absolute numbers (n), relative frequencies (%), and the total sample (N) for the analyzed data. Tables were organized to present the cleft type, biological and socioeconomic profile of individuals, the aspects of maternal and child health care received, and the city of birth.

Results

Between 2010 and 2023, a total of 463 live birth cases with orofacial clefts (OC) were recorded in the state of Sergipe. A peak incidence was observed in 2022, with 53 new cases (11.4%) (Table 1).

For the same period, DATASUS records, categorized according to the ICD, indicated predominance of non-specified cleft palate (Q359), accounting for 44.7% of cases (Table 2).

Regarding biological and socioeconomic variables, the population of new patients with clefts in Sergipe was found to be predominantly of admixed ethnicity (79.9%) and female (56.5%). The majority of mothers' ages were not reported (81.6%), and their educational level corresponded to a period of 8 to 11 school years (49%) (Table 3). The DATASUS platform only has data on sex at birth for the years 2011 to 2013, which precludes generalizing these findings for the period, as shown in Table 4.

Table 1. Yearly evolution of recorded live birth cases with orofacial clefts in Sergipe, between 2010 and 2023.

Year of birth	n	%
2010	23	5.0%
2011	25	5.4%
2012	32	6.9%
2013	28	6.0%
2014	20	4.3%
2015	36	7.8%
2016	36	7.8%
2017	33	7.1%
2018	39	8.4%
2019	32	6.9%
2020	35	7.6%
2021	36	7.8%
2022	53	11.4%
2023	35	7.6%
Total (N)	463	100%

Source: DATASUS (Ministry of Health/SVS - Live Birth Information System – SINASC), 2025.

Table 2. Live births with orofacial clefts in Sergipe according to ICD* anomaly, between 2010 and 2023.

ICD anomaly	n	%
Q351 - Hard palate cleft	5	1.1%
Q353 - Soft palate cleft	1	0.2%
Q355 - Hard and soft palate cleft	1	0.2%
Q359 - Non-specified cleft palate	207	44.7%
Q360 - Bilateral cleft lip	14	3.0%
Q361 - Median cleft lip	4	0.9%
Q369 - Unilateral cleft lip	147	31.7%
Q370 - Hard palate cleft with bilateral cleft lip	1	0.2%
Q371 - Hard palate cleft with unilateral cleft lip	7	1.5%
Q372 - Soft palate cleft with unilateral cleft lip	2	0.4%
Q373 - Soft palate cleft with unilateral cleft lip	16	3.5%
Q374 - Hard palate cleft with bilateral cleft lip	1	0.2%
Q375 - Hard/soft palate cleft with unilateral cleft lip	3	0.6%
Q378 - Cleft palate with bilateral cleft lip, non-specified	8	1.7%
Q379 - Cleft palate with unilateral cleft lip, non-specified	46	9.9%
Total (N)	463	100.0%

Source: DATASUS (Ministry of Health/SVS – Live Birth Information System – SINASC), 2025.

*ICD = International Classification of Diseases.

Table 3. Live births with orofacial clefts in Sergipe according to biological and socioeconomic variables, between 2010 and 2023 (n = 463).

Biological and socioeconomic variables	n	%
Ethnicity/Skin color		
White	45	9.7%
Black	37	8.0%
Admixed	370	79.9%
Indigenous	1	0.2%
Not informed	10	2.2%
Mother's age range (years)		
<15	2	0.4%
15-19	18	3.9%
20-34	58	12.5%
35-39	4	0.9%
40-44	3	0.6%
Ignored	378	81.6%
Mother's educational level (years)		
None	6	1.3%
1 to 3	32	6.9%
4 to 7	140	30.2%
8 to 11	227	49.0%
12 or longer	57	12.3%
Not informed	1	0.2%

Source: DATASUS (Ministry of Health/SVS – Live Birth Information System – SINASC), 2025.

Table 4. Live births with orofacial clefts in Sergipe according to biological sex, between 2011 and 2013.

Biological sex	n	%
Male	36	42.4%
Female	48	56.5%
Ignored	1	1.2%
Total	85	100.0%

Source: DATASUS (Ministry of Health/SVS – Live Birth Information System – SINASC), 2025.

Regarding maternal and child healthcare in the state of Sergipe between 2010 and 2023, 74.1% of live births with OC occurred between 37 and 41 weeks. The site of birth was not reported in 81.6% of cases, there was 56.8% of vaginal deliveries, and 97.6% were singleton pregnancies. The number of prenatal consultations was not reported in 81.6% of cases (Table 5).

The cities with the highest rates of live births with clefts in the state of Sergipe were Aracaju (71.1%), followed by Itabaiana (14.3%) (Table 6).

Table 5. Live births with orofacial clefts in Sergipe according to variables of maternal and child healthcare, between 2010 and 2023 (N = 463).

Variables of maternal and child healthcare	n	%
Length of pregnancy (weeks)		
22 to 27	1	0.2%
28 to 31	18	3.9%
32 to 36	88	19.0%
37 to 41	343	74.1%
42 or longer	5	1.1%
Not informed	8	1.7%
Type of pregnancy		
Single	452	97.6%
Twins	11	2.4%
Type of delivery		
Vaginal	263	56.8%
Cesarean section	200	43.2%
Site of birth		
Hospital	80	17.3%
Home	1	0.2%
Others	4	0.9%
Not informed	378	81.6%
Prenatal care consultations		
None	4	0.9%
1 to 3 times	10	2.2%
4 to 6 times	41	8.9%
7 or more	30	6.5%
Not informed	378	81.6%

Source: DATASUS (Ministry of Health/SVS – Live Birth Information System – SINASC), 2025.

Table 6. Live births with orofacial clefts in Sergipe according to city of birth, between 2010 and 2023 (n = 463).

City of birth	n	%
Aracaju	329	71.1%
Capela	9	1.9%
Carira	1	0.2%
Carmópolis	1	0.2%
Cristinápolis	1	0.2%
Estância	16	3.5%
Itabaiana	66	14.3%
Lagarto	16	3.5%
Nossa Senhora da Glória	7	1.5%
Nossa Senhora do Socorro	3	0.6%
Pirambu	1	0.2%
Poço Redondo	2	0.4%
Porto da Folha	1	0.2%
Propriá	8	1.7%
Salgado	1	0.2%
Simão Dias	1	0.2%

Source: DATASUS (Ministry of Health/SVS – Live Birth Information System – SINASC), 2025.

Based on data from DATASUS presented in Tables 1 to 6, a prevalence of OC of 1:994 live births was found in Sergipe between 2010 and 2023, considering 460,120 births for this period.

Discussion

For the period 2010 to 2023, the state of Sergipe recorded 463 cases of live births with orofacial clefts (OC), resulting in an estimated prevalence of 1 case for every 994 births. Unspecified cleft palate (ICD Q359) was the most common cleft type, followed by unilateral cleft lip (ICD Q369).

Regarding biological variables, there was predominance of individuals of admixed descent (79.9%). Regarding sex, DATASUS records cover only the years 2011 to 2013. Therefore, it is not possible to determine the prevalence of OC in the state for this variable within the study period. However, in this short period, there was higher incidence of female infants.

Half of the mothers had, on average, 8 to 11 years of education, which may reflect the socioeconomic conditions of the affected population. Most pregnancies occurred between 37 and 41 weeks, and there were 43.2% of deliveries by cesarean section. These data, although corroborating the high rate of cesarean sections in Brazil — well above the 15% suggested by the World Health Organization¹¹ —, should be analyzed considering that 23.1% of babies were born prematurely (22 to 36 weeks). In these cases, this type of delivery is often chosen because it is safer, although it may not always be the most appropriate option.¹²

Regarding the type of pregnancy, the vast majority were single, and only 2.4% were twins. The cities with the highest rates of live births with clefts were the capital Aracaju, followed by Itabaiana, Estância, and Lagarto.

An important limitation of data provided by DATASUS is the high proportion of incompleteness in the variables analyzed, especially regarding maternal age, site of birth, and number of prenatal consultations, with 81.6% of records presenting missing data in at least one of these categories. This gap compromises the detailed analysis of factors associated with OC, reinforcing the need for improved pro-

cesses and recording of maternal and child health information in the public system, to ensure greater reliability and data quality for future research and effective public policies.

A comparative analysis with studies in Sergipe and other states in the Northeast reveals methodological limitations, mainly due to the use of different data sources and research designs. However, between 2003 and 2013, it was identified that the most common cleft in the state of Sergipe was the complete cleft lip and palate (48.1%). Regarding the side, 72.4% of individuals had unilateral clefts, with predominance of females (51%), and most mothers received prenatal medical care (79.7%).¹

Also, the prevalence of OC recorded in DATASUS in Sergipe between 2010 and 2013 indicated 22 cases of OC in 2010, 21 cases in 2011, 25 cases in 2012, and 21 cases in 2013.¹ However, currently, assessment of data available on the platform for this same period reveals that new cases have been added, demonstrating a delay in filling out records on the platform, rather than underreporting due to lack of records.

The prevalence rate observed in this study is higher than recorded between 2003 and 2013 by Teixeira,¹ both in DATASUS (1:2,049) and in SEAFESE (1:1,201). However, this increase appears to be more related to an improvement in the quality of notifications in the DATASUS system during the study period, rather than to an actual increase in the incidence of cases.

However, it may also be inferred that Teixeira¹, in 2015, was able to access older data, from 2003 to 2009, which are currently no longer publicly available in the DATASUS section on birth defects and anomalies.

Nationally, the prevalence in Sergipe (1:994) appears to be discrepant from the rest of the country (4.24:10,000). However, as discussed by da Silva et al.⁷, who used data from 1999 onward, this is related to significant underreporting in the first years of data collection on birth defects and a delay in updating data, as previously discussed. Another important factor in the low prevalence expected for the study period in Brazil refers to the lack of data registry from several states in different years.⁷

On a global scale, the state of Sergipe appears to have a similar prevalence as expected for South American populations (0.99:1000). However, the literature reveals heterogeneity in data collection and distribution across different regions of the world, particularly in poorer countries with poor health systems.⁶ These variations reinforce the importance of improving data collection and quality, especially in regions with more vulnerable health systems.

Conclusions

Based on the results observed and discussed, it can be inferred that:

- The prevalence of orofacial clefts in the state of Sergipe from 2010 to 2023 was 1 case for every 994 live births.
- The DATASUS system still has a considerable number of variables reported as "not informed". However, qualitative progress has been observed in this service over the years. The number of cases registered in DATASUS has shown an upward trend in the total number of patients with clefts born each year since 2010, peaking in 2022. However, it is unclear whether this is due to an increase in incidence, or better management and availability of data.
- Comparing the present results with previously published data,¹ it was observed that data available in DATASUS may change over time due to the number of revisions performed each year.

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Critical revision of the article:

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Final approval of the article:

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Buccal lipectomy: variations of the intraoral technique – integrative review

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» The authors report no commercial, proprietary or financial interest in the products or companies described in this article.

» Patients displayed in this article previously approved the use of their facial and intraoral photographs.

Introduction: Buccal lipectomy consists of partial resection of the buccal fat pad and is indicated for esthetic and/or functional purposes. **Objective:** This study aims to discuss descriptions of the intraoral technique, its variations, anatomical considerations and the results achieved. **Methods:** Integrative review of Lilacs, PubMed and SciELO databases. Sixteen articles were selected, totaling 507 patients submitted to the procedure. **Results:** Surgical approaches were performed on the buccal mucosa or the upper buccal sulcus. The parotid duct was identified as the main anatomical reference for planning the incision, which was usually positioned inferiorly and posteriorly to the ductal opening. Tissue dissection was followed by delicate traction of fat tissue, and resistance to traction was the main parameter used to stop the excision. It is assumed that the resection was restricted to the buccal extension and main body of the buccal fat pad. The rate of postoperative complications was 7.8%. **Conclusion:** The surgical technique presented slight variations related to the incision and tissue divulsion, but these did not substantially interfere with the postoperative results. It was observed that surgery promoted an improvement in facial contour, patient satisfaction and remission of trauma to the buccal mucosa.

Keywords: Surgery, oral. Lipectomy. Cheek. Adipose tissue.

Introduction

The buccal fat pad (BFP), or Bichat's fat pad, is a round fat compartment, encapsulated by a thin connective tissue membrane and located superficially to the buccinator muscle.¹⁻⁴ Anatomically, it presents as a main body and four extensions: buccal, pterygoid, temporal, and pterygopalatine.^{3,4} The buccal extension, together with the main body, represents more than half the volume of the buccal fat pad,⁴ being responsible for the fullness of cheeks.²

Several functions are assigned to the BFP, such as assisting in sucking^{1,4,5} and chewing,⁴ acting as an intermuscular 'cushion', especially in neonates.⁶ It also provides cushioning protection to the adjacent structures,⁴ such as the parotid duct and branches of the facial nerve.⁶

The clinical applications of the buccal fat pad include its use for reconstructive purposes in cases of tissue defects,^{2,5} being manipulated as an autologous graft or pedicled flap⁷. It can also be subjected to resection,⁷ a procedure named 'buccal lipectomy'⁸, 'buccal fat excision'^{9,10} or 'bichectomy'.^{1,7}

Buccal lipectomy may be indicated for esthetic purposes, aimed at patients who have a rounded facial appearance, due to the pronounced volume of the fat pad in the cheek region.⁴ Thus, surgery aims at reducing the fullness of cheeks and refining the lower facial third, enhancing the zygomatic eminences.^{4,7} Additionally, surgery can also be performed due to functional indications, in cases of Morsicatio buccarum.²

The surgical technique can be performed by extra- or intraoral approach,^{2,4,11} the latter being the most commonly used⁴. In this context, professionals should be aware of information published in the literature regarding this technique. Thus, the objective of this study is to discuss

the variations of the intraoral buccal lipectomy technique, as well as its anatomical considerations and results obtained by this procedure.

Methodology

The methodology consisted of an integrative review, selecting articles that described the buccal lipectomy technique. The PICO strategy was applied to conduct the inclusion criteria:

- Population (P): individuals seeking facial fullness reduction, facial contour redefinition, and/or remission of buccal mucosa trauma.
- Intervention (I): buccal lipectomy by the intraoral approach.
- Comparison (C): between surgical techniques.
- Outcome or dependent variable (O): studies describing the surgical technique and the results obtained.
- Study type (S): primary case report/case series studies, cohort studies, or clinical trials.

However, articles within any of the following situations were excluded: technique not performed on living participants, i.e., reproduced in anatomical specimens or only described as a recommendation; use of buccal fat as a graft or pedicled flap; buccal lipectomy due to lipoma or traumatic hernia; extraoral surgical access; resection of temporal extensions of the fat pad.

The search involved the Lilacs, Pubmed, and Scielo databases. Figure 1 illustrates the article selection flowchart. No time restriction was applied. The selected languages were Portuguese and English. Initially, 297 articles were found. However, after reading the full texts, applying the inclusion and exclusion criteria, and removing duplicate articles, 16 articles were selected to compose the results of this review.

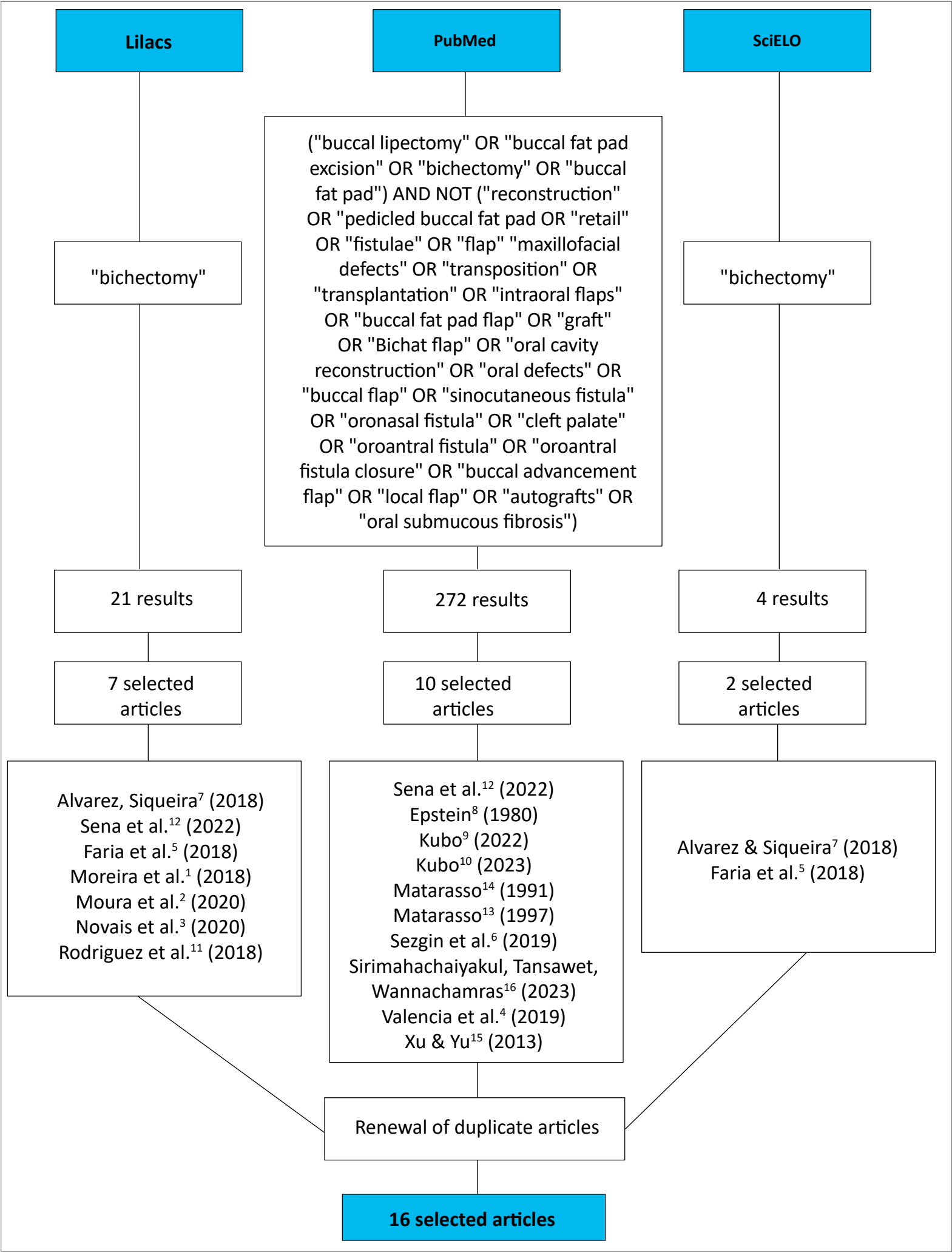


Figure 1. Flowchart of article selection.

Results

According to the present methodology, 16 articles were selected. These included four case reports,^{1,3,12,13} six case series,^{2,7,8,11,14,15} four cohort studies^{5,6,9,16} and two randomized clinical trials.^{4,10} Thus, a survey of 507 individuals submitted to buccal lipectomy was obtained.

Table 1 groups the main information collected from each article, including type of study, general information about the sample, type of indication for the procedure (esthetic, functional or esthetic-functional), anesthesia (general or local, with or without sedation), characteristics of the surgical incision (location, extent, depth, angulation and type of scalpel used) and the amount of fat excised (volume and/or weight).

Considering the studies that reported the age and sex of participants,^{1,3-7,9-16} the age ranged from 18 to 79 years and the sample consisted of 393 women (85%) and 69 men (15%). Nine studies reported association with other procedures, including application of botulinum toxin to the masseter⁷; blepharoplasty;^{7,9} masseter dissection;¹⁵ cervical lipoplasty;^{6-9,14} facial fat grafting;⁷ lipolysis by injection;¹⁶ mentoplasty;^{7,8} facial filling;⁷ nasolabial resection;⁸ rhinoplasty;⁶ and rhytidoplasty.^{7,8,10} It should be mentioned that not all procedures were performed simultaneously with buccal lipectomy. In the study by Sirimahachaiyakul, Tansawet and Wannachamras,¹⁶ the sample was subdivided into two groups: the experimental group, in which patients underwent lipolysis by injection in the cheeks prior to surgery, and the control group, in which patients had no history of lipolysis in the region.¹⁶

Table 1. Description of studies.

Author (year)	Type of study	Number of patients	Sex	Age	Indication	Anesthesia	Incision	Excised volume/weight #
Sirima-hachai-yakul; Tansawet; Wannachamras ¹⁶ (2023)	Cohort	100	86 ♀ 14 ♂	20 - 44 27 (mean)	Esthetics	Local	Buccal mucosa jugal – 1 cm inferiorly to the PD. Extension of 2 cm. Use of cold scalpel.	Mean 2.6 g
Kubo ¹⁰ (2023)	RCT	130	118 ♀ 15 ♂	21 - 79 47 (mean)	Esthetics	Local + sedation	Buccal mucosa – posteriorly and 1 cm inferiorly to the PD. Extension of 1.5 cm, vertical. Use of electric scalpel.	Mean 1.6 g
Sena et al. ¹² (2022)	Case report	1	1 ♀	19	Esthetic-functional	Local	Upper buccal sulcus – superiorly and posteriorly to the PD. Extension of 1 cm, horizontal. Restricted to the mucosa. Use of cold scalpel and surgical laser.	1.5 mL/2.1 g
Kubo ⁹ (2022)	Cohort	30	28 ♀ 2 ♂	32 - 71 54 (mean)	Esthetics	Local + sedation	Buccal mucosa – posteriorly and 1 cm inferiorly to the PD. Extension of 1,5 cm, vertical. Use of electric scalpel.	Mean 1.6 g
Moura et al. ² (2020)	Case series	39	NR	NR	Esthetics 27 Esthetic-functional 12	Local	Buccal mucosa – 1 cm inferiorly and 0.5 cm posteriorly to the PD. Extension of 1 cm, vertical. Restricted to the mucosa.	NR
Novais et al. ³ (2020)	Case report	2	2 ♀	19 and 32	Esthetic-functional	Local	Buccal mucosa – 1 cm inferiorly to the PD (case 1). Upper buccal sulcus – superiorly and posteriorly to the zygomatic crest (case 2). Extension of 1 cm, horizontal. Restricted to the mucosa	Ranged from 1.6 to 5 mL
Sezgin et al. ⁶ (2019)	Cohort	13	13 ♀	21 - 40 28 (mean)	Esthetics	General 8 Local + sedation 18	Buccal mucosa – inferiorly to the PD and superiorly to the occlusion line, at the molar level. Extension of 1,5 cm, horizontal. Use of cold scalpel.	Mean 2.7 mL (1.8 to 4.9 mL)

PD = parotid duct; NR = not reported by the authors; RCT = randomized clinical trial; ♀ = female sex; ♂ = male sex; # = Values reported in the column refer to the weight or volume of fat excised from both sides; * = The number of patients operated in the study was 7, yet only 3 were submitted to buccal lipectomy.

Table 1. (continuation) Description of studies.

Author (year)	Type of study	Number of patients	Sex	Age	Indication	Anesthesia	Incision	Excised volume/weight #
Valencia et al. ⁴ (2019)	RCT	54	44 ♀ 10 ♂	19 - 36 26 (mean)	Esthetics	Local	Buccal mucosa – 1 cm posteriorly to the PD. Extension of 0.5 cm, horizontal. Restricted to the mucosa. Use of cold scalpel.	Mean 4.3 g
Alvarez; Siqueira ⁷ (2018)	Case series	27	22 ♀ 5 ♂	19 - 59 32 (mean)	Esthetics	General 25 Local + sedation 2	Buccal mucosa – inferiorly and posteriorly to the PD. Extension of 2 cm, vertical. Restricted to the mucosa. Use of cold scalpel.	95% of the buccal extension
Faria et al. ⁵ (2018)	Cohort	59	46 ♀ 13 ♂	21 - 53 31 (mean)	Esthetics	Local	Buccal mucosa – inferiorly and posteriorly to the PD. Extension of 1.5 cm, vertical. Restricted to the mucosa. Use of electric scalpel.	Mean 3.2 mL (1.2 to 4.3 mL)
Moreira et al. ¹ (2018)	Case report	1	1 ♀	27	Esthetics	Local	Buccal mucosa – inferiorly and posteriorly to the PD. Extension of 1 cm, horizontal. Use of cold scalpel.	3.2 g
Rodriguez et al. ¹¹ (2018)	Case series	6	4 ♀ 2 ♂	26 - 32	Esthetics	Local	Buccal mucosa – inferiorly and 1.5 cm posteriorly to the PD. Extension of 0.8 to 1 cm, oblique. Involved mucosa and muscle. Use of cold scalpel.	NR
Xu & Yu ¹⁵ (2013)	Case series	8	8 ♀	24 - 32 31 (mean)	Esthetics	Local	Buccal mucosa – on the occlusion line. Extension of 1.5 cm, horizontal.	NR
Matarasso ¹³ (1997)	Case report	3*	3 ♀	36, 54 and 56	Esthetics	Local	Upper buccal sulcus – molar level. Involved mucosa and muscle.	NR
Matarasso ¹⁴ (1991)	Case series	25	17 ♀ 8 ♂	18 - 60	Esthetics	General 6 Local 19	Buccal mucosa – inferiorly and 1 cm posteriorly to the PD. Extension of 2.5 cm.	4 – 6 g
Eptsein ⁸ (1980)	Case series	9	NR	NR	Esthetics	Local	Upper buccal sulcus – superiorly to the PD, at the molar level. Extension of 3 cm.	NR

PD = parotid duct; NR = not reported by the authors; RCT = randomized clinical trial; ♀ = female sex; ♂ = male sex; # = Values reported in the column refer to the weight or volume of fat excised from both sides; * = The number of patients operated in the study was 7, yet only 3 were submitted to buccal lipectomy.

Valencia et al.⁴ subdivided their sample into two groups – hydrodissection (experimental) and without hydrodissection (control). Thus, concomitantly with the anesthetic technique, 15 mL of saline solution was infiltrated along with the anesthetic solution in patients in the hydrodissection group, while in the control group, only the anesthetic solution was injected⁴ (Table 1).

Buccal lipectomy was performed bilaterally and by an intraoral approach in all selected studies. The incision was made in the buccal mucosa in 13 studies,^{1-7,9-11,14-16} involving 493 patients (97.2% of the sample). In four studies, access was performed through the upper buccal sulcus,^{3,8,12,13} involving 14 patients (2.7% of the sample). In the study by Novais et al.³, both approaches were used. In two studies, the authors used imaginary line tracings to guide the positioning of the incision^{7,11} (Figs 2 and 3).

After incision, blunt dissection of the anatomical planes was performed, including separation of the buccinator muscle fibers. After identifying and clipping the buccal fat, Faria et al.⁵ and Matarasso¹³ incised the fibrous capsule that surrounds the buccal fat pad, while Alvarez & Siqueira⁷ and Sena et al.¹² chose to keep it intact. Subsequently, the fat was pulled towards the surgical field until excision. Except for the study by Valencia et al.,⁴ the others performed suturing of the surgical wound.¹⁻¹⁶

Rodriguez et al.¹¹ applied photobiomodulation in the first 48 hours after buccal fat excision in the experimental group (n=3), while the control group (n=3) did not receive such therapy.

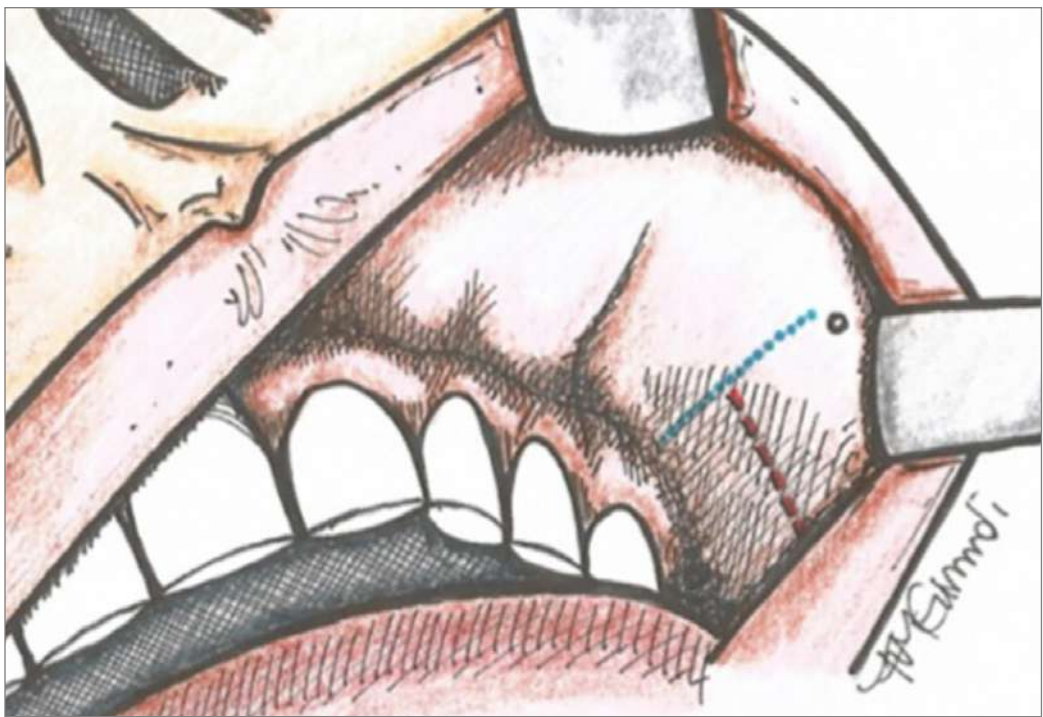


Figure 2. Intraoral "T" technique. Initially, the buccal vein (blue line) and the parotid duct opening (point on the right) are identified. Then, the incision (red line) is drawn perpendicular halfway between the duct and the buccal sulcus, starting at the buccal vein. Source: Alvarez and Siqueira⁷, 2018.

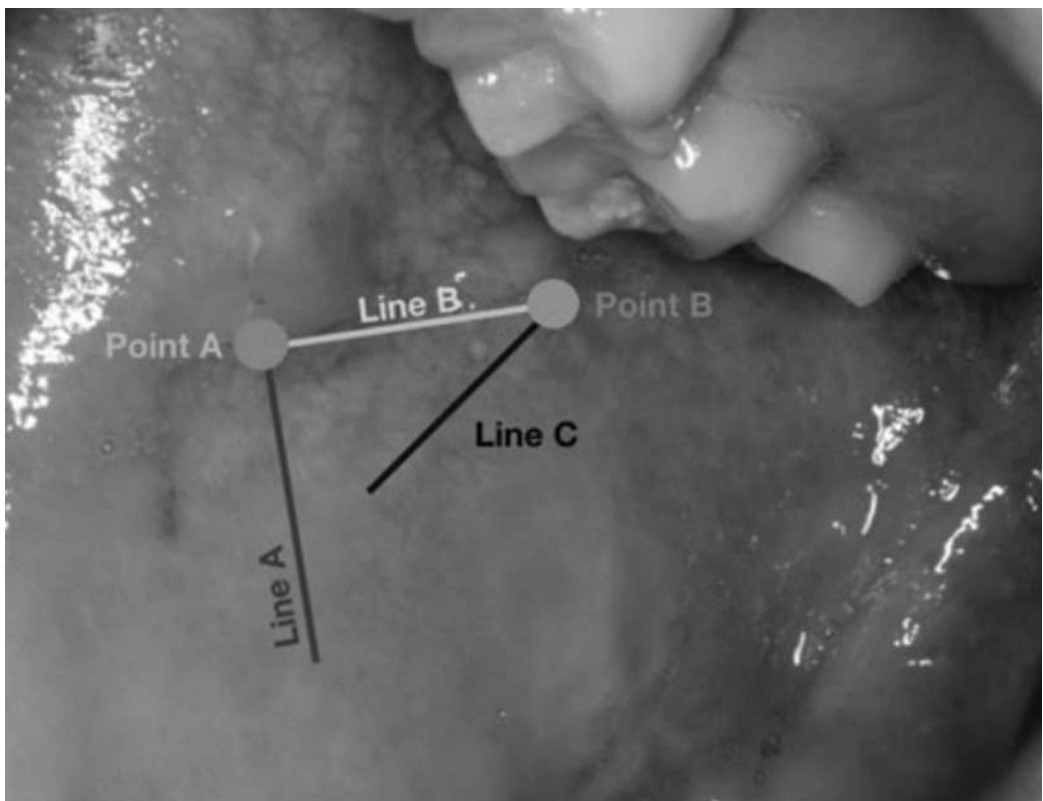


Figure 3. Incision planning. Point A: parotid duct opening. Line A: imaginary line parallel to the anterior border of the masseter muscle crossing the parotid duct opening, representing the safety limit of the incision. Point B: imaginary point located 1.5 cm posterior to the parotid duct opening. Line B: imaginary line connecting points A and B. Line C: incision line angled at 30° with line B, with 0.8- to 1-cm length. Source: Rodriguez et al.¹¹, 2018.

Table 2 summarizes the information described on the postoperative outcomes achieved in each study, as well as the reported follow-up time and postoperative complications.

The reported follow-up time ranged from 48 hours to 4 years. The overall postoperative complication rate was 7.8% (40 cases).

Table 2. Postoperative results.

Author (year)	Follow-up	Postoperative outcomes	Complications
+ Sirimahachaiyakul; Tansawet; Wannachamras ¹⁶ (2023)	1 to 12 months 7.41 months (mean)	Comparison – injection lipolysis vs. without injection lipolysis: The authors reported greater difficulty in excising fat in patients in the injection lipolysis group. Also, all complications occurred in this group.	Suture dehiscence 1 Flaccid cheeks 1
+ Kubo ¹⁰ (2023)	12 months	The 3D photography software revealed a volumetric reduction of the lower face. Satisfaction questionnaire: 96.2% declared themselves satisfied. According to the author's report, there was improvement in facial contour.	Thin facial aspect 2 Hemorrhage 1
Sena et al. ¹² (2022)	6 months	Comparison – laser incision vs. cold scalpel incision: • The side subjected to laser incision presented less pain at 5 and 7 days postoperatively (VAS scale) and less edema at 7 and 14 days postoperatively (facial measurements) compared to the side subjected to cold scalpel. According to the author's report, there was remission of traumatic lesions to the buccal mucosa and improvement in facial contour. The patient stated to be satisfied with the result.	NR
+ Kubo ⁹ (2022)	12 months 36 months*	The 3D photography software revealed a reduction in volume and horizontal length of the lower face. Satisfaction questionnaire: 80.1% declared themselves satisfied.	Flat cheeks 1 Hematoma 24 Hemorrhage 1
Moura et al. ² (2020)	2 months	Satisfaction questionnaire: 89% declared themselves satisfied.	Infection 1
Novais et al. ³ (2020)	1.5 to 2 months	According to the authors' report, there was remission of traumatic lesions in the buccal mucosa and the facial contour was more defined. Also, the patients reported a high degree of satisfaction.	NR
+ Sezgin et al. ⁶ (2019)	6 to 13 months 9.4 months (mean)	Ultrasound revealed a mean reduction of 3.1 mL in facial volume, bilaterally. The examination demonstrated that temporal extensions were intact in 100% of cases. Satisfaction questionnaire: 100% declared themselves satisfied.	None

NR = not reported; VAS = Visual analog scale; + = There was association with other cervicofacial procedures in these studies; * = The follow-up time of the study was 12 months, except for one patient who was followed for 36 months postoperatively; 3D = three-dimensional.

Table 2. (continuation) Postoperative results.

Author (year)	Follow-up	Postoperative outcomes	Complications
Valencia et al. ⁴ (2019)	6 to 18 months 9.2 months (mean)	Comparison – hydrodissection vs. without hydrodissection: The hydrodissection group showed 41.2% reduction in pain (VAS scale) compared to the control group, both during and at 2 and 72h postoperatively. The hydrodissection group showed a 50% reduction in surgical time compared to the control group.	Neuropraxia of facial nerve 2
+ Alvarez; Siqueira ⁷ (2018)	NR	According to the authors' report, the patients were satisfied.	Neuropraxia of facial nerve 1 Sialoceles 1
Faria et al. ⁵ (2018)	12 to 26 months	Satisfaction questionnaire: 93.22% declared themselves satisfied. According to the authors' report, the cervicofacial contour was more harmonious.	Hematoma 1
Moreira et al. ¹ (2018)	6 months	According to the authors' report, the patient was satisfied.	NR
Rodriguez et al. ¹¹ (2018)	48 hours	Comparison – photobiomodulation vs. without photobiomodulation: The photobiomodulation group presented less edema (facial measurements) and less pain (VAS scale) compared to the control group, both at 24h and 48h postoperatively.	NR
+ Xu & Yu ¹⁵ (2013)	6 to 8 months	According to the authors' report, 100% of patients were satisfied.	None
+ Matarasso ¹³ (1997)	18 to 48 months 36 months (mean)	According to the author's report, all patients were satisfied.	None
+ Matarasso ¹⁴ (1991)	6 to 48 months 36 months (mean)	According to the author's report, patients noticed a subtle esthetic change.	None
+ Eptsein ⁸ (1980)	10 to 14 months	According to the author's report, all patients were satisfied.	Hemorrhage 2

NR = not reported; VAS = Visual analog scale; + = There was association with other cervicofacial procedures in these studies; * = The follow-up time of the study was 12 months, except for one patient who was followed for 36 months postoperatively; 3D = three-dimensional.

Discussion

This study aimed to analyze the descriptions published in the literature on the intraoral technique of buccal lipectomy, as well as its variations, anatomical considerations, and results achieved.

Regarding the anesthetic protocol, local anesthesia proved effective for the procedure. Conversely, in three studies, part of the patients underwent general anesthesia.^{6,7,14} Thus, it is assumed that the association of buccal lipectomy with other surgical procedures may have justified the choice of general anesthesia.

In this review, the use of hydrodissection was identified in a randomized clinical trial.⁴ This technique provided more satisfactory results concerning pain reduction and surgical time, when compared to surgery without hydrodissection.⁴ However, no other studies using this approach for buccal lipectomy were found.

Regarding the surgical incision, there were variations in location, angulation, and depth. Basically, two types of approaches were used: in the upper buccal sulcus^{3,8,12,13} or in the buccal mucosa.^{1-7,9-16} Among these, the buccal mucosa approach proved to be more prevalent, especially performed inferiorly and posteriorly to the parotid duct opening.^{1,2,5,7,9-11,14}

When comparing both approaches — buccal mucosa and upper buccal sulcus — Novais et al.³ and Kubo^{9,10} converge in reporting that incision in the buccal mucosa, inferiorly to the duct (Matarasso technique), requires greater tissue dissection, which makes the procedure more traumatic, increasing the likelihood of postoperative edema. The only study that employed both techniques was conducted by Novais et al.,³ in which the authors concluded that the approach through the buccal

sulcus demonstrated easier access to the fat pad, greater efficiency concerning the volume of tissue removed, and was less traumatic. However, the more superiorly located access increases the risk of excessive fat resection, which can lead to an excessively thin appearance in the upper cheek region.¹⁰ From an anatomical standpoint, the Matarasso approach allows for more targeted tissue resection towards the buccal extension of the BFP, the portion responsible for the fullness of cheeks.^{9,10}

Regarding the anatomical references adopted for incision planning, the authors agreed that caution is required concerning the parotid duct, keeping the incision at a slight distance from the ductal opening.¹⁻¹⁶ The only study that did not consider the duct as reference for the incision was conducted by Xu & Yu,¹⁵ who chose to perform it on the occlusion line. Regarding the incision design, its angulation varied across vertical,^{2,5,7} horizontal^{1,3,4,6,9,10,12,15} or oblique,¹¹ and its approximate length varied from 0.5 to 3 cm.

The authors agreed in restricting the incision depth to the mucosal layer, managing the buccinator muscle layer only with blunt instruments.^{2,3,4,5,7,12} This approach was supported by Alvarez & Siqueira,⁷ aiming at reducing intraoperative bleeding. In contrast, two studies mentioned that the incision depth was extended to the buccinator muscle, simultaneously involving the mucosal and muscular layers.^{11,13} However, no studies were found that compared both depths and their clinical implications.

Regarding the type of scalpel used, there was slight predominance of use of electric scalpel (222 cases, 43.5% of the sample)^{5,9,10} compared to cold scalpel (202 cases, 39.4% of the sample).^{1,4,6,7,11,16} Also, we identified

a split case report in which the patient's side submitted to laser incision presented more efficient hemostasis, pain control and edema control, when compared to the side in which the cold scalpel was used.¹² In this context, the use of surgical laser was advantageous due to its cauterizing effect, considering that the tissues surrounding the buccal fat pad are highly vascularized. However, it should be noted that this is a case report, and no other studies have used the same methodology.

After the incision, tissue dissection maneuvers are performed to achieve access to the buccal space and, consequently, to the buccal fat pad. At this stage of surgery, blunt instrumentation was recommended to prevent injury to local noble structures.^{1-3,5,7,9,10,12-15} Additionally, Alvarez and Siqueira⁷ indicate that such dissection should be performed parallel to the buccinator fibers, to minimize surgical trauma.

Aiming at assisting in the excision of buccal fat, external pressure on the face can be used.^{2,3,8,14,13} However, Alvarez & Siqueira⁷ disagree with this maneuver, arguing that it could distort the local anatomy and complicate the identification of the fat pad.

After identifying the buccal fat pad, the authors differed on whether or not to preserve its fibrous capsule. While the capsule was incised in some studies,^{2,5,14,13} others advise against such approach and preferred to keep it intact.^{7,12} The justification for preserving the capsule, according to Sena et al.,¹² lies in facilitating the homogeneous removal of fat on both sides. Also, the authors agreed that, for excision of the buccal fat pad, delicate traction should be applied to this structure^{2,7,8,12-14} under rotational movements.^{1,5,12}

Considering that buccal lipectomy involves partial resection of the buccal fat pad, it is advisable to know how much tissue should be removed. In this sense, the parameter most used by the authors consisted of resecting only the tissue that projected easily or that was not resistant to traction.^{1,2,4,6,9,11,12,14} This parameter is based on the intention to avoid excessive resection, excessively thin facial appearance^{4,6,9,14} and lesions to local noble structures.^{6,14} In this context, the authors alluded to preserving the upper-posterior portions of the fat pad,^{2,5,6,7,9} which in turn tend to retract during clipping due to the ligaments that pull them towards the surrounding tissues.¹⁰

Concerning the weight and volume excised, there were variations from 0 to 6 grams^{4,9,10,12,14,16} and from 1.5 to 5 milliliters,^{3,5,6,12} respectively. Besides the surgical technique of the professional, such differences may be assigned to the size of the buccal fat pad, which differs among patients, as confirmed in studies using ultrasound in the preoperative period.^{3,6} Another factor that may influence the amount of fat excised is the previous history of lipolysis by injection in the cheek area, as demonstrated in a cohort study.¹⁶ The literature indicates that tissue resection should not exceed 5 mL (50 to 70% of the total volume of the buccal fat pad), which corresponds to the buccal extension and the main body of the fat pad². In this context, considering the articles that informed the values of excised weight and volume,^{1,3,4,5,6,9,10,14,16} it is assumed that these studies restricted the resection of the buccal extension and main body. It is inferred that excising the most superior and posterior portions could lead to functional impairments in mastication and greater postoperative morbidity, without additional esthetic benefits.^{2,6} Sezgin et al.⁶ demonstrated, by ultrasound, that the temporal extensions were intact six months after surgery.⁶

In the postoperative period, there was a low complication rate (7.8%), which was even lower (2.9%) considering only studies that performed buccal lipectomy in isolation.^{1-5,11,12} Thus, may be assumed that the association with other procedures may have increased the postoperative morbidity. Regarding the type of complication, those of vascular nature, such as hematoma and hemorrhage, were the most reported, affecting 5.9% of the total sample.^{5,8,9,10,16} It should be emphasized that four articles did not report any information about complications,^{1,3,11,12} thus it is not possible to state if they were free of complications or they were omitted.

When conducting the literature review, a limitation was identified in the literature regarding the lack of longitudinal studies on buccal lipectomy. The reported postoperative follow-up time ranged from 48 hours to 4 years. Thus, future studies should monitor the effects of surgery on the aging process. It is worth noting that studies as conducted by Rodriguez et al.¹¹ only evaluated variables related to the immediate postoperative period in relation to photobiomodulation, which may have justified the short follow-up time.

It was observed that the evaluation of postoperative results was conducted using a variety of methods, either measurable or not. Among these methods, three-dimensional photographs^{9,10} prove to be the most reliable method to assess the volumetric reduction promoted by surgery, since they quantified this variation in real size. It is worth noting that, although 13 articles reported information regarding patient satisfaction,^{1-3,5,6-10,12-15} only 5 explicitly mentioned the application of questionnaires, reporting an acceptance rate of 89 to 100%.^{2,6,9,10}

It was observed that the association of buccal lipectomy with other cervicofacial procedures is common in the literature.^{6-10,14-16} Thus, patients aiming to reduce cheek fullness also tend to seek other procedures that aim at cervicofacial harmony. It is postulated that such association may have influenced the postoperative outcomes achieved.

Considering the photographs and descriptions provided by the articles, there was improvement in facial contour.^{1-3,5,6-10,12-15} Also, surgery promoted remission of clinical manifestations of buccal mucosal trauma,^{2,3,12} highlighting its role not only in esthetics, but also for function.

Conclusion

Buccal lipectomy surgery by intraoral approach may present some technical variations, especially during incision and tissue dissection. However, in this review, such variations demonstrated little impact on the results achieved by surgery, with more influence in the transoperative and immediate postoperative periods. Two types of access can be used: in the upper buccal sulcus or in the buccal mucosa, the latter being the most usual. Also, it was observed that, in the short and medium terms, surgery provided favorable results in terms of esthetic improvement of facial contour, patient satisfaction, and remission of buccal mucosa trauma.

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Data acquisition, analysis or interpretation:

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Writing the article:

SCFG, PRM

Critical revision of the article:

SCFG, PRM, RMB, DNS, MAAS

Final approval of the article:

SCFG, PRM, RMB, DNS, MAAS

Overall responsibility:

SCFG, PRM, RMB, DNS, MAAS

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Current antibiotic protocols: penicillin allergy in oral surgery

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ABSTRACT

Introduction: Allergy to amoxicillin (a first-line beta-lactam) is a common challenge in Dentistry, especially in oral surgery and prophylaxis. Historically, clindamycin was the main alternative, but recent guidelines revised this recommendation, due to the high risk of *Clostridioides difficile* colitis. **Objective:** The primary objective was to assess the rationale for clindamycin restriction and detail the preferred alternatives. **Methods:** This systematic review analyzed publications (2010-2024) and clinical guidelines (AHA, ADA) to identify and evaluate current antibiotic protocols for patients with documented or suspected amoxicillin allergy. **Results:** Clindamycin has been formally removed from the first line of international prophylactic alternatives, citing the high risk of pseudomembranous colitis and increased microbial resistance. Preferred alternatives include macrolides (azithromycin/clarithromycin) and doxycycline. Cephalosporins may be used in cases of non-IgE-mediated allergy (non-immediate allergy). **Conclusion:** The routine use of clindamycin in oral surgery for patients with penicillin allergy is no longer acceptable. Current protocols require dental professionals to prioritize safer alternatives, adopting an antimicrobial “stewardship” approach including allergic risk stratification and judicious drug use.

Keywords: Penicillin allergy. Clindamycin. Antibiotic prophylaxis. Oral surgery. *Clostridioides difficile*.

Introduction

The management of odontogenic infections and prophylaxis of infectious complications, such as bacterial endocarditis, are fundamental pillars of oral surgery. In this scenario, beta-lactam antibiotics, particularly amoxicillin, are recognized as gold standard, due to their favorable spectrum against the most common oral pathogens and their safety profile.¹

It is estimated that up to 10% of the general population report penicillin allergy, although true, Ig-E mediated hypersensitivity (anaphylaxis), is much less prevalent.² Inaccurate diagnosis or the maintenance of a "penicillin allergy" label without clinical confirmation creates the need for drug replacement, leading the patient to use second-line antibiotics that often provide less advantageous risk-benefit profiles.

Historically, clindamycin, an antibiotic from the lincosamide class, has been considered the alternative of choice for patients with penicillin allergies undergoing oral surgery.^{3,4} The rationale for its use rely on in its excellent oral bioavailability, good penetration into soft and bone tissues, and proven efficacy against the main anaerobic pathogens and Gram-positive cocci present in the oral cavity.⁵

However, clinical practice based on automatic substitution by clindamycin has been progressively challenged by strong evidence that the risk associated with this drug may be disproportionate to its indication in Dentistry. Recent guidelines, such as those from the American Heart Association (AHA) and the American Dental Association (ADA), have promoted a paradigm shift, removing clindamycin from the first alternative position.^{6,7} This change was mainly based on the notoriously high risk of pseudomembranous colitis induced by *Clostridioides difficile* (*C. difficile*), which may be fatal.

Conversely, older and even some national and regional guidelines^{8,9} might still cite clindamycin as a viable option, demonstrating the need for an urgent update in the clinical practice of dental professionals.

The aim of this literature review is to provide an in-depth and up-to-date analysis of antibiotic therapy protocols in patients with amoxicillin allergy undergoing oral surgery, detailing the scientific basis that led to the restriction of clindamycin use and highlighting the safer alternatives recommended by the most recent international guidelines. Additionally, the study explores the role of Antimicrobial Stewardship in Dentistry, including the importance of screening and "de-labeling" the penicillin allergy.¹⁰

Methodology

This literature review was conducted to synthesize the current knowledge on antibiotic therapy in patients with amoxicillin allergy undergoing oral surgery procedures, addressing both the prophylaxis and treatment of established infections.

Search strategy and data source

The literature review was conducted on the databases PubMed (including MeSH), Scopus, and Google Scholar. The search period prioritized publications after 2010, with special focus on articles and guidelines from 2020 to 2024, to ensure the inclusion of the most recent changes in protocol.

Descriptors and search criteria

The controlled descriptors (DeCS/MeSH) and free terms used in the search included combinations of: "Penicillin Allergy" OR "Amoxicillin Hypersensitivity" AND "Clindamycin" OR "Azithromycin" OR "Cephalosporins" AND "Antibiotic Prophylaxis" OR "Infective Endocarditis" AND "Oral Surgery" OR "Dental Procedures" AND "Clostridioides difficile" OR "Pseudomembranous Colitis".

Systematic review articles, meta-analyses, clinical trials, observational studies, and consensus statements from professional associations (AHA, ADA, and international health agencies) were included. Articles without full text available or exclusively addressing antibiotic therapy in oncological or immunosuppressed patients without direct relevance to routine oral surgery were excluded.

Data selection and analysis

Initial screening was based on titles and abstracts. Potentially relevant articles were read for data extraction, which were categorized into three main thematic axes for analysis and presentation in the Results: (1) The Increased Risk of Clindamycin; (2) Preferred Pharmacological Alternatives; and (3) Implications of New Guidelines and Antimicrobial Stewardship. The reliability and validity of information were verified by cross-referencing between guidelines from different health entities.

Results

The results of the literature review and analysis confirm a consolidated shift in clinical recommendations regarding the use of clindamycin, with clear preference for other antimicrobial alternatives in patients with amoxicillin allergy.¹¹

1. The Exclusion of Clindamycin from the First-Line Alternatives

Clindamycin, despite its excellent activity against oral anaerobes, has been progressively marginalized. The decisive basis for its exclusion from primary prophylaxis protocols (and restriction in empirical treatment) has been the disproportionately high risk of antibiotic-associated diarrhea and, in severe cases, pseudomembranous colitis caused by *C. difficile* toxin.¹²

Epidemiological studies demonstrate that, although the overall incidence of *C. difficile* infection (CDI) is relatively low, clindamycin presents the highest risk among all commonly used antibiotics, being associated with a CDI risk up to 17 times higher compared to individuals exposed or not to macrolides.¹¹ This risk is significant even after a single dose used for prophylaxis.

Besides the gastrointestinal risk, the use of clindamycin, when compared to beta-lactams, was associated with higher mortality, leading to questions about its clinical efficacy *in vivo* in contexts of emerging resistance.¹² For these reasons, consensus documents from 2021 onwards^{6,13} removed it from routine prophylactic protocols.

2. Preferred Pharmacological Alternatives

The most recent guidelines prioritize antibiotics classes with comparable efficacy and superior safety profile in the context of oral surgery.^{14,15}

A. Macrolides (Azithromycin and Clarithromycin)

Macrolides are the most recommended alternatives for the prophylaxis of infective endocarditis in patients with penicillin allergy.

- Azithromycin: Dosage of 500 mg (oral intake), single dose, one hour before the procedure⁶. It is preferred due to its prolonged half-life and lower rate of drug interactions.
- Clarithromycin: Dosage of 500 mg (oral intake), single dose, one hour before the procedure.⁶ Though effective, it may cause more gastrointestinal dysfunction (nausea) than azithromycin.

Both macrolides cover *Viridans* streptococci, the main etiological agent of infective endocarditis of oral origin.

B. Tetracyclines (Doxycycline)

Doxycycline 100 mg (oral intake), single dose, is also mentioned as a viable prophylactic option, especially for patients with contraindications to macrolides.⁶ Its spectrum covers several oral pathogens and its prophylactic use presents low risk of CDI.

C. Cephalosporins (Ex: Cephalexin)

Cephalosporins are beta-lactams structurally similar to penicillin, but the risk of cross-allergy is usually low, ranging from <3% to <5%¹⁶. They are considered safe only for patients with history of non-immediate penicillin allergy (non-IgE mediated, i.e., without anaphylaxis, angioedema, or severe urticaria).

- Cephalexin (first generation): Prophylactic dose of 2 g (oral intake), one hour before the procedure⁷. It presents a good spectrum against Gram-positive bacteria.
- Caution: Patients with history of anaphylaxis to penicillin should avoid cephalosporins and opt for macrolides or doxycycline.

3. The Focus on Antimicrobial Stewardship and Allergy

Recent literature emphasizes that the management of penicillin allergy is an integral part of Antimicrobial Stewardship.

High Number of "False Allergies": The label of penicillin allergy is frequently incorrect.¹⁰ It is estimated that more than 90% of patients who report allergy do not have true hypersensitivity after screening.² Maintaining this label leads to unnecessary use of more expensive and potentially more toxic alternatives, such as clindamycin.

De-labeling strategies: Referral for allergy testing or oral provocation tests is highly recommended for low-risk patients, since "de-labeling" allows for a safe return to amoxicillin¹⁷. This optimizes therapy for future infections and is also a public health strategy to reduce selective pressure on second-line antibiotics.

Rational prescription: Most oral surgery procedures (simple extractions, uncomplicated implants) do not require routine antibiotic prophylaxis. The indication should be restricted to: 1) patients at high risk for infective endocarditis (prosthetic valve, history of endocarditis, specific congenital heart disease) and 2) cases of extensive surgery with a high risk of contamination or severely immunocompromised patients.^{14,15} Local treatment (drainage, tooth extraction) remains the primary intervention for localized abscesses.

Discussion

The evolution of antibiotic therapy protocols in oral surgery is a microcosm of the global Antimicrobial Stewardship (AS) movement. AS aims to ensure the use of antibiotics only when necessary, as well as selection of the most appropriate agent, at the correct dose and for the shortest effective time.⁷ Dentistry, as a significant prescriber of antibiotics, has a crucial responsibility in this context.

The removal of clindamycin as a first-line alternative for patients with penicillin allergy^{6,11} represents a victory for patient safety over clinical tradition. Although clindamycin is a powerful agent, the risk of CDI — an infection that can lead to prolonged hospitalization, colectomy, and even death — is a rather high burden to be justified in a routine prophylaxis setting, especially when safer alternatives are available.

The central aspect is related to risk management. Preferred alternatives, such as azithromycin and clarithromycin, have demonstrated a significantly lower gastrointestinal safety profile and risk of CDI, while maintaining adequate coverage for endocarditis prophylaxis.⁶ Doxycycline, a tetracycline, is an excellent option for patients with contraindications or failure in macrolides, with low toxicity and efficacy against Gram-positive cocci.

Regarding cephalosporins, the use of cephalexin or cefuroxime should be done with caution and under strict screening. The risk of cross-allergic reaction, although low in non-IgE-mediated allergies, still requires a detailed history of the type of reaction previously suffered by the patient.¹⁶ Mild delayed skin reactions (non-anaphylactic) generally allow the safe use of first- or second-generation cephalosporins. However, for any history of anaphylaxis, the rule is to avoid cephalosporins in

those who have had anaphylaxis, angioedema, or urticaria from the use of penicillin/ampicillin; in mild non-immediate reactions, evaluate the use of first/second generation cephalosporins.

A neglected but fundamental component for AS is the "de-labeling" of penicillin allergy. Healthcare professionals, including dental professionals, should be educated about the low probability of true allergy in many labeled patients.² By de-labeling the allergy (by referral to an allergologist), the patient returns to the use of amoxicillin, reducing the need to use second-line antibiotics, reducing the risk of CDI and decreasing the selective pressure for antimicrobial resistance.^{10,17}

The clinical implications of this review in Dentistry are clear: 1) Re-assess the indication: the use of antibiotics, whether for prophylaxis or treatment, should be limited to the strict criteria of guidelines.¹⁵ Most extractions do not require prophylaxis. 2) Prioritize safety: when prophylaxis is mandatory (risk of endocarditis), clindamycin should be avoided. Azithromycin, clarithromycin and doxycycline are the new primary alternatives.⁶ 3) Investigate the allergy: a detailed history of the nature of the previous allergic reaction is essential to differentiate immediate (IgE-mediated) from non-immediate reactions, allowing risk stratification and eventual release to use cephalosporins.

In short, contemporary practice requires a change in mindset, in which clindamycin is reserved as a last therapeutic option, only in cases of failure or contraindication of all safer alternatives. Adherence to this new paradigm improves patient safety and actively contributes to the control of antimicrobial resistance in the community.

Conclusions

The paradigm of automatic substitution of amoxicillin by clindamycin in allergic patients, in the context of oral surgery, has been formally refuted by the most recent international clinical guidelines, due to the disproportionately high risk of *Clostridioides difficile* colitis.

Dental professionals should adopt the updated protocol, which prioritizes the use of macrolides (azithromycin/clarithromycin) and doxycycline as primary alternatives for prophylaxis and treatment. First- or second-generation cephalosporins are safe options for patients with non-anaphylactic allergies.

Dental professionals should actively participate in Antimicrobial Stewardship, including screening and referral for penicillin allergy de-labeling, reducing unnecessary exposure to second-line antibiotics and preserving the effectiveness of amoxicillin in the future.

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Abdominal fat graft in TMJ surgery: retrospective study

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» Patients displayed in this article previously approved the use of their facial and intraoral photographs.

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ABSTRACT

Introduction: Temporomandibular joint (TMJ) ankylosis is a rare condition, usually caused by trauma or local infections, characterized by the fusion of the articular surfaces by bone or fibrous tissue. It severely restricts mouth opening, affecting chewing, speech, appearance, and hygiene. Gap arthroplasty with interpositional abdominal fat graft is a well-established treatment. **Objective:** This retrospective longitudinal study aimed to assess clinical and imaging outcomes in four patients who underwent this procedure at a specialized center. **Methods:** Mouth opening, pain, and heterotopic bone formation in the condylar segment were evaluated one week before and 12 months after surgery. Scar quality at the donor and recipient sites was also assessed, based on patient and professional perceptions, compared to normal skin. Data were analyzed with a significance level of 0.05. **Results:** There was a significant improvement in mouth opening ($p = 0.005$). Although pain and condylar volume decreased, no significant differences were found ($p > 0.05$). Both patient and professional assessments indicated that surgical scars resembled normal skin. **Conclusion:** Gap arthroplasty with abdominal fat graft interposition proved effective in the management of TMJ ankylosis.

Keywords: Ankylosis. Arthroplasty. Temporomandibular joint. Abdominal fat. Scar.

Introduction

Temporomandibular joint (TMJ) ankylosis, unilateral or bilateral, is a severe, rare, and distressing condition characterized by the fusion of the mandibular condyle and the temporal fossa through fibrous or bony adhesions.^{1,2} These structural changes significantly alter the anatomy and physiology of the maxillofacial complex, leading not only to masticatory limitations, but also airway involvement and facial deformity, affecting the patient in a psychosocial context.³ Regarding its etiology, it may be of traumatic origin, infectious, as well as arising from previous joint surgical procedures and/or systemic diseases.^{4,5}

Diagnosis is based on a combination of clinical and imaging examinations. Clinically, patients present with mechanical restriction of mandibular movement, manifested by severely limitation of mouth opening, as well as difficulty in speaking and chewing. This condition compromises effective oral hygiene and increasing the risk of dental caries and periodontal disease. Facial deformity may be present in patients who developed ankylosis in childhood or during the growth periods.^{3,6,7} Imaging allows for classification of the ankylosis type according to Sawhney's system (type I, II, III and IV).⁸

The surgical management of TMJ ankylosis promotes the functional re-establishment of the structures involved. The recovery of mouth opening range enables the efficient return of oral hygiene.⁶ Contemporary surgical options include simple arthroplasty of the ankylotic mass, gap arthroplasty with or without interpositional grafting, costochondral reconstruction, and alloplastic joint replacement.^{9,10} The selection of surgical technique depends on factors such as extent of ankylosis, patient age and skeletal maturity, surgeon's ability, etiology and cost.^{2,5,11,12}

When a gap arthroplasty is performed, the concomitant use of autogenous tissue grafts serves to obliterate the dead space created by resection of the ankylotic mass and stimulate hemostasis, preventing the chances of recurrence of ankylosis.^{13,14} This study aimed to evaluate the mouth opening, pain perception and the residual condylar bone volume of patients undergoing gap arthroplasty of TMJ with association of the use of non-vascular graft of abdominal fat. Additionally, this study seeks to show the perception of the individuals participating in the study and professionals responsible for the surgery, regarding the perception of the tissue scar resulting from both the donor site and the recipient site.

Methods

Study design

This study was approved by the Research Ethics Committee, in accordance with the ethical standards established by National Health Council resolution no. 466/2012. It was conducted in accordance with the principles of the Declaration of Helsinki. The report adheres to the STROBE guidelines for observational studies. This was a longitudinal retrospective study performed on four patients who underwent gap arthroplasty surgery with abdominal adipose tissue graft interposition over a three-year period. The study population was composed of individuals of both sexes, aged 16 years or older, with indication for TMJ ankylosis surgery.

Participants were excluded if they presented with any type of alteration and/or systemic impairment that could influence the normal healing process, neuropathic disorders associated with joint pain, alteration and/or genetic or syndromic disorders.

Surgical technique of arthroplasty associated with grafting of abdominal fat tissue

All patients underwent arthroplasty for the treatment of TMJ ankylosis under general anesthesia with bronchoscopy-guided nasotracheal intubation. Four patients received unilateral arthroplasty, while one underwent bilateral arthroplasty. Surgical access was achieved via an endaural approach, starting at the helix–preauricular skin junction. The dissection proceeded along with the tragal cartilage, extending superiorly to the temporal fascia and inferiorly to the parotid tail, exposing the zygomatic arch and the ankylotic block. The ankylotic block was then removed using piezoelectric and micro-saw instruments for gap arthroplasty, followed by a mandibular mobilization. When indicated, intraoral coronoidectomy was performed bilaterally.¹⁵ Concurrently, an autologous abdominal fat graft was removed by the general surgery team through a 3–4 cm transverse incision in the lower abdomen and prepared with topical clindamycin before implantation. The harvest was performed by the general surgery team under the same general anesthesia. The fat was minimally manipulated and transferred to the TMJ field as a single piece, for interpositional placement. The grafts were inserted in the articular space, and both surgical sites were closed in layers with absorbable sutures in the deeper planes and nylon in the skin. All study participants were referred to physiotherapy in the post-operative period, in which the recommendation was to start after seven days of the surgical procedure (Fig. 1).

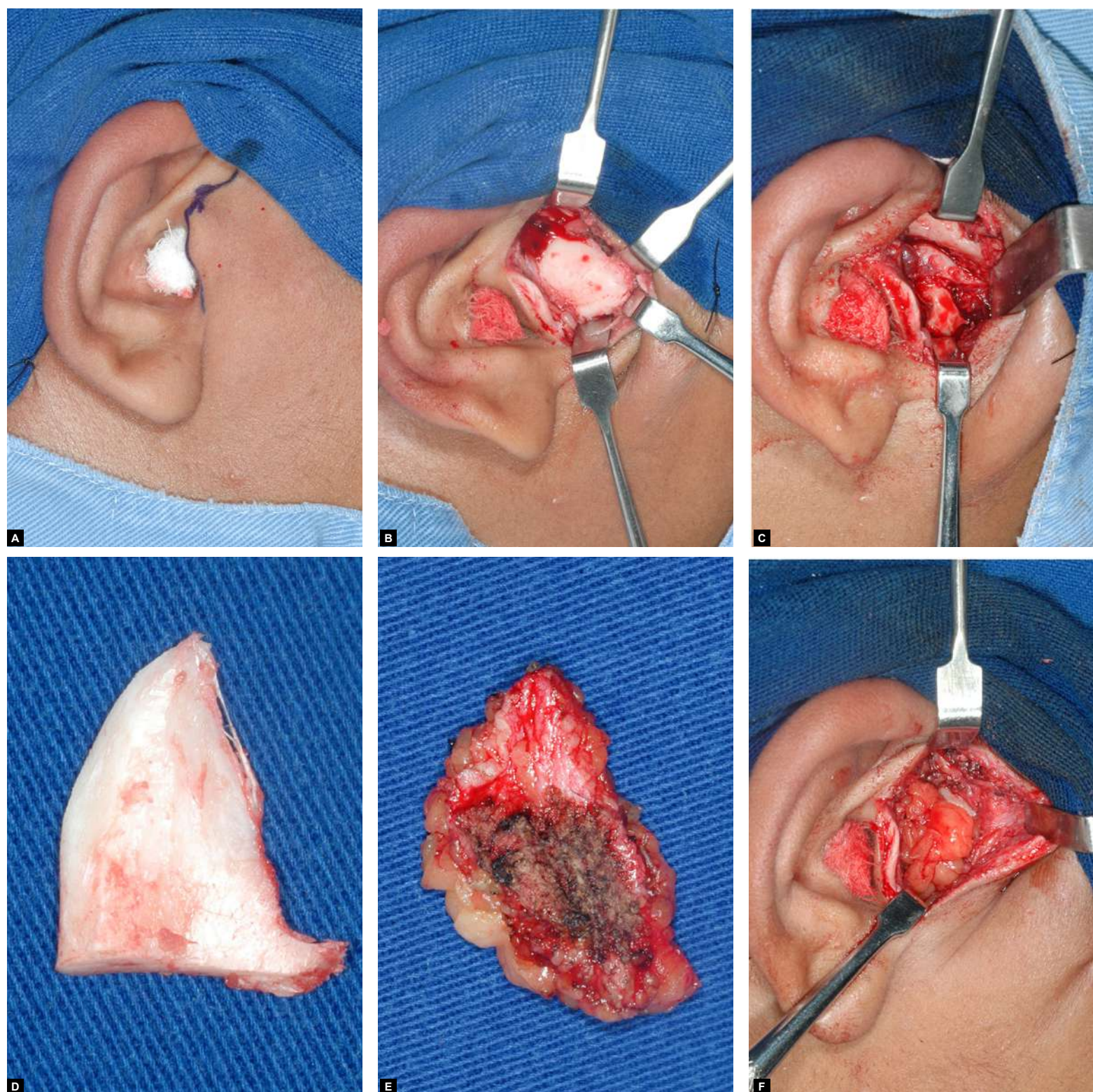


Figure 1. TMJ arthroplasty surgery: **A)** incision marking on the skin for endaural access; **B)** access and exposure of the ankylosed mass; **C)** release of the ankylosed mass; **D)** coronoid process removed; **E)** abdominal adipose graft removed; **F)** graft inserted in the arthroplasty region.

Evaluation of the mouth opening and pain perception

For the evaluation of mouth opening, with and without pain, two measurements were obtained using a standardized millimeter ruler at two time points: one week before the surgical procedure (T1) and another 12 months after the surgical procedure (T2). During the evaluation all measurements were performed without assistance from the professional for mouth opening.

In the scope of the evaluation of the pain perception during mouth opening, a visual analogue scale (VAS) was used, because it was presented as a simple and easily understood tool by the patients participating in the study.¹⁶ The scale consisted of a line marked at its ends with scores of 0-10, where zero was equivalent to "no pain" and 10 was "worse already felt". This scale was also used in the preoperative and postoperative period, where it was applied as a response to two questions asked: "during a state of masticatory rest, how much pain do you feel today in your jaw joint?" and "in maximum opening of the mouth, what intensity of pain you feel today?"

Evaluation of heterotopic bone formation

Quantitative assessment of heterotopic bone formation in the residual condyle was performed through volumetric analysis of the condylar process using computed tomography (CT) and/or magnetic resonance imaging (MRI). Three-dimensional reconstruction was conducted using Mimics[®] software (Materialise NV, Belgium) following a standardized protocols.^{17,18} The condylar process was delineated using four anatomical landmarks: the most anterior point of the articular eminence (AEa)

as the anterior limit, the superior point of the remaining mandibular head (SCm) as the superior limit, the posterior point of the mandibular head/stump as the posterior boundary, and the highest point of the mandibular lingula (LnM) as the inferior boundary. Following landmark identification, the condylar process was segmented from surrounding anatomical structures by creating a digital mask to isolate the region of interest. This mask was then used to generate an accurate 3D reconstruction of the residual condyle, facilitating the precise volumetric quantification (in cubic millimeters) of heterotopic bone formation within the defined anatomical boundaries.

Evaluation of the perception of the tissue scar

To assess the remaining tissue scar from the surgical procedure, the Patient and Observer Scar Assessment Scale (POSAS scale) was used. This scale was developed by Draaijers et al. in 2004 and updated to POSAS 3.0 version by Carrière et al.¹⁰ This standardized instrument is widely recognized for measuring scar quality, encompassing visual, tactile, and sensory characteristics.¹⁰ The POSAS comprises two distinct scales: one applied to the patient and another to the observer (typically the healthcare professional). Both include six numerically scored questions, rated from 1 to 10, with 10 representing the worst imaginable scar. The assessment was conducted by previously trained evaluators, with the participant in a horizontal supine position under artificial lighting. The scale aims to analyze variables such as vascularization, pigmentation, thickness, surface relief, and pliability of the scar, as well as symptoms like pain and itching.¹⁰

Statistical analysis

Comparative analysis of mouth opening measurements, pain scores and condylar volume between preoperative (T1) and postoperative (T2) periods was performed using paired Student's *t*-test. In order to analyze the consistency of the answers among the interviewers during tissue scar assessment, the interclass correlation coefficient (ICC) was used. All analyses were conducted using the IBM SPSS Statistics software (Statistical Package for Social Science, USA) version 24.0, with a statistical significance level defined as $p < 0.05$.

3. Results

Two male and two female patients were included in this study. The median (minimum and maximum) age was 18 years (range 16-56 years). Self-report ethnicity was represented for 40% European descent and 60% African American. Regarding the etiology, two had a history of trauma and two had unknown origin. The study evaluated a total of five TMJs.

The results are presented in Table 1, as means and standard deviation of the mouth opening, pain and condylar volume. The patients presented a greater mouth opening in the postoperative period of 12 months, when compared with the preoperative values of one week before the arthroplasty procedure ($p < 0.05$). Regarding the other variables studied, there was no statistical difference ($p > 0.05$).

The results obtained in the evaluation of the remaining tissue scar of the surgical procedure by the POSAS scale are described in Table 2. It was observed for both the professionals and the patients, that medians were quite similar between the conditions presented by the scale

as well as the variability of values, resulting in a good reliability and satisfactory condition of the scars (ICC = 0.805), where they presented close to the normal skin parameters.

Table 1. Evaluation of mouth opening, pain and condylar volume in the pre and postoperative period.

Variables	Preoperative (T1) Mean (SD)	Postoperative (T2) Mean (SD)	P value
Mouth opening (mm)	5.6 (3.7)	29.2 (12.1)	0.005*
Pain	3.2 (4.0)	0.8 (1.0)	0.278
Condylar volume (mm³)	1.201(1.145)	993 (739)	0.466

The significance level is 0.05. Bold values indicate significance. *Student's t-test.

Table 2. Perception of the resulting scar in the postoperative period.

Variables (POSAS Scale)		SCAR	
		Endaural access Median (Min - Max)	Abdominal access Median (Min - Max)
Professional	Vascularity	2 (1 - 3)	2 (1 - 2)
	Pigmentation	2 (1 - 2)	2 (2 - 5)
	Thickness	2 (1 - 2)	2 (2 - 2)
	Surface relief	2 (1 - 2)	2 (2 - 3)
	Pliability	2 (1 - 2)	2 (2 - 3)
	Surface area	2 (1 - 2)	2 (2 - 4)
Patient	Presence of pain in the past few weeks	1 (1 - 1)	1 (1 - 1)
	Presence of itching in the past few weeks	2 (1 - 9)	7 (1 - 8)
	Scar color different from the color of your normal skin	1 (1 - 2)	3 (1 - 6)
	Scar stiffness different from the stiffness of your normal skin	1 (1 - 2)	5 (1 - 6)
	Scar thickness different from the thickness of your normal skin	1 (1 - 1)	3 (1 - 6)
	Scar more irregular than your normal skin	1 (1 - 1)	3 (1 - 6)

Discussion

This study evaluated the therapeutic efficacy of abdominal adipose tissue graft interposition in TMJ arthroplasty regarding mouth opening, pain perception, condylar volume and scar quality.

Regarding mouth opening outcomes, the study demonstrated an increase in mouth opening statistically significant, consistent with improvements reported in previous studies.^{1,2,19} Notably, our findings align with the functional improvements documented by these authors, who similarly reported restoration of jaw mobility sufficient for daily activities. Clinically, this restoration of jaw mobility proved functionally meaningful as patients achieved a comfortable opening for daily activities including mastication, speech and oral self-care.

As for pain perception, VAS scores demonstrated a clinically relevant improvement in pain symptoms, decreasing from moderate preoperative levels to mild postoperative levels, although this reduction did not reach statistical significance. These findings are consistent with previous studies that reported gradual pain reduction over longer follow-up periods.^{14,20} Our results parallel the trends observed in these studies, where similar timeframes were required to achieve statistical significance in pain reduction. Although statistical significance was not achieved, likely due to the limited sample size, the absolute reduction observed was considered clinically meaningful. The improvement in reported pain levels suggests a relevant clinical response, and one of our hypotheses is that the combination of joint release and adipose tissue interposition may contribute to symptom relief by preventing bone-to-bone contact and enabling functional remodeling. Future prospec-

tive studies with larger patient cohorts are necessary to confirm these preliminary findings.

Condylar volume represents the three-dimensional anatomical configuration of the mandibular condyle, which can be measured through imaging examinations. Heterotopic ossification constitutes a pathological condition marked by ectopic bone and cartilage formation within soft tissues that do not normally undergo ossification, including muscular, tendinous, ligamentous, and periarticular structures. The most accepted hypothesis suggests that heterotopic ossification is induced by inflammation secondary to local trauma, leading to soft tissue injury, and can be classified as traumatic or non-traumatic.¹⁷⁻¹⁹ In our study, among the five treated temporomandibular joints evaluated, 80% of cases (four joints) showed no evidence of heterotopic bone deposition on the residual condyle, suggesting that the interposition of abdominal adipose tissue between the articular surfaces may be effective in preventing the recurrence of ankylosis. This finding is comparable to rates reported in the literature,¹⁷⁻¹⁹ where similar interpositional materials demonstrated effectiveness in preventing re-ankylosis. The observed decrease in condylar volume over the follow-up period likely reflects a process of bone remodeling or resorption at the surgical site (local trauma), which, under normal physiological conditions, would be followed by bone neoformation.

The surgical scars at the donor and recipient sites were assessed by both professionals and patients. Professionals rated the pre-auricular (endaural) and abdominal scars with a median score of 2, both considered satisfactory. Patient-reported outcomes, however, demonstrated

divergence: while the endaural scar received satisfactory ratings, the abdominal scar was consistently perceived as irregular. The differences in scar perception can be attributed to the visibility of the abdominal scar, while the pre-auricular scar remains smaller and more camouflaged. Age and sex also played a role, with younger and female patients rating the abdominal scar worse. Professionals, however, found the scars to be similar. These findings are consistent with those of Dimitroulis,²⁰ who described similar patient concerns regarding donor site aesthetics when using abdominal grafts, though professional assessments typically rate these scars favorably. The abdominal scar was placed in the groin area, in accordance with established techniques. Our results are in line with studies using other autogenous grafts that show comparable functional outcomes.¹³ This supports abdominal fat as a reliable and low-morbidity interpositional material.

To conclude, the presented surgical protocol used in this study demonstrated clinical efficacy, yielding statistically significant improvements in mouth opening that are comparable to those reported in the literature.^{1,2,19} A reduction in condylar volume was observed in 80% of the cases, suggesting the adipose tissue graft may contribute to the treatment, with prevention of heterotopic ossification rates similar to other interpositional materials,¹⁷⁻¹⁹ although no statistically significant difference was found. Regarding patient perception, the abdominal scar was rated worse, compared to the pre-auricular scar. However, according to the surgeons, both scars were very similar to normal skin parameters. Further studies, especially long-term studies, are needed to confirm the effectiveness of these results.

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Evaluation of skin wounds by different routes of ozone therapy

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ABSTRACT

Introduction: The skin, the largest organ in the body, has protective functions and regenerative capacity. Ozone therapy, with antimicrobial, anti-inflammatory, and wound healing properties, has been applied by several routes, promoting tissue repair. Despite promising, it still lacks standardized protocols and clinical studies, justifying investigations into its use in skin wounds. **Objective:** This study evaluated the effectiveness of ozone therapy by intraperitoneal and subcutaneous insufflation on the repair of skin wounds in rats. **Methods:** Forty-eight 6-month-old male Wistar rats with dorsal wounds were distributed into four groups: subcutaneous control (SUB-CONT), intraperitoneal control (INT-CONT), subcutaneous ozone (SUB-OZO), and intraperitoneal ozone (INT-OZO), the latter two treated with 0.1 ml of ozone by the respective route. The animals were euthanized on the 4th, 7th, and 14th postoperative days for histological, histometric, and inflammatory profile analyses. **Results:** Data analyzed by the Shapiro-Wilk test and two-way ANOVA ($p < 0.05$) showed that the treated groups performed better than controls, with significant differences in inflammatory cell count, mature collagen fibers, and extent of the healing process. The INT-OZ group showed the best performance over time. **Conclusion:** Ozone therapy was found to promote wound healing, and the intraperitoneal protocol is promising for future clinical studies related to skin wound healing.

Keywords: Wounds and injuries. Ozone. Wound healing.

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Introduction

The skin is the largest organ in the human body, composed of dermis, epidermis, and subcutaneous fat layer. The skin protects internal organs and tissues from damage, infections, UV radiation, and extreme temperatures^{1,2}. It is essential for survival, suffers frequent damage and depends on regeneration and healing for protection. Tissue repair is universal: in unicellular organisms, it involves enzymes that restore complex structures and molecules; in higher organisms, it also includes tissue repair by regeneration or scarring.^{2,3}

Regeneration effectively restores the epidermal barrier in normal conditions. When repair fails, there may be ulcerative defects or scarring with functional loss due to fibrotic scar formation. Wound healing is a complex process involving interaction between cells, biochemical components, and the skin extracellular matrix. In simple terms, these events involve redness, swelling, heat, and pain.³

Healing occurs in four phases: coagulation, inflammation, proliferation, and remodeling, involving inflammatory mediators, growth factors, cell interactions, and processes such as epithelialization, fibroplasia, angiogenesis, wound contraction and remodeling. Failure or delay in any stage of healing can delay or impair wound closure.⁴

Ozone therapy is important in the treatment of skin wounds due to its various therapeutic properties; ozone (O_3) is a highly reactive oxidant composed of three oxygen atoms. Ozone is present in the soil as a pollutant and in the stratosphere as a protective layer against ultraviolet radiation, contributing to the biological balance of Earth.⁵ In the last decade, ozone has been highlighted in Dentistry, due to its antimicrobial

and healing properties, being successfully used in treatments such as carious lesions, ulcerations, extractions, osteonecrosis, herpetic lesions, sterilization, tooth whitening, and TMJ disorders.⁶

Ozone has antimicrobial, immunostimulant, anti-hypoxic, and biosynthetic biological actions. It destroys microbial membranes, improves oxygen transport and the metabolism of inflamed tissues, stimulates the cellular and humoral immune system, increasing the immune response and synthesis of substances that reduce inflammation and aid in healing. In high doses, it can cause immunosuppression.⁷

The biosynthetic effect of ozone activates protein synthesis, increasing ribosomes and mitochondria, which increases functional activity and the cellular regeneration potential⁷. Studies show that ozone therapy is used as an adjuvant treatment for wounds, especially in diabetic patients, by promoting controlled inflammatory responses, reducing oxidative damage, and stimulating essential cytokines for healing. In addition to its antimicrobial action, it aids in preventing complications and accelerating healing.^{8,9} Ozone is therapeutically used for several acute, chronic, and inflammatory diseases, such as burns and diabetic ulcers, but its mechanism of action is still poorly understood.^{10,11}

Ozone administration varies according to the treatment objective and site, and can be applied by gas, water, or oil. The intravenous route is avoided due to the risk of embolism, using O₂-O₃ saline solution. Gas is preferably applied by sealed systems, while ozonized water acts as a rinse or safe topical treatment.^{5,10} The combination of ozone with ozonized water significantly improves the treatment of bacterial, viral, and fungal skin infections.¹⁰ Other treatment modalities include direct injection via

intramuscular, intradiscal, and paravertebral routes. There are still no standardized protocol or comparative studies on the treatment of skin wounds with ozone therapy.^{8,9} This study aims to add knowledge about adjuvant therapies to optimize the repair of skin wounds. Ozone therapy has been highlighted as an adjuvant in the treatment of COVID-19, inactivating microorganisms, including SARS-CoV-2, by oxidizing cysteines, besides inducing a controlled inflammatory response, increasing blood flow and oxygenation. Clinical studies in China and Italy evaluate its systemic efficacy and for disinfection of surfaces.¹² Several ozone therapy regimens have been successfully evaluated *in vitro* and *in vivo*, but more clinical studies are needed to evaluate its efficacy and administration routes. Currently, it is an experimental treatment in Medicine, but growing in Dentistry.^{13,14}

The review indicates that ozone therapy favors tissue repair and improves the local inflammatory response, stimulating cytokines and growth factors. It is a lost-cost, non-invasive therapy without side effects, which accelerates healing and can be used as a complement in wound treatment^{8,9}. Within the context of Oral and Maxillofacial Surgery and Medicine, this proposal is justified by investigating adjuvant therapeutic strategies that may optimize the repair of skin wounds, especially when compromised by local or systemic disorders.

Objectives

The aim of this study was to evaluate the efficiency of different types of ozone therapy application, with emphasis on intraperitoneal and local subcutaneous insufflation in the repair of skin wounds in rats.

Methodology

Experimental design

The study was conducted on 48 male Wistar rats, aged 6 months old and weighing 250–300 g, kept in the animal laboratory. The study followed international and Brazilian ethical standards and was approved by the Institutional Review Board on the Use of Animals (CEUA) (report n. 0522-2021).

The number of animals per group was determined by calculation of Test Power in the statistical software Sigma Plot 12.0 (Exakt Graph and Data Analysis, San Jose, CA, USA), following data from a previous publication¹¹, in which — from the mean difference values for two groups = 4.7; standard deviation = 1.1 —, considering a test power of 0.9 and an alpha of 1% for the study in rats, four specimens would be needed per experimental group.

The animals were kept in the animal laboratory in plastic cages with four rats each, in a controlled environment ($22 \pm 2^{\circ}\text{C}$, 12h light/dark cycle), receiving solid diet (Ração Ativada Produtor[®], Anderson & Clayton S.A., Laboratório Abbot do Brasil Ltda, São Paulo, SP, Brazil) and water *ad libitum* throughout the experiment.

The 48 male rats were divided into four groups with 12 animals each: SUB-CONT (subcutaneous puncture without therapy), INT-CONT (intra-peritoneal puncture without therapy), SUB-OZO (subcutaneous ozone therapy 0.1 ml) and INT-OZO (intraperitoneal ozone therapy 0.1 ml). Treatment was applied at every two days, with euthanasia at 4, 7, and 14 days postoperatively.

The rats were sedated with ketamine and xylazine by intraperitoneal injection. Trichotomy and skin antisepsis with 10% PVPI were performed on the dorsal region. Using a 3-cm diameter template, the area for surgical wound creation was delimited, and the epidermis and dermis were removed from the animals' dorsa. All groups underwent this procedure (Fig 1).

After wound creation, the SUB-OZO and INT-OZO groups received ozone therapy using a device from OZONE & LIFE Indústria, Comércio e Sistemas LTDA (São José dos Campos/SP, Brazil). Application was performed subcutaneously (near the wound) and intraperitoneally (posterior abdomen), using 0.1 ml of ozone, on postoperative days 0, 2, 4, 6, 8, 10, 12, and 14.

The dose was based on Soares et al.¹¹ (0.1 ml), which demonstrated effectiveness in healing; the literature lacks standardization, but comparisons with other studies²¹ showed correspondence by concentration/volume calculations. For animals weighing 250–330 g, the calculated volume varies between 0.1–0.17 ml; despite favorable reports with lower concentrations (e.g., 4 ppm $\approx$ 0.004 ml), for practical reasons, application was standardized at 0.1 ml per animal (Fig 2).

Euthanasia occurred on days 4, 7, and 14 postoperatively, when the rats anesthetized and subjected to cardiac perfusion with 100 ml of saline supplemented with 0.1% heparin and 800 ml of 4% formaldehyde (Sigma Chemical®, St. Louis, MO, USA) in 0.1 M phosphate-buffered saline (PBS- Sigma Chemical®), 4°C, pH 7.4. The surgical wound area was collected with a 1-cm margin beyond the incision.

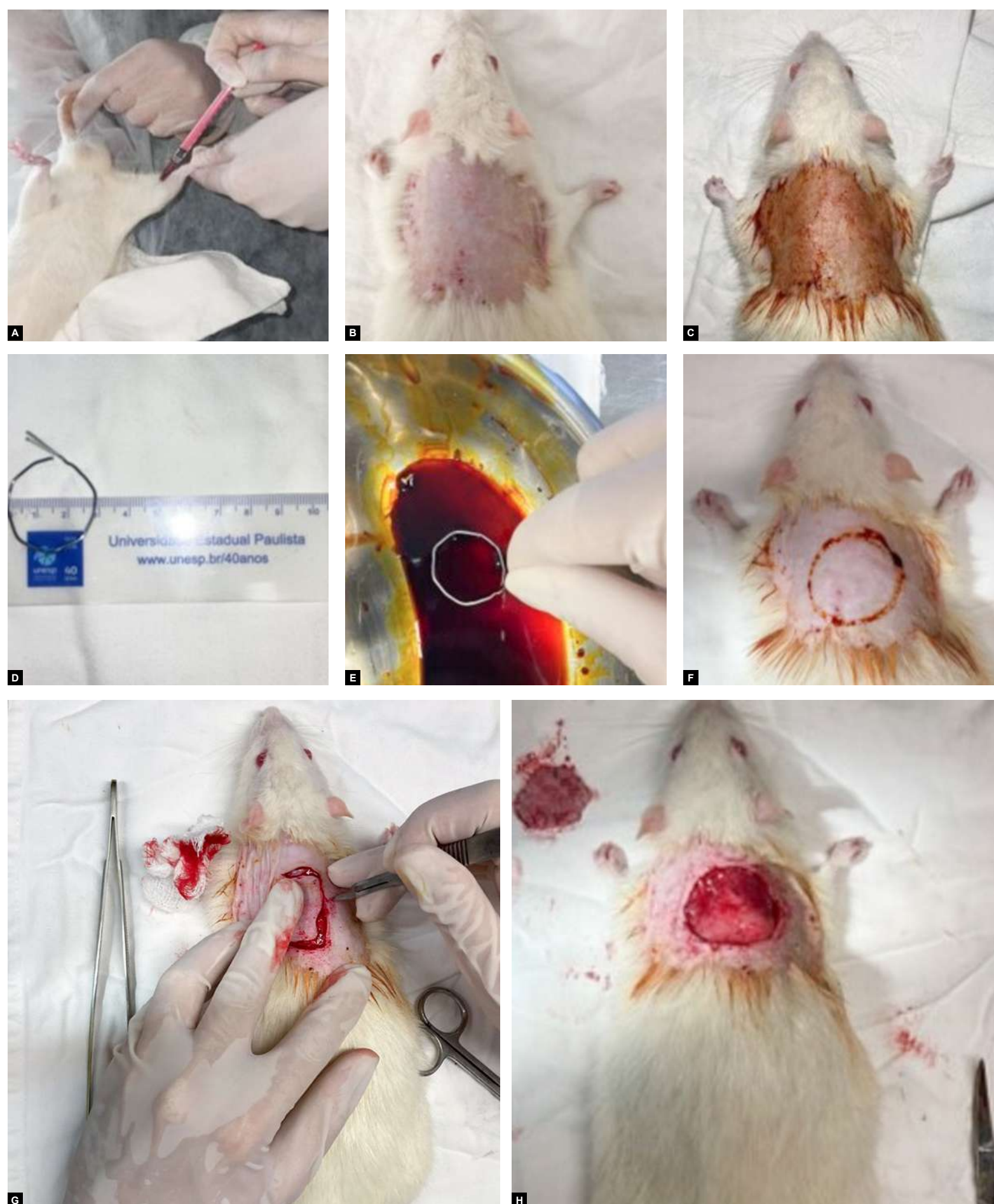


Figure 1. Surgical steps of the surgical procedure to create the skin wound: **A)** anesthesia with ketamine and xylazine; **B)** trichotomy of the dorsal region; **C)** antisepsis of the area of interest with 10% PVPI; **D, E, F)** using a 3-cm diameter template, to delineate the wound area; **G)** creation of skin wound in the dorsal region; **H)** completed skin wound in the back region.



Figure 2. Sequential photos of ozone acquisition **(A)** and subsequent ozone application by intraperitoneal **(B)** and subcutaneous **(C)** routes.

Analysis methods

Laboratory processing

The wound region was separated and specimens were dehydrated in alcohols, cleared with xylene, embedded in paraffin, and cut into 5- μ m slices. Axial sections were achieved to analyze internal and external planes, and paired slides were stained with hematoxylin and eosin (HE).¹⁵

Microscopic analysis and microscopic area of interest (MAI)

Microscopic analyses were performed by a histologist blinded to the treatments, evaluating three histological sections of the wound, including its margins and the intermediate healing area.

Histological analysis

Skin fragments from the wounds were embedded in paraffin, sectioned using a microtome (5 μ m), and stained with hematoxylin and eosin (H&E) to analyze vascularization, fibroblasts, granulation tissue, and inflammation.¹⁶ Images were captured by optical microscope, digitized, and analyzed using ImageJ software with calibration based on pixel optical density.

Evaluation of inflammatory profile

Images at 100x magnification of H&E-stained slides were analyzed on the ImageJ software with a 130-point grid, counting lymphocytes and blood vessels that touched the intersections.

Analysis by Picrosirius Red

In the analysis by Picrosirius Red (PSR), the areas of interest were processed, embedded in paraffin, and sectioned at 5 µm from the wound center, being distributed into two slides with three sections each. After PSR staining, three sections were analyzed per slide under polarized light microscopy to evaluate collagen fiber maturation. The LAS software automatically identified and calculated the area of each fiber type, based on the selected color.

Biometric analysis

In the histometric analysis, the slides were photographed using an optical microscope (Nikon® eclipse E100) with coupled cameras (Biovera® IS50), using magnifications of 4x, 10x, 40x, and 100x. Images were captured using ISListen 3.2 software to measure the linear extent of the healing process, both horizontally and vertically.¹⁷

Results

Evaluation of inflammatory profile

Inflammatory cell count

At 4 and 7 days, the SUB-OZO, INT-OZO, SUB-CONT, and INT-CONT groups showed similar results, but the ozone-treated groups (SUB-OZO

and INT-OZO) showed lower inflammatory cell count. At 14 days, all groups showed reduced inflammation and did not differ from each other. There was significant reduction in inflammation over time (4D > 7D > 14D), except in the INT-CONT group, which maintained similar values between 4 and 7 days, differing only at 14 days (4D = 7D > 14D) (Fig 3).

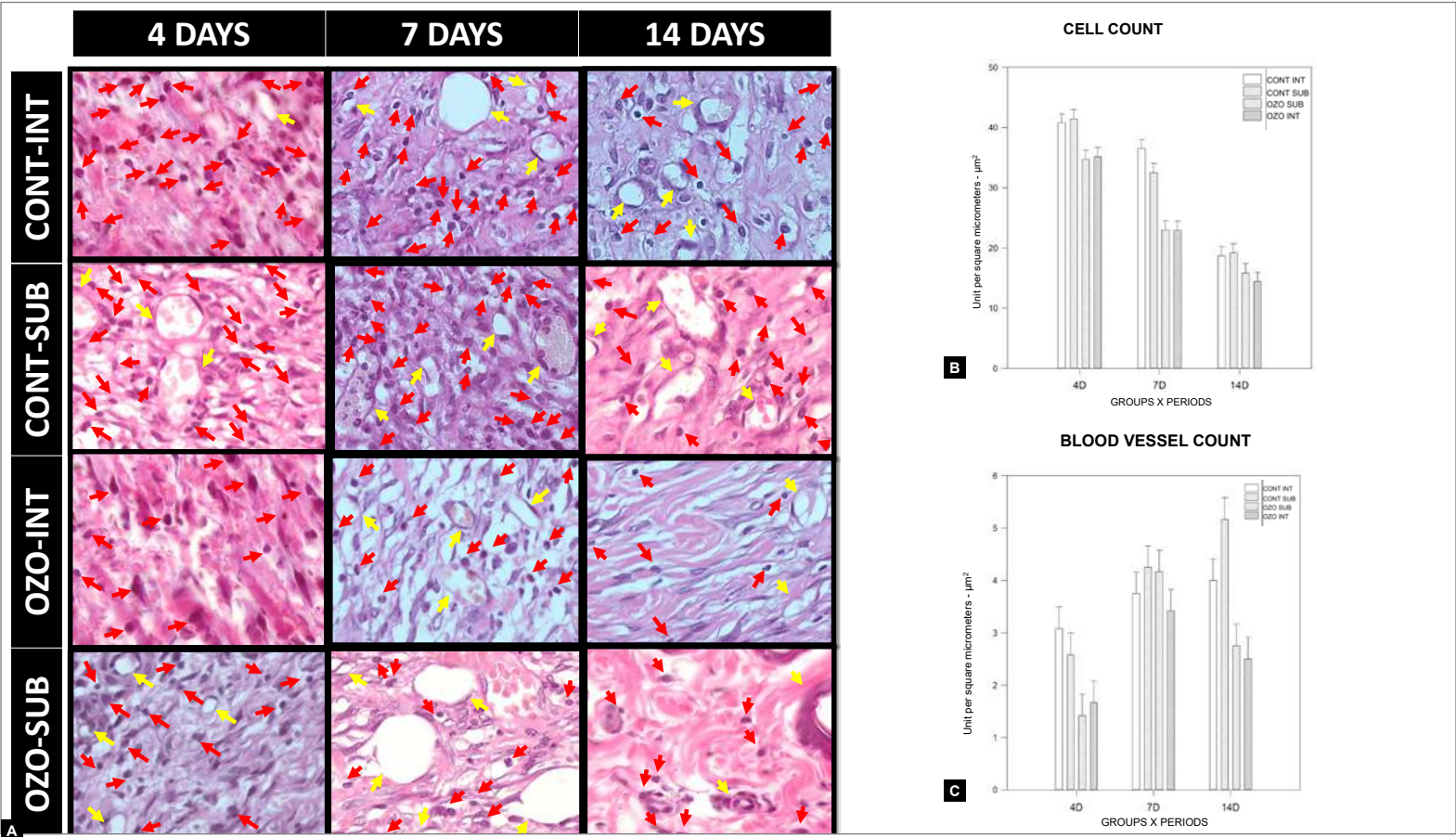


Figure 3. A) Histological images of INT-CONT, SUB-CONT, SUB-OZO, and INT-OZO groups at 4, 7, and 14 days, showing lymphocytes (red arrows) and blood vessels (yellow arrows) in HE staining, 100x objective. **B)** Graph showing the mean and standard deviation of inflammatory cell count in the INT-CONT, SUB-CONT, SUB-OZO, and INT-OZO groups at 4, 7, and 14 days, with significant differences between treated and control groups and between periods, except for INT-CONT. **C)** Graph showing the mean and standard deviation of blood vessel count in the INT-CONT, SUB-CONT, SUB-OZO, and INT-OZO groups at 4, 7, and 14 days.

Blood vessel count

At 4 days, only the INT-CONT group differed from the SUB-OZO group, showing lower values. At 7 days, there were no significant differences between groups. At 14 days, the SUB-CONT group differed from the INT-OZO and SUB-OZO groups, and the INT-CONT group differed from the INT-OZO group. In the temporal analysis, only the INT-CONT group did not show variations between periods. In the SUB-CONT group, the values at 7 and 14 days were higher than at 4 days; in the SUB-OZO group, all periods differed (7D > 14D > 4D); in the INT-OZO group, there was difference only between days 4 and 7 (Fig 3).

Analysis by Picrosirius Red

In the Picrosirius Red analysis for immature collagen fibers (green), at 4 days, all groups showed similar results. At 7 days, INT-CONT showed higher values than SUB-CONT and SUB-OZO, without differences between the other groups. At 14 days, SUB-OZO showed higher values than SUB-CONT and INT-CONT, without differences between the control groups or between the ozone groups.

In general: SUB-OZO = INT-OZO > INT-CONT = SUB-CONT.

In the analysis of mature collagen fibers (red), there were no significant differences between periods for INT-CONT, SUB-CONT and SUB-OZO. In the INT-OZO group, at 7 days, the values were higher than at 4 and 14 days. In the same period (7 days), INT-OZO showed higher values than SUB-CONT and INT-CONT, without differences between the other groups. At 14 days, no significant differences were observed between groups (Fig 4).

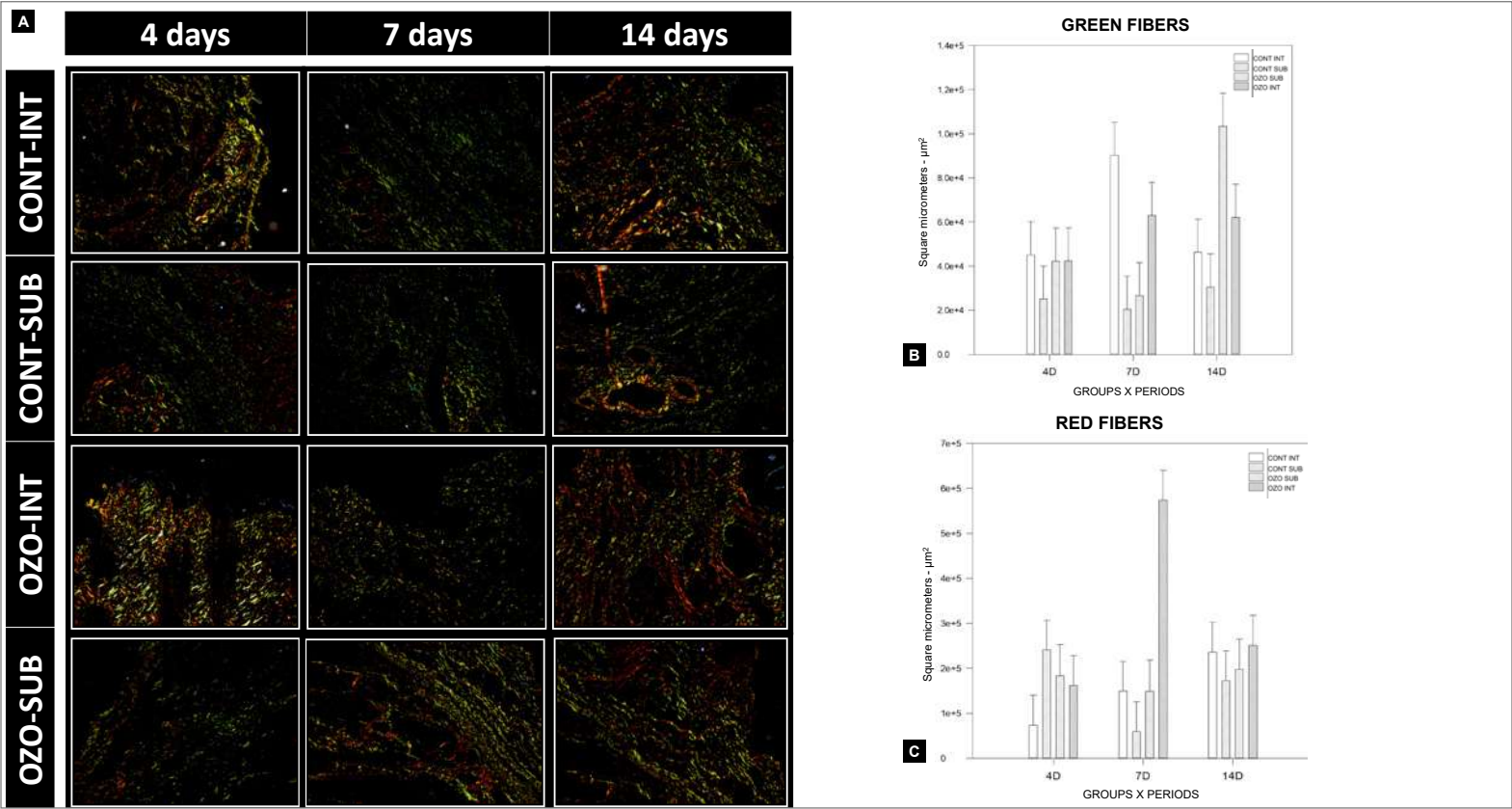


Figure 4. A) Histological image in Picrosirius red of the SUB-CONT, INT-CONT, SUB-OZO and INT-OZO groups at 4, 7 and 14 days, showing immature (green) and mature (red) collagen fibers, under 100x objective. **B)** Graph showing immature collagen fiber count (green) in the INT-CONT, SUB-CONT, SUB-OZO, and INT-OZO groups at days 4, 7, and 14, with significant differences on days 7 (INT-CONT vs. SUB-CONT and SUB-OZO) and 14 (SUB-OZO vs. SUB-CONT and INT-CONT). **C)** Graph showing mature collagen fiber count (red) in the INT-CONT, SUB-CONT, SUB-OZO, and INT-OZO groups at days 4, 7, and 14, with significant difference on day 7 (INT-OZO vs. SUB-CONT and INT-CONT) and no differences on day 14.

Histometric analysis

Horizontal linear extent of the healing process

In the evaluation of the horizontal linear extent of healing, there were no significant differences between groups at any time. However, in all groups, a significant progressive reduction was observed over time (4D > 7D > 14D) (Fig. 5).

Vertical linear extent of the healing process

Vertical linear extent of the center of the healing process

In the analysis of the vertical linear extent of the wound center, there

were significant differences between all periods (14D > 4D > 7D). In all periods, the groups treated with ozone (INT-OZO and SUB-OZO) showed higher values than controls (INT-CONT and SUB-CONT). At 7 days: INT-OZO = SUB-OZO > SUB-CONT = INT-CONT (Fig 5).

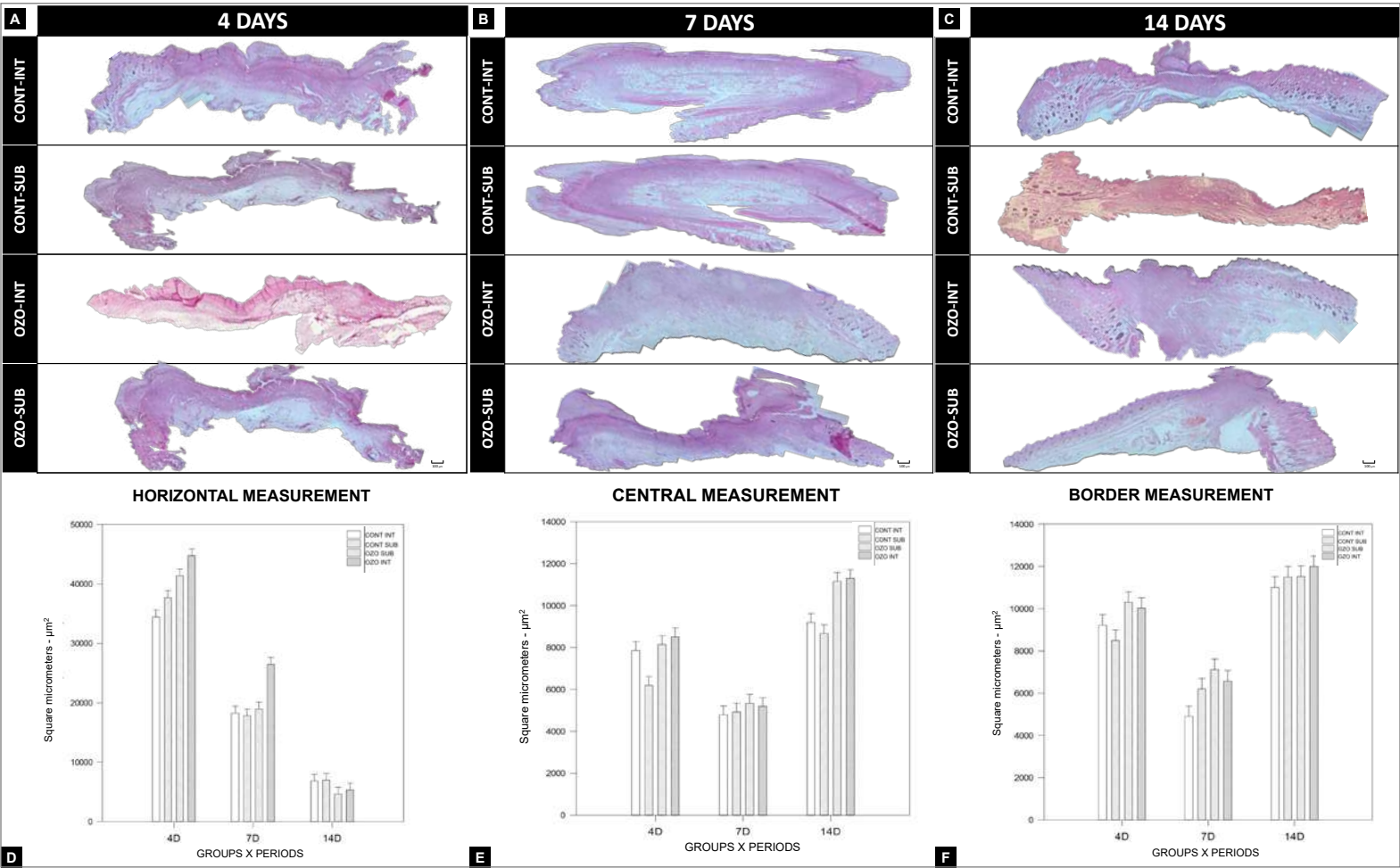


Figure 5. A-C) Panoramic images of histometric evaluation of the INT-CONT, SUB-CONT, INT-OZO and SUB-OZO groups at 4, 7 and 14 postoperative days, respectively. **D)** Graph representing the vertical linear extent of the center of the healing process. Groups INT-CONT, SUB-CONT, SUB-OZO and INT-OZO are shown at 4, 7 and 14 days. Significant differences were observed between the SUB-OZO and INT-OZO groups x SUB-CONT and INT-CONT for all study periods. In the comparison between periods, significant differences were found in all comparisons made within all study groups. **E)** The graph shows the vertical linear extent of the healing process in the INT-CONT, SUB-CONT, SUB-OZO, and INT-OZO groups at 4, 7, and 14 days, with significant differences between treated and control groups at all study periods, as well as between different periods within each group. **F)** The graph shows the vertical linear extent of the margins of the healing process in INT-CONT, SUB-CONT, SUB-OZO, and INT-OZO groups at 4, 7, and 14 days, showing significant differences between treated groups and the INT-CONT group, as well as differences between different study periods within each group.

Vertical linear extent of the margins of the healing process

In the analysis of vertical linear extent of the wound margins, all groups showed significant differences between periods (14D > 4D > 7D). In all periods, INT-OZO and SUB-OZO had higher values than INT-CONT, without differences between themselves or in relation to SUB-CONT. There was also no difference between INT-CONT and SUB-CONT. At 7 days: INT-OZO = SUB-OZO > INT-CONT (Fig 5).

Statistical analysis

Quantitative data for each parameter (PSR, cell count, horizontal and vertical extents of the wound healing process) were initially subjected to the Shapiro-Wilk normality test, which demonstrated homogeneity of specimens in all analyses ($p > 0.05$). PSR data were analyzed by two-way ANOVA, comparing each collagen fiber coloration (green and red) separately. The remaining data were analyzed by two-way ANOVA (experimental groups vs. periods). A significance level of 0.05 was used for all tests. Statistical analysis was performed on the SigmaPlot 12.0 software (Exakt Graphs and Data Analysis, San Jose, California, USA).

Discussion

Although different ozone therapy protocols have been studied for tissue repair, few studies explore its mechanism of action, and the biological effects reported in the literature are controversial¹¹. The null hypothesis that there would be no differences between groups was rejected, as ozone therapy accelerated the healing of skin wounds, especially at 4 and 7 days, with emphasis on the INT-OZO application.

Assessment of angiogenesis showed that, although the groups did not differ in the initial periods, at 14 days the groups treated with ozone (SUB-OZO and INT-OZO) presented lower blood vessel count compared to controls. This suggests that ozone therapy may act by increasing myofibroblastic proliferation, favoring healing;⁸ thus, the lower number of blood vessels in the treated groups at study completion indicates that healing was nearly complete. The results confirm that ozone therapy, similar to other growth factors, stimulates the release of substances that promote new blood vessel formation,¹⁸ including the production of VEGF, responsible for the migration and proliferation of endothelial cells and vasodilation.¹⁹

The study showed that intraperitoneal ozone therapy favored the maturation of collagen fibers, especially at 7 days, being more effective than the subcutaneous route. This can be explained by the mechanical impact of application close to the wound in the subcutaneous route. The results agree with other studies that indicate that ozone therapy can affect biochemical components, with varying effects according to the concentration and administration route, influencing the fibroblast population and deposition of extracellular matrix by increasing growth factors^{8,18}. PDGF stimulates the migration, proliferation and differentiation of fibroblasts into myofibroblasts, while TGF- β promotes fibroblast proliferation and the production of extracellular matrix.^{8,19}

In the linear analysis of healing, there were no significant differences in horizontal extent between groups, but ozone therapy was effective in recovering the vertical thickness of the epithelial structure. The treated groups showed greater vertical thickness, indicating better reorganiza-

tion of connective and epithelial tissues, reinforcing the role of ozone in a more advanced healing process, due to its anti-inflammatory, anti-apoptotic and antioxidant properties.¹⁸ These results corroborate previous studies in the literature, such as the report of Kim et al.¹⁸, which determined that topical application of ozone had healing effects on acute skin wounds; and Sahin et al.²⁰, who demonstrated that ozone accelerated the healing of surgical wounds in rabbits when applied topically.

The study showed that ozone therapy is a promising approach for the healing of skin wounds, encouraging further studies to evaluate its clinical use, such as in the treatment of diabetic ulcers. This therapy may be an effective, low-cost, and easily accessible option, compared to conventional therapies.

Conclusion

Within the limits of this *in vivo* study, it can be concluded that ozone therapy was effective in the healing process of skin wounds, and the protocol used in INT-OZO presented better healing properties and may be considered for future clinical studies.

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Conservative treatment of unicystic ameloblastoma in adolescent: 10-year follow-up

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ABSTRACT

Introduction: Ameloblastoma is a benign odontogenic tumor that represents 9 to 11% of tumors in this category, classified into three forms: conventional, unicystic and peripheral. These variations influence the clinical and radiographic characteristics, age range and treatment methods. In some cases, a conservative approach with regular monitoring may be effective, using techniques such as decompression followed by curettage, cryotherapy or application of Carnoy's solution. **Objective:** The aim of this study was to report the case of a 14-year-old patient with unicystic ameloblastoma, extending from the left mandibular angle to the midline of the mandible, affecting teeth from the lower right lateral incisor to lower left second molar region. **Case report:** Treatment included decompression, multiple tooth extractions, enucleation associated with peripheral osteotomy and application of Carnoy's solution. **Conclusion:** After 10 years of follow-up, the patient has no signs of recurrence and is rehabilitated with dental implants.

Keywords: Ameloblastoma. Conservative Treatment. Decompression.

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Introduction

Ameloblastoma is a benign odontogenic tumor of epithelial origin, representing 9–11% of all odontogenic tumors.¹ It predominantly affects the posterior mandible (80%) and, despite its slow growth, is locally invasive.^{1,2} Radiographically, it appears as a well-defined unilocular or multilocular radiolucent lesion, often causing tooth displacement or root resorption.^{1,3} Among its three main variants (conventional, unicystic, and peripheral), the unicystic variant is rare, accounting for 5–22% of cases, and typically arises in the mandibular ramus of young patients.^{4,5}

Clinically, unicystic ameloblastoma presents as a painless swelling, sometimes associated with an impacted tooth, resembling a dentigerous cyst. Histologically, it is classified into luminal, intraluminal, and mural subtypes. The luminal variant remains confined to the epithelial lining, while the intraluminal subtype extends into the cystic lumen. The mural variant, which infiltrates the cyst wall, exhibits more aggressive behavior, with post-enucleation recurrence rates similar to conventional ameloblastoma, often requiring radical treatment.³

Management varies from conservative approaches, such as enucleation and curettage, to more extensive surgical resections, depending on the histological pattern. Adjuvant therapies, including cryotherapy or Carnoy's solution, may reduce recurrence, which ranges from 10% to 25%, though the optimal treatment strategy remains debated.^{1,4,5}

This study presents the conservative treatment and 10-year follow-up of an adolescent female diagnosed with unicystic ameloblastoma in the left posterior mandible. Despite aggressive clinical features, including root resorption and cortical perforation, a conservative approach was successfully employed, highlighting its potential in select cases.

Case report

A 14-year-old female was referred by her private general dentist to a stomatology reference center after a large mandibular radiolucency was detected on a panoramic radiograph. At the initial consultation, the patient reported a one-month history of the swelling, with no associated pain or other symptoms. At the physic exam, the patient presented with facial asymmetry due to both extraoral and intraoral swelling on the left side of the mandible.

The panoramic radiograph revealed a unilocular radiolucency surrounded by a radiopaque halo, extending from the region of the lower left second molar to the lower right lateral incisor, with apical root resorption of the lower left first premolar, lower left second premolar, lower left first molar, and lower left second molar. Additionally, there was displacement of the lower left first and second premolars (Fig. 1A). A vitality test was performed, and the lower left canine was the only tooth that did not respond to thermal testing. Intraoral palpation revealed a soft area, indicating cortical fenestration. An exploratory puncture revealed yellowish fluid (Fig. 1B).

The patient was subsequently referred for treatment at the Maxillofacial Service. A cone beam computed tomography (CBCT) scan was requested, which revealed the three-dimensional extent of the lesion,

cortical bone fenestration, and involvement of the mandibular canal (Fig. 1C-D). An incisional biopsy was performed and, due to the cystic characteristics observed during the procedure, along with the extent of the lesion and the patient's age, it was decided to perform a decompression as initial approach. A silicone drain was placed to establish communication between the interior of the lesion and the oral mucosa (Fig. 1E).

It was decided to maintain the drain for four months to alleviate intralesional pressure before enucleation, while awaiting the surgery schedule at the hospital. The patient was instructed to irrigate the drain daily with saline solution.

Four months latter, a new CT scan showed a decrease in the perimeter of the lesion, with reactional bone formation (Fig. 1F-G). At this point, the patient reported discomfort in the drain area, and the family expressed concerns regarding the resolution of the condition. With the histopathological examination confirming the diagnosis of unicystic ameloblastoma, it was decided to proceed with enucleation surgery.

The surgery was performed under general anesthesia at the hospital. The lesion was completely enucleated (Fig. 2A-B). A peripheral osteotomy was performed on the sides of the surgical cavity, to ensure complete removal of the lesion. Due to the proximity of the mandibular canal, three applications of Carnoy's solution, each lasting one minute, were performed to the inferior border, to avoid osteotomy in this area (Fig. 2C). Due to the bone fragility, a titanium reconstruction plate was placed, to prevent a mandibular fracture (Fig. 2D). The surgery proceeded without complications, and the patient was discharged from the hospital the following day.

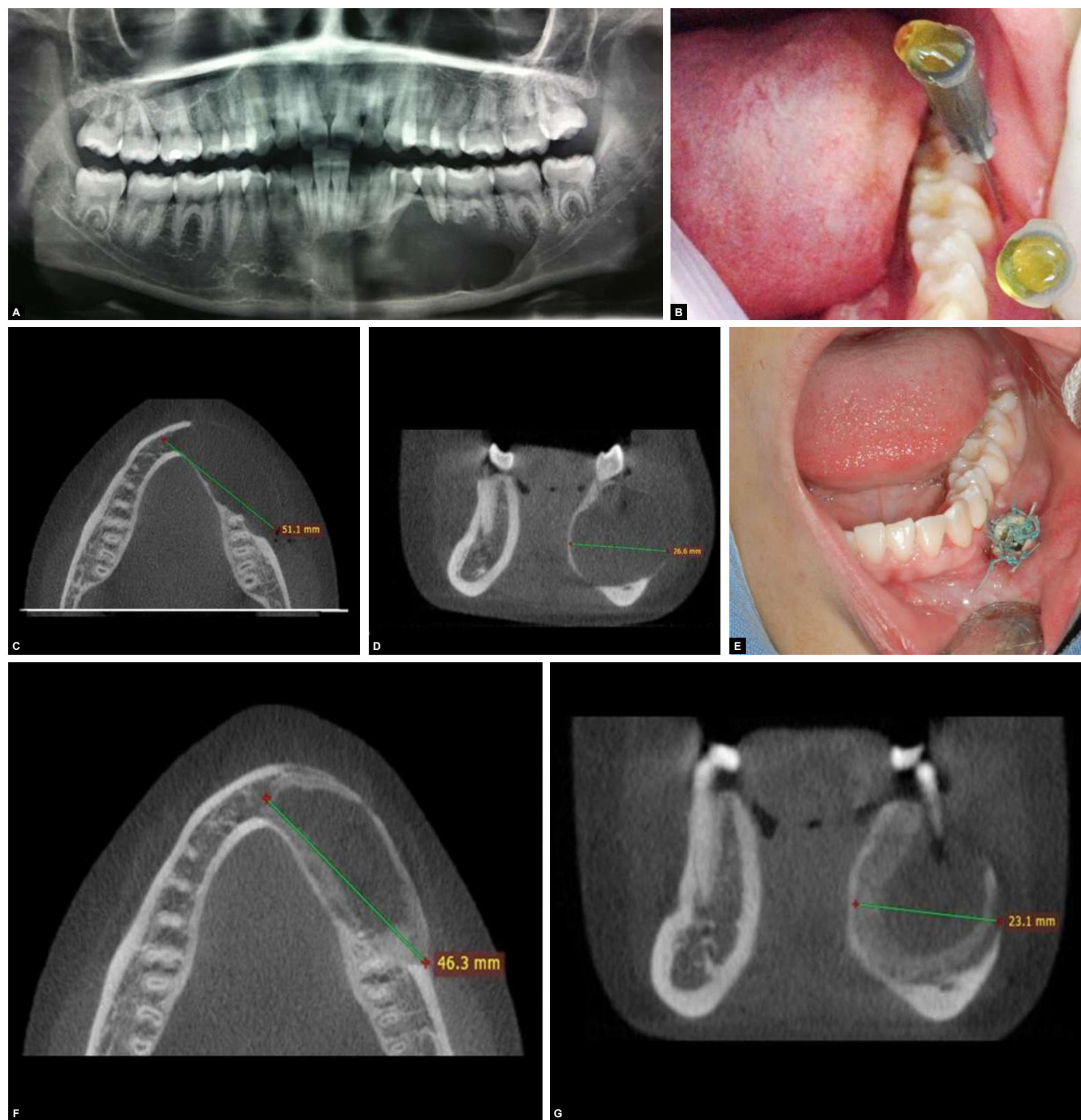


Figure 1. A) Radiolucent image involving dental elements from the region of the lower right incisor to the lower left second molar, with displacement and root resorption. **B)** Puncture image showing the presence of citrine fluid inside the lesion. **C-D)** Axial and coronal sections of the CT scan, showing the extent of the initial lesion. **E)** Image of the intraoral drain positioned for decompression of the lesion. **F-G)** Axial and coronal sections of the CT scan, showing the formation of reactive bone four months after decompression.

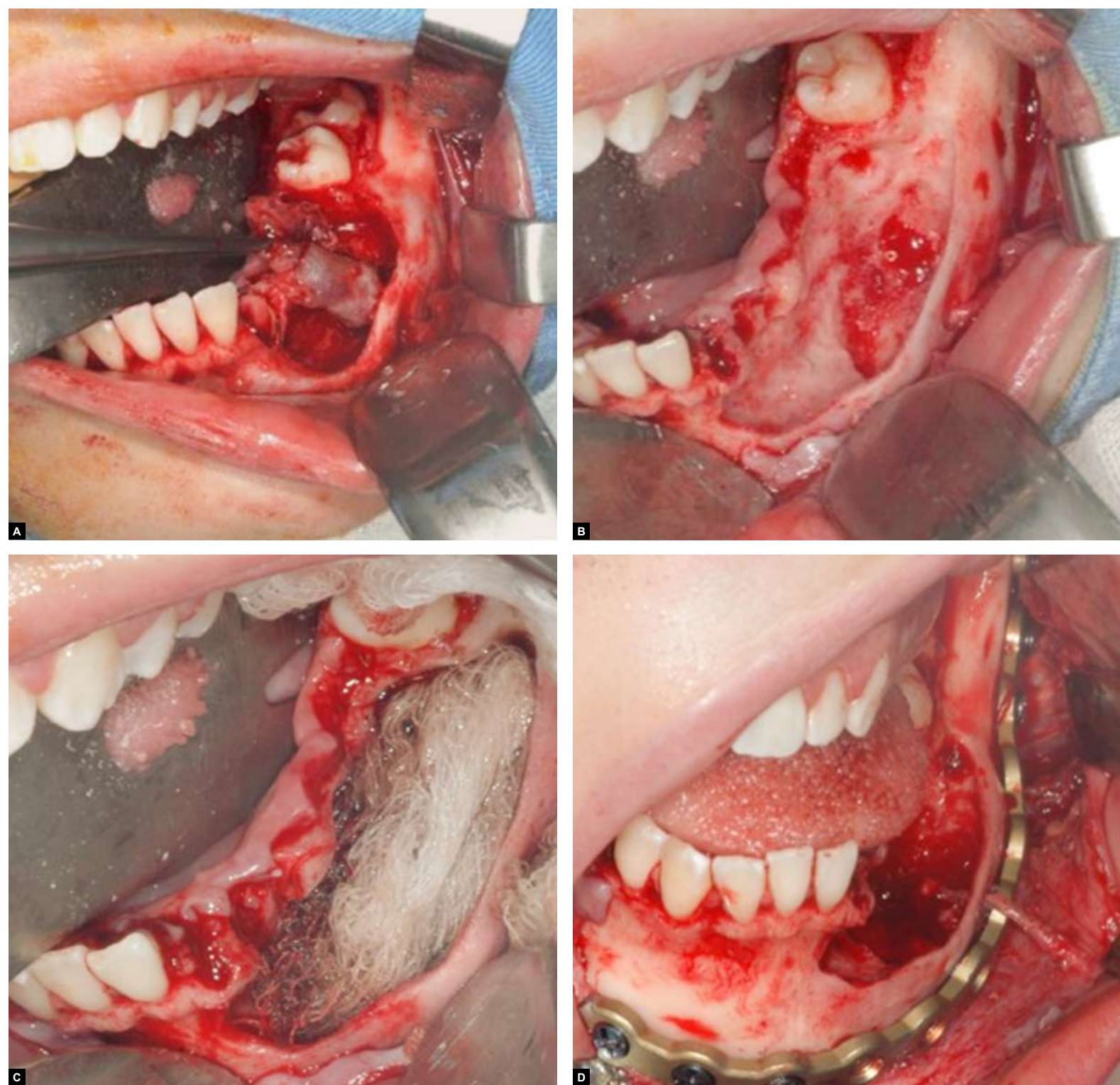


Figure 2. **A)** Intraoperative image demonstrating the removed teeth and enucleation of the lesion, with its encapsulated appearance. **B)** Lesion cavity after peripheral osteotomy. **C)** Application of Carnoy's solution in the bone cavity. **D)** Reconstruction plate of the 2.4 system installed.

Postoperatively, the patient reported paresthesia of the left lower lip area and presented with significant facial edema. Some weeks later, with well-healed soft tissues, provisional dental rehabilitation was conducted using a removable partial prosthesis with a soft lining material, to prevent pressure on the surgical area (Fig. 3A).

The patient was followed up and, one year later, CBCT scan showed adequate bone formation in the area, allowing for the removal of the reconstruction plate, to avoid compromising the patient's growth and function (Fig. 3B). The patient continued to be monitored every six months, undergoing new imaging exams during the first five years. Five years after the intervention, the patient was 19 years old, showed no signs of recurrence, thus, it was decided to proceed with the rehabilitation of the edentulous area using a fixed implant-supported prosthesis. Four implants were placed in the area of new bone formation, and a fixed prosthesis was installed, restoring the patient's quality of life by reestablishing chewing function and aesthetic (Fig. 3C-D).

The patient continued to be monitored annually at our service, and currently, with 10 years of follow-up, she remains free of any sign of recurrence, reporting good function and no complaints related to facial aesthetics or her smile (Fig. 3E-F). From now on, she will undergo clinical and radiographic monitoring every two years.



Figure 3. **A)** Image of the provisional rehabilitation of the area affected by the lesion, demonstrating the aesthetic and functional rehabilitation of the treated area. **B)** Panoramic radiograph, showing the reconstruction plate one year after treatment. **C)** Five year follow-up extraoral image showing a fixed implant-supported prosthesis in the area affected by the lesion. **D)** Panoramic radiograph showing the positioning of the four implants installed in the region previously affected by the lesion. **E)** Extraoral image showing a 10-year follow-up of fixed implant-supported prosthesis in the area affected by the lesion. **F)** Panoramic tomography reconstruction image 5 years after implant installation, showing maintenance of the bone structure and peri-implant health in the region.

Discussion

Unicystic ameloblastoma, frequently observed in young patients as demonstrated in this case, necessitates treatments that minimize morbidity while maintaining efficacy. Resection, although associated with lower recurrence rates, is generally avoided in children, due to ongoing facial growth and potential psychological impact.^{2,3} Therefore, a conservative approach, such as decompression combined with peripheral osteotomy, was selected, demonstrating high effectiveness and preservation of vital anatomical structures, particularly crucial in extensive lesions like the one presented.

Among the treatments for unicystic ameloblastoma, the literature shows that they can range from surgical resection to more conservative approaches. Although resection has the lowest recurrence rates, it is avoided in children due to continued facial growth, the presence of unerupted permanent teeth, and the issues of facial disfigurement, which can be psychologically impactful.^{2,3} Furthermore, the lesion in this case was large, which would require segmental resection of the mandible, completely involving the left mandibular body. Therefore, for large lesions and in young patients, conservative options are a good option, as they help preserve important anatomical structures.⁶

Due the observation of radiographic images compatible with tooth resorption in the present case, indicating a more aggressive lesion,⁷ we opted to associate adjuvant therapies. Thus, to prevent recurrence, an adjuvant treatment with Carnoy's solution associated with enucleation and peripheral osteotomy was used. Carnoy's solution penetrates the spaces of the cancellous bone, destroying tumor cells that could cause recurrence.² In addition, the teeth associated with the lesion were removed to minimize the possibility of recurrence, as tumor cells could remain around the apex of the roots.⁷

Although Carnoy's solution was used in this case report, it is now known that chloroform has potential carcinogenic effects, leading to its prohibition in some countries. This restriction resulted in the introduction of a chloroform-free version, called modified Carnoy's solution (MCS), which, however, did not show promising results in terms of recurrence rates. Additionally, other substances have gained prominence in the adjuvant therapy of tumors with high recurrence rates, such as 5-Fluorouracil.⁸

Concerning the reconstruction with a titanium plate, it was important to prevent pathological fractures, given the lesion's extent and the resulting mandibular fragility. The plate was removed after one year, consistent with recommendations in the literature, due to continued growth and adequate bone healing.⁹ Rehabilitation with dental implants, planned after a five-year follow-up, restored masticatory function and enhanced the patient's quality of life, aligning with reported high success rates in ameloblastoma cases.¹

The extended ten-year follow-up, encompassing the critical five-year period for recurrence¹⁰, validates the treatment's success, with no signs of recurrence and complete functional rehabilitation. Despite the minimal risk of recurrence after this period, continuous follow-up will be maintained.

Final considerations

The management of unicystic ameloblastoma in young patients should prioritize less aggressive treatment, that preserve vital anatomical structures, facilitating rehabilitation and maintaining patient quality of life. The adjuvant therapies are important to reduce recurrence. Nevertheless, long-term follow-up must be rigorous, ensuring early detection of potential recurrence, thereby preserving the patient's health and well-being.

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Reconstruction of the orbital floor through digital surgical planning: case report

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ABSTRACT

Introduction: The blow-out fracture concept involves an explosion of the orbital floor and displacement of orbital contents into the ipsilateral maxillary sinus. It is considered the fourth most susceptible region to facial trauma. **Objective:**

This paper aims to report a clinical case of correction of a pure blow-out fracture sequela, resulting from aggression, using virtual planning. **Case report:**

A 27-year-old male patient primarily complained of esthetic concerns, presenting with dystopia, enophthalmos, and ophthalmoplegia when looking upward to the right. Open surgical treatment was performed in the operating room to repair the orbital floor using a heat-activated polymethylmethacrylate (PMMA) prosthesis for support, associated with three screws of a 1.5-mm fixation system. The prosthesis was prepared using DICOM data from a facial CT scan and mirror imaging of the contralateral (unaffected) orbit, which was not affected and preserved its normal anatomy, on the Autodesk Meshmixer software. At hospital discharge, the patient reported improvement in signs and symptoms. **Conclusion:** The treatment of orbital fractures remains one of the most challenging, particularly in cases involving sequelae. Currently, alloplastic materials have become the first choice for secondary corrections, due to their several advantages.

Keywords: Orbital fractures. Maxillofacial prosthesis. Orbit.

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» The authors report no commercial, proprietary or financial interest in the products or companies described in this article.

Introduction

Human orbit is considered the fourth region most susceptible to maxillofacial trauma, due to its prominent location in the midface.¹ It is delimited by the bone walls: lateral, medial, roof, and floor, which present different thicknesses and anatomical shapes. The incidence of traumatic forces on the midface can cause different types of orbital fractures, especially in the medial wall and floor, which are the most fragile, due to their proximity to pneumatic spaces. These fractures may be associated with other bones or not, and can be divided into "blow-out" and "blow-in" fractures. Therefore, they are diagnosed by imaging exams, such as computed tomography and radiographs.²

The epidemiological overview of orbital fractures predominantly affects males aged 21 to 31 years, most often resulting from car accidents or physical aggression. Significant pathognomonic signs such as diplopia, enophthalmos, limited eye movement, and even paresthesia of the ipsilateral infraorbital nerve are identified in affected patients, a complication resulting from its rupture or compression.²⁻⁴

Treatment requires thorough clinical and radiographic analysis to assess the need for surgery.¹ Intervention may be immediate in cases of symptomatic fractures, such as mechanical restriction, aiming to reduce sequelae. Elective intervention may also be indicated, with evaluation of signs and symptoms approximately fourteen days after the accident, considering the reduction of edema and its possible consequences after drug therapy.⁴

By the surgical approach, primary reconstruction of blow-out fractures can restore the patient's function and esthetics, by releasing the entrapped adjacent soft tissue, restoring orbital volume, and covering bone defects.⁵

This study aims to report a clinical case of repair of a pure blow-out fracture resulting from a physical aggression involving a gun butt. A custom heat-activated polymethylmethacrylate (PMMA) prosthesis was used to eliminate enophthalmos and ipsilateral dystopia, exploring its limitations and challenges.

Case report

This paper was approved by the Institutional Review Board, CAAE: 88957725.6.0000.5192.

A 27-year-old male patient presented to the Oral and Maxillofacial Surgery and Traumatology department after three months of being hit with a gun butt. He complained primarily of esthetic issues, with dystopia, enophthalmos, and right-sided ophthalmoplegia in supraversion. After initial evaluation and requesting a multislice computed tomography (MSCT) scan of the face, a pure blow-out fracture was found on the right side, with entrapment of the inferior orbital muscles with lack of continuity (Fig 1).

Open treatment was proposed in the operating room for orbital floor repair using a heat-activated polymethylmethacrylate (PMMA) prosthesis for support, combined with three 1.5-mm fixation system screws installed in the infraorbital rim, to maintain medium- and long-term stability of the contents within the orbital cavity.

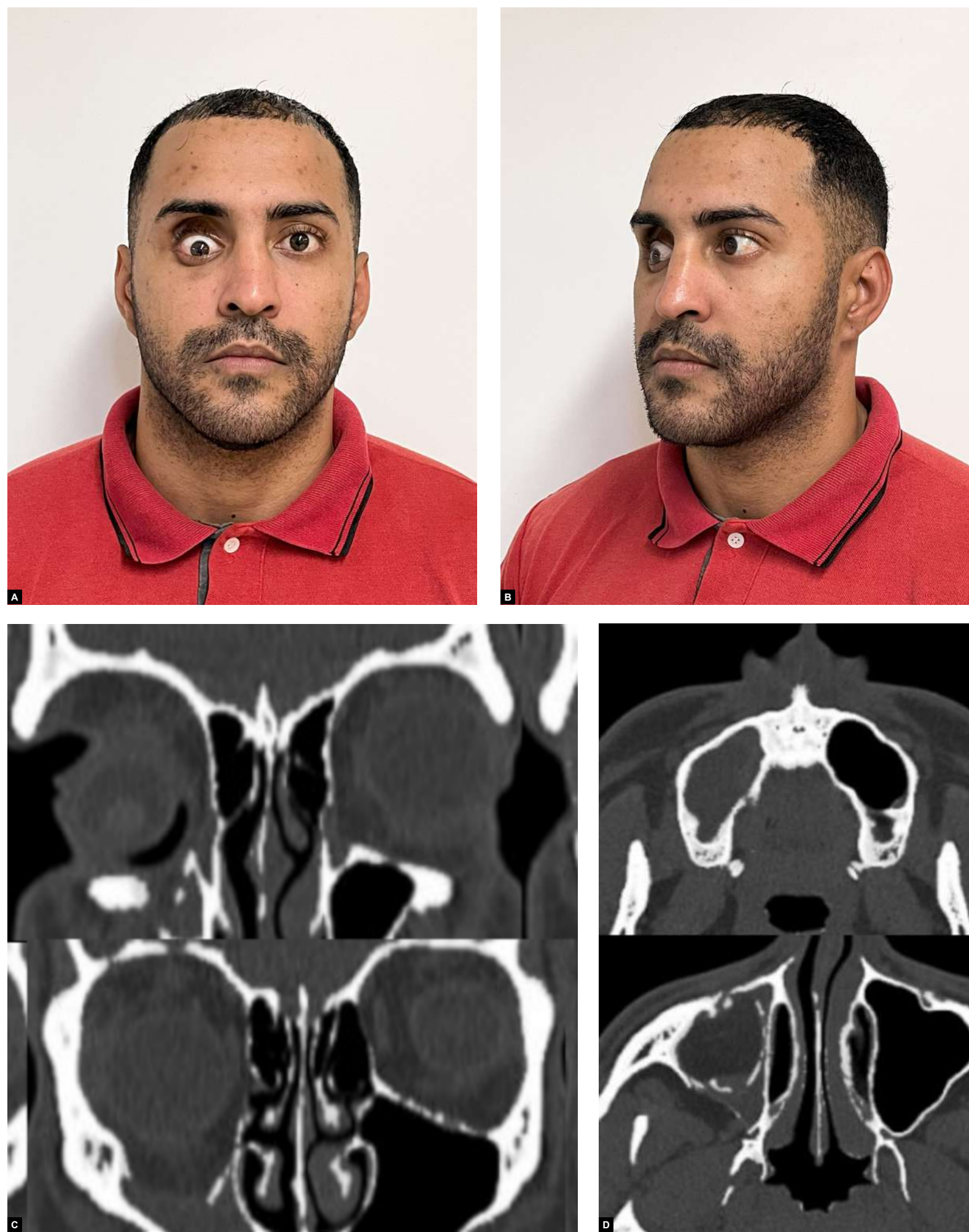


Figure 1. **A)** Frontal aspect. **B)** Oblique lateral view. **C)** Axial MSCT scans. **D)** Coronal CT scans.

In the laboratory, the virtual model of the prosthesis generated using Meshmixer software (San Francisco, California) was exported in STL format and printed on a 3D printer with castable resin. The printed piece serves as a mold for embedding in a metal muffle with special plaster. After setting, the heat-activated PMMA is poured into the muffle under controlled pressure and heat, promoting its polymerization. Subsequently, the prosthesis is removed from the mold, finished and polished, ensuring a similar thickness to the contralateral floor and biocompatibility. Finally, it is sterilized (Fig 2).

The procedure was performed under general anesthesia. Tarsorrhaphy was not firmly attached to the Frost dressing to allow slight intraoperative eyelid opening for subsequent forced duction testing. To achieve tissue vasoconstriction and separation anatomical planes, Lidocaine Hydrochloride with 2% Epinephrine (Cristália, Itapira, São Paulo) was injected locally.

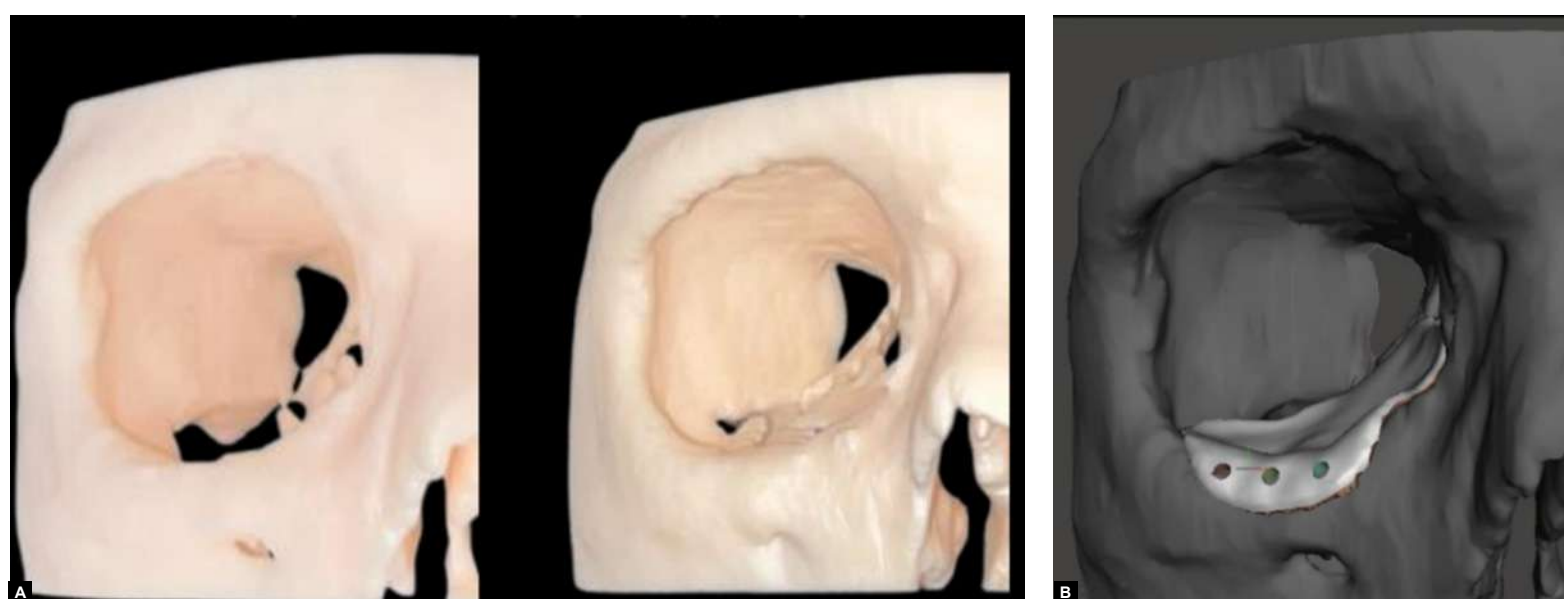


Figure 2. A) Mirroring of contralateral side of the fracture in 3D prototype. **B)** Virtual planning of customized prosthesis.

The subtarsal approach was chosen, considering the reduced likelihood of sclera exposure and ectropion. After careful subperiosteal dissection of the anterior maxilla and orbital floor, the infraorbital rim was adequately exposed and the orbital contents were retracted superiorly for precise prosthetic adaptation and fixation. Tissue synthesis was performed in layers. Vicryl 4.0 (Ethicon, Raritan, New Jersey, USA) was used for the deep portions, and Nylon 5.0 (Donati®, Aparecida de Goiânia/GO, Brazil), for the intradermal technique (Fig 3).

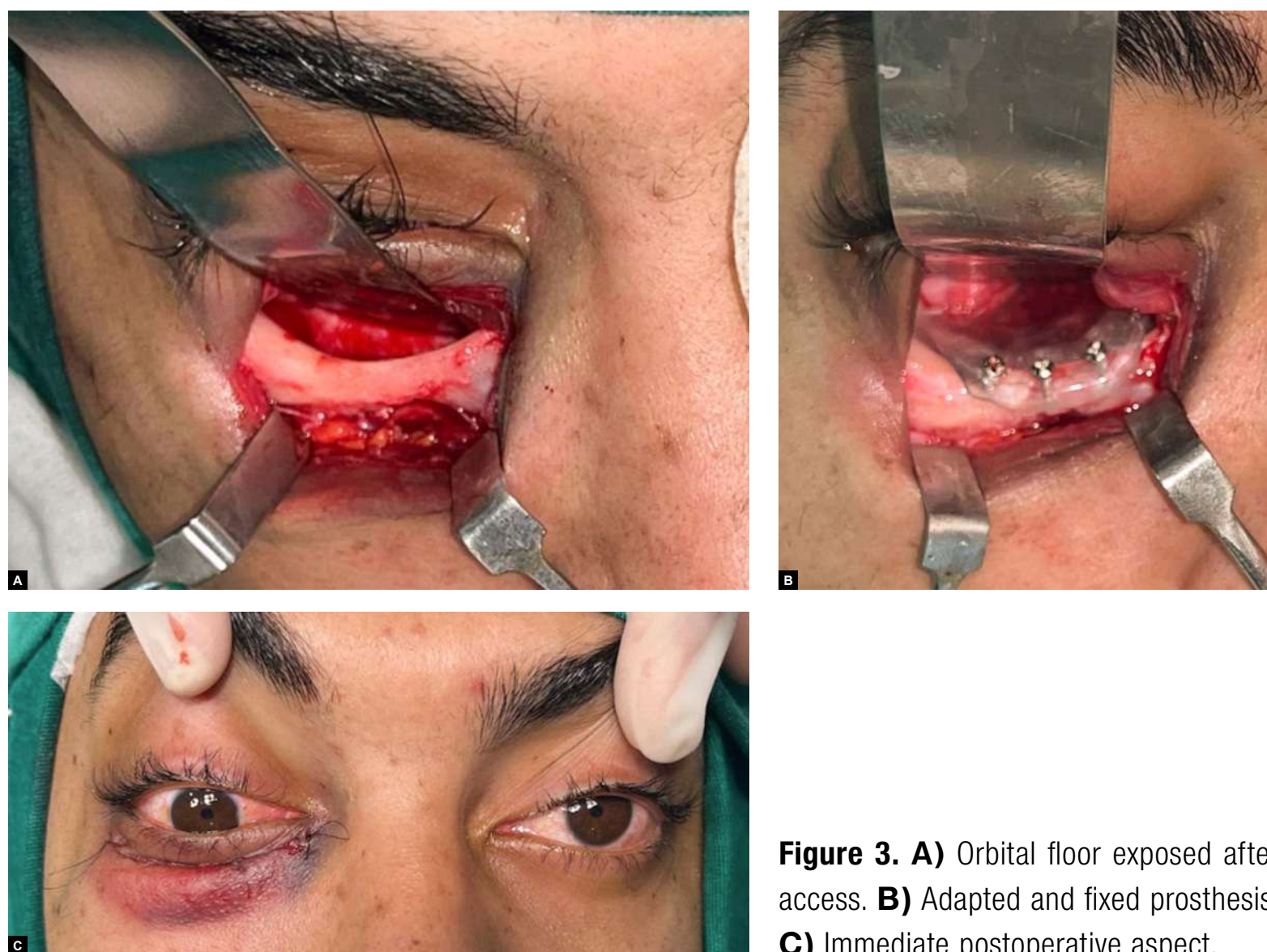


Figure 3. **A)** Orbital floor exposed after access. **B)** Adapted and fixed prosthesis. **C)** Immediate postoperative aspect.

Nine months after the procedure, the patient remains under post-operative follow-up, without esthetic or functional complaints regarding the blow-out fracture. However, the ipsilateral maxillary sinus remains occluded and asymptomatic. There were no further movement restrictions or complaints of diplopia and/or low visual acuity. Enophthalmos and dystopia were not evident (Fig 4).

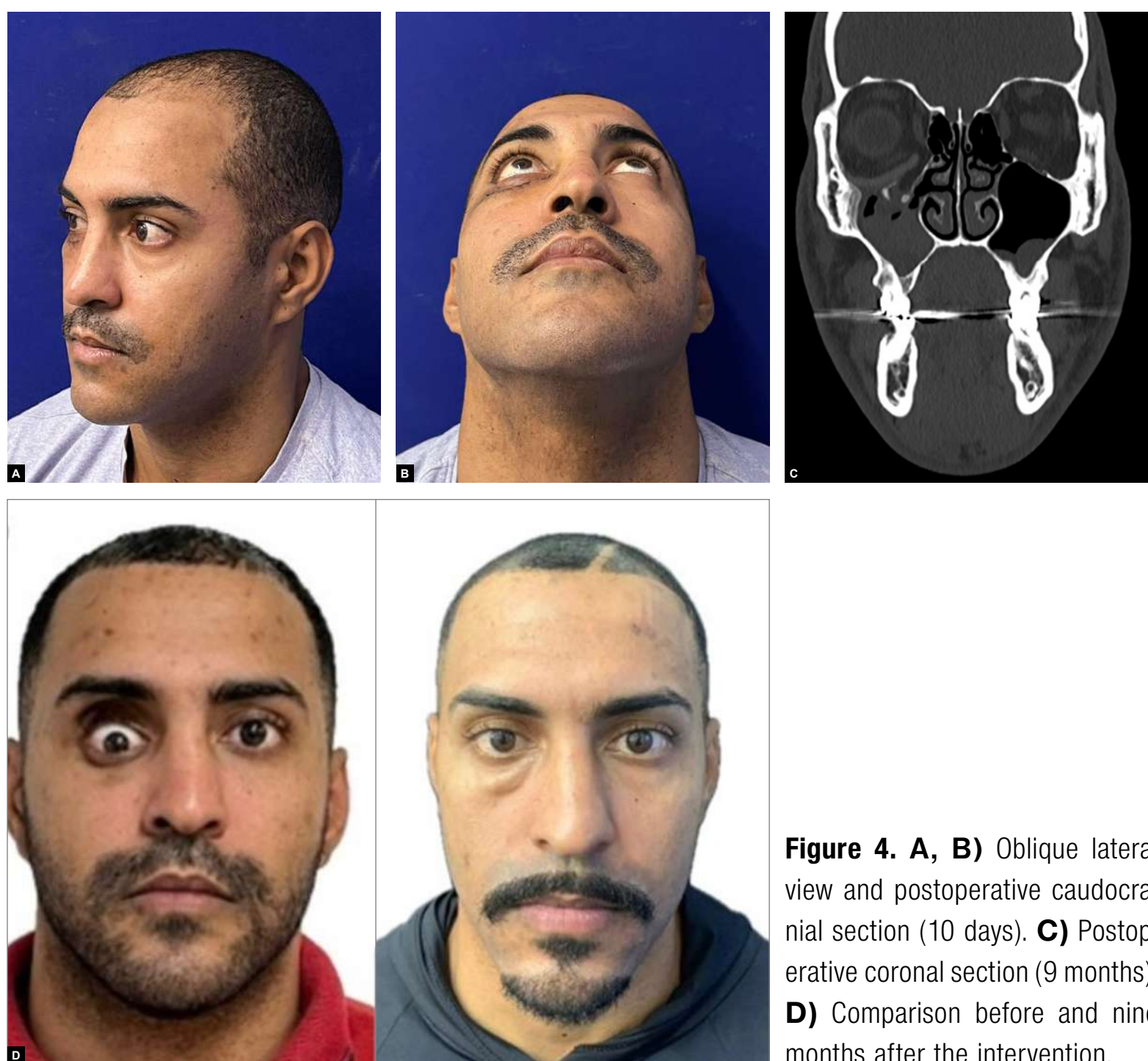


Figure 4. **A, B)** Oblique lateral view and postoperative caudocranial section (10 days). **C)** Postoperative coronal section (9 months). **D)** Comparison before and nine months after the intervention.

Discussion

Orbital fractures involving the orbital floor are called blow-out fractures and are caused by increased orbital pressure from the soft tissues, causing orbital floor explosion and displacement of orbital contents into the ipsilateral maxillary sinus.¹ The entrapment of surrounding soft tissues can result in limited eye movement, diplopia, or enophthalmos. Patients may also experience hyperesthesia, dysesthesia, and hyperalgesia, due to trauma to the infraorbital nerve.⁴

Studies indicate no significant differences in diplopia within 14 to 29 days after the incident, justifying early intervention. Initial double vision is also considered the most common consequence after floor fracture repair, with a reported prevalence of up to 86% and resolution within few weeks. Dystopia is a common long-term postoperative consequence, with incidence of up to 27%, and is often treated with secondary surgery to revise or augment the implant.³

MSCT is considered the gold standard for diagnosing orbital floor fractures, since it is rapid and widely available in trauma referral centers. The coronal view is the most suitable for diagnosis, because it allows better visualization of the orbital floor, extrinsic eye muscles, and the presence of invaginated contents in the maxillary sinus.⁶

Patients should not undergo surgery if there is no significant damage to the orbit, absent or minimal displacement of the orbital frame, floor fracture that does not reach the key area, and absence of diplopia. The absolute indications for open treatment include presence of retrobulbar hematoma, severe enophthalmos (> 0.3 mm), peribulbar soft tissue entrapment, large defects filling 50% of the orbital floor, and oculocardiac reflex.⁴

The subciliary approach commonly has a significant rate of complications, including scarring and eyelid retraction, when compared with the subtarsal and transconjunctival approaches. However, the subtarsal approach provides adequate surgical exposure of the infraorbital rim and orbital floor, allowing wide and direct visualization, as well as sufficient space for intraoperative handling, placement, and adaptation of the synthesis/reconstruction material.^{7,8}

The choice of biomaterial, autogenous or alloplastic,⁴ to be used in the reconstruction considers the weight of orbital contents, biocompatibility, good osseointegration, being inert to the tissues, as well as radiopacity, which can allow for better postoperative monitoring by imaging exams and easy adaptation and handling.⁶

Studies show that the use of virtual planning with 3D prototyping is a good tool for ensuring proper implant positioning and orbital reshaping. With the development of new technologies, there have been improvements in examinations, measurements, and material testing on individual prototypes, currently enabling better planning, allowing faster surgical procedures and better clinical outcomes.⁴

Conclusion

Blow-out fractures pose challenges for oral and maxillofacial surgeons and traumatologists, since the treatment options are varied and depend on the complexity of the case. Rehabilitation using a PMMA prosthesis fabricated by virtual planning to restructure the orbital floor has shown promising results in the current scenario. However, comprehensive knowledge of the access options and materials commercially available for grafting is necessary, as the approach must be appropriate and personalized to the patient.

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Pediatric Gorlin-Goltz syndrome: long-term follow-up and adaptive management

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ABSTRACT

Introduction: Managing Gorlin-Goltz syndrome (GGS) in pediatric patients is particularly challenging, as it necessitates balancing the treatment of the disease's progressive and aggressive nature. **Objective:** This study report a long follow-up of a pediatric patient with GGS out of the ordinary, due to the presence of two major criteria changes in the first decade of life. **Case report:** Patient was diagnosed at 8 years old with multiple odontogenic keratocysts, ocular hypertelorism, macrocephaly and early falx cerebri calcification. A conservative treatment approach was initially adopted to preserve permanent teeth and normal maxillofacial growth. Over a follow-up period of more than six years, the patient experienced multiple recurrences, requiring a transition to a more radical surgical approach. **Conclusion:** This case highlights the complexity of managing a progressive disease in a growing patient. While conservative approaches are crucial for preserving dentition and growth in pediatric patients, a dynamic and adaptable treatment plan is essential due to the aggressive nature of the odontogenic keratocyst.

Keywords: Gorlin-Goltz syndrome. Odontogenic cysts. Early diagnosis.

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» Patients displayed in this article previously approved the use of their facial and intraoral photographs.

Introduction

Gorlin-Goltz syndrome (GGS) is a hereditary, multisystemic, autosomal dominant disorder exhibiting complete penetrance, variable expression, and a prevalence of 1:56,000 individuals.¹⁻³

Clinical manifestations include dermal changes, such as basal cell carcinomas and palmoplantar keratoses, as well as dental and skeletal changes (multiple odontogenic keratocysts and anomalies of the ribs and vertebrae), ophthalmic changes (hypertelorism), and neurological changes, such as falx cerebri calcification, congenital hydrocephalus, and medulloblastomas.^{2,3}

The occurrence of odontogenic keratocysts is considered one of the most frequent and consistent features of GGS.^{4,5} Furthermore, odontogenic keratocystic associated with GGS demonstrate a more aggressive biological behavior, with a higher recurrence rate (82%), compared to solitary cysts (61%).⁶

While the diagnostic criteria for GGS are well-established, its early manifestation is rare, as most major criteria typically manifest in the second and third decades of life.³ Thus, the aim of the present study was to report the case of a pediatric patient with GGS, in which a diagnosis was established in the first decade of life.

This report provides a detailed, long-term follow-up of over six years, documenting the clinical evolution and the shift in therapeutic strategy, with valuable insights into the progressive nature of the syndrome in a growing patient. Approval was obtained from the Ethics Research Committee, under protocol number 3.348.612.

Case report

An 8-year-old male patient, leucoderma, the only child of non-consanguineous parents, presented to the pediatric dentistry clinic in 2017. The patient reported that a solitary mandibular lesion was identified during a routine orthodontic examination in 2015 (Fig. 1A). A biopsy was performed in 2016, with a histopathological diagnosis of odontogenic keratocyst. Subsequently, enucleation and curettage of the lesion were performed at a Children's Hospital in the same year.

Upon our reevaluation, we noted a palpable swelling in the lower labial vestibule in the anterior mandibular region. Panoramic radiography revealed a radiolucent lesion with sclerotic borders, extending from the bud of tooth #33 to that of tooth #45, suggestive of a recurrent odontogenic keratocyst. Additionally, small radiolucency was noted, involving the crowns of developing teeth #37 and #47 (Fig. 1B).

Given the size of the lesion in the mental region, decompression was performed, coupled with surveillance of the smaller lesions. Fragment was submitted for histopathological analysis, which confirmed a recurrent odontogenic keratocyst. Six months post-procedure, panoramic radiography revealed a reduction in the size of the lesion, consistent with the decompression process (Fig. 1C). Concurrently, an increase in the size of the lesions associated with teeth #37 and #47 was noted. To preserve these developing teeth, marsupialization of these lesions was performed.

Histopathological examination of the lesion involving tooth #37 yielded a diagnosis of a dentigerous cyst, while the lesion associated with tooth #47 was diagnosed as an odontogenic keratocyst, thereby raising suspicion for GGS. Consequently, further investigations were conducted,

including a gastroenterological evaluation, postero-anterior chest radiography, and computed tomography of the skull, which revealed early falx cerebri calcification. Physical examination also revealed clinical features suggestive of GGS, such as moderate hypertelorism and increased cranial circumference (Fig. 2). Due to the presence of multiple keratocysts and well as early falx cerebri calcification, which is major characteristics of the syndrome, in addition to secondary characteristics such as macrocephaly and hypertelorism, GGS clinical diagnosis was established.

During a follow-up in 2018, a panoramic radiograph revealed a new radiolucent area associated with the impacted tooth #23 (Fig. 1D). Surgical enucleation with curettage of the lesion was performed, with care taken to preserve the tooth. Histopathological analysis revealed a odontogenic keratocyst.

In a follow-up examination in 2019, a depressed, irregularly shaped, light-brown macule was observed on the lower third of the right side of the face. The patient was referred to dermatology, where a biopsy was performed, the result of which was consistent with papular cutaneous mucinosis of infancy. A new panoramic radiograph was obtained, revealing a radiolucent, multilocular, well-defined lesion involving the crowns of teeth #37 and #38 (Fig. 3A). To preserve the developing tooth buds, marsupialization of the lesion was performed, and the tissue fragment was submitted for histopathological analysis. The initial histopathological diagnosis of the lesion associated with tooth #37 in 2017 was a dentigerous cyst. Conversely, this subsequent analysis confirmed the diagnosis of odontogenic keratocyst.

In 2020, in periodic evaluation, a hypodense, multilocular area involving the region of the body and the left branch, suggestive of odontogenic keratocyst, dentigerous cyst or ameloblastoma was observed (Fig. 3B-3C). In addition, the presence of hypodense lesion involving the left posterior region of the maxilla was observed, invading the maxillary sinus region, involving teeth #26, #27 and #28, and generating displacement of teeth #27 and #28 (Fig. 4A-B). Also a hypodense area in the mesial region of tooth #47 was identified. Enucleation of all identified lesions, extraction of the teeth #17, #18, #27, #28, #37, #38 and #48 was performed under general anesthesia, and a non-absorbable titanium plate was inserted on the left mandibular body and branch region. In histopathological analysis, the diagnosis of odontogenic keratocyst was confirmed for both lesions.

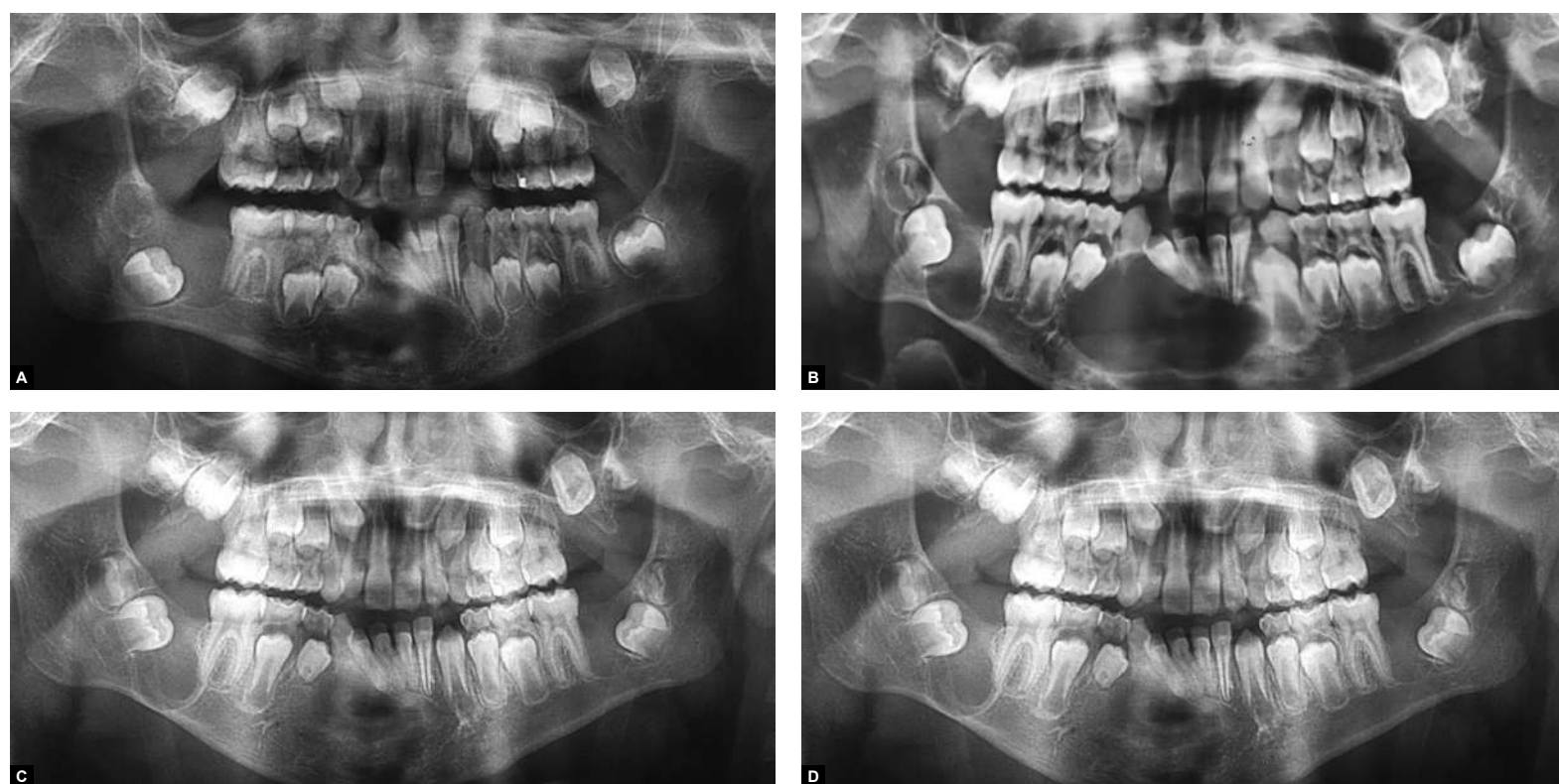


Figure 1. **A)** Keratocyst located in the mandibular symphysis region. **B)** Radiolucent image in the mentonian region and another involving the teeth #37 and #47. **C)** Radiologic aspect after decompression treatment. **D)** Radiolucent image involving tooth #23 impacted.

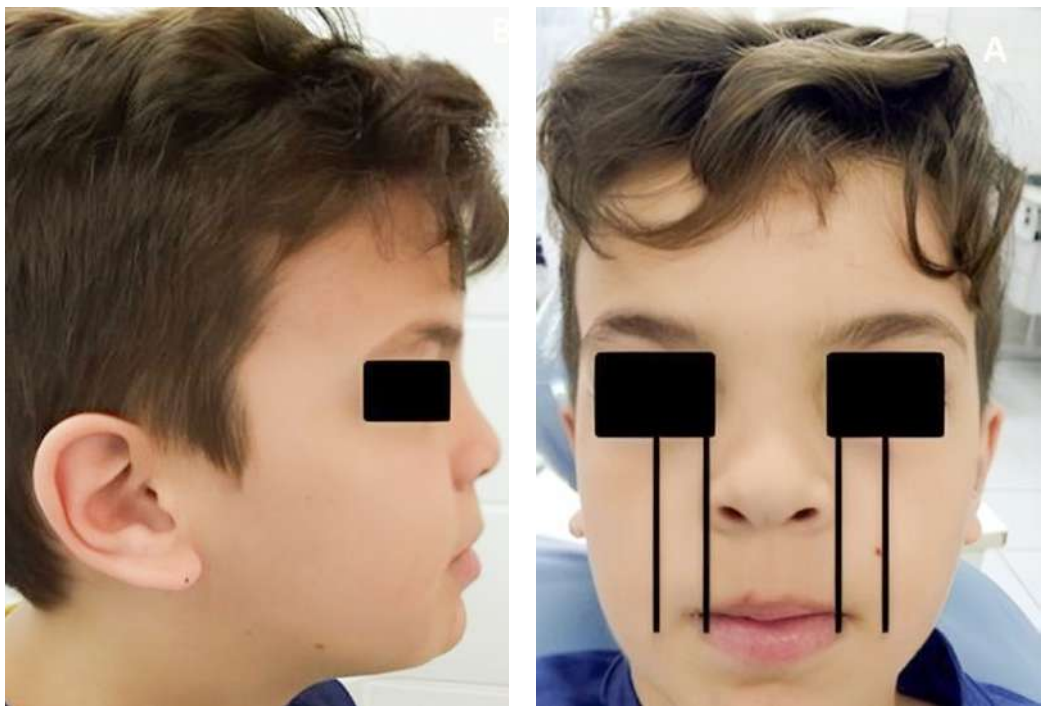


Figure 2. Clinical images showing the presence of moderate hypertelorism and increased cranial circumference.

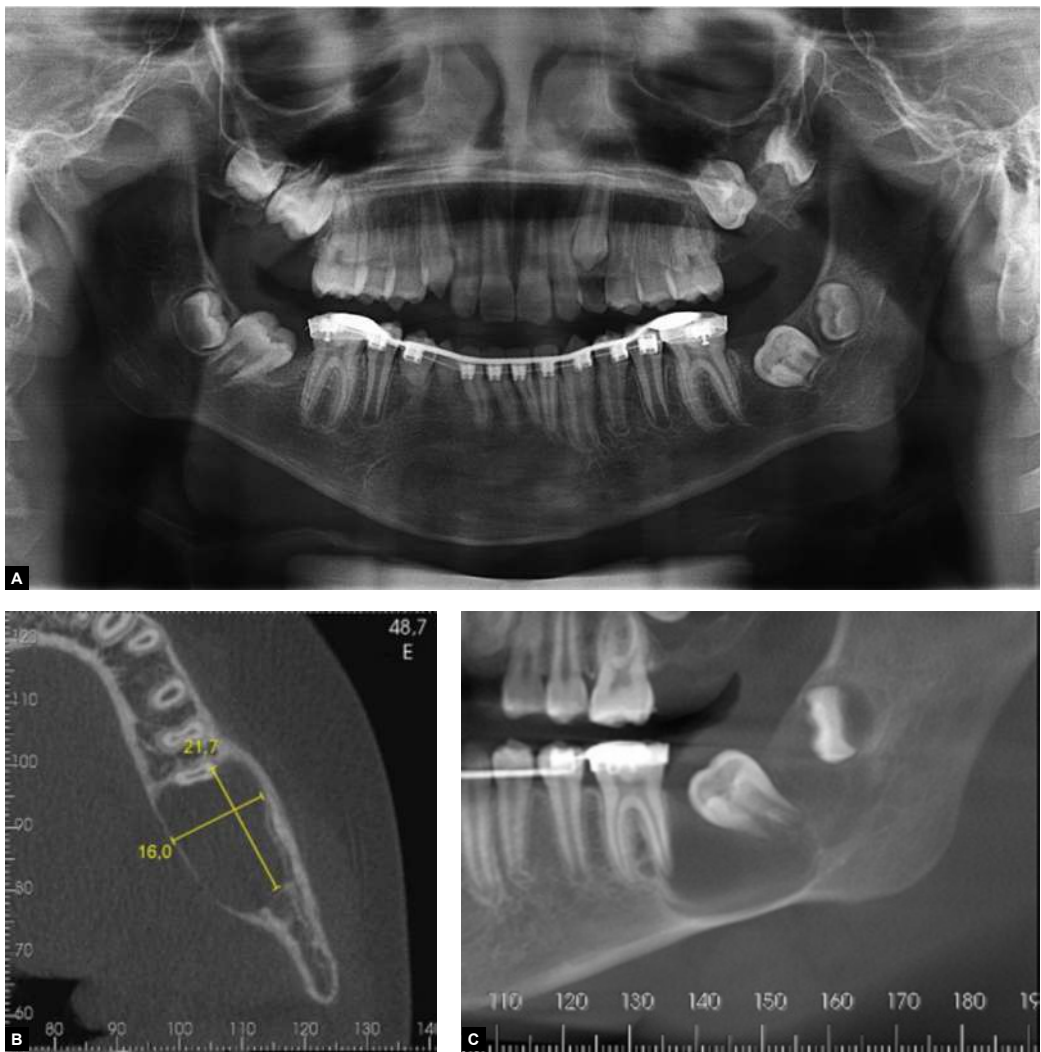


Figure 3. A) Radiographic image showing new radiolucent, well defined, multilocular area, involving the crowns of teeth #37 and #38, diagnosed as keratocyst. **B, C)** Hypodense area in body and left ramus of the mandible.

In 2021, in the radiographic follow-up, better bone quality was observed in the region of body and mandibular ramus, with a lower risk of pathological fracture, therefore osteosynthesis material was removed. In 2023, a radiolucent image was observed in the left maxilla and right mandible, suggestive of recurrence of the lesions (Fig. 4C-D). Enucleation was performed with curettage of the all lesions, in addition to extraction of tooth #26, under local anesthesia. At the moment, the patient is in clinical and radiographic follow-up, has been referred to the geneticist and is being monitored by the dermatologist.



Figure 4. A, B) Radiographic images showing hypodense lesion involving the left posterior area of the maxilla, invading the maxillary sinus and causing displacement of teeth #27 and #28. **C)** Radiographic image showing hypodense lesion in the left posterior area of the maxilla, involving tooth #26. **D)** Hypodense area in right body of the mandible adjacent to tooth #47.

Discussion

GGs is caused by mutations that inactivate the tumor-suppressor PTCH1 gene in 9q22.3-q311, a protein that inhibits the Sonic Hedgehog pathway, intervening in cell proliferation and survival.¹ Given the absence of a compatible family history, and because the physical examination of first-degree relatives did not present relevant changes, it was assumed that a new mutation occurred.

In 1994, diagnostic criteria for GGS were proposed, requiring the presence of two major criteria or one major criterion with two minor criteria.² However, recognizing GGS can be challenging, particularly in pediatric patients, as most major criteria typically manifest in the second and third decades of life.³ The present case exhibits an unusual presentation, as the GGS diagnosis was established within the first decade of life, due to the presence of two major criteria: multiple odontogenic keratocysts and early falx cerebri calcification. Additionally, the patient presented with minor criteria, such as macrocephaly and hypertelorism.

Odontogenic keratocysts are considered one of the most frequent and consistent features of GGS.⁴ While various treatment modalities have been documented, a universally accepted approach remains undefined. In young patients, conservative treatment strategies such as decompression and marsupialization should be prioritized, as aggressive interventions can have unfavorable effects on maxillofacial development, tooth development, and the eruption process.⁶⁻⁸ The management of the present case was initially primarily conservative, and this approach successfully preserved teeth and bone structure for a significant period.

However, the high rate of recurrence and the aggressive nature of the new lesions in 2020, which threatened a pathological fracture and involved extensive areas, necessitated a reevaluation of the treatment strategy. The decision was made in consultation with the orthodontist and the patient's family, to perform a more radical surgical approach, including enucleation and multiple extractions, to reduce the risk of future complications and improve the long-term prognosis. This transition highlights the need for a dynamic treatment plan, adaptable to the evolution of the disease, rather than adhering strictly to a single approach.

It is important to note that diagnostic errors, such as the initial misdiagnosis of an odontogenic keratocyst as a dentigerous cyst in 2017, are not uncommon in cysts associated with the crown of an unerupted permanent tooth.⁹ Diagnostic ambiguity may result from either nonrepresentative tissue sampling by the surgeon, or the histologic section's failure to capture diagnostic epithelium in a transverse plane relative to the cystic lining. These issues collectively highlight the intrinsic difficulty in histologic diagnosis, particularly with large and heterogeneous lesions. For instance, a odontogenic keratocyst may not uniformly exhibit the classically defined epithelial characteristics across its entire surface.¹⁰

Patients with GGS require management by a multidisciplinary team to ensure adequate monitoring and treatment, given the systemic nature of the syndrome.^{2,4} Although life expectancy is generally not significantly affected, associated manifestations such as basal cell carcinomas and odontogenic keratocysts have aesthetic implications of treatment that can impact patients, especially young individuals, both psychologically and socially.

Conclusion

The management of odontogenic keratocysts in pediatric patients with GGS is complex and requires an individualized, long-term approach. This case report demonstrates that, while conservative treatment strategies are crucial for minimizing long-term sequelae during the growth phase, the high recurrence rate and the potential for aggressive lesion growth demand rigorous, periodic follow-up. The successful application of a dynamic treatment plan, transitioning from conservative to more radical approaches when clinically indicated, is essential for achieving a favorable outcome in these patients.

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Management of facial injury from dog bite

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ABSTRACT

Introduction: Canine bites resulting in facial trauma pose a significant clinical challenge, due to the high risk of infection and the associated functional and esthetic disorders. These injuries are classified as complex wounds, often with polymicrobial contamination. **Objective:** This article aims to report a clinical case and discuss the main strategies for managing such injuries. **Case report:** A 79-year-old female patient, victim of a canine bite, presented extensive facial injuries that required surgical intervention in hospital setting under general anesthesia. Besides surgical reconstruction, management included antibiotic therapy, rabies and tetanus prophylaxis, and admission to the intensive care unit for clinical monitoring. **Conclusions:** The management of canine facial bites requires a careful approach to prevent infections and optimize recovery. Antibiotic prophylaxis may be indicated in moderate to severe cases, but the decision should be based on factors such as severity, location, and time since injury. Tetanus and rabies prophylaxis are always necessary, while early wound cleansing and treatment within 8 hours are crucial for better outcomes. The combination of tissue damage, infection risk, and potential sequelae requires immediate and specialized attention, to minimize complications and promote recovery.

Keywords: Domestic animals. Dog bite. Facial trauma.

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Introduction

Animal bites represent a relevant public health problem, with an increasing incidence over the years. Among bites, canine bites are the most frequently treated in emergency services, followed by feline and human bites.¹ The risk of subsequent infection is related to several factors, including the initial care provided to the wound, anatomical location of the lesion, individual characteristics of the patient, type of trauma caused and the attacking animal species.²

The prevalence of animal bites varies according to geographic, cultural and behavioral factors. Studies indicate that children, especially boys, are frequent victims, due to greater interaction with animals and lower ability to recognize signs of aggressiveness. This type of trauma is among the top 15 types of non-fatal injuries in the general population under 10 years of age.³ However, these injuries can affect individuals of all ages, especially those working directly with animals or having frequent contact with them.⁴

The kinematics is so intense and penetrating that it can cause huge skin avulsions, devitalize soft tissues, and cause damage to neurovascular structures; however, associated bone fractures are rare. This type of injury results in complex facial trauma, which may have functional and esthetic effects and also involve polymicrobial infections.^{5,6} This study aims to report a clinical case of dog bite in an elderly patient treated at the Urgency and Emergency State Hospital of Espírito Santo (Brazil), addressing the main strategies for clinical management.

Case report

A 79-year-old female patient was treated at Urgency and Emergency State Hospital of Espírito Santo (HEUE) after suffering a dog bite that resulted in extensive lacerated-contusive injuries to her face and left arm. The facial wounds were located in the middle and lower facial thirds on the left side, affecting the nasal, labial, and cheek areas, with exposure of teeth (Fig 1A).

Initial emergency care was conducted by the on-call general surgeon, according to Advanced Trauma Life Support (ATLS™) protocols. The maxillofacial surgery and orthopedics teams were called for team evaluation. Imaging exams, including facial computed tomography, and laboratory tests, were requested to complement the diagnosis and establish the therapeutic plan.

Considering the severity and extent of facial injuries, it was decided to perform primary wound closure in the operating room, under general anesthesia with orotracheal intubation. Strict local antisepsis was performed with chlorhexidine solution, followed by application of 2% aqueous chlorhexidine. Next, local infiltration was performed with 2% lidocaine with adrenaline, and abundant wound irrigation with 0.9% saline solution (Fig 1B).

Surgical debridement was carefully performed, promoting regularization of the wound edges and removal of devitalized tissues. Hemostasis was achieved with the aid of an electric scalpel. Primary closure was then initiated by suturing of deep layers using 3-0 Vicryl® resorbable suture, followed by skin suturing with 5-0 Nylon suture using simple and continuous sutures (Fig 1C). At completion, sterile dressing was applied to protect the surgical wounds.



Figure 1. A) Initial patient care, evidencing wounds resulting from a dog bite on the face. **B)** Appearance of lesions after antisepsis performed in the operating room. **C)** Immediate postoperative aspect of facial reconstruction after sutures.

The lesions present in the left upper limb were evaluated and treated by the general surgery and orthopedics teams, according to the specific protocols of the specialties involved.

In the immediate postoperative period, the patient was transferred to the Intensive Care Unit (ICU), breathing ambient air spontaneously. Intravenous antibiotic therapy was maintained with amoxicillin 875 mg combined with potassium clavulanate 125 mg, administered at every 8 hours throughout the hospitalization period. Daily local dressings were performed using aseptic technique, to optimize the healing process and prevent secondary infections.

On the first day of hospitalization, rabies vaccination protocol and tetanus prophylaxis were initiated. The first dose of rabies vaccine was administered intramuscularly, preceded by rabies immunoglobulin. Tetanus prophylaxis was performed with a booster dose of tetanus antitoxin, following the recommended schedule of 5,000 IU intramuscularly. The second dose of rabies vaccine was administered after three days.

The patient remained hospitalized for nine days and was discharged with instructions for postoperative home care. Six months after the injury, she returned for outpatient evaluation, showing favorable wound healing, without clinical signs of infection. However, a hypertrophic scar developed in the affected area. The patient remains under regular outpatient follow-up, with no indication for additional therapeutic intervention to date (Fig 2).



Figure 2. Postoperative appearance of the healed lesions six months postoperatively.

Discussion

One of the main discussions in the management of dog facial bites involves the role of antibiotic prophylaxis. Wounds resulting from this type of injury often present a significant risk of infection, due to the introduction of aerobic and anaerobic pathogens from the animal's microbiota and the victim's skin microbiota. The microbiology of wounds caused by animal bites is polymicrobial, composed of a variety of aerobic and anaerobic organisms. The most commonly involved aerobic species include *Neisseria*, *Corynebacterium*, and *Staphylococcus*. Anaerobic bacteria frequently found in bite wounds include *Fusobacterium*, *Bacteroides*, *Prevotella*, *Propionibacterium*, *Peptostreptococcus* and *Porphyromonas*.^{2,4,5,7}

There are divergences in the literature regarding the need for antibiotic prophylaxis, since the risk of infection can be significantly reduced by adequate cleaning and debridement, combined with rich vascularization of the face and neck regions, making antibiotic prophylaxis unnecessary in some cases. Thus, the decision to use prophylactic antibiotics should be based on factors such as type of animal, wound severity and location, and the time elapsed since the bite.⁸

Conversely, some authors recommend the use of amoxicillin combined with clavulanic acid for a period of 3 to 5 days as preventive therapy, especially for moderate to severe lesions located on the face.^{2,4,8}

Tetanus and rabies prophylaxis is essential in all cases of animal bites, following the guidelines of the Ministry of Health and considering the patient's vaccination history. Administering the tetanus vaccine after a dog bite is necessary due to the risk of infection by *Clostridium tetani*, which

causes tetanus. Although tetanus is not transmitted directly by bites, injuries caused by animals, especially in contaminated environments, can create ideal conditions for these bacteria to enter the body. The tetanus vaccine should be administered if the person has received fewer than three doses, or if there is no information about previous vaccinations. A booster dose is also necessary if the last dose was administered more than 10 years earlier, or more than 5 years earlier in the case of serious injuries.⁵ In the present case, tetanus vaccination was performed in a single booster dose.

Rabies is a zoonosis caused by Lyssavirus that affects the central nervous system, transmitted by wound contamination with the saliva of an infected animal. The course of action depends on two main factors: the severity of injury, and the possibility of observing the animal involved. Initially, all exposures should be treated by thorough wound washing with soap and water.⁵

In cases of minor injuries, such as superficial scratches or contact with saliva on intact skin, when the animal is known and healthy, it is only recommended to monitor the animal for ten days. If it remains healthy, there is no need to start vaccination. If the animal dies, disappears, or develops rabies, five doses of vaccine should be applied (days 0, 3, 7, 14, and 28). However, if the animal is unknown, unavailable for observation, or considered a risk, immediate initiation of the vaccination schedule with five doses is indicated. If the animal is found and remains clinically well during the observation period, immunization can be discontinued. In severe accidents, including deep or multiple bites, the approach should be stricter. If the attacking animal is known and can be

monitored, two doses of the vaccine are initiated. If the animal remains healthy for ten days, the schedule can be discontinued. However, if the animal is unknown, disappears, dies during the observation period, or presents clinical signs suggestive of rabies, the exposure is considered high-risk. In this case, it is necessary to complete the vaccination protocol with five doses, besides application of antirabies serum.^{9,10}

In the present case, the domestic animal presented proof of valid vaccination, yet the wounds were very severe. Thus, the rabies vaccination protocol was followed, with the prophylactic schedule of two doses. Additionally, the administration of rabies immunoglobulin was also indicated. The combination of vaccination and rabies immunoglobulin is highly effective in preventing human infection when administered after the bite of an animal infected with the rabies virus.⁷

A randomized clinical trial demonstrated that primary closure of dog bite wounds on the face is often preferred in the management of wounds in the facial region, due to its ability to minimize scarring and optimize the esthetic results. The study results demonstrated no increase in the infection rate in wounds subjected to primary suturing, and significant esthetic improvement was observed in cases treated by this technique.⁹

Corroborating these findings, studies have also reported that primary closure is the treatment of choice for non-infected facial lacerations resulting from bites, provided they are evaluated within the first 24 hours, which provides better esthetic outcomes. However, wounds with clinical signs of infection, significant depth, or higher risk of infective complications should be treated with healing by secondary intention to reduce the risk of infection and promote safer recovery.^{2,6}

In most cases, irrigation with sterile saline is fundamental to remove bacteria and foreign bodies from the wound. Conservative debridement of devitalized tissues aids in the prevention of infections and promotes healing.²

The formation of hypertrophic scars is a relatively frequent complication, especially in extensive, deep lesions or in the presence of high mechanical stress. This risk can be worsened by factors such as trauma severity, presence of infection, tension on the wound, and individual characteristics. In the present case there was development of hypertrophic scars, defined as excessive proliferation of fibrous tissue, with elevation of the scar in relation to the adjacent skin plane. Factors such as patient's age, depth and irregularity of lesions, tension applied by the suture, and possible genetic predisposition may have contributed to this scarring response, resulting in alterations in the tissue regeneration process and disorganized collagen deposition.⁸

Conclusion

Animal bites on the face represent a challenge for healthcare professionals, requiring an individualized approach for each case. Initial management should follow established protocols for facial trauma associated with bites, prioritizing clinical stabilization and infection prevention. Healthcare professionals should be familiar with the different therapeutic approaches for animal bites to offer the most appropriate treatment for each patient. Also, regular patient follow-up allows early detection of complications and ensures effective treatment.

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Facial reconstruction after cancer treatment, with polymethylmethacrylate

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ABSTRACT

Introduction: Facial malignancies treated with surgery usually result in significant anatomical defects. Titanium is the gold standard, but its high cost limits accessibility. PMMA emerges as a cost-effective alternative, with good efficacy when associated with 3D planning. **Case report:** A patient, who underwent maxillectomy and radiotherapy 4 years prior for squamous cell carcinoma of the palate, presented with an extensive maxillary defect. 3D planning, stereolithography with ABS polymer, and a custom-made PMMA implant molded in a muffle were utilized. The surgical approach was via a Weber-Fergusson incision, leading to a successful outcome with adequate reconstruction. **Conclusion:** PMMA proved viable for facial reconstruction in situations where titanium implants are not accessible. It presents intraoperative moldability, adjustable radiopacity, and reduced cost. Careful patient selection, precise planning, and appropriate surgical technique are recommended. Randomized studies are necessary to consolidate its role in craniofacial surgery.

Keywords: Polymethylmethacrylate. Facial reconstruction. Oncological surgery. Craniofacial implants. Three-dimensional planning.

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» Patients displayed in this article previously approved the use of their facial and intraoral photographs.

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Introduction

The treatment of malignant facial neoplasms, often based on ablative surgery combined with radiotherapy, can cause extensive anatomical defects, giving rise to functional and esthetic repercussions of great magnitude. The loss of bone and soft tissue volume compromises chewing, speech, and swallowing, and also presents a severe psychosocial impact, given the central role of the face in nonverbal communication and personal identity. Customized titanium metal prostheses have been considered the "gold standard" for reconstruction of large craniofacial defects, due to their biocompatibility and mechanical resistance. However, their high cost and the sophisticated infrastructure required for production by three-dimensional metal printing prevent their widespread availability in many centers.

In recent years, three-dimensional planning techniques combined with biomaterials such as polymethyl methacrylate (PMMA) have renovated the discussion about lower-cost and highly effective alternatives. PMMA offers advantages such as intraoperative moldability, adjustable radiopacity, and reduced cost. Although there are consolidated reports of its use in cranioplasties, publications of cases specifically focused on reconstruction of the jaws and superficial facial structures, especially after cancer treatment, are still scarce. This report aims to detail the use of a PMMA mold for reconstruction of an extensive left maxillary defect in a patient after maxillectomy and radiotherapy, emphasizing the planning workflow, surgical technique, and clinical evolution, besides discussing the perspectives of this method considering the current literature.

Case description

A 47-year-old female patient with a history of epidermoid carcinoma of the left palate had been submitted to radical partial maxillectomy associated with adjuvant radiotherapy four years earlier. The treatment sequelae revealed voluminous bone loss of the zygomatic-maxillary complex, resulting in significant facial depression, evident asymmetry compared to the contralateral side, besides masticatory dysfunction, speech impairment, and recurrent infections due to communication between the oral and nasal cavities and the maxillary sinus. The patient consented to the publication of her case, signing an informed consent form, with approval from the Institutional Review Board.

For reconstruction planning, a facial computed tomography scan with thin slices (0.5 mm) was performed, allowing for three-dimensional reconstruction of the bone remnants and the defect (Fig 1). Using virtual modeling software, the ideal contour was outlined, based on the contralateral side, and a stereolithographic prototype was constructed in ABS polymer, on which an autoclavable muffle was made. Under general anesthesia with nasotracheal intubation and standard antiseptic precautions, surgery consisted of access via a Weber-Fergusson incision, with careful skin extension to preserve the subcutaneous blood vessels of the region, which had been previously irradiated. Careful detachment of the musculocutaneous flaps was performed, with exposure of the remaining bone stumps and careful hemostasis.

Intraoperatively, the PMMA was prepared according to the manufacturer's instructions, respecting the powder and liquid ratio, and inserted into the previously sterilized flask. After the initial polymerization period

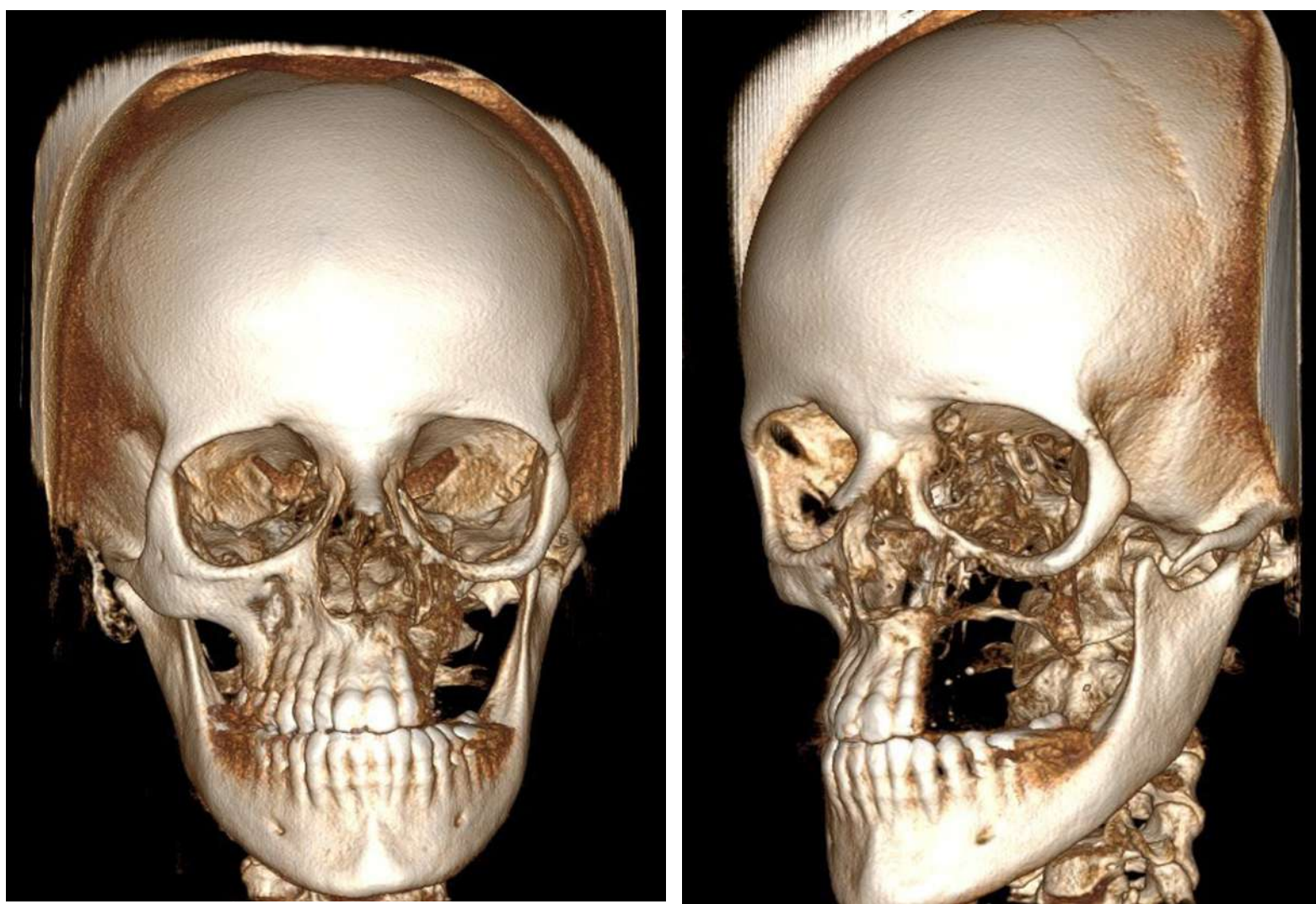


Figure 1. Bone defect.

of about twenty minutes, the prosthesis was detached from the muffle, receiving primary finishing with burs under continuous cooling (Fig 2). The customized piece presented satisfactory anatomical contour, adapting to the bone bed. It was fixed with titanium plates and screws at four fixation points, ensuring primary stability (Fig 3). Good fitting was observed between the PMMA surface and the adjacent bone, without significant gaps. After abundant irrigation, the wound was closed in layers: the muscle plane and subcutaneous tissue with 3-0 resorbable polyglactin suture, and the skin with 5-0 nylon with simple sutures.



Figure 2. PMMA prosthesis.

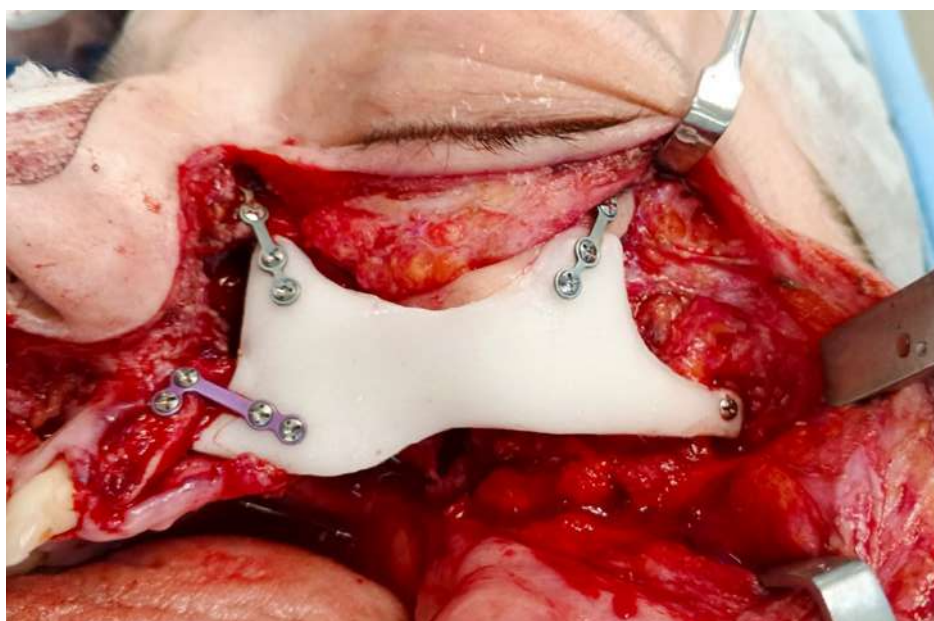


Figure 3. Prosthesis in place.

The immediate postoperative period was uneventful. At hospital discharge on the following day, the patient presented with a balanced facial contour and no signs of infection or extrusion. During follow-up, no adverse events such as rejection, prosthesis migration, or chronic inflammatory reactions were detected. Reestablishment of facial contour, improvement in static and dynamic symmetry, and recovery of masticatory function were observed, with the expected scar at the site of the original incision (Fig 4).



Figure 4. Pre and 20-day postoperatively.

A follow-up CT scan after 14 months revealed perfect fitting of the prosthesis to the bone and adjacent soft tissues, without signs of osteoradionecrosis (Fig 5).

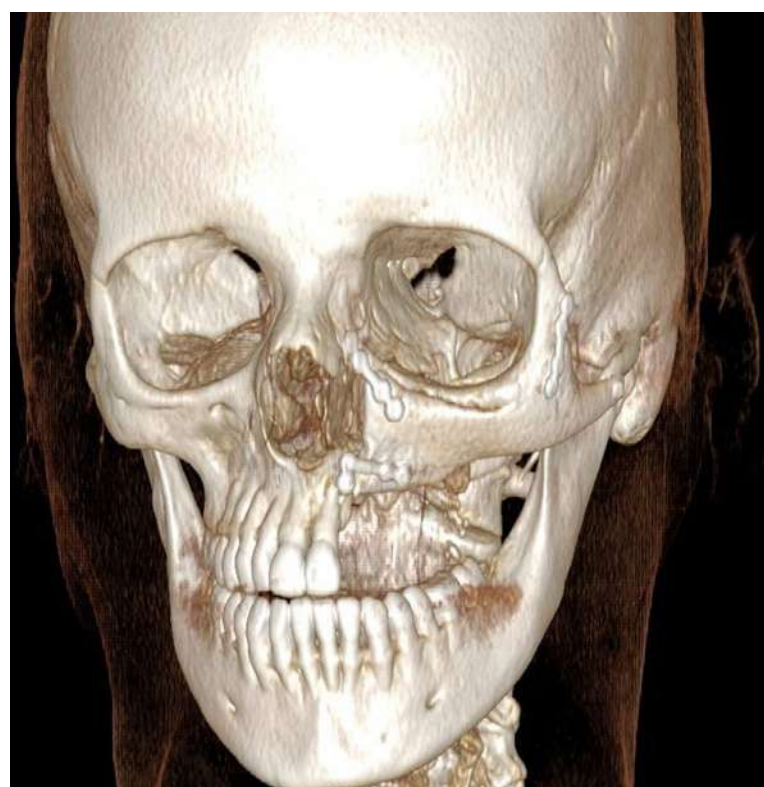


Figure 5. Control CT scan at 14 months.

Discussion

The literature regarding the use of PMMA in facial reconstructions initially highlights its application in cranioplasties, especially in cases of frontal or temporoparietal defects, with reports dating back to the 1990s. The reports of Lara et al.¹ and Chiarini et al.² demonstrated that, with proper molding and sterilization techniques, PMMA offers satisfactory mechanical strength and dimensional stability, without significant increase in complications in long-term follow-up. However, most publications focus on cranial regions and trauma patients. Cancer cases, especially involving reconstruction of irradiated facial tissues, are rare, limited to small series or isolated reports.

One of the main concerns regarding the use of PMMA in previously irradiated tissues is the compromised healing and risk of exposure or infection. However, in the present report, it was observed that adequate patient selection, precise 3D planning, and careful surgical technique were mandatory for the success. The creation of a muffle allowed the PMMA to be molded outside the surgical bed, reducing the time of tissue ischemia and contamination. Such practices were mentioned by Chiarini et al.² and Bruens et al.,³ who emphasize the importance of contamination control and intimate fitting of the prosthesis, to minimize dead spaces and stress points.

Compared with titanium metal prostheses, PMMA offers cost advantages — nearly 90% lower — and simpler logistics, not requiring highly specialized laboratories. Conversely, it does not offer the same resistance to extreme traction, but for facial defects without direct masticatory load on the prosthesis, its rigidity is sufficient. Studies by Moreira-Gonzalez et al.⁴

report a comparable occurrence of complications between PMMA and titanium in cranioplasties, reinforcing the viability of the former in selected reconstructions.^{5,6}

Despite the promising results, it is recognized that this report is isolated, without statistical power to define protocols. The literature lacks randomized comparative trials between different biomaterials in facial reconstruction after cancer treatment. In the short and medium terms, the stability of PMMA appears adequate; however, longer investigations are needed to assess surface changes, risk of degradation, and possible low-grade inflammatory reactions over the decades.^{7,8}

Conclusion

Facial reconstruction with customized PMMA presents as a viable and low-cost alternative, especially when customized metal prostheses are not accessible. Three-dimensional planning and the fabrication of surgical muffles ensure anatomical and functional predictability, even in patients previously submitted to radiotherapy. Additional cases and long-term follow-up studies may consolidate the role of PMMA as an important resource in craniofacial reconstructive surgery.^{9,10}

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OBJECTIVE AND EDITORIAL POLICY

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ABSTRACT

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- » If a figure has already been published, its caption must credit the original source.
- » All figures must be cited in the text.

Graphs and cephalometric tracings

- » Should be cited in the text as figures.
- » Files containing the original versions of the graphs and tracings, in the programs used to make them, should be sent.
- » It is not recommended to send them only in bitmap image format (not editable).
- » The drawings submitted may be improved or redesigned by the journal's production team, at the Editorial Board's discretion.

Tables

- » Tables should be self-explanatory and should complement, not duplicate, the text. Tables are illustrations with numerical statistical data.
- » They should be numbered with Arabic numerals, in the order in which they are mentioned in the text.
- » Each table should have a short title.
- » There should be no blank data: a dash indicates non-existent data, an ellipsis indicates unknown data.
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- » Tables should be sent as a text file (Word or Excel, for example), not as a graphic element (non-editable image).

MANDATORY DOCUMENTS

All manuscripts should be accompanied by the following documents:

Institutional review board / IRB (original articles on clinical research and in vivo research/case reports)

Articles must, if applicable, refer to the opinion of the institution's Ethics Committee (recognized by the CNS - National Health Council) without, however, specifying the name of the university, center or department. The document proving the opinion must be sent. If applicable, report compliance with the recommendations of international protection bodies and the Declaration of Helsinki, in line with the ethical standards of the committee responsible for human/animal experimentation.

The National Commission for Ethics in Research (CONEP) - in accordance with CNS Resolutions No. 466 of 2012 and No. 510 of April 7, 2016 - provided guidance to IRB's and researchers, via Circular Letter No. 166/2018-CONEP/SECNS/MS, of June 12, 2018, on the procedures for submitting Case Reports to IRB's, via Plataforma Brasil.

The **Letter to the Editor** modality, if it contains a clinical case, must also be submitted to the CEP.

Human rights and animal protection (original clinical research article and in vivo research/case reports)

Report compliance with the recommendations of international protection organizations and the Declaration of Helsinki, adhering to the ethical standards of the committee responsible for human/animal experimentation. For research carried out on human beings, the opinion of the Research Ethics Committee must be included, in accordance with Resolution 466/2012 CNS-CONEP.

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If there is any interest of the authors concerning the study objective, it should be explicitly mentioned.

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REFERENCES

- » All papers cited in the text should be included in the reference list.
- » All references should be cited in the text.
- » To enhance reading, the references should be cited in the text indicating only their numbers.
- » The references should be indicated in the text by superscript Arabic numbers in order of appearance.
- » The abbreviations of journal titles should be formatted according to the publications "Index Medicus" and "Index to Dental Literature".
- » The authors are responsible for the accuracy of references, which should contain all data necessary for their identification.
- » The references should be presented at the end of the text completion, following the Vancouver guidelines (http://www.nlm.nih.gov/bsd/uniform_requirements.html).
- » Use the examples below:

Paper with up to six authors

Espinar-Escalona E, Ruiz-Navarro MB, Barrera-Mora JM, Llamas-Carreras JM, Puigdollers-Pérez A, Ayala-Puente. True vertical validation in facial orthognathic surgery planning. Clin Exp Dent. 2013 Dec 1;5(5):e231-8.

Paper with more than six authors

Pagnoni M, Amodeo G, Fadda MT, Brauner E, Guarino G, Virciglio P, et al. Juvenile idiopathic/rheumatoid arthritis and orthognathic surgery without mandibular osteotomies in the remittent phase. J Craniofac Surg. 2013 Nov;24(6):1940-5.

Book chapter

Baker SB. Orthognathic surgery. In: Grabb and Smith's Plastic Surgery. 6th ed. Baltimore: Lippincott Williams & Wilkins. 2007. Chap. 27, p. 256-67.

Book chapter with editor

Breedlove GK, Schorfheide AM. Adolescent pregnancy. 2nd ed. Wiecezorek RR, editor. White Plains (NY): March of Dimes Education Services; 2001.

Dissertation, thesis and monograph

Ryckman MS. Three-dimensional assessment of soft tissue changes following maxillomandibular advancement surgery using cone beam computed tomography [Thesis]. Saint Louis: Saint Louis University; 2008.

Electronic publication

Sant'Ana E. Ortodontia e Cirurgia Ortognática – do planejamento à finalização. Rev Dental Press Ortod Ortop Facial. 2003 maio-jun;8(3):119-29 [Acesso 12 ago 2003]. Disponível em: <http://www.dentalpress.com.br/artigos/pdf/36.pdf>.

INFORMATION FOR AUTHORS

Adherence to the specific guidelines for each type of study - be it a systematic review, clinical case study, retrospective study or clinical trial - is essential to guarantee the quality, transparency and reproducibility of scientific research. JBCOMS recommends the use of guidelines when preparing manuscripts.

In the case of systematic reviews, guidelines such as PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) ensure that the methodology for searching, selecting and analyzing data is rigorous and standardized.

For clinical case reports, it is recommended to use the CARE (Case Report Guidelines) guideline, which guides the detailed description of the case, facilitating its usefulness to the scientific community.

Retrospective studies, which analyze previously collected data, should follow standards such as STROBE (Strengthening the Reporting of Observational Studies in Epidemiology), ensuring that the report is transparent in terms of data selection, variables analyzed and potential biases.

In addition, for randomized clinical trials, the CONSORT (Consolidated Standards of Reporting Trials) guideline is essential to ensure that the design, conduct and reporting of results are clear and reliable.

Compliance with these guidelines not only increases the credibility of the study, but also facilitates its acceptance in high-impact scientific journals. Here are some links to consult:

- CARE (Case Report Guidelines):
<https://www.care-statement.org>
- STROBE (Strengthening the Reporting of Observational Studies in Epidemiology):
<https://www.strobe-statement.org>
- PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses):
<https://www.prisma-statement.org>
- CONSORT (Consolidated Standards of Reporting Trials):
<https://www.consort-statement.org>

NOTICE TO AUTHORS AND CONSULTANTS: REGISTRATION OF CLINICAL TRIALS

The Journal of the Brazilian College of Oral and Maxillofacial Surgery supports the clinical trial registration policies of the WHO (<http://www.who.int/ictrp/en/>) and the ICMJE - International Committee of Medical Journal Editors (<http://www.icmje.org/>), recognizing the importance of these initiatives for the registration and international dissemination of information on clinical trials in open access. Therefore, following the BIREME/PAHO/WHO guidelines for indexing journals in LILACS and SciELO, only clinical research articles that have received an identification number in one of the Clinical Trials Registries validated by the criteria established by the WHO and ICMJE, whose addresses are available on the ICMJE website: <http://www.icmje.org/about-icmje/faqs/clinical-trials-registration>. The identification number should be entered at the end of the abstract. We therefore recommend that authors register their clinical trials before they begin.

Sincerely,
Dr. Rafaela Scariot
Editor-in-Chief of JBCOMS
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