Prosthetic upper jaw restoration with zygomatic and conventional implants in a patient with a giant cell lesion

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Abstract

The rehabilitation choice of patients undergoing resective surgery until some time ago was that of a removable prosthesis.
With the introduction of implants and digitized programming, it is possible to perform previsualization of the surgical treatment and program all the various rehabilitation prosthetic phases.
The authors present a case of a patient suffering from a giant cell lesion whose upper right jaw was surgically removed and then prosthetically rehabilitated.
So, the only possibility we have of reducing the invasiveness of surgical treatments is to make an early diagnosis.

Key words: prosthetic restoration, zigomatic implant, giant cell lesion.

Introduction

Giant cell lesions of the maxilla and paranasal sinuses represent a rare, locally aggressive disorder that presents as a soft tissue mass with distinct histologic and clinical features. Giant cell injury is a locally aggressive benign primary bone neoplasm. It was first described by Sir Ashley Cooper in 1818. It accounts for 5-15% of all benign bone tumors. It most often affects women between the 2nd and 3rd decades of life. 1 to 3% occur in children under 14 years of age.
They are located in the epiphyses and metaphyses of the long bones (knee, femur, tibia, radius) (1).
In the maxillofacial area, they are very rare and are found, in order of frequency, in the mandible, upper jaw, skull base, and mandibular condyle. In these cases, it is necessary to rule out a disease associated with Paget's (2-4).It represents the most common lesion associated with secondary aneurysmal bone cysts (39%). Inflammatory, angiogenic, and osteoclastic, although none of them is demonstrated. The role played

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by the p 53 suppressor gene in its genesis has recently been confirmed (5).

It usually manifests as a single, asymptomatic, or painful tumor with rapid expansion that generally settles in the vestibular sulcus. It can cause displacement and/or loss of teeth, oral opening limitations, pathological fractures (11-37%), or paresthesias.

Other times, it manifests as incidental radiolucency on a conventional radiological examination. Radiologically, it manifests as a multilocular radiolucent image in "soap bubbles," similar to that described for ameloblastoma (7).

Less commonly, it presents as a unilocular image. Sometimes, it causes an expansion and thinning of the cortical with sclerotic edging and root resorption. In half of the cases, the bone cortex is destroyed.6 Angiographic studies are beneficial, showing a hypervascular lesion in most cases (60-65%), although there are hypovascular (26-30%) or even avascular (10%) cases (8).

The lesion is not a granuloma in the strict histologic sense, and clinically, it is not reparative, often demonstrating neoplastic features (9).

Because there is evidence that the often-cited differences between giant cell granuloma and giant cell tumor are not as well-defined as commonly believed, we prefer to use the noncommittal term “giant cell lesion.” (10)

Likely, giant cell “granuloma” of the jaws and giant cell tumors of other bones represent a continuum of a single disease process rather than being completely separate entities (11).

Case reports

A 52-year-old woman presented to the Department of Maxillofacial of the National Autonomous University of Mexico with a painless swelling on the right side of the face for six months. (Figure 1) The swelling had an insidious onset and progressed slowly. There was no history of any loosening of teeth. There was no history of trauma to the face five to six years ago. There were no facial paraesthesias, nasal discharge, epiphora, or systemic symptoms. Medical history and family history were non-contributory.

Figure 1.

The tomograph showed a well-defined radiolucent area that extended from the right lateral incisor to the left second molar región in the maxillary (Figure 2).

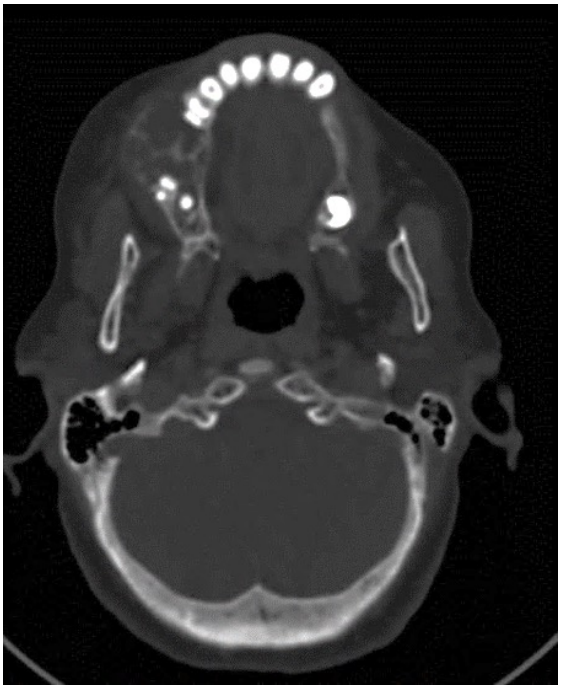


Figure 2

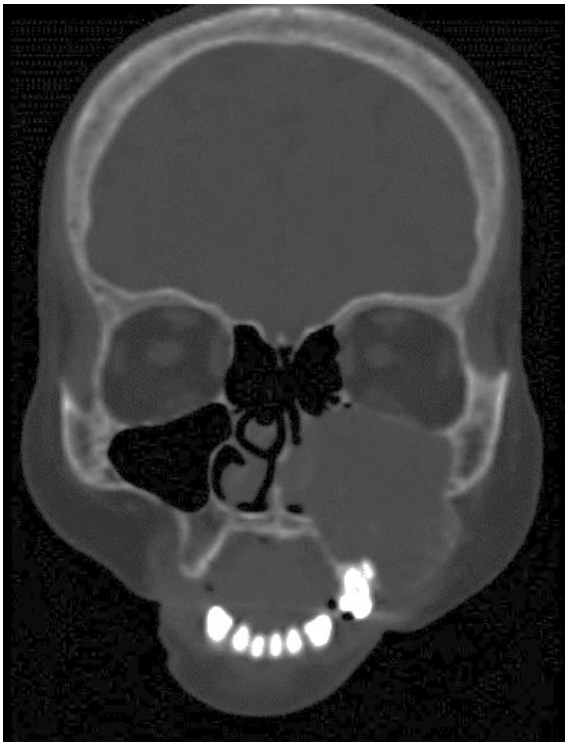


Figure 3

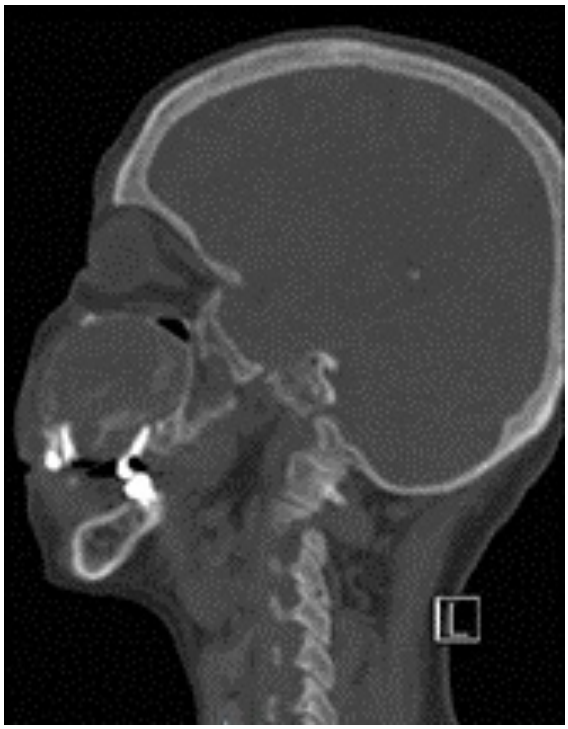


Figure 4.

A maxillary tomogram showed the absence of the bony hard palate on the right side with an associated soft tissue mass extending into the nasal area; this image infiltrates the medial wall TEPof the nostrils, where it infiltrates the nasal septum, middle and inferior turbinates, respecting the floor of the orbit, in the axial section can be seen an image with mixed areas in the retromolar area of the maxilla with Hypodense predominance compared to bone tissue.

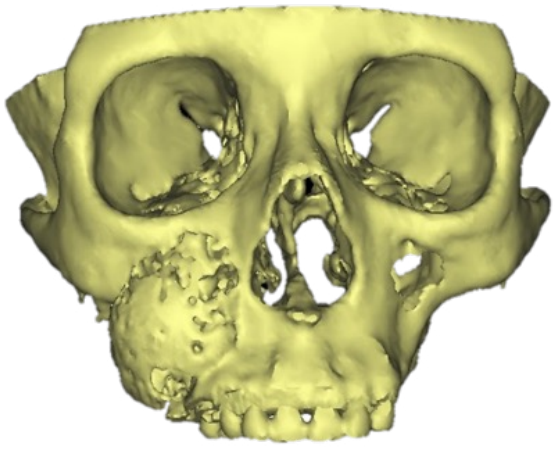


Figure 5

Based on the topography, it was decided to develop a 3D reconstruction to later elaborate stereolithography for planning the surgical phase, the conformation of the mesh for the orbit, and removing the part of the upper jaw (Figs. 5-8).

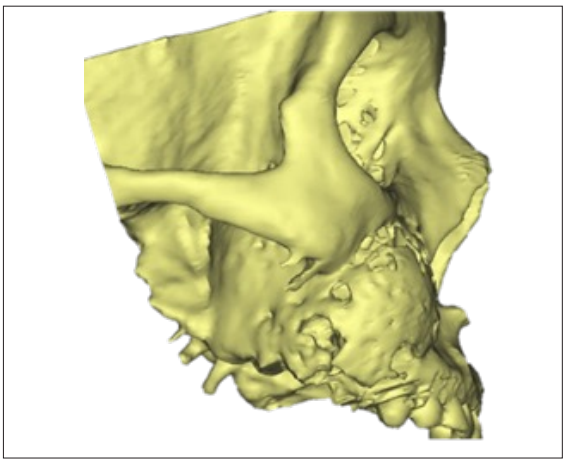


Figure 6

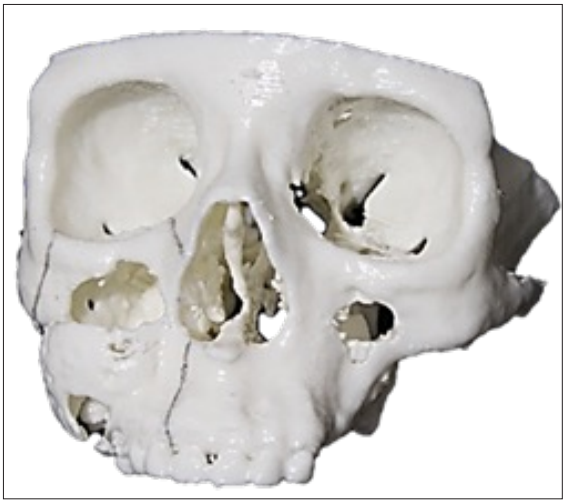


Figure 7

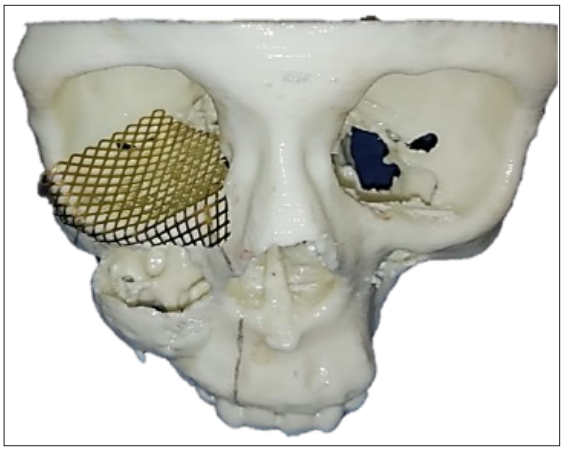


Figure 8

The eye was approached through a transcaruncular incision as a way of approach, which was carried out in combination with a pure transconjunctival incision, respecting the tear canaliculi (Figs. 9,10).

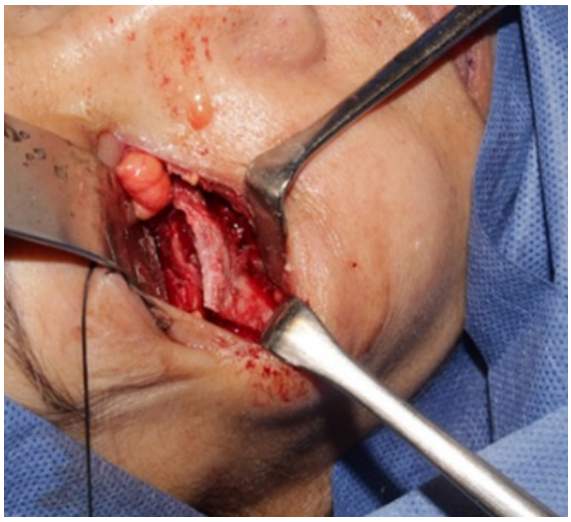


Figure 9

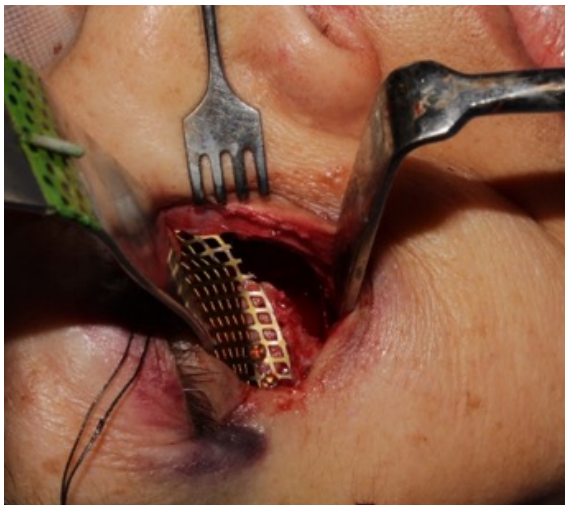


Figure 10

For the upper jaw portion, an intraoral approach was performed to make the cut previously planned in the stereolithography (Figure 11).

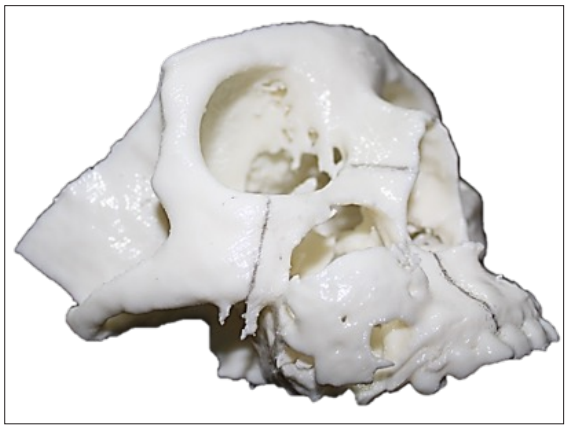


Figure 11

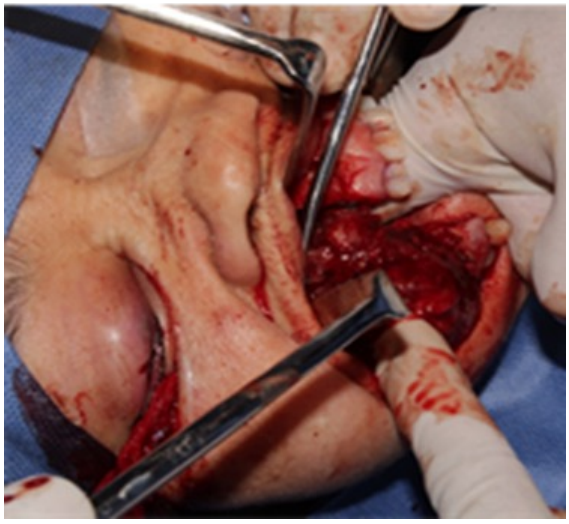


Figure 12

The procedure was done through a partial maxi-reading to preserve the two upper central ones for the prosthesis placement (Figs. 12-14).

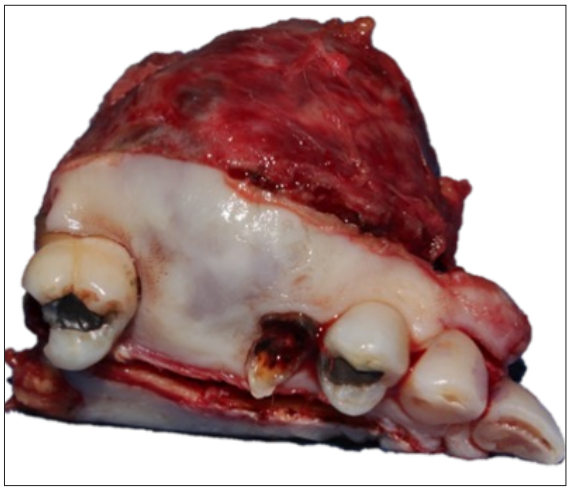


Figure 13

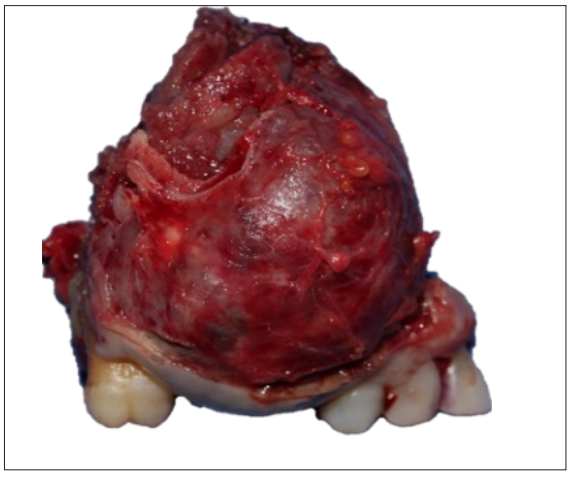


Figure 14

After removing the upper jaw, a maxillofacial prosthesis was placed to maintain the contours of the tissues and the facial appearance of the patient and avoid further problems. Figure 15,16

Figure 15

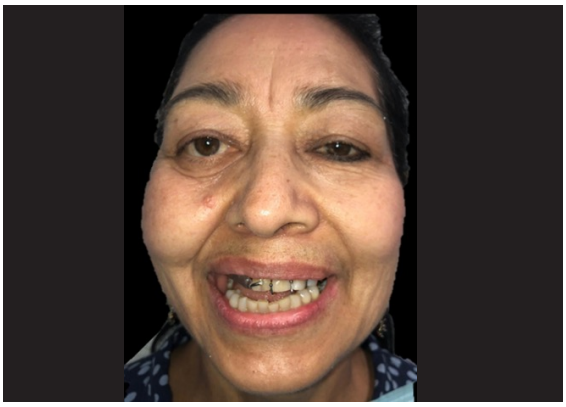


Figure 16

Pathology findings

A potentially aggressive osteolytic lesion is observed locally, composed of numerous multinucleated giant cells immersed in a spindle cell stroma with a fibrous appearance. At higher magnification, bone spicules surrounded by multinucleated giant cells (arrows) are observed, which are related to osteoclasts due to their osteolytic effect. H&E; 40x.

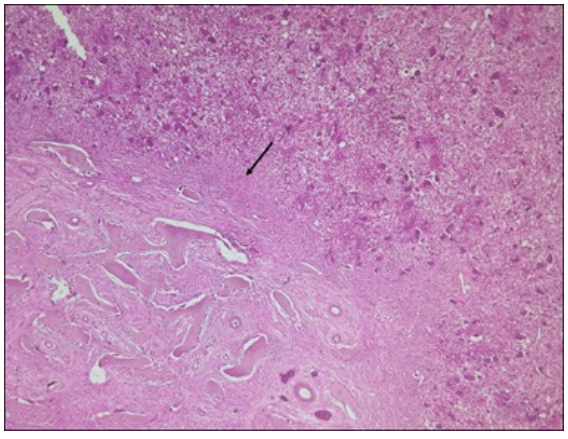


Figure 17

Multinucleated giant cells have variability in size and shape, can have up to 20 nuclei, and mitosis, but no atypia. Note its association with a spindle cell stroma and blood vessels with extravasated erythrocytes (arrows). H&E; 40x (Figs. 17,18).

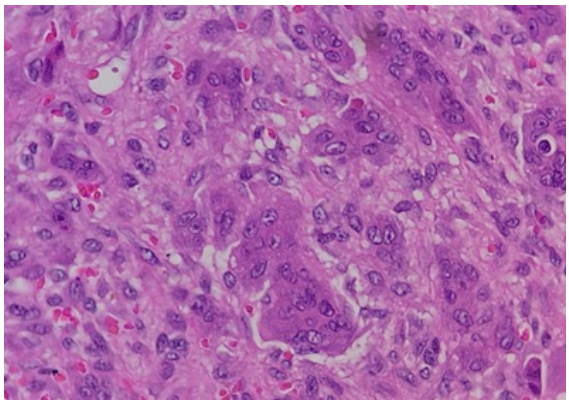


Figure 18

After surgery, the patient received secondary treatment of chemotherapy. The second CT scan showed the maxillectomy and bone remnant performed to plan rehabilitation using zygomatic, pterygoid, and conventional implants (Figs. 19,20).

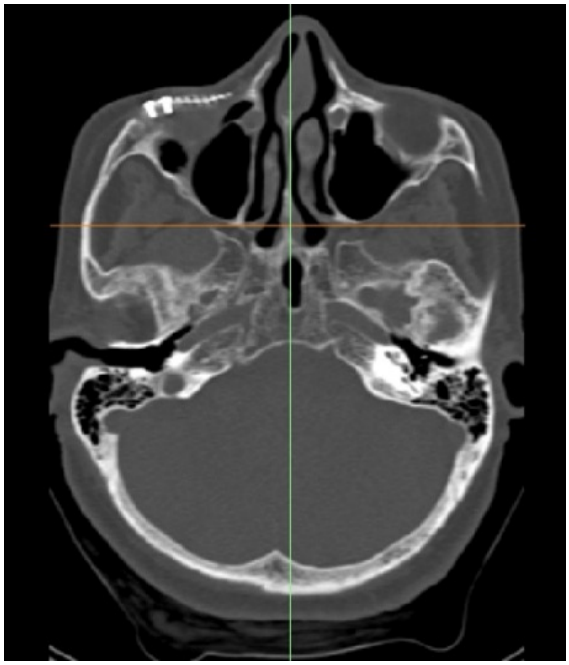


Figure 19

A diagnostic wax-up was developed to analyze the occlusion and the prosthetic plane and the location for the placement of zygomatic, pterygoid, and conventional implants; a third tomography was taken for a 3D reconstruction with the markers corresponding to the wax-up (Figs. 21-23).

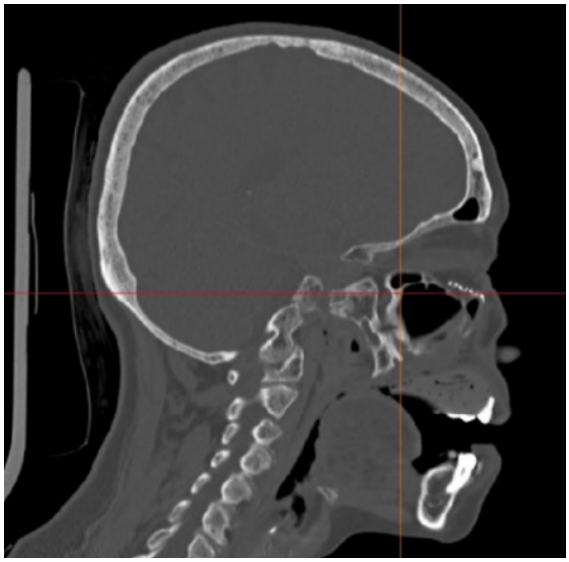


Figure 20

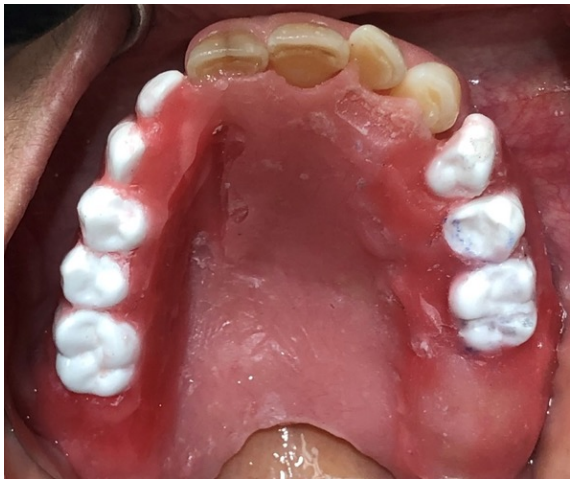
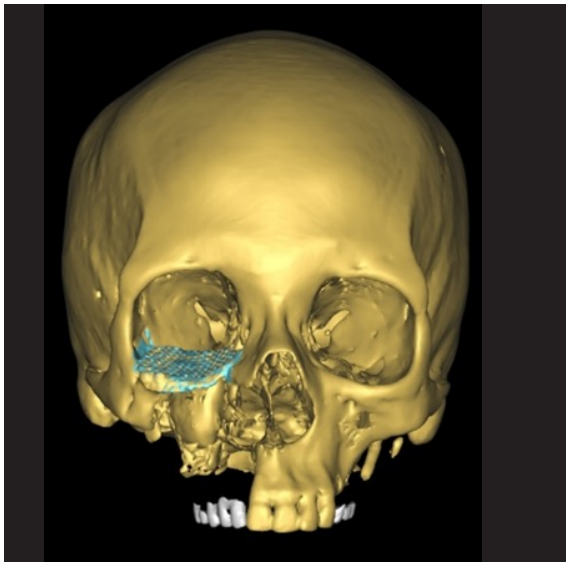


Figure 21



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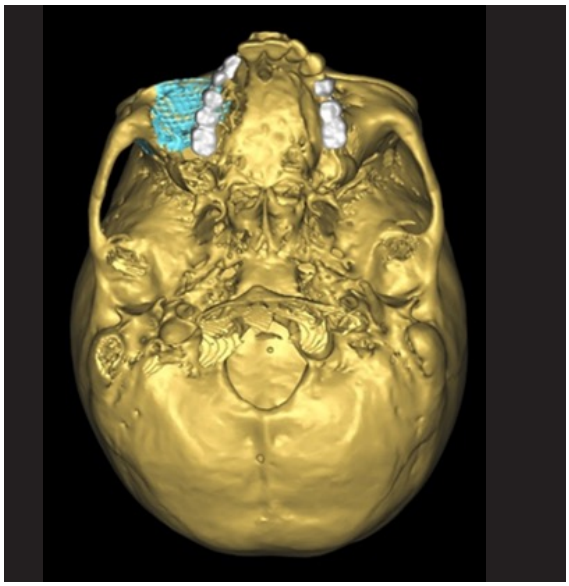

Figure 23

The upper right side presented a fairly large vertical and horizontal discrepancy during the initial examination. The upper right central side did not have bone support due to the resective surgery of the tumor, so the tumor was extracted (Figure 24).

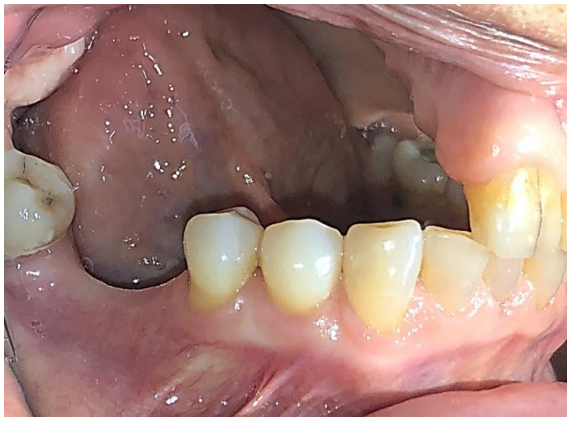

Figure 24

Extractions of the three remaining anterior teeth were performed to achieve a better prosthetic and aesthetic plane; the process was regularized for better aesthetics and the emergence profile of the anterior implants and the prosthesis (Figure 25).

The 3D reconstruction based on the tomography was analyzed, and it was determined to place an 11.5 mm Nobel Biocare right pterygoid implant, a 38 mm zygomatic implant in the right zygomatic implant, extraction of the remaining anterior teeth, and placement of two 13 mm Nobel Biocare implants in the left upper central and left canine areas. A Nobel Biocare 40 mm zygomatic implant was placed on the upper left side (Figs. 27-29).

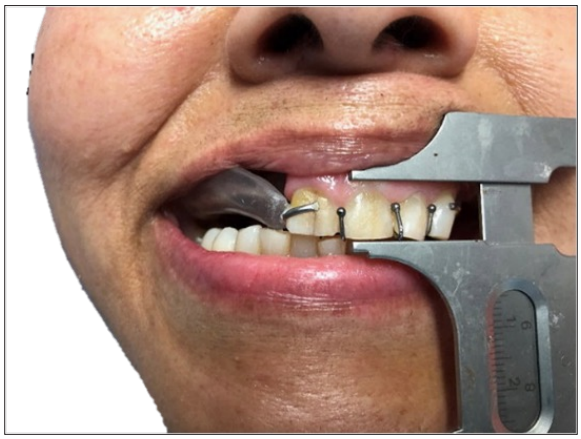

Figure 25

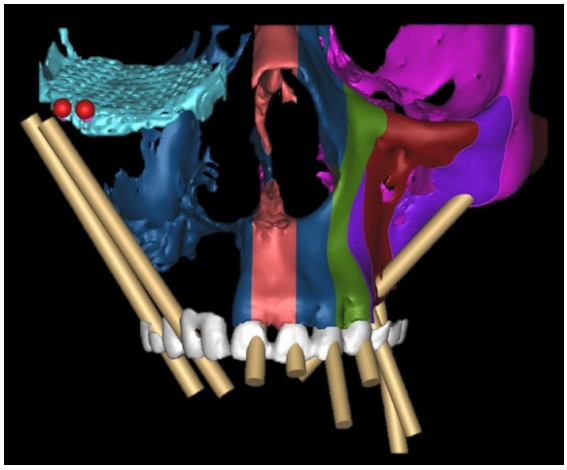

Figure 26

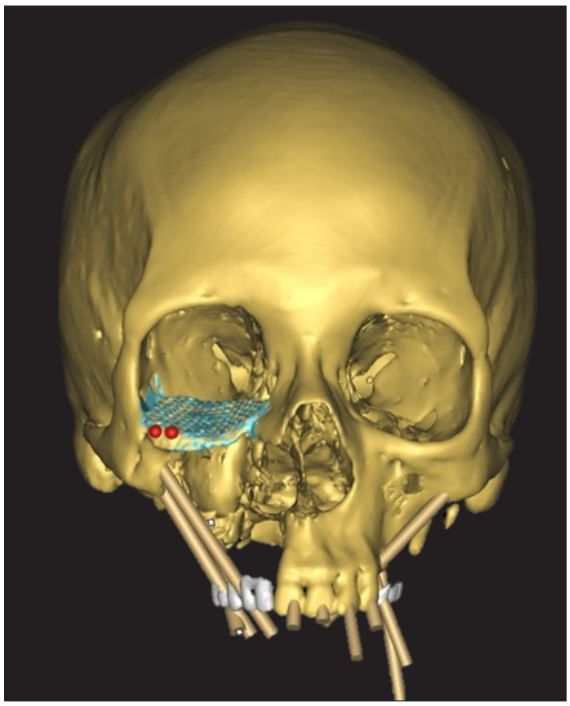

Figure 27

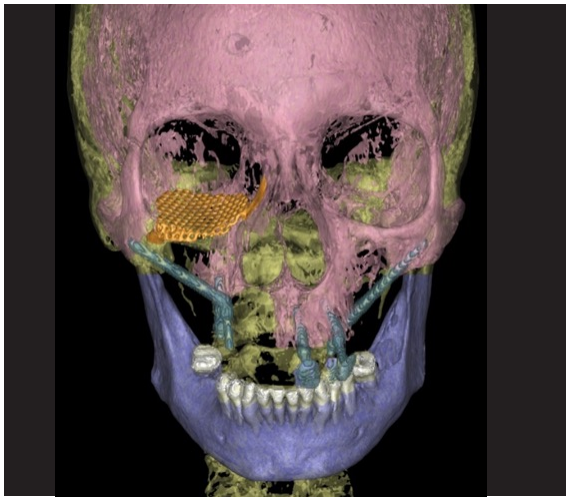

Figure 28

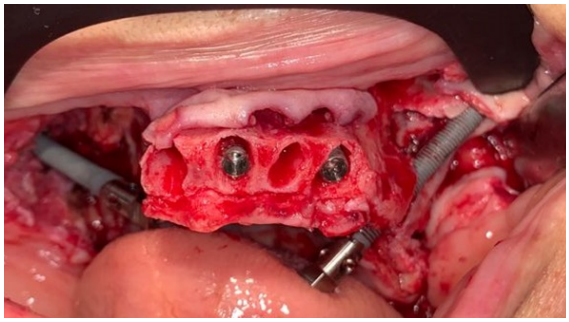

Figure 29

In the upper part, an immediate loading protocol was made with provisionalization (Figure 30).

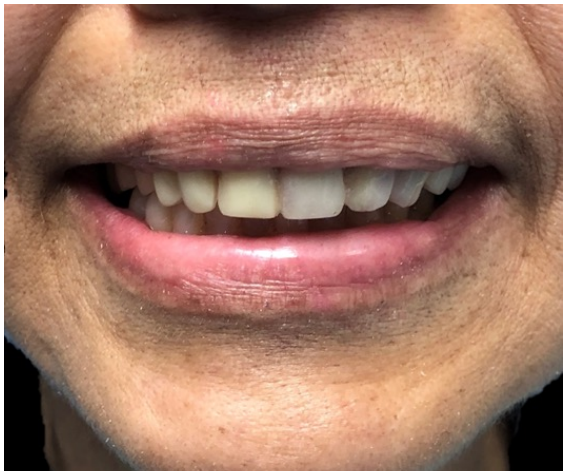

Figure 30

In the lower part, orthodontics was performed to improve anterior crowding and expand the arch to achieve better arch conformation and occlusion.
Once healed after 3 months, an impression was taken to make two micro-milled structures that could receive two types of prosthesis (Figure 31).

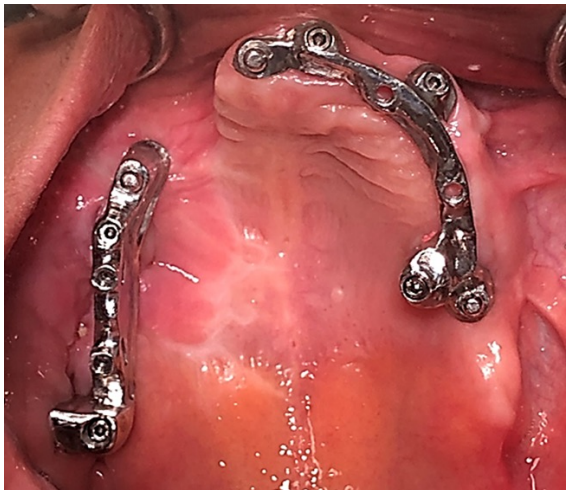

Figure 31

The vertical and horizontal defect caused by the maxillectomy was compensated in both removable and fixed prostheses.
Because these types of injuries recur in 2 to 3 years, it was decided to make a removable prosthesis to be checked at intervals when necessary.
The milled microstructure was designed to receive housing for a removable partial prosthesis for two attachments, OT Cap de Rehin 83 on the left side and two on the left side (12) (Figs. 32,33).

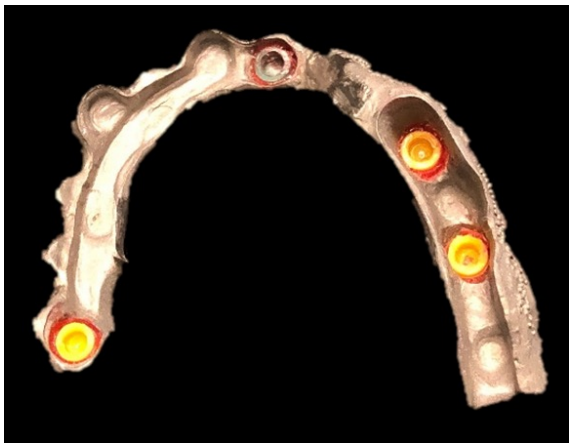

Figure 32

In this way, the entire structure obtains passive rigidity by being wholly attached to the structure bilaterally.
For the second fixed prosthesis in porcelain metal, only one of the Rehin 83 OT cap attachments is removed from the drill microstructure and screwed in using four screws (Figs. 34,35).

It was possible to obtain complete patient satisfaction regarding occlusal, functional, and aesthetic aspects by combating the collapse of respective surgery through elaborate prostheses (Figs. 36-38)

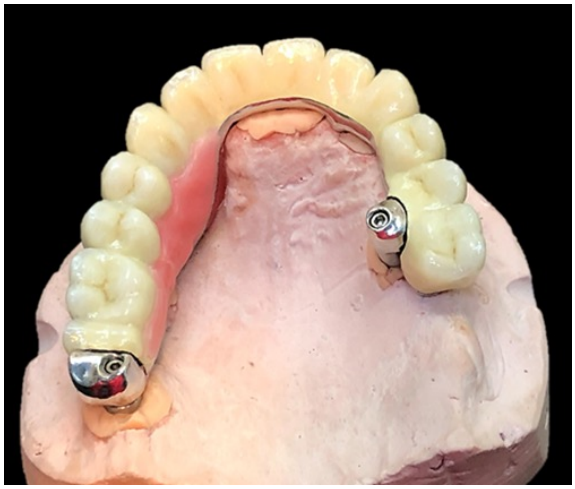

Figure 33

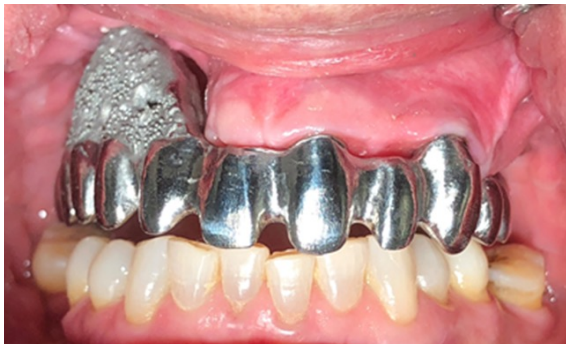

Figure 34

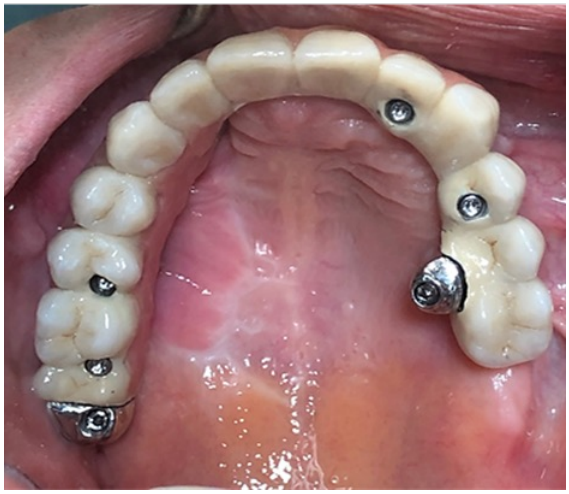

Figure 35

Figure 36

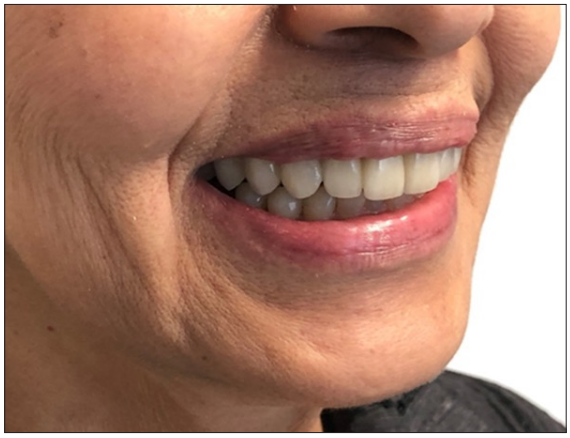

Figure 37

Figure 38

Discussion

Before 1953, giant cell lesions of the jaws were usually diagnosed as “giant cell tumors” and were generally considered similar to the giant cell tumor of long bone. In 1953, Jaffe proposed the term “giant cell reparative granuloma” for lesions found in the jaws. He believed these jaw lesions only mimicked the actual giant cell tumor of bone and had several clinical and histologic differences from the actual giant cell tumor of bone. Jaffe stated that the jaw lesions were not true neoplasms but represented a local reparative reaction (13).

Subsequently, this concept was widely accepted, and most publications after 1953 have referred to these lesions as giant cell reparative granuloma or giant cell granuloma (13,14).

In a recent study of an extensive series of giant cell lesions of the jaws, Whitaker and Waldron correlated the clinical behavior with the histologic findings (15).

The clinical and radiologic criteria Choung et al. and Ficcara et al. suggested for separating giant cell lesions into aggressive and nonaggressive types were used. Aggressive lesions were characterized by pain, rapid growth, cortical perforation, and root resorption of teeth involved by the tumor (17).

Nonaggressive lesions showed few or no symptoms, lack of cortical perforation, root resorption, and slow growth. The study of Whitaker and Waldron showed significant differences in the distribution of giant cells and the frequency of osteoid within lesions that recurred as opposed to those that did not (15).

Campanacci (1987) divides tumors into three stages:

- Stage I: intra-osseous lesion with histology and indolent radiology.
- Stage II: Intra-osseous lesion with cortical expansion and thinning but with intact periosteum and benign histology. Stage III: extra-bony lesion of an aggressive nature but with benign histology. The vast majority (70-80%) are stage II (18).

Some authors classify them as aggressive and non-aggressive. The most common aggressive form is large tumors with rapid growth, pain, bleeding, and tooth mobility. There may be root resorption and perforation of the bone cortex. They have a high recurrence rate, especially in the first 3-4 years after treatment, and if simple curettage is performed (40-60%), en bloc resection reduces it to 7-10% (19-21).

The non-aggressive form corresponds to asymptomatic tumors, which are smaller and have much less recurrence after treatment. Diagnosis is complicated and must be based together on clinical findings, radiology, and histology. It is often necessary to study serum calcium, phosphorus, and PTH to differentiate it from brown tumors from hyperparathyroidism. In extensive lesions or aggressive behavior, adjuvant therapies can be used to reduce the size and risk of tumor bleeding during surgery. These include preoperative embolization, intralesional corticosteroid injection, and systemic administration of calcitonin. It should be noted that, with daily subcutaneous injection of interferon alfa-2a, complete tumor regressions and bone filling of residual cavities have been achieved (22).

Isolated radiotherapy is not recommended due to its potential for malignancy, except in patients who refuse surgery. However, some authors describe its successful use in primary tumors and recurrences.

The treatment of choice is surgical, recommending an en-bloc resection with wide safety margins given the high risk of recurrence and the potential for malignant transformation that it exhibits. In cases where the histological diagnosis is made after surgical exciresis, with free margins, follow-up with periodic controls is recommended (23,24).

Diagnosis is complicated and must be based together on clinical findings, radiology, and histology. It is often necessary to study serum calcium, phosporus, and PTH to differentiate it from the brown tumor of hyperparathyroidism. The tumor tissue is friable and highly vascular, with small cystic areas, whitish-gray necrotic foci, hemorrhage, fibrosis, and xanthomatous regions (25).

Two factors have been attributed to the etiopathology: 1.-Inflammatory, angiogenic, and osteoclastic, although none is clearly demonstrated. The role played by the p53 suppressor gene in its genesis has recently been confirmed (5).

Other research methods have recently been employed to discern differences between giant-cell granulomas and giant-cell tumors (26).

Regezi et al. found that HLA-DR antigen detection was not helpful in differentiation between congenital, reactive, and neoplastic giant cell lesions (27).

Eckardt et al. found that nuclear DNA analysis using image cytometry was of no assistance in separating aggressive from nonaggressive giant cell lesions (28).

However, in view of the overlapping clinical and histologic features, we favor the concept previously proposed by researchers: that giant cell lesions of the jaws and giant cell tumors of the extragnathic skeleton are not distinct and separate entities. The authors prefer to consider them to represent a continuum of a single disease process modified by the anatomic location and possibly other factors not yet clearly understood. Until future research delineates some method for separating giant cell tumors from giant cell "granulomas," we believe it is more logical to use the more noncommittal designation of giant cell lesion for the jaw lesions. Certainly, the designation of "granuloma" for an aggressive, recurring lesion, such as case 1 in the present report or cases reported by others, is not appropriate (6, 30, 31, 51, 52, 53, 54).

The authors advocate surgical resection for all giant cell lesions of the maxilla and paranasal sinuses.

References:

1. Cicconetti, A., Passaretti, A., Rastelli, C., Rastelli, E., Falisi, G. Innovations in oral and maxillofacial surgery: Biomimetics meets physiology. Journal of Biological Regulators and Homeostatic Agents, 2019, 33(5), pp. 1609–1614
2. Falisi, G., Cutilli, T., Rastelli, E., Bernardi,S., Continenza, M.A., Vittorini Velasquez, P., Severino, M.Rare case of inverted impacted canine in infra orbitary position requiring surgical therapy on ORAL and Implantology, 2019, 12(1), pp. 36–41
3. Di Paolo, C., Papi, M.D.P ., Falisi, G., ... Polimeni, A., Fiorini, A. Subjects with temporomandibular joint disc displacement and body posture assessment via rasterstereography: A pilot case-control study European Review for Medical and Pharmacological Sciences, 2020, 24(17), pp. 8703–8712
4. Fabiano, F., Matarese, G., Bollero, P ., ... Dipalma, G., Inchingolo, F. Clinical decision-making review on magnetic attachments versus mechanical attachments in dental prosthetics Australasian Medical Journal, 2017, 10(11), pp. 944–950
5. Vittorini-Velasquez, P ., Falisi, G., Galli, M., Gallegos-Rivera, J.C. Self-bone graft and simultaneous application of implants in the upper jawbone. (Fit lock technique). Acta odontológica latinoamericana : AOL, 2011, 24(2), pp. 163–167
6. Scarano, A., Leo, L., Lorusso, F., ... Greco Lucchina, A., Di Carmine, M.S. Topical hemostatic agents in oral surgery: a narrative review European Review for Medical and Pharmacological Sciences, 2023, 27(3), pp. 135–140
7. Di Giacomo, P ., Di Paolo, C., Qorri, E., ... Manes Gravina, G., Falisi, G. Conservative Therapies for TMJ Closed Lock: A Randomized Controlled Trial Journal of Clinical Medicine, 2022, 11(23), 7037
8. Lorusso, F., Mortellaro, C., Greco Lucchina, A., ... Di Carmine, M.S., Scarano, A.Wettability of Mg-HA/Chitosan-based membrane surfaces: blood vs. autologous platelet liquid (APL) European Review for Medical and Pharmacological Sciences, 2023, 27(3), pp. 153–161
9. Borgonovo A, Grandi T, Vassallo S, Signorini L. Extrasinus Zygomatic Implants for the Immediate Rehabilitation of the Atrophic Maxilla: 1-Year Postloading Results From a Multicenter Prospective Cohort Study. J Oral Maxillofac Surg. 2021 Feb;79(2):356-365
10. Signorini L, Faustini F, Samarani R, Grandi T. Immediate fixed rehabilitation supported by pterygoid implants for participants with severe maxillary atrophy: 1-Year postloading results from a prospective cohort study. J Prosthet Dent. 2021 Jul;126(1):67-75
11. Bernardi, S., Qorri, E., Botticelli, G., ... Rastelli, C., Falisi, G. Use of electrical field for biofilm implant removal European Review for Medical and Pharmacological Sciences, 2023, 27(3), pp. 114–121
12. Falisi, G., Qorri, E., Botticelli, G., ... Mondragon, M., Di Giacomo, P.STABILIZATION OF THE LOWER DENTURE THROUGH THE USE OF FINE MINI-IMPLANTS: RETROSPECTIVE STUDY European Journal of Musculoskeletal Diseases, 2024, 13(2), pp. S1–S7
13. Botticelli, G., Pizzolante, T., Capogreco, M., ... Testa, G., Rastelli, S. Clinical and radiographical evaluation of two agenesis alveolar ridges of upper lateral incisors. A case report with 5 years follow up ORAL and Implantology, 2024, 16(3), pp. 107–112
14. Gerardi, D., Bernardi, S., Bruni, A., Falisi, G., Botticelli, G. Characterization and morphological methods for oral biofilm visualization: where are we nowadays? AIMS Microbiology, 2024, 10(2), pp. 391–414
15. Varvara, G., Angiolani, F., Rinaldi, F., ... Botticelli, G., Pizzolante, T. COMPLICATION OF THE EXTRACTION OF MAXILLARY ANTERIOR SUPERNUMERARY TEET:THE ACCIDENTAL EXTRACTION OF THE PERMANENT TOOTH BUD Bulletin of Stomatology and Maxillofacial Surgery, 2025, 21(1), pp. 29–35
16. Ferrazzano, G.F., Di Fabio, G., Gatto, R., ... Botticelli, G., Caruso, S. Effectiveness and Tolerability of a New Formulation of a Topical Anesthetic in Reduction of Pain and Parents' Satisfaction in Pediatric Dentistry Children, 2023, 10(3), 444
17. Botticelli, G., Kostandini, D., Pizzolante, T., ... Scarano, A., Rastelli, S. USE OF THE ELECTRICAL DEVICE ON DENTAL IMPLANT'S BACTERIAL BIOFILM: A PRELIMINARY IN VITRO STUDY Bulletin of Stomatology and Maxillofacial Surgery, 2025, 21(2), pp. 5–12
18. Pizzolante, T., Botticelli, G., Severino, M., Caporro, G., Rastelli, S. THE USE OF HYPNOSIS IN DENTISTRY IN ANXIOUS PATIENTS. SYSTEMATIC REVIEW OF THE LITERATURE OF THE LAST 5 YEARS Bulletin of Stomatology and Maxillofacial Surgery, 2025, 21(2), pp. 99–113
19. Negri, P., Russomanno, N., Eramo, S., ... Viarchi, A., Sev-

erino, M. ANALYSIS OF RESISTANCE OF ORTHODONTIC COMPONENTS TO MOUTHWASHES, DISINFECTANTS AND STERILIZER: AN IN VITRO STUDY Bulletin of Stomatology and Maxillofacial Surgery, 2025, 21(1), pp. 19–28
20. Rastelli, S., Caporro, G., Severino, M., ... Gasbarri, A., Pizzolante, T. Anatomically guided full arch implant-prosthetic rehabilitations ORAL and Implantology, 2024, 16(3), pp. 146–152
21. Memè, L., Pizzolante, T., Saggiomo, A.P., ... Inchingolo, F., Rastelli, S. The use of ozone therapy for the treatment and post-surgical management of patients treated with bilateral extraction of the included third mandibular molars ORAL and Implantology, 2024, 16(3), pp. 124–132
22. Rastelli, S., D'amario, M., Iacomino, E., ... Guerra, D., Capogreco, M. Early diagnosis of Sjögren's syndrome: the role of biopsy of the minor salivary glands Journal of Biological Regulators and Homeostatic Agents, 2022, 36, pp. 81–86
23. Guerra, D., D'amario, M., Lacarbonara, M., ... Lupi, E., Capogreco, M. 3D printed anatomical models in the preliminary planification and execution of complex implanplacement: a case report Journal of Biological Regulators and Homeostatic Agents, 2022, 36(2), pp. 65–70
24. Pizzolante, T., Saggiomo, A.P., Principi, M., ... Jolla, E., Rastelli, S. Minimal invasive sinus elevation (MISE), a different approach for maxillary sinus lift surgery ORAL and Implantology, 2024, 16(3), pp. 140–145
25. Franco, R., Lupi, E., Iacomino, E., ... Santos, J.M.M., D'Amario, M. Low-Level Laser Therapy for the Treatment of Oral Mucositis Induced by Hematopoietic Stem Cell Transplantation: A Systematic Review with Meta-Analysis Medicina (Lithuania), 2023, 59(8), 1413
26. Romano, L., Giuliani, A., Muselli, M., ... De Nardi, P., Vistoli, F. Toward Environmentally sustainable surgery: Waste recycling in general surgery operating room. Preliminary cognitive audit World Journal of Surgery, 2024, 48(11), pp. 2637–2643
27. Taglieri, G., Arrizza, L., Daniele, V., ... Iacomino, E., Ventura, L. Application of nanoparticles in consolidation treatments of archeological bones Pathologica, 2015, 107(3-4), pp. 216
28. Lauriello, M., Mazzotta, G., Mattei, A., ... Iacomino, E., Eibenstein, A. Assessment of Executive Functions in Children with Sensorineural Hearing Loss and in Children with Specific Language Impairment: Preliminary Reports Brain Sciences, 2024, 14(5), 491
29. Iacomino, E., D'amario, M., Tucci, C., ... Sollima, L., Capogreco, M. An unexpected synovial sarcoma of the parotid gland: a rare localization Journal of Biological Regulators and Homeostatic Agents, 2022, 36, pp. 71–79
30. Litta, F., Memè, L., Grilli, F., ... Bambini, F., Mummolo, S. RARE ODONTOSTOMATOLOGY COMPLICATION ASSOCIATED WITH DISLOCATION OF A SILASTIC NASAL SPLINT: A CASE REPORTn Bulletin of Stomatology and Maxillofacial Surgery, 2023, 19(4), pp. 83–90
31. Manica U.; Izzi F.; Palmacci M.; Rastelli S.; Ceresoli L.; Balbi B.; Nagni M.
Implant-prosthetic rehabilitation of an agenesis lateral incisor: a case report and literature review
ORAL and Implantology, Vol. 16 No. 1 (2024) https://doi.org/10.11138/oi16114-18
32. Giovannetti, F., Lupi, E., Di Giorgio, D., ... Petricca, G., Valentini, V. Impact of COVID19 on Maxillofacial Fractures in the Province of L'Aquila, Abruzzo, Italy. Review of 296 Patients Treated with Statistical Comparison of the Two-Year Pre-COVID19 and COVID19 Journal of Craniofacial Surgery, 2022, 33(4), pp. 1182–1184
33. Di Somma, L., Iacoangeli, M., Nasi, D., ... Polonara, G., Scerrati, M. Combined supra-transorbital keyhole approach for treatment of delayed intraorbital encephalocele: A minimally invasive approach for an unusual complication of decompressive craniectomy Surgical Neurology International, 2016, 7, pp. S12–S16
34. Franco, R., Rosa, A., Lupi, E., Capogreco, M. The Influence of Dental Implant Roughness on Biofilm Formation: A Comprehensive Strategy Dental Hypotheses, 2023, 14(3), pp. 90–92
35. Mannino, M., Lupi, E., Bernardi, S., Becelli, R., Giovannetti, F. Vascular complications with necrotic lesions following filler injections: Literature systematic review Journal of Stomatology, Oral and Maxillofacial Surgery, 2024, 125(5), 101499
36. Bernardi, S., Bianchi, S., Lupi, E., ... Macchiarelli, G., Varvara, G.Plasmacytoma in the Maxillary Jaw: A Diagnostic and Therapeutic Challenge Hematology Reports, 2024, 16(1), pp. 22–31
37. Oliva, S., Capogreco, M., Murmura, G., ... Mariachiara, D.C., D'Amario, M. The socket shield technique and its complications, implant survival rate, and clinical outcomes: a systematic review Journal of Periodontal and Implant Science, 2022, 52, e32
38. Messi, M., Consorti, G., Lupi, E., ... Valassina, D., Balercia, P. A new operative open-wings technique to correct the frontoforehead unit in metopic synostosis The Journal of craniofacial surgery, 2015, 26(3), pp. 902–905
39. Quinzi, V., Tecco, S., Nota, A., ... Mummolo, S., Marzo, G. Mesial rotation of the upper first molar: Association with anterior dental crowding in mixed and permanent dentition Applied Sciences (Switzerland), 2020, 10(15), 5301
40. Mummolo, S., Severino, M., Campanella, V., ... Quinzi, V., Marchetti, E. Periodontal disease in subjects suffering from coronary heart disease. Journal of Biological Regulators and Homeostatic Agents, 2019, 33(3), pp. 73–82
41. Saccomanno, S., Mummolo, S., Giancaspro, S., ... Marzo, G., Quinzi, V. Catering work profession and medico-oral health: A study on 603 subjects Healthcare (Switzerland), 2021, 9(5), 582
42. Pennazza, G., Marchetti, E., Santonico, M., D'Amico, A., Di Natale, C. Application of a quartz microbalance based gas sensor array for the study of halitosis Journal of Breath Research, 2008, 2(1), 017009
43. Saccomanno, S., Mummolo, S., Laganà, D., ... Marzo, G., Quinzi, V. The digital diagnostic approach to stafne's bone cavity (Sbc): From a review of the literature to the description of a clinical case. Open Dentistry Journal, 2021, 15(Special Issue), pp. 111–119
44. Mummolo, S., Ortu, E., Necozione, S., Monaco, A., Marzo, G.Relationship between mastication and cognitive function in elderly in L'Aquila International Journal of Clinical and Experimental Medicine, 2014, 7(4), pp. 1040–1046
45. Mancini, L., Tarallo, F., Quinzi, V., ... Mummolo, S., Marchetti, E. Platelet-rich fibrin in single and multiple coronally advanced flap for type 1 recession: An updated systematic review and meta-analysis Medicina (Lithuania), 2021, 57(2), pp. 1–20, 144
46. Dinoi, M.T., Mummolo, S., Monaco, A., ... Campanella, V., Marzo, G. Correction to: Orthodontic treatment of the transposition of a maxillary canine and a first premolar: a case report (Journal of Medical Case Reports (2015) 9 (48) DOI: 10.1186/s13256-015-0521-z) Journal of Medical Case Reports, 2019, 13(1), 68
47. Giuca, M.R., Pasini, M., Pagano, A., Mummolo, S., Vanni, A. Longitudinal study on a rehabilitative model for correction of atypical swallowing. European journal of paediatric dentistry : official journal of European Academy of Paediatric Dentistry, 2008, 9(4), pp. 170–174
48. Memè, L., Strappa, E.M., Monterubbianesi, R., Bambini, F., Mummolo, S. SEM and FT-MIR Analysis of Human Demineralized Dentin Matrix: An In Vitro Study Applied Sciences (Switzerland), 2022, 12(3), 1480
49. Candotto, V., Oberti, L., Gabrione, F., ... Romano, M., Mummolo, S. Current concepts on cleft lip and palate etiologyJournal of Biological Regulators and Homeostatic Agents, 2019, 33(3), pp. 145–152
50. Aesthetic rehabilitation in lower mandibular area for agenesis in site 4.2: a case report and literature review Matteo Palmacci, Marco Saverino, Gian Luca Pancrazi, Costanza Ferraro, Lara Ceresoli, Umberto Manica, Matteo Nagni ORAL and Implantology Vol. 16 No. 1 (2024) https://doi.org/10.11138/oi1613-6
51. Matteo Nagni, Marco Severino, Lorenzo Redi, Agostino Zizza, Gian Luca Pancrazi, Emilio Vavassori, Bianca D'Orto Possible complications in oral surgery and their

management in patients affected by type 1 diabetes: narrative review ORAL and Implantology Vol. 16 No. 1 (2024) https://doi.org/10.11138/oi16132-37

52. Bianca D'Orto, Carlo Chiavenna, Renato Leone, Martina Longoni, Matteo Nagni and Paolo Capparè Marginal Bone Loss Compared in Internal and External Implant Connections: Retrospective Clinical Study at 6-Years Follow-Up Biomedicines 2023, 11(4), 1128; https://doi.org/10.3390/biomedicines110411
53 Paolo Capparè, Giulia Tetè, Bianca D'Orto, Matteo Nagni and Enrico Felice Gherlone Immediate Loaded Full-Arch Mandibular Rehabilitations in Younger vs. Elderly Patients: A Comparative Retrospective Study with 7-Year Follow-Up J. Clin. Med. 2023, 12(13), 4524; https://doi.org/10.3390/jcm12134524
53. Matteo Nagni, Filippo Pirani, Bianca D'Orto, Francesco Ferrini and Paolo Cappare Clinical and Radiographic Follow-Up of Full-Arch Implant Prosthetic Rehabilitations: Retrospective Clinical Study at 6-Year Follow-Up Appl. Sci. 2023, 13(20), 11143; https://doi.org/10.3390/app132011143