Clinical and radiographical evaluation of two agenesis alveolar ridges of upper lateral incisors. A case report with 5 years follow up

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Abstract

Besides the functional issues, lateral incisor agenesis represents a significant aesthetic drawback (1).
The decision about the treatment plan is complex due to the long-term success, which is not easy to achieve. It has to be discussed with the orthodontists to choose the closure, using permanent canines to replace the missing teeth, or maintaining the spaces, for example, with Maryland bridges or implants.
The main advantage of orthodontic gap closure is that this approach preserves the natural architecture of the complex and soft tissues. However, canines and premolar sizes and shapes should be adjusted to mimic the replaced teeth, eventually resorting to odontoplasty or veneers (13).
This article aims to show clinical protocols and procedures for the Split Crest without any graft.
The biggest problem in agenesis cases is the thickness of the bone, which is bucco-palatal and associated with the need for proper functional and esthetic rehabilitation.
In the case that we reported, because of the lack of thickness, we performed a minimally invasive split crest, which allowed us to correct the implant insertion with immediate loading by a temporary crown, just for aesthetic reasons.

Keywords: Lateral incisor agenesis, Orthodontic gap closure, Split crest technique

Introduction

Missing teeth can result from trauma, periodontal disease, caries, other infections, or dental agenesis (2). According to Kavadia et al., tooth agenesis accounts for between 2 and 10% of missing teeth (3). Expressly, lateral incisors represent the second most commonly affected teeth, excluding third molars and second premolars (4).
The prevalence of permanent dentition agenesis ranges from 2.2% to 7.6%, with apparent racial differences and a modest reference toward females. Most of those affected (83%) have only one or two teeth missing. It is a congenital disorder, usually hereditary, although localized disturbances can account for dental agenesis via probable mutagenic activity. According to King at all. The most commonly reported teeth missing are described as mandibular second premolars (44%), maxillary lateral incisors (22.9%), maxillary second premolars (21.2%), mandibular central incisors (3.5%) and mandibular lateral incisors (2.5%) (18).
In implantology, surrounding bone is necessary in implant positioning because the vestibular and buccal lamellae should present a minimum thickness of 1.5mm in terms of horizontal size (5).

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Dental agenesis is often associated with tooth ectopias and/or other abnormal dental conditions like a smaller or conoid tooth on the opposite side of the arch. In such cases, the canines are often mesially or lingually positioned, compared with their normal position, the midline being deviated towards the side affected by the agenesis. Sometimes, the agenesis of maxillary lateral incisors is associated with rare diseases or severe syndromes that cause problems with oral rehabilitation (19).

Various procedures have been sought that may facilitate autogenous bone grafting (6-7) or guided bone regeneration (8) to increase the alveolar crest, all of which infer a risk of dehiscence and infection, jeopardizing the graft (6, 9, 10).

The protocol for treating agenesis of maxillary lateral incisors depends more on practice organization and the clinical skills available than on considerations regarding treatment effectiveness (19).

There are at least four options for treating congenital agenesis of the maxillary lateral incisors. These include (1) conservative approach, an aesthetic remodeling of the deciduous maxillary lateral incisor employing a composite resin (20), (2) orthodontic treatment to close the gap with replacement using a reshaped canine (20), (3) orthodontic treatment to open space with placement of cantilevered resin-bonded fixed dental prostheses (21–23) and (4) orthodontic treatment to open the space with placement of implant-supported fixed prosthetic restorations (21, 24, 25). The decision for the most adequate treatment setting must consider the type of malocclusion, the anterior teeth relationship, space availability, and the condition of the adjacent tooth (26).

In severe bone atrophy, dental mini-implants may provide a valid solution in patients with narrow alveolar ridges when there is a small interdental space (such as in cases with lateral agenesis).

Split-crest bone manipulation (11-12) is considered an approach that may replace bone grafting or guided bone regeneration (GBR) procedures in treating narrow alveolar ridges.

To achieve an adequate treatment outcome from functional and esthetic points of view (14,15) and to obtain a correct prosthetic rehabilitation (16) it is essential to have at least 1 mm of width around the implant bone crest at the buccal and palatal planes. Intra-oral tissues (mandibular branch) or extra-oral tissues (e.g., iliac crest bone) grafts usually produce good results. Still, they need invasive procedures, and complications can occur, such as additional surgical procedures (17).

Traditional methods of ridge expansion include onlay and inlay bone grafts, sandwich osteotomies, guided bone regeneration, and alveolar distraction osteogenesis (27). Although these methods are effective, they require long periods for bone consolidation before implant placement and create a possible second morbidity at a donor site (27-29)

This method aims to generate bone around the implant sites through bone osteotomies that enable buccal cortex repositioning after greenstick fracture of the buccal bony wall. Since its introduction, many studies have attempted to prove that the alveolar ridge split technique is an excellent alternative to traditional alveolar augmentation procedures (30-32)

Materials and methods

The patient came to our clinic for a malocclusion visit. We made the OPT and discovered the genesis of the two upper lateral incisors. After X-ray and clinical evaluation, we decided to maintain the space for future implants.

The surgical sites were assessed by clinical intraoral examination and CBCT, which was used to determine the height and the thickness of the alveolar bone and the root inclination of the adjacent teeth. (Figs. 1, 2)

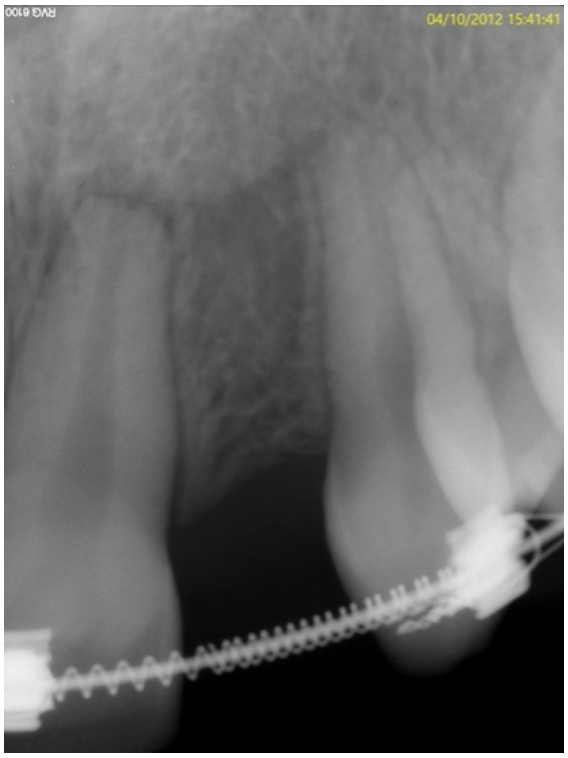

Figure 1. Periapical Rx of the left side

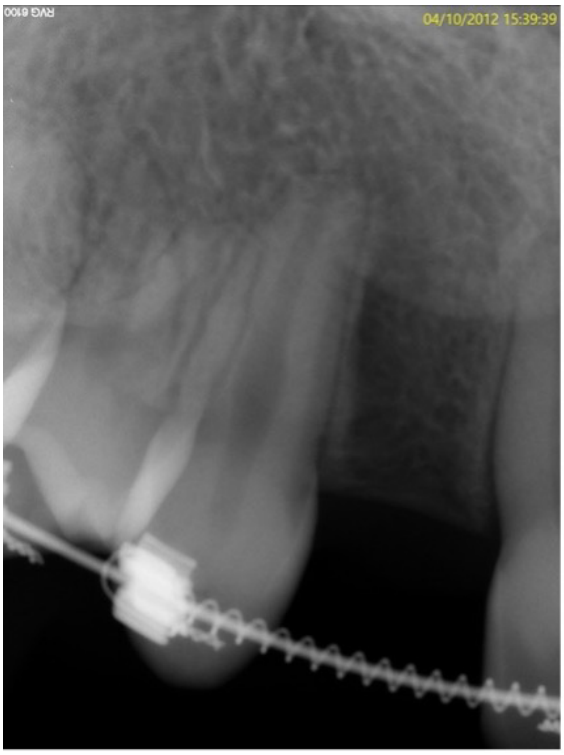

Figure 2. Periapical rx of the right side

Figure 3. shows the presence of two implants in the side of the lateral incisors

The bone ridge had a thickness

Antimicrobical prophylaxis was obtained with amoxicillin, which started the night before surgery and the morning after the surgery. The patient continued all antibiotic treatment after surgery for 6 days. Cortisone 4 mg 1 hour before surgery, 30 min before a painkiller.

Stepwise cortisone, for the next three days and a painkiller in case as needed.

Since 2 days after surgery the patient started to use clorexidine just on the surgery side 30 min before or after brushing her teeth.

The patient's mouth was rinsed with a chlorhexidine digluconate 0.2% solution for 1 minute, and all the site and the skin were covered by Betadine.

After local anesthesia (Mepivacaine with adrenaline), a crestal incision more palatally, then partial thickness.

After this, we did mucoperiostal flap to expose the crestal ridge without releasing incision.

The cortical bone was cut with the sonosurgery scalpel, initially with an Agabiti blade, to do the horizontal incisions in the middle of the ridge with two releasing incisions, one mesial and one distal.

The alveolar ridge was split longitudinally with an osteotome by Magnetic Mallet, provoking a greenstick fracture, which is used for cutting or preparing the bone with depth markings.

After the split crest procedure, we used specific drills to prepare the site for the implant.

Then we torqued the implant at 50N, and we made a CBCT to assess the result of the surgery (Figure 3)

Sutures were performed with a resorbable 4-0 removed after 7 days.

Discussion

Simion and colleagues (33) and Scipioni and colleagues (34) have introduced the split-crest procedure in combination with immediate implant placement.

This surgical procedure is about splitting the alveolar ridge longitudinally in two parts, provoking a longitudinal greenstick fracture at the top of the bone to create a space-making defect.

This procedure allows us to avoid the onlay grafts taken from the hip, the maxillary tuberosity, symphysis of the chin, or the external oblique ridge, presenting postoperative morbidity associated with bone harvesting. The healing between separated bone plates is similar to that of a bone fracture, so additional bone grafts or barrier membrane applications on furrows are not always necessary when the ridge-splitting procedure is applied (34-35).

Because the evaluation of vertical and horizontal bone change around the implant is regarded as an important measure of implant success (36-37), the assessment of marginal bone dimension around implants placed by the osteotome technique, like ridge splitting or ridge expansion, has been performed (38).

We placed two implants in both lateral incisor sites by split-crest procedure, and the healing period was about 11 months, in which the patient was with two Maryland bridges.

Primary stability is an essential factor for the osseointegration process and immediate loading procedure, as it increases the success rate of dental implants (39).

It has been claimed that implant placement by the osteotome technique not only improves primary stability but could lead to accelerated bone healing compared with conventional implant placement in trabecular bone, as can be found, for example, in the human posterior maxilla. (40)

The findings clearly demonstrate that the MISE (Minimally Invasive Sinus Elevation) technique is a highly reliable procedure and a groundbreaking alternative to more invasive, traditional sinus elevation methods. One of its standout advantages is its ability to dramatically minimize surgical trauma, a major consideration for patients and surgeons. Despite being less invasive, the MISE technique maintains exceptionally high success rates, offering a safe and effective solution for patients with moderate bone resorption. This is especially important because, unlike traditional approaches, which often require more complex and invasive surgical

interventions, MISE reduces the risk of postoperative complications, such as infections, prolonged healing periods, and discomfort. Additionally, the reduced trauma makes it a more accessible option for patients who may be at higher risk due to age or medical conditions, further broadening its appeal as a preferred treatment method. Overall, MISE is a modern, patient-centered technique that combines effectiveness with a more comfortable, less risky experience for patients (9,27).

In addition to its proven effectiveness in minimizing surgical trauma, the MISE (Minimally Invasive Sinus Elevation) technique exhibits an impressive degree of adaptability across a wide range of clinical scenarios. One of the most remarkable aspects of this technique is its ability to deliver successful outcomes even in patients with severely limited residual bone height. This condition often poses significant challenges in the realm of implant dentistry. Traditional sinus elevation methods can be far less effective in such cases, usually requiring more complex and invasive interventions that increase the patient's discomfort and heighten the risk of complications. Conversely, MISE offers a more versatile and patient-friendly approach, allowing for predictable success even in complex anatomical situations. This adaptability makes MISE a desirable option for dental surgeons, enabling them to treat a broader range of patients without resorting to more aggressive surgical techniques. By maintaining high levels of clinical success while minimizing both invasiveness and recovery time, the MISE technique further establishes itself as a cutting-edge solution that can be tailored to meet the specific needs of individual patients, ultimately enhancing their overall treatment experience (28,29).

The benefits of the MISE (Minimally Invasive Sinus Elevation) technique extend far beyond the realm of clinical outcomes, encompassing several practical advantages that significantly enhance the overall patient experience. One of the most noteworthy benefits is the reduction in surgery time, which contributes to increased patient comfort and leads to a more streamlined and efficient use of operating room resources. Shorter procedures mean less time under anesthesia for patients, reducing potential risks and promoting quicker recovery. This efficiency is a significant advantage for healthcare providers and patients, as it allows for higher patient turnover and optimal use of surgical facilities.

Additionally, MISE's lower rate of postoperative complications is critical in improving patient satisfaction. The minimally invasive technique results in less trauma to surrounding tissues, leading to fewer complications such as infections, swelling, or prolonged healing times. This translates into fewer follow-up visits, reducing the need for additional treatments or corrections that can otherwise burden both the patient and the healthcare system. The combination of fewer complications and shorter recovery periods directly impacts healthcare costs, making MISE a clinically effective choice and a cost-efficient one. By minimizing the need for extended aftercare and follow-ups, patients experience smoother recoveries. At the same time, healthcare providers benefit from reduced resource consumption, making MISE a win-win solution from both medical and economic perspectives (30).

In summary, the MISE (Minimally Invasive Sinus Elevation) technique presents a range of distinct advantages compared to traditional sinus elevation methods. Key benefits include a substantial reduction in surgical trauma, making it less invasive and more comfortable for patients while maintaining high success rates even in challenging cases like those involving minimal residual bone height. Its adaptability to various clinical conditions further sets it apart, allowing for successful outcomes in situations where conventional techniques might be less effective or more invasive. Additionally, the procedure's reduced surgery time enhances patient comfort and efficiently utilizes operating room resources. This efficiency, coupled with the lower incidence of complications, directly contributes to improved patient satisfaction, fewer follow-up visits, and reduced healthcare costs.

This discussion will explore these advantages in greater depth, offering a detailed analysis of how the MISE technique is transforming the landscape of dental implantology and why it is becoming the preferred choice for modern practitioners. By examining the clinical, practical, and economic benefits, we will illustrate why MISE significantly advances sinus elevation procedures (31).

Conclusion

To conclude, within the limits of the present study due to the presence of just one patient, the clinical and radiographical outcomes indicated that the split crest procedure in the anterior area could be a promising and effective technique that enabled the achievement of functional and esthetic rehabilitation of patients with agenesis of the upper lateral incisors, after an accurate selection of the patients, the use of a magnetic mallet and the immediate staged implant placement.

The results showed that immediate loading of implants placed in split-crest procedure presented a favorable clinical outcome at 5 years of follow-up.

Immediate-loading implants placed after the split-crest procedure may have the same biological behavior as fresh socket implants. In these surgical procedures, only half of the implant length is placed in the native bone with a correct insertion torque, while a coronal portion is only in contact with the bone walls. Likewise, in fresh extraction socket implants, the width of the coronal gap between the implant surface and bone walls at the time of implant placement represents a critical point for bone healing because as the gap widened, the amount of bone-to-implant contact decreased, and the point of the highest bone to implant contact shifted apically.

However, further studies are mandatory to improve the parameter of surgical procedure, soft tissue management, and to study macro and micro texture of the dental implants.

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Conflicts of interest

The authors declare no conflicts of interest

References

1. Kavadia S, Papadiochou S, Papadiochos I, Zafiriadis L. Agenesis of maxillary lateral incisors: a global overview of the clinical problem. Orthodontics (Chic.). 2011;12(4):296-

2. Memè, L., Bambini, F., Pizzolante, T., ... Bianchi, A., Mummolo, S. Osteonecrosis of the jaw in patients with metastatic renal carcinoma: systematic review and meta-analysis. ORAL and Im-plantology, 2024, 16(2), pp. 79–87
3. Memè, L., Grilli, F., Pizzolante, T., ... Sampalmieri, F., Mummolo, S. Clinical and histomorpho-metric comparison of autologous dentin graft versus a deproteinized bovine bone graft for Socket Preservation. ORAL and Implantology, 2024, 16(2), pp. 101–106
4. Kennedy DB. Orthodontic management of missing teeth. J Can Dent Assoc. 1999 Nov;65(10):548-50.
5. Crespi R, Capparè P, Gastaldi G, Gherlone E. reactive soft tissue preservation in large bone defects after tooth extraction: A cone beam study: Int Oral Maxillofac Impants 2016;31:179-185
6. Chiapasco M, Abati S, Romeo E, Vogel G. Clinical outcome of autogenous bone blocks or guided bone regeneration with e-PTFE membranes for the reconstruction of narrow edentulous ridges. Clin Oral Implants Res 1999;10:278-288
7. Pizzolante, T., Memè, L., Ciccariello, A., ... Inchingolo, F., Mummolo, S. Complications of zy-gomatic implantology: observational clinical study Bulletin of Stomatology and Maxillofacial Surgery, 2024, 20(4), pp. 73–80
8. Hammerle CH, Jung RE, Feloutzis A. A systematic review of the survival of implants in bone sites augmented with barrier membranes (guided bone regeneration) in partially edentulous pa-tients. J. Clinical Periodontology 2002;29(suppl):226-231
9. Marchetti, E., Pizzolante, T., Americo, L.M., ... Quinzi, V., Mummolo, S.Periodontology Part 4: Periodontal disease in children and adolescents. European Journal of Paediatric Dentis-try, 2022, 23(4), pp. 332–335
10. Bernardi, S., Mummolo, S., Varvara, G., ... Marzo, G., Macchiarelli, G. Bio-morphological eval-uation of periodontal ligament fibroblasts on mineralized dentin graft: An in vitro study
11. Journal of Biological Regulators and Homeostatic Agents, 2019, 33(1), pp. 275–280
12. Mummolo, S., Marchetti, E., Albani, F., ... Tecco, S., Marzo, G. Comparison between rapid and slow palatal expansion: Evaluation of selected periodontal indices Head and Face Medi-cine, 2014, 10(1), 30
13. Summers RB. A new concept in maxillary implant surgery: The osteotome technique. Compend Contin Educ dent 1994;15:152-160
14. Schneider U, Moser L, Fornasetti M, Piattella M, Siciliani G. Esthetic evaluation of implants vs canine substitution in patients with congenitally missing maxillary lateral incisors: are there any new insights? Am J Orthod Dentofacial Orthop. 2016 Sep;150(3):416-24. https://doi.org/10.1016/j.ajodo.2016.02.025
15. Tecco, S., Baldini, A., Mummolo, S., ... Marzo, G., Gherlone, E.F. Frenulectomy of the tongue and the influence of rehabilitation exercises on the sEMG activity of masticatory muscles. Jour-nal of Electromyography and Kinesiology, 2015, 25(4), pp. 619–628
16. Saccomanno, S., Mummolo, S., Giancaspro, S., ... Marzo, G., Quinzi, V. Catering work profes-sion and medico-oral health: A study on 603 subjects. Healthcare (Switzerland), 2021, 9(5), 582
17. 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 re-port
18. Journal of Biological Regulators and Homeostatic Agents, 2022, 36(2), pp. 65–70
19. Simion M, Baldoni M, Zaffe D. Jawbone enlargement using immediate implant placement asso-ciated with a split-crest technique and guided tissue regeneration. Int J Periodontics Restorative Dent. 1992;12(6):462-73.
20. Mummolo, S., Ortu, E., Necozione, S., Monaco, A., Marzo, G. Relationship between mastica-tion and cognitive function in elderly in L'Aquila. International Journal of Clinical and Experi-mental Medicine, 2014, 7(4), pp. 1040–1046
21. Saccomanno, S., Mummolo, S., Laganà, D., ... Marzo, G., Quinzi, V. The digital diagnostic ap-proach to stafne's bone cavity (Sbc): From a review of the literature to the description of a clini-cal case. Open Dentistry Journal, 2021, 15(Special Issue), pp. 111–119
22. Pizzolante, T., Rasicci, P., Saggiomo, A.P., ... Capogreco, M., Mummolo, S. Buccal Fat Pad Flap and Buccal Advancement Flap for Closure of Oroantral Fistula: A Systematic Review and a Case Report. ORAL and Implantology, 2024, 16(2), pp. 50–61
23. Hebel K, Gajjar R, Hofstede T (2000) Single-tooth replacement: bridge vs. implant-supported restoration. J Can Dent Assoc 66(8):435–438
24. Botelho MG, Chan AW, Leung NC, Lam WY (2016) Long-term evaluation of cantilevered versus fixed–fixed resin-bonded fixed partial dentures for missing maxillary incisors. J Dent45:59–66
25. Sofia Rastelli, Mario Capogreco, Maurizio D'Amario, Gianni Falisi, Marco Severino, Enzo Iaco-mino, IMPIANTI PTERIGOIDI: una valida alternativa per la riabilitazione dei settori posteriori del-la mascella atrofica , Oral and Implantology: A Journal of Innovations and Advanced Techni-ques for Oral Health: Vol. 16 No. 1 (2024)
26. 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 Muscu-loskeletal Diseases, 2024, 13(2), pp. S1–S7
27. DeDominicis WE (2002) Implant replacement of congenitally missing lateral incisor: a case re-port. J Oral Implantol 28(6):279–282. https://doi.org/10.1563/1548-1336(2002)028%3c0279: IROCML%3e2.3.CO;2
28. Marchetti, E., Ratta, S., Mummolo, S., ... Bedini, R., Marzo, G. Evaluation of an endosseous oral implant system according to UNI en ISO 14801 fatigue test protocol Implant Dentis-try, 2014, 23(6), pp. 665–671
29. Pini NI, Marchi LM, Pascotto RC (2014) Congenitally missing maxillary lateral incisors: update on the functional and esthetic parameters of patients treated with implants or space closure and teeth recontouring. Open Dent J 8:289–294. https://doi.org/10. 2174/1874210601408010289
30. Basa S, Varol A, Turker N. Alternative bone ex- pansion technique for immediate placement of im- plants in the edentulous posterior mandibular ridge: a clinical report. Int J Oral Maxillofac Implants. 2004;19: 554–558.
31. Manica, U., Izzi, F., Palmacci, M., ... Balbi, B., Nagni, M. Implant-prosthetic rehabilitation of an agenesis lateral incisor: a case report and literature review. ORAL and Implantology, 2024, 16(1), pp. 14–18
32. 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 Regu-lators and Homeostatic Agents, 2022, 36, pp. 81–86
33. Bernardi, S., Mummolo, S., Zeka, K., ... Continenza, M.A., Marzo, G. Use and Evaluation of a Cooling Aid in Laser-Assisted Dental Surgery: An Innovative Study. Photomedicine and Laser Surgery, 2016, 34(6), pp. 258–262
34. Female patient with psoriatic arthritis involving the TMJGiovanni Falisi , Roberto Gatto , Carlo Di Paolo , Alberto De Biase , Carlo Franceschini , Annalisa Monaco, Sofia Rastelli, Gianluca Bot-ticelli PMI: 33628524 PMC7892245 DOI: 10.1155/2021/6638638
35. Coatoam GW, Mariotti A. The segmental ridge- split procedure. J Periodontol. 2003;74:757–770. Scipioni A, Bruschi GB, Calesini G. The edentu- lous ridge expansion technique: a five-year study. Int J Periodontics Restorative Dent. 1994;14:451–459.
36. Falisi G, Di Paolo C, Rastelli C, Franceschini C, Rastelli S , Gatto R, Botticelli G Ultra-short implants, alternative prosthetic rehabilitation in mandibular atrophy in frail subjects: a retrospec-tive.Assistenza sanitaria (Basilea). 6 febbraio 2021;9(2):175. doi: 10.3390/healthcare9020175.
37. Marchetti, E., Ratta, S., Mummolo, S., Bedini, R., Marzo, G. Mechanical Reliability Evaluation of an Oral Implant-Abutment System According to UNI en ISO 14801 Fatigue Test Protocol Im-plant Dentistry, 2016, 25(5), pp. 613–618

38. 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
39. Cusenza, I., Pensa, V., Rastelli, S., D'orto, B., Nagni, M. Conscious sedation in dentistry: narra-tive review. ORAL and Implantology, 2024, 16(1), pp. 7–13
40. Summers RB. A new concept in maxillary implant surgery: the osteotome technique. Compend Contin Educ Dent. 1994;15:152–160.
41. Simion M, Baldoni M, Zaffe D. Jawbone enlargement using immediate implant placement asso-ciated with a splitcrest technique and guided tissue regeneration. Int J Periodontics Restorative Dent 1992; 12:462–473.
42. Scipioni A, Bruschi GB, Calesini G. The edentulous ridge expansion technique: a five year study. Int J Periodontics Restorative Dent 1994; 14:451–459.
43. Coatoam GW, Mariotti A. The segmental ridge-split proce- dure. J Periodontol 2003; 74:757–770.
44. Falisi, G.,Foffo, G.,Severino, M., ...Gatto, R.,Botticelli, G. Analisi SEM-EDX della deposizione di particelle metalliche da frese chirurgiche dopo procedure di chirurgia guidata da impianto Rive-stimenti , 2022, 12(2), 240
45. Iacomino, E., Rastelli, S., Capogreco, M., ... Grivetto, F., D'amario, M. Pterygoid implants in se-vere posterior maxillary atrophy: a case report. ORAL and Implantology, 2024, 16(2), pp. 88–94
46. Roos J, Sennerby L, Lekholm U, Jemt T, Grondahl K,Albrektsson T. A qualitative and quantita-tive method for evaluating implant success: a 5-year retrospective analysis of the Brånemark implant. Int J Oral Maxillofac Implants 1997;12:504–514.
47. Memè, L., Bambini, F., Pizzolante, T., ... Bianchi, A., Mummolo, S. Evaluation of a single non-surgical approach in the management of periimplantitis: glycine powder air-polishing versus ul-trasonic device. ORAL and Implantology, 2024, 16(2), pp. 67–78
48. Arcuri, C., Petro, E., Sollecchia, G., Mummolo, S., Marzo, G. Laser in periodontal pockets: In vivo and in vitro study. Journal of Biological Regulators and Homeostatic Agents, 2020, 34(3), pp. 139–146
49. Carlo Di Paolo , Erda Corri , Giovanni Falisi , Roberto Gatto , Sergio Rexhep Tari , Antonio Sca-rano , Sofia Rastelli , Francesco Inchingolo, Paola Di Giacomo RA.DI.CA. Splint therapy in the management of temporomandibular joint displacement without reduction J Pers Med. 2023 lug 3;13(7):1095. doi: 10.3390/jpm13071095.
50. Severino, M., Caruso, S., Rastelli, S., ... Nota, A., Tecco, S. Hand-carried ultrasonography in-strumentation in the diagnosis of temporomandibular joint dysfunction. Methods and Proto-cols, 2021, 4(4), 81
51. Guerra, D., Severino, M., Caruso, S., Rastelli, S., Gatto, R. The importance of using physical tridimensional models for the management and planning of extended osseous odontogenic le-sions Dentistry Journal, 2021, 9(11), 134