Pterygoid implants in severe posterior maxillary atrophy: a case report

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Abstract

A good clinician must be able to make a diagnosis and identify the ideal treatment plans based on this. The treatment plan choice depends on the patient's needs and the clinical and anatomical conditions. Therefore, to have multiple alternatives, it is advisable to enlarge clinical acknowledgment. The placement of pterygoid implants to rehabilitate the posterior maxillae region needs to be used more. Pterygoid implants are non-traditional dental implants, longer than usual (up to 25mm), inserted into the sphenoid bone's pterygoid process. The pterygoid bone is a tough and compact bone that guarantees dental implants have high primary stability and safer immediate loading. To obtain better stability of dental rehabilitation, pterygoid implants can also be used in combination with traditional dental implants and / or zygomatic implants or trans-sinus tilted implants.
This technique is ideal because it has better bone quality than tuber maxillae, the patient can count teeth down to the second molar, immediate loading is possible, treatment times are limited, and it is a predictable treatment.
The presentation of this case report aims to highlight how and why it is necessary to consider the option of inserting pterygoid implants as a valid alternative.

Keywords: Maxillary atrophy, Pterygoid implant, Pterygomaxillary region, Immediate Loading

Introduction

Implant rehabilitation of the edentulous posterior maxilla is always challenging. The posterior maxilla has several anatomical obstacles, and surgical access is demanding. To overcome these complications, several surgical procedures have been introduced through the years. Since sinus lift, bone augmentation, and short implants have their own limitations, the pterygoid bone should be considered a successful alternative for rehabilitating the posterior maxilla.
This case report describes that atrophic posterior maxilla can be restored without additional surgical procedures.

Case report

The case proposed concerns a 77-year-old female patient, hypertensive, with mild periodontal disease and partially edentulous in the second quadrant associated with severe bone atrophy in the posterior maxilla. The alveolar bone in the maxillary posterior region often has horizontal and vertical dimensional changes due to bone resorption and sinus pneumatization.
In the second quadrant, there was four elements prosthetic bridge cemented on natural pillars, 2.5 and 2.7, with a cantilever in position 2.4 (Figure 1, 2, 3, 4, 5, 6, 7).

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Figure 1. orthopantomogram x-ray before treatment.

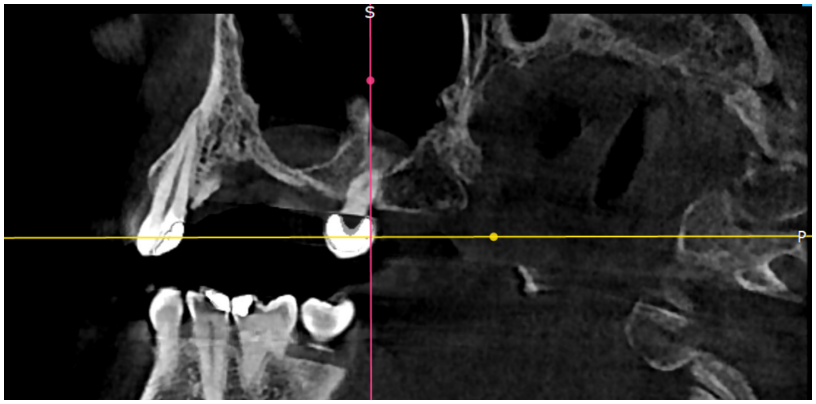

Figure 2. cone beam scan (CBCT) with sagittal view before treatment

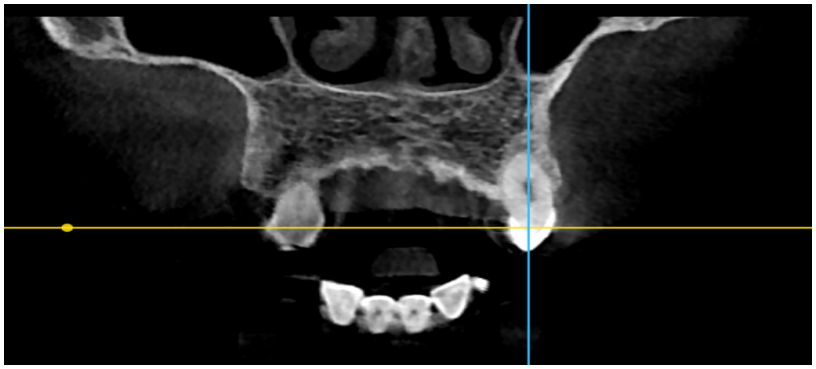

Figure 3. cone beam scan (CBCT) with coronal view before treatment at the location of the element 2.5

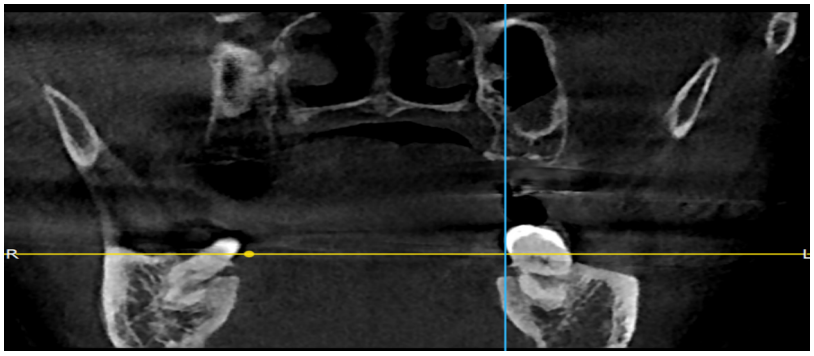

Figure 4. cone beam scan (CBCT) with coronal view before treatment at the location of the element 2.6

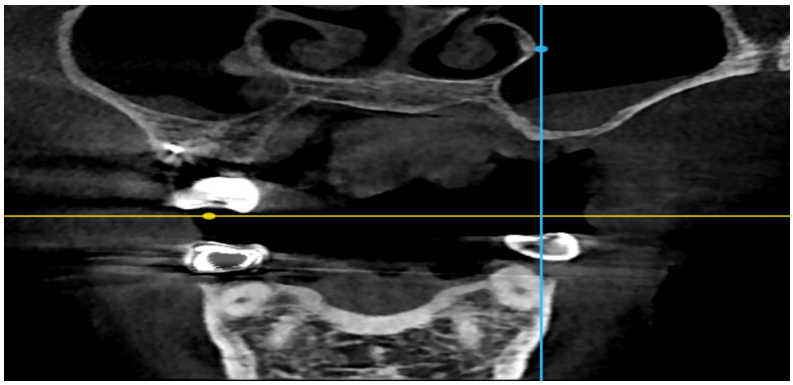

Figure 5. cone beam scan (CBCT) with coronal view before treatment at the location of the element 2.7

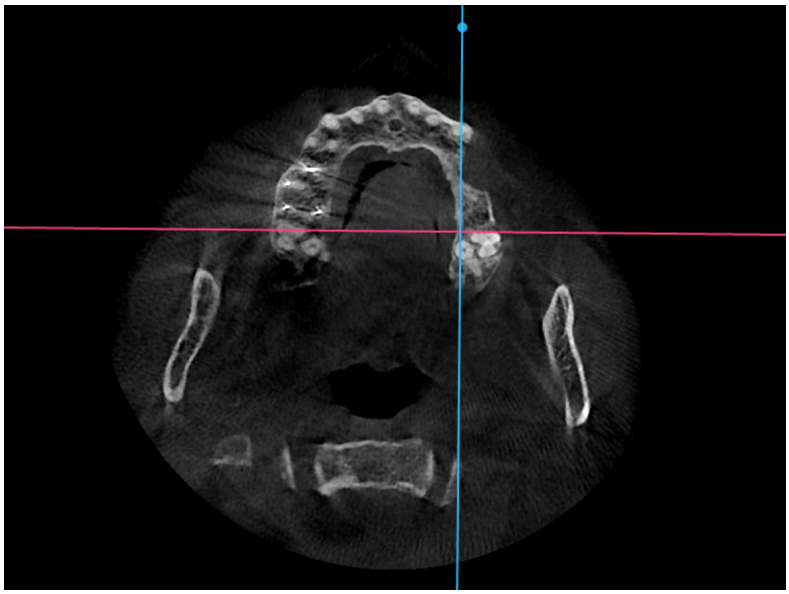

Figure 6. cone beam scan (CBCT) with axial view before treatment

Figure 7. three-dimensional sagittal view before treatment

The element 2.5 had a vertical fracture for which the prognosis is harmful and requires an extraction. Considering the patient's need to finish the treatment in the shortest time possible, the therapeutic plan chosen, in agreement with the patient, consisted of partial implant-prosthetic rehabilitation of the II quadrant without bone regeneration procedures. The patient's orthopantomogram X-ray and CT scan showed severe bone deficiency both vertically and horizontally. Therefore, the pterygoid bone and the cortex of the

nasal cavity were chosen to ensure good implant primary stability.
The patient was subjected, in profound sedation, to the extraction of 2 dental elements (2.5 and 2.7) with removal of the bridge and contextual insertion of a pterygoid implant in position 2.7 (4,2mm x 20mm; Noris Medical) and a trans-sinustiltedimplant in position 2.4 (4,2mmx18mm; Noris Medical). Both pterygoid implant and trans-sinus tilted implant were inserted using drills and osteotomes for better surgical management of the osteotomy site preparation. A temporary 4-unit screwed partial fixed bridge with a resin-based titanium structure was applied through immediate loading (Figure 8, Photo 1, 2).
After six months, a definitive fixed implant-supported zirconia prosthesis was applied (Figure 9).
The patient was satisfied with the prosthesis's comfort, ability to speak, oral hygiene maintenance, esthetics, and functionality.
After 2 years post-intervention, both radiographically and upon objective examination, the implant-prosthetic rehabilitation demonstrates stability, devoid of mobility, inflammation, or infection (Figures 10, 11, 12, 13, 14, 15).

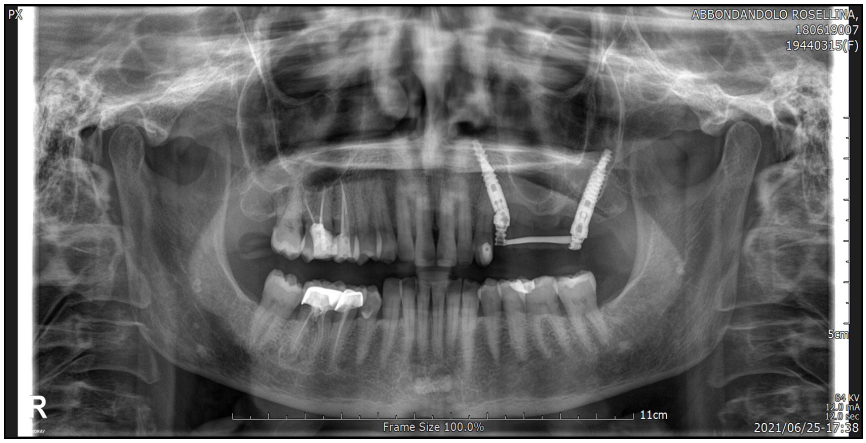

Figure 8. orthopantomogram x-ray 24 hours after treatment. Two dental extractions (2.5 and 2.7) in the upper arch. Two dental immediate post-extractive implants. One trans-sinus tilted implant (4,2x18 mm; Noris Medical) and one pterygoid implant (4,2x20 mm; Noris Medical)—immediate loading of a 4 unit temporary screwed partial fixed bridge with a resin based titanium structure.

Figure 9. Oorthopantomogram x-ray 6 months after treatment. Definitive 4-unit fixed implant-supported zirconia prosthesis.

Photo 1: 4 unit temporary screwed partial fixed bridge with a resin-based titanium structure—occlusal view.

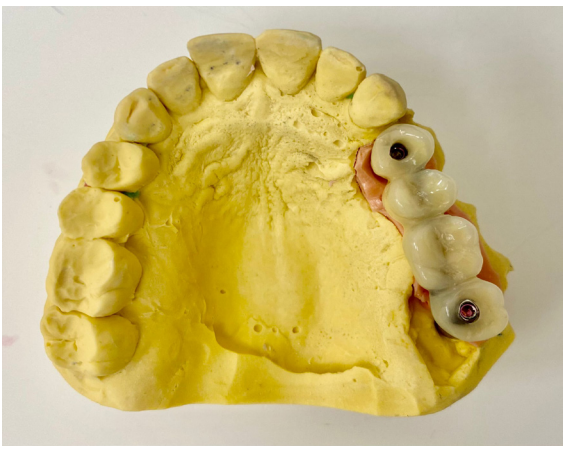

Photo 2: 4-unit temporary screwed partial fixed bridge with a resin-based titanium structure. Sagittal view.

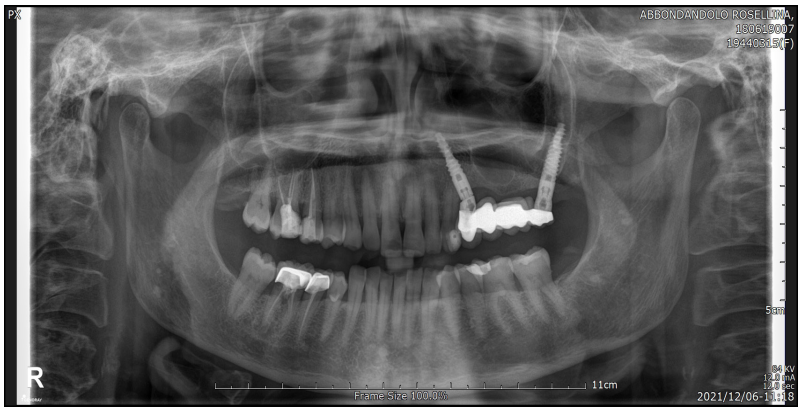

Figure 10. orthopantomogram x-ray 2 years after treatment.

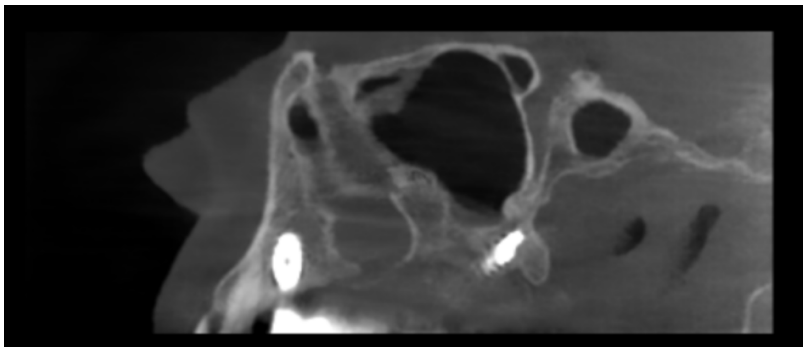

Figure 11. cone beam scan (CBCT) with sagittal view 2 years after treatment

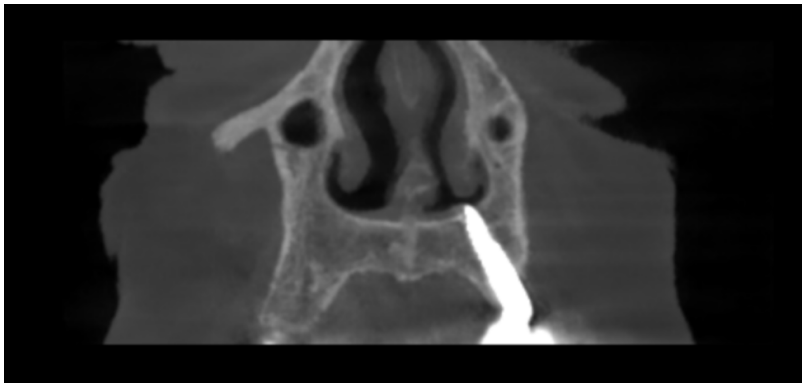

Figure 12.cone beam scan (CBCT) with coronal view 2 years after treatment at the location of the implant 2.4

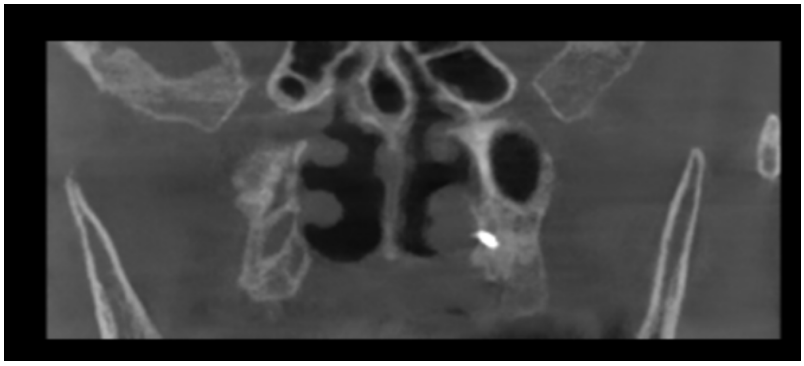

Figure 13. cone beam scan (CBCT) with coronal view 2 years after treatment at the location of the implant 2.7

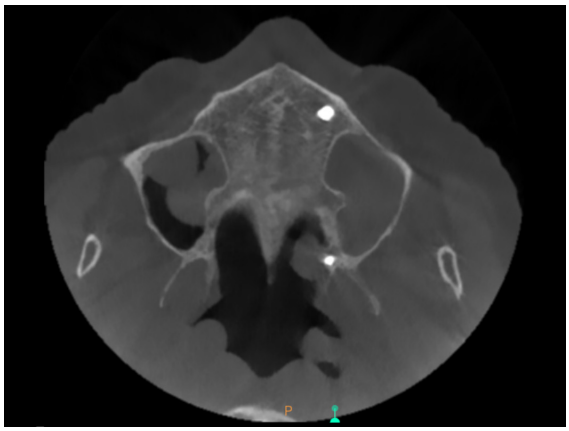

Figure 14. cone beam scan (CBCT) with axial view 2 years after treatment

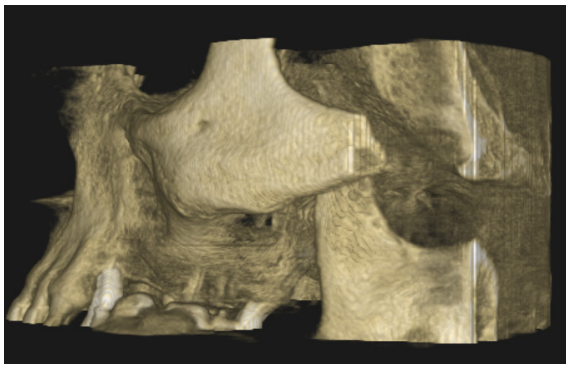

Figure 15. three-dimensional sagittal view 2 years after treatment

Discussion

Implant therapy is a cutting-edge solution to an edentulous arch. However, atrophic posterior maxilla presents limitations such as poor quality and quantity of bone, presence of the maxillary sinus, difficult accessibility, and high occlusal load [1]. To overcome these deficiencies, regenerative bone techniques have been introduced in oral surgery. Regenerative bone techniques need multiple surgeries, which lead to higher morbidity and longer treatment times before prosthetic rehabilitation can be achieved [1].

Due to the disadvantages of these techniques, a quick and effective method of rehabilitating the posterior maxilla is the placement of implants in the pterygomaxillary region and the lateral wall of the nasal bone. Ptergomaxillary implants require high surgical skills, but they are proven to be statistically superior to other treatment alternatives [2].

The pterygoid is a bone that confers primary stability to the implant thanks to its high density and absence of resorption. This also allows for immediate loading. The mean width of the pterygomaxillary joint is 7.5 mm, the mean height is 12.51 mm, and the mean volume is 321.7 mm3 [3]. Gender, age, and dental status are critical factors as they significantly affect bone density in this region.

Pterygoid implants have high success rates, similar bone loss levels to standard implants, and minimal complications [4]. Araujo RZ et al. have carried out a large-scale search of electronic databases analyzing literature published between 1995 and 2018 focused on clinical outcomes of pterygoid implants. All studies were retrospective, and a total of 634 patients received 1.893 pterygoid implants, with a mean implant survival rate of 94.87% [5]. This study demonstrates that pterygoid implants can be successfully used in patients with atrophic posterior maxilla.

From the prosthetic point of view, cantilever use has an unfavorable biomechanical behavior, mainly for the distal cantilever. The use of two implants and a four-unit bridge with a central pontic presents lower values of stress and strain[6]. Therefore, using a pterygoid implant, the molar region can be rehabilitated, restoring proper chewing.

The article “Rehabilitation of Atrophic Posterior Maxilla with Pterygoid Implants: A 3D Finite Element Analysis ” concerns the biomechanical behavior of pterygoid implants. The study described in the article used 3D models of pterygoid implant-supported prostheses and compared the stress and strain distributions in the pterygoid implants and surrounding bone using finite element analysis [7]. This study has proved that pterygoid implants decrease the stress and strain level in the surrounding bone for all cases studied.

An alternative to implant treatment could have been a removable partial denture. However, clinicians must give importance to the psychological, functional, and esthetic effects of prosthetic rehabilitation. A systematic review conducted in 2018 compared distinct prosthodontic treatment modalities, analyzing the difference in the improvement of oral health-related quality of life. Implant-supported fixed dental prostheses showed greater short-term and long-term improvement in oral health-related quality of life than removable partial dentures [8]. Implant-supported fixed prostheses in patients with posterior edentulous conditions also improve nutrient intake [9].

Conclusions

The rehabilitation of the posterior maxilla using pterygoid implants offers a series of advantages, such as excellent posterior bone support without the need for bone grafts, reduction of pain and morbidity in the postoperative period, high biomechanical stability, and fewer operations. Follow-up will be needed to monitor and evaluate osseointegration and implant health after months and years.

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Conflict of interest

There is nothing to declare.

References

1. Immediate rehabilitation of the posterior maxilla with extensive sinus pneumatization with one axial and one trans-sinus tilted implant: a 3-year clinical report and a classi-fication. Agliardi EL, Romeo D, Wenger A, Gastaldi G, Gherlone E.J Prosthet Dent. 2015 Mar;113(3):163-8. doi: 10.1016/j.prosdent.2014.07.017. Epub 2014 Nov 25.

2. Pterygomaxillary implants: a graftless solution to deficient maxillary bone. Anan-dakrishna GN, Rao G.J Indian Prosthodont Soc. 2012 Sep;12(3):182-6. doi: 10.1007/s13191-012-0121-1. Epub 2012 Jun 12.
3. Three-dimensional descriptive study of the pterygomaxillary region related to pterygoid implants: A retrospective study. Salinas-Goodier C, Rojo R, Murillo-González J, Prados-Frutos JC.Sci Rep. 2019 Nov 7;9(1):16179. doi: 10.1038/s41598-019-52672-x.
4. Rehabilitation of the atrophic posterior maxilla with pterygoid implants: a review. Candel E, Peñarrocha D, Peñarrocha M.J Oral Implantol. 2012 Sep;38 Spec No:461-6. doi: 10.1563/AAID-JOI-D-10-00200. Epub 2011 May 13.
5. Clinical outcomes of pterygoid implants: Systematic review and meta-analysis. Araujo RZ, Santiago Júnior JF, Cardoso CL, Benites Condezo AF, Moreira Júnior R, Curi MM.J Craniomaxillofac Surg. 2019 Apr;47(4):651-660. doi: 10.1016/j.jcms.2019.01.030. Epub 2019 Feb 1.
6. Finite element analysis of implant-supported prosthesis with pontic and cantilever in the posterior maxilla. de Souza Batista VE, Verri FR, Almeida DA, Santiago Junior JF, Lemos CA, Pellizzer EP.Comput Methods Biomech Biomed Engin. 2017 May;20(6):663-670. doi: 10.1080/10255842.2017.1287905. Epub 2017 Feb 13.
7. Rehabilitation of Atrophic Posterior Maxilla with Pterygoid Implants: A 3D Finite Ele-ment Analysis. Wilkirson E, Chandran R, Duan Y.Int J Oral Maxillofac Implants. 2021 May-Jun;36(3):e51-e62. doi: 10.11607/jomi.8185.
8. Oral health-related quality of life after prosthodontic treatment for patients with partial edentulism: A systematic review and meta-analysis. Ali Z, Baker SR, Shahrbaf S, Martin N, Vettore MV.J Prosthet Dent. 2019 Jan;121(1):59-68.e3. doi: 10.1016/j.prosdent.2018.03.003. Epub 2018 Jul 10.
9. Implant-supported fixed prosthesis improves nutrient intake in patients with partial edentulous posterior regions. Fukahori S, Kondo Y, Nodai T, Aonuma F, Tamura A, Tsuka S, Mukaibo T, Masaki C, Hosokawa R.J Prosthodont Res. 2019 Oct;63(4):411-414. doi: 10.1016/j.jpor.2019.03.007. Epub 2019 Apr 18.
10. Early diagnosis of Sjögren's syndrome: the role of biopsy of the minor salivary glands Rastelli, SofiaaSend mail to Rastelli S.; D'amario M.a; Iacomino E.b; Lacarbonara M.a; Guerra D.a; Capogreco M.a
11. Pterygoid Implant for Atrophic Posterior Maxilla. Balaji VR, Lambodharan R, Mani-kandan D, Deenadayalan S.J Pharm Bioallied Sci. 2017 Nov;9(Suppl 1):S261-S263. doi: 10.4103/jpbs.JPBS_103_17.
12. Management of Maxillary Cluster Implant Failures with Extra-Maxillary Implants: A Clinical Report. Loewenstein AG, Bidra AS, Balshi TJ.J Prosthodont. 2020 Jun;29(5):369-373. doi: 10.1111/jopr.13178. Epub 2020 May 7.
13. Implant rehabilitation for atrophic maxilla: a review. Ali SA, Karthigeyan S, Deivanai M, Kumar A.J Indian Prosthodont Soc. 2014 Sep;14(3):196-207. doi: 10.1007/s13191-014-0360-4. Epub 2014 Apr 22.
14. Retrospective study of 68 implants placed in the pterygomaxillary region using drills and osteotomes. Peñarrocha M, Carrillo C, Boronat A, Peñarrocha M.Int J Oral Maxillo-fac Implants. 2009 Jul-Aug;24(4):720-6.
15. Monitoring phenolic compounds in rice during the growing season in relation to fun-gal and mycotoxin contamination Giorni, PaolaaSend mail to Giorni P.; Rastelli, Silvi-abSend mail to Rastelli S.; Fregonara, SofiaaSend mail to Fregonara S.; Bertuzzi, Ter-enziobSend mail to Bertuzzi T.
16. Quantitative Assessment of the Edentulous Posterior Maxilla for Implant Therapy: A Retrospective Cone Beam Computed Tomographic Study. Padhye NM, Bhatavadekar NB.J Maxillofac Oral Surg. 2020 Mar;19(1):125-130. doi: 10.1007/s12663-019-01236-7. Epub 2019 May 9.
17. Tilted trans-sinus implants for the treatment of maxillary atrophy: case series of 35 consecutive patients. Testori T, Mandelli F, Mantovani M, Taschieri S, Weinstein RL, Del Fabbro M.J Oral Maxillofac Surg. 2013 Jul;71(7):1187-94. doi: 10.1016/j.joms.2013.02.013. Epub 2013 Apr 21.