Cureus
Part of SPRINGER NATURE

Open Access Case Report

# Pressure-Molded Thermoplastic Prosthesis for a Patient With Reduced Inter-arch Space After Fibula Flap Reconstruction of the Maxilla: A Case Report

**Review began** 09/18/2026
**Review ended** 11/04/2026
**Published** 11/14/2026

© **Copyright** 2026
Ghosh et al. This is an open access article distributed under the terms of the Creative Commons Attribution License CC-BY 4.0., which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

**DOI:** 10.7759/cureus.119680

Modhupa Ghosh [1], Aarzoo Pathak [2], Rekha Gupta [2], Preeti N. Mishra [1], Shubhra Gill [2], Mamta Phogat [3], Harpreet Grewal [4]

1. Prosthodontics, Guru Teg Bahadur Hospital, Delhi, IND 2. Prosthodontics, Maulana Azad Institute of Dental Sciences, Delhi, IND 3. Orthodontics, Guru Teg Bahadur Hospital, Delhi, IND 4. Orthodontics, University College of Medical Sciences, Delhi, IND

**Corresponding author:** Rekha Gupta, dr_rekhagupta@yahoo.co.in

## Abstract

Osteosarcomas of the maxilla are usually treated by radical surgical resections followed by microvascular flap reconstructions. Flaps that are placed are however often incompatible with the surrounding oral structures and entail adverse outcomes in restoration. Oral health quality of life deteriorates remarkably in those affected owing to impairment of essential functions, such as mastication, speech, and esthetics, along with adverse effects on psychosocial well-being. The conventional means of secondary surgical remodeling followed by ideal prosthetic rehabilitation may not be feasible in all cases. This case report presents the rehabilitation of a 31-year-old male patient who underwent treatment for osteosarcoma of the maxilla, followed by surgical reconstruction with a bulky microvascular free fibula flap. The psychological trauma of the experience prevented the patient from undergoing secondary debulking procedures or seeking further prosthetic rehabilitation for nine years. The lack of sufficient interocclusal and labial prosthetic space for rehabilitation, in the absence of a debulking procedure, posed a challenge for prosthetic rehabilitation. This was overcome by the innovative application of thermoplastic, pressure-molded sheets to fabricate a functional and esthetic prosthesis, which improved the patient's appearance and psychological well-being while minimally altering his existing oral functions. The patient was evaluated regularly for six months and demonstrated satisfactory adaptation to the prosthesis.

**Categories:** Plastic Surgery, Oncology, Dentistry
**Keywords:** bulky tissue flap, osteosarcoma of maxilla, pressure molding technique, prosthodontic rehabilitation, reduced inter-arch space

## Introduction

Unforeseen morbidities involving the head and neck region render a poor quality of life for the individuals who withstand such an ordeal due to difficulties faced in mastication, speech, aesthetics, and social acceptance [1]. Osteosarcoma is a rare malignancy commonly affecting the long bones. Osteosarcoma of the jaw accounts for 6-8% of all osteosarcomas, with the mandible having slightly more predilection than the maxilla. Males are more affected than females [2-6]. Its aggressive nature, along with low odds of distant metastasis, makes radical resective surgery along with adjuvant chemotherapy and radiotherapy the preferred modality of treatment in those affected [7].

Prosthodontic rehabilitation of maxillary defects poses a considerable challenge due to their complex anatomy and the maxilla being a focal point linking the nasal and oral cavities [8]. Obturators are the non-surgical, less invasive modality of choice for rehabilitation of such defects [9]. In recent years, surgical reconstruction using microvascular flaps from the fibula, iliac crest, and scapula has become popular due to its ability to provide three-dimensional restoration of the resected oral tissues [10]. Though these procedures help in restoring continuity and overcoming the immediate life-threatening concerns, from a prosthetic rehabilitation point of view, they leave much to be desired in the long run. Surgical reconstruction, when performed in an unplanned manner, without anticipating the prosthetic requirements, leads to a compromised site having insufficient contours and vestibular depth, unfavorable soft-tissue bulk, or a compromised base for the prosthesis. Unpredictable hard tissue healing, soft tissue contracture or hypertrophy, and graft resorption further jeopardize the condition. Furthermore, negligible inter-arch space due to a bulky flap design often becomes tedious to manage through conventional treatment modalities, either fixed or removable, without being invasive. Secondary surgical procedures, such as flap debulking, vestibuloplasty, bone grafting, or implant placement, are usually needed to create a more favorable foundation. Fixed prosthetic interventions involving placement of dental implants in microvascular flaps is a viable option having a success rate of 92.2%. However, radiotherapy has been shown to lower the implant survival rate in irradiated free fibula flaps to 73.8-84.6% [11-13]. Hyperbaric oxygen therapy (HBOT) has been proposed to improve implant survival and healing in irradiated tissues by improving the plasma-

oxygen content, stimulating angiogenesis, and fibroblast proliferation. However, studies have not been able to establish any such benefits till date [14].

Additionally, secondary surgeries may not always be desired by the patients also due to their negative psychological impact apart from the associated physical burden. Therefore, a simpler non-surgical alternative is desirable for selected patients. This clinical case elucidates a method to rehabilitate patients presenting with reduced inter-arch space due to prosthetically unplanned reconstruction. It presents a simplified treatment approach to help such patients gain an esthetic semblance of normality while maintaining prosthesis functionality.

## Case Presentation

A 31-year-old male patient presented with the chief complaint of disruption in his social life caused by the absence of his upper front teeth and the visibly unesthetic appearance of the microvascular flap present in the same region for the past nine years (Figure *1A*).




**FIGURE 1: Non-surgical rehabilitation of bulky flap with restricted inter-arch space.**

A) Before treatment. B) After treatment

He was a histopathologically diagnosed case of well-differentiated osteosarcoma of the maxillary anterior alveolus and the anterior palate and had undergone segmental maxillectomy, Brown Class IIc, followed by microvascular free fibular flap reconstruction. This was followed by cycles of chemotherapy with inj. cisplatin and Adriamycin; subsequently, he was administered image-guided radiation therapy (IGRT) with a cumulative dose of 54 Gy at the reconstructed site, three months post-surgery. The patient was on regular follow-up and had remained disease-free for nine years following completion of the initial treatment at the time of presentation. Meanwhile, he did not undergo any prosthetic rehabilitation.

Clinical examination revealed an incompetent upper lip showcasing the flap, which hampered the patient's facial esthetics considerably and conferred an iatrogenic convex profile (Figure *2A*).




**FIGURE 2: Lateral view.**

A) Pre-prosthesis. B) Post-prosthesis

Intraoral examination revealed a bulky microvascular flap covering the anterior maxillary alveolus and half of the hard palate antero-posteriorly. The flap had dimensions of 1.9 cm vertically, 4.5 cm mesio-distally, and 3.5 cm antero-posteriorly. It involved the right first premolar region and crossed the midline to the left second premolar region. On palpation, the area was firm, non-tender, with minimal soft tissue mobility. The considerable bulk of the reconstructed flap severely restricted the inter-arch space without any prosthesis

being worn. A freeway space of 2 mm was observed at the premolar region. The mandibular anteriors were found to impinge on the flap, leading to localized areas of erythema due to mechanical trauma, which resolved following elimination of traumatic contact post-prosthesis (Figures *3A*, *3B*).




**FIGURE 3: Intra-oral views.**

A) Frontal. B) Occlusal

Recent cone beam computed tomography (CBCT) images showed satisfactory healing of the grafted site except in the maxillary left lateral incisor and canine area, which was questionable (Figure *4*).

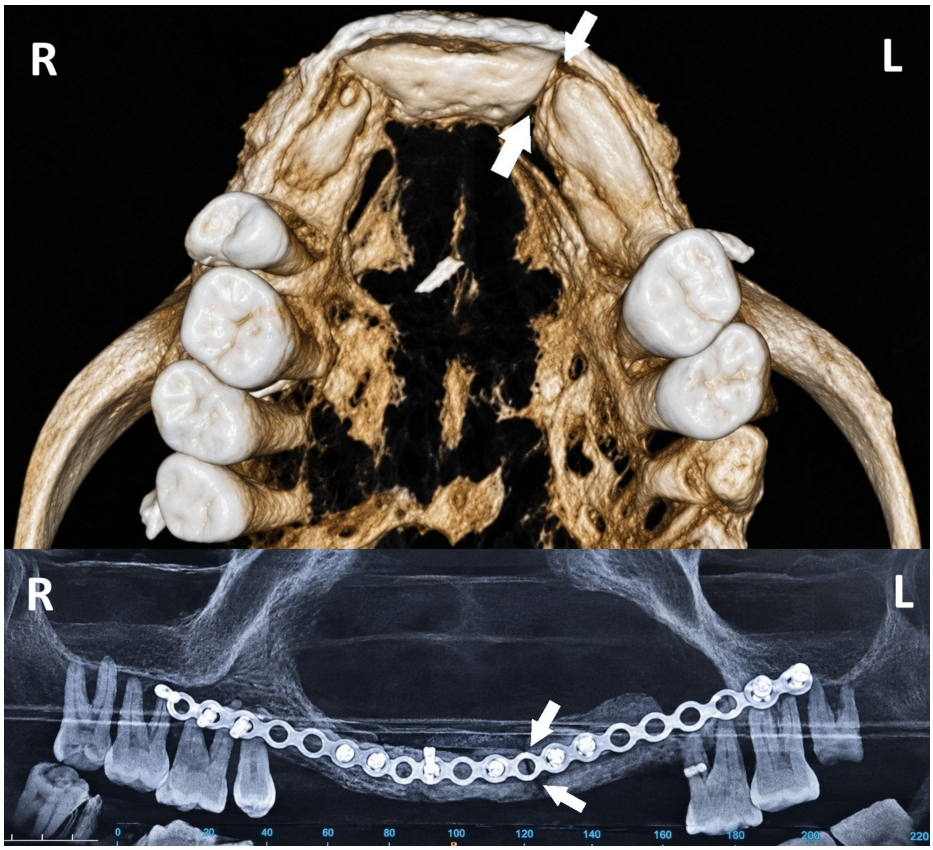



**FIGURE 4: Cone beam computed tomography (CBCT) of the maxilla.**

Arrows depict areas of questionable healing in the maxillary left lateral incisor and canine region.

The patient was informed about the need for a secondary debulking procedure to increase the available volume of the oral cavity along with a reduction in his facial convexity, to facilitate a successful prosthetic result. However, due to previous traumatic experiences, the patient was skeptical and was not willing to undergo further surgical intervention. This prevented the use of conventional prosthetic options, such as debulking under local anesthesia, implants in the healed segment, a flexible or flangeless RPD, and an overlay prosthesis due to the restricted inter-arch space. Keeping in mind the patient's psychological well-

being and the limitations associated with other treatment options, it was decided to rehabilitate him prosthetically using a conservative, non-invasive, thermoplastic sheet-supported partial denture. The primary outcome focus was on esthetics. The patient was informed about the procedure and the various possible outcomes, both favorable and unfavorable, and informed consent was obtained.

Impressions for both arches were made in alginate (Zelgan Advanced; Dentsply Sirona, Charlotte, NC) and poured in type III dental gypsum (Kaldent; Kalabhai Karson Pvt. Ltd., Mumbai, India). The maxillomandibular relationship was recorded based on the available occlusal contacts and the patient's existing jaw relation and mounted on an articulator. Acrylic teeth (AcryRock; Ruthinium Group, Badia Polesine, Italy) were trimmed on the lingual and ridge lap surfaces to reduce bulk, while the visible labial surface was preserved to maintain esthetics. The approximate thickness of the modified teeth was 1-1.5 mm. The teeth set-up was executed directly on the cast, with the teeth being positioned labial to the flap as facings and temporarily secured in position with a drop of cyanoacrylate (one drop instant adhesive Fevikwik Gel; Pidilite, Mumbai, India). A thin layer of pink, auto-polymerizing resin (DPI RR Cold Cure; Dental Products of India, Mumbai, India) was contoured around the teeth to replicate the natural gingiva, preceded by separating media application (Pyrax Cold Mould Seal; Pyrax Polymers, Roorkee, India). The setup was then removed from the maxillary cast and carefully finished and polished. It was again temporarily secured to the same position on the cast using cyanoacrylate resin, and a transparent, polyethylene terephthalate-glycol (PET-G ) thermoplastic sheet (Duran; Scheu Dental GmbH, Iserlohn, Germany) of 0.75 mm thickness was molded over the acrylic teeth setup using the pressure molding machine (Biostar; Scheu Dental GmbH). During pressure molding, the thermoplastic sheet closely adapted to the artificial teeth-autopolymerizing resin complex, providing mechanical retention within the prosthesis. Undercuts were assessed on the cast before pressure molding. No major undercuts that could hamper the insertion or removal of the prosthesis were identified. Minor undercuts were intentionally preserved to contribute to prosthesis retention. The sheet was trimmed such that it covered the remaining teeth and the palatal region to aid in retention, and the margins were smoothed (Figures *5A*, *5B*).

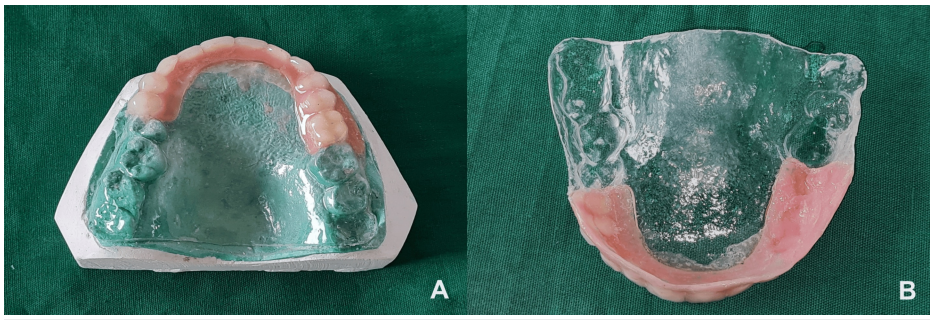



**FIGURE 5: Prosthesis fabricated using pressure-molding technique.**

A) Cameo surface. B) Intaglio surface

The prosthesis was checked in the patient's mouth for fit and comfort, ease of insertion and removal without excessive force or trauma to the supporting tissues, and occlusal contacts and interferences. The prosthesis demonstrated an acceptable occlusal relation. The patient exhibited normal salivary flow on clinical assessment and was instructed to follow regular oral hygiene protocols, including toothbrushing, interdental cleaning, and meticulous cleaning of the prosthesis. He was advised to remove the prosthesis during meals and at night (Figures *6A*, *6B*).




**FIGURE 6: Prosthesis seated intraorally.**

A) Frontal view. B) Occlusal view

Regular follow-ups were done at 1 week, 15 days, 1 month, and 3 months, along with subjective assessment in terms of facial esthetics, lateral profile, and speech through clinical observation, evaluation of clinical photographs taken before and after rehabilitation, and patient-reported satisfaction. A clinically observable improvement was noted in the patient's facial appearance with minimal effect on the lateral profile (Figures *1B*, *2B*). The patient expressed satisfaction with the esthetic outcome and adaptation to the prosthesis. No loosening, delamination, or separation of the teeth from the thermoplastic sheet was observed. During follow-up visits, the underlying teeth and mucosa were evaluated for signs of caries, inflammation, or tissue changes.

After three months of follow-up, a second prosthesis was fabricated in the same way with modifications aimed at improving mastication and structural integrity. A thermoplastic sheet with an increased thickness of 2 mm (Duran; Scheu Dental GmbH) was used, and the occlusal surfaces of the remaining teeth were exposed to permit direct contact between the opposing natural dentition to aid in mastication (Figure *7*).

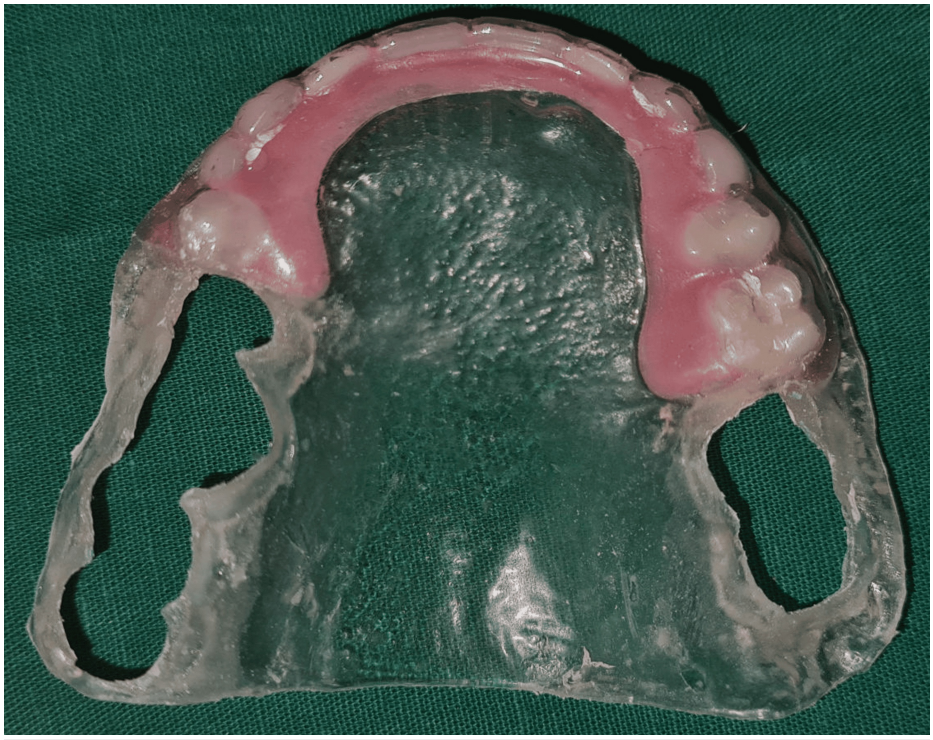


**FIGURE 7: Modified prosthesis with uncovered occlusal surfaces of the remaining natural dentition.**

The patient was followed up for a total duration of six months following prosthetic rehabilitation. The prosthesis remained intact without any wear, cracks, or separation of teeth. The patient reported satisfactory mastication following modification of the prosthesis.

## Discussion

This case highlights the complications that may ensue after microvascular graft reconstruction in post-maxillary resection cases and the challenges it poses in rehabilitation. Though such flaps fulfil their fundamental functions, when executed in a prosthetically unplanned manner, they have definite drawbacks in the long term. The need for a multidisciplinary team approach involving both the surgeon and a prosthodontist is paramount for a successful outcome.

Factors such as osseous and soft tissue flap response, degree of scar contractures, amount of radiation received, and most importantly the wish of the patient are instrumental in determining whether undertaking a secondary reconstructive surgery would be beneficial or not [15]. The possibility of flap debulking under local anesthesia was considered but not pursued because of the patient's reluctance to undergo further surgical intervention. Dental implants in the healed segment, though a viable option in such cases [16,17], were ruled out due to the limited prosthetic space and the need for additional surgical intervention in a previously irradiated site. A flexible, flangeless, conventional, or cast removable partial denture, or an overlay prosthesis, also would not have been successful in providing adequate contour and tooth replacement without adding additional bulk in the already limited restorative space. An unanticipated tumor at an early age, with a nine-year trial with partial edentulism, discouraged the patient, and fear of a

secondary surgical procedure caused apprehension and distress. Keeping in mind the patient's psychological predicament and a need for reassurance, a simple, conservative, and non-invasive method using thermoplastic sheets was devised to fabricate a prosthesis accommodating the anatomical constraints to address the patient's functional and esthetic needs and to improve his quality of life.

Irreversible hydrocolloid impressions were made to record the site of interest passively and comfortably without ensuing harm to the tissue bed. The treatment plan to restore the facial esthetic region involved thinning of the acrylic teeth to a paper finish in order to limit the convexity in the facial profile. A minimal amount of auto-polymerizing resin was used to fix the teeth to the desired position and replicate the gingiva. A 0.75-mm-thick thermoplastic transparent sheet was the securing medium decided upon to work within the limited space available.

The use of a pressure-molded thermoplastic sheet proved beneficial in multiple aspects. Firstly, it served as a suitable mode of retention by virtue of its close adaptation to the remaining dentition, as well as the microvascular flap and remaining hard palate [18,19]. Although the remaining premolars and molars were available as abutments, their compromised periodontal support (Figure *4*) made them less suitable for conventional clasp retention. Further, the use of conventional clasps in this case would not have served the desired purpose due to the restricted inter-arch space and the need to minimize additional prosthetic bulk, together with the complex anatomy of the reconstructed maxillary region. Secondly, it served as a suitable scaffold for the fragile tooth setup done in acrylic resin by encapsulating it and providing a supporting framework that helped maintain its positioning and structural integrity [19]. The same would not have been possible with a conventional partial denture, as acrylic resin lacks the strength to withstand functional stresses in thin sections. Thirdly, the sheet acted as a protective barrier between the flap and the mandibular anterior teeth. It helped prevent further trauma and promoted healing. Resolution of the localized erythema was subsequently clinically observed during follow-up. Finally, due to the thermoplastic nature of the sheet, the selected 0.75-mm-thick sheet, once pressure molded, underwent further thinning, resulting in a final thickness of 0.5-0.6 mm. This enabled the clinician to deliver a prosthesis having minimal occlusal bulk, thereby limiting the increase in vertical dimension, along with negligible alteration in the patient's existing facial convexity, while successfully serving its purpose within the reduced inter-arch space available [20].

After the prosthesis had been successful in terms of esthetics and improved the quality of life of the patient, a second prosthesis with a thicker sheet and uncovered occlusal surface of the remaining dentition was fabricated to prevent removal of the prosthesis at meals and aid in mastication. As the occlusal surfaces were exposed and in direct contact with the opposite teeth, the increased thickness of the thermoplastic sheet did not contribute to an increase in the vertical dimension of occlusion while improving the structural integrity of the prosthesis. A positive outcome was noted in terms of overall patient satisfaction, adaptability, and mastication.

However, such thermoplastic sheet-supported prosthesis also has its limitations. The prosthesis might need replacement in the future due to the possible risk of fatigue-related breakage, surface wear, and discoloration. Loss of retention and adaptation may occur during prolonged use. Further, there might be a tendency for food lodgement around the teeth and within the prosthesis, adding to the hygiene burden and increasing the risk of developing radiation caries, requiring frequent maintenance and strict oral hygiene protocols [21]. Careful selection of thermoplastic sheet thickness is also necessary in such cases to reduce unwarranted alteration of the vertical dimension. Further, clinical studies with longer follow-up periods are required to establish the long-term efficacy of this approach. It is an alternative mode of therapy, and its usefulness may vary on an individual basis. Conventional prosthetic planning, especially osseointegrated dental implants, remains the mainstay treatment in such cases [16].

## Conclusions

Surgical resections in malignant cases followed by complicated reconstructions may be the need of the hour due to the stakes involved; however, when performed in an unplanned manner, they present considerable challenges for the subsequent prosthetic rehabilitation. This underscores the importance of a multidisciplinary approach involving medical and dental professionals, since the initial phases of treatment planning should anticipate the prosthetic requirements and facilitate a comprehensive rehabilitation plan to optimize outcomes. Such compromised cases require a careful clinical assessment and prosthodontic expertise. The technique described in this case report provides an esthetic and functional prosthetic alternative without any surgical intervention, aimed at the psychological well-being of the patient. However, its long-term performance and broader clinical applicability require further evaluation.

## Additional Information

### Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

**Concept and design:** Modhupa Ghosh, Aarzoo Pathak, Rekha Gupta, Shubhra Gill

**Acquisition, analysis, or interpretation of data:** Modhupa Ghosh, Preeti N. Mishra, Mamta Phogat, Harpreet Grewal

**Drafting of the manuscript:** Modhupa Ghosh, Aarzoo Pathak, Preeti N. Mishra, Mamta Phogat

**Critical review of the manuscript for important intellectual content:** Modhupa Ghosh, Rekha Gupta, Shubhra Gill, Harpreet Grewal

**Supervision:** Modhupa Ghosh, Rekha Gupta, Shubhra Gill, Harpreet Grewal

## Disclosures

**Human subjects:** Informed consent for treatment and open access publication was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

# References

1. Fromm L, Gotfredsen K, Wessel I, Øzhayat EB: Oral health-related quality of life, oral aesthetics and oral function in head and neck cancer patients after oral rehabilitation. J Oral Rehabil. 2019, 46:738-46. 10.1111/joor.12806
2. Demicco EG, Deshpande V, Nielsen GP, Kattapuram SV, Rosenberg AE: Well-differentiated osteosarcoma of the jaw bones: a clinicopathologic study of 15 cases. Am J Surg Pathol. 2010, 34:1647-55. 10.1097/PAS.0b013e3181f7dac6
3. Amini Shakib P, Foroughi R, Seyedmajidi M: Osteosarcoma of the maxilla: a rare case with unusual clinical presentation. J Dent Res Dent Clin Dent Prospects. 2013, 7:177-81. 10.5681/joddd.2013.029
4. Baumhoer D: Bone-related lesions of the jaws. Surg Pathol Clin. 2017, 10:693-704. 10.1016/j.path.2017.04.007
5. Lee RJ, Arshi A, Schwartz HC, Christensen RE: Characteristics and prognostic factors of osteosarcoma of the jaws: a retrospective cohort study. JAMA Otolaryngol Head Neck Surg. 2015, 141:470-7. 10.1001/jamaoto.2015.0340
6. Chaudhary M, Chaudhary SD: Osteosarcoma of jaws. J Oral Maxillofac Pathol. 2012, 16:233-8. 10.4103/0973-029X.99075
7. Ferrari D, Codecà C, Battisti N, et al.: Multimodality treatment of osteosarcoma of the jaw: a single institution experience. Med Oncol. 2014, 31:171. 10.1007/s12032-014-0171-9
8. Andrades P, Rosenthal EL, Carroll WR, Baranano CF, Peters GE: Zygomatic-maxillary buttress reconstruction of midface defects with the osteocutaneous radial forearm free flap. Head Neck. 2008, 30:1295-302. 10.1002/hed.20874
9. Chen C, Ren W, Gao L, Cheng Z, Zhang L, Li S, Zhi PK: Function of obturator prosthesis after maxillectomy and prosthetic obturator rehabilitation. Braz J Otorhinolaryngol. 2016, 82:177-83. 10.1016/j.bjorl.2015.10.006
10. Cordeiro PG, Bacilious N, Schantz S, Spiro R: The radial forearm osteocutaneous "sandwich" free flap for reconstruction of the bilateral subtotal maxillectomy defect. Ann Plast Surg. 1998, 40:397-402. 10.1097/00000637-199804000-00013
11. Shokouhi B, Cerajewska T: Radiotherapy and the survival of dental implants: a systematic review . Br J Oral Maxillofac Surg. 2022, 60:422-9. 10.1016/j.bjoms.2021.09.006
12. Panchal H, Shamsunder MG, Petrovic I, et al.: Dental implant survival in vascularized bone flaps: a systematic review and meta-analysis. Plast Reconstr Surg. 2020, 146:637-48. 10.1097/PRS.0000000000007077
13. Wüster J, Mahlow L, Neckel N, et al.: Long term dental implant survival and bone level changes with special emphasis on radiation therapy after free fibula flap reconstruction - a retrospective study. Clin Oral Investig. 2025, 29:559. 10.1007/s00784-025-06587-9
14. Benites Condezo AF, Araujo RZ, Koga DH, Curi MM, Cardoso CL: Hyperbaric oxygen therapy for the placement of dental implants in irradiated patients: systematic review and meta-analysis. Br J Oral Maxillofac Surg. 2021, 59:625-32. 10.1016/j.bjoms.2020.08.050
15. Iyer S, Ramu J, Krishnadas A: Secondary reconstruction of head and neck cancer defects - principles in its practice. J Maxillofac Oral Surg. 2023, 22:1-9. 10.1007/s12663-023-01875-x
16. Gangwani P, Almana M, Barmak B, Kolokythas A: What is the success of implants placed in fibula flap? A systematic review and meta-analysis. J Oral Maxillofac Res. 2022, 13:e3. 10.5037/jomr.2022.13103
17. Ikbal LK, Emrah S, Kerem K: Dental implant-supported prosthetic rehabilitation with custom attachment in a patient with partial maxillectomy defect because of osteosarcoma: a case report. J Oral Implantol. 2021, 47:518-23. 10.1563/aaid-joi-D-20-00021
18. Demir A, Babacan H, Nalcacı R, Topcuoglu T: Comparison of retention characteristics of Essix and Hawley retainers. Korean J Orthod. 2012, 42:255-62. 10.4041/kjod.2012.42.5.255
19. Nakamori K, Yamagishi M, Takaya K, Igarashi T, Hiratsuka H: Effectiveness of a custom-made temporary obturator after bilateral total maxillectomy. Surgical Science. 2013, 4:322-24. 10.4236/ss.2013.47063
20. Deepika K, Goel S, Gupta R, Jain RA: Application of polyvinyl chloride sheet as delayed surgical obturator in

maxillectomy defects secondary to mucormycosis - a case series. J Oral Biol Craniofac Res. 2023, 13:207-9. 10.1016/j.jobcr.2023.01.004

21. Bansal K, Deepika K, Longdo M, Gupta R: A distinctive approach to rehabilitate patient with bilateral maxillectomy defect by two-piece hollow obturator - case report. Int J Adv Res. 2024, 12:1078-83. 10.21474/IJAR01/19541