Implant-supported over denture (maxilla and mandibular RP4) in the patients with a history of radio and chemotherapy: A case report with 3 years’ follow-up

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ABSTRACT
In prosthodontics, edentulism has been a long-lasting issue. Implant therapy today is to help overcome several limitations of traditional complete denture. In patients who have received chemo and radiotherapy in another region than their neck and head, the success of dental implants is still uncertain. Although some local and systemic factors can be contraindications to dental implant treatment, there are very few absolute medical contraindications to dental implant treatment; however, some conditions can raise
the risk of treatment failure or complications. The case report describes the successful survival of dental implants placed in the maxilla and mandible of a patient who has undergone radio and chemotherapy for prostate cancer.

**Keywords:** Chemotherapy, dental implant, implant-supported overdenture, radiotherapy, implant-supported bar overdenture, radiographic guide, surgical stent

1. INTRODUCTION

Tooth loss is accompanied by functional, aesthetic, and occlusal alterations, as well as speech and psychological difficulties. Implant restoration is a reliable option that has become a widely used procedure all over the world (Li Fu et al., 2019). An implant-supported fixed dental prosthesis can provide a high degree of masticatory function and comfort for an individual with a completely edentulous maxilla and mandible. However, this restoration requires frequent maintenance (Avanti Merchant et al., 2020; Li Fu et al., 2019; Gupta et al., 2018; Ricardo Morandi et al., 2017). Implant-supported over dentures have also been widely and successfully used to rehabilitate patients with edentulism. Compared with maxillary fixed dentures, this option offers similar retention and function, and facilitate aesthetics, phonetics, and hygiene (Ricardo Morandi et al., 2017). Bone resorption may be restricted by locating implants in the edentulous mandible and loading them a slight irritative stimuli change bone shape, architecture, and volume, resulting in subperiosteal growth (Reena Luthra et al., 2016). This is supported by Wolff's law, which states that a change in function leads to a change in structure (Reena Luthra et al., 2016). Long-term achievement rates indental implants over 90–95% are considered to be realistic treatment outcomes in the general population (Himanshu Aeran et al., 2015; Misch et al., 2015). The right number of implants, their place, and angulation are determined by appropriate diagnosis and treatment planning, leading to prosthesis success. Clinicians’ interest in implant dentistry, however, has to be tempered by comprehensive knowledge and understanding of the physiologic implications of existing systemic diseases or therapies for treatment outcome and patient wellbeing (Himanshu Aeran et al., 2015; Misch et al., 2015). The medical history should be carefully reviewed prior to any endosseous implant therapy in patients, and a physical exam should be done if necessary (Li Fu et al., 2019). An existing systemic disease or ongoing systemic therapy may complicate or contraindicate the implant dentistry (Himanshu Aeran et al., 2015; Misch et al., 2015). Increased knowledge of the underlying disease process can have improved the management of patients suffering from bone metabolism abnormalities, diabetes mellitus, xerostomia, and antineoplastic chemotherapy (Himanshu Aeran et al., 2015). This article describes a patient with radio and chemotherapy for the prostate malignancy in whom successful restoration has been achieved with implant-retained overdentures (RP4) for 3 Years’ Follow-Up.

2. CASE REPORT

A 64-year-old male patient was reported for the replacement of old Dentures, with the chief complaint of difficulty in chewing. Dental history revealed that the patient had undergone uneventful extractions 35 years back due to periodontal involvement and has worn complete dentures for 34 years. Further, medical history revealed that he had undergone three cycles of chemotherapy with cabazitaxel and radiation therapy 11 years back for prostate cancer. All vital signs were normal. Clinical and radiographic evaluation revealed complete edentulous upper and lower jaws with significant bone loss and deficiency in height and width (Figs. 1 & 2).

![Figure 1 and 2 complete edentulous upper and lower jaws](image)

Due to the resorption pattern observed in the patient, he was informed about the poor prognosis of constructing a new denture. The patient was given various treatment alternatives, including implant therapy, the appropriate one for him. After obtaining his consent, we went about the treatment.
3. CLINICAL PROCEDURE
Maxillary and mandibular dentures were fabricated conventionally. The patient was initially given diagnostic impressions. Primary models were poured in type for 1 dental plaster on which custom trays were fabricated with the help of these trays border molding with the green stick low fusing impression sticks, and the final impressions were made with ZOE (Fig.3).

![Figure 3](image3.jpg)

**Figure 3** border molding with the green stick

These impressions gave the final models, and, on similar bases, record bases and wax rims were fabricated. The patient’s jaw and centric relation was recorded, a facebow transfer was obtained, and this relation was mounted on a semi-adjustable articulator (Hanau Wide Vue). This mounting was used as a diagnostic aid to judge the available interarch space in the patient, which was measured to be around 18mm. A trial denture arrangement was made, and a bilateral balanced occlusal scheme was selected. Deflecting contacts in both centric and dynamic parafunctions were eliminated. This denture was then acrylized and duplicated with clear acrylic resin, gutta-percha pointers were placed in the favorable implant positions, and the patient was asked to take a CBCT wearing the same, which acted as a radiographic guide (Fig.4).

![Figure 4](image4.jpg)

**Figure 4** radiographic image

With the help of this CBCT and digital imaging software, the implant treatment planning was done, and the implant locations, size, and diameter were determined (Fig.5).

![Figure 5](image5.jpg)

**Figure 5** digital imaging

Under general anesthesia, the implant surgery was carried out in a two-stage surgical protocol. The surgery included inferior alveolar nerve medialization (because of severe vertical bone loss and adjacent of inferior alveolar nerve to a lingual plate of a mandibular ridge), 7 implants in the mandible (DIO implants 11.5 mm length and 4 mm diameter), and 7 implants with open sinus lift in the maxilla (DIO implants 13 mm length and 4 mm diameter) with the help of a surgical template. The mandibular osteotomy sites were prepared in the A, B, C, D, E, and region of the first molar with the help of a surgical template. The maxillary osteotomy
sites were the region of centrals, canines, second premolars, and first molars. A guide pin was used to ensure that the second implant was as parallel as possible to the first (Fig. 6).

![Figure 6](image)

**Figure 6** The maxillary osteotomy sites

In the primed locations, the chosen implants were located. Surgical cover screws were located. With prime closure, the flaps were estimated. The patient was told not to wear the denture for two weeks after surgery. The patient was given postoperative antibiotics for 7 days along with chlorhexidine mouth wash four times daily until the sutures were removed. The intaglio surface of the denture was relieved. According to the manufacturer’s instructions, soft tissue conditioning material (GC Reline Soft TM) was applied to the denture intaglio surface, and the surplus liner material was cropped. The denture was finished, polished, and inserted into the patient’s mouth. By this, the patient was able to wear a movable prosthesis during the osseointegration time with no excessive forces to the surgical places. The patient was visited on regular follow-up, and the denture was relined as needed. Six months later, after confirmation of the osseointegration, the patient was presented for the second stage surgery, and gingival formers were placed (Fig. 7).

![Figure 7](image)

**Figure 7** gingival formers

Later, initial impressions were made; the casts then were poured. On the prime cast, the custom trays were fabricated to be used for the open-tray impression technique, and border molding for maxillary and mandibular arches was done (Fig. 8).

![Figure 8](image)

**Figure 8** border molding for maxillary and mandibular arches

Transfer copings were attached to the implants and secured with floss and pattern resin. The final impressions were made using polyvinyl siloxane impression material, and master casts were prepared (Fig. 9).
A new jaw relation and centric record were taken and mounted on the semi-adjustable articulator. Teeth were set up, and the indexing of denture tooth position for space analysis was made (Fig. 10).

Then, full maxillary arch and mandibular tow piece Bar and Ball attachments were waxed up & fabricated. The bar was finished, polished, and checked in the patient intraorally and radiographically for passive fit (Fig. 11).

A new jaw relation and centric record were taken and mounted on the semi-adjustable articulator. Teeth were set up. Afterward, dentures processing was completed by a conventional labor technique. Remount after processing and occlusal contacts adjusting was done. As anterior group function (Fig. 12).
Figure 12 Remount after processing

The finished bar was located in the patient’s mouth. The abutment was screwed with a final torque of 35 N/cm. The screw openings were blocked with gutta-percha points. The denture was inserted in the patient’s mouth and checked for proper extensions and occlusal contacts (occlusal pattern anterior group function) (Fig. 13).

Figure 13 Occlusal pattern

The patient was given home-care instructions, being trained to locate and eliminate the prosthesis appropriately. The first recall was after 24 hours. For every six months, the routine follow-up was recommended. The patient was instructed to remove their prosthesis at night. A soft single-tufted brush was indicated to preserve attachments free from plaque and calculus. The patient is successfully using the overdenture for 4 years and is satisfied with the function, aesthetics, and retention of the restoration (Fig. 14).

Figure 14 Patient successfully using the overdenture

The radiologic examination has not shown any evidence of radiolucency and the horizontal bone loss around the implants after 3 years (Fig. 15).
4. DISCUSSION

Radiation and chemotherapy have been a boon to the medical profession in treating patients with malignant conditions. Thorough knowledge and skills of prosthodontists can improve the quality of life of patients undergoing radiation and chemotherapy (Palak Prajapati et al., 2016). Thus, it is necessary to evaluate the risk versus benefits of dental treatment that must be discussed with the patient in detail for successful treatment. It is intricate to reach a definitive conclusion regarding the influence of chemotherapy on the survival of dental implants; thus, long-term studies are needed. The rehabilitation of an edentulous maxilla and mandibular with dental implants is a challenging treatment, particularly when the jaws are severely atrophied. In addition to insufficient bone volume for implant placement, unfavorable intermaxillary relationships, as well as the association of these conditions, can result in difficulties (Ricardo Morandi et al., 2017). A passive fit is essential to prevent mechanical complications (Ricardo Morandi et al., 2017; Reena Luthra et al., 2016). There are two maxillary overdenture options (RP5, RP4); an average of four to ten implants is used to support bar overdenture (Ricardo Morandi et al., 2017; Misch et al., 2015). RP4 is preferred design because of providing improved security and confidence to the patient compared with RP5 or denture; however, the cost is similar to the fixed. Treatment planning for maxillary RP4 is similar to the fixed prosthesis since it is fixed during function (what the patients’ desire). The maxillary RP4 complications are more than the fixed prosthesis; however, the aesthetics, lip supports, speech, and hygiene is better than the fixed, even hybrid prosthesis (Misch et al., 2015; Himanshu Aeran et al., 2015). Data on the implant-retained overdenture indicate that most of the complications and prosthodontic maintenance are related to the attachment components of the overdenture (Gupta et al., 2018; Misch et al., 2015). There are five mandibular overdenture options (OD1-OD5); an average of two to nine implants is used to support bar overdenture (Misch et al., 2015). Mandibular fifth option with atleast five implants is a minimum treatment option for a patient with moderate to severe problems related to the traditional mandibular denture. The second patient’s condition that determines this option is for the treatment of continued bone loss in the posterior mandible (Misch et al., 2015). As with any treatment modality, after care and maintenance are vital if the overdenture is to be successful; thus, the patient must be advised to do this and be checked regularly. Implant-supported restorations require optimal surgical implant positioning for success. An implant-retained over denture requires meticulous treatment planning than a conventional complete denture. The final placement of the implants should follow the principles of ideal implant parallelism and maximum initial stabilization, as well as a path of placement and removal (Sweta Bhandari et al., 2015; Dipti Lamba De et al., 2014; Misch et al., 2015).

5. CONCLUSION

The treatment presented results in the prosthetic restoration of an atrophied edentulous maxilla and mandible and also facilitates improved masticatory function, aesthetics, and oral hygiene. This RP4 option system in implant-supported complete dentures is reliable and associated with good stability and retention. Literature suggests that bar-retained implant-supported overdentures are excellent treatment options for edentulous jaws. Such restorations show high implant and prosthesis survival rates (>97%) and a limited incidence of any complications, making them a treatment of choice for edentulous patient.

Conflict of interest

The authors declare that they have no conflict of interest.
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Informed Consent
Written and Oral informed consent was obtained from the participant included in the study.

REFERENCE