

A bar and ball attachment prosthesis over osseointegrated implants post mandibular resection

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Abstract

Rehabilitation of mandibular resection poses functional, esthetic, and psychological challenges. The deviation and rotation of the mandible toward the resected side leaves the patient with almost no option of chewing. This is aggravated if the patient is edentulous. The case report discussed in this article was an edentulous patient taken up with the primary goal to limit deviation toward resected side and provide a stable and retentive prosthesis to the patient. Two implants were placed anteriorly, splinted with bar and clip supported superstructure. The splinted implants with bar and clip superstructure provided the mandibular prosthesis with retention and some support. A posterior implant was also placed in the region of mandibular first molar on the left side for added support. This provided with a tripod configuration and limited the prosthetic movement of the mandibular prosthesis. This case report highlights an alternate way toward the rehabilitation of edentulous mandible post mandibular resection when surgical reconstruction may not be feasible.

Key Words: Mandibular resection, osseointegrated implants, segmental hemimandibulectomy

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INTRODUCTION

Rehabilitation of mandibular resection poses functional, esthetic, and psychological challenges. Not only is the mastication impaired but patient's control over the remaining mandible is also compromised.^[1]

The deviation and rotation of the mandible toward the resected side leaves the patient with almost no option of chewing.^[2] This is aggravated if the patient is edentulous. This further

gets accentuated with disfigurement and feeling of remorse. The rehabilitation needs to address the resection and the effect left by it. There is a strong need that the rehabilitation should go hand in hand with resection and reconstruction. This calls for an interdisciplinary team approach.

The use of osseointegrated implants has revolutionized and brought a ray of hope for attempting rehabilitation post mandibular resection.^[3]

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A critical review into the literature clearly suggests inadequate restoration through conventional prosthodontic procedures.^[4] The rehabilitation should be aimed to restore the missing teeth, control deviation, limit disfigurement, and maintain optimum occlusion.

This case report is an innovative approach incorporating osseointegrated implants along with a combination of attachments to overcome the functional, esthetic, and social limitations of patient's resection surgery.

CASE REPORT

A 72-year-old male patient reported to the Department of Prosthodontics, Institute of Technology and Sciences, Centre for Dental Studies and Research, Muradnagar, Uttar Pradesh, India, with the chief complaint of difficulty in chewing food due to deviation of the lower jaw [Figure 1]. The patient had a history of segmental hemimandibulectomy of the right side 8 years back.

Medical records of the patient revealed that he was asymptomatic 8 years back prior to the development of an ulcer over his right alveolus. He had a history of smoking for 50 years. It was diagnosed to be moderately differentiated squamous cell carcinoma of the alveolus with TMN staging T4N2aM0.^[5] The patient underwent segmental right hemimandibulectomy and primary closure was achieved with no skin graft used to restore the defect resulting in Cantor and Curtis type II resection defect.^[6] Subsequently, radiotherapy (<5000 cGy) was given for the same which was completed 6 years back. No chemotherapy was administered to the patient.

The clinical examination revealed resected mandible up to the first premolar region on the right side without restoration of the defect continuity. The mandible was deviating toward the resected side and disfigurement was evident extraorally. In the maxillary arch, premolars were present in the right side with Grade II recession and secondary caries.

Root canal treatment was done for the maxillary premolars and they were resected and submerged for the preservation of bone levels.

This case posed a challenge for the rehabilitating team. The patient declined a second reconstructive surgery at the time of examination. The remaining edentulous residual bone has to be optimally utilized for the stability, support, and retention of the prosthesis and control of deviation. It was decided to restore the lower arch with implant-retained overdenture. Two implants with bar superstructure were planned in the anterior region and a single implant with a ball attachment was planned

in the mandibular left posterior region for additional vertical support.

Primary and secondary impressions were made using standard techniques. The maxillomandibular relationship was recorded by operator maneuvered lateral guidance of the mandible to place it in the most advantageous position within the reach of the patient.^[3] The maxillomandibular relation was obtained with the centric occlusion registration record.

In the definitive prosthesis, a functionally generated maxillary ramp would guide the prosthesis in this comfortable chewing position repeatedly. The palatal ramp was 4–5 mm in width and 10 mm in length. The patient had a deviation of 1 cm toward the resected side and to prevent this, a palatal occlusal ramp was added parallel to the row of maxillary teeth on the left side [Figure 2]. This facilitated the mandible into a more desirable maxillomandibular relationship. The stability of the mandibular denture obtained by implants would further enhance the role of palatal guidance ramp to achieve the comfortable chewing position.

The abnormal jaw relations along with angular path of closure favored the use of monoplane teeth in semiadjustable articulator (Hanau Wide-vue, Waterpik, 010885) to achieve a non restrictive occlusion. Teeth arrangement was restricted till the second premolar on the right mandibular region. Neutrocentric concept of occlusion was followed.

Cone beam computed tomography (Kodak 9500 CBCT unit, Kodak Dental Systems, Carestream Health Inc. Rochester, NY) was done to plan the implant positions in mandible with the patient wearing radiographic guide made from duplicating the patient's denture [Figure 3]. A customized surgical guide was fabricated for the patient and three Adin implants (Adin Dental Systems, Israel) were placed. Anteriorly two implants were placed between the resected side and the mental foramina of normal side (Adin swell 3.75D × 11L mm) on either side of the symphyseal region. One implant was placed in the region of mandibular left first molar of dimension 5.0 mm × 6.25 mm [Figure 4]. Primary closure was achieved and the implants were allowed to osseointegrate under submerged healing protocol for 3 months.

Stage II surgery was performed using tissue punch 3 months post implant placement and gingival formers were placed.

Implant impressions were made using splinted open tray technique with polyether (Pentamix™ II, 3MESPE) and poured in type IV die stone (Kalrock Kalabhai, India) after application of gingival mask (GI-mask, Coltene Whaledent Inc., USA).



Figure 1: Mandibular deviation toward resected side



Figure 2: Palatal guidance ramp

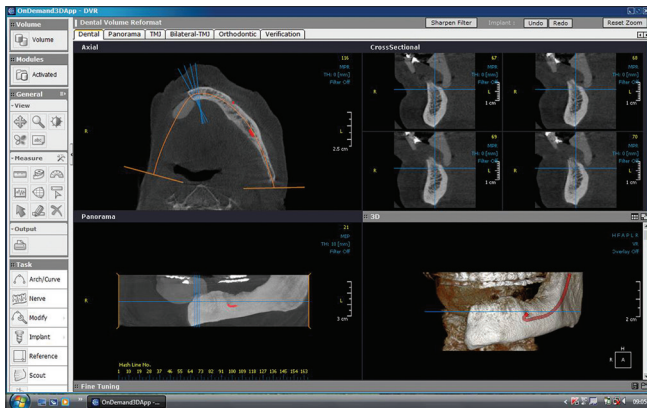


Figure 3: Implant simulation on cone beam computed tomography scan

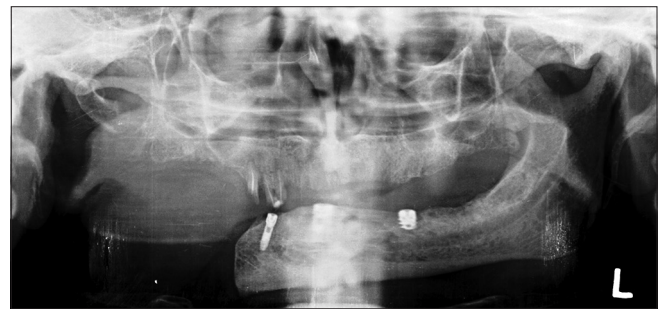


Figure 4: Postimplant placement orthopantomogram

On evaluation of prosthesis by questioning the patient regarding retention, control of deviation, chewing ability, stability, and esthetics, the prosthesis was found to be satisfactory.^[7]

DISCUSSION

Rehabilitation of a mandibulectomy defect is a multifaceted task aiming toward the restoration of function, esthetics, and psycho-social well-being of the individual. The resection surgery is severely debilitating and opens up a whole new challenge for the restorative team. A wide range of rehabilitating options are available for reconstruction of the defect which includes autogenous bone (avascular bone grafts, pedicled bone flaps, free vascularized osteomyocutaneous flaps, prelaminated and prefabricated bone grafts), osteogenetic distraction, alloplastic materials (with or without bone), tissue-engineered grafts.^[8-10]

The changing trends toward the rehabilitation of such defects have witnessed an increasing emergence toward implant supported fixed or removable prosthesis.

Post mandibular resection surgery, radiotherapy might be required in several cases. The irradiated bone is more prone to postradiation complications such as osteoradionecrosis. It is advocated that implant placement may be done either prior

Prefabricated plastic bar (Rhein, Germany) was positioned advantageously using a putty index obtained from the copy of trial denture [Figure 5]. The pattern was casted in chrome cobalt alloy (Me-alloy, Dentsply). The entire assembly was aligned on the cast [Figure 6]. The fit was verified over the abutments clinically and radiographically [Figure 7]. Posteriorly, an O-ring was torqued. The casted bar was luted in the patient's mouth with U 200 resin cement (3M ESPE, Germany). Post bar placement, a polyether impression, was made blocking the area underneath the bar with modeling wax and a final cast was poured in die stone. Mandibular denture was cured in heat cure resin along with the metal housings for retentive clips.

The female part for O ring was incorporated in the mandibular denture using intraoral permanent reline material (Ufi Gel Hard, VOCO, Germany) using direct technique.

The final prosthesis was evaluated intraorally and the patient was recalled after 24, 48, and 72 h [Figure 8]. The patient was put on a 6-month recall visit and requested only minor adjustments in the last 3 years.

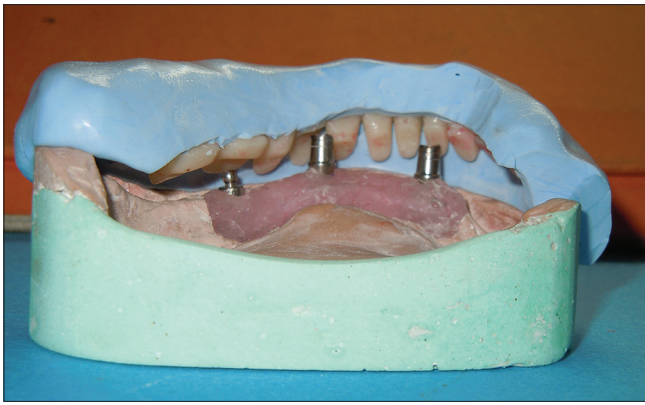


Figure 5: Placement of plastic bar using putty index of trial denture



Figure 6: Bar and O-ring superstructure



Figure 7: Intraoral periapical radiograph of anterior implants with superstructure



Figure 8: Final prosthesis

to radiotherapy or after a healing period of 9–12 months and should have elapsed prior to implant placement.^[11] It has been cited in literature that radiation of more than 5000 cGy increases the implant failure rate to 33%.^[12]

The case report discussed in this article was an edentulous patient who was taken up with the primary goal to limit deviation toward resected side and provide a stable and retentive prosthesis to the patient. An option of vascularized reconstruction of the resected site followed by implant placement was offered to the patient for which he did not consent. This posed a greater challenge in terms of retention and stability of mandibular prosthesis as the patient was completely edentulous.

It was planned to place two implants anteriorly splinted with bar and clip supported superstructure. The option of milled bar was not considered as only two implants were being splinted which were placed at a distance of around 20 mm. Further, the casted bar along with copings were planned to be luted on the implant abutments. The splinted implants with bar

and clip superstructure provided the mandibular prosthesis with retention and some support. A posterior implant was also placed in the region of mandibular first molar region on the left side. In a conventional mandibular edentulous situation, a overdenture supported with 2 implants splinted with bar superstructure derives some amount of support from the posterior ridges. However, in this situation due to hemimandibulectomy, the posterior support is limited. Thus, an additional implant in the posterior region was planned to serve three facets. First, to provide additional support and second to give a tripod support to distribute stresses uniformly and to provide additional retention. At the same time, this additional implant with ball superstructure did not limit the functioning of the splinted anterior implants and allowed for prosthetic movement.

The rehabilitating team needs to work in an altered environment by controlling the abnormal muscular pull and redirecting the forces on the remaining hard and soft tissue so as to optimize and preserve what remains. In a hemimandibulectomy defect without vascular reconstruction, the remaining alveolar bone had to be well utilized. The tripod placement of implants and a judiciously chosen combined use of bar and clip attachment anteriorly (to provide retention) and a ball attachment

posteriorly (to provide retention and stability) made the prosthesis achieve adequate retention and stability in a situation of compromised bone support.

Further to stabilize the prosthesis and limit the deviation, a maxillary palatal guidance ramp was incorporated in the maxillary complete denture which guided the rotating mandibular closure and also provided with a broad occlusal table.^[5] The maxillary occlusal ramp, in this case, was successful due to the stability and retention of mandibular prosthesis provided by osseointegrated implants. This controlled deviation and increased the masticatory efficiency. A better quality of life was given to the patient in terms of masticatory efficiency, prosthetic retention, and stability and esthetics.^[1,3] The patient was advised to comply with the oral hygiene instructions given to him.

An important aspect of this case was that after rehabilitation the patient would definitely gain more confidence. Such patients should now be counselled for reconstruction of the continuity defect for complete support.

This case report gives a novel method of optimizing the available bone support due to mandibular resection in some challenging situations (when the patients are not willing for restoration of the continuity defect) by the interplay of various implant attachments. A tripod implant configuration aids in providing adequate retention and stability to the prosthesis.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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