

Twin Neurocentric Concept of Occlusion – A Glimmer of Hope for Rehabilitating a Partially Resected Edentulous Mandible

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Abstract

Oral cancer is the sixth most common type of cancer in India and oral squamous cell carcinoma dominates all the oral cancer cases with potentially malignant disorders. Consumption of tobacco including smokeless tobacco, betel-nut chewing, excessive alcohol consumption, unhygienic oral condition, and sustained viral infections are some of the risk factors for the incidence of oral cancer. Lack of knowledge increases the mortality rate of any form of cancer. Surgical resection of the tumor produces various problems such as mandibular deviation due to formation of scar tissue and decreased mouth opening due to trismus. Functional rehabilitation is hampered due to denture instability which is a major disadvantage in such cases. This article highlights the functional rehabilitation of a hemi-mandibulectomy patient who has undergone resection without reconstruction followed by radiotherapy with a denture having twin neurocentric concept of occlusion.

Keywords: Cantor and curtis, Mandibular resection, Neurocentric occlusal scheme, Oral squamous cell carcinoma, Twin occlusion.

INTRODUCTION

Oral rehabilitation of a patient who has a partially resected mandible is one of the most challenging procedures confronting the maxillofacial prosthodontist. The situation becomes further complicated due to the therapeutic radiation which results in atrophic oral mucosa and reduced mouth opening due to formation of scar tissue. Surgical resection of tumor often includes a partial mandibular resection, partial glossectomy, resection of the floor of the mouth, and radical neck dissection. The extent of surgery and the effects of radiation therapy determine the amount of rehabilitation needed by a given patient.^[1]

While rehabilitating completely edentulous hemi-mandibulectomy patient, there are various limitations due to surgery and radiotherapy.

Limitations due to surgery include the following^[2]

1. Scar tissue formation,
2. Deviation of resected mandible due to loss of tissue during surgical resection,
3. Limited co-coordinative ability,
4. Limited posterior throat form due to obliteration by the grafts, and
5. With only one-half or two-thirds of the mandible remaining, stability, support, and retention of the mandibular denture are compromised.

Various limitations to radiotherapy are^[2]

1. The oral mucosa becomes atrophic and fragile, predisposing to soft-tissue irritation and ulceration,
2. The reduced salivary output, and the thick mucinous nature of the saliva that remains after therapeutic levels of radiation, impairs retention, and compromises lubrication of the denture-mucosal interface.

Both these limitations produce prosthodontic complications such as^[3]

1. Loss of mandibular continuity causes deviation of the remaining mandibular segment toward the defect and rotation of mandibular occlusal plane inferiorly,

Rotation is due to:

- Pull of the suprahyoid muscles on the residual mandibular fragment causing inferior displacement and rotation around the fulcrum of the remaining condyle,
- Gravity, and
- Loss of anchorage of elevator muscles.

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Received: Jul. 01, 2024; **Accepted:** Jul. 30, 2024; **Published:** Aug. 12, 2024

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How to cite this article: Rajan K, Choudhury IS, Biswas D, Saha A. Twin Neurocentric Concept of Occlusion – A Glimmer of Hope for Rehabilitating a Partially Resected Edentulous Mandible. J Res Adv Dent 2024;15(6):1-4.

Access this article online

Website:
www.jrad.co.in

DOI:
<https://doi.org/10.53064/jrad.2024.15.6.577>

Sequelae:

- Facial disfigurement,
 - Loss of occlusal contact, and
 - Loss of ability to bring lips together for saliva control and to initiate swallowing process.
2. The angular pathway of mandibular closure induces lateral forces on the dentures, which dislodge them,
 3. The deviation of the mandible creates abnormal jaw relationships. The abnormal profile and position of the mandible in relation to the maxilla may prevent the ideal placement of the denture teeth over their supporting structures,
 4. The impairment of motor and/or sensory control of the tongue, lip, and cheek impairs the ability of the patient to control the prosthesis during function.

Prosthodontic prognosis in segmental resection patients causes the following^[4]

1. Decreased mouth opening due to trismus due to surgical trauma.
2. Formation of scar tissue further reducing mouth opening.

Prosthodontic prognosis in such patients can be improved by early post-resection physical therapy

1. To reposition the mandibular segment to a more normal position, and
2. To minimize scar formation that could make deviation more severe.

This must be carried out as early as possible and can be in the form of physical therapy carried out by the patient himself or by providing a mandibular resection guidance prosthesis.

Obtaining stability in dentures is another challenge due to the differences between natural and artificial teeth such as thickness, rigidity, and site of the attaching membranes, especially in such cases where the remaining denture bearing area is inadequate.

To obtain maximum stability in the prosthesis, M. M. De Van in 1954 proposed the concept "Neurocentric Occlusion." This concept revolves around the neutralization of the cuspal inclines and centralization of forces which act on the denture bearing area during centric relation by incorporating various factors that aid in better stability in the dentures.^[5]

CASE REPORT

A 55-year-old male patient reported to the department of prosthodontics with a chief complaint of difficulty in chewing food and facial disfigurement. The patient's medical history revealed that he was diagnosed with squamous cell carcinoma on the right side of the mandible, for which he had undergone resection of the mandible 1 year ago following which he underwent radiotherapy. Panoramic radiograph revealed mandibular resection from the midline till the condyle (Class III Cantor and Curtis classification) (Figure 1).

Extraoral examination revealed an asymmetrical face, a deviated mandible toward right side and a convex facial profile. On intraoral examination, it was found that, in the maxillary arch, all remaining tooth posterior to both canines were missing and the mandibular arch was completely edentulous.

Treatment plan

A maxillary removable partial denture with twin row of teeth along with a monoplane occlusion and sectional mandibular denture was the treatment of choice to rehabilitate the patient.

Clinical and laboratory procedure***Fabrication of the maxillary removable partial denture and sectional mandibular complete denture***

Initially, a primary impression was recorded in irreversible hydrocolloid impression material (Figure 2a). After border molding, final impressions were made using zinc oxide eugenol impression material and master cast was poured (Figure 2b). Record bases for bite registration were prepared on stone master cast (Figure 3a). The patient's tactile sense or sense of comfort was used to assess the vertical dimension of occlusion. The patient was instructed to move his mandible as far as possible to the unaffected side and then gently close his mandible to record a functional maxilla-mandibular relationship. The casts were, then, mounted on a free plane articulator.

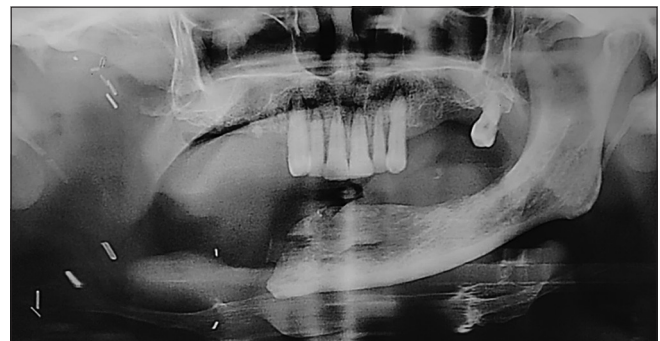


Figure 1: Panoramic radiograph revealing Class III Cantor and Curtis mandibular defect

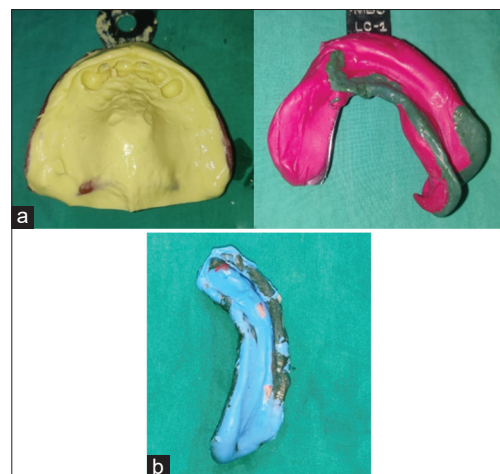


Figure 2: (a) Maxillary and mandibular primary impression made and (b) mandibular secondary impression

Arrangement of twin row of teeth in neurocentric occlusal concept

Accordingly, teeth size selection was carried out, teeth arrangements were done using zero-degree posterior teeth. Two rows of maxillary posterior teeth were arranged on the unaffected side. First row of teeth was arranged as per the anatomic guideline of the contour of the patient's ridge. Second row of teeth were arranged palatal to the first row which intercusated with the mandibular teeth. A wax trial was done in the mouth and was checked for esthetics, phonetics, vertical dimension, and occlusion (Figure 3b and c).

Finishing and polishing of denture

The dentures were, then, processed with heat polymerized acrylic resin. After proper finishing and polishing, dentures were inserted into the patient's mouth and evaluated for esthetics and function (Figure 4a). Minor adjustments were made on the dentures and it was again polished. Finally, there was freedom of mandibular movement without any interferences, as well as broad and long occlusal contact (Figure 4b).

Denture insertion and delivery

The patient was given post-insertion instructions and was motivated to make efforts to learn to adapt to the new dentures. Simple exercises were suggested to the patient such as repeated opening and closing of mandible.

DISCUSSION

This article highlights the functional rehabilitation of hemi-mandibulectomy patient who has undergone resection without reconstruction followed by radiotherapy using two concepts which are:

- a. Incorporating twin row of teeth
- b. Using neurocentric concept of occlusion.

Rosenthal had described a technique employing a twin/second row of maxillary posterior teeth on the untreated side of the maxillary denture. The teeth slide over one another, down the incline formed by the second row of teeth, and into a functional occlusal position.^[6] The palatal row of teeth intercusated with the remaining mandibular teeth and the buccal row of teeth supported the cheeks.

In the neutron-centric concept of occlusion, the teeth are not inclined to form compensatory curves. In the mediolateral direction, the teeth are set with no medial and lateral inclination. Thus, this concept of occlusion eliminates any anteroposterior or mediolateral inclines of the teeth and directs the forces of occlusion to the posterior teeth. The occlusal plane is parallel to the mean plane of the denture foundation.^[7,8]

After incorporating these two concepts, the patient could intercusate the mandibular teeth properly due to twin maxillary occlusal table and experienced enhanced stability of the dentures due to teeth arrangement following the

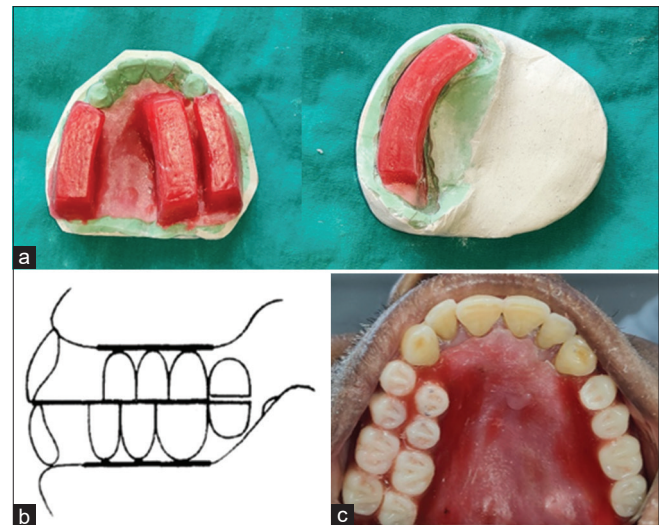


Figure 3: (a) Twin row of occlusal wax rims made on maxillary and mandibular cast, (b) diagrammatic representation of principles of neurocentric occlusion, and (c) first row of teeth arranged as per the anatomic guideline of the contour of the patient's ridge. Second row of teeth arranged palatal to the first row which intercusated with the mandibular teeth



Figure 4: (a) Polished dentures and (b) intraoral photographs of prosthesis

neurocentric concept, and thus, these improved the masticatory ability.

CONCLUSION

A functional and esthetic rehabilitation of patient with marked alveolar ridge deformity is a valuable service provided to the patient. In the present case, the twin neutron-centric occlusal scheme provided good stability to the denture which, further, improved the function and esthetics of the patient.

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