

Prosthetic rehabilitation of a patient with hemimandibulectomy by a double occlusal table prosthesis

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Abstract

The objective of prosthetic rehabilitation of patients with hemimandibulectomy is to regain the masticatory function, comfort, esthetics, and self-esteem. This article presents a plan for the management of hemimandibulectomy with a removable maxillary double occlusal table prosthesis. A male patient, aged 43 years, was referred to Prosthodontic Out Patient Department with complaints of compromised aesthetics, difficulty in speaking, and lack of ability to chew. The patient underwent surgery 3 years ago in which hemimandibulectomy was performed due to oral squamous cell carcinoma. The patient had a Cantor and Curtis Type II defect. The mandible was resected distally from canine region on the right side of the arch. A prosthodontic device was planned with a double occlusal table, also known as twin occlusion prosthesis. The rehabilitation of hemimandibulectomy patients with a double occlusal table is of considerable importance. This report describes a simple prosthetic device that will help patients in regaining their functional and psychological well-being.

Keywords

Hemimandibulectomy, prosthodontic rehabilitation, double occlusal table, twin occlusion prosthesis

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Introduction

Oral diseases are widespread all over the world and negatively affect people's quality of life.¹ It greatly affects various anatomic regions of the oral cavity, making the functions like chewing, swallowing, speech, and oral competence difficult. These include ameloblastoma, osteoradionecrosis of jaws, salivary gland tumors, oropharyngeal carcinomas, trauma, and so on. However, the most frequent carcinomas in the head and neck area are squamous cell carcinomas of the oral cavity.²

Squamous cell carcinoma of the oral cavity is a malignant neoplasm that makes individuals suffer both physiologically and psychologically. Surgical resection of the tumor and the structures involved with it, along with radiotherapy or chemotherapy, is the treatment protocol for oral squamous cell carcinoma (OSCC).³ Moreover, the demand for surgical reconstructive efforts is greater when extensive regions are removed in a surgical procedure. One of the most difficult and demanding essays is the prosthodontic rehabilitation of such individuals, especially for the mandible, because the segmental loss of mandibular integrity leads to its deviation toward the resected area with lack of occlusion.⁴ In addition, segmental loss of mandible results in limited mouth opening,

scar formation, abnormal jaw relationships, and compromised health of oral mucosa which further worsens the mandibular deviation.⁵ To reestablish an acceptable occlusal relationship for the residual dentition which helps to achieve mastication is the mainstay treatment modality for hemimandibulectomy cases.⁶ This case report deals with the Cantor and Curtis type II defect in which the mandible was resected distally from canine region on the right side of the arch.

In this report, the patient was rehabilitated with a double occlusal table. Different prosthetic options are proposed by various authors to rehabilitate patients with hemimandibulectomy depending on the existing clinical status. Mathew and Thomas⁷ proposed the use of a Guiding Flange prosthesis, the

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Figure 1. Mandibular deviation to the affected area.

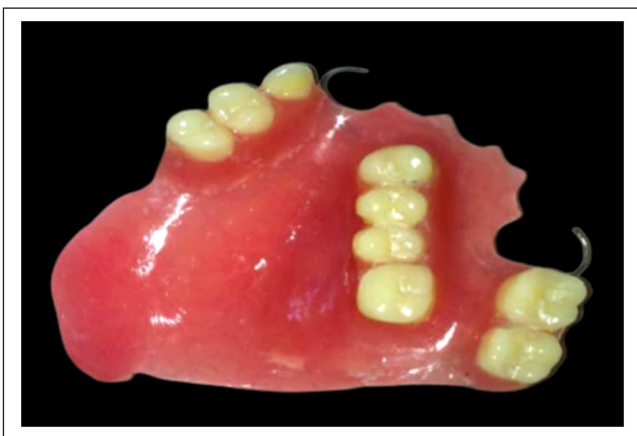


Figure 2. A removable maxillary partial denture with a double occlusal table.

utilization of a Palatal Ramp was delivered by Swoope,⁸ and Rosenthal⁹ introduced the concept of using a twin occlusion prosthesis which was followed by several other authors who have modified palatal ramps and utilized numerous maxillary teeth in the shape of twin occlusion on the unresected area.^{10,11} Bahri et al.¹² used maxillomandibular fixation screws with

orthodontic elastics to enhance the actions of guide flange prosthesis. On the other hand, the use of implant-supported prosthesis would be a great option, but care should be taken when grafting is done because the patients suffering from carcinomas undergo radiotherapy which can cause osteoradionecrosis of the graft material.¹³

This study will help the readers in dealing with the treatment plan of the patients undergoing hemimandibulectomy, and it will lend a helping hand to postgraduate trainees in constructing a maxillary partial denture with a double occlusal table.

The goal of this article is to present a prosthesis that is simple, lightweight yet strong enough to withstand the masticatory forces, and cost-effective as patients with oral carcinomas are mostly from a low socioeconomic background, due to the consumption of chewing and smoking carcinogens.¹⁴ The spectrum of the case description categorized the double occlusal table prosthesis, a cost-effective option in patients from low-income strata, where reconstruction surgeries and endosteal dental implant placement are not affordable. Furthermore, this prosthesis is a ray of hope for those individuals in which free flap reconstructive surgeries are not performed due to lack of infrastructure and skilled surgeons.

Case description

A male patient, aged 43 years, married referred to the Prosthodontic Out Patient Department with complaints of compromised aesthetics, difficulty in speaking, and lack of ability to chew. The patient was a factory worker, and on taking the history, he revealed that he first experienced discomfort and puffiness on the right area of his mandible 3 years ago, and that squamous cell carcinoma of the oral cavity was subsequently determined to be the cause.

The patient underwent surgery in which hemimandibulectomy of the affected side was performed. His medical history showed that he was hypertensive and was on medication. This patient had not been undergone chemotherapy or radiation therapy. Extraoral examination revealed mandibular deviation on the right side compromising the esthetics (Figure 1). Intraorally, he had maxillary Kennedy class I partially edentulous arch. On the other hand, mandibular examination revealed Cantor and Curtis Type II defect in which the mandible was removed distally from the canine region on the right area. On both arches, the surviving teeth were found to be periodontally weak but no mobility was evident. The remaining teeth were 11, 12, 21, 22, 23, 24, 25, 31, 32, 33, 34, 35, 36, 37, 41, 42, and 43 (Federation Dentaire Internationale (FDI) numbering system). Furthermore, the patient was habitual eating betel nuts for the past 8 years. Since the patient also had limited mouth opening and stiffness of the oral tissues, a simple prosthetic device was planned which was a maxillary partial denture with a double occlusal table (Figure 2).

Using the alginate impression material (Zhermack Hydrogum, Italy), the maxilla and mandible's initial imprint



Figure 3. Intraoral view of the processed maxillary denture with a double occlusal table.

was created in a metal stock tray, followed by a secondary impression with addition silicone (Zhermack Hydrosil, Italy), made in a custom tray of self-cure-polymethyl methacrylate-resin. The master cast was obtained after pouring the impression with a dental stone Type III (Zhermack, Italy), on which the base plate of self-cure PMMA resin was constructed. Fabrication of the wax occlusion rim occurred on the base plate, and the jaw relation was performed by instructing the patient to close the mandible to a functional posture that is specific to the unilateral closure pattern. To rehabilitate with a removable partial denture prosthesis, it should possess an adequate amount of retention, stability, and support. Keeping in mind the affordability concern of the patient, cast partial denture (CPD) was not offered. Hence, unlike a CPD in this partially dentate maxillary arch, the support and stability were gained by both the teeth and mucosa enveloping the remaining ridges. The retention in the presented case was provided by the circumferential clasps on the abutment teeth, 12 and 25. The retentive arm was placed in the buccal side of the abutment tooth's middle and cervical thirds, while reciprocation was provided by the acrylic arm of the denture on the lingual aspect of the tooth. The posterior rotation of the denture was resisted by the direct retainer (clasps). Moreover, the anterior rotation of the denture was prevented by the interdental extensions of acrylic, whereas the resistance to the mesial and lateral rotation was provided by the lateral slope of the palatal surface and flanges of the acrylic denture. Furthermore, the teeth setup was of considerable importance in this case. After articulating the master cast with the occlusion rims, the two rows of semi-anatomic acrylic teeth (Welbite, China) were selected. The edentulous spaces were replaced by the first row of anatomical teeth in the desired position. The second row of teeth was arranged on the palatal to the first row, where the mandible was closing in the functional position. In the upcoming clinical visits, the denture trial was done, and all occlusal errors were rectified.

Heat-curable PMMA (Welbite, China) was used to construct the finished denture.

Written informed consent was obtained from the patient for their anonymized information to be published in this article. He had been informed that all of his personal data would remain confidential and the consent were sought out.

Outcome and follow-up

The processed denture was delivered to the patient (Figure 3). Any kind of irregular borders, sharp edges, and pressure spots was located by a thorough examination. Guidance on denture maintenance and instructions on oral care was provided. Initially, the patient was monitored after 24 h to evaluate any kind of ulceration or sore spots. Since then, a periodic follow-up after 15 days, 1 month, 3 months, up to 6 months was done. The patient initially had trouble using the prosthesis but eventually, it was improved and the patient showed satisfactory results in mastication, phonetics, and psychological well-being

In addition to the functions of mastication and phonetics, this prosthesis served as a training device; it also enabled the mandible to close vertically in its functional position. The prosthesis placement and its removal were well explained to the patient.

Discussion

Mandibular deformity rehabilitation is of utmost importance to restore oral function.¹⁵ The rehabilitation of mandibular defects are challenging because in addition to the loss of anatomical structures, there is a proprioceptive loss which leads to the absence of sensation of muscles of mastication and occlusion.¹⁶ Hence, the purpose of this report was to present a prosthetic device that would help in acquiring the normal physiological oral functions.

To attain prosthodontic rehabilitation, there is a need to understand the different classifications of mandibular defects. For example, the HCL classification—hemi mandibular (H), central (C), and lateral (L)—was introduced by Jewer and Boyd for hemimandibular defects.¹⁷ This was later modified by Boyd which included the soft tissue components.¹⁸ Condyle, Ramus, Body, Symphysis by Urken et al.¹⁹ defined the bone, soft tissue, and nerve involvement. Schultz²⁰ clarified the unilateral or bilateral character of a defect, its dentate alveolus and ramus, its donor vessels' laterality, and its condylar participation. Segmental mandibulectomy is divided into four categories by Brown which are lateral, hemimandibulectomy, anterior and posterior with or without condylectomy.²¹ Similarly, Cantor and Curtis²² provided a classification of partial hemimandibulectomy, based on the nature of resection, which represents six types of mandibular defects.

This article has dealt with Cantor and Curtis Type II hemimandibulectomy defect in which early reconstruction was not performed, resulting in scar formation, which stiffened the tissues and made prosthetic rehabilitation difficult. Therefore,

a maxillary removable partial denture with a double occlusal table was planned. A maxillary removable partial with a double occlusal table is a removable device in which two rows of acrylic teeth are arranged. The first row of teeth is placed on the edentulous spaces, and the second row of teeth is placed on the palatal surfaces of the first row where the mandible close in the functional direction.

In some cases, scar contraction limits the mouth opening in a more extensive manner than the placement and removal of removable appliances become difficult.²³ Therefore, a fixed guide flange prosthesis is designed in such cases, which would keep the muscles in a stressed condition, preventing scar contraction. Coutinho et al.²⁴ used a mandibular molar tooth on which the molar band was placed and a u-shaped loop with a tube was soldered on it, which was facing the buccal surface of maxillary posterior teeth. This appliance reduced the mandibular deviation by gliding the mandible into centric occlusion, and it enabled the normal overlap, vertically and horizontally, of the remaining dentition.

Compared with fixed guide flange prosthesis, a simpler form the removable guide flange prostheses have also been proposed. These include mandibular guide flange and palatal guide flange prosthesis, where the motive was to minimize mandibular deviation and to gain proper occlusion which would help in mastication.²⁵ Hence, depending on the intraoral situations, the patient's acceptance, and keeping in mind their comfort level, either a fixed or removable prosthesis can be prescribed.

Phonetics is also an important parameter in achieving the normal physiological activity of the patient. Pronunciation of the words, especially the consonant sounds, requires the oral structures to be placed in their respective positions. For example, for the production of bilabial, labio-dental, linguo-dental, and linguo-palatal sounds, the correlation among the lips, teeth, tongue, and hard or soft palate are important.^{26,27} In this case, the replacement of the missing teeth at the appropriate vertical dimension of occlusion, buccal soft tissue support, thickness and contouring of palatal plate, and well-finished sleek bioprosthesis were ensured to improve the phonetics in patient.

As with every study or technique, there are certain flaws, the presented report also encountered certain limitations. Instead of giving an acrylic denture, a CPD could be planned which would enhance mechanical properties and strengthen the denture. Through the computer-aided design and manufacturing (CAD-CAM), three dimensional (3D) rapid prototyping, and digital scanning, the denture framework could be created with ease and precision.^{28,29} The use of fixed osseointegrated prosthesis could be considered after thorough medical clearance.³⁰

In spite of these limitations, the double occlusal table prosthesis possesses numerous strengths. The prosthesis is cost-effective. In addition, it is patient friendly, a reversible treatment modality, and lightweight to withstand the force of

gravitation. Being a simple device, it helps a patient to accept it psychologically. The use of new techniques creates technical complexity in terms of manufacturing. The metal frameworks can bother the patient and may look aesthetically displeasing.

Conclusion

The rehabilitation of hemimandibulectomy patients with double occlusal table prosthesis is efficacious and is of considerable importance. This report gives a productive plan to give a prosthesis in the maxilla when there is limited space left in the mandibular arch. However, clinical techniques, complexity of the case, maintenance of the prosthesis, and patient acceptance will determine the treatment prognosis.

Declaration of conflicting interests

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Ethical approval

Our institution does not require ethical approval for reporting individual cases or case series.

Informed consent

Written informed consent was obtained from the patient(s) for their anonymized information to be published in this article.

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