

Rehabilitating Occlusion with a Guiding Flange Prosthesis in a Patient with Mandibular Resection: A Case Report

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Abstract

Defects with the discontinuity of the mandible following a segmental mandibulectomy present a major challenge for rehabilitation. These challenges include correction of deranged mandibular movements, disfigurement, and esthetics, correction of functional difficulty seen during swallowing, speech and articulation, and also of surgical side deviation of the remainder mandibular structure. The following case report elaborates on the prosthodontic rehabilitation of a patient with the help of a device named «Guide Flange Prosthesis» which is indicated to correct such manifestations seen after hemimandibulectomy.

Keywords: *Rehabilitating Occlusion; Flange Prosthesis; Mandibular Resection.*

Introduction

Mandibular defects present a great challenge for its rehabilitation. When there is a unilateral defect of mandible due to trauma or surgery, there is mandibular deviation towards the surgical site and the mandibular occlusal plane rotates and tends inferiorly. It also causes extrusion of maxillary teeth eventually resulting in a lack of occlusion and altered maxillomandibular relationships¹. Extensive involvement of osseous and soft tissues, loss of sensory and motor innervations, and scar tissue formation after hemimandibulectomy radically compromise the prosthetic prognosis.

Most severe mandibular deviation & dysfunction is caused mainly when there is extensive loss of soft tissue which can occur from tight wound closure, radiation therapy, and the ones that require radical neck dissections².

The mandibular deviation can be reduced by retaining the patient's neuromuscular system. The basic objective is for the muscles to reprogram themselves and attain an acceptable interocclusal relationship for the remainder of the mandible, so that all opening and closing movements are mostly in control of the patient. These include early corrective mandibular movement therapy, physiological exercise programs, and removable partial dentures for partially edentulous and complete denture prostheses for

completely edentulous patients along with all possible modifications in an occlusal scheme to compensate for deviation³.

Cantor and Curtis have classified the mandibular defects into 6 categories:⁴

Class I: Mandibular resection involving alveolar defect with preservation of mandibular continuity.

Class II: Resection defects involve loss of mandibular continuity distal to the canine area

Class III: Resection defect involves loss up to the mandibular midline region

Class IV: Resection defect involves the lateral aspect of the mandible, but are augmented to maintain pseudoarticulation of bone and soft tissues in the region of the ascending ramus.

Class V: Resection defect involves the symphysis and parasymphysis region only, augmented to preserve bilateral temporomandibular articulations.

Class VI: Similar to class V, except that the mandibular continuity is not lost.

Prosthetic rehabilitation with conventional prostheses such as mandibular based guidance restorations, and palatal based guidance restorations or implant-supported

prostheses have been advocated for the correction of mandibular deviation^{5,6}. A Guiding flange prosthesis (GFP) is a mainly a mandibular prosthesis designed in a manner to achieve a neutral mediolateral position of the mandible but is not made to make consistent repetition of this position for mastication^{7,8}. A guiding flange prosthesis can be either removable or fixed. Removable prosthesis gets support from both teeth and tissues. So it cannot be retained intraorally if only a few teeth remained in the sectioned mandible.

Case Report: A male patient aged 45 years, reported to our department with the chief complaint of reducing chewing capacity due to the inability in intercuspation of teeth and deviation of the jaw. The patient presented with a history of tobacco chewing for 10 years, 10 times/day, and was diagnosed with early squamous cell carcinoma involving left buccal mucosa and mandibular alveolus. The patient underwent hemimandibulectomy on the left side 4 months ago with PMMC flap reconstruction for the defect. Radiation therapy was completed a month before.



Fig. 1: Patient showing deviation of mandible towards the side of the defect and inability to occlude on the normal side

Extraoral, the symptoms included facial asymmetry, deviation of the lower third of face towards the left on mouth opening, decreased mouth opening, left corner of the mouth drooping downward, angular cheilitis. The patient was unable to guide himself into occlusion (Fig.1). Intraorally, he presented with left mandibular defect distal from the midline, with surgical skin graft on the resected side, and missing teeth that include 31-37, and 25-27(Fig. 2). The patient was partially edentulous with Kennedy's Class II for both maxillary and mandibular arch. Orthopantomogram revealed the

absence of the mandible distal to the midline. The case was diagnosed as Cantor and Curtis Class III mandibular defect. The treatment plan decided was mandibular guide flange prosthesis to aid in the correction of mandibular deviation.



Fig. 2: Hemimandibulectomy on the left side with missing molars in the upper arch. Reconstruction was done with a PMMC flap

Fabrication of Prosthesis:

- Primary Impression for the mandible was made using a stainless steel edentulous stock tray made which was trimmed on the side of the defect and irreversible hydrocolloid (alginate).
- The primary impression for the maxillary arch was also made using an irreversible hydrocolloid (alginate).
- Casts were retrieved by pouring Type III gypsum material into the obtained impressions.
- The patient is trained and guided into occlusion and a bite registration record is obtained.
- The obtained casts are articulated on a mean value articulator based on the recorded bite registrations.
- A stainless steel Orthodontic wire of 19 gauge, was used to fabricate a sub-structure for the modified Guiding Flange prosthesis.
- C clasps were fabricated on the first premolars and Adams clasp on first molars of the first quadrant of the maxillary cast.
- Another C clasp is fabricated on the first premolar and Adams clasp on the first molar of the fourth Quadrant of the mandibular arch.

- The wire was also used to fabricate a crib by bending it into zig-zag fashion for the length extending from the distal of the second premolar to the medial for the second molar of the fourth quadrant.
- The clasps are stabilized on the cast using modeling wax on the lingual side of the mandibular cast and palatal side of the maxillary cast
- The casts are coated with two layers of separating media.
- Using cold cure clear acrylic, the buccal vestibular flange is acrylic, for both upper and lower cast.
- After that lingual and palatal flange is fabricated using cold cure acrylic.
- The crib is stabilized in an incline along the buccal aspect of the mandibular first molar manually keeping the maxillary arch in articulation and then it is acrylic.
- The upper and lower fragment of the guiding flange prosthesis is removed from the cast and trimmed to not leave any sharp edges.
- Finishing and polishing was done for both the upper and lower fragments of the Guiding flange prosthesis
- Stability and retention are observed after the prosthesis is tried into the patient's mouth. (Fig. 3)
- Thus a smooth gliding flange surface is to achieve to guide the remaining portion of the mandible to a definite closing point to attain adequate occlusion.
- The Flange height should be such that it can guide the mandible into occlusion without any hindrance. This remains practically within the limit of the height of the buccal vestibule.
- The prosthesis was finally inserted into the patient's mouth and he was informed of all post-insertion instructions.
- The patient seems to be pleased with the overall performance of the prosthesis.



Fig. 3: Insertion of the Guiding Flange Prosthesis leading to a reduction in deviation of the mandible and proper intercuspation

Discussion

The extent and site of a mandibular tumor denote the amount of resection of the mandible, which could be from marginal, through segmental or Hemi, subtotal, or total mandibulectomy. When there is the unilateral loss of continuity of mandible, there is the deviation of the remaining segment of the mandible towards the side of the defect. This also leads to inferior rotation of the occlusal plane. The cause of this deviation is due to the loss of muscles and tissues during the surgical excision⁹.



Figure 4: Maxillary component of the guiding Flange prosthesis with stabilizing plate to prevent orthodontist movement of the maxillary teeth.



Figure 5: Mandibular fragment of the guiding flange prosthesis with a crib as an inline plane to guide the mandible into occlusion

On segmental removal of the mandible, reconstruction is recommended immediately to preserve the facial symmetry and mastication ability of the patient. There have been various surgical techniques and Prosthodontic rehabilitation techniques, which with time have advanced, to help the patient improve function and esthetics but still 50% of these patients report with impaired masticatory function^{10, 11}. The most common treatment options for patients after hemimandibular resection are palatal based guiding restorations, lower arch removable guide flange prosthesis maxillo-mandibular fixation, and/or implant-supported prosthesis. Amongst these, the most recent and recommended advancement in facial reconstructive surgery is osseointegrated oral and dentofacial implants, that may adequately rehabilitate oral cancer patients, helping them to return to a healthy, productive life. An implant-supported prosthetic rehabilitation cannot be considered since no bone graft¹² was used.

For healing to complete and the osseous graft to be accepted, it requires an extensive amount of time. Therefore, any definitive treatment should be delayed in the best interest of the patient. But during this period, there is a contraction of tissues leading to a gradual increase in difficulty to manage the defect prosthetically. A Guiding Flange prosthesis during this initial healing period helps to reduce the deviation of the mandible and improve the efficiency of mastication. This is achieved as the mandibular muscles get reprogrammed to establish a good occlusal relationship for the residual mandible¹³.

Guiding flange prosthesis and any removable partial denture similarly attain support, the primary sources being the residual alveolar ridge and the remaining natural teeth. The best approach would be the placement of multiple clasps distributed widely, but the presence of natural teeth determines their placement. The rigidity of retentive elements should not be more than necessary, but it increases with a decrease in the number of teeth involved¹⁴.

The mandibular guiding flange (Fig. 4) device fits generally over the good natural teeth in the mandibular arch, opposite the side of the defect (base-plate), and is attached with a guide plane (flange splint). From the buccal flange of the mandibular fragment of the prosthesis, a crib extends vertically into the buccal vestibule, contacting the buccal flange of the maxillary fragment of the prosthesis and buccal surface of the opposing maxillary teeth. This extension aids the mandible to properly position itself in the mediolateral direction and hence aids in vertical chewing. No or very little lateral movement is provided by this device^{12,15}. This guide plane helps to accomplish centric occlusion during mastication as it is necessary for every patient to maintain it for the sake of attaining basic harmony¹⁶.

To maintain esthetics of this patient during mandibular movements, the mandibular Guiding Flange Prosthesis was fabricated in transparent self-cure acrylic resin and all the wire substructure comprising of retentive wire components were deliberately kept distal to the mandibular canine to minimize the prosthesis display. To prevent palatal orthodontic movement of the maxillary teeth by the force generated by the buccal flange against them, a stabilizing plate was provided for resistance. The maxillary stabilization plate and all its wire components (Fig. 5) were also placed distal to the canines leading to their minimum display and maximize esthetics. The prosthesis must not extend into the junction of the graft and the normal tissue as it can affect the healing¹⁷.

The Guiding Flange Prosthesis can be considered equivalent to a training device for a patient with deviated and deranged mandible to successfully and consistently repeat the mediolateral position. In some patients, there may be some stress generation when the use of the device is continued for a longer period. All such stresses should be carefully monitored. If the reprogramming of muscles is achieved and the patient can occlude on his own, this device can be discontinued.

Conclusion

A long-standing segmental hemimandibulectomy without early intervention presents a challenge during rehabilitation due to a lack of hard use support and loss of muscles during excision. Therefore such patients require as early Prosthodontic intervention as possible to maintain function and esthetics. Mandibular guiding flange prostheses are utilized on an interim basis. However, a definitive mandibular guidance prosthesis with a metal guiding flange is recommended after healing has complete and the patient can guide himself into intercuspation with the help of this device. This will lead him to successfully correct the deviation and achieve acceptable occlusion for normal mandibular function and mastication.

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