



Mandibular fixed guide flange prosthesis: An innovative approach

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ABSTRACT

Oral cancers are common disease which disfigures tissues and require resection of maxilla, mandible floor of the mouth, and tongue. Resection of tissues without reconstruction causes mandibular deviation towards the resected side which depends on amount soft and hard tissue resected, surgical site closure, loss of proprioceptive sense of occlusion and timing of prosthodontic therapy. Rehabilitation of such patients (with non-reconstructed defects) starts with physical therapy and prosthodontic therapy to reduce deviation and scar contraction. This case report explains the fabrication of fixed mandibular guide flange prosthesis. The guide flange corrects the mandibular deviation and assist patient to close in maximum intercuspal position.

INTRODUCTION

Oral cancer is one of India's top three types of cancer worldwide It ranks the eighth most common type of cancer.¹⁻⁵ Oral cancer disfigures tissue, which often necessitates resection of the mandible, maxilla, floor of the mouth, and tongue, and can bedevastating to patient's mental health.⁶ The lateral margin of the tongue and the floor of the mouth are the most prevalent intraoral locations for squamous cell carcinoma (SCC). The mandible is predisposed to tumor invasion in both places, necessitating its removal in conjunction with considerable sections of the tongue, the floor of the mouth, and the nearby lymphatic system.⁷ When the mandible is resected patient loses his ability of proprioception and muscles of mastication on the operated side which causes significant deviation of the mandible on the operated side.⁷⁻¹¹

Microvascular free flaps are safe and reliable method for comprehensive functional and esthetic mandibular defect reconstruction. In developing countries such reconstruction methods are not regularly available as the treatment option, instead guide flange prosthesis is well established approach to manage such defect which are not reconstructed.¹⁸

The amount of deviation when defect is not reconstructed depends upon 1) location and extent of resection 2) amount of soft tissue involvement, 3) degree to which innervation has



been involved, 4) how tightly the surgeon closed the wound, and 5) presence of remaining natural teeth.¹²

Rehabilitation of resected (non-reconstructed) mandibles starts with correction of mandibular deviation by stretching exercise.^{7,12} The earlier mandibular guiding therapy is started during treatment; the better the patient's final occlusal relationship will be.¹³ Mandibular deviation can be reduced or minimized using prosthetic methods such as intermaxillary fixation, mandibular-based guidance restorations, and palatal-based guidance restorations.¹² Schaaf et al described removable partial denture prosthesis for a patient who has remaining natural teeth and can be utilized for support.¹²

A removable guide flange prosthesis cannot be retained intraorally if the sectioned mandible has only a few teeth left. Radiation and surgical scarring can aggravate retention problems by restricting mouth opening and functional vestibule depth, making it impossible for the patient to place and remove the guide flange prosthesis, leading to more occlusion problems.^{6,12} To address the drawbacks of the removable design, a fixed prosthesis that prevents scar contraction by keeping muscles in a stressed state while still providing corrective and masticatory activities is recommended.^{6,12} This case report describes the prosthetic management of patients after a Hemi mandibulectomy (non-reconstructed) with a fixed mandibular guide flange prosthesis.

CASE REPORT

A 33-year-old male patient reported to the department of prosthodontics with resected mandible 18 months back. Past medical history revealed that he had squamous cell carcinoma. The patient underwent extensive resection of the left side of the mandible from the parasymphysis region to the lower part of the coronoid process without any reconstructive procedure (Cantor and Curtis Class III) (Fig 1 and 2). Clinical examination revealed severe mandibular deviation to the affected side and a lack of maxillary and mandibular teeth intercuspation.

Intraoral examination revealed missing 16 and 30. The patient had a mandibular deviation of 8.6mm on the resected side with rotation in the sagittal plane (Fig 1).

Objectives for treatment of these defects are 1) To guide the mandible in maximal intercuspation position with interim prosthesis. 2) To fabricate definitive prosthesis to maintain this maximal intercuspation position.

TECHNIQUE

FABRICATION OF INTERIM PALATAL RAMP PROSTHESIS

1. Maxillary complete arch and mandibular sectional impressions were made with irreversible hydrocolloid impression material (Zhermack Tropicalgin) in perforated metal trays and poured with type 4 gypsum product (Kalabhai Ultrarock Die) to obtain casts.
2. Full palatal coverage prosthesis was constructed in heat cure acrylic resin (Dental Products of India -RR cold cure acrylic), following conventional prosthodontic guidelines, then fitted and adjusted into the mouth (Fig 3).
3. Mix of auto polymerizing acrylic resin (Dental Products of India -RR cold cure acrylic) was prepared and placed on the palatal side of the prosthesis on the non-defect side.
4. Prosthesis was placed inside the patient's mouth and the mandible was closed in the desired position, thus establishing index in the palate.



5. In the first appointment this index was present slightly palatally so as to reduce discomfort to the patient.
6. Prosthesis was polished, disinfected and inserted in the patient's mouth and instructed the patient to wear this continuously (Fig 4 and 5).
7. Prosthesis was relined at regular intervals for up to 3 months until the patient can move the mandible in the maximal intercuspal position.

FABRICATION OF DEFINITIVE FIXED MANDIBULAR GUIDE FLANGE

The patient had a missing 30 and had to go for replacement of the same, so a fixed partial denture was advised for 29 30 31 along with a guide flange fixed to it.

1. Tooth preparation was done with 29 and 31 for a full metal crown, and the impression was made with elastomeric impression material (Fig 6).
2. Bite registration (Alu wax, Maarc Dental India) was done to record the maximal intercuspal position and articulate maxillary and mandibular cast on an articulator.
3. Wax pattern was made on the cast to fabricate the all-metal (Dentaurum, Germany) Fixed partial denture.
4. To this wax pattern "U" shaped wax pattern was attached with a roller made of wax on it.
5. Height of the completed wax pattern was adjusted to the buccal surface of the maxillary teeth on an articulator.
6. On completed wax pattern with buccal flange investment material (Bellasan, Bego Germany) was applied by paint on the technique of 1.5mm thickness and wax was adapted over investment material to make freely moving roller.
7. Whole wax pattern casted as one unit to maximize the strength of the prosthesis (Fig 7).
8. The roller extension made on the buccal flange moves freely and reduces the friction while closing the jaws, due to these overall stresses are reduced on prosthesis and teeth in contact with this prosthesis (Fig 9).
9. Prosthesis was polished and checked for any occlusal interferences, and they were removed.
10. The prosthesis was sterilized with dry heat before cementing it to the prepared site
11. Prosthesis was luted with glass ionomer cement (GC Corporation Tokyo Japan) and excess luting cement was removed (Fig 8).
12. Regular follow-ups were done to check the effect on the periodontium of teeth in contact.

Figure 1. Maxillary mandibular teeth in occlusion showing deviation of mandible towards operated side.



Figure 2. Panoramic radiographic view showing mandibular discontinuity defect.



Figure3. Interim palatal guide flange prosthesis.



Figure4. Interim palatal guide flange prosthesis seated in patients' mouth.



Figure5. Interim palatal guide flange prosthesis showing correction of deviation of mandible.



Figure6. Definitive impression of tooth preparation with elastomeric impression material in sectional tray.



Figure 7. Fixed mandibular guide flange prosthesis.



Figure 8. Intraoral view of cemented fixed guide flange prosthesis.



Figure9. Fixed guide flange showing position and level of loop at time of articulation.



DISCUSSION

The mandibular guide flange prosthesis is widely used and the subject of numerous studies. The nature of the surgical defect, early initiation of guidance therapy, patient cooperation, and other factors all influence the success of mandibular guidance therapy.¹³

Robinson and Rubright et al mentioned the use of a preoperative mounted cast to fabricate a temporary acrylic resin guide flange, which is inserted in the patient's mouth on the 3rd postoperative day and used for 1 year followed by a definitive removable partial denture.¹⁴ Desjardins et al 1979 stated that in dentulous patients, maxillary palatal inclined plane, and palatal to posterior teeth on the non-defect side was mentioned as viable training device.¹⁵

Chalian et al advocated the use of a cast partial denture framework along with a lower inverted U-shaped flange that slides against the maxillary horizontal bar to achieve maximal intercuspal position. Masticatory movement with this prosthesis in the patient's mouth is restricted only to the vertical direction.¹⁶



The proposed fixed guide flange is recommended for patients with significant mandibular resection without reconstruction who have limited mouth opening ability due to tissue scarring and lack the motor skills to manage a removable prosthesis.⁶The mandibular fixed guide flange mentioned here is a three-unit fixed partial denture that replaces the missing 30 and has a U-shaped buccal flange extended superiorly along the buccal surface of the maxillary molar. This appliance features a freely moving roller that reduces friction and stresses on contacting teeth while also guiding the mandible in the maximal intercuspal position. The fixed guide flange prosthesis presented here reduces mandibular deviation on the surgical side while also minimizing scarring by maintaining tissues under constant stress. This appliance can be used only when the remaining teeth are periodontally sound to counteract the lateral forces exerted by the guide flange and masticatory force. Advantages of this fixed appliance are 1) High strength and rigidity as cast in a single unit without any soldering 2) Functional 3) Comfortable 4) Economic 5) Easy to fabricate 6) Easy to maintain hygiene.

Potential risks are 1) Fracture of abutment teeth 2) Fracture of prosthesis 3) Dislodgement of prosthesis 4) Trauma to periodontal ligaments of abutment teeth. First the interim prosthesis was fabricated to correct the deviation and reduce the stresses on fixed guide flange prosthesis. Fixed guide flange prosthesis was fabricated with conservative tooth preparation, optimal retention and resistance form, casted in single unit with freely moving roller reduced stresses, friction and helped to overcome potential risks.

24 hours following the cementation of a fixed mandibular guide flange prosthesis, the patient was evaluated for any pain, strain, or stress in the temporomandibular joint, periodontal ligament of abutment teeth, and muscles involved. The patient was further recalled on 1-month and 3-month follow-ups to evaluate the efficiency of the fixed guide flange appliance and to ensure that there was no detrimental effect on abutment teeth and teeth in contact with the guide flange appliance.

fixed guide flange prosthesis described in this case report is a viable option for Koumjian and Firtell's modified Herbst appliance to guide the mandible in maximal intercuspation.¹⁷

SUMMARY

The proposed fixed guide flange prosthesis provides a novel approach for the rehabilitation of hemimandilectomy patients. Fixed Guide flange consists of a three-unit fixed partial denture and a "U" shaped loop with a roller cemented on the mandibular teeth. The disadvantage of this appliance is the possible migration of maxillary teeth adjacent to the loop. There is further scope for research to evaluate the influence of fixed guide flange on opposing teeth and its long-term adverse effect on the abutment teeth.

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