

MANDIBULAR RESECTION GUIDANCE PROSTHESES: A REVIEW

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ABSTRACT

The unilateral loss of mandibular continuity due to surgery or trauma results in mandibular deviation towards the defect side resulting in loss of occlusion on the unresected side. Mandibular resections also result in impaired speech articulation, difficulty in swallowing, mandibular deviation, poor control of salivary secretions, and severe facial disfigurement. One of the primary goals of treatment is the restoration of acceptable occlusal function. Residual dentition can be used to confirm proper realignment of the mandibular fragments in dentate patients. This can be achieved by the use of various guidance prosthesis. The guidance prosthesis can effectively restrain the mandible after partial mandibulectomy procedures to achieve a functional occlusal relationship thereby facilitating early progression to a nearly perfect functioning permanent restoration. This paper presents an overview of the various mandibular guidance prosthesis that can be used to correct mandibular deviation following partial mandibulectomy.

Key Words: Mandibulectomy, Mandibular deviation and Guidance Prosthesis

INTRODUCTION

Discontinuity of the mandible after surgical resection or trauma destroys the balance and symmetry of mandibular function, which leads to altered mandibular movements and deviation of the residual segment towards the defect side, resulting in loss of occlusion on the unresected side.⁽¹⁾ This mandibular deviation is mainly due to uncompensated influence of contralateral musculature particularly the internal pterygoid muscle and pull from the contraction of cicatricial tissue on the resected side.^(2,3)

The degree of deviation is dependent on several factors which include the location and extent of osseous and soft tissue resection, the method of surgical site closure, degree of impaired tongue function, the presence and condition of the

remaining natural teeth, the degree to which innervation has been involved, the use of adjunctive procedures like radiation therapy and the timing of prosthodontics treatment.^(4,5,6)

Loss of mandibular continuity also causes rotation of mandibular occlusal plane inferiorly on the defect side. The pull of the suprahyoid muscles on the residual mandibular fragment causes inferior displacement and rotation around the fulcrum of the remaining condyle thus giving the tendency to an anterior open bite.⁽⁷⁾

The other debilitating consequences following resection are impaired speech articulation, difficulty in swallowing, poor control of salivary secretions, and severe cosmetic disfigurement.⁽²⁾

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The prosthodontic rehabilitation of such patients is challenging. One of the primary goals of treatment is the restoration of acceptable occlusal function. The methods used to minimize this deviation include use of skin grafts and flaps for wound closure, intermaxillary fixation at the time of surgery, mandibular guidance prosthesis and intensive physiotherapy to decrease the fibrosis.⁽¹⁾

The degree of success is related to the location and extent of the mandibular resection, the amount of adjacent soft tissue removed during surgery and the presence or absence of natural teeth.⁽⁸⁾

This paper presents an overview of the various mandibular guidance prosthesis that can be used to correct mandibular deviation following partial mandibulectomy

INTERMAXILLARY FIXATION

Aramany and Myers presented a philosophy of treatment that advocated the use of intermaxillary fixation with arch bars and elastics for five to seven weeks immediately after surgery. This type of fixation maintains the residual mandible in the proper maxillomandibular position and permits healing of the defect and the associated scar formation with the teeth in occlusion. If Inter maxillary fixation is used in immediate post-operative period, very little muscle retraining may be needed. The degree of deviation seems to be inversely proportional to the length of time the mandible is fixed.^(4,5)

VACCUM FORMED PVC SPLINTS

Following the removal of intermaxillary fixation, early progression to a more definitive appliance can be facilitated by using an intermediate Vacuum formed PVC appliance. This appliance consists of upper and lower splints processed on upper and lower plaster models. The upper splint should include all standing teeth and the palatal vault to provide maximum lateral stability, the lower should comprise the teeth plus the vestibular flanges which will act as guide planes for the mandible on

closure. The upper and lower models are articulated in the intercuspal position. The two splints are then inserted on to the arches and fused together in this position by interposing a further layer of the heated polymer. On closure of jaws the lower teeth and mandible are readily and easily guided into the lower half of the splint by its flanges and indentations into the correct occlusal relationship. Jaw movements are thus gently restrained and guided by the soft plastic splint making it comfortable for the patient to wear. The appliance may also be worn at night-time. This appliance has a relatively short shelf life and needs to be replaced by a more definitive acrylic or metal appliance once the patient adapts to path of closure.⁽⁹⁾(Figure 1)

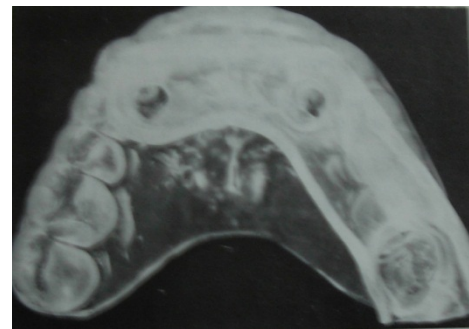


Fig.1 Vacuum formed PVC splint

MANDIBULAR GUIDANCE PROSTHESIS

If the continuity of the mandible can be restored with a bone graft, metal plates or a combination of both methods, most of the problems of the discontinuity can be resolved.

However for some patients who do not desire reconstruction, or who are medically compromised, mandibular guidance therapy can be instituted to retrain the patient's neuromuscular system to provide an acceptable maxillo-mandibular relationship of the residual portion of the mandible which permits occlusion of the remaining natural teeth.⁽¹⁾ The Proprioceptive influence of the remaining teeth in the maxilla and the residual mandibular segment can greatly facilitate training of the patient to attain repeatable

intercuspal position . This can be achieved by the use of various guidance prosthesis. The mandibular guidance prosthesis may be broadly divided into two types:⁽¹⁾

- 1) Palatal based guidance prosthesis which include Maxillary inclined plane prosthesis. Positioning prosthesis with palatal flange, widened maxillary occlusal table
- 2) Mandibular based guidance prosthesis which include Mandibular lateral/ oblique guide flange prosthesis

Maxillary inclined plane prosthesis:

This prosthesis is fabricated from a functionally generated occlusal record and provides an occlusal table palatal to the maxillary teeth on the non-defect side which slopes occlusally away from the natural teeth. The prosthesis is retained using interproximal ball clasps or adams clasps. Because the residual mandible is deviated medially, mandibular closure results in the progressive sliding of the remaining mandibular teeth up the incline in a superior and lateral direction until the occlusal contact is reached. The duration of wear depends on the extent of deviation. An ideal result is achieved when the patient can repeatedly approximate the maxillary and mandibular teeth without the use of inclined plane prosthesis.^(4,8,10) (Figure 2)



Fig 2 Maxillary inclined plane prosthesis:

Positioning prosthesis with palatal flange:

Patients who are able to use their presurgical intercuspal position after mandibular resection often complain of inability to prevent the mandible from deviating towards the defect side during

sleep. On awakening they have difficulty reestablishing normal occlusal contact. Also muscle pain and temporo-mandibular discomfort are common complaints. To minimize nocturnal deviation of residual mandible, a positioning prosthesis can be made by extending a palatal flange inferiorly into the lingual vestibule between the lateral border of the tongue and the lingual surface of the mandible .This flange can be formed in the mouth with autopolymerizing acrylic resin. The palatal extension should be sufficient enough to prevent medial deviation of unresected mandible even when the mouth is open. The flange should contact only the lingual surfaces of mandibular teeth and it should not impinge on the lingual mucosa of the mandible throughout the opening and closing movements. Only the lingual surfaces of the mandibular teeth should contact the flange.⁽⁵⁾ (Figure 3)



Fig 3 Positioning prosthesis with palatal flange:

Mandibular lateral guide flange prosthesis:

In patients who can achieve proper medio lateral position of the mandible but cannot hold that position for adequate mastication, mandibular lateral guide flange prosthesis may be used. The guide flange is attached to a cast mandibular removable partial denture. The guidance flange can be either molded in wax at the try-in stage and processed in clear acrylic resin or a heavy wire loop may be used. The guide flange is extended into the maxillary muco-buccal fold superiorly and diagonally on the non defect side without impinging on the

muco-buccalfold. This extension functions against the maxillary posterior teeth and mechanically maintains the residual mandible in position for vertical chewing stroke with little or no lateral movement thereby diminishing the degree of mandibular deviation.^(3,4,8,11) (Figure 4 and 5)



Fig. 4 Mandibular lateral/ oblique guide flange prosthesis:



Fig. 5 Deviation of the mandible prevented by Mandibular lateral/ oblique guide flange prosthesis

The use of guidance prosthesis consisting of both maxillary and mandibular cast removable partial denture that engage with each other by some mechanism has also been mentioned in literature. Nesrin Sahin et al have described the fabrication of cast metal guidance flange prostheses. It consists of maxillary and mandibular removable partial dentures each having buccal guidance flanges on the non-defect side which engages with each other during function. Also supporting flanges are fabricated on the defect side of both the maxillary and mandibular frameworks to assist in controlling mandibular deviation and coordinate masticatory movements.⁽⁶⁾

Chalian et al have described the fabrication of a guide flange prosthesis which consists of maxillary and mandibular cast

removable partial denture. The frameworks are designed to be in contact during function and to limit mandibular deviation. A lower inverted u shaped flange slides against an upper horizontal bar on the non-defect side. Mastication is limited to vertical movement.⁽¹²⁾

Acrylic splint herbst

In patients with mandibular resection acrylic splint herbst appliance can also be used for achieving correct maxillo-mandibular relationship. It consists of an acrylic splint given in the upper and lower arch. A tube is incorporated in the upper splint which engages the sleeve of the lower splint. It prevents the mandible from deviating and the hinge mechanism between the tube and sleeve allows for opening and closing movements during mastication.⁽⁴⁾ (Figure 6)

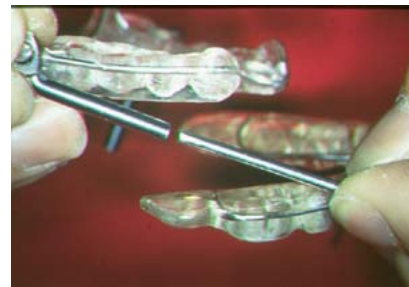


Fig. 6 Acrylic splint herbst

A widened maxillary occlusal table:

Patients who cannot attain the ideal mediolateral position of the remaining segment and an acceptable occlusal contact of the teeth, in spite of the use of various guidance prostheses, a palatal ramp or a widened maxillary occlusal table using double row of teeth may be used. This can provide a surface against which the natural or artificial teeth of the residual mandible can occlude to facilitate mastication.^(7,13) (Figure 7 and 8)



Fig. 7 A widened maxillary occlusal table



Fig. 8 Occlusion provided by the widened maxillary occlusal table to the deviated mandibular segment

Exercise program

The use of various guidance prosthesis should be supported by a well organized exercise program.⁽¹⁴⁾ The objective of these exercise programs is to reprogram the remaining musculature and improve the maxillo-mandibular relationship, reduce the scar contracture and decrease trismus.⁽¹⁾

The exercise program can be started two weeks post surgically. It consists of simple opening and closure of mandible with and without the appliance and patient grasping the chin and moving the mandible away from the surgical site.^(1,6)

DISCUSSION

The patient who has undergone mandibular resection is left with multiple physiologic and cosmetic deficiencies, including the inability to masticate in an acceptable or efficient manner. One of the primary goals of treatment is the restoration of acceptable occlusal function. The use of simple guidance prosthesis can effectively retrain the mandible after partial mandibulectomy procedures to achieve a functional occlusal relationship which can be maintained throughout the post-operative healing period. This in turn facilitates the construction of nearly perfect functioning permanent restoration. The success of such guidance therapy varies and depends upon the nature of surgical defect, early initiation of guidance

therapy and patient cooperation and other factors⁽¹⁾

Guidance prosthesis has the following advantages

1. Effectively realigns the residual mandible to occlude with the opposing maxillary dentition
2. Improved mastication
3. Improved speech and swallowing
4. Ease of fabrication and economical
5. Good patient compliance
6. Facilitates early progression to a nearly perfect functioning permanent restoration.

The earlier the mandibular guidance therapy is initiated in the course of treatment, the more successful is the patient's definitive occlusal relationship.⁽⁶⁾ The retraining prosthesis is used for a time that varies with the patient and the extent of the defect. An ideal result is achieved when the patient can repeatedly approximate the maxillary and mandibular teeth without the use of the guidance prosthesis.⁽⁷⁾

Once the training flange prosthesis has been successful in retraining the mandibular muscles to easily and repeatedly control the residual segment to permit occlusal contact for mastication, conventional fixed or removable prosthodontics care can be provided for the patient.

Conclusion

Mandibular guidance therapy, can be a useful adjunct to preserve the mandibular function after partial mandibulectomy procedures and to minimize complications associated like mastication, speech and swallowing. The philosophic approach to the treatment and rehabilitation of patients with resected mandible is not in concentrating on what has been sacrificed in the eradication of disease but rather in taking full advantage of remaining structures.

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