

Mandibular Resection Guidance Therapy and Appliances: A Review.

Abstract:

Mandibular resection leads to mandibular deviation towards the defect side resulting in loss of occlusion on the unresected side, altered mandibular movements, esthetic disfigurement, difficulty in swallowing, impaired speech and articulation. Surgical Reconstruction may not be feasible in each case. Prosthetic Rehabilitation along with physical therapy helps to regain form and function in such patients and enhance their quality of life. This can be accomplished by the use of various guidance prosthesis which can efficiently retrain the mandible after resection procedures to achieve a functional occlusal relationship thereby enabling early advancement to a nearly perfect functioning permanent restoration. This paper presents an insight on the various mandibular guidance prosthesis that can be used to correct mandibular deviation following partial mandibulectomy and the rehabilitative aspects of mandibular deviation.

Keywords: Mandibular Deviation, Mandibular resection, Guidance Prosthesis.

Introduction:

Mandibular resection results in esthetic disfigurement, impaired speech articulation, problems with mastication, difficulty in swallowing and mandibular deviation towards the resected side. Surgical reconstruction might not be always possible [1]. Prosthodontic rehabilitation plays a crucial role in such patients to regain form function.

Mandibular deviation is dictated by the extent of hard and soft-tissue ablation during surgery, the sort of surgical closure, the extent of tongue function impairment, remnant teeth available for occlusion, and therefore the degree of loss of sensory and motor function. [2,3]

The methods which are being used to minimize the deviation include use of skin grafts and flaps for wound closure, intermaxillary fixation at the time of surgery, mandibular guidance prosthesis along side intensive physiotherapy. The success rate depends on the situation and extent of the mandibular resection, the quantity of adjacent soft tissue removed during surgery and presence or absence of natural teeth. [4]

Mandibular resection leads to esthetic deficit, functional disabilities, occlusal disabilities and most significantly psychological distress to the patient. [5] The rehabilitation of such patients is sort of challenging. This paper presents an summary of varied aspects of prosthetic rehabilitation of mandibulectomy patients to correct mandibular deviation, improve mastication, speech and esthetics and thus enhance their quality of life.

Classification of Mandibular Defects:

A classification of mandibular defects has been described by Cantor and Curtis. Although the classification system is suggested primarily for edentulous patients, it is also applicable to partially edentulous patients.

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Received : 29 Sep., 2021, **Published :** 31 March, 2022

Access this article online	
Website: www.ujds.in	Quick Response Code 
DOI: https://doi.org/10.21276/ujds.2022.8.1.24	

How to cite this article: Paiker Jafri, Amrita Jayaswal, Shitij Srivastava, & Abhinav Shekhar. (2021). Mandibular Resection Appliances: A Review. UNIVERSITY JOURNAL OF DENTAL SCIENCES, 8(1). 125 - 129

Cantor and Curtis Classification²

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 restored.

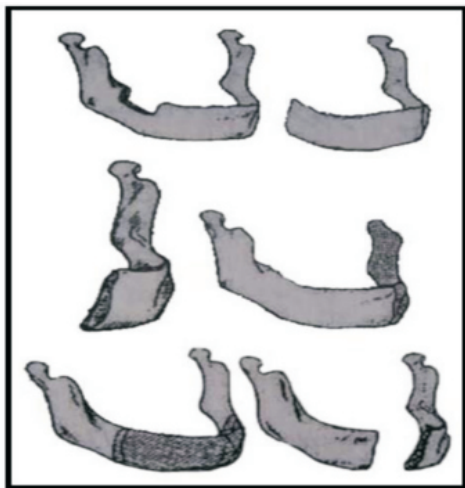


Figure-1: Cantor And Curtis Classification

Mandibular Guidance Therapy:

The success of mandibular guidance therapy depends on the nature of the surgical defect created, early initiation of guidance therapy as well as patient's cooperation.

The earlier the mandibular guidance therapy is initiated, the better is the result.

Mandibular guidance therapy is successful mostly in patients who undergo mandibular resection with minimal involvement of floor of the mouth, tongue and adjacent soft tissues.[2]

Intermaxillary fixation:

Aramany and Myers advocated the use of intermaxillary fixation achieved with arch bars and elastics for five to seven weeks immediately after surgical resection. This type of fixation helps to take care of the residual mandible in proper maxillomandibular position and enables healing of the defect and therefore the associated scar formation with the teeth in occlusion. With the use of Intermaxillary fixation in immediate post-operative period, not much of muscle retraining may be required. The degree of deviation seems to be inversely proportional to the length of time the mandible is fixed. (6,7)

Two-piece Gunning splint :

Fattore et al.[8] advocated a 2-piece Gunning splint both for intermaxillary fixation and as a guidance appliance for an edentulous patient following hemisection of the mandible.

Vacuum formed PVC splints:

This appliance consists of upper and lower splints processed on upper and lower plaster models. To achieve maximum lateral stability, the upper splint should include all standing teeth and the palatal vault,. The lower splint should include the teeth along with 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. Then the two splints are inserted on to the arches and fused together in that position by interposing a further layer of the heated polymer. On closure of jaws, the lower teeth and mandible are readily guided into the lower half of the splint by its flanges and indentations into the correct occlusal relationship. Thus, the soft plastic splint gently restrains and guides the jaw movements, along with being comfortable for the patient to wear. The patient may also wear the appliance 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]

Resection Guidance Restorations:

Placement of a resection guidance restoration can be considered in the absence of primary wound complications. The guidance prosthesis may be fabricated for either maxilla or mandible. The guidance prostheses are used for an interim period until acceptable occlusal relationships and proper

proprioception are reestablished. After an acceptable occlusal relationship is established, the use of guidance prosthesis may be discontinued or occasionally utilized to reinforce the proprioceptive mechanism.

Robinson and Rubright[10] suggested that if the mandible can be manipulated into an acceptable maxillomandibular relationship but the patient lacks the motor control to bring the mandible into occlusion, a cast mandibular resection restoration is appropriate. This mandibular guidance prosthesis consists of a removable partial denture framework, with a metal flange that extends 7 to 10 mm laterally and superiorly on the buccal aspect of the premolars, and molars on the non-defect side. The maxillary teeth are engaged by the flange during mandibular closure, thereby guiding the mandible into an appropriate intercuspal position. The flange can be made of acrylic resin or cast chrome cobalt metal. A cast metal guidance ramp is suggested if the mandible can be comfortably manipulated into an acceptable occlusal position. In case of resistance encountered in positioning of mandible, a guidance ramp of acrylic resin is preferred as the material can be adjusted periodically as an improved relationship is obtained.

A second design confines the guidance ramp and index to a maxillary prosthesis. These maxillary prostheses are usually fabricated of acrylic resin with either cast- or wrought-wire retainers. These are used on an interim basis until an acceptable occlusion can be established.

The prosthesis covering full palate is constructed, in accordance with the conventional prosthodontic guidelines, and then fitted and adjusted in patient's mouth. The mandible is manipulated laterally towards the desired position, and the occlusal contact with the palatal prosthesis is noted.

The prosthesis is then removed and a mix of autopolymerizing acrylic resin is prepared and added to the palatal prosthesis, along the lateral and anterior borders on the non-defect side. The prosthesis is placed back in the mouth and the mandible is manipulated to the desired position, thus establishing an index in the palate. The movement is repeated several times until polymerization of resin begins. Then the prosthesis is removed from the patient's mouth to allow for complete polymerization. The prosthesis is again replaced in

the mouth after adjustment and smoothing. The patient should be able to close into the index, with appropriate manipulation of the mandible. After polishing of the prosthesis, the patient is given the instructions to wear it continuously along with explaining the objectives of the prosthesis to the patient as well as outlining the exercise instructions. After the patient returns, the mandible usually exhibits more freedom of movement laterally towards the non-surgical side, requiring palatal ramp adjustment and enabling the mandible to assume a more desired maxillomandibular relationship. When an acceptable intercuspal position is achieved, occlusal equilibration is generally required to maintain the mandibular position.

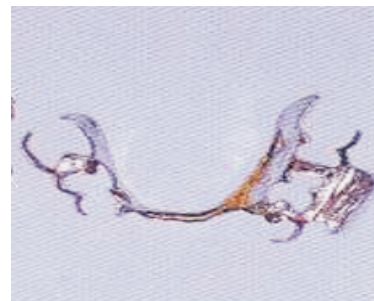


Figure 2 : Mandibular guide flange used to restrict deviation of the mandible during function.

Twin Occlusion:

Rosenthal proposed two rows of maxillary posterior teeth on the unresected side.¹³ Two rows of teeth on the unresected side of the maxillary denture were arranged because the patient could not close in proper intercuspation and hence, could not masticate. Double row of teeth placed on the opposing maxillary prosthesis help guide the mandible into a more desirable maxillomandibular relationship through cuspal interlocking and also provides a broader occlusal .

Semi-anatomic teeth were used for esthetics while occlusal grinding was done to deliver freedom in lateral movements, which also helped in minimizing lateral stresses that would otherwise have displaced the mandibular prosthesis. The teeth slide over one another down the incline formed by the second row of teeth and into a functional occlusal position. The inner row of teeth in twin occlusion helped in restoring the function, whereas the outer row helped in supporting the cheeks and enhancing the esthetics.

Exercise program:

Prosthetic treatment should be combined with a well organized exercise regimen to reprogram the remaining musculature and improve the maxillo-mandibular relationship, reduce the scar contracture and decrease trismus.[2]

The exercise program can be initiated two weeks after surgery. 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.[2,12]

Mandibular Reconstruction using Rapid Prototyping Technology:

Mandibular reconstruction is often required after partial resection and continuity defect. Mandibular reconstruction helps in maintenance of proper esthetics and facial symmetry and to achieve good functional result, thereby preserving the form and strength of the jaw and permitting dental rehabilitation in future.

Precious time in the operating room is invested in plate contouring for mandibular reconstruction. Rapid prototyping technologies can construct physical models from computer-aided design via 3-dimensional printers. A prefabricated 3D model is achieved, which helps in accurate contouring of plates and/or planning of bone graft harvest geometry prior to the surgery. The two most commonly used rapid prototyping technologies are stereolithography and 3D printing.[17]

Conclusion

Mandibular resection results into Disfigurement and functional disability. Prosthetic rehabilitation in such patients is quite challenging but can be done within physiological confines[14].

Mandibular guidance therapy, can be a valuable aide to preserve the mandibular function after partial mandibulectomy procedures and to minimize complications associated like mastication, speech and swallowing .[15]

Prosthetic treatment Along with appropriate mandibular exercise regimen can go along way in reestablishing the patient's physiological and psychological well being.16

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