

CLINICAL VARIABLES ASSOCIATED WITH THE REHABILITATION OF A HEMIMANDIBULECTOMY PATIENT

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Abstract: Mandible is perhaps one of rarest bones that could be hypothetically termed as an organ because not only it helps in mastication and deglutition it plays a major role in species survival. Humans exceptionally have refined and mastered its use in communication also. The bone is unique in the body since it is a single bone that is attached by two separate joints that are capable of functioning independently. Its attachment with remaining skull besides temporomandibular joint also includes an attachment through muscles, ligaments, disk, occlusion and skin. Any breach in the continuity of the mandible through disease or trauma results in a pattern of mandibular movement that is more complex and dynamic in nature. Hemimandibulectomy is one such clinical condition that results after removal of any portion of mandible and poses clinical challenges to prosthodontic rehabilitationists. This article presents a case of hemimandibulectomy who was successfully rehabilitated by using a dynamic occlusal ramp in the maxillary complete denture.

Keywords: mandibular movements, occlusion, articulator, sarcoma, translation, articular disc.

Introduction

The mandible is one of the strongest and largest bones of the human face. Besides forming the lower jaw its mobility is single largest determining factor in dental occlusion that serves the functions of speech, mastication and deglutition besides protection. Although the bone starts developing from two distinct loci, both components ultimately fuse in the midline. The bone is unique in that it is joined to the cranium by two different joints that need to work in coordination for efficient

movements that are capable of masticating food. Impairment of coordination between two joints as a result of muscle or the bone itself produces non effective mandibular movement that are not even capable of biting even soft diet. Discontinuity of the mandible in the form of hemimandibulectomy is mostly because of surgical treatment of neoplastic lesions of the oral cavity involving the mandible, floor of the mouth, tongue or even the palate.^{1,2}

Loss of continuity in the mandible also destroys the balance of the mandibular

movement and function, leading to altered mandibular movement and deviation of the residual fragment towards the surgical side.^{3,4} amongst various functional problems associated with rehabilitation of such patients, the problem of frontal plane rotation of the mandible compounded by loss of motor control with varying degrees of mandible deviation are the central point of this case presentation.

Clinical case report

A completely edentulous male patient aged 65 years was referred to the department of Prosthodontics by department of oral surgery after undergoing Class II type (Cantor and Curtis, 1971)⁵ of resection. Patient history indicated tobacco chewing habit since 38 years due to which he was diagnosed with squamous cell carcinoma of the left buccal mucosa (T₄, N₀, and M₀) about two years back. Medical history revealed the surgical removal of the tumor with extensive resection of the mandible distal to the lower canine region together with a radical neck dissection. Surgical reconstruction of soft tissue was done by myocutaneous flap followed by radiotherapy for four months. Extra oral examination presented asymmetrical face, convex profile with a square face. There was a deviation of the mandible with forward rotation towards the surgical side at rest position of the mandible. The deviation increased when patient opened the mouth. Other significant oral findings included facial paralysis of the affected side, completely edentulous well-formed residual alveolar ridges, poor

neuromuscular coordination and control over movement of the mandible. The treatment plan presented to the patient was a maxillary denture with a modified ramp on the right side.

Clinical procedures

Preliminary impressions were made using irreversible hydrocolloids (Thixotropic, Zhermach, Italy); the impression was modified with impression compound (Pinnacle, DPI) to record the buccal vestibular depth (**Fig 1A**). Diagnostic casts were prepared which was then followed by the fabrication of a special tray. Final impressions were made after doing routine border molding with modelling plastic (DPI tracing stick, Dental products of India, Mumbai, India). Overextensions in the region of the defect were avoided as per guidance given in the literature.⁵ Regular procedures for complete denture fabrication were followed till the stage of denture trial. At this stage after the artificial teeth (semi-anatomic posteriors) were arranged on a programmed semi adjustable articulator Hanau Widevue (Waterpik, Ft Collins, CO, USA) (**Fig 1B**), the denture was tried for its retention and stability in the patient's mouth. After verification of the previous steps, the design of occlusal ramp was initiated at this stage. Modelling wax was added on the palatal side of the denture, the surface of which was softened with heat and then both dentures were inserted and the patient was asked to move the mandible in the same way as he would do when he eats. Mandibular teeth carved paths on the occlusal ramp



Figure 1: (A) Modified impressions using dual impression technique (B) Conventional complete trial denture (C) Trial denture with modified ramp (D) Processed complete denture



Figure 2: (A) Occlusal relation in the beginning (B) Relation in occlusion (C) Complete denture at rest (D) Complete denture in occlusion

which was then refined further at consecutive softening (**Fig 1C**). The modified maxillary trail denture was then processed using heat cure denture base resin (DPI-Heat cure, Dental products of India Ltd, Mumbai, India) (**Fig 1D**). At the next appointment the denture was further refined by a clinical remount procedure in which all occlusal interferences were removed (**Fig 2 A and B**). The denture was finally evaluated for effectiveness of the occlusal ramp in maintaining occlusion in assumed centric relation (**Fig 2 C and D**). The patient received instructions regarding denture care and maintenance. The patient was followed up periodically for minor occlusal corrections.

Discussion

Before discussing various aspects of rehabilitation of hemimandibulectomy, one word of caution needs to be reiterated. As experienced by the authors, these cases should always be planned before surgery by a multidisciplinary team involving a prosthodontist, oral physician and surgeon, general surgeon, anaesthetist, speech therapist and physiotherapist.⁹ The rehabilitation of such patients has to be preventive as well as interceptive rather than mere final rehabilitation. A well planned

definitive prosthesis in such cases would limit or even alter the outcome of impaired mandibular movement as a result of the surgical scar formation. In short, the prosthesis when introduced in the mouth before fibrosis of healing tissues starts would benefit the patient more and would also decrease the complexity of the problems involved in rehabilitation of such cases.

As in this case, functional rehabilitation also started after the patient has undergone resection without reconstruction. Since a considerable period of time had elapsed after the surgical procedure and minimal sacrifice of soft tissues was undertaken therefore guide flange prosthesis in the form of a maxillary ramp was undertaken. Other treatment options available for such patients include maxillary ramp, mandibular flange prosthesis and a dual or twin occlusion denture.⁵⁻¹³ Use of the maxillary ramp as described by Swoope¹⁴ remains to be an efficient treatment option for completely edentulous patients, although rehabilitation of edentulous patient has more difficulties than dentulous patients because of limited coverage and retention, impaired centric and eccentric relations and loss of sensory and

motor innervation. Accuracy in recording Maxillo mandibular relations in a deviated mandibular position is perhaps the most critical procedure in such cases. As compared to the conventional centric relation, the relation in such cases is not a repeatable one and one should aim that the maxillary ramp promotes doing so for the established centric occlusion.

Another important occlusal feature that has not been mentioned in the literature and was a feature in this case is enhancing the lateral compensatory curves. To understand the feature, one must analyze the mandibular rotation that occurs as a result of a loss of temporomandibular joint. A resected mandible with one joint rotates inward due to lack of fulcrum on opposite side. When the mandibular occlusal surface comes in contact with the maxillary ramp the mandible starts rotating backward to assume a straighter position. As the mandible is moved over the occlusal ramp the mandible tries to assume a vertical position but fails to do so because of continuous movement of the mandible. After running the entire length of the ramp the teeth now finally come opposite to each other in occlusion. At this stage if the teeth continue to run laterally then the chances of the mandible assuming a vertical position becomes less. This can be prevented by incorporating an exaggerated buccal inclination of the molars and premolars. As the buccal cusps of the mandibular denture reach this position, further sliding is prevented by maxillary buccal cusps which in turn allow the forces to be used in up righting of the mandible. The vertical position of the mandible in turn straightens the cuspal tips of the lower teeth. However, an important clinical aspect of such feature is that the patient has to learn how to bring the feature into effect. This is easily achieved by slow, controlled movement of the mandible once the mandibular denture comes into contact with the ramp. Forces in

excess won't allow the cusps to assume the position as described in this case.

Conclusion

Mandibular resection handicaps an individual in extreme ways and therefore such cases should always have a multidisciplinary approach. Planning should be based on cause and effect relationship. There are no clinical studies that describe the altered mandibular movements in such cases. Further studies are required to establish the occlusal schemes for such patients.

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