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A Novel Technique for Construction of Guiding Flange Prosthesis For Hemi mandibulectomy

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Abstract

Aim: Patients who undergo mandibular resection frequently have trouble chewing and may develop long-term facial deformities. In this scenario, rehabilitation of the mandibular muscles is the main objective in order to return them to a more normal position and function. This may result in an improved occlusal relationship, improving facial aesthetics and enabling better control during opening and closing movements.

Background: Surgical resection of mandible can disrupt the normal anatomy and function due to pull of muscles of the affected side, leading to mandibular torsion. Only after complete healing 'definitive treatment options, such as mandibular reconstruction can be undertaken.

However, initiating intermediate prosthodontic therapy immediately after the surgical phase is recommended to prevent the possibility of worsening mandibular deviation during healing due to scar formation and tight wound closure.

The earlier the prosthodontic intervention, the more successful the outcome is likely to be.

Case description: This clinical case report presents a new technique for constructing a guiding flange appliance for rehabilitation of hemi mandibulectomy.

Clinical significance: The article describes an innovative technique for fabricating mandibular guide flange appliance which ensures stability to the prosthesis and re-establishes occlusal relationship to the remaining teeth.

Keywords: Guide flange prosthesis, hemi mandi bulectomy, mandibular deviation, key and keyway, fixed- removable.

Introduction

The mandible is the largest bone in the viscerocranium and the only movable bone of the skull. It contours the lower facial structures and is crucial for face aesthetics, phonetics, mastication, and dentition support. Through the coordination of several muscles and ligaments at two special tempo romandibular joints, this U-shaped bone articulates with the skull. These joints help in coordinated and smooth mouth opening and closing. A person's quality of life may be impacted by disruption of this intricate system, which can also affect chewing, speech and appearance.

The resection of the defect can result in mandibular discontinuity with resultant retrusion of the mandible towards the amputated side due to forces from the pull of digastric and suprahyoid muscles, resulting in impaired mastication towards the resected side. Facial asymmetry, midline shift, and collapsed occlusion are common effects of the altered muscle function. A tight wound closure and scar contracture make things worse. Hence, interim prosthesis rehabilitation should be initiated immediately after surgical phase, so that definitive guidance prosthesis management after complete healing becomes much easier. The degree of surgical resection and degree of muscle pull impact how well these abnormalities are restored with prosthesis. Removable prosthesis designs are generally used for prosthetic rehabilitation. In this case report a novel method for treating a mandibular deformity with a fixed removable partial denture is described.

Case Report

A male senior citizen reported to the Department of Prosthodontics, with a chief complaint of inability to eat with the existing prosthesis. The patient revealed a history of right-sided mandibulectomy due to adenoid cystic carcinoma.

After post-operative healing, the patient was rehabilitated with a maxillary twin occlusal appliance which became loose on gradual usage.

Extraoral examination revealed facial asymmetry with marked right-sided depression. An intraoral examination indicated a deviation of approximately 16 mm to the defect side during mouth opening and the absence of a mandibular ridge extending posteriorly from the midline. It was noticed that the patient could approximate the mandible to intercuspation on closure without much effort, but the occlusion was unstable. Radiographic (OPG) evaluation confirmed Canter and Curtis class III mandibular defect (Fig. 2).

Intraoral examination revealed hyperaemic palatal tissues due to continuous use of the existing prosthesis (Fig. 3). All teeth displayed hypo mineralized regions that might be signs of caries development. The remaining teeth had sufficient support from the bone and soft tissues. Radiation therapy increased the chance of developing radiation caries because of the concomitant reduced salivary flow and plaque build-up around the teeth. [1]

The patient was explained about the various treatment options for the rehabilitation of present situation and importance of preserving the remaining teeth. To decrease mandibular rotation, it was chosen to manage with a fixed removable form of mandibular guide pros thesis. Time, effort and cost involved for the treatment

were explained clearly and a detailed consent was obtained.

For the purpose of treatment planning, diagnostic castings were articulated on a mean value articulator. The design incorporated metal flange fixed to the mandibular telescopic cast partial denture and keyway for metal flange over buccal surface of 24. This would prevent lateral torsion of the mandible upon mouth opening and also provides stable occlusion upon closing. Tooth preparations were done on the upper arch to receive splinted porcelain fused metal crowns. Tooth preparations on the lower arch were carried out to receive splinted metal retainers with chamfer finish lines to accommodate telescopic cast partial denture. 3-D printed resin mock-ups were surveyed, casted and cemented onto lower arch (Fig. 4). On the 3-D printed mock-up of maxillary arch, a keyway with pattern resin was placed over buccal surface of 24 (Fig. 5). A resinous occlusion rim was constructed over the mandibular metal copings to which a plastic matrix (key) was planned to the buccal aspect of 34 and 35 region. Jaw relation was recorded using ALUWAX and articulated. The finished upper and lower prostheses were tried for verifying the accuracy of the function of the key and keyway (Fig, 6).

The impression of the defective side was made using putty and light-body addition silicone attached to the retentive mesh of the mandibular framework and moulded intraorally to support the tongue and cheek. This impression was poured using an altered cast technique, and teeth arrangement was made. The acrylic resin portion on the mesh of the framework was polymerized, finished, and polished (Fig. 7). The telescopic prosthesis was evaluated intraorally, and the mandible was manipulated to occlusion (Fig. 8).

Discussion

According to Cantor and Curtis (1971) mandibular defects are classified as[2]

Class 1: Radical alveolectomy with preservation of mandibular continuity.

Class 2: Lateral resection of mandible distal to cuspid.

Class 3: Lateral resection of the mandible to the midline.

Class 4: Lateral bone graft surgical reconstruction.

Class 5: Anterior bone graft surgical reconstruction.

Class 6: Resection of anterior portion of the mandible without reconstructive surgery to unite lateral fragments.

The residual mandibular segment is frequently retrunded and deviated to the surgical side in the resting posture after surgical resection.[3] Upon opening, the deviation increases, leading to an angular path of opening and closure. The absence of muscles of mastication on the surgical side causes rotation of the mandible on closure as a result of an imbalance in the pull of these muscles. Loss of the proprioceptive sense of occlusion leads to the uncoordinated, less precise movement of the mandible.

After the initial contact on the nonsurgical side has been made, the teeth on the surgical side of the mandible shift away from the maxillary teeth when viewed from the frontal plane. As the force of closure is increased, the remaining mandible rotates through the frontal plane. Hence the term ‘frontal plane rotation’.[4]

One of the basic objectives for management of mandibular discontinuity is to train the muscles for mandibular control during mouth opening and repeated occlusal approximation upon closing. The success of mandibular guidance therapy varies and depends on the extend of the surgical defect, early initiation of guidance therapy, patient cooperation, operator skill and other factors.

Literature review states various type of removable prostheses for managing mandibulectomy such as mandibular guide flange, maxillary guidance ramp etc.[5,6,7] The maxillary guidance appliance serves only in the interim stage until an acceptable occlusion can be established.[8]

Robinson et al. and Nesrin Sahin et al. suggested that if the mandible can be manipulated into an acceptable maxillomandibular relationship, but lacks motor control to bring the mandible into occlusion, a cast metal mandibular guidance flange prosthesis is appropriate.[9,10]

Because the first premolar was a pontic location and had more surface area for accommodating a groove for guiding flange, the premolar region was chosen as the site for the cast metal flange in this case study. Continuous use would generate harmful lateral stresses on the remaining abutment teeth, hence the flange was designed to be removable and only be used as needed. The maxillary abutment teeth were splinted for cross arch distribution of the forces exerted by the pull of the mandible. To increase the retention of the telescopic prosthesis, metal copings of adequate height and parallel axial walls were provided on mandibular teeth. This fixed- removable flange design provided precise movement of mandible to occlusion. 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 with a guidance pros thesis. The frameworks are designed to be in contact during function and to limit mandibular rotation. Mastication was limited to simple vertical movement.

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Legend Figures

Figure 1: (A-B): Pre operative view A. Extra oral B. Intra oral.

Figure 2: Orthopantomogram.

Figure 3: Hyperemic palatal tissues due to existing prosthesis.

Figure 4: Metal coping on lower arch.

Figure 5: 3-D printed mock up for maxillary arch.

Figure 6: Upper and lower prosthesis with guiding flange.

Figure 7: Lower prosthesis after acrylization.

Figure 8: Extra oral view with prosthesis