Case Report:

Twin Occlusion Mandibular Complete Denture Prosthesis for a Partial Glossectomy patient – A Case Report

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Received on Mar18, 2025, accepted for publication on Jun 23, 2025, dx.doi.org/10.5455/mjhs.2026.021

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Abstract:
Oral cancer is one of the more common malignancies affecting people all around the world. Treatment of such tumors usually involves multi-modal approaches involving surgical resection of the affected area, radiotherapy and chemotherapy. Surgical removal of complete (Glossectomy) or portion (Hemi or Partial Glossectomy) of the tongue results in compromised oral function. Prosthodontic rehabilitation of such patients involves various challenges which can affect the treatment outcome. The challenges that conventional treatment options face for prosthodontic replacement in such patients include mandibular jaw deviation, reduced chewing efficiency, altered phonetics, compromised esthetics, reduced prosthesis retention and stability. More complex treatment procedures involve surgical reconstruction of the defect followed by implant supported fixed or removable prosthesis. Twin occlusion removable prosthesis offers a simplified and interim treatment solution in such cases. This prosthetic treatment option helps in improving masticatory efficiency, phonetics and esthetics in these patients and serves as a transitional treatment approach until a more definitive treatment is provided.

Keywords:
Glossectomy, Rehabilitation, Complete Denture, Dental Occlusion

Introduction:

Oral rehabilitation of patients with glossectomy (surgical removal of all or part of tongue) presents a unique set of challenges for prosthodontists. Glossectomy, often performed as a treatment for oral cancer, results in significant anatomical and functional impairments, including compromised tongue mobility, altered phonetics, and diminished masticatory efficiency[1]. These challenges are compounded in edentulous patients, where the absence of teeth further complicates the restoration of oral functions and aesthetics[2].

The mandibular arch, when edentulous, requires meticulous planning to ensure stability, retention, and function of the prosthesis[2]. In cases involving partial glossectomy, achieving these objectives is further hindered by asymmetrical oral anatomy and compromised muscular control. Literature review advocates fabrication of guide flange or palatal ramp prosthesis for patients to prevent deviation of the mandible and to improve masticatory function and aesthetics[3]. The concept of "twin occlusion" also presents with an effective solution in such complex scenarios, accommodating the altered oral dynamics and ensuring optimal prosthetic function[4,5,6].

Various articles discuss the application of twin occlusion to provide stability and to improve masticatory efficiency of the prosthesis especially in a patient who has undergone surgical resection of mandible[4,5]. Twin occlusion is a prosthodontic design strategy that improves denture stability by providing dual occlusal contacts, making it particularly useful in complete denture prosthetics for patients with poor ridge support or demanding functional needs[6,7]. This article highlights the prosthodontic management of an edentulous mandibular arch in a partial glossectomy patient, emphasizing the use of twin occlusion in restoring functionality and quality of life.

Case Presentation:

Patient Information:

A male patient who was 58 years old of Saudi Arabian origin, reported to the Outpatient of Prosthodontics Department with a chief complaint of difficulty in chewing food. He presented with a surgical history for treatment of Oral Squamous Cell Carcinoma (OSCC) affecting the left side of tongue 16 years ago. He underwent surgical resection of the affected area (partial Glossectomy) followed by surgical reconstruction of the defect area with a free flap procedure. The patient had no significant prior medical illness or relevant family history contributing to the existing condition. He was moderately built with no history of chronic medication use or

recent drug intake was reported.

Clinical Examination:

On extra-oral examination, wrinkling of skin along the corner of the mouth due to loss of vertical dimension was observed. The patient's face form was square tapering with a straight lateral profile. Temporo-mandibular joint examination revealed no abnormalities or associated symptoms, and the mandibular movements were well coordinated but had a slight deviation towards the right side on mouth opening.

Intraoral examinations showed completely edentulous mandibular arch opposing partially edentulous maxillary arch (Kennedy's Class III). The patient had multiple crowns on the remaining natural teeth in the maxillary arch which were compromised with Periodontitis, Stage IV Grade B (2017 AAP/EFP disease classification), and poor oral hygiene (Oral Hygiene Index-Simplified score >3.0). The nature of saliva of the patient was mucous with scant quantity. The arch form of mandibular ridge was Class III (House Classification) with ovoid shape and inverted 'U-shaped' ridge form with short and flat crest (Fig 1A). The height of the residual ridge according to Jack H. Rayson and James M. Terry classification was Class II having undergone moderate amount of bone resorption (Fig 1A). There were no prominent bony undercuts on the mandibular ridge. The initial examination also revealed adequate inter-arch space with Angle's Class I ridge relationship. The border tissue attachment was closer to the ridge near the surgical area on the left side of the mandibular arch. The post mylohyoid space according to A. Neil's Classification was Class III with less than half of the mouth mirror sinking.

The tongue appeared normal in size, but the color appeared to vary due to the free flap surgical reconstruction after partial glossectomy on the left side. The patient had restricted mobility of the tongue during right lateral movement (Fig 1B) but left lateral movement was unaffected (Fig 1C). The mandibular jaw movement was also visibly deviated towards the right side on mouth opening. Due to the restricted mobility of the tongue and coupled with complete edentulousness in the mandibular arch, the patient had significantly reduced chewing ability and mild difficulty in swallowing and phonetics.

Diagnosis and Treatment Options:

The provisional diagnosis was Kennedy's Class III partially edentulous maxillary arch with Periodontitis, Stage IV Grade B (2017 AAP/EFP disease classification) with multiple cervical caries in the remaining teeth and completely edentulous mandibular arch. The comprehensive treatment plan would include assessment of

periodontal status and restorative evaluation and management of the remaining teeth in the maxillary arch and prosthetic rehabilitation of the mandibular arch. The rehabilitation options for mandibular arch include fixed or removable implant-supported prosthesis. The patient preferred a more conservative treatment procedure and hence a conventional removable complete denture was planned. Although the intraoral examination revealed a fair prognosis for the mandibular removable complete denture prosthesis, it remained a preferable option since the denture can serve as an interim prosthesis until a more definitive implant supported fixed or removable prosthesis is fabricated



Fig 1A-Mandibular residual alveolar ridge with moderate bone resorption, Fig 1B-Restricted tongue mobility during right lateral tongue movement, Fig-1C – Normal tongue mobility during left lateral tongue movement, Fig-1D – Border molding of mandibular arch and final impression with light body addition silicone impression material, Fig-1E – Right side Occlusion during Try-in showing good intercuspation, Fig-1F – Left side Occlusion during Try-in showing less occlusal contact due to mandibular deviation towards right side.

Treatment Procedure and follow-up

The diagnostic impression of both arches was made using alginate impression material (Zhermack Dental, Italy) on stock impression tray. Border moulding of the mandibular arch was performed using green stick impression compound (Kerr Dental, USA) on light-cured acrylic custom tray (Morsa Dental, Germany) and final impression was recorded using light body consistency addition silicon impression material (Zhermack Dental, Italy) (Fig 1D). Tentative jaw relation was then performed using wax occlusal rims. It was observed during the centric relation record that the left side posterior occlusal contacts were less than the right side. The jaw relation record was then mounted on

an average value articulator (Artex System, Germany) and teeth arrangement was completed using semi-anatomic acrylic teeth (Ivoclar, Liechtenstein). The try-in appointment also confirmed fewer posterior occlusal contact (Figure 1F) on the left side of the mandibular arch, but the right-side occlusion showed good intercuspation with the maxillary arch (Fig 1E). This was due to the mild deviation in the mandibular arch towards the right side after surgical reconstruction was performed for the partial glossectomy procedure (Fig 2A).



Fig 2A–Frontal view showing mandibular jaw deviation towards right side and increased horizontal overjet in the left side posterior teeth, Fig 2B-Wax trial denture after teeth arrangement with twin occlusion, Fig 2C–Occlusal view of twin occlusion teeth arrangement on trial denture, Fig 2D-Intra oral view of final mandibular denture prosthesis with twin occlusion on the left side, Fig 2E–Frontal view of final prosthesis placed intra-orally showing normal occlusion, Fig 2F–Left side Occlusion showing normal relation between upper and lower teeth.

The teeth arrangement was then revised on the left side by adding another row of teeth (twin occlusion) buccal to the existing posterior teeth (Fig 2B and 2C). The first row of teeth was arranged as per contour of the patient's ridge, and the other set was arranged buccal to the first row on which the maxillary teeth occlude. The trial denture was then acrylized with high impact heat cured acrylic resin material (Xthetic high impact, AcrylX, Germany), finished and polished followed by delivery of the prosthesis to the patient (Fig 2D, 2E and 2F). Post insertion instructions were given to the patient and follow up care was provided at one week and one month time intervals after prosthesis delivery.

Discussion:

In the Western world, tongue is the most common primarily affected cancer site in the oral cavity[8]. Cancers of the lip and oral cavity, comprising cancers of the lip, tongue

and mouth collectively represent the 16th most common neoplasm worldwide, with almost 355,000 new diagnoses and over 177,000 deaths estimated in 2018[9]. The tumor primarily arise from epithelium cells, and almost 90% are oral squamous cell carcinoma (OSCC) in origin[9]. Cancers of the oral tongue have been traditionally associated with tobacco and alcohol consumption with the highest incidence rates found in India[8,9]. There is strong evidence to suggest that Human Papillomavirus (HPV) increases the risk of cancers in the oropharyngeal region (including base of tongue, lingual tonsil and soft palate) [9]. Among the Asian countries, due to the increased popularity of habitual alcohol intake, smoking and betel nut chewing, tongue cancer incidence is significantly high[8,9]. Glossectomy is performed primarily to treat premalignant and malignant lesions of tongue[10]. The tongue is a specialized sensory organ, wherein there is complex arrangement of extrinsic and intrinsic musculature, which performs the motor functions[10]. Glossectomy may also be indicated for the treatment of macroglossia, obstructive benign tumors and sleep apnea[10].

The glossectomy procedure is classified into four types based on the amount/ volume of tongue that undergoes surgical resection[11]. This includes Total glossectomy (complete excision), Subtotal glossectomy (excision of more than half but less than the complete tongue), Hemi-glossectomy (excision of half of the tongue) and Partial glossectomy (surgical excision of less than half of the tongue)[11]. Reconstructive surgeries are necessary to restore appearance and function where there is significant resection of tongue volume[12]. For locally invasive and resectable tongue cancer, reconstruction with free or pedicled flaps gave better functional outcomes[12]. The patient described in this article has undergone partial glossectomy with subsequent surgical reconstruction of the tongue using a free flap procedure.

Oral cavity play a vital role in performing essential functions such as swallowing, speech production, chewing, taste, expression of emotions and social interaction[12]. Surgical resection of parts of mobile functional tongue may reduce mastication, swallowing, speech, salivation, cranial motor-nerve and sensory function, nutrition, delayed complications and physical appearance subsequently decreasing patients' quality of life, having significant impact on the psychosocial state of the patients[13]. The less visible disability of psychosocial functioning includes severe depression, recreation level and reduced activity[13].

The functional outcome of surgical

resection of tongue is affected by the extension and localization of resection, type of reconstruction, mobility of residual tongue, and adjuvant Radiotherapy[13]. Adjuvent therapies such as radiotherapy and chemotherapy, especially when administered preoperatively has a significant impact on speech production postoperatively[13]. Hence, the type and design of flap used for reconstruction of such defects plays a significant role in the treatment outcome. Larger tumors (length, width, and depth) were associated with poorer speech outcomes.

Various Case studies[3-7] have reported utilization of guide planes and twin occlusion to reduce mandibular deviation and to improve chewing efficiency with improved occlusal contacts. Prosthodontic rehabilitation in such cases depends on the volume of tongue that has undergone surgical resection, since the remaining volume preserves the tongue function[12,15]. Other factors that influence the treatment outcome include the type of surgical flap and adjuvant therapies undergone by the patient[12]. Guide flanges incorporated into a prosthesis generally reduces the mandibular deviation and guides the mandible towards a more effective chewing position[14]. The application of guide flanges is more efficient in patients who have more extensive surgical bony defects coupled with significant jaw deviation[14].

The literature search also discusses various case reports for prosthodontic rehabilitation in hemi-mandibulectomy patients by using twin occlusion prosthesis[3-7]. The case presented in this article does not have significant mandibular deviation during mouth opening and hence a guide plane was not warranted in such a scenario. Guide flange therapy is most successful in patients where resection involves only bony structures with minimal sacrifice of tongue, floor of the mouth, and adjacent soft tissue[14,15]. After performing jaw relation procedure, it was observed in this patient that the left side of the mandibular wax occlusal rim has lesser occlusal contacts in comparison to the right side of the jaw (Figure 1F). Masticatory efficiency depends on the greater area of contact between the opposing teeth; hence 'twin occlusion' prosthesis can provide a simple and easy solution to improve chewing in such patients[6,7]. The application of Twin occlusion refers to a specific occlusal scheme where two distinct occlusal surfaces are present on the same prosthetic tooth or teeth, allowing for dual occlusal contact points during mandibular movements[3,5]. This type of occlusal scheme provides certain advantages such as, better force distribution compared to single-point occlusion, reduced denture movements

during mastication thereby providing additional stability in compromised alveolar ridge support[6,7].

The limitation of such prostheses includes reduced retention and stability in comparison with prosthesis supported by dental implants[15]. Other reasons for reduced retention and stability for the mandibular removable denture fabricated in this patient include less salivary flow and the quality of saliva being mucous in nature, the lingual flange on the left side of the denture has lesser extension than the right side (border tissue attachment closer to the ridge, A. Neil's Classification – Class III post mylohyoid space). The limited extension was also due to the flap reconstruction followed by partial glossectomy procedure performed on the left side.

Conclusion:

Partial glossectomy results in reduced capacity of the tongue to perform essential oral functions such as chewing, swallowing and speech. Twin occlusion is an innovative simplified solution for patients who have undergone surgical resection of maxilla, mandible or the accompanying soft tissues surrounding them such as the tongue musculature or floor of the mouth. This concept of placing two rows of teeth increases the occlusal contacts thereby improving masticatory efficiency in the prosthesis. Hence, twin occlusion can be considered as an effective occlusal scheme in prosthodontic rehabilitation for patients who have undergone partial glossectomy.

Conflict of Interest:

There are no conflicts of interest.

Funding Statement:

No funding was received for this project.

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