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Early Prosthodontic Management of Mandibular Deviation Following Hemimandibulectomy Using Guide Flange and Palatal Ramp Prostheses: A Case Series

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ABSTRACT

Background: Mandibular discontinuity following hemimandibulectomy results in significant deviation of the residual mandibular segment, leading to impaired mastication, speech, swallowing, and facial symmetry. Early prosthodontic rehabilitation using mandibular guidance prostheses plays a pivotal role in minimizing deviation, promoting neuromuscular re-education, and restoring functional occlusion during the postoperative healing period.

Case Presentation: Two patients who underwent unilateral hemimandibulectomy for oral squamous cell carcinoma were rehabilitated using different mandibular guidance prostheses based on their functional ability to achieve an acceptable maxillomandibular relationship. The first patient demonstrated reducible mandibular deviation and was treated with an acrylic mandibular guide flange prosthesis. The second patient exhibited severe deviation with limited voluntary correction and was rehabilitated using a maxillary acrylic palatal ramp prosthesis. Both prostheses were fabricated as heat-polymerized acrylic guidance appliances and adjusted periodically during follow-up to accommodate progressive improvement in mandibular movements.

Results: After three months of rehabilitation, mandibular deviation decreased from 8 mm to 3 mm in the first patient and from 10 mm to 4 mm in the second. Both patients demonstrated improved intercuspation, masticatory efficiency, speech, and facial symmetry without prosthesis-related complications.

Conclusion: Early prosthodontic intervention using appropriately selected mandibular guidance prostheses effectively reduced mandibular deviation and restored functional occlusion following hemimandibulectomy. Prosthesis selection should be guided primarily by the patient's ability to voluntarily reposition the mandible rather than by the extent of the surgical defect alone.

Keywords: *Hemimandibulectomy; Mandibular deviation; Guide flange prosthesis; Palatal ramp prosthesis; Maxillofacial prosthetics; Oral squamous cell carcinoma.*

I. INTRODUCTION

Oral squamous cell carcinoma (OSCC) is among the most prevalent malignancies affecting the oral cavity and frequently requires surgical resection to achieve adequate oncologic clearance. Depending on the extent of disease, treatment may involve marginal, segmental, or hemimandibulectomy, resulting in varying degrees of functional and esthetic impairment. [1,2]

Loss of mandibular continuity following hemimandibulectomy produces a characteristic deviation of the residual mandibular segment toward the resected side because of the unopposed action of the contralateral muscles of mastication, scar contracture, altered neuromuscular coordination, and loss of proprioceptive feedback. Consequently, patients experience impaired mastication, compromised speech, dysphagia, drooling, facial asymmetry, and a marked reduction in quality of life. [3–6]

Successful rehabilitation of mandibular discontinuity defects requires a multidisciplinary approach involving maxillofacial surgeons, prosthodontists, physiotherapists, and speech therapists. During the early postoperative healing period, before definitive reconstructive surgery or implant-supported rehabilitation can be undertaken, mandibular guidance therapy plays an essential role in minimizing deviation, preserving functional mandibular movements, and facilitating neuromuscular re-education. [2,4,7]

Several prosthetic designs have been described for the management of mandibular deviation, including mandibular guide flange prostheses, maxillary palatal ramp prostheses, twin occlusion prostheses, and implant-assisted rehabilitation. The selection of an appropriate guidance prosthesis depends on multiple clinical factors, including the degree of mandibular deviation, the patient's ability to voluntarily reposition the mandible, the remaining dentition, and the extent of associated soft tissue loss. [4,7–10]

A mandibular guide flange prosthesis is generally indicated in patients who are able to manually position the mandible close to the desired intercuspal relationship but are unable to reproduce it consistently during function. In contrast, a maxillary palatal ramp prosthesis provides passive mechanical guidance and is particularly useful in patients with severe mandibular deviation and limited neuromuscular control. [4,8–10]

Heat-polymerized acrylic guidance prostheses remain a practical option for interim rehabilitation because they are economical, lightweight, relatively easy to fabricate, and can be readily modified during follow-up visits to accommodate progressive improvements in mandibular movements. Their adjustability makes them especially suitable during the postoperative healing phase before definitive rehabilitation is considered. [2,4,10]

Although both guide flange and palatal ramp prostheses are well established, reports directly illustrating the clinical decision-making process for selecting one prosthesis over the other during early postoperative rehabilitation remain limited. Therefore, the present case series describes two patients with mandibular discontinuity following hemimandibulectomy who were rehabilitated using different mandibular guidance prostheses based on the severity of mandibular deviation and the patient's ability to achieve a functional maxillomandibular relationship. The report highlights the clinical indications, fabrication procedures, and functional outcomes associated with each prosthetic approach. [4,10,11]

CASE REPORT 1

A 55-year-old male patient was referred to the Department of Prosthodontics three weeks after undergoing a right-sided hemimandibulectomy for the management of oral squamous cell carcinoma. The patient complained of inability to achieve proper occlusion, difficulty in mastication, deviation of the mandible during opening and closure, and impaired speech. No prosthodontic rehabilitation had been initiated following surgery.

Extraoral examination revealed facial asymmetry with deviation of the chin toward the resected side during mandibular movements (Figure 1). Intraoral examination demonstrated a healing surgical defect with obliteration of the buccal vestibule in the resected region, loss of mandibular continuity, and adequate healing of the surgical site (Figure 2). The remaining dentition exhibited satisfactory periodontal support without clinically significant mobility and was considered suitable for prosthetic rehabilitation.

Clinical assessment demonstrated approximately 8 mm deviation of the mandibular dental midline from the maxillary midline at maximum intercuspation. However, gentle manual guidance enabled the patient to achieve a reproducible functional maxillomandibular relationship, suggesting adequate neuromuscular adaptability and making the patient an appropriate candidate for mandibular guidance therapy using a guide flange prosthesis. This treatment modality has been recommended for patients who can voluntarily or manually achieve a functional intercuspal relationship but are unable to reproduce it consistently during function.

Clinical Procedure

Preliminary impressions of the maxillary and mandibular arches were made using irreversible hydrocolloid impression material in perforated stock trays. During the same appointment, the mandible was manually guided into the maximum attainable intercuspal position, and an interocclusal record was obtained. The impressions were poured in Type III dental stone to obtain diagnostic casts (Figure 3).

A reinforcing substructure was fabricated using 19-gauge stainless steel orthodontic wire and adapted on the mandibular cast. The framework incorporated retentive arms around the mandibular first premolar and first molar to reinforce the acrylic guide flange. An Adams clasp was fabricated on the mandibular second premolar to provide additional retention. The maxillary and mandibular casts were mounted on a mean-value articulator using the recorded interocclusal relationship (Figure 4).

Modeling wax was adapted over the wire framework to fabricate the denture base and guide flange. The guide flange was contoured on the articulator to establish contact with the buccal surfaces of the opposing maxillary posterior teeth, thereby providing a predetermined path of mandibular closure into the desired intercuspal position. Following verification of the wax pattern, the prosthesis was processed using heat-polymerized polymethyl methacrylate resin by conventional flasking, dewaxing, packing, curing, finishing, and polishing procedures (Figure 5). Similar reinforcement of acrylic guide flange prostheses using stainless steel wire has been advocated to improve rigidity and resistance to functional stresses.[11]

At the insertion appointment, retention, stability, tissue adaptation, and occlusion were evaluated. Minor selective adjustments of the guide flange were carried out using acrylic trimming burs until a smooth and reproducible path of mandibular closure into maximum intercuspation was achieved without premature occlusal contacts or soft tissue impingement (Figure 6). Pressure-indicating paste was used to identify areas requiring relief before final delivery of the prosthesis. The patient received instructions regarding prosthesis hygiene, insertion and removal, and mandibular guidance exercises consisting of repeated opening and closing movements in front of a mirror to facilitate neuromuscular re-education.

Follow-up

The patient was reviewed after 24 hours, one week, one month, and three months. At each visit, occlusion and mandibular movements were evaluated, and minor selective adjustments of the guide flange were performed whenever required to maintain functional guidance.

After three months of rehabilitation, mandibular deviation reduced from approximately 8 mm to 3 mm, with marked improvement in intercuspation, masticatory efficiency, speech, and facial symmetry. The prosthesis remained stable throughout the observation period, and no complications such as mucosal ulceration, clasp distortion, or prosthesis fracture were observed. The patient expressed a high level of satisfaction with both the comfort and functional outcome of the prosthesis.

CASE REPORT 2

A 42-year-old male patient was referred to the Department of Prosthodontics one month following a left-sided hemimandibulectomy performed for the management of oral squamous cell carcinoma. The patient complained of marked mandibular deviation toward the resected side, inability to achieve satisfactory occlusion, difficulty in mastication, impaired speech, and facial asymmetry. These functional limitations had considerably affected his dietary intake and quality of life.

Extraoral examination revealed deviation of the chin toward the resected side during mandibular closure with noticeable facial asymmetry (Figure 7). Intraoral examination demonstrated a well-healed surgical defect with loss of mandibular continuity and obliteration of the buccal vestibule on the operated side. The remaining dentition exhibited satisfactory periodontal support and was considered suitable for prosthetic rehabilitation (Figure 8).

Clinical evaluation demonstrated approximately 10 mm deviation of the mandibular dental midline from the maxillary midline at maximum intercuspation. Unlike Case 1, repeated manual guidance failed to position the mandible into a stable functional occlusal relationship, indicating poor neuromuscular control and a greater degree of muscular imbalance. Considering the severity of deviation and the patient's inability to consistently achieve intercuspation, a maxillary palatal ramp prosthesis was selected to provide passive mechanical guidance during mandibular closure. This treatment approach has been recommended in patients with severe mandibular deviation who are unable to voluntarily reposition the mandible into a functional occlusal relationship.

Clinical Procedure

Preliminary impressions of the maxillary and mandibular arches were made using irreversible hydrocolloid impression material in perforated stock trays. During the same appointment, the mandible was manually guided into the maximum attainable functional occlusal position, and an interocclusal record was obtained. The impressions were poured in Type III dental stone to obtain diagnostic casts.

The maxillary and mandibular casts were mounted on a mean-value articulator using the recorded interocclusal relationship. C clasps were fabricated on the maxillary first premolars, while Adams clasps were fabricated on the maxillary first molars to provide adequate retention of the prosthesis. Modeling wax was adapted over the maxillary cast to fabricate an interim acrylic guidance prosthesis, and a palatal ramp was developed in the premolar–molar region of the non-resected side. The inclination, width, and height of the ramp were contoured on the articulator to establish a predetermined guiding surface that redirected the mandibular teeth into the desired intercuspal position during closure. Following verification of the wax pattern, the prosthesis was processed using heat-polymerized polymethyl methacrylate resin by conventional flasking, dewaxing, packing, curing, finishing, and polishing procedures (Figure 9).

At the insertion appointment, retention, stability, tissue adaptation, and occlusion were evaluated (Figure 10). Minor selective adjustments of the palatal ramp were performed using acrylic trimming burs until smooth mandibular guidance into a reproducible functional occlusal relationship was achieved without premature occlusal contacts or soft tissue impingement. Pressure-indicating paste was used to identify areas requiring relief before delivery of the prosthesis (Figure 11). The patient received instructions regarding prosthesis maintenance, oral hygiene, and mandibular guidance exercises involving repeated opening and closing movements in front of a mirror to facilitate neuromuscular adaptation. Similar protocols have been described for early postoperative rehabilitation using maxillary guidance appliances.

Follow-up

The patient was reviewed after 24 hours, one week, one month, and three months. At each follow-up appointment, mandibular movements, occlusal contacts, and prosthesis stability were evaluated. Minor selective adjustments of the palatal ramp were performed whenever required to accommodate the improving mandibular path of closure and maintain effective functional guidance.

After three months of rehabilitation, mandibular deviation decreased from approximately 10 mm to 4 mm. The patient demonstrated improved intercuspation, enhanced masticatory efficiency, clearer speech, and improved facial symmetry during mandibular closure. The prosthesis remained stable throughout the observation period without complications such as mucosal ulceration, clasp distortion, or prosthesis fracture. The patient reported substantial improvement in oral function and overall satisfaction with the prosthetic rehabilitation.

II. DISCUSSION

Rehabilitation of mandibular discontinuity defects following hemimandibulectomy is challenging because loss of mandibular continuity disrupts the normal balance of the stomatognathic system. Deviation of the residual mandibular segment toward the resected side has been attributed to the unopposed action of the contralateral muscles of mastication, scar contracture, altered neuromuscular coordination, and loss of proprioceptive feedback. These changes can compromise mastication, speech, swallowing, and facial symmetry.[2,4–6]

Early prosthodontic rehabilitation is intended to establish a reproducible functional path of mandibular closure before progressive scar maturation and neuromuscular adaptation make correction more difficult. Mandibular guidance prostheses have therefore been described as training appliances that facilitate neuromuscular adaptation rather than simply replacing missing structures. [4,6] In the present cases, guidance therapy was initiated within one month of surgery and was accompanied by repeated mandibular opening and closing exercises and periodic prosthesis adjustment.

The principal clinical consideration in these cases was mandibular reducibility. In Case 1, gentle manual guidance allowed the patient to reach and reproduce a functional maxillomandibular relationship; a mandibular guide flange was therefore selected to provide active guidance during closure. In Case 2, repeated manual guidance failed to produce a stable functional relationship and the deviation was greater; a maxillary palatal ramp was selected to provide passive mechanical guidance. This approach is consistent with established guidance-prosthesis principles, in which prosthesis selection is individualized according to the patient's residual mandibular control, remaining dentition, and clinical anatomy.[4,5,12,13]

The biomechanical principles of guide flange and palatal ramp prostheses differ considerably despite their common objective of restoring functional occlusion. A guide flange prosthesis provides active guidance by contacting the buccal surfaces of the opposing maxillary teeth and directing the mandibular segment into the desired intercuspal position during closure. Conversely, a palatal ramp prosthesis provides passive mechanical guidance through an inclined palatal surface that redirects the mandibular teeth during closure in patients with limited voluntary neuromuscular control. Previous authors have emphasized that proper case selection is essential because successful rehabilitation depends on matching the prosthesis to the patient's functional ability rather than applying a single design to all mandibular discontinuity defects. [4,9,12,14.]

Both prostheses in the present report were fabricated using heat-polymerized polymethyl methacrylate resin because acrylic guidance appliances are economical, lightweight, relatively simple to fabricate, and can be readily modified during follow-up as mandibular function improves. Reinforcement of the mandibular guide flange with stainless steel wire provided additional rigidity without increasing prosthesis weight. Similar advantages of acrylic guidance prostheses have been reported in previous case reports and clinical series evaluating interim rehabilitation following mandibular resection. [7,12,15,16.]

Regular follow-up and mandibular guidance exercises constituted an important component of treatment in both patients. Repeated opening and closing exercises performed in front of a mirror facilitate proprioceptive feedback,

improve muscular coordination, and enhance neuromuscular re-education. Previous studies have consistently recommended combining physiotherapy with guidance prostheses to obtain predictable functional outcomes and reduce long-term mandibular deviation. [6,13.]

Both patients demonstrated progressive reduction in mandibular deviation together with improvements in intercuspation, masticatory efficiency, speech, and facial symmetry following three months of rehabilitation. These findings are consistent with those reported by Kar et al., Lingeshwar et al., and Patil et al., who observed favorable functional outcomes following early rehabilitation with mandibular guidance prostheses. More recently, a systematic review by Kumar et al. concluded that early prosthodontic intervention combined with patient-specific prosthesis selection remains the most predictable conservative approach for managing mandibular discontinuity defects, although the available evidence is largely based on case reports and small case series. [12,16,18,19.]

An important clinical contribution of the present report is the demonstration of a practical decision-making approach for selecting between a guide flange prosthesis and a palatal ramp prosthesis based on mandibular reducibility. Although both prostheses are well documented individually, comparatively few reports have highlighted the clinical reasoning underlying prosthesis selection in patients with similar surgical defects but differing neuromuscular capabilities. The present cases suggest that assessment of mandibular reducibility should be considered an essential component of treatment planning because it directly influences prosthesis selection, patient adaptation, and functional outcome. [4,10,18,19.]

The present case series has certain limitations. Functional improvement was evaluated primarily by clinical examination and measurement of mandibular deviation without objective assessment using three-dimensional jaw tracking, electromyography, or validated patient-reported outcome measures. In addition, the small sample size and short follow-up period limit generalization of the findings. Future prospective clinical studies incorporating larger patient cohorts, digital mandibular motion analysis, and standardized quality-of-life assessment are required to establish evidence-based guidelines for prosthesis selection following mandibular resection. [18–21.]

Within these limitations, the present case series demonstrates that early prosthodontic intervention using appropriately selected mandibular guidance prostheses effectively restores functional occlusion and reduces mandibular deviation following hemimandibulectomy. Selection of the prosthesis should be individualized and based primarily on mandibular reducibility, neuromuscular control, and remaining dentition rather than on the extent of the surgical defect alone.

Table 1. Objective clinical outcomes and prosthesis-selection findings in the two cases.

Parameter	**Case 1**	**Case 2**
Hemimandibulectomy side	Right	Left
Initial midline deviation	≈8 mm	≈10 mm
Deviation at 3 months	≈3 mm	≈4 mm
Absolute reduction	≈5 mm	≈6 mm
Clinical reducibility at presentation	Reproducible with manual guidance	Not reproducible with repeated manual guidance
Guidance prosthesis	Mandibular guide flange	Maxillary palatal ramp
Follow-up	3 months	3 months

Table 2. Proposed clinical decision framework for selection of a mandibular guidance prosthesis.

Clinical finding	**Clinical interpretation**	**Prosthesis considered**
Mandible can be manually positioned toward functional	Adequate functional reducibility	Mandibular guide flange

intercuspation and the relationship is reproducible		
Stable functional relationship cannot be achieved despite repeated manual guidance	Limited functional reducibility	Maxillary palatal ramp
After insertion	Reassess occlusion, mandibular path, tissue adaptation, and prosthesis stability	Selective adjustment, guidance exercises, and scheduled follow-up

III. CLINICAL SIGNIFICANCE

In patients with mandibular discontinuity following hemimandibulectomy, assessment of functional mandibular reducibility can help guide selection of an interim prosthesis. In these two cases, a mandibular guide flange was used when manual repositioning produced a reproducible functional relationship, whereas a maxillary palatal ramp was used when a stable relationship could not be achieved. This provides a practical framework for individualized early rehabilitation, but requires confirmation in larger prospective studies.

IV. CONCLUSION

Early prosthodontic guidance may help reduce mandibular deviation and re-establish a functional maxillomandibular relationship following hemimandibulectomy. In these two cases, prosthesis selection was based on clinical assessment of mandibular reducibility: the patient who could achieve a reproducible relationship with manual guidance received a mandibular guide flange, whereas the patient with limited reducibility received a maxillary palatal ramp.

Both patients demonstrated a reduction in clinically measured mandibular deviation over three months, with accompanying clinical improvement in intercuspation and functional complaints. Because this is a two-case report without standardized functional outcome measures or a comparison group, the findings should be considered descriptive. Larger prospective studies are required to determine whether mandibular reducibility can serve as a reliable criterion for guidance-prosthesis selection.

FIGURE LEGENDS

Figure 1. Preoperative extraoral photograph demonstrating facial asymmetry in Case 1.

Figure 2. Intraoral view showing mandibular discontinuity defect following right-sided hemimandibulectomy.

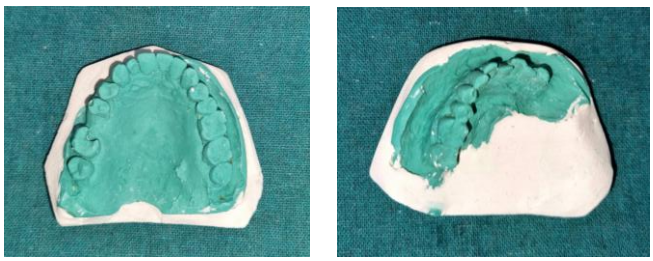

Figure 3. Diagnostic casts obtained after preliminary impressions.

Figure 4. Wire substructure and Adams clasp adapted on the mandibular cast.

Figure 5. Fabricated acrylic mandibular guide flange removable partial denture.

Figure 6. Intraoral insertion of the guide flange prosthesis demonstrating mandibular guidance.

Figure 7. Preoperative extraoral photograph of Case 2.

Figure 8. Intraoral view of mandibular discontinuity defect following left-sided hemimandibulectomy.

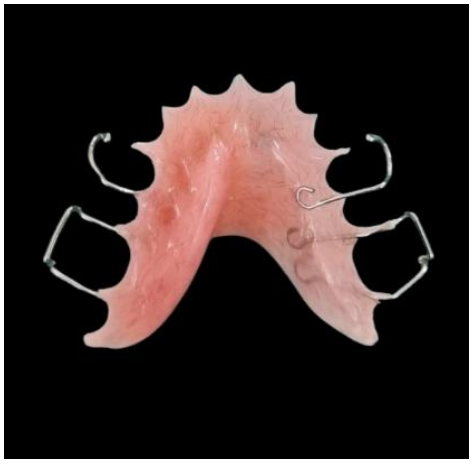

Figure 9. Fabricated acrylic maxillary removable partial denture with palatal ramp.

Figure 10. Intraoral view of the palatal ramp prosthesis.

Figure 11. Clinical outcome after prosthesis insertion demonstrating improved occlusal relationship.

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