

Integrated Obturator–Guiding Flange Prosthesis for Rehabilitation of an Acquired Aramany Class II Maxillary Defect with Post-Radiotherapy Trismus: A Clinical Case Report

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Abstract

Background: Maxillectomy performed for treatment of head and neck malignancies can leave patients with major functional problems, particularly when the resulting defect communicates with the nasal cavity. Speech, swallowing and mastication may be affected, and nasal regurgitation can become a significant complaint. These problems become more difficult to manage when the patient has also undergone flap reconstruction and radiotherapy, especially in the presence of trismus and altered mandibular movement. In such situations, prosthetic rehabilitation must address the defect while also providing adequate retention, stability and function.

Case presentation: A 57 year old woman was referred for prosthodontic rehabilitation following treatment for squamous cell carcinoma involving the right palate and retromolar trigone (RMT). She had undergone a right sided Commando procedure comprising wide local excision, right palatectomy, partial maxillectomy, upper alveolar resection and right modified radical neck dissection, followed by reconstruction with an anterolateral thigh free flap. Postoperative image guided radiotherapy was subsequently completed to a total dose of 60 Gy in 30 fractions. At presentation to the prosthodontic department, the patient had an extensive oro nasopharyngeal communication, approximately 1.5 cm of maximum interincisal opening and marked rightward deviation of the mandible during closure. The defect was classified as an Aramany Class II maxillary defect. A single unit, hollow obturator with an integrated palate buccal guiding flange was fabricated. The palatal component was designed to seal the communication, while the guiding flange was incorporated to redirect the deviated mandible during closure. C-clasps provided direct retention from the remaining dentition. The final prosthesis weighed 13.0 g.

Outcome: The prosthesis successfully sealed the oro nasopharyngeal communication. The patient reported cessation of nasal regurgitation during swallowing and improvement in speech resonance. The guiding flange provided immediate mechanical guidance of the mandible toward a more centered functional occlusal position.

Conclusion: A lightweight hollow obturator incorporating a guiding flange can provide a practical single appliance solution when an acquired maxillary defect is accompanied by trismus and altered mandibular closure. Careful impression making, prosthetic design and use of the remaining dentition for retention are

important in achieving a stable and functional result.

Keywords: maxillary defect; obturator prosthesis; Aramany Class II; hollow obturator; guiding flange; trismus; maxillofacial prosthodontics; mandibular deviation, Retromolar trigone (RMT).

1. Introduction

Surgical treatment of oral and maxillofacial malignancies can leave patients with defects that affect much more than appearance. When the oral and nasal cavities are no longer adequately separated, patients may experience hypernasal speech, nasal regurgitation and difficulty with swallowing and mastication. Prosthodontic obturation is widely used to restore this separation and help re-establish oral function in patients with acquired maxillary defects.^[1-8]

The design of the obturator depends largely on the size and location of the defect, the remaining teeth, available support and the condition of the surrounding tissues. Aramany classified partially edentulous maxillectomy defects according to their relationship with the remaining dentition, providing a useful framework for prosthesis design.^[1,2] In a Class II defect, the defect is unilateral and the remaining contralateral teeth can provide important support and retention.

Large maxillary defects can, however, create another problem: prosthesis weight. A conventional solid obturator may require a considerable amount of acrylic resin to occupy the defect. The resulting weight can increase gravitational dislodgement and place additional demands on the remaining retentive structures. Hollow obturator designs have therefore been described as a way of reducing prosthesis weight while maintaining the required external contour.^[9-14]

Some patients also develop marked mandibular deviation following extensive surgery because of altered anatomy, scar formation and disruption of muscular balance. In such situations, restoring the defect alone may not be enough. Guiding flange and palatal ramp prostheses have been used to provide a mechanical pathway for mandibular movement and help the patient establish a more favorable path of closure.^[15-18]

Trismus adds another layer of difficulty. Restricted mouth opening can make conventional impression procedures, tray insertion and removal, and placement of the final prosthesis more challenging. Modified impression techniques have therefore been described for patients with complex maxillectomy defects and limited oral opening.^[19]

This case report describes the prosthodontic rehabilitation of a patient with an acquired Aramany Class II maxillary defect, postradiotherapy trismus and marked mandibular deviation using a **single unit, ultra lightweight hollow obturator incorporating an integrated palato buccal guiding flange**.

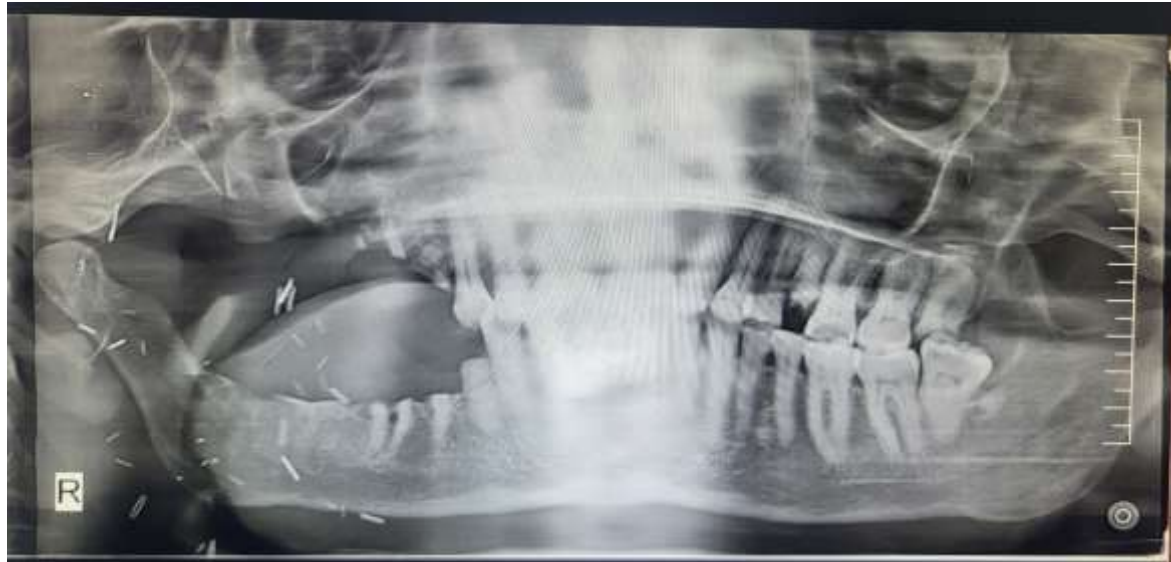
2. Case Presentation

A 57 year old woman was referred to the Department of Prosthodontics for rehabilitation following treatment for squamous cell carcinoma involving the right palate and retromolar trigone. The available clinical record describes a cT_{4a}N_{3b}M₀ lesion. She underwent a right sided Commando procedure consisting of wide local excision, right palatotomy, partial maxillectomy, upper alveolar resection and right modified radical neck dissection. Reconstruction was carried out using a microvascular anterolateral thigh free flap. The patient subsequently received postoperative image guided radiotherapy to a total dose of 60 Gy in 30 fractions.

At the time of prosthodontic evaluation, the patient had an extensive postoperative oro nasopharyngeal communication. Clinical examination showed contraction and marginal breakdown of the reconstructed

flap with exposure of structures within the nasal cavity. She also had significant trismus, with a maximum interincisal opening of approximately 1.5 cm.(Figure 3) A marked rightward deviation of the mandible was noted during closure.

Figure 1:Pre-prosthetic panoramic radiograph demonstrating the postoperative surgical changes and remaining dentition.



A panoramic radiograph was obtained as part of the pre-prosthetic assessment. The radiograph demonstrated the postoperative right maxillary/mandibular region with evidence of previous surgical intervention and the remaining dentition available for prosthetic support and retention. Surgical clips were also evident within the cervical and operative regions. (Figure 1)

The patient complained of severe nasal regurgitation of fluids and hypernasal speech. These symptoms were attributed to the absence of an effective separation between the oral and nasal cavities.

Based on the unilateral nature of the defect and the remaining contralateral dentition, the defect was classified as an **Aramany Class II maxillary defect**.^[1] (Figure 2)

Figure 2: Pre-treatment intraoral view Figure 3:Pre-treatment extraoral view



demonstrating the acquired oro-nasopharyngeal communication and postoperative alteration of the palatal tissues.



demonstrating severe restriction of mouth opening, with an interincisal distance of approximately 15 mm or 1.5 cm.

The treatment plan was designed around several practical objectives: to close the oro nasopharyngeal communication, reduce nasal regurgitation, improve speech resonance, obtain adequate retention from the

remaining dentition, keep the prosthesis as light as possible, accommodate the limited mouth opening, and provide guidance for the deviated mandible during closure.

3. Prosthodontic Procedure

3.1 Impression making

Due to the patient's restricted mouth opening, a conventional stock tray could not adequately record the extent and details of the defect. A preliminary impression was therefore made using irreversible hydrocolloid with a stock tray. (Figure 4) A diagnostic cast was obtained from this impression and used to fabricate the first custom tray. A second impression was then made using irreversible hydrocolloid with the first custom tray to obtain a more detailed reproduction of the defect and surrounding structures.

The second custom tray was used for the definitive impression. The depth and extent of the defect were first recorded using green-stick impression compound. Following application of tray adhesive, a medium-body elastomeric impression material was used as a wash to obtain the definitive impression of the defect and remaining supporting tissues.^[9] (Figure 5)

The definitive impression was poured in Type III dental stone to obtain the master cast. The cast clearly reproduced the extent of the unilateral defect and the available remaining dentition, which was subsequently used for prosthesis design and direct retention. (Figure 6).

The master cast was surveyed to determine the path of insertion and to identify suitable undercut areas for direct retention. The survey also assisted in evaluating the position of the remaining teeth and establishing the orientation of the prosthesis in relation to the defect. (Figure 7).

3.2 Maxillomandibular relationship

The maxillomandibular relationship was recorded at the patient's functional vertical dimension. Because the mandible deviated significantly to the right during closure, manual physioguidance was used to guide the mandibular midline toward the facial midline, to the extent that this position could be achieved comfortably and reproducibly.

The maxillary and mandibular casts were subsequently mounted on a semi adjustable articulator to facilitate prosthesis fabrication and accurately incorporate the guiding flange in relation to the patient's deviated mandibular path of closure.

4. Prosthesis Design

The final prosthesis was planned as a single unit maxillary appliance with four main components: an obturating palatal portion, a hollow bulb, an integrated guiding flange and clasps.

4.1 Obturating component

The palatal component was designed to occupy the defect and establish an effective seal of the acquired oro nasopharyngeal communication, thereby restoring separation between the oral and nasal cavities. Its extension was kept as conservative as possible while ensuring adequate obturation and minimizing pressure on the reconstructed tissues.

4.2 Hollow bulb design

The size of the defect meant that a conventional solid obturator would have required a substantial amount of acrylic resin. A hollow design was therefore selected to reduce the weight of the prosthesis. The hollow cavity was created using the lost salt technique, in which salt was incorporated within the wax pattern and subsequently removed after polymerization to create the internal hollow space. Hollow obturator techniques have been described extensively as a means of reducing prosthesis weight while maintaining

the required external contours and adequate acrylic thickness.^[9-14] Reducing prosthesis weight is particularly important in extensive maxillary defects, where gravitational forces may contribute to prosthesis displacement and compromise retention. In the present case, the final prosthesis weighed 13.0

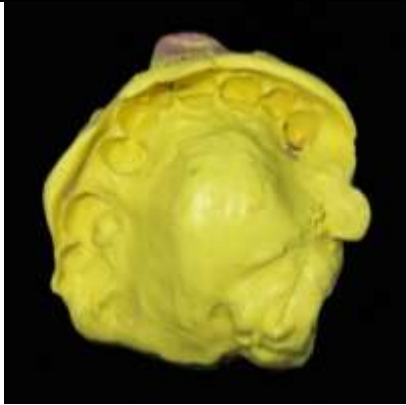


Figure 4:Primary impression made with irreversible hydrocolloid using the first custom tray, demonstrating recording of the maxillary arch and the postoperative defect.

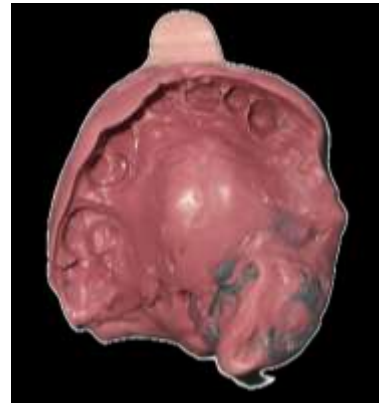


Figure 5:Definitive maxillary impression. The defect was initially recorded and its depth/extent established using green-stick impression compound, followed by a medium-body elastomeric impression wash after application of tray adhesive.



Figure 6:Master cast obtained from the definitive impression, demonstrating the extent and depth of the postoperative maxillary defect and the remaining dentition available for prosthetic retention.



Figure 7:Surveying of the master cast to determine the path of insertion and identify suitable areas for direct retention.

Guiding flange

The principal feature of the prosthesis was the incorporation of a **palatobuccal guiding flange directly into the maxillary obturator**. The patient presented with a marked rightward deviation of the mandible during closure, secondary to the extensive surgical alteration.

Therefore, obturation of the maxillary defect alone would not have addressed the patient's complete functional problem.

An inclined guiding ramp was incorporated on the nondefect side of the obturator and positioned to contact the buccal surfaces of the opposing mandibular teeth during closure. As the patient closed, the inclined surface provided a controlled mechanical pathway for the deviated mandible, guiding it toward a more favorable and reproducible functional position.

The important feature of this design was that **mandibular guidance and defect obturation were achieved within the same prosthesis**. Conventional obturation addresses the anatomical communication, whereas a guiding flange addresses the altered mandibular path.^[15-18] In the present case, these two functions were deliberately combined into a single removable maxillary appliance.

This approach was particularly relevant because the patient also had severe trismus, with a maximum interincisal opening of approximately 1.5 cm. The use of a single appliance eliminated the need for a separate guiding prosthesis and simplified insertion and removal in a patient with restricted oral access.

4.4 Retention

C-clasps were adapted to selected remaining contralateral teeth and incorporated into the prosthesis to provide direct mechanical retention. In view of the extensive postoperative defect and limited supporting anatomy, utilization of the remaining dentition was essential for achieving adequate retention and stability of the obturator.

5. Laboratory Fabrication

After completion of the definitive impression and fabrication of the master cast, the planned design was transferred to the working cast.

The wax pattern included the palatal obturating component and the guiding flange as a single unit. The guiding flange was shaped on the articulator according to the recorded mandibular pathway and the relationship with the opposing dentition. (Figure 8)

The clasps were adapted to the selected teeth and incorporated into the wax pattern. The defect portion was designed as a hollow bulb to minimize the amount of acrylic resin needed, fabricated using lost salt technique.

The prosthesis was subsequently processed in heatpolymerized acrylic resin, finished and polished.

The final appliance consisted of a single acrylic prosthesis with the hollow obturating component, integrated guiding flange and direct retentive clasps.



Figure 8: Wax pattern of the maxillary prosthesis on the master cast, demonstrating the extent of the obturating component over the surgical defect and its relationship with the remaining dentition.



Figure 9: Processed hollow obturator demonstrating the lightweight hollow design of the defect-obturing component and the integrated guiding flange with direct retentive clasp assemblies.



Figure 10: Measurement of the final prosthesis weight using a digital weighing scale, demonstrating a weight of 13 g.

6. Insertion and Adjustment

The completed prosthesis was inserted and evaluated clinically for retention, stability, adaptation to the defect and relationship with the remaining dentition.

Particular attention was given to the reconstructed tissues because of the patient's previous surgery and radiotherapy. The obturating component was checked for adequate closure without excessive pressure on the surrounding tissues.

The guiding flange was adjusted to establish an appropriate relationship with the opposing mandibular dentition during closure. The aim was to provide guidance without interfering unnecessarily with mandibular movement or other oral functions. The final prosthesis weighed **13.0 g**. (Figure 10)

7. Clinical Outcome

Following insertion, the prosthesis successfully bridged the oronasopharyngeal communication. The patient reported immediate cessation of nasal regurgitation during swallowing and an improvement in speech resonance.

The guiding flange provided immediate mechanical guidance of the mandible toward a more centered functional occlusal position during closure. (Figure 11)

The use of a single appliance also meant that a separate mandibular guiding prosthesis was not required. This was particularly useful in a patient with restricted mouth opening, where insertion and management of two separate appliances could have added another practical difficulty. The clinical photographs demonstrate the progression from defect recording and cast fabrication through prosthesis processing and final intraoral placement.



Figure 11: Intraoral view of the completed maxillary obturator in situ, demonstrating adaptation of the obturating component, direct retention with C-clasps, and the integrated guiding flange in relation to the opposing mandibular dentition.



Figure 12: Frontal intraoral view of the completed obturator in situ, demonstrating direct retention with C-clasps and the relationship of the prosthetic guiding component with the opposing mandibular dentition.

8. Discussion

The rehabilitation of a patient following maxillectomy is rarely limited to replacing missing tissue. In many cases, the prosthesis has to compensate for several changes at once: an acquired communication, altered tissue contours, reduced support, changes in muscle function and, sometimes, restricted mouth opening.

That combination was evident in the present case. The patient had an extensive postoperative communication, postradiotherapy trismus and a pronounced rightward mandibular deviation. The prosthesis therefore had to solve more than one problem.

The clinical significance of the present case lies not in the use of an obturator or a guiding flange individually, both of which are established prosthodontic concepts, but in their functional integration into a single maxillary prosthesis. In this patient, the same appliance restored the oralnasal separation while simultaneously providing mechanical guidance of a markedly deviated mandible.

This integrated design transformed the obturator from a prosthesis that merely occupied the defect into a functional appliance that simultaneously addressed the defect and the altered mandibular path of closure.

8.1 Restoring oralnasal separation

An effective obturator should establish a functional separation between the oral and nasal cavities while remaining stable during speech and swallowing. Previous studies have shown that obturator function influences several important areas of daily life, including pronunciation, mastication, swallowing and overall quality of life.^[5-8, 20, 21]

In the present patient, nasal regurgitation and hypernasal speech were prominent complaints. The palatal portion of the prosthesis was therefore designed primarily around achieving an effective seal of the acquired communication.

The immediate cessation of nasal regurgitation reported by the patient after insertion highlights the importance of establishing this seal.

8.2 Why a hollow obturator?

A large maxillary defect creates a relatively large prosthetic space. Filling that space completely with solid

acrylic can result in a heavy appliance. The additional weight can work against retention, particularly in a unilateral defect.

The hollowbulb concept has been used for decades for precisely this reason. Nidiffer and Shipmon first described the hollow bulb obturator for acquired palatal openings, and subsequent authors have described different methods for producing lightweight hollow prostheses.^[9-14]

In this case, the hollow design resulted in a final prosthesis weighing only **13.0 g**.

Although the weight reduction itself is not a new concept, it was particularly useful in this patient because the prosthesis had to remain stable despite a large surgical defect and limited supporting anatomy.

8.3 The challenge of trismus

The patient's approximately 1.5cm mouth opening significantly influenced the clinical procedure. Conventional impression making could have been difficult because the tray would have had to pass through a restricted oral opening and subsequently be removed without traumatizing the surgical tissues. Modified impression techniques have been described in maxillectomy patients with trismus, including techniques designed to improve access to deep or irregular defects.¹⁹

In the present case, a custom tray allowed the defect to be recorded while respecting the restricted opening and the condition of the reconstructed tissues. This was not simply a technical modification; it was dictated by the patient's clinical anatomy.

8.4 Managing mandibular deviation

The second major challenge was the patient's altered mandibular path. Extensive surgery can alter the relationship between the mandible and surrounding soft tissues, and postoperative scarring or loss of normal muscular attachments can contribute to deviation.

Guiding flange prostheses have traditionally been described for patients with mandibular resection and subsequent deviation.^[16-18] Palatal ramp prostheses have also been reported as an approach to postsurgical mandibular deviation.^[15]

In the present case, rather than using a separate mandibular appliance, the guiding component was incorporated into the maxillary obturator. The inclined palate buccal ramp contacted the opposing mandibular dentition during closure and provided a mechanical guide toward a more centered pathway.(Figure 12) This was particularly relevant because the patient had very limited mouth opening. Combining the two functions in one appliance simplified prosthesis management and avoided the need to insert two separate prostheses.

8.5 Retention in a unilateral defect

Retention is a major consideration in maxillary obturator treatment because the appliance is exposed to both gravitational and functional forces.^[1,8]

The remaining contralateral teeth in this patient were therefore used directly through C-clasps. This allowed the available dentition to contribute to retention without adding an unnecessarily complex framework to an already large prosthetic design.

8.6 Rationale for the integrated hybrid design

The significance of the present prosthesis lies not in the individual use of a hollow obturator or a guiding flange, both of which are established prosthodontic approaches, but in the **integration of these functions within a single lightweight maxillary prosthesis**.

The prosthesis was designed to address the patient's multiple, interrelated functional problems simultaneously. The palatal component restored separation between the oral and nasal cavities, the hollow configuration minimized prosthetic weight, the remaining contralateral dentition provided direct retention,

and the integrated guiding flange addressed the patient's altered mandibular path of closure. Thus, a single removable appliance provided both **anatomical rehabilitation of the defect and functional guidance of mandibular movement**.

This integrated approach was particularly relevant in the present case because the extensive surgical defect, altered tissue anatomy, and severe trismus limited conventional prosthetic options. Incorporating the guiding component into the obturator also avoided the need for a separate mandibular guidance appliance, thereby simplifying insertion, removal, and day to day management.

The defining feature of the prosthesis was therefore the integration of obturation and mandibular guidance within a single removable maxillary appliance.

8.7 Effect of previous radiotherapy

Previous radiotherapy also influenced treatment planning. Irradiated tissues may be more susceptible to trauma and may complicate prosthetic rehabilitation. Studies evaluating patients with maxillary defects have reported an association between radiotherapy and poorer functional or quality of life outcomes in some groups.^[6, 21]

For that reason, careful impression making, conservative prosthesis extension, attention to tissue pressure and regular follow up are important. The removable nature of the present prosthesis also allowed the reconstructed area to remain accessible for inspection and hygiene.

8.8 Limitations

This is a single case report, and the clinical findings cannot be generalized to all patients with acquired maxillary defects.

The reported functional improvements were based on clinical assessment and the patient's experience rather than standardized quantitative measures of speech, swallowing or mandibular movement. Long term follow up would also be useful to determine whether the improvement in mandibular guidance is maintained and to assess the long term condition of the reconstructed tissues and retentive teeth.

9. Conclusion

The present case describes the rehabilitation of an acquired Aramany Class II maxillary defect complicated by post radiotherapy trismus and marked mandibular deviation.

A single unit, ultra lightweight hollow obturator with an integrated palate buccal guiding flange was used to address the patient's anatomical and functional requirements simultaneously. The palatal component restored separation between the oral and nasal cavities, while the guiding flange provided a mechanical pathway for mandibular closure. The hollow design minimized prosthetic weight, and the remaining dentition was used to provide direct retention.

The case demonstrates the value of individualized prosthetic design when conventional rehabilitation is complicated by extensive surgery, radiotherapy, limited mouth opening and altered mandibular movement.

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