

CAD CAM Aided Hollow Bulb Obturator – A Technical Case Report

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Abstract: A rewarding area of Prosthodontics is the rehabilitation of patients with acquired maxillary defects. The utilization of obturator prostheses stands as the foremost therapeutic approach for rectifying acquired maxillary defects. Obturator is the prosthesis used to close a congenital or acquired tissue opening, primarily of hard palate and or contiguous alveolar structures. This intervention yields enhancements in speech, mastication, swallowing, and facial aesthetics, accomplished through the restoration of oro-nasal separation. Moreover, obturator prostheses have demonstrated the capacity to ameliorate patients' psychological well-being and overall quality of life. Notably, hollow bulb obturators offer advantages such as reduced weight, increased retention, and that prevents fluid and food accumulation. This clinical report describes the prosthetic approach employed in rehabilitating an acquired palatal defect specifically of type IV per the Aramany classification employing definitive hollow bulb prosthesis, utilizing CAD/CAM technology.

Keywords: CAD/CAM, Definitive Obturator, Hollow Bulb Obturator, Maxillary Defect, Weightless Denture.

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I. INTRODUCTION

In the dynamic realm of dentistry, rapid technological process has significantly reshaping the conventional dental practices. At the forefront of this transformation is dental CAD CAM technology – a ground breaking innovation that has revolutionized the way dental procedures are conducted, leading to enhanced precision, efficiency and overall treatment.

The utilization of obturator prosthesis stands as the foremost therapeutic approach for rectifying acquired maxillary defects. This intervention yields enhancements in speech articulation, mastication, swallowing, and facial aesthetics, accomplished through the restoration of oro-nasal separation. Moreover, obturator prostheses have demonstrated the capacity to ameliorate patients' psychological well-being and overall quality of life.

II. OBTURATOR

Obturator is a maxillofacial prosthesis used to close a congenital or acquired tissue opening, primarily of the hard palate and/or contiguous alveolar/soft tissue structures.[1]

Ambroise Pare was probably the first to close a palatal defect in the early 1500s.

He uses two mechanisms. In one variation he used a sponge in the upper surface of the prostheses.

Once the sponge gets moistened by secretion it swells up and holds the Prostheses in place. And in another variation he used a turn buckle type of mechanism to hold the Prostheses in place. [2]

III. CLASSIFICATION OF OBTURATORS [3]

- According to phase of treatment:
 - Surgical obturator
 - Interim obturator
 - Definitive obturator
- According to physiological movement:
 - Static
 - Functional

- According to location:
 - Lateral or buccal obturator
 - Alveolar obturator
 - Hard palate obturator
 - Soft palate obturator
 - Palatal lift obturator
 - Pharyngeal obturator
- According to type of attachment:
 - Fixed obturator
 - Hinged obturator
 - Meatus obturator
 - Detachable obturator
 - Magnetically retained obturator
 - Implant retained obturator
- Depending on material used:
 - Metal obturator
 - Resin obturator
 - Silicon obturator

IV. HOLLOW BULB OBTURATORS

One of the main problems of an obturator maxillary prosthesis is weight, the larger the defect the heavier the prosthesis. The weight of the obturator can act as a dislocating force; hence the prosthesis should be as light as possible. The approach we follow is to create the obturator, the bulb of which is hollow, which significantly enhances the retention, decrease the weight of the prostheses, supports the content of the orbit and prevents ophthalmic complications like diplopia, enophthalmos. It decreases the pressure to the surrounding structures and aid in deglutition. [4]

V. CASE REPORT

A 70 year old female patient reported to the department for the rehabilitation of posterior maxillary defect, who was operated for squamous cell carcinoma after being diagnosed and confirmed by biopsy. The patient presented with an obvious nasal twang, difficulty in speech and deglutition.

On intraoral examination, a class IV maxillary defect as per the Aramany classification[5] was seen on the left side of the palate. The defect showed its extension from the canine region to the posterior aspect of the hard palate. The mediolateral extension was from midpalate region to the buccal vestibule and superiorly extends into the floor of the orbit. The patient had a partially dentate maxillary arch.

Owing to such unfavorable conditions, it was necessary to plan a prosthesis that would be light and easy to wear. So the treatment plan was made to rehabilitate the patient with definitive hollow bulb obturator with Cobalt chromium cast metal framework utilizing CAD CAM technology.

VI. FABRICATION OF PROSTHESES

As per the planned design, the obturator prosthesis was to be retained by 2 embrasure clasps and canine extension. Rest seats were prepared on molars and premolars. (Fig 1) Guide planes were prepared on the distal proximal surface of canine which prevents rotational dislodgement of the prostheses and disengagement of retentive clasp assembly.[6]



Fig-1 Prosthetic Mouth Preparation

The design of the Prostheses should be in linear configuration. Support is gained from center of all the remaining teeth. Retention is gained from buccal aspects of premolars and molar and within the maxillary defect; retention is gained from the undercuts of residual hard and soft palate, lateral scar band and anterior nasal aperture. Stability is gained from the bracing component of the prosthetic framework.[6]

Primary impression was taken using irreversible hydrocolloid alginate impression material. Custom tray was fabricated on the primary cast with self cure acrylic resin. Using impression compound, the tray was extended to cover the defect. Followed by border molding is done using green stick compound and final impression was made using alginate in custom tray.

Once the master cast was obtained , it was scanned using a dental scanner where surveying and blocking out of the virtual digit cast and design of major and minor connectors were made . The buccal clasp arms are outlined to the desired clasp contour and shape and then support bars are then added to the digital framework at the anterior and posterior segments. (Fig 2)

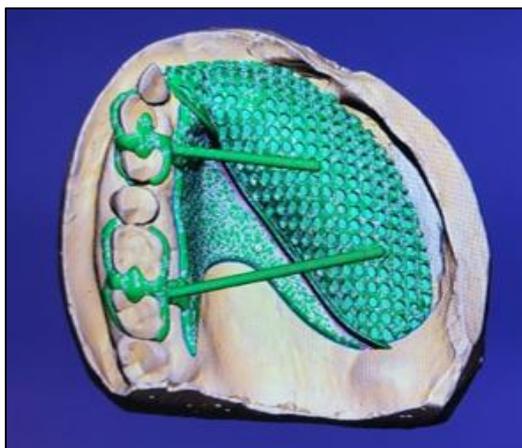


Fig-2 CAD Designing

The main benefits of introducing cad cam in fabrication of framework involves Automatic determination of proposed path of insertion, removal of undesirable undercuts and rapid identification of desirable undercuts , reduced fabrication time , improved functional & esthetic results and improved quality of fits.

Wax pattern were prepared using CAD CAM milling machine (Fig 3) and they were casted conventionally with a Cobalt chromium metal alloy. (Fig 4) The metal framework was tried in patient's mouth to evaluate the fit with underlying structures.[7]

Occlusal rims were constructed on the framework. Bite registration were made. The acrylic teeth were arranged and the wax trial was done to verify the occlusion.

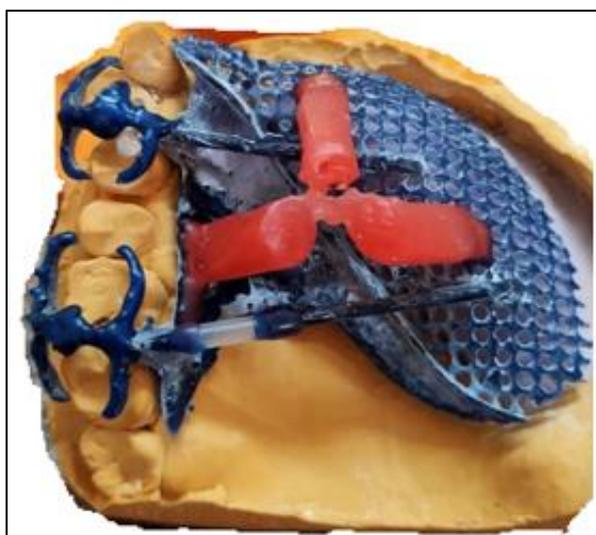


Fig-3 Milled Wax Pattern

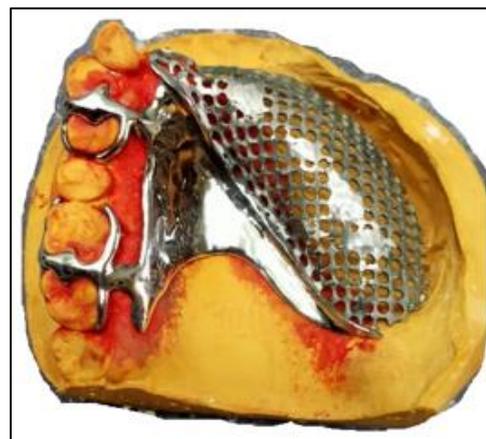


Fig-4 Metal Framework

Then the denture was invested in the denture curing flask and acrylized to fabricate hollow bulb obturator using lost salt technique. During packing procedure, the heat cure acrylic resin is placed in the base and the counter flask with salt interposed between the two layers of heat cure acrylic resin in the defect area. The clamped mould was cured with short curing cycle for 90 mins at 74 degree C followed by boiling at 100 degree C for 60 mins.[8]

Once the curing was completed, the salt is retrieved by making a small hole in the Prosthesis which is then closed with self cure acrylic resin.

VII. DISSCUSION

Wu and Schaaf reported hollowing the obturator significantly reduce the weight of prosthesis from 6.55 – 33.06%. Even though the open hollow obturators have advantages of hygiene facilitation, ease of fabrication and better speech, it still have the problem like accumulation of mucous, food and fluids causes bad taste and odour.[9]So the closed hollow obturators are better in prevention of fluid and food collection, provide maximum extension and reduce air space.[10]

For hollowing the obturator different materials are being used in literature, they are wax shim, sugar, acrylic resin shim, polyurethane foam, plaster matrix, cellophane, wrapped asbestos, silicone putty, light body coated gauze, thermocol, dental stone, play dough, salt, gelatin soap, and alum. In this present case, salt is used for its advantages like low cost, simple technique, and there will be no residual crystals left after curing.[11]

According to Aramany, obturator design for class IV, the design is linear. Support is located on the centre of all remaining teeth. Retention is located mesially on the premolars and palatal on the molars. Stabilizing components are palatal on the premolars and buccal on the molars.[6]

P.Rohit et al. conducted an invite study on reliability of electronic surveyor and concluded that the master cast can be scanned with the help of multislice helical CT scan. The undercut depth, height of the contour and guiding plane are viewed in multiple angles. So, in this case, casts are scanned and surveying is done with digital surveyor and designing is made.[12]

With the help of CAD/CAM technology the desired framework design is milled with wax resin. This SLS technology provides better fit compared to conventional wax pattern. Then the milled wax is conventionally casted with cobalt chromium alloy.[13]

Different alloys are being used for fabrication of metal framework such as type IV gold, chrome cobalt chromium, titanium and recently peek. In this case, cobalt chromium alloy is used because of its excellent mechanical properties and lower cost. [14]

VIII. CONCLUSION

Embracing CAD/CAM technology is not just a trend; it is a gateway to transforming the future of dental restorations. Stay ahead of the curve and unlock the full potential of your dental practice by embracing this remarkable technological advancement.

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