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CLINICAL REPORT

Fabrication of an Interim Closed Hollow Bulb Obturator Prosthesis with Frozen Saline: A Modified Technique

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ABSTRACT

Maxillary defects can be congenital or acquired in nature. Anatomical defects may be created between oral and the nasal cavity due to surgical resection and patients are usually faced with difficulties while performing normal functions such as speaking and swallowing, due to the communication formed between the cavities. Rehabilitation of the defect site with an obturator prosthesis assists in achieving these goals reducing the morbidity and thereby improving the psychological state of the patient. While rehabilitating these large defects, one of the main problems is with the weight of the prosthesis. The prosthesis may become bulky and non-retentive due to its weight. To overcome these difficulties hollow bulb obturators fabricated using different techniques. Also, a closed obturator design has been found to be advantageous over the open type as it prevented the seepage of oral and nasal secretions into the hollow space thereby helping in easy maintenance of the prosthesis. This case report deals with a simplified method for fabrication of an interim obturator with closed hollow bulb design for a 75-year-old male patient with a Class I Aramany's defect.

Keywords: Rehabilitation, Obturator, Hollow Bulb.

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INTRODUCTION

Defects of the orofacial region can be debilitating for an individual as it impairs the normal form and function of the stomatognathic system. These defects may be congenital or acquired in nature[1,2]. Frequently adopted technique is ablative surgical therapy for the control of abnormal growths in the oral cavity and other malignancies. The postsurgical effect can be serious as the stomatognathic system is disturbed by the loss of form and function and also the facial contour.

Postsurgical maxillary defects result in fluid leakage through the nose and hypernasal speech, including the possibility of aspiration[3]. Patients with maxillary defects often encounter problems with mastication and speech due to the presence of oroantral communication. Prosthodontic treatment mainly aims at closing the oro-nasal compartments thereby reducing the nasal regurgitation and hypernasal speech. An obturator prosthesis helps in rehabilitating such situations[1,2].

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An obturator according to the GPT - 9 is defined as " A maxillofacial prosthesis used to close a congenital or acquired tissue opening, primarily of the hard palate or contiguous alveolar or soft tissue structures"[4]. The obturator can be given during different phases of rehabilitation as surgical, interim or a definitive prosthesis. The hollow design of the obturator has significant advantages over the non- hollow variant as it considerably reduced the overall weight and thereby helped in better retention of the prosthesis. Also, the closed type hollow bulb was found to be better when compared to the open type as it prevented the entry of oral and nasal secretions into hollow space and helped in easy maintenance of the prosthesis by the patient[5,6]. The degree of extension of an obturator in the defect site depends on factors like the extent of the defect, resiliency of the lining tissue and the need for achieving basic functional requirements like support, retention and stability.[7].

Various techniques have been proposed for the fabrication of hollow bulb obturators [8]. Schneider used crushed ice to create a matrix inside the bulb to maintain the hollowness during processing[9]. Matalon and Parel used sugar whereas Srinivasan et al in their study fabricated the hollow bulb portion using the lost salt technique.[10,11] .Other materials were also incorporated to create the hollowness. Chalian used an acrylic resin shim in the defect area whereas Tanaka et al incorporated polyurethane foam[12,13].

In this case report, a modified technique has been described for fabrication of an interim closed hollow bulb obturator processed using a single base -double counter pour technique and custom frozen saline for the fabrication of the hollow bulb.

Case Report

A 75-year-old male patient reported to the Department of Prosthodontics for the rehabilitation of an extensive maxillary defect. The patient reported with the complaint of difficulty in breathing for the past 6 months. The patient was diagnosed with squamous cell carcinoma of the left maxillary sinus. The lesion was extending superiorly to the floor of the orbit, posteriorly till medial and lateral pterygoid plates, medially crossing the midline involving hard palate and laterally till the zygomatic arch. The patient had a Class I Aramany's maxillary defect. Primary and secondary impressions were made of the defect site and master cast was poured in type IV dental stone. Bite registration and the wax trial procedures were done and the retentive clasp was given on teeth 17 and 18 in the trial denture. The processing of the hollow bulb obturator was carried out using a single base-double counter pour technique and custom frozen saline was used for the fabrication of the bulb portion.

TECHNIQUE

Impression, Maxillomandibular Relation and Denture Trial:

• Primary impression was made of the defect site using impression compound and irreversible hydrocolloid (Zelgan plus, Dentsply India Pvt. Ltd, Gurgaon) (Figure 1). The custom tray was fabricated using self polymerized acrylic resin(DPI-RR Cold cure, Dental Products of India, Mumbai), green stick compound(DPI Pinnacle Tracing sticks, Dental Products of India) was used for border moulding and then 0.5 mm of material was scraped off on the surface of the green stick compound. Once the material was scraped off, the tray adhesive material was added onto the surface of acrylic resin and green stick compound. Then secondary impression was made using light body addition silicone material(Reprosil, Dentsply International, Milford). The master impression thus obtained was poured using Type IV gypsum product to obtain the master cast.

•The master cast was then duplicated using reversible hydrocolloid material agar-agar(Castogel, BEGO and Co, Germany) after blocking out the unfavourable undercuts.

•The occlusal rim was fabricated over a self polymerized acrylic denture base resin(DPI-RR Cold cure, Dental Products of India) by blocking out the defect region completely in the duplicated master cast using aluminium foil.

•Then jaw relation registration was made and teeth setting was done in the anterior region for the aesthetic purpose and a flat occlusal table was provided on the posterior surface with wax.

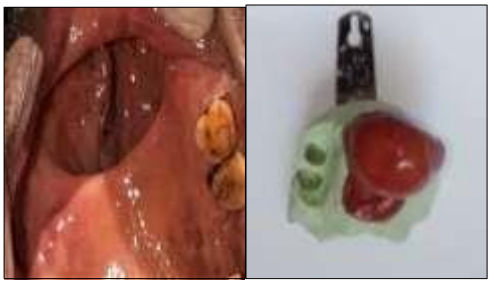

Figure1: (a) Showing the intraoral defect site, (b) Diagnostic impression of maxilla made using impression compound and alginate

Fabrication of the Hollow Bulb using the First Counter Pour

•Type II plaster was used to block out unfavourable undercuts in the defect site and at the tooth portion

of the master cast for the easy removal of the counter pour after flasking procedure.

•Putty consistency addition silicone was adapted along the walls of the defect and over the dentulous portion of the cast. The adaptation of putty within the defect space ensured a smooth even finish for the inner portion of the hollow bulb. It helped in maintaining a thin space for the heat polymerized resin and also facilitated the easy removal of the counter portion of the flask from the defect space during the flasking and processing stages. (Figure 2).

Figure 2: Adaptation of putty along the defect space and dentulous portion of the cast

•Flasking of the master cast (blocked in the dentulous region and over defect region to create a mould space for heat processed acrylic resin to flow) to the base of the flask was completed using Type II Dental Plaster. Separating medium (Cold mold seal, DPI, Mumbai) was applied and the first counter was poured. Once the plaster was set the counter portion of the flask was separated from the base pour. The putty silicone which was adapted over the defect site was then removed(Figure 3).

Figure 3: (a) Counter portion of the flask, (b) Master cast in the base pour with the puttyremoved from the defect space

•On both the halves of the flask, separating medium was reapplied and allowed to dry. Heat polymerized acrylic resin (Heat cure acrylic, Dental Products of India, India) was placed over the defect area and a trial closure was performed to remove the excess material extending beyond the defect border(Figure 4). The counter portion of the flask(first counter) was repositioned over the base of the flask and clamps were tightened. Processing of the bulb portion was done by subjecting it to a short curing cycle(74˚ C for 2 hours and 100 ˚C for an additional one hour).

•After processing was complete, the flask was removed from the water bath and bench cooled for 30 mins. Subsequently, the flask should be immersed in cool tap water for 15 mins. The counter portion of the flask was carefully retrieved from the master cast.

Figure 4: Packing of heat cure acrylic resin

Fabrication of the Interim Obturator using Second Counter Pour

•The trial base containing the denture teeth was transferred to the master cast in the base of the flask and were waxed up. The waxed up trial base and the clasps were sealed onto the master cast which contained the previously cured hollow bulb (Figure.5). After applying separating medium to the base pour, the second counter pour was carried out and flasking was completed using Type II dental plaster.

•The dewaxing procedure was completed by placing the flask in boiling water for 4 minutes and the counter and base portion of the flask were separated. The bulb portion was filled with saline and kept for freezing in a refrigerator. The use of custom frozen saline reduced the freezing point of ice making it colder and reduced the rate at which the ice melted . This helped in prolonging the working time for maintaining the hollowness of the obturator(Figure.6). Separating medium was applied to both parts of the flask and allowed to dry. Heat polymerized acrylic resin was placed on the second counter containing the denture teeth and the base of the flask was placed over it and tightly secured with help of a clamp. Processing of the heat polymerized resin was carried out by

following a short curing cycle as mentioned previously. After the bench curing the final prosthesis was carefully retrieved from the master cast, finished and polished (Figure.7).

Figure 6: (a)Hollow bulb filled with frozen saline after the dewaxing procedure, (b) second counter lid with acrylic teeth and clasps after dewaxing

•Saline incorporated within the bulb was drained after perforating the bulb portion using 701 carbide bur and the outlet was sealed with light polymerized acrylic resin.

Figure 7:Final interim obturator prosthesis

•The finished and polished interim obturator was inserted in the patient's mouth. The patient is on a regular follow up and has been reviewed for the last 6 months (Figure.8 a,b)

Figure.8(a)Pre-operative photograph (b) Post – operative photograph

DISCUSSION

Cysts or tumors can be managed by surgery, It is the Prosthodontist's role to restore the function and aesthetics for maxillofacial patients who suffer from functional as well as facial deformity. In patients with a maxillectomy defect, the primary goal is to give prosthetic obturation which will close the defect and separate the oral cavity from sinonasal cavities. Degree of impairment and difficulty in prosthetic rehabilitation is influenced by defect size and location. Most commonly followed treatment modality is the use of maxillary obturator prosthesis than surgical reconstruction as it is less invasive, easily accepted by the patient and easy to fabricate and maintain[14]. The bulb extension of the obturator helps in facilitating speech by providing resonance to the voice. Bulb extension can be open hollow, closed hollow or solid type. The most preferred is the hollow bulb obturator due to its reduced weight and the better speech by adding resonance to the voice. There will be an increase in retention, better patient acceptance and comfort due to the significant decrease in the weight of the obturator[15]. Closed hollow bulb obturator is better compared to the open type as it prevents the seepage of oral and nasal fluids into the hollow space thereby helping in better maintenance by the patient[16].

Wu et al in their study found that there is a reduction in the prosthesis weight from 6.55% to 33.06% by using hollow bulb obturators [17].

The processing of the bulb portion can be done with the oral portion of the prosthesis or can be separately fabricated and joined later with light or chemically polymerizing acrylic resin[18,19]. There are various techniques which have been used in the fabrication of obturator in one piece or two pieces [20]. The advantages of one-piece obturator are: it is hygienic and there are no lines of demarcation between the bulb portion and the denture base portion.

In this case, the bulb portion was fabricated initially and used as a receiver for the custom frozen saline which was used for maintaining the hollowness and joined with the oral portion using heat polymerized resin. The obturator which was completely fabricated of heat polymerised acrylic resin minimized the staining, reduced leakage and also increased the longevity and durability of the prosthesis. The custom made frozen saline space created here allowed for uniform space to be maintained in the bulb portion, unlike the crushed ice which may collapse and get merged with the resin in previous techniques [9]. Charles et al in their study used frozen water for creating the hollowness of the bulb [21]. But in tropical weather conditions, it is difficult to maintain the hollowness of the bulb as frozen freshwater melts at a relatively faster rate. The use of frozen saline helped in achieving suitable working time as it reduced the freezing point of ice by making it colder and melt at a lower rate. However, the reduction in the freezing point of ice meant a longer time duration for the freezing process to complete.

CONCLUSION

This modified technique can be employed for the fabrication of a lightweight closed hollow bulb obturator prosthesis using heat polymerized acrylic resin. The custom frozen saline used in this study helped in maintaining the hollow space of the bulb during the final processing.

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