

Low Volume Salivary Reservoir in Complete Denture Prosthesis for Xerostomia

Manas Singh¹, Anchal Deep¹, Khurshid A Mattoo^{2*} and Roma Goswami³

¹Department of Prosthodontics, MPMS University, India

²Department of Prosthodontics, Jazan University, Saudi Arabia

³Department of Prosthodontics, Subharti University, India

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Corresponding author:

Khurshid A Mattoo,
Department of Prosthodontics, Jazan
University, Saudi Arabia,
Email: drkamattoo@rediffmail.com

ABSTRACT

Diabetes mellitus is a metabolic syndrome that affects most of the systems of the human body. Xerostomia is a common complication which is compounded if the patient is elderly. Denture wearing in such cases is difficult since it is very uncomfortable. The denture can be modified, however, to accommodate a reservoir for salivary substitute. An elderly male patient suffering from diabetes mellitus (type 1) sought complete denture prosthesis. A diagnosis of existing xerostomia was established through history taking and clinical examination. A low volume salivary reservoir was incorporated within the denture without the use of any expensive attachment and/or equipment. The reservoir consists of the hollowed palatal vault of the complete denture prosthesis on which a custom made snap-on lid was fabricated. Holes were provided on the lid to allow salivary flow. The patient was satisfied with the outcome of the complete denture prosthesis.

INTRODUCTION

Xerostomia is defined as a dryness of the mouth from lack of normal secretions [1]. It results due to changes in the amount and/or composition of saliva. It is essentially one of the major complication of one of the most common endocrine disorders namely diabetes. Xerostomia may or may not be associated with hyposalivation which is considered to appear when salivary flow rates are less than 0.1 ml/min at rest or 0.7 ml/min under stimulation [2]. Therefore, xerostomia can even occur in patients with normal salivary flow [3]. Diabetes Mellitus (DM), is a metabolic disorder that has affected about 29 million people in the United States alone and is a serious health care concern globally [4]. Xerostomia in uncontrolled diabetes is a result of dehydration that results due to symptoms of polyuria, polydipsia, autonomic dehydration and certain drugs [5]. In elderly patients, xerostomia is also a natural consequence of the aging process since there is atrophy of the salivary gland and reduction of salivary production as a result of aging [6].

Completely edentulous patients with underlying diabetes are not conducive for implant supported prosthesis, and the option of conventional complete denture poses hazards since existing xerostomia compromises denture wearing. Various objectives of impression making in such cases cannot be achieved without the presence of

adequate saliva. Besides normal functions, dentures can in fact cause trauma to the tissues if the dentures are worn on dry mucosa. In order to provide a moist oral environment, various approaches have been employed which include dietary measures, salivary stimulants, patient counselling and use of salivary substitutes like artificial saliva [7]. In complete denture prosthodontics, use of locks, magnets and precision attachments have been used to create a salivary reservoir [8-10]. However use of such attachments are technique sensitive and are not economically viable for a large number of patients, especially those living in the low income countries. This case report describes a simple low volume reservoir fabrication in a complete denture that does not require any sort of attachment.

CASE REPORT

An elderly male patient aged 74 years was referred by the department of oral medicine and diagnosis to the department of prosthodontics with chief complaint of inability to masticate food. The patient was suffering from diabetes mellitus (type 1) since last fifteen years. The patient was a farmer by occupation, used to smoke, but had left since 5 years, used to still work in his fields. Dental history revealed that the patient had been completely edentulous seven years back. He had been wearing a complete denture for a year, but had to discontinue because of oral tissue intolerance. Extra oral examination revealed no negative clinical finding except the patient's skin was pigmented generally, including his body (Figure 1A). Intra oral examination disclosed well-formed maxillary and mandibular completely edentulous residual alveolar ridges with no other significant negative clinical finding except the entire mucosa was dry and pale white in color. Further questioning revealed that the patient had difficulty in eating food in terms of increased duration of swallowing, dry lips and mouth, dysphagia, halitosis, mucositis and speech difficulty. The diagnosis established was that of completely edentulous maxillary and mandibular residual alveolar ridges with existing uncontrolled and involuntary xerostomia. Treatment options presented to the patient were fabrication of a complete denture with a custom made reservoir since the patient could not afford expensive treatment options like precision attachment designed complete denture prosthesis.

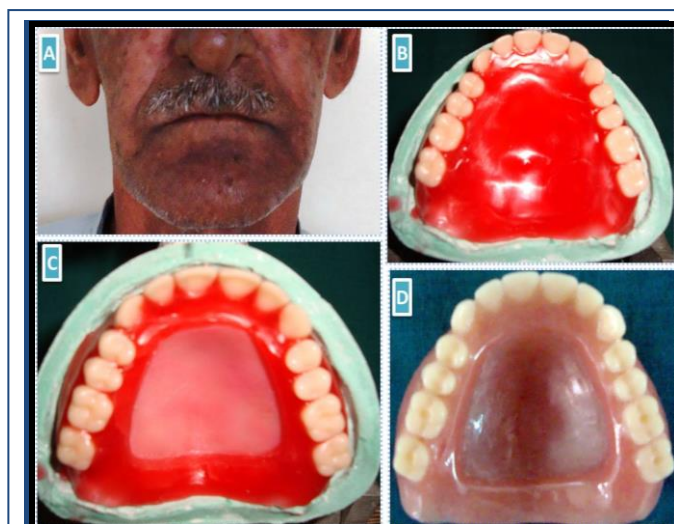


Figure 1: A) Extra oral view of the patient B) Completed trial denture C) Carved reservoir with margin lock in wax D) Maxillary processed denture with reservoir.

Procedure

- 1) Preliminary impressions for maxillary and mandibular arches were made using irreversible hydrocolloid impression material on a perforated complete edentulous stock tray made of stainless steel. Custom tray borders were molded using a low fusing compound following which final impressions were made using zinc oxide eugenol impression paste.
- 2) Routine clinical and laboratory procedures for fabrication of the complete denture prosthesis with balanced occlusion were done till the stage of denture trial (Figure 1B). The trial denture at this stage was then modified by removing the wax over the denture base on the palatal surface of the maxillary denture (Figure 1C). Denture base thickness was limited to less than 2 mm in this region.
- 3) The sides of the carved reservoir were then provided with a snap-on type of lock by carving the wax from under the borders. This creates a ledge that extends mesially from all sides. The maxillary denture is then processed using a routine laboratory method for denture processing.
- 4) The complete denture was finished and polished (Figure 1D).
- 5) On the processed denture a lid was fabricated using extra hard pink wax (Moyco Industries, Inc, Philadelphia, PA). The corresponding snap on lock mechanism was carved at the borders of the lid by extending the wax above and below the existing ledge created within the denture (Figure 2A).

6) After verifying the fit of the lid, the same was then processed in clear acrylic heat cure denture base resin (DPI-Heat cure, Dental products of India Ltd, Mumbai, India). The processed lid was then finished and polished (Figure 2B). Small holes were then made in the lid to allow flow of water from the reservoir.

7) The denture with salivary reservoir was then checked intraorally for its function (Figure 2C) and the occlusion was checked for denture stability (Figure 2D). The patient was asked to report on multiple follow up visits since adjustments in the denture were mandatory. The patient reported regularly for follow up visits and was successfully wearing the complete denture prosthesis with extreme satisfaction.

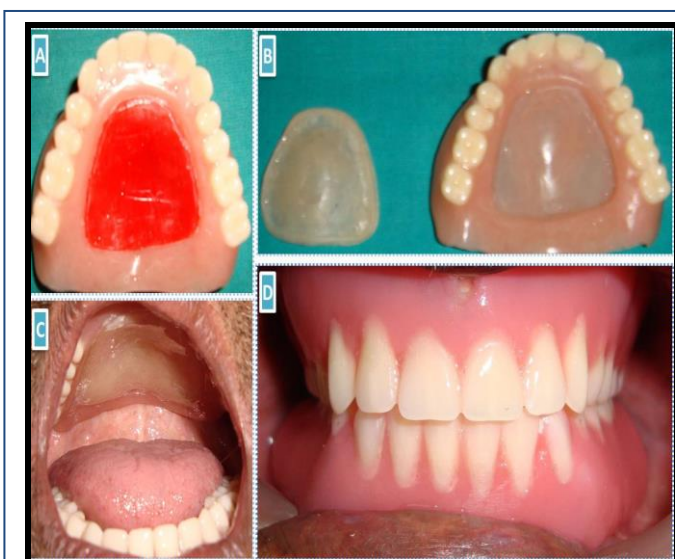


Figure 2: A) Processed maxillary denture with salivary reservoir lid in wax B) Processed maxillary denture with salivary reservoir and lid C) Intra oral view of denture D) complete denture in occlusion.

DISCUSSION

Xerostomia is the subjective experience of oral dehydration, which may not be necessarily, be associated with a decrease in quantity of salivary flow [2]. However, diabetic patients have been shown to have a decreased salivary flow [11]. With increased age, the salivary glands are more prone to the deleterious effects of disease, medication and radiotherapy [12]. Xerostomia is a common complication of diabetes and the prevalence of xerostomia has been reported to be between 38.5% to 53% of children and adolescents with diabetes mellitus type 1 [13]. Xerostomia in diabetes is thought to be

due to damage to salivary gland parenchyma, altered microcirculation to the salivary gland, increased dehydration and more importantly disturbances of glycemic control [6,14].

Complete denture fabrication in patients with existing xerostomia poses a challenge to both dentist and the patient. The objectives of an impression like retention and stability entirely depend upon the presence of saliva, which keeps oral mucosa constantly moist. Denture wearing becomes traumatic in absence of saliva and various authors have suggested different techniques for incorporating a salivary reservoir within a complete denture. Use of precision attachments have [8,9] have been criticized for hygiene maintenance problems. Similar problems arise when using a resilient liner for salivary reservoir [15]. The technique mentioned in this article is simple and inexpensive and does not require any special equipment or attachment. The technique is based on the principle of customized prosthesis which has been found to be inexpensive in the previous report [16]. The snap on type of the lock is effective and can be enhanced by the provision of a sliding lock as was done in this case. Denture hygiene maintenance is not a problem since the patient can remove the lid and clean the reservoir with a brush. Since it is a low volume reservoir, patients need to restore water levels frequently. Another problem is that the holes in the lid need to be kept in less numbers and that of small size. The sudden suction by the patient can remove all stored artificial saliva from the reservoir.

The reservoir for saliva can be placed in either the maxillary or the mandibular denture depending upon the clinical situation. Placement of a reservoir within the maxillary denture does not have any effect on the retention and stability of the denture since the reservoir opens towards the tongue. On the contrary, the reservoir when placed within the mandibular denture hampers its stability when the patient desires to suck the saliva from the denture. In such case, the patient has to stabilize the mandibular denture in order to affect the salivary suction. Such drawback is overcome when the maxillary denture is selected for providing a reservoir. Other distinct advantages of placing a salivary reservoir within the maxillary denture are larger reservoir size, well distributed salivary flow over entire mouth, no blockage of holes from the food [17].

Another issue in maxillary salivary reservoir with lid designs could be the possibility of patient losing the lid. Although the lid is removable, the patient was advised to limit the removal of the lid only during cleaning of the denture. Filling of the reservoir can be easily accomplished by filling with a 5ml disposable syringe through one of the holes provided within the lid. The possibility of the lid being swallowed by the patient is minimal since the lid design opens and closes in only one direction. The posterior displacement of the lid should be minimized while designing the lid. The uses of denture adhesives are not recommended to be used as a means of improving retention in improperly fabricated ill-fitting dentures [18]. Extra technical excellence should be practiced while fabricating complete denture prosthesis for medically compromised patients.

While Toljanic and Zucuskie [17] incorporated salivary reservoir in maxillary denture, Sinclair et al found mandibular denture to deliver saliva directly to the mucosa because of the influence of gravity [19]. Various other designs have been suggested in the literature. Sinclair et al [19] used magnets to connect reservoir parts. Mendoza and Tomlinson split the upper and lower parts in the mandibular denture although additional laboratory stages made their procedure time consuming [20]. Burhanpurwala et al prepared salivary reservoir in the mandibular denture using a single articulator but two flasks [21]. The drawbacks of these methods were overcome by the method described in this article by selecting the maxillary denture and designing a salivary reservoir that is not time consuming, does not need additional equipment, material or procedure and is effective in function.

CONCLUSION

The provision of salivary reservoir in complete denture prosthesis is a simple technical procedure that can be made during fabrication of prosthesis. The comfort of wearing the complete denture is enhanced by such features.

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CONFLICT OF INTEREST

The authors declare that they had no conflict of interest during the fabrication of the denture or during the publishing of this report.

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