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Original Research Article

An ingenious technique for functional palatal reservoir construction in complete dentures

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ABSTRACT

The retention, stability and comfort of wearing denture is greatly influenced by the flow, quantity and consistency of saliva. Insufficient salivary output results especially in old-aged edentulous patients may result in denture sores because of lack of lubrication by saliva, thus, reducing patient's ability to retain the prosthesis. Various approaches have been concernes with the use of reservoir with holes have been described in the literature. However the flow of salivary substitute is very difficult to control. Moreover the frequent cleaning of the denture required to maintain the patency of the reservoir holes poses various challenges to the patient. This article explains a novel technique for the incorporation of a reservoir with controlled salivary flow in complete denture to enhance the retention of the prosthesis and thus, improving the comfort of wearing denture and the speech of patient.

1. Introduction

The complete denture is a removable prosthesis that comprises of a denture base, the oral tissues and the salivary layer.[1] Saliva being a multifaceted medium serves many purposes in not only oral but also pharyngeal environment. It aids in the swallowing of food by its lubricating action, cleanses the dentition, acts as an immunological barricade and stimulates taste receptors. Saliva plays a crucial role in the retention of complete dentures.[2] Adequate quantity, flow and consistency of saliva determines the fit of denture bases to the supporting tissues.

According to Humphrey and Willianmson,[3] the funtions of saliva include:

1. Buffer capacity and remineralization
2. Lubricates oral mucosa
3. Maintainence of tooth integrity
4. Antibacterial activity
5. Taste and digestion
6. Irrigation and cleaning of teeth
7. Retention and comfort of denture

Salivary wetting mechanics is critical for the retention and stabilization of removable prostheses.[4] Presence of saliva creates cohesion (bond created by saliva between the oral mucosal epithelium and the denture base), adhesion (bond formed between saliva components) and surface tension (denture's ability to resist separation from tissues) that are interrelated and determine the fit of the prosthesis.[5]

The normal flow for stimulated saliva is above 1.5 to 2 ml/min. Unstimulated salivary flow rate is approximately 0.3 to 0.4 ml/min.[3] The diminished output of saliva from major as well as minor salivary gland is called "Salivary Hypofunction" and subjective complaint of dry mouth is known as Xerostomia. It may result as a manifestation of salivary gland disorders like sialothiasis, Sjogrens syndrome, due to the intake of certain medications (like pilocarpine, bromhexine), in medical conditions like diabetes mellitus, renal failure or as a result of head and

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neck radiation.[6] In case of Xerostomia patient care should be taken as tissue can be easily damaged and teared. Erosion and ulceration of mucosal tissues, increased incidence of dental caries, alteration in taste perception, loss of denture retention, difficulty in swallowing and mastication, gingivitis are some of the common the problems which are encountered due to less production of saliva.[7]

The decreased or complete absence of saliva as in case of xerostomia can be corrected by the use of salivary substitutes that can help in counteracting these problems.[8]However, continuous self-administration of these stimulants is required to restore ensure adequate salivary flow rate.[7] To overcome this problem in patients with xerostomia, various techniques have been cited such as incorporation of reservoirs with holes in the maxillary or mandibular dentures or both to ensure the consistent flow of salivary substitute in the oral cavity.[9]A salivary reservoir is an intraoral device that is incorporated into a removable prosthesis in order to allow the continuous release of salivary substitute into the oral cavity over a prolonged period of time so as to maintain the ecological balance.[10] Although these techniques have shown to be useful but they suffered from certain drawbacks such as poorly controlled flow rate of salivary substitute leading to the recurring refilling of the reservoir, obstructed flow of salivary substitute in the mouth because of the contamination of artificial saliva by the food particles that enter the reservoir through reservoir holes.[1]

This article highlights a technique that helps in the fabrication of a palatal reservoir for maxillary denture with controlled salivary flow.

2. Technique

1. The complete denture is to be constructed in a conventional method until the trial. Cobalt- chromium inlet tube about 10 mm in length and 2 mm in diameter is placed. The placement is done underneath the maxillary first molar acrylic teeth in such a way that it is inclined palatally passing from the buccal to the palatal surface.
2. Then a cobalt-chromium complete palatal plate is fabricated so that it has a thickness of 0.4 mm in thickness and 1 mm at the site joining the acrylic region.(Figure 1)
3. The denture is then processed and finished making sure that the patency of inlet tube is maintained and the occlusal errors are corrected.(Figure 2)
4. To create an external finish line, an undercut of 10^0 is fabricated 2 mm above the junction of the metal palate and acrylic resin.(Figure 3)
5. On the polished palatal surface, soft tissue liners are placed. The patient is asked to wear it for next 24 hours. This will help in contouring of the soft tissue liner functionally. The soft tissue liner that extends into the created undercut is removed. A plaster index is made over the contoured soft liner and a then a thin strip of modeling wax is adapted over the index's inner surface that extends upto the external finish line.(Figure 4)
6. In the middle one-third of first pattern, an oval shaped cut of about 1.5x1 cms dimension is made. Elevations about 0.5x0.25 cms in dimensions are made with wax along the sides of the cut which act as orientation ridges as shown in (Figure 5).
7. This pattern is duplicated with alginate and the second plaster index is made.(Figure 6)
8. The second wax pattern is made on the second plaster index covering the center portion of index extending onto the elevations.(Figure 7)
9. An adequate piece of rubber dam is taken to hold the acrylic plates in position which is then attached to the plates using self cured acrylic resin as shown.(Figure 8)
10. The entire setup is then placed in position corresponding to the undercut region in the denture and sealed securely with self cured acrylic resin.(Figure 9)
11. The second acrylic plate is slightly pushed up and the holes are made on the sides in the rubber dam with a straight probe.
12. The salivary reservoir is filled with artificial saliva by injecting through the inlet tube and is closed using a customized rubber stopper.(Figure 10)
13. The denture is then delivered to the patient and the stability of the denture is checked. The patient is trained to push up the inner acrylic plate with his tongue with the aid of the horizontal elevation in the second acrylic plate.(Figure 11a,b)
14. The patient is periodically reviewed and the no of holes are increased until adequate flow was achieved.
15. Proper instructions are provided for the patients regarding the denture care, as well as how to load, use and maintain the denture reservoir.

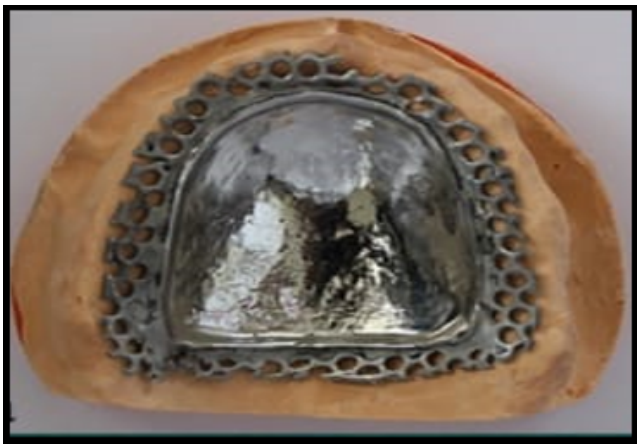

Fig. 1:

Fig. 2:

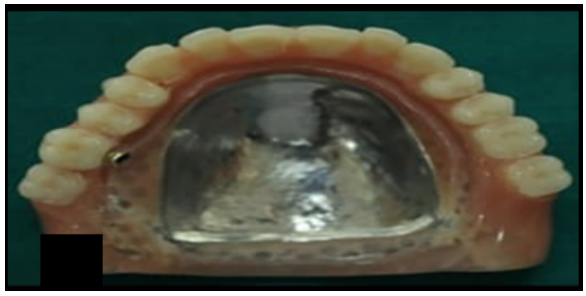

Fig. 3:

Fig. 4:

Fig. 5:

Fig. 6:

Fig. 7:

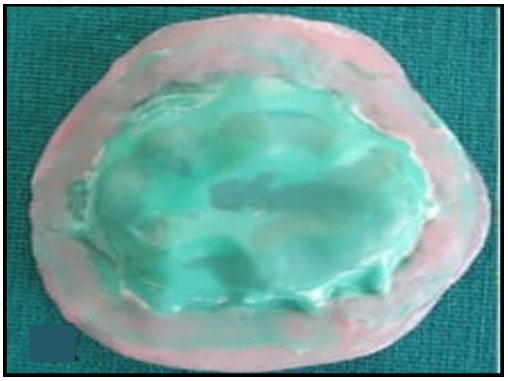

Fig. 8:

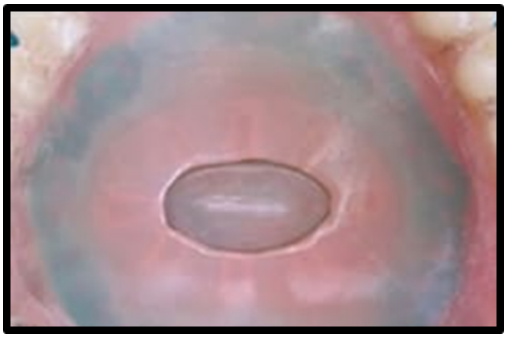

Fig. 9:

Fig. 10:

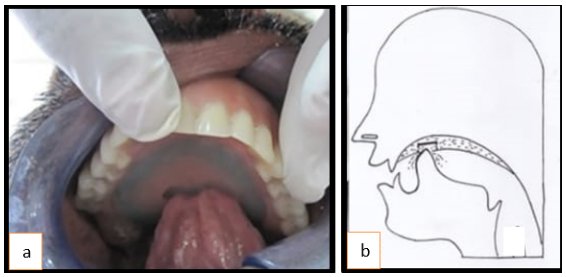

Fig. 11:

3. Discussion

Edentulous patients with conditions like xerostomia face various difficulties in normal function apart from dryness of mouth Xerostomia results in reduced surface tension which make the denture loose resulting in extreme discomfort and trauma to the patient. Due to the dryness of mouth, the tongue, buccal mucosa and the lips stick to the denture and thus, hamper the speech and masticatory functions of the oral cavity.

Researches have been conducted to solve this problem and various methods have been introduced. One of such method described in the literature is the use of salivary reservoir in complete and partial dentures. Modgi and Aras[11] described a technique for incorporation of saliva reservoir in the maxillary cast partial denture with the help of precision attachments in a patient with post-irradiation xerostomia. Female component of precision attachment was placed in complete coverage palatal major connector and male component was incorporated in the lid of the reservoir. But this technique had a drawback as the cost of treatment is very high if this precision attachment is to be used.

Similarly, Toljanic and Zucuskie[12] also placed a salivary reservoir in the maxillary denture. They concluded that it is better to incorporate a reservoir in maxillary denture than in mandibular denture owing to the larger size of the reservoir. The larger reservoir allows the flow of saliva to the entire territory of the mouth while in case of mandibular reservoir the flow of saliva gets restricted to the areas like the floor of mouth. Also the fluid and food in the floor of the mouth may result in blocking of holes in mandibular reservoir and cleaning is difficult.[13]

However in contrary to this concept, Sinclair et al[14] thought that the mandibular denture when used as a reservoir denture had the advantage of simple gravity feed system and the delivering the wetting agent directly to the mucosa. Also he highlighted that incorporation of reservoir in maxillary denture would result in additional weight which would eventually affect the retention and stability of the denture.

According to Sinclair et al[14] design and construction of the reservoir denture should fulfill three criteria:

1. Maximum space for the reservoir.
2. Minimum adjustments in the finished denture so that a maximally extended reservoir would not be perforated.
3. Provide ease of cleaning and refilling the reservoir.

The most crucial factor determining the decision for the fabrication of reservoir in the maxillary denture is the amount of inter-arch space present. If the palatal vault is shallow, the palatal reservoir is inadvisable. It is because of the increased palatal thickness that is required for the fabrication of palatal reservoir which would constrict the oral space and would interfere with speech and swallowing.[15] But if chrome-cobalt plate is used in the palatal aspect of denture, it reduced the palatal thickness and increases the space for the reservoir. Also metal dentures, if used, showed better retention and wetting characteristics than the acrylic resin denture.[11]

In patients with xerostomia, silicone impression materials are used as they are well tolerated and are less traumatic to the oral mucosa. Zinc oxide eugenol paste is not used as it will burn the oral mucosa. Materials like plaster of paris will adhere to the mucosa and abrade it and hence are also avoided.[9]

The average flow of saliva for a normal individual is 500-1500ml/day. The salivary denture reservoir will aid in maintaining the moisture in oral cavity. However, frequent intake of water by the patients is recommended.

4. Conclusion

This article highlights an innovative technique for the fabrication of a palatal salivary reservoir in patients with xerostomia that is easy to use and clean, durable and quite affordable for the patient and also ensures prolonged wetting of oral structures.

5. Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

6. Source of Funding

None.

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