

Reservoir Denture – A Ray of Hope to Xerostomia Patient: Case Report

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ABSTRACT

Background: Xerostomia can make the wearing of dentures very uncomfortable. To overcome this problem, techniques are developed to incorporate reservoirs within the dentures, with varying degrees of success. The present article is a case report of a patient suffering from Xerostomia, successfully treated by a reservoir denture with a modified technique. This split-denture could lubricate oral tissues efficiently and also was easily cleansed by the wearer.

Keywords: Xerostomia, reservoir, split-denture.

INTRODUCTION

The oral cavity is a moist environment. A film of saliva constantly coats its inner surface. Saliva plays an important role in maintaining the wellbeing of the mouth. It's the body's natural mouth rinse. Any variation in its production not only affects the health of the oral cavity but also interferes with the work of a Prosthodontist ¹. XEROSTOMIA is a condition with dryness of mouth, which is a clinical manifestation of salivary gland dysfunction. It occurs with a resting rate of saliva flow of 0.1ml/min or less.

The etiological factors are radiation-induced, ageing, systemic diseases, developmental abnormalities.

Different treatment modalities have been followed, which includes stimulation of salivary production locally by chewing gums, mints, paraffin and citric acid containing lozenges—systemic stimulation by Bromhexine, Anethole tritone (ANTT), Pilocarpine. Symptomatic treatment is by use of salivary substitutes like carboxymethyl cellulose or hydroxyethyl cellulose as lubricants^{2,3}. Reservoir denture offers prosthodontists an alternative

method of treating patients suffering from Xerostomia where other treatment modalities have failed⁴.

This article is a Case report of a patient who has been treated with split mandibular reservoir denture successfully.

CASE REPORT

A 65-year-old male patient came with a chief complaint (c/c) of difficulty in eating food, dryness of mouth, and frequent need to sip water. The patient had a history of smoking, about ten bidis per day for the past 20 years. His medical history indicated use of a number of medications for asthma, angina and hypertension. The patient is edentulous for one year. Extraoral examination revealed reduced vertical dimension of the face, hollow cheeks, unsupported lips, and mild distortion of speech on sibilant sounds (Fig 1). Intraoral examination revealed maxillary and mandibular edentulous residual ridges, and dry mouth (Fig 2).

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Fig 1: Extraoral features.



Fig 2: Intraoral features.



Fig 3: Trial dentures.



Fig 4: Putty impression of the mandibular trial denture and new denture base.



Fig 5: Wax trial denture.

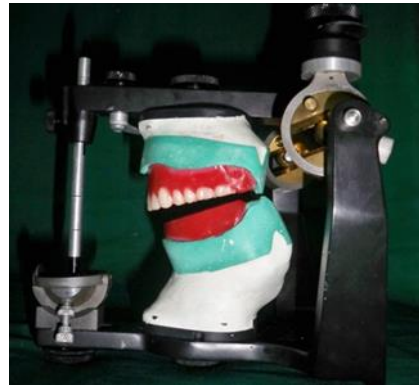


Fig 6: Wax denture reduced till the line.



Fig 7: Female attachments placed.



Fig 8: Lower half of the split denture in clear acrylic.



Fig 9: Duplicate cast of Fig 8.



Fig 10: Duplicate cast remounted using putty index.



Fig 11: Teeth arrangement for the upper half of split denture.



Fig 12: Split mouth denture.



Fig 13: Denture in patients mouth.



Fig 14: Reservoirs and outlet holes created.

To arrive at a diagnosis based on his c/c and history, mouth mirror test was performed at an interval of 10 minutes repeatedly and a provisional diagnosis of Xerostomia was made. Based on the findings, a mandibular split reservoir denture was planned. He was instructed to avoid dry foodstuffs, smoking of cigarettes as tobacco increases oral dryness, and use a salivary substitute till the final dentures were ready.

Procedure

Step 1

Preliminary impressions were made in the impression compound. Final impressions were made in light body elastomeric impression material as use of zinc oxide eugenol impression paste may cause burning sensation to the patient. Casts were poured and duplicated. The duplicate models were then marked as 'Model 2'.

Face bow transfer was made. Necessary maxillo-mandibular relations were recorded. The casts were then mounted, and the teeth were arranged for a try in (Fig 3). To allow a deeper area for the future placement of reservoirs, shorter teeth were used in the mandibular denture. The wax dentures were then tried in the mouth.

Step 2

An impression of the mandibular trial denture was made in putty material (Fig 4). A new mandibular denture base was made and inverted on the putty impression to check for the fit. Denture base was removed, and molten wax was poured in the impression, and the denture base was positioned over the molten wax to the exact fit. Thus, a duplicate wax trial denture was obtained.

Step 3

Now, it is required to construct the lower half of the split denture in clear acrylic with female attachments

Procedure-

The height of the clear acrylic base section had to be determined. This was done by measuring the anterior height of the mandibular trial denture. Then, the length of the lower anterior teeth plus two mm was considered for the upper half of the split denture allowing for sufficient strength under the teeth. This measurement was scribed on duplicated wax denture (Fig 5) as prepared in step 2, and the wax was removed to this delineator, with the occlusal surface as flat as possible (Fig 6). The female portions of five press-fit buttons were positioned in the wax with one anteriorly, one each in canine and one each in posterior regions. These were placed exactly in the centre of the wax base and kept parallel to each other. The female portions were submerged up to the occlusal edge of wax (Fig 7). The duplicated wax denture with female portions is now placed on model 2 and flaked, dewaxed in a regular manner. The flask was packed with heat cure clear acrylic. It was heat processed and was deflated. Polishing was done (Fig 8).

Step 4**Construction of the upper section of split denture**

The maxillary trial denture was placed on the articulator, and the newly constructed mandibular clear acrylic base was placed on the lower cast. The clearance between the upper denture and the lower base section provided the length of the teeth plus 2mm.

A squash bite in putty material is now recorded between the maxillary trial denture and the mandibular clear acrylic base with the incisal pin touching the table. To construct the upper section of the split denture, the clear acrylic mandibular base section was waxed up and duplicated using irreversible hydrocolloid impression material. A set of five female portions of press buttons identical to the ones used in clear denture base were positioned in the indentations of alginate impression. The impression was poured in stone. Thus, a stone cast representing clear acrylic denture base along with female portions of the press buttons was constructed (Fig 9).

The duplicate stone cast was articulated in place of the clear acrylic base using the squash bite and plastered into place (Fig 10).

The male parts of the press-fit buttons were fitted in their counterparts on the duplicate cast, and the teeth were arranged in maximum intercuspation with opposing denture using wax (Fig 11). The maxillary denture and newly arranged mandibular teeth of the upper half of the split denture along with male portions of the press buttons were flaked and processed. After careful deflasking, the upper segment of the mandibular denture was attached to the lower segment using the press-fit action and polished (Fig 12).

Step 5**Reservoir placement and Denture insertion**

Because clear acrylic was used for the base section, the extent of the reservoirs could be clearly visualized. They were cut into the acrylic base of the denture from the top. Since the internal surfaces of the reservoirs cannot be polished, they were cut as cleanly and smoothly as possible to facilitate easy cleaning.

One reservoir each was placed in the posterior segment. The reservoirs were made as large as possible while maintaining sufficient thickness of the denture walls for strength. A minimum thickness of 2mm was maintained for the reservoir walls.

Once the reservoirs were placed, a 0.5mm diameter straight fissure bur was used to drill a drainage hole from the tissue surface of the base into the

reservoirs. Drainage was tested by filling the reservoirs with water and placing the denture on a paper towel to check that capillary action slowly drained the chambers.

The split reservoir denture was now inserted (Fig 13). Details on how to separate the two halves were provided along with post-insertion instructions.

To clean the reservoirs, the patient was instructed to flush out the reservoirs weekly with 1 per cent sodium hypochlorite solution. Additionally, a fine orthodontic wire was provided to clean the drainage holes if they become blocked (Fig 14). The patient was instructed to clean the reservoirs daily with either a small bottle brush or a cut-down toothbrush. The patient was advised to use the salivary substitute.

DISCUSSION

Complete denture patients may often pose a challenge to the Prosthodontist with Xerostomia. Many techniques are available in literature proposed by Vergo and Kadish⁴ in 1981, Vissink and co-workers⁵ in 1984, Toljanic and Schweiger⁶ in 1985, Vissink and co-workers⁷ in 1986 modified the salivary reservoir, thermoformed bubble type of appliance in 1997 by M. Frost, R. M. Gardner⁸. These techniques posed problems with speech, the flow of saliva substitute, cleaning the reservoirs and exaggerated gag reflex.

Sinclair et al.⁹ used cobalt samarium magnets to connect the lower and upper part of the mandibular reservoir denture. Though he succeeded in providing a reservoir with a maximum capacity, the procedure required exhaustive laboratory steps.

Several other techniques have also come into the light which included the construction of reservoirs in the mandibular dentures by Burhanpurwala et al¹⁰ in 2009 and Sanjay B. Lagdive et al¹¹ in 2011 constructed reservoirs in both maxilla and mandible in which bulk of the prosthesis was increased to create room for the reservoirs. Appropriate selection of the cases is important to follow such techniques.

Agrawal et al¹² in 2011 described a method for fabricating maxillary salivary reservoir between the anterior-posterior strap major connector in a

patient with Sjogren's syndrome. The design was bulky and affected speech.

Modgi and Aras¹³ 2012 elucidated a technique of fabrication of salivary reservoir cast partial denture using precision attachment. Disadvantage of this technique is increased cost of the treatment.

Ladda R et al¹⁴ in 2014 constructed mandibular reservoir denture with a slight modification in the technique in which reservoirs were included during the fabrication process itself.

Singh PP et al¹⁵ in 2014 gave maxillary salivary reservoir denture. In this, the lid was fabricated using resilient liner. It's a functional type because the salivary substitute oozes out as the patient presses his tongue against the anterior portion of the palate. The lid was fixed to the denture base using autopolymerizing resin. The disadvantages are bulk of the prosthesis, cost of fabrication, difficulty in cleaning the reservoir and also in refilling the reservoir space.

In 2016, Gurkar et al¹⁶ constructed a maxillary reservoir denture by increasing the thickness of the palatal plate of the denture. This would interfere with the speech.

Joseph et al¹⁷ in 2016 designed a reservoir in the maxillary denture such that it does not interfere with speech, but the technique is case sensitive. It cannot be used in high vault palate cases. Also, there was a need to preserve the working cast for the fabrication of lid in future.

In 2019, Kalamalla A Saran Babu et al¹⁸ described the incorporation of a palatal reservoir over the palatal metal base plate as in this case mandible was dentulous. Drawbacks of this technique include bulkiness of the denture, Obstruction of the orifice, additional laboratory steps.

AR Mendoza, MJ Tomlinson¹⁹ in 2003 innovated a technique for the construction of a salivary reservoir in the mandibular denture. This technique with a few modifications, is used successfully in the present case as this case satisfies the criteria required by this technique.

Although no claim could be made for perfection, various advantages and disadvantages with any of

the techniques must be understood. They can be summarized as-

Advantages

- Ready access to the reservoirs, both by the patient and for professional attention.
- It allows easy cleaning of the reservoirs.
- The use of clear acrylic for the base section permits the clinician to determine the best size and position for placement of the reservoirs.
- Additionally, it also enables the patient to clearly visualize the levels of saliva substitute within the chamber.

Disadvantages

- Laboratory stages are time consuming and precision is essential to ensure accurate and smoothly fitting segments.
- Case selection is extremely important because cutting reservoirs into the denture requires sufficient interarch distance for this technique.

CONCLUSION

Xerostomia is a more common symptom among the elderly population. Varied treatment modalities and procedures have been proposed. Each technique has its own advantages and disadvantages. Selection of the technique depends on the case. Hence, careful diagnosis and proper management plays a vital role to increase patient compliance and comfort to wear any prosthesis, which in turn can improve the quality of life.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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