Review article

SALIVARY STIMULATION: NEWER TECHNIQUES

Aatika Islam[1], Shalabh Kumar[2,] A.P.Nirmal Raj[3], Roopal Dubey [4], Dhiren Sanjeev Shah[5], Tambolkar Rajeshwari A[6]

Post Graduate [1,4,5,6] Professor [2] Professor & Head [3]

1-6- Department of Prosthodontics and crown & bridge, Teerthanker Mahaveer Dental college and Research Centre, Moradabad, Uttar Pradesh, India

Abstract

Saliva play very important role in maintaining health. It has several functions, such as detritus dilution, lubrication of oral cavity, bolus, maintaining the oral mucosa integrity, food solubilization, mechanical cleansing action, and remineralization. Decrease in flow of saliva is hyposalivation which may be caused due to certain autoimmune diseases, connective tissue complications, as a result of radiation therapy to neck and head, certain medications, or due to some other condition. Oral dryness is a symptom of xerostomia. Treating xerostomia is very challenging in dental practice. Recently, TENS used to increases saliva production in patients with radiation therapy and even in healthy patients. There are intraoral devices or the three generation which play a key role in increasing salivary secretions. This article presents a review about new developments for the treatment of xerostomia by incorporating salivary pacemakers and its three generations.

Keywords: xerostomia, auriculotemporal nerve, neuro-electrostimulator, osteointegrated implant.

INTRODUCTION:

It can be said that saliva lacks the emotional aspects of tears, the sincerity of sweat, and the drama of blood, which is why saliva is not one of popular bodily fluids, (Mandel 1990). Although, saliva is not required for any life-sustaining functions, and is taken for granted, but its absence or diminution can lead to significant reduction in the perceptions of quality of life for a patient and may significantly increase morbidity[1,2]. Primarily, saliva constitutes of proteins, water, and electrolytes[3], these components augments and facilitates speech, lubrication, irrigation, taste, swallowing, and mucous membranes' protection in the upper digestive tract[1]. Moreover, saliva prevents the dental caries of teeth with its antimicrobial and buffering activities of physiological functions[3].

One of the symptoms of oral dryness is Xerostomia, which means that the fluid loss from the oral cavity is more than the salivary flow, which is majorly a result of loss of salivary gland hypofunction[4]. Xerostomia is a common problem, where women are 10-29% more likely to be affected as compared to men[5] in middle to late life which suggests the anticholinergic action of several drugs, and this condition can be found in young adults also, but rarely in children.[6,7]

Dentists face many problems while treating dry mouth patients, where treatment with salivary substitutes, lubricants, adoption of masticatory methods or salivary stimulation by gustatory can help but not for long period of time. Xerostomia reccurs once the treatment is interrupted8. In a recent study functional non-pharmacological method were used in treating xerostomia; however, none of the treatments present currently can fulfill these expectations[9].

Therefore, this report presents the advances of neuroelectro-stimulation in xerostomia patients.

ETIOLOGY:

Several complications of connective tissues, autoimmune diseases, use of medications, radiation therapies to neck and head are a leading cause to xerostomia.

Hyposalivation leads to several health problems which can seriously affect the nutritional status, taste, dietary habits, speech, quality of life, and tolerance to dental prosthesis for a patient, which can further increase the risk of periodontal diseases, susceptibility to dental caries, oral infection including candidiasis, and tooth loss[10].

Drugs Associated With Xerostomia [1]

Catogory	Generic Name
Anticholinergic agents	Atropine Belladonna Benztropine Oxybutynin Scopolamine Trihexyphenidyl
Antidepressant and antipsychotic agents Selective serotonin-reuptake inhibitors	Citalopram Fluoxetine Paroxetine Sertraline Venlafaxine
Tricyclic antidepressants	Amitriptyline Desipramine
Heterocyclic antidepressants	Imipramine Haloperidol Mirtazapine
Monoamine oxidase inhibitors Atypical antidepressants	Pimozide Phenelzine Bupropion Nefazodone Olanzapine
Diuretic agents	Chlorothiazide Furosemide Hydrochlorothiazide Triamterene

Sedative and anxiolytic agents	Alprazolam Diazepam Flurazepam Temazepam Triazolam
Antihypertensive agents	Captopril Clonidine Enalapril Guanfacine Lisinopril Methyldopa
Muscle relaxant agents	Cyclobenzaprine Orphenadrine Tizanidine
Analgesic agents Central nervous system/opioids	Codeine Meperidine Methadone Pentazocine Propoxyphene Tramadol
Non-steroidal anti-inflammatory agents	Diflunisal Ibuprofen Naproxen Piroxicam
Antihistamines	Astemizole Brompheniramine Chlorpheniramine Diphenhydramine Loratadine Meclizine

Salivary Glands

20% of the total saliva is secreted by parotid gland, which is serous type histologically. 70% of the total saliva is secreted by submandibular gland which is mixed type both serous and mucous. 5% of the total saliva secreted sublingual salivary gland which is also mixed type. In salivary glands Acinar cells discharge secretory granules containing salivary enzymes to the ducts. Almost 1500 mL of saliva is produce per day[11].

Management / Treatment

Extraoral

- Tens therapy

Intraoral

- Three Generations Of Pacemakers

Transcutaneous Electric Nerve Stimulation

It was reported that when the TENS is placed over the major salivary gland i.e. parotid gland, it tends to increase the saliva production which is caused by radiation specially in healthy individuals and patients with xerostomia, auriculotemporal nerve (efferent pathway) might be stimulated by TENS which supplies the secretomotor drive to the parotid gland.[12,13] TENS was classified as class II device by the FDA in 1972[14] .

Salivary Pacemakers (Intraoral devices)

First-generation electrostimulating devices

USA (Salitron; Biosonics, Fort Washington, PA, USA) in 1988 approved a device for neuro-electrostimulation to increase salivary secretion. To generate salivation and to provide signals to related neuron probe was used each day for a few minutes between the palate and dorsum of the tongue (Figure1)[15,16,17] . But because of its high price and large size its wider use was hampered.

Figure 1
a)First-generation neuro electrostimulation device consisted of a hand-held probe, tipped with stainless steel electrodes, and a console that housed a battery and the electronic signal-generating power source, the size and shape of which were similar to a video or CD player.
(b)The probe was applied to the intra-oral mucosal surfaces by the user (between the dorsum of the tongue and palate) for a few minutes each day and delivered a stimulating signal to sensitive neurons of the mouth to induce salivation

Second-generation devices

(GenNarino Saliwell Ltd. Germany) Removable intraoral appliance the second-generation salivary neuro electrostimulator customized by making impression of their arches and fits on the mandibular arch like mouthguard. Its convenient for the patient to insert and remove. In order to allow safe and contamination-free intraoral application the electronic components are fixed within the appliance. It helps the patients to communicate with the device and also the function can be modified as its a remote control [Figure 2]. The dryness of the mouth can be reduced during the application and also 10 mins after its removed by using this device.

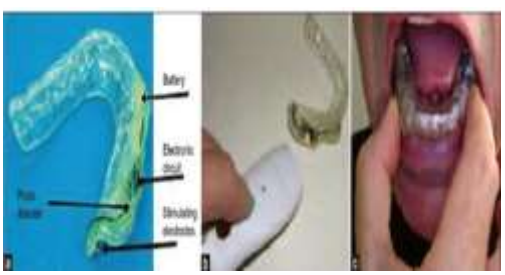

Figure 2
Second-generation removable device
(a)The miniaturized electronic stimulator
(b)The stimulator is activated by remote
(c) Used in mandibular arch in non-invasive manner

Dental implant-based third-generation intraoral device

Miniature neuroelectrostimulating device was developed by the Saliwell Crown Saliwell Ltd. Germany. Components of second-generation were miniaturized and packaged into a device which is permanently mounted on a commercially available osteointegrated implant , which is of same shape and dimensions of a molar tooth. The device also have wetness sensor which detect changes in wetness/dryness. They are implanted in lower third molar region to avoid interference with normal oral function and also the close proximity to the lingual nerve which carries both afferent and efferent salivary impulses[9]. [Figure 3].

Figure 3
Third-generation implant-supported neuroelectrostimulating device
(a) Exposure of mandibular bone
(b) Implant bed preparation in mandibular bone
(c) Dental root implant insertion
(d) Neuro electro stimulating device and applicator
(e) Saliwell crown
(f) Radiograph of both the implant and crown

CONCLUSION

Condition of hyposalivation and xerostomia interferes with nutrition, leads to decline of oral hygiene. This article highlights the role a prosthodontist plays by presenting new developments for treatment of xerostomia by in corporating salivary pace makers and its three generations that play a key role in increasing salivary flow. It is a prime concern to prevent and treat xerostomia which is a common clinical challenge in oral medicine practice.

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CORRESPONDING AUTHOR
Dr. Aatika Islam,
Post Graduate,
Department of Prosthodontics and crown & bridge, Teerthanker Mahaveer Dental College and Research Centre, Moradabad, Uttar Pradesh, India
Email Id: aatikaislam1october@gmail.com
Contact No. +919639657375

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