

To Evaluate the Effectiveness of Transcutaneous Electric Nerve Stimulation (TENS) in patients with hyposalivation: A Pilot Study

Dr. Jagdhari. Smriti. B¹, Dr. Patni V.M.², Dr. Motwani Mukta³,
Dr. Gangotri Shweta⁴

(^{1,2,3} Dept. Oral Medicine & Radiology, VSPM'S Dental College & Research Center, Nagpur. Maharashtra.
India ⁴ Triveni Dental College Bilaspur Chhattisgarh. India)

Abstract:

Aim: Saliva is necessary fluid for oral health. Medications, radiation therapy, and many systemic conditions decrease salivary function and increase patient's risk for caries and other oral infections. Palliative management of xerostomia includes wetting agents such as ice chips, increase water intake, lip balm, chewing sugarfree gums and saliva substitutes. Systemic agents stimulate salivary flow but often have unfavorable side effects. All have met with limited success.

The purpose of this study is to assess the effectiveness of transcutaneous electric nerve stimulation (TENS) as a means of stimulating salivary function in these subjects.

Materials and method: This study comprised of 30 patients who are known case of diabetics, taking antidepressant, or diuretic drug, under gone radiation therapy and postmenopausal women with decrease salivary secretions. Unstimulated saliva was collected for 5 minutes in beaker and measure. The TENS electrode pads were placed externally on the skin overlying the parotid glands. The TENS unit was then activated and stimulated saliva collected for an additional 5 minutes.

Results: The mean value of unstimulated saliva is 2.343 which increased after stimulation 3.053 with the difference of .71 showed significant increase ($p < 0.001$) in the salivary secretion after TENS stimulation. There were no adverse events observed after the use of TENS.

Conclusion: The present study using TENS therapy has definitely shown encouraging results in increasing salivary secretion without any side effects.

Keywords: Unstimulated saliva, Stimulated saliva, TENS, hyposalivation,

I. Introduction

Saliva is an important body fluid that plays a vital role in maintaining oral health. A reduced salivary flow can have a devastating affect on the physical and psychological well-being of the patient. Saliva has many important physiologic functions. It maintains neutral pH and contains calcium and phosphate that are essential for maintaining enamel mineralization. As a lubricant, it aids in speech, swallowing, clearing of debris, and reduces friction. Saliva contains salivary IgA and thus plays a role in oral immunology. It contains amylase, thereby initiating carbohydrate digestion. It also possesses a number of antibacterial enzymes, such as lysozyme, peroxidases, histatins, and lactoferrin.¹ Many systemic and local disorders causes hyposalivation i.e. decrease in salivary flow like- **Stress, Diabetes, Menopause, Antidepressant or antipsychotic drugs, Diuretic drugs, Radiation therapy, Parkinson's disease and Sjogren's syndrome.**

Conservative and systemic management of xerostomia that has been previously discussed in literature are symptomatic agents such as ice chips, increase water intake, lip balm, chewing sugar free gums, artificial saliva and saliva substitutes. All the modalities help to relieve the symptom but do not stimulate the salivary secretion. Pharmacological agents, like pilocarpine HCl, have been studied extensively; nevertheless, more than one third of patients display adverse effects similar to those produced by other cholinergic drugs, including: gastric upset, perspiration, tachycardia, bradycardia, arrhythmia, increases of pulmonary secretions, muscular tone and urinary frequency and blurred vision². Therefore there is a need to find out a modality that will stimulate salivary secretion without any side effect.

Aims & objectives: To evaluate the role of extraoral TENS therapy in patients of hyposalivation.

II. Materials and method

This study comprised of 30 patients who are known case of diabetics, taking antidepressant or antipsychotic, diuretic drug, postmenopausal women with decreased salivary secretions in VSPM'S Dental College & Research Center.

Subjects were asked to refrain from- eating, drinking, chewing gum, smoking, and oral hygiene procedures for at least 1 hour prior to the saliva collection. Unstimulated saliva was collected between 9a.m. to 12 p.m. for 5 minutes in beaker and measured in ml.

The TENS electrode pads were placed externally on the skin overlying the bilateral parotid glands with the TENS unit in the “off” position (setting of TENS -the pulse rate was fixed at 50 Hz, the pulse duration was fixed at 250usec and the unit was in normal mode). (Figure 1,2) Serous saliva of parotid would be clinically most useful for managing xerostomia and also it is easily accessible for application of TENS electrode. The TENS unit was then activated and the intensity control switch adjusted for patient comfort, it is applied for 5 min and stimulated saliva collected for an additional 5 minutes. Optimal intensity was defined as the maximum intensity that the subject still perceived to be comfortable.

Patient who are-diabetics (2years), taking antidepressant or antipsychotic drugs (6 months) ,diuretic drugs (2years), postmenopausal women above 50 years were included in the study.

Patient having salivary gland disorders, trauma to face, any nerve injury, habit of tobacco, smoking, pan were excluded from study.

III. Result

This study found a significant increase in the salivary secretion after TENS stimulation. Only 3 cases were showing no changes in saliva flow after application of TENS. There were no adverse events observed after the use of TENS. Table 1 showing number of male and female patients in all groups. In table 2 Mean Value and SD of Unstimulated and stimulated saliva in all group showing significant difference. Table 3 showing Mean Value of Unstimulated and stimulated saliva in all group with its difference value. After statistical analysis (paired t test) all group showed significant increased (p value is significant 4.5556×10^{-13}) in stimulated secretion after TENS therapy showing in table 4.

IV. Discussion

TENS has been used for various reasons like postoperative pain, osteoarthritis, and chronic musculoskeletal pain. Also, TENS has a therapeutic modality for dry mouth. Weiss WW³ was the first to use TENS in 1986 in patients with Sjogren's Syndrome and post radiation by applying probe on tongue and palate as an intra oral measure. FP Strietzel et al⁴ used intra-oral neuro-electro-stimulation for the management of xerostomia (Primary Sjogren's syndrome, Medication-induced xerostomia ,Idiopathic xerostomia) and found significant effects but drawback of this device is high cost and patients discomfort^{2,4,5,6}. The mechanism of TENS on parotid gland is that it directly stimulates the auriculotemporal nerve that supplies secretomotor drive to the parotid gland. Sympathetic stimulation produces viscous and sparse saliva. It requires higher frequency and longer pulse duration. Electric stimulation of parasympathetic nerves of salivary glands produces watery saliva at low frequencies. Previously TENS has been used in the form of attachment in removable appliances or implants^{2,4,5,6}. In 2005 Istvan. A. Hargitai et al¹, used extra-oral device in normal population and found increase in salivary flow after the therapy.

In present study we also used extraoral TENS therapy but in patients who complaint of dry mouth or hyposalivation and we found increased salivary secretion by using extraoral neuro-electro-stimulation. Istvan. A. Hargitai et al noticed twitching of facial musculature and anesthesia of skin but none of our patients experienced any of these side effects.

The added advantage of TENS over other measures like chewing gums or citric lozenges is that it can be used even during eating. As compared to intra-oral devices, extra-oral devices are not only non invasive but also less expensive. TENS therapy is a simple chair side technique which gives instant improvement in symptom of hyposalivation by increasing the salivary secretion.

V. Conclusion

Hyposalivation results in lot of discomfort and morbidity in patients and there is a need to find out alternative device over others which is non invasive, economical and having no side effect. The present study using TENS therapy has definitely shown encouraging results in increasing salivary secretion without any side effects. Since this is a pilot study having limited number of patients, further study with larger sample size is required.

References

- [1]. Hargitai IA, Sherman RG, Strother JM The effects of electrostimulation on parotid saliva flow: a pilot study. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2005 Mar;99(3):316-20
- [2]. Gloria Lafaurie , Stefano Fedele, Rafael Martín-Granizo López et al .Biotechnological advances in neuro-electro-stimulation for the treatment of hyposalivation and xerostomia. Med Oral Patol Oral Cir Bucal. 2009 Feb 1;14 (2):E76-80
- [3]. Weiss WW Jr. Use of an Electrical Stimulation in patient with dry mouth. J Oralmaxillo surg 1986 44;845-85

To Evaluate the Effectiveness of Transcutaneous Electric Nerve Stimulation (TENS) in patients with

- [4]. FP Strietzel, R Marti'n-Granizo, S Fedele L L, Russo, M Mignogna, PA Reichart, A Wolff. Electro stimulating device in the management of xerostomia. Oral Diseases (2007) 13, 206–213
- [5]. Stefano fedele. Neuroelectrostimulation in Treatment of Hyposalivation and Xerostomia in Sjögren's Syndrome: A Salivary Pacemaker. The journal of rheumatologyJ Rheumatol August 2008 35(8):1489-1494
- [6]. M. Steller, L. CHOU, T.E. Daniels. Electrical Stimulation of Salivary Flow in Patients with Sjogren's Syndrome. J Dent Res 67(10):1334-1337, October, 1988

Table -1 showing number of male and female in all group

	Postmenopausal	Anti psychotic	Diabetes	Diuretic
Male			2	3
Female	9	9	4	3
Total	30			

Table 2 showing Mean Value and SD of Unstimulated and stimulated saliva in all group

Group	Mean value		SD	
	Unstimulated	Stimulated (After TENS)	Unstimulated	Stimulated (After TENS)
Postmenopausal	2.14	2.8	0.63	0.7
Anti psychotic	2.1	2.86	0.70	0.63
Diuretic	2.73	3.43	1.234	1.29
Diabetes	2.53	3.33	0.78	0.83

Table 3 showing Mean Value of Unstimulated and stimulated saliva in all group

Group	Mean value		
	Unstimulated	Stimulated(After TENS)	Difference
Postmenopausal	2.14	2.8	0.66
Anti psychotic	2.1	2.86	0.65
Diuretic	2.73	3.43	0.7
Diabetes	2.53	3.33	0.8

Table 4 After statistical analysis (paired t test) all group showed significant increased in stimulated secretion after TENS therapy

	Unstimulated (ml)	Stimulated (ml)	Difference
mean	2.343	3.053	.71
S.D.	0.817	0.879	
t test	12.34292		
P value	4.5556x 10 ⁻¹³		

p value is significant

Legends-

Figure1- TENS Unit

Figure 2- electrode pads were placed externally on the patient skin over the parotid region

Figure 1



Figure 2

