Case Report

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IONTOPHORESIS A BOON FOR TREATMENT OF DENTINAL HYPERSENSITIVITY: CASE REPORT

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ABSTRACT

Aim: Dentinal hypersensitivity is an unpleasant symptom which occurs because of dentin exposure as a result of attrition, erosion, abfraction, and gingival recession. There are various treatment modalities to treat dentinal hypersensitivity. Iontophoresis is one of the popular technique which allows a concentrated application of drugs into the desired localized region of exposed dentine there by reducing the dentinal hypersensitivity.

Case Report: This article describes about treatment of patient with dentinal hypersensitivity using Iontophoresis technique.

Discussion: Immediate relief from dentinal hypersensitivity was achieved by clogging the dentinal tubules with usage of APF (Acidulated phosphate fluoride) gel by this iontophoresis technique.

Conclusion: Six months follow up study of this patient showed the long lasting effects of this technique, achieved by deeper penetration of fluoride ions. So it can be used as a first line of treatment in dentinal hypersensitivity.

Key Words: Dentinal hypersensitivity, Electrical dosage, Iontophoretic unit, Iontophoresis, APF gel (Acidulated phosphate fluoride gel)

INTRODUCTION

Dentinal hypersensitivity is characterized by short, sharp pain arising from exposed dentin in response to external stimuli, which cannot be ascribed to any other form of dental defect or disease.[1] It commonly involves the cervical region of facial surfaces of premolars and canines.[2] It causes discomfort and pain to the patient which also deters to maintain adequate oral hygiene.[3] Dentinal hypersensitivity is triggered by thermal, chemical, and mechanical stimuli. Chemical stimuli such as acidic foods (mainly fruits), sweets, and rarely salty foods, Mechanical stimulus such as tooth brush bristles during brushing, nicking the sensitive area with a finger nail, and cold stimuli causes pain and hypersensitivity.[4]

Histologically, sensitive dentin has two times widened, larger dentinal tubules than normal tooth.[4]

The various causes of dentin exposure are Attrition due to parafunctional habits, Mastication, tooth brushing abrasion, erosion by acids, and abfractions. Gingival recession due to periodontal diseases, and faulty tooth brushing causes hypersensitivity.[5]

The Main reason for pain in Dentinal hypersensitivity was proposed in Hydrodynamic theory of Brannstrom and Astron in 1964. It was very well accepted by all. This theory states that stimuli causes displacement of the fluids within the Dentinal tubules which indirectly stimulates the extremities of the pulp nerves causing pain sensation.[6]

According to Lutin, An Ideal desensitizing technique or material should be painless, must not irritate the pulp, be easily applied, be permanently effective, be quick acting, be consistently effective, produce no discolouration.[7]

A potential desensitizing agent clogs the tubules or decreases the activity of the dentinal sensory nerves. Various measures are used to treat this condition in clinic or in home care.

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The home measures include Desensitizing dentifrices or mouth washes with active compounds such as sodium fluoride, potassium nitrate, strontium chloride, stannous fluoride etc. The clinic measures include application of sodium fluoride, strontium chloride, cavity varnishes, restorative resins and also includes the use of Laser, resin, Cyanoacrylate, and Iontophoresis. Among which Iontophoresis is effective and long lasting treatment modality for treating hypersensitivity.[2]

IONTOPHORETIC UNIT

The term Iontophoresis (Greek word) is simply defined as ion transfer.

Ionto = Ion; Phoresis = Transfer

The process of influencing ionic motion by electrical current has been termed Iontophoresis, Electrophoresis, or cataphyoresis. The method of Iontophoresis was described by PIVATI in 1747.[5]

MECHANISM OF ACTION

Iontophoresis utilizes a low ampere direct electrical current to introduce ions or ionized drugs into the tissue. It allows concentrated application of the drug to the desired localized area without the systemic effects of the conventional oral or parenteral drug therapy.

Normally, ionized drugs will not penetrate the tissue rapidly enough to be of any therapeutic value. By applying appropriately charged direct electrical current, ionized drugs can be driven in to the tissue, based on the principle – like charges repel and opposite charges attract.

- Ex: Fluoride - Negative ion.

Applying fluoride under a negatively charged electrode, fluoride can be driven with a direct electrical current into the tooth structure. [2]

ARMAMENTARIUM

JONOFLUOR SCIENTIFIC is an apparatus for the topical application of fluorine gel for desensitisation of the teeth, prophylaxis of caries, and in case of periodontitis. It is designed to use 12- Volt (8×1.5 V) batteries that supplies a direct current of 12 volts. An ammeter with graduations ranging from 0 to 5 milliamperes and at differences of 0.5 mA each.

- A Polarity Selection Switch: On/Off
- Jack With Cable: Jack with black and red spiral cables.
- Black Plug: For impression trays with electrode.
- Red Plug: For electrode to be held in hand.
- Electrode for Touching: An impression tray with electrode is used over the dental arch.
- ELECTRODE TO BE HELD: Usually positive, connected to the red cable. [Fig.1]

CASE REPORT

Mrs. Prema 36/F reported to Department of periodontics with a chief complaint of sensitivity in the right lower back teeth since three months.

On clinical examination, Abrasion involving 44 and 45. [Fig.4]

EVALUATION TEST

Before doing the procedure, sensitive tooth was isolated by cotton rolls and subjected to tactile, air blast tests.

Tactile test

Dentinal hypersensitivity of the surface was examined using dental explorer which was moved around the surface in sweeping motion.

Air blast test

Air blast using air syringe was directed on the selected tooth surface for one second. [Fig.5]

VRS (Verbal Rating Scale) was used to record scores

1. No discomfort
2. Mild discomfort
3. Moderate discomfort
4. Severe pain only during application of stimulus
5. Severe pain persisting after removal of stimulus.

PROCEDURE

The sensitive tooth to be treated is isolated with cotton rolls and dried. A sponge with Thin layer of APF (Acidulated phosphate fluoride) gel is applied in a tray. [Fig.6] An autoclaved tray with disposable sponges applied with APF gel is to be kept in contact with affected teeth surfaces. The metal electrode with red spiral is held in the patient hand. Metal electrode with black spiral should contact with rectangular slot in the impression tray. [Fig.7] Resistance knob is slowly turned clock wise and increasing current 0.5 to maximum 2.5 mA to the tooth until the patient experience pain or sensitivity. [Fig.8] Procedure is repeated at a low ampere current. Current is applied for 2 minutes.

Once the treatment is over, knob is turned off and the electrodes is removed from the patients dental arch. Repeat the tactile and Air blast test and evaluate the response from the patient.

- Before starting the treatment dentinal hypersensitivity of selected tooth surface was checked and scores were recorded, immediately after treatment the surface was checked and scores recorded. Post operatively dentinal hypersensitivity was checked and scores recorded after 1 week, 1 month, and 6 months. [Fig.9,10]
- Iontophoresis is repeated after one week in those patients with persistent dentinal hypersensitivity.

DISCUSSION

Several hypothesis have been proposed by which iontophoresis produces desensitization of dentin. One mechanism proposed by Lefkowitz (1963) states that the application of current to dentin leads to formation of reparative dentin which results in dead tracts in primary dentin. A second possible explanation of iontophoresis is that the electrical current produces paresthesia by altering the sensory mechanisms of pain conduction.[8]

A third alternative explanation of iontophoretic desensitization causes ionic movement by electrical current which may enhance ion uptake by the dentinal tubules results in desensitization.[8]

Parr and Brokaw remarked that the rate of penetration of the drug would be increased by giving more electrical current. It also minimize the treatment time.[2]

Carlo et al. found that patients with severe hypersensitivity required a second application, while those with mild-to-moderate sensitivity experienced highly significant relief and did not require any additional therapy.[2]

Cortico steroids Iontophoresis (Methyl prednisolone) increases peri tubular mineralization. Thus lumen would be decreased, resulting in less dentin tubule fluid movement, reducing dentin sensitivity.[8]

Topical sodium fluoride, strontium chloride reducing hypersensitivity by precipitating calcium fluoride, and recrystallization in form of strontium apatite complex and thus blocking dentinal tubules, reduce the diameter of open tubules respectively. Both of the techniques are short lived, because of wearing away of resin layer.[8,9]

Recently tooth pastes containing carbonated hydroxyl apatite Nano crystals are being studied. It produces biomimetic coating on enamel and thus prevents tooth decay, revitalize the teeth and seal the dentinal tubules. But these are technique sensitive.[10]

Lasers reduces dentin hyper sensitivity with formation of secondary dentin by odontoblast due to bio stimulation but long term relief was not achieved.[5]

CONCLUSION

Reduction in dentinal hypersensitivity was almost immediate with iontophoresis technique and was confirmed in this case. This Iontophoresis technique is safe and effective treatment option to treat dentinal hypersensitivity.

APF gel Iontophoresis is more effective in reducing hypersensitivity immediately and effects are comparatively long lasting by deeper penetration of fluoride ions. Iontophoretically treated teeth had a fluoride concentration twice that of topically applied fluoride. Before any other therapeutic steps like resin primers and low level laser therapy this can be used as a first line of treatment.

Further studies with larger population sample are being carried out in our college to prove the effectiveness of treating dentinal hypersensitivity with Iontophoresis.

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Figure 1: Iontophoretic unit.

Figure 2: APF gel, plastic tray, sponges.

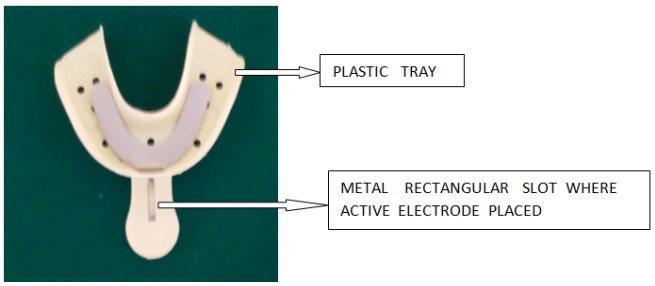

Figure 3: Parts of plastic tray.

Figure 4: Abrasion involving 44, 45.

Figure 5: Air blast test was done.

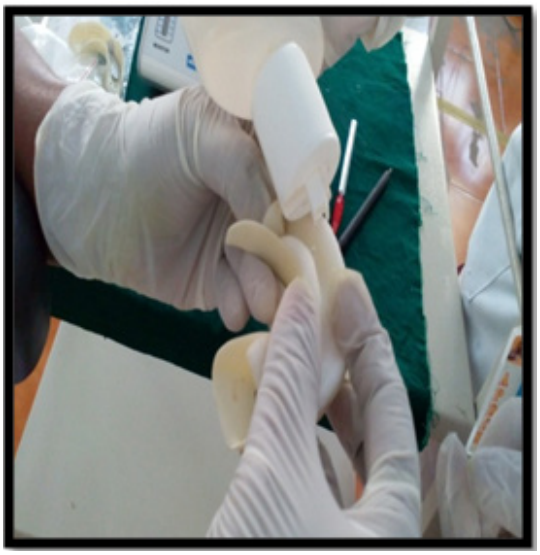

Figure 6: APF gel applied in sponge with tray.

Figure 7: Metal electrode placed in rectangular slot in the tray.

Figure 8: Iontophoresis was done.

VAS SCORE – 4 [Before treatment]

Figure 9: Dentinal hypersensitivity checked before treatment.

VAS SCORE - 0 [After treatment]

Figure 10: Dentinal hypersensitivity checked immediately after treatment.