CLINICAL ORAL SCIENCE AND DENTISTRY

REVIEW ARTICLE ISSN 2688-7428 Open Access

Diagnosis and Management of a Patient Presenting with Symptoms of Localised Pain to a Cold stimulus following Periodontal Treatment

Janaphan K[1,2], Gillam DG[1]

[1]Department of Periodontics and Implant Dentistry, Thammasat University, Rangsit Campus, Phatum Thani, Thailand.

[2]Institute of Dentistry, Barts and the London School of Medicine and Dentistry QMUL, London, UK.

Received date: October 12, 2022, **Accepted date:** October 17, 2022, **Published date:** November 01, 2022

***Corresponding Author:** Dr. David G Gillam, Institute of Dentistry, Barts and the London School of Medicine and Dentistry QMUL, London, UK.

Abstract

Aims:

Dentine hypersensitivity has been reported to be a somewhat enigmatic condition which can affect individuals during their daily routine of brushing their teeth, drinking hot or cold fluids or drinks or food that may be acidic in nature. Individuals may also discomfort following treatment from their dentist, for example, following placing a restoration (filling) in a tooth or following treatment for periodontal reasons, such as the removal of dental tartar (calculus), scaling, debriding, or polishing their teeth (a non-surgical procedure) or because of a surgical procedure. This short overview attempts to provide practical recommendations when a patient complains of discomfort or sensitivity to a cold stimulus following a recent visit to their dentist.

Keywords: Periodontal Treatment, Dentine Hypersensitivity, Post-operative Pain, Diagnosis, Management.

Introduction

According to Gillam and Chatzopoulou [1] the pain associated with dentine hypersensitivity (DH)/root sensitivity (RS) is generally considered to be transient in nature and will resolve once the initiating stimulus, such as cold air from a dental air syringe, has been removed. The prevalence of this condition, however can vary between 15% to 74% and as such affects the quality of life of the patient [2]. Although the pain experienced by the patient in response to a stimulus such as cold has been explained historically by various mechanisms, there has been some disagreement on the actual mechanism of action.

Currently, however, the most accepted is the hydrodynamic theory (based on fluid movement within the dentinal tubules) as proposed by Brannstrom [3] which essentially promotes two basic approaches for treating hypersensitive dentine namely a) occlude the patent (open) tubules on the exposed dentine and thereby reduce any stimulus-evoked fluid movements and b) reduce the intradental nerve excitability within the tooth, so that the nerves do not respond to the stimulus-evoked fluid movements in the dentinal tubules.

According to Dababneh et al., [4] a cold stimulus can produce the most significant clinical problem in cases of dentine hypersensitivity and as such the pain response is almost instantaneous, and the patient experiences a sharp pain as opposed to the slow dull response to heat ([5]. The important diagnostic outcome from these observations is that it enables the clinician to determine a differential diagnosis when attempting to provide treatment of the problem [6}. The aim of this short overview, therefore, is to provide recommendations for clinicians when a patient complains of discomfort or sensitivity to a cold stimulus following a recent visit to their dentist.

Overview

The scenario outlined in this review is a common occurrence when patients contact their dentist or hygienist following recent dental treatment. To some extent this is different to examining a new patient complaining of dental pain including dentine hypersensitivity, in that the dentist will already have a comprehensive medical and dental history of the patient. Nevertheless, it is still important not to cut corners when discussing the problem with the patient. It is important for the clinician to appreciate that pain is highly subjective, and it is what the patient perceives at the time of contacting the clinician and as such it can be acute or chronic (with an acute exacerbation), sharp, throbbing, transient or on-going in nature.

Pain is also a psychologic phenomenon in which the emotional elements can influence the subjective interpretation of pain. For example, factors that affect pain perception are anxiety, fear, depression, and coping ability [7]. In addition, the central nervous system sensitization could play a role for lingering pain symptoms of dentine hypersensitivity due to its ability to propagate the painful sensation in the brain regardless of the elimination of the cause [8]. It is therefore, of paramount importance for the clinician to obtain a correct diagnosis before providing any further interventions.

A painful response to any stimulus can be quite challenging and sometimes is not straightforward to ascertain the cause of the condition. Furthermore, there are numerous dental conditions that can cause symptoms similar to dentine hypersensitivity and as such a definitive diagnosis of dentine hypersensitivity should be based on the exclusion of other dental conditions following a thorough clinical examination together with the relevant medical and dental history [6, 9-11].

Diagnosis and Management

Diagnosis:

Although the background outlined in this scenario is a patient complaining of discomfort to a cold stimulus following recent periodontal treatment it is, nevertheless, still important to ascertain the patient history to obtain any relevant updated information such as the description of pain, pain-inciting stimuli, etc., following the recent appointment. Information regarding the severity and characteristic of pain experienced by the patient is therefore, essential in obtaining a correct diagnosis and to differentiate dentine hypersensitivity from the other dental conditions with similar clinical symptoms. For example, the evidence of referred pain, pain during chewing, pain provoked at night in which patient needs to take pain relief medication following the previous periodontal treatment.

It may be that following the clinical examination and noting the description of the symptoms, the clinician may suspect other causes of dental pain such as a displaced or fractured restoration following ultrasonic scaling and debridement and it may be reasonable to further investigate the problem using diagnostic tests such as, sensibility tests or diagnostic radiographs [6, 9-11] (see Table 1 for other possible conditions to exclude during the clinical examination).

Cracked tooth syndrome,
Fractured restorations
Pulpal response to caries or restorative treatment,
Chipped or fractured teeth
Vital tooth bleaching
Nano leakage of dentine adhesives
Inappropriate application of medicaments during cavity floor preparation

Table 1: Examples of dental conditions with symptoms similar to DH/RS (modified from Dababneh et al., [4])

Although the clinician should identify all sensitive teeth during the examination by using cold air from a triple syringe or by running an explorer over the exposed dentine, it should be noted that (in this scenario) the patient's complaint is from cold and as such the patient should be warned that they may experience some transient discomfort during the evaluation. For the purposes of good record keeping and determining the level of discomfort before and after treatment a visual analogue scale (0-10 VAS) score can be used [6, 10-11).

Furthermore, the patient's perception of hypersensitivity may be less evident than a tooth stimulation method (clinical evaluation), reflecting good coping mechanisms by the patient [12]. It is also important for the clinician to determine whether the patient's discomfort is localized (as in this scenario) or generalized involving most, if not, all the patient's teeth. Information from the patient may help.

A useful tip which may help in identifying whether the discomfort is from DH/RS is to take a VAS score following blowing cold air onto the tooth, apply a sealant or smear of toothpaste and then reassess using a VAS.

If the pain has been diminished or eliminated, then it would be reasonable to determine a diagnosis of DH/RS. If, however, the discomfort remains or is not diminished then the clinician would be required to conduct further diagnosis tests to determine the cause as previously discussed. If the discomfort is from DH/RS the effect in response to a cold stimulus would be transient in nature and once the stimulus is removed, then the discomfort would cease [9] The persistence of pain regardless of the removal of the stimuli would indicate that there are irreversible inflammatory changes in the dental pulp [13] which would require further investigation.

It is also important to note that teeth initially presenting with sensitivity can develop increased tooth sensitivity more frequently following non-surgical periodontal treatment [14]

Management

Following the clinician's definitive diagnosis of DH/RS, a management plan can be initiated to prevent any further episodes of discomfort during the patient's day to day activities and reduce any impact on the patient's quality of life (QoL) (6, 10-11, 15]. It is therefore important to avoid simply giving the patients a toothpaste or treatment without correcting the aetiological causes of the problem 10-11]. This will also include educating the patient with their oral hygiene regime (brushing techniques etc.,) and the type of diet to avoid such as acid food and drink which may impact on the tooth surface (e.g., erosion).

The management of DH/RS therefore, is to eliminate any predisposing aetiological(s) factor that causes the exposure of underlying dentine and the subsequent opening of the dentinal tubules [10-11]). This should also include professional care when scaling and debriding the tooth surfaces during non-surgical and surgical treatment, together with the use of desensitizing polishing pastes following treatment [1, 16] Meticulous dental biofilm control following non-surgical periodontal treatment has been shown to reduce sensitivity which may be explained by mineral depositions at the peripheral end(s) of the dentinal tubules [14] or the creation of a smear layer.

Currently the two main mechanisms of desensitizing agents for DH/RS (based on the Hydrodynamic theory) are a) tubule occlusion and b) nerve blocking by means of ionic diffusion. These agents can be classified according to their mode of action into over the counter (At-home/OTC) or In-office products (Professionally applied).

However, the existing evidence suggests that no desensitizing agent is considered as the ideal product in relieving the symptoms DH/RS [16]. Furthermore, the choices of professional, home use treatment or the combination of both are mainly arbitrary depending on the practitioners [4]. Fluoride varnishes and gels, glutaraldehyde/2-hydroxethylmethacrylate (HEMA), potassium nitrate, and bonding agents have been reported to be most often used to treat DH among USA dentists [17] A systematic review and meta-analysis however, suggested that there is sufficient evidence to support the use of potassium-, stannous fluoride-, potassium and stannous fluoride-, calcium sodium phosphosilicate-, and arginine-containing desensitizing toothpastes. Strontium-containing desensitizing toothpaste, however, was reported to have no statistically significant

desensitizing effect [18].

Innovative products (bioactive glasses) such as NovaMin • in the form of a toothpaste has been used to reduce DH [19]. These glasses can adhere to the tooth structure and form a hydroxyapatite layer, thereby blocking the exposed dentinal tubules [20] By way of a contrast, the mechanism of potassium nitrate has been reported to block nerve activity by means of raising extracellular potassium ion [21].

Other therapeutic strategies have also been proposed for the treatment of DH/RS, including lasers, fluoride iontophoresis, anti-inflammatory agents, ions and salts, dentine sealants, periodontal soft tissue grafting, restorative and homeopathic medication [22]. If patients are concerned about their aesthetics (exposure of the root surface due to gingival recession), then surgical root coverage procedures with or without the combination of restorative treatment could become a suitable option [23].

Despite the reduction of DH/RS following a surgical root coverage procedure, it should be noted that these procedures may not necessarily provide a predictable outcome in addressing DH/RS [24-25]. However, there is currently no definite consensus regarding the gold standard for treatment of this condition [6, 10-11, 26].

Discussion

DH/RS are terms used to describe discomfort associated with both healthy mouths as well as those individuals with periodontal disease and subsequent therapy [27-29]. According to investigators almost half of patients following periodontal treatment experience discomfort, with the intensity increasing during the first few week's post-treatment then subsequently decreasing [29-31].

Furthermore, it has been reported that those individuals with periodontal disease or who have periodontal treatment have an increased prevalence of DH/RS compared to those individuals with healthy mouths [32]. It is, therefore, essential for the clinician to reassure the patient that their discomfort is transient (of short duration) and that the discomfort will diminish rapidly within one to two weeks. The clinician should educate the patient regarding tooth brushing techniques and good plaque control as well as dietary advice to reduce the acidic intake of food and drink (preventive management strategy). It would also be appropriate to either; 1) apply a desensitizing agent on the area identified as sensitive as well as recommending a desensitizing toothpaste for home use and 2) apply a desensitizing polishing paste if more than one or two teeth are involved (e.g., generalized rather a localized problem).

The patient should also be reappointed within two to four weeks (depending on the clinician's availability) for a follow-up visit to determine whether the problem has been resolved and to check patient compliance with the clinician's recommendations. If the condition has not improved or has worsen following the initial diagnostic appointment, then the patient should be re-examined to determine whether more invasive treatment is required [6, 10-11]. It should however be acknowledged that in certain circumstances, if the conventional approach of DH/RS has failed, then endodontic treatment or extraction may be considered [4].

Conclusions

It is important for the clinician to recognize that a thorough medical and dental history together with a clinical examination is essential when identifying causes of dental pain. Furthermore, in the diagnosis of DH/RS the clinician is advised to provide a definitive diagnosis before considering any treatment. In the example provided in this scenario the clinician should acknowledge that simply providing treatment without considering the underlying causes of the problem will not prevent further occurrences of the problem.

Finally, both the patient and the clinician need to manage their expectations since it may not be possible in some situations to completely resolve the problem and as such should attempt with a suitably preventive strategy to minimize the impact on the patient's QoL. It is also essential for the clinician to reassure the patient that the problem is transitory in nature and should revolve following treatment.

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