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Management and Prevention Strategies for Treating Dentine Hypersensitivity

David G. Gillam

Abstract

The clinician faces numerous challenges when confronted with patients complaining of oro-facial pain, which can involve both dental and non-dental causes. Perhaps one of the most enigmatic clinical conditions that a clinician may encounter is that of dentine hypersensitivity (DH), dentine sensitivity (DS) or root sensitivity (RS), which is both problematic to identify and difficult to treat and may have a major effect on the patient's quality of life (QoL). Ideally, the clinician needs to prevent or minimize these effects to reduce any unnecessary discomfort for the patient and this may be accomplished through preventive strategies, the provision of the required information about the procedures both pre- and post-treatments as well as reassuring the patient in the event of any subsequent discomfort. Furthermore, it is important for the clinician to be able to correctly diagnose the exact cause of the patient's discomfort and have the confidence to successfully manage the problem. This chapter aims to cover the relevant aspects for both diagnosing and managing DH with an emphasis on adopting a preventive strategy that will attempt to minimize or eliminate the problem, thereby enabling the patient to have an improved quality of life.

Keywords: dentine hypersensitivity, management, in-office (professionally applied), over-the-counter (OTC) (at home), prevention strategies, quality of life (QoL)

1. Introduction

According to Gillam [1], one of the challenges facing the clinician when examining a patient complaining of different types of dental pain is that the patient may be suffering from both physical or emotional discomfort. This may be very traumatic to them in terms of being unable to cope, resulting in the loss of sleep and work as well as in an economic cost to the health care provider [2–4]. This in turn may present difficulties for the clinician in determining a correct diagnosis of the cause of the patient's pain. The importance of differentiating these different types of oro-facial pain based on the patient's presenting clinical features and a thorough medical and dental history is a key to the successful management of the patient's pain [1]. Furthermore, it should be recognized that pain is subjective in nature and is pertinent to the individual's own perception of pain, which may also be influenced by several factors such as a previous history of pain, anticipation, or fear of the proposed dental

treatment. Although dentine hypersensitivity (DH) may not be as severe as some of the other oro-facial conditions, it is a relatively common condition, which has an impact on the individual patient's well-being and quality of life (QoL) [5]. There have been concerns regarding the awareness and confidence of clinicians to diagnose and successfully manage DH [1, 6, 7]. To address these concerns, several management and preventive strategies have been suggested to provide practical guidelines for clinicians [6, 8–10]. These guidelines include identifying the cause of the patient's presenting problem based on a good medical and dental history with a thorough clinical examination using the appropriate diagnostic tests when distinguishing DH from other forms of oro-facial pain. Recommendations for the management of DH also included the importance of removing the aetiological and pre-disposing features to prevent further episodes of pain associated with DH to alleviate the impact on the patient's QoL. The use and/or recommendations of the appropriate in-office (professionally applied) or over the counter (OTC; at-home) products and/or techniques depending on the severity of the problem should also be included in the clinician's management strategy. The importance of a management plan that includes both a preventive strategy to reduce further damage to both the hard and soft tissues of the mouth, and with a monitoring component within the plan cannot be overstated [10]. This chapter, therefore, covers the relevant aspects for diagnosing and managing DH with an emphasis on adopting a preventive strategy that will attempt to minimize or eliminate the problem, thereby enabling the patient to have an improved QoL.

2. Prevalence and awareness of dentine hypersensitivity

2.1 Prevalence of dentine hypersensitivity

The published prevalence figures for dentine hypersensitivity range from approximately 1% to over 70% depending on how the figures are collected. For example, data from questionnaire studies report a higher prevalence of the condition, whereas data from clinical studies that examine the patient provide lower prevalence figures. The information from these types of studies may also depend on the location (university or hospital clinics, general dental practice, or specialist practice such as restorative or periodontics) and the country or culture of the population. For example, the traditional prevalence figures for DH *per se* are estimated to be 10% with an average of 33% across studies as reviewed by Cuhna-Cruz and Watana [11], whereas the prevalence figures for root sensitivity (RS) due to periodontal disease or its treatment is considerably higher (60–98% [12, 13]). DH/RS may therefore affect individuals over all age groups; however, from the literature, the peak prevalence is between the ages of 30 and 60 years with females numerically more affected than males [12]. There is also evidence from the published studies that the buccal (facial) tooth surfaces are most likely to be affected and there appears to be an association between DH/DS and gingival recession. According to the West et al.'s [14] study in young European adults aged 18 to 35 years, there is a link between a so-called healthy erosive diet, lifestyle and tooth wear with DH/RS.

2.2 Awareness of dentine hypersensitivity by clinicians

According to the findings of the Canadian Advisory Board on Dentin Hypersensitivity [6], 14 knowledge gaps were identified from the survey of participating clinicians, and these were classified as relating to either the causes and

diagnosis or the management of the condition. It was evident from these findings that the prevalence of DH was underestimated, and this was due in part to the lack of routine screening for the condition by clinicians. Less than 50% of the participants considered a differential diagnosis to eliminate other dental conditions with similar pain characteristics to those of DH. There was also confusion regarding the nature of the predisposing factors associated with DH as well a misunderstanding of how desensitizing products work (mechanism of action). Furthermore, about 50% of the participants indicated that they lacked confidence in treating DH effectively with a similar percentage indicating that they would try to modify any predisposing factors prior to further treatment. A recent review of questionnaire studies on the awareness of DH by clinicians indicated that there are still areas of concern in the understanding of the underlying principles involved in the management of DH [7].

3. Mechanisms, aetiology, predisposing factors, and clinical features of dentine hypersensitivity

3.1 Mechanisms

The currently accepted mechanism associated with DH as proposed by Brännström and Åström is hydrodynamic in nature [15]. This theory relies on minute fluid movements within the dentinal tubules in response to an external stimulus such as cold air or water to initiate pain in the dental pulp. There is also *in vitro* evidence that in areas of clinically identified sensitive dentine there are a greater number of open dentinal tubules compared to non-sensitive areas. Underpinning this theory is the presence of open dentinal tubules on the exposed root surface (cervical area), which in turn affects the degree of fluid flow through the tubule. This theory promotes two basic approaches for treatment: (1) by occluding the exposed open dentine tubules in the cervical region of the exposed root surface, which in turn reduces any stimulus-evoked fluid movements within the dentinal tubules and effectively prevents the transmission of the external stimulus (such as a cold stimulus) to the pulp, and (2) by potassium ion diffusion within the dentinal tubule to reduce intra-dental nerve excitability and prevent any nerve activation [16]. The question whether the hydrodynamic theory is also associated with root sensitivity has been questioned due to the presence of dental plaque on the root surface, which may encourage the ingress of bacteria within the dentinal tubules [12, 16].

3.2 Etiology and predisposing factors

The etiology of DH/RS is multifactorial in nature, and it is evident that the structure of dentine is altered because of a combination of the associated pre-disposing factors, which may include anatomical factors such as tooth position, quality of the buccal plate, and so on. For example, once the overlying hard and soft tissues have been removed exposing the underlying dentine surface through gingival recession, tooth surface loss through attrition, abrasion and possibly abfraction, over-zealous toothbrushing techniques, the effects of periodontal disease and its subsequent treatment, then these factors may play a part in widening the open dentinal tubules through erosion with the combination of over-zealous toothbrushing techniques. An epidemiological study in a population of young adults aged 18–35 years by West et al. [14] reported that there was a link between a healthy erosive diet and lifestyle and toothwear with DH.

3.3 Clinical presentation

Pain associated with DH is considered transient in nature and once the initiating stimulus, such as cold air from a dental air syringe or a cold drink, has been removed, the problem will have been resolved. The clinical features of DH as reported in the published literature primarily deal with the features associated with DH in patients with a well-maintained oral hygiene rather than clinical features associated with RS *per se*. It is reasonable, however, to acknowledge that some of the aetiological and predisposing factors will be similar (**Figure 1**). For example, the combination or synergistic effects with attrition, abrasion, erosion, and so on, together with over-zealous tooth brushing on exposed dentine in the cervical/root area of a tooth may accelerate the tooth wear process. The loss of gingival tissue due to the impact of the above factors or because of periodontal disease and/or periodontal therapy may also expose the underlying dentine resulting in DH/RS. The importance of the underlying bone texture, thickness of the buccal plate as well as the thickness of the gingival (periodontal) biotype may also result in gingival recession (loss of attachment), particularly following scaling procedures in shallow pockets (≤ 4 mm). Although DH/RS may affect any tooth or tooth surface, the intra-oral distribution involves the buccal (facial) surfaces of incisor, canine, premolar, and molar teeth RS, which may also affect the interdental, palatal, and lingual surfaces. Non-carious cervical lesions (NCCL) with or without DH/RS may also be present.

3.4 History taking and clinical evaluation

It is important to recognize that two broad categories of patients attend a dental clinic: (1) patients who are regular attenders and have an established relationship with the clinician, and (2) patients who have not been previously attending a dental practice but may have decided to attend due to a dental problem such as toothache, esthetic concerns, or other dental problems which have arisen. In the first category of patients, the clinician will be aware of their personal medical and treatment history and to some extent, the consultation period including the examination may be straightforward. For example, a patient who has recently received dental treatment such as restoration

Figure 1.
Clinical features of a patient with gingival recession and dentine hypersensitivity (Acknowledgement N. Pandya [17]).

of a tooth or had their teeth professionally cleaned may be experiencing discomfort from these procedures and such a problem can be swiftly identified and treated [16]. Patients who have not previously attended a dental practice, however, may require a more prolonged consultation to obtain the relevant medical, dental, and social history prior to the clinical examination and subsequent diagnosis of DH.

For patients with a more obscure orofacial problem, a persistent idiopathic facial pain (PIFP) may require a more extensive examination and it is advisable for the clinician to refer these patients to a Specialist Oral Medicine/Pain clinic [16].

Prior to a clinical examination, the clinician should obtain medical, dental, social, and dietary histories to supplement the information collected during the clinical examination and any subsequent tests such as radiographs. During the initial consultation, it is important to ask the patient why they have arranged the appointment. Toothache is one of the most common of oro-facial pains that prompts a patient to visit a dentist and where possible the clinician should determine the nature of the problem, the location of the pain (if the patient is able to pinpoint the exact location), duration, intensity, and any factors that may intensify or relieve the pain. For example, the clinician can ask if the patient is able to continue their daily activities such as eating, drinking, brushing their teeth without any discomfort. One suggestion would be to use visual analogue scale (VAS) scores (0-10), verbal descriptors, or Quality of Life Questionnaires (QoL) to determine the severity of the discomfort the patient is experiencing, and any impact DH/RS may have the patient's QoL [5]. The clinical examination will involve a thorough evaluation of the patient's oral status including a Basic Periodontal Examination (BSP) and a Basic Erosive Wear Assessment (BEWE) to determine the degree of tooth surface loss [10].

During the clinical examination, clinicians will use a dental explorer probe and air from a triple air syringe to screen any sensitive areas on the exposed cervical/root region. If the patient is prone to DH, then this mechanical or evaporative/thermal stimulus will elicit a response from the patient [1]. The response to these stimuli will be varied depending on the individual's pain threshold and subjective perception of pain. This pain should be transient in nature, in that once the stimulus has been removed, the pain will be resolved. If the pain, however, is continuous in nature, then this may indicate that the problem is related to other dental problems such as dental caries, which will require more extensive testing using an ice stick, ethyl chloride, pulp testers, and so on to evaluate the status of the dental pulp (pulp vitality testing). A simple test at this stage of the initial evaluation for DH is to (1) ask the patient to indicate their perception of the pain they are experiencing with DH following blowing cold air on the tooth (or teeth) in question using a VAS score, (2) apply a varnish to the affected site of the identified tooth (or teeth), and (3) retest the tooth (or teeth) in question using cold air from a dental air syringe and ask the patient to indicate their pain perception using a VAS score. If there is an improvement in the VAS scores, then this may indicate that the initial diagnosis of the patient's problem was DH (see management section).

3.5 Diagnosis and differential diagnosis of Dentine hypersensitivity

3.5.1 Diagnostic evaluation including special investigations

According to Gillam [7], there are a variety of methodological approaches used in the dental clinic to identify (diagnose) DH such as tactile, evaporative, and thermal

stimulation using cold air from a dental triple syringe as well as the patient’s self-reporting (VAS, patient history, etc.). An example of the range of methodological approaches recommended or used by clinicians can be observed in **Figure 2** [18]. The use of these methodological approaches may, however, be difficult to justify [19].

A useful device to aid clinicians in determining both a provision and definitive is the use of mnemonics such as ‘LOCATE’ or ‘SOCRATES’. This will help to ascertain the relevant information to identify the patient’s problem by asking the following questions:

- Pain characteristics: What were the symptoms relating to pain experienced by the patient?
- Location of the pain: Was the pain localized or generalized in nature and can the patient point to the site of the problem?
- Pain onset: Was the patient able to relate to the clinician when the pain started?
- Pain duration: Was the pain transient or long lasting in nature?
- Pattern of pain: Was the patient able to recall the pattern of the pain?
- Pain severity: What was the severity of pain and did it vary?
- Relieving factors: Are there factors that relieve or worsen the pain such as the application of cold or heat, medication, changing position (lying down), and so on?
- Associated factors: Are there any other factors that you might be aware of when you are experiencing pain?

Figure 2.
Diagnostic steps used by clinicians to identify DH (Acknowledgement Exarchou et al. [18]).

The clinician, however, should be aware that depending on the longevity and severity of the patient's pain, and particularly from severe toothache, they may have difficulties recalling some of these features due to being unable to cope with pain before attending the clinic [2].

3.5.2 Diagnosis of dentine hypersensitivity

The classic definition of DH was based on specific wording as 'pain derived from exposed dentine in response to chemical, thermal tactile or osmotic stimuli which cannot be explained as arising from any other dental defect or disease' [6]. In other words, DH is in essence a diagnosis of exclusion based on both the history of the problem and a clinical examination to exclude other forms of oro-facial pain and as such a thorough clinical examination together with a medical and dental history of the patient should enable the clinician to come to a correct diagnosis [1, 20].

There are, however, several problems facing the clinician when investigating oro-facial pain, for example, the time taken to identify the areas in the mouth causing the discomfort as well as the highly subjective nature of the pain response [20]. The clinician is, therefore, reliant not only on the patient's self-reporting of the history of DH but also on the information that they have accumulated through their own analysis of the problem (medical, dental, and social history together with a thorough clinical examination, which may require further evaluation). For example, patients who have recently received restorative, bleaching, and periodontal procedures within the last few weeks before attending the clinic may in fact be suffering from post-operative sensitivity and this should be relatively easy to identify and reassure the patient that the pain should resolve within 4-6 weeks and if not to return for further investigation. For new patients or those with a recent complaint of DH, the clinician will spend more time discussing the problem with the patient, trying to determine the history of the problem using some of the diagnostic tests indicated in **Figure 2**. The clinician should be aware that as DH is an exaggerated response of the normal pulp-dentine, the patient may only be aware of the problem once an external stimulus such as a cold stimulus (cold air from a dental triple syringe, suction from a high-volume suction, etc.). The evidence identified during this process may enable to provide a provisional diagnosis of DH.

3.5.3 Differential diagnosis of dentine hypersensitivity

According to the Canadian Advisory Board on Dentin Hypersensitivity [6], there is a major problem in the diagnosis of DH where $\leq 50\%$ of the clinicians participating in the survey considered using a differential diagnosis to eliminate other dental conditions with similar pain characteristics to those of DH. Other studies have also reported on the apparent reluctance by clinicians to consider in this aspect of the management of DH [7].

One of the reasons for this reluctance in making a definitive diagnosis of DH may be the complexity and time required to eliminate the other dental conditions that have similar pain characteristics to DH such as reversible and irreversible pulpitis, dental abscess, cracked tooth syndrome, periodontal disease, pericoronitis, idiopathic oral facial pain, and post-operative sensitivity [18] (**Figure 2**). It is, therefore, important for the clinician to make a definitive diagnosis of DH before undertaking any treatment of the patient's problem. A useful summary of selected oro-facial conditions with their pain characteristics and presenting features is shown in **Table 1** [20].

Aetiology	Pain character and timing	Pain intensity	Proving factors	Relieving factors	Associated features
Dentine hypersensitivity	Sharp, stabbing, stimulation evoked	Mild to moderate	Thermal, tactile, chemical, osmotic	Removal of the stimulus	Attrition, erosion, abrasion, abfraction
Atypical odontalgia (persistent dentoalveolar pain)	Continuous, no paroxysmal, dull, aching and throbbing but occasionally sharp	Mild to moderate	Touch, heat and cold	Sleep and rest Topical agents: lidocaine, capsaicin. Systemic agents: antidepressants	May have no obvious clinical features
Reversible pulpitis	Sharp, stimulation evoked	Mild to moderate	Hot, cold, sweet	Removal of the stimulus	Caries, restorations
Irreversible pulpitis	Sharp, throbbing, intermittent/continuous	Severe	Hot, chewing, lying flat	Cold in the late stages	Deep caries
Cracked tooth syndrome	Sharp intermittent	Moderate to severe	Biting, 'rebound pain'	—	Trauma, parafunction
Periapical periodontitis	Deep, continuous boring	Moderate to severe	Biting	Removal of trauma	Periapical redness, swelling, mobility
Lateral periodontal abscess	Deep continuous aching	Moderate to severe	Biting	—	Deep pockets redness and swelling
Pericoronitis	Continuous	Moderate to severe	Biting	Removal of trauma	Fever, malaise, imprint of upper tooth
Dry socket (acute alveolar osteitis)	Continuous 4–5 days post-extraction	Moderate to severe	—	Irrigation	Loss of clot, exposed bone

Table 1.
Differential diagnosis of dental pain (modified acknowledgement Aghabeigi [20]).

4. Clinical management of dentine hypersensitivity

Once a definitive diagnosis has been determined, the clinician can then formulate a management strategy to treat the condition. The complexity of this treatment plan will depend on (1) on the extent and severity of the problem, (2) the willingness of the patient to comply with the recommendations provided by the clinician, and (3) the ability of the clinician to successfully diagnose the problem and provide the appropriate treatment including preventative strategies. Broadly speaking, the initial treatment will be either (1) professionally applied (in-office treatment) such as a fluoride varnish or more invasive strategy (composite, laser, periodontal surgery) for localized severe DH, or (2) patient applied/at home [over the counter treatment (OTC)] such as an OTC toothpaste for a mild-moderate discomfort (see **Table 2** for examples). The clinician should also be aware of the impact of DH on the QoL of the patient and it is important for the clinician to monitor whether the recommended treatment has improved the patient's QoL. For example, can the patient continue their daily routine of eating, drinking and oral hygiene practices without any interruption to their daily activities.

Several investigators have recommended treatment algorithms to help the clinician manage DH successfully [6, 8, 10]. An example of one of these algorithms is displayed in **Figure 3** based on the recommendations from a UK Guidelines workshop, London, UK [10]. An important aspect of these guidelines was the recognition that

Gingival recession	Tooth wear	Periodontal treatment
<p>Clinical evaluation</p> <ul style="list-style-type: none">• Clinical measurement of the Gingival Recession defect• Take study casts and clinical photographs to monitor condition over time• Check and Monitor periodontal health• Identification and correction of predisposing or precipitating factors• Use of pain scores to assess and monitor DH (e.g., visual analogue scores)	<p>Clinical evaluation</p> <ul style="list-style-type: none">• Identify cause of tooth wear (enamel loss)• Record severity of lesions, if possible, using a recognized index (Smith & Knight 1984, Bartlett et al. 2008)• Take study casts and clinical photographs to monitor condition over time• Check and Monitor periodontal health.• Use of pain scores to assess and monitor DH (e.g., visual analogue scores)	<p>Clinical evaluation</p> <ul style="list-style-type: none">• Periodontal disease or periodontal treatment as the primary cause of exposure of dentine and associated DH.• Check and Monitor periodontal health (6-point pocket charting)• Use of pain scores to assess and monitor DH (e.g., visual analogue scores)
<p>Patient education (including preventive advice)</p> <ul style="list-style-type: none">• Show patient the affected site(s)• Explain probable cause for recession.• Explain factors triggering sensitive teeth episodes• Encourage patients to modify their oral hygiene regimen in order to reduce damage to gingivae (e.g., reducing brushing force, correction of toothbrush technique)• Reduce excessive consumption of acid foods and drinks	<p>Patient education (including preventive advice)</p> <ul style="list-style-type: none">• Show patient the site(s) and explain probable cause of the tooth wear lesion(s)• Recommend an oral hygiene regimen to minimize risk of further tooth wear.• Where appropriate recommend reducing frequency of consumption of acidic food & drink.	<p>Patient education (including preventive advice)</p> <ul style="list-style-type: none">• Reinforce the need for good oral hygiene• Show patient the site(s) affected by periodontal disease and explain probable cause of the exposed dentine• Guide the patient to improve 'at home' oral hygiene regimen.• Instruction on measures of reducing periodontal risk factors for example diabetes, smoking, obesity.

Gingival recession	Tooth wear	Periodontal treatment
<p>Corrective clinical outcomes</p> <ul style="list-style-type: none">• Reduce excessive consumption of acid foods and drinks• Manufacture of silicone gingival veneers• Orthodontic treatment• Restorative correction of recession defect and sub-gingival margins of fillings and crowns• Polymers: Sealants/varnishes/resins/dentine bonding agents• Laser obturation of dentinal tubules• Use of Desensitizing polishing pastes• Pulpal extirpation (root canal treatment)	<p>Corrective clinical outcomes</p> <ul style="list-style-type: none">• Provide high fluoride remineralizing treatment (pre-emptive phase)• Provide professional desensitizing treatment to relieve DH• Encourage patient to seek advice from medical practitioner, if tooth wear caused by working environment or reflux/excessive vomiting (Psychiatric evaluation may also be appropriate)• Restorative correction in the form of composite build-up, crowns may also be appropriate	<p>Corrective clinical outcomes</p> <p>Initial phase</p> <p>Non-surgical periodontal procedure(s).</p> <p>DH treatment (including desensitizing polishing pastes/ Fluoride varnishes)</p> <p>Re-evaluation</p> <p>Follow-up assessment on periodontal status and dentine hypersensitivity</p> <p>Corrective phase</p> <ul style="list-style-type: none">• Surgical periodontal procedure(s), for example, guided tissue regeneration, Coronally Advanced Flap + Enamel Matrix Derivatives, Connective Tissue Graft (flap), Free Gingival Graft (acellular dermal matrix allograft)• DH treatment (including desensitizing polishing pastes/ Fluoride varnishes) <p>Follow-up management</p> <p>Maintenance phase</p> <ul style="list-style-type: none">• Supportive periodontal therapy• Ongoing monitoring of periodontal health• Dentine hypersensitivity treatment (including desensitizing polishing pastes/Fluoride varnishes)• Oral hygiene advice
<p>Recommendations for home use (including toothpaste/mouth rinses)</p> <ul style="list-style-type: none">• Oral hygiene implementation as per recommendation• Strontium chloride/strontium acetate• Potassium nitrate/chloride/citrate/oxalate• Calcium compounds:• Calcium carbonate and arginine and Caesin Phosphopeptide+Amorphous Calcium Phosphate• Bioactive glass• Nano/hydroxyapatite• Fluoride in higher concentration (2800/5000 ppm F[prescription])• Amine/sodium/sodium monofluorophosphate/ stannous fluoride	<p>Recommendations for home use (including toothpaste/mouth rinses)</p> <ul style="list-style-type: none">• Oral hygiene implementation as per recommendation• Toothpastes and mouth rinses (see Recommendations for gingival recession)	<p>Recommendations for home use (including toothpaste/mouth rinses)</p> <ul style="list-style-type: none">• Oral hygiene implementation as per recommendation• Regular brushing with an antibacterial toothpaste to aid plaque control.• Short period, the use of a 0.2% chlorhexidine solution for plaque control• Use of a desensitizing mouth rinse twice daily for DH control (when appropriate)

Table 2.
Overall management strategy options for treating DH (Acknowledgement Gillam et al. [10] modified).

Figure 3.
Selected responses from participants on what other dental conditions should be excluded when determining a differential diagnosis (Acknowledgement Exarchou et al. [18]).

the management of DH should be based on the presenting features of the problem rather than simply providing a blanket treatment plan to cover all aspects of DH. For example, three categories were presented for the clinician to consider: (1) patients with gingival recession in a well-maintained mouth, (2) patients with a tooth wear problem, and (3) patients with a periodontal problem (**Table 2**) [10]. This concept was utilized and developed by Gillam and Koyi [21] covering six clinical case scenarios in dealing with oro-facial pain with specific clinical presentations.

The management of DH can therefore involve both simple and complex cases to treat and it is important that the clinician is aware of both their expectations of success and the patient's expectation of resolving their pain. There may be times when this aspiration can only be partially met to the satisfaction of both parties. The clinician should avoid simply handing out or recommending a treatment or technique without identifying the aetiological factors that initiated the problem in the first place. One of the concerns from the Canadian Advisory Board on Dentin Hypersensitivity [6] was whether clinicians had the confidence in the products that they recommended for treatment. This concern has also been highlighted by several investigators and it appears that this issue is still a matter of concern [7, 19].

Depending on the severity of the problem, the following products and techniques can be suggested (see **Table 2**). The question as to whether these products or techniques are effective in the treatment of DH has been the subject of several systematic reviews and meta-analysis [22–25].

5. Preventive strategies

The importance of a preventive strategy for minimizing further episodes of DH cannot be overstated. It is not enough to simply provide a patient with a treatment such as a toothpaste or composite restoration without first eliminating or at least minimizing the aetiological or predisposing features that initiated the problem in the first place. This aspect will involve reviewing the clinical features implicated with the condition such as patients with a healthy mouth or patients with a periodontal or

restorative problems. For example, patients with a healthy, plaque-free mouth may be over-zealous, or an enthusiastic brusher with a healthy diet that may include acidic drinks will need advice on modifying their tooth brushing technique and minimizing the effects of dietary acids. The patient with a periodontal or restorative problem will require more extensive and prolonged treatment and perhaps one way of initially alleviating post-operative pain following this treatment would be to apply a desensitizing polishing paste or dental varnish [16].

Traditionally, clinicians expect their patients to change their health behavior, which is a philosophy based on a top-down approach (clinician directed) where the patient was provided information that was considered beneficial to them by the clinician. This philosophy, however, not only failed to empower the patient but was also ineffective in motivating the patient to initiate any behavior changes to improve their health and well-being. It is, therefore, important for the clinician to adopt management strategies and goals that will effectively encourage the patient to take individual responsibility to initiate these behavioral changes in the lifestyle of their patients. According to Gillam and Ramseier [26], the introduction of patient-centred approaches such as Motivational Interviewing is ideal for motivating patients in dental practice. It is acknowledged, however, that for many clinicians, this approach may be difficult to implement, due to time constraints, although the process could be continued over several visits as in the periodontal maintenance phase [27]. There are several factors to consider when developing a strategy using this approach, for example, (1) the extent and severity of the patient's problem, (2) acquiring the patient's permission to discuss any proposed changes, (3) the availability of the patient and their willingness to engage with the consultation process, (4) the rapport between the patient and clinician, (5) the willingness of the patient to reflect on the proposed changes and to weigh up the advantages/disadvantages and decide whether to accept or reject these proposals, (6) the patient's motivation to initiate these changes and subsequently adhere (comply) to the recommended changes to their behavior, and (7) the frequency of monitoring during the maintenance phase and subsequent reinforcement strategy in monitoring the patient's progress [26, 27].

6. Summary and take-home message

According to Gillam ([20] modified), the following key points may be useful in ascertaining whether a patient has DH and how much it impacts on their QoL and should enable the clinician not only to manage the problem in a structured manner but also to encourage to take personal ownership of their oral health by making the necessary changes/modifications in their behavior.

- Ask patients if they have a history of DH
- Ask patients if it is a current problem
- Does it impact on their QoL? If 'Yes', ask them to elaborate on the extent and severity of the problem
- Examine the patient for DH, particularly the buccal (facial) surfaces of the standing teeth using a probe and an air-blast from a dental triple syringe.

- A good history of the complaint is important, listen to the patient and examine areas where the dentine is exposed, identify any aetiological and predisposing factors. Listen to the patient; they will give you the diagnosis.
- The use of diet sheets will help in identifying potential risk factors in the diet (diet analysis).
- Have a basic understanding of the mechanisms associated with dentine hypersensitivity, in particular, the Hydrodynamic Theory and its importance in choosing a suitable OTC/professionally applied product when treating the patient.
- Educate the patient, indicating where they can reduce the impact of DH on their QoL, modifying their toothbrush technique, using a less abrasive toothpaste and avoiding consuming acidic food and drinks particularly around the time of brushing.
- Encourage the patient to take ownership of their oral health to allow for any behavior changes to reduce the impact of DH on the QoL when undertaking their day-to day activities (Consider the use of Motivational Interviewing).
- Remember there is no one treatment or procedure that will resolve all your patient's problems and that simply providing a toothpaste or in-office procedure alone without correcting or modifying any underlining predisposing features that initiated the problem will not resolve the problem in the long term.
- Apply the guidelines outlined in this chapter; in your practice, monitor patients DH within your practice's recall procedure(s), avoid simply handing out or recommending dental products expecting the problem to resolve, without any further intervention by the clinician.
- Use the algorithm (or similar examples; see references) illustrated in this chapter to aid you in the management of DH. It may be that despite all your efforts the patient still has oro-facial pain. The steps outlined in the algorithm will enable you to revisit the diagnosis of DH, which may result in further investigations to determine the cause (reversible/irreversible pulpitis) or a referral to a specialist oral medicine clinic if the problem is of a non-dental origin such as idiopathic facial pain (PIFP).

7. Concluding remarks

DH is an enigmatic dental condition that is often discounted or underdiagnosed by clinicians who may fail to appreciate its impact on the QoL of their patients, and therefore, screening for the problem should be included in a clinical examination.

Clinicians should recognize it is a diagnosis of exclusion and all other possible causes of the pain should be ruled out. This will require the clinician to collate the relevant medical, dental, social, and diet history from the patient, which will supplement the clinical examination. It is important for clinicians to acknowledge

that the management is not just based on providing or recommending OTC products or in-office therapies and procedures but on the removal or modification of any predisposing feature together with involving the patient to make changes in their own behavior to minimize the impact of DH on their QoL.

Conflict of interest

The author declares no conflict of interest.

Author details

David G. Gillam

Oral Bioengineering, Institute of Dentistry, Barts and the London School of Medicine and Dentistry QMUL, London, UK

*Address all correspondence to: d.g.gillam@qmul.ac.uk

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