Diagnosis and management of dentine hypersensitivity

Dr David G. Gillam

The aim of this review is to update dental practitioners on this troublesome clinical condition that is not fully appreciated by many dental practitioners and as such is often under-diagnosed in dental practice.

Diagnosis and differential diagnosis

Before considering a treatment strategy for the management of the condition, it is important to note from the published literature that there are a number of individuals who may be at risk from dentine hypersensitivity (DH), for example, overzealous brushing, periodontal treatment patients, bulldozers, people with xerostomia, high-acid foods/drink consumers, older people exhibiting gingival recession, and people who chew ‘smokeless’ or ‘snuff’ tobacco.

History-taking, oral examination and diagnosis

One of the difficulties facing the dental professional when confronted with a patient complaining of tooth pain is that there are a number of clinical conditions that may elicit the same clinical symptoms as DH, and they have to be eliminated before a correct diagnosis of DH can be made. It is also important to acknowledge that patients who have been suffering from various types of oro-facial pain in the form of a throbbing or tooth sensitivity may suffer various physical or emotional symptoms that can be very upsetting and disturbing to them. For example, they may experience a feeling of despair or helplessness, and frustration of not being able to cope and rely on a dental professional to resolve their problem. This in turn may make recording a satisfactory history of the condition difficult and the dental professional will need all his or her skills in obtaining the correct diagnosis, which will lead to a successful conclusion in his or her treatment strategy. In a busy dental practice, this may take time and the dental professional needs to be a good listener, sympathetic and patient in order to elicit the necessary information from the patient.

However, it is important to remember that no irreversible treatment procedure should be performed until a definite diagnosis is made; in other words, no diagnosis, no treatment.

No doubt dental professionals may remember various acronyms from Dental School such as ‘LOCATE’ and ‘SOCRATES’ in order to aid them in obtaining sufficient information about the character, site, onset, duration, periodicity and severity of the problem that the patient may have when they come to see the dental professional (the reason for attending). Further questions as to what makes the problem better or worse, as well as asking the patient to describe the pain he or she is experiencing, may provide a very useful clinical description of the condition.

This aspect of the diagnostic and management process is often under-diagnosed in dental practice and as such is important to consider. It is evident from the Canadian consensus document that provides a very useful clinical description of the condition and suggests the need to eliminate other forms of tooth pain or sensitivity.

Counselling and prevention

This aspect of the diagnosis and management process is however should not exclude the dental professional from identifying and relieving any aetiological and predisposing factors in his or her management strategy.

It is important to note that diagnosis may not be simple, as there are a number of conditions that may cause similar symptoms, of which the dental professional needs to be aware. These may include conditions such as cracked tooth syndrome, dental caries, reversible and irreversible pulpi- tis, fractured teeth or restorations, post-operative sensitivity (from restorative, periodontal and bleaching procedures) and atypical facial pain (see also Table 1, page 12). These may well require a prolonged clinical examination using various diagnostic tests (such as vitality, pulp tester, ethyl chloride, ice stick, percussion, and radiographs). A useful tip in diagnosing cracked tooth syndrome, for example, is the use of a diagnostic local infiltration for example, is the use of a diagnostic local infiltration or inferior dental block on the use of a tooth sleuth. The importance of the definition as suggested by Addy et al. is evident from the Canadian consensus document that provides a very useful clinical description of the condition and suggests the need to eliminate other forms of tooth pain or sensitivity.
12 Trends & Applications

**Table 1:** Differential diagnosis of dental pain (adapted from Aghabegeri).

<table>
<thead>
<tr>
<th>Aetiology</th>
<th>Pain character and timing</th>
<th>Pain intensity</th>
<th>Provoking factors</th>
<th>Believing factors</th>
<th>Associated features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dentine hypersensitivity</td>
<td>Sharp, stabbing, stimulation evoked</td>
<td>Mild to moderate</td>
<td>Thermal, evaporative, tactile, chemical, osmotic</td>
<td>Removal of the stimulus</td>
<td>Attrition, erosion, abrasion, attrition</td>
</tr>
<tr>
<td>Reversible pulpitis</td>
<td>Sharp, stimulation evoked</td>
<td>Mild to moderate</td>
<td>Hot, cold, sweet</td>
<td>Removal of the stimulus</td>
<td>Caries, restorations</td>
</tr>
<tr>
<td>Irreversible pulpitis</td>
<td>Sharp, throbbing, intermittent/continuous</td>
<td>Severe</td>
<td>Hot, chewing, lying flat</td>
<td>Cold in the late stages</td>
<td>Deep caries</td>
</tr>
<tr>
<td>Cracked tooth syndrome</td>
<td>Sharp, intermittent</td>
<td>Moderate to severe</td>
<td>Biting, ‘rebound pain’</td>
<td>Trauma, para-function</td>
<td></td>
</tr>
<tr>
<td>Peri-implantitis</td>
<td>Deep, continuous boring</td>
<td>Moderate to severe</td>
<td>Biting</td>
<td>Removal of trauma</td>
<td>Peri-implantitis, swelling, mobility</td>
</tr>
<tr>
<td>Lateral periodontal abscess</td>
<td>Deep, continuous aching</td>
<td>Moderate to severe</td>
<td>Biting</td>
<td>Deep pockets redness and swelling</td>
<td></td>
</tr>
<tr>
<td>Peri-implantitis</td>
<td>Continuous</td>
<td>Moderate to severe</td>
<td>Biting</td>
<td>Removal of trauma</td>
<td>Fever, malaise, imprint of upper tooth</td>
</tr>
<tr>
<td>Dry socket (acute alveolar osteitis)</td>
<td>Continuous</td>
<td>4-5 days post-extraction</td>
<td>Moderate to severe</td>
<td>Irrigation</td>
<td>Loss of clot, exposed bone</td>
</tr>
</tbody>
</table>

**DENTAL TRIBUNE Asia Pacific Edition**

**Page 11**

Often forgotten. It is not acceptable practice to simply treat DH by providing a toothpaste, restoration or gingival graft without due consideration of the aetiological and predisposing factors that gave rise to the problem initially. The use of diet history sheets to help both the patient and the dental professional identify the various erosive elements in the form of food and drinks is a valid tool in this process. Advice should therefore be based on the findings from the completed diet sheet particularly in identifying the various erosive elements in the patient’s diet. The dental professional can be instrumental in educating the patient by providing information (by demonstration, professional literature etc.) on correct brushing procedures (and type of brush) in order to prevent/minimise further damage to the exposed root surface. The importance of counselling the patient concerning his or her intake (especially frequency) of acidic fruits and beverages with low pH, particularly in relation to when the teeth are brushed, should not be underestimated. For example, brushing with desensitising or fluoride toothpaste prior to drinking fruit juice may help to reduce any erosive effects on the tooth surface, or avoiding sucking a portion of grapefruit in the anterior part of the mouth to prevent loss or dissolution of tooth substance.

**Management of dentine hypersensitivity**

It is important that the dental professional not simply rely on previous success strategies but address the specific aetiological and predisposing factors relevant to the patient. The choice and suitability of a particular treatment procedure or product should be based on a sound understanding of evidence-based dentistry rather than on product literature alone. A problem in evaluating results from the various studies in the published literature is that there is a very strong placebo effect when assessing patients with pain in the form of DH. As emphasised in this article, any treatment strategy (over-the-counter [OTC] or in-office) in a patient suffering from DH should be based on a current diagnosis of the condition by the dental professional who should be aware of other clinical conditions that are similar in their presenting features.

Management should be based on the severity of the condition. For example, for isolated problems, therapy is largely professionally delivered in the form of in-office treatment using adhesives, resins, cervical restorations (glass-ionomer cements) and varnishes that may provide effective treatment of DH over time.

**Fig. 1:** Flowchart for the clinical management of dentine hypersensitivity (adapted with permission of George Warman Publications [UK] Ltd.).

Note 1: Pain evoked by thermal, evaporative (jet of air), probe, osmotic or chemical stimuli as part of the clinical examination of the patient.

Note 2: Alternative causes of tooth pain include caries, chipped tooth, erupted tooth syndrome, fractured or leaking restorations, gingivitis, palato-gingival grooves, post-restoration sensitivity or pulpite.

Note 3: Treatment may be delayed in a stratified manner, as follows with least severe to severe dentine hypersensitivity of dental professionals may prefer to treat the patient directly, using an in-office procedure.

Note 4: Some form of follow-up is recommended. However, the follow-up interval may vary, depending on patient and dental professional’s preference and circumstances.

Note 5: Mild dentine hypersensitivity persists after the initial follow-up appointment; dental professionals may consider preventive and at-home therapies. If the sensitivity is more severe, some form of an office treatment may be appropriate.
“Most people are worried it is often something worse.”

Dr Nick Rote. East Finchley, UK

1 in 3 people suffer from dentine hypersensitivity and over 50% of sufferers don’t mention it to their dental professional.¹ Research shows that this may be because they fear it requires major dental work, the pain may be variable so they don’t report it or because they may be using techniques to try and avoid the pain.²

These findings highlight the important role that dental professionals play in actively diagnosing dentine hypersensitivity.

Recommending daily brushing with Sensodyne is a simple, effective solution which is clinically proven to reduce the symptoms of dentine hypersensitivity.

“When they come back to see me next time, they’re very pleased that the solution was given to them so easily.”

² Canadian Advisory Board on Dentin Hypersensitivity, Consensus-Based Recommendations for the Diagnosis and Management of Dentin Hypersensitivity, J Can Dent Assoc 2003; 69(4) 221 - 226
³ Sensodyne is a registered trade mark of the GlaxoSmithKline group of companies. Further information is available on request.

DAILY PROTECTION FROM THE SYMPTOMS OF SENSITIVE TEETH
The importance of implementing preventative and management strategies in identifying and eliminating predisposing factors in particularly erosive factors (such as dietary acids) cannot be ignored...

Guided tissue regeneration and flap procedures to treat DH associated with localized gingival recession have also been recommended. However, these should not necessarily be the first treatment option for resolving the problem and, as indicated in this article, providing a treatment procedure without identifying and modifying the aetiological and predisposing features responsible may not resolve the problem in the long term. Post-operative pain following periodontal procedures such as scaling, root surface debridement and periodontal surgery may also be problematic in the short term and palliative procedures, such as the application of varnishes (for example, Duraphat), resins etc., as well as the adjunctive use of a desensitising mouthwash, may also be recommended. The use of desensitising toothpastes prior to, during and following tooth-whitening procedures has also been recommended and this is particularly important for patients with a known history of DH who may be undergoing such procedures.

Over the last decade a number of new product innovations have come on to the market, for example the combination of casein phosphopeptides (CPP) and amorphous calcium phosphate (ACP) Recaldent (CPP-ACP, GC America, Inc.) has been claimed to reduce DH. ACP has also been used in bleaching trays to reduce DH during the bleaching process. Products have been developed from bioactive and bio-compatible glasses that are known to induce osteogenesis in physiological systems and may offer suitable materials for surface reactivity that could theoretically occlude tubules. NovaMin (calcium sodium phosphosilicate) is a new product formulation found in a variety of dental products for sensitive teeth, such as NuCare Propile Paste (Sunstar Butler) and Opalescence (NovaMin Technology, Inc.).

According to Gillam, technology based on a combination of an amino acid arginine and an insoluble calcium carbonate compound (Pro-Argin) has recently been developed as a desensitising paste for use in the dental surgery area as an OTC toothpaste product (8% per minute, arginine, calcium carbonate, and 1,450 ppm fluoride as sodium monofluorophosphate). This technology appears to have been based on previous work by Kleinberg and it has previously been suggested that at physiological pH the positively charged arginine in the combination binds to the negatively charged dentine surface, thereby encouraging a calcium-rich mineral layer into the open (exposed) dentine tubule, acting as an effective plug or tubule occlude. Initial laboratory (in vitro) evidence appears to support this in that the product does occlude open dentine tubules and effectively block fluid flow and is resistant to an acid challenge. Evidence from subsequent clinical studies appears to support its efficacy as a desensitizer.

For generalised sensitivity involving several teeth, OTC toothpastes containing potassium nitrate, chlorite and citrate) and strontium-based products (strontium/stannum/diatomaceous earth) have been shown to be clinically effective in well-controlled clinical studies, and are readily available to the consumer. According to Orchardson and Gillam, formulations containing potassium salts (in toothpaste, gels, solutions and mouthwash) have been widely used for treating DH; however, the effectiveness of these formulations (in toothpaste form) in reducing DH has been questioned.

It would also be appropriate for the dental professional to recommend an OTC product for the patient to use for two to four weeks and then review the situation if the pain has not resolved sufficiently for the patient to enjoy some ‘quality of life’. Subsequent treatment could be in the form of a more invasive therapy, such as restorations. The advantages, however, of using an OTC product readily available for the treatment of DH by the consumer compared to attending a dentist for treatment include ease of access and expense. One disadvantage is that OTC desensitising products may take up to two to four weeks to relieve symptoms, whereas in therapy a dental professional-applied therapy ideally may provide immediate relief of discomfort.

One of the interesting observations that may be relevant in the treatment of DH is the introduction of desensitising products in the form of prophylaxis pastes that can be used by the dental professional in the dental office and supplemented by a selected desensitising product at home (such as the dental professional who wishes to be successful in treating the condition it is important to realise that there is no ‘one size fit’ panacea for the treatment of this condition but rather a selected armamentarium of products and procedures. It is important therefore for the dental professional to have a management strategy that is based on a thorough history and examination, leading to a definitive diagnosis that involves not only the removal of any aetiological and predisposing factors, but also careful monitoring of the condition following initial treatment. To this end, a number of treatment paradigms have been suggested by researchers (Fig. 1, page 12).

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