

# A decision tree for the management of exposed cervical dentin (ECD) and dentin hypersensitivity (DHS)

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## Abstract

**Introduction** Dentin hypersensitivity (DHS) is a problematic clinical entity that may become an increasing clinical problem for dentists to treat as a consequence of patients retaining their teeth throughout life and improved oral hygiene practices.

**Objectives** The aim of this review was to develop a decision tree for the management of exposed cervical dentin (ECD) and DHS.

**Material and methods** A brief PUBMED literature search was performed on dentin hypersensitivity using “MeSH” terms, “review”, and “management”. In addition, some websites and local guidelines were screened.

**Results** From this review, it became clear that all dentate patients should routinely be screened for ECD and DHS. In this respect, underdiagnosis of the condition will be avoided and the preventive management can be initiated early.

**Conclusion** A decision tree process and a flowchart for daily practice were designed which should be started up as soon as a patient present with ECD or suffers from DHS. This approach takes into account the possible improved quality of life of the patient and is further based on a hierarchy of treatment options. In this respect, active management of DHS will usually involve a combination of at-home and in-office therapies. Starting with the use of desensitizing toothpastes is strongly recommended.

**Keywords** Exposed cervical dentine · Dentine Hypersensitivity · Review

## Introduction

As clearly shown in previous articles within this special issue, dentin hypersensitivity (DHS) is a well-known patient complaint which is patent in middle-aged people and most probably will increase with aging [1]. Besides the importance of correct diagnosis [2, 3], appropriate treatment recommendations for patients are needed [4]. Various treatment methods have been proposed to date universally accepted treatment guidelines. It is important to emphasize once more that the basic requirements for having DHS is exposed cervical dentin (ECD) and open dentin tubules [5]. In this respect, it is interesting to realize that dentists should be aware of the presence of ECD. Most of the patients are not aware themselves of the present harm or the physiologic alteration of the dentition. Moreover, patients who experience DHS wait to mention until the next recall visit, and most of them do not specifically seek treatment for this problem, most likely because they do not view it as a significant dental health problem [6]. However, it is clearly shown that DHS can significantly be related to substantially impaired oral health-related quality of life [7–9].

As with all conditions or diseases, management strategies that include treatment are usually more successful than treatment alone; therefore, the following approach was proposed by Addy about 10 years ago [10].

- Ensure the correct diagnosis of DHS, which is based on history and examination and compatible with the definition’s clinical descriptor.
- Consider a differential diagnosis, as suggested by the definition of DHS, which alone may explain the symptoms or identify the presence of other conditions contributing to the pain of DHS.
- Treat any and all secondary conditions that induce symptoms similar to DHS (differential diagnosis).

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- Identify etiological and predisposing factors, particularly with respect to erosion and abrasion. Consider detailed, written, dietary histories and oral hygiene habits (frequency, duration and timing of brushing, brushing frequency, estimation of brushing force, frequency of brush change, and appearance of brush at change). Some of these aspects of tooth brushing behavior are best appraised by observing the patient brushing in the dental practice.
- Remove or modify identified etiological or predisposing factors. Offer dietary advice to minimize erosion and oral hygiene instruction to minimize abrasion and to distinguish abrasion from erosion.
- Recommend or provide treatments appropriate to the individual needs of the sufferer. The number of teeth involved and the severity of the pain are important variables and should influence the treatment options.

The aim of this review was to design a decision tree which can be useful as soon as a patient present with ECD or suffers from DHS. The manuscript was reviewed and accepted by the GABA forum group.

The GABA forum group on dentin hypersensitivity was composed by:

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## Material and methods

A PUBMED literature search on dentin hypersensitivity was performed focussing on English written manuscripts using the MeSH terms “review” (273 hits) and “management” (12 hits). Within the reviews, most manuscripts focussed on the etiology or summarized the current treatment strategies. Only a few reports could be selected regarding treatment strategies including a decision tree. In addition, some

websites of manufacturers were visited. Finally, the Adelaide University Special Topic nr 6 [11] on dentin hypersensitivity was consulted.

The best developed report came from the Canadian Advisory Board on Dentin Hypersensitivity (CABDHS) who published in 2003 their “Consensus-Based Recommendations for the Diagnosis and Management of Dentin Hypersensitivity” [12].

Since then, an interesting flowchart for the clinical management of DHS [13] and only some reports dealing with the concept and methodology for its objective evaluation [14] or reviewing diagnosis and treatment procedures of dentinal hypersensitivity [15] were published. Most recently, the Academy of General Dentistry published a DHS management document [16] which was mainly based on the CABDHS report.

## The need for treatment strategies

From the CABDHS report, it became clear that there is a knowledge gap within the dentist and dental hygienist populations. To illustrate, the survey found that fewer than half of the 542 respondents (331 dentists and 211 dental hygienists) considered a differential diagnosis for DHS, even though it is by definition a diagnosis of exclusion [2, 3]. The survey also revealed that many respondents (64 % of dentists and 77 % of hygienists) incorrectly cited bruxism and malocclusion as triggers for DHS, while only a small percentage of the respondents (7 % of dentists and 5 % of dental hygienists) could correctly identify erosion as a primary cause. In this respect, it is clear that abrasion and erosion may be implicated here, but acid erosion seems to be predominant [13]. Furthermore, 17 % of dentists and 48 % of hygienists were unable to identify the accepted hydrodynamic theory of DHS. Approximately half of the respondents reported that they lacked the confidence to manage a patient’s pain caused by DHS. Also, only half of the respondents reported that they would try to modify the patient’s predisposing factors to control the pain.

A total of 14 knowledge gaps were identified, and they were classified as related to the “causes and diagnosis” or “the management” of the condition (see Table 1).

The most striking gaps related to management were the lack in knowledge on the working mechanisms of the longest used and best known active ingredients in toothpastes: strontium chloride (occluding the dentinal tubules) and potassium nitrate (decrease of excitability of nerves that transmit pain sensation).

**Table 1** Summary of knowledge gaps regarding the etiology, diagnosis and management of Dentin Hypersensitivity as proven by the Canadian Advisory Board on Dentin Hypersensitivity [12]

Gaps related to etiology / diagnosis	Gaps related to management
1. Underestimation of prevalence	1. Lack of confidence in managing pain
2. Screening is not routinely conducted	2. Only half of respondents tried to modify predisposing factors
3. No consideration of a differential diagnosis although a diagnosis by exclusion is widely accepted	3. Most of the respondents reported incorrectly that fluoride compounds are the most popular desensitizing ingredients
4. Malocclusion and bruxism are considered as triggers although no evidence	4. Only 10% of respondents correctly thought that desensitizing toothpastes disrupt pain transmission by preventing repolarisation within the nerve.
5. Erosion and gingival recession were incorrectly identified as causative factors	5. A number of respondents did not believe that desensitizing toothpastes were effective in preventing caries even though most contain fluoride.
6. The accepted hydrodynamic theory is not generally known	6. A number of respondents believed that desensitizing toothpastes were effective in preventing dentine hypersensitivity despite the lack of data
7. Most of the dentists and hygienists incorrectly cited toothbrush abrasion as a reason for continued tubule exposure	7. Although the latter gap, a number of respondents did not believe that desensitizing toothpastes relieved dentine hypersensitivity

**The development of a decision tree**

Although the CABDHS document is a reasonable basis, there are a few shortcomings. The algorithm as described restricts to the recommendation for diagnosis and management of DHS. The following was not taken into account:

- Having ECD without pain
- Having sensitive teeth without decrease of a patient’s quality of life
- An order of priority or hierarchy in treatment options

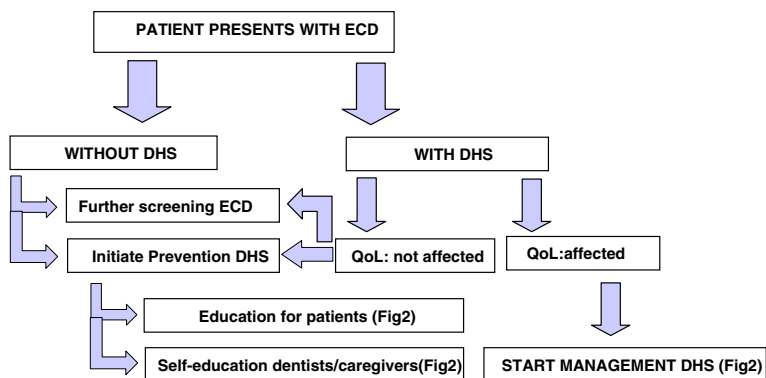
Furthermore, the recommendation to initiate for DHS management can be extended and should include also recommendations for the dental professionals and not for patients only as suggested by Chu et al. [16] based on Drisko et al. [18]. In the present review, an overall approach of the management of ECD and DHS will be given.

In a first approach, Fig. 1. illustrates how to start the thinking and managing process when ECD is occasionally found during routine check ups. As soon as ECD is seen, one should initiate a further screening asking some specific questions (cfr Fig. 2 (Aa)):

- Probing for lifestyle habits/practices, intrinsic and extrinsic acid (citrus juices and fruits, carbonated drinks, wines, and ciders),
- Obtaining detailed dietary information including the dietary intake relevant to medical problems that may have an impact on the oral cavity,
- Probing for gastric acid reflux and excessive vomiting.

Along with this specific screening, it is important to distinguish between a localized and a generalized problem which may be mild, moderate, or severe in nature. The latter will influence the future management which usually will involve a combination of at-home and in-office therapies. In practice, the regimen adopted will depend on the per-

**Fig. 1** A Treatment decision tree for patients with exposed cervical dentine (ECD) (QoL = quality of life, DHS = dentin hypersensitivity)



ceived severity of the condition and the number of teeth involved.

The above-mentioned screening needs to be followed by the initiation of prevention of DHS in two directions: education of patients and self education of practitioners and care givers.

In Fig. 2 (Ba and Bb), a listing is given of suggestions for patients and for dental professionals. If the patient presents with ECD combined with a complaint of DHS, one has to point out if this pain sensation affects the patient’s quality of life (QoL). In this respect, the patient can be questioned on:

- Pain and discomfort
- Probable limitations in dietary choices (drinks?)
- The effectiveness of oral hygiene
- Probable negative esthetics

If QoL is not affected, it is recommended to start the prevention program of DHS. If QoL is decreased, it is

strongly recommended to start a further management program of DHS as illustrated in Fig. 2.

When a patient presents with DHS expressed by sharp pain sensations and with a negative influence on the patients QoL, an additional screening obtaining a complete history of the patient especially focussed on nutritional habits (Fig. 2 (Aa)) and the promoted diagnosis by exclusion (Fig. 2 (Ab)) has to be performed.

If there is no consistency between history and examination, other causes than DHS must be sought for. If consistency is present, management of DHS must be initiated. The latter should be focused on suggestions for patients (Fig. 2 (Ba)) as well as for dentists and caregivers (Fig. 2 (Bb)). Regarding the patients, dietary counseling and non-harmful oral hygiene habits are very important. This can be supported by the daily use of anti-sensitive toothpastes. Therefore, a combination of individualized instructions on rather oral health behaviors, use of at-home products, and additional professional treatment may be required to manage the

**Fig. 2** A Treatment decision tree for patients with dentin hypersensitivity (DHS) and a decreased quality of life (QoL) (modified from the Canadian Advisory Board on Dentin Hypersensitivity-2003)

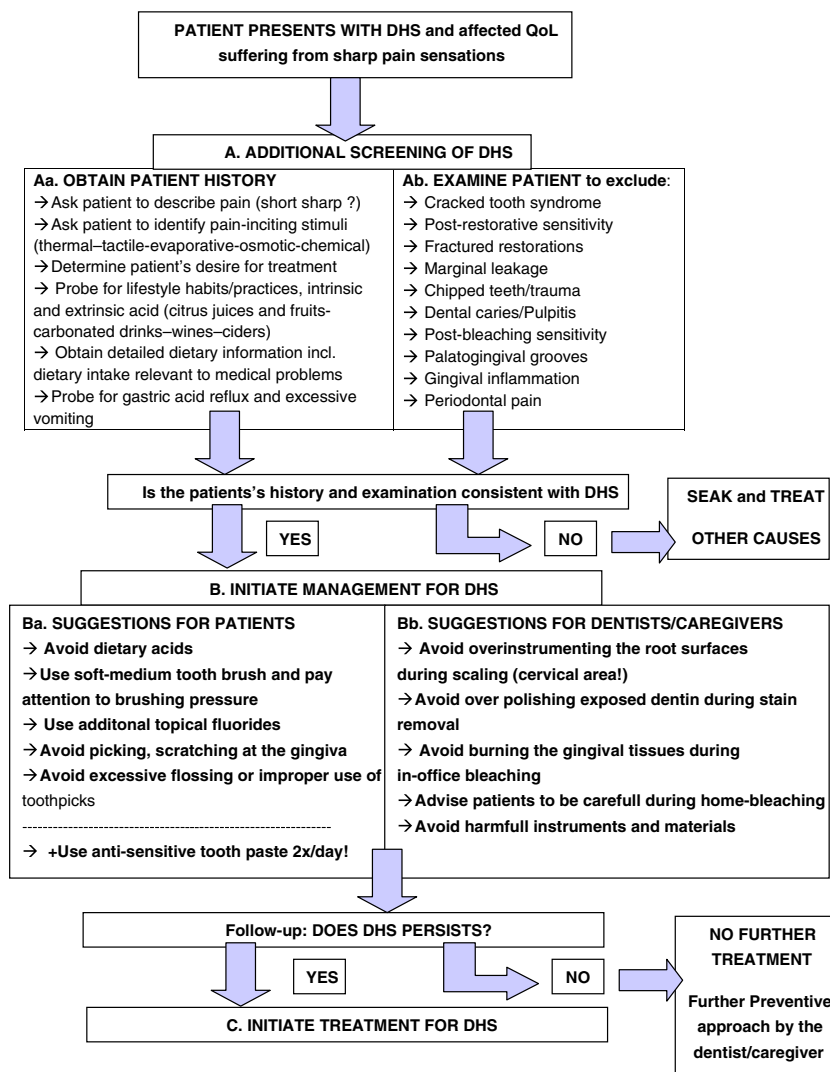
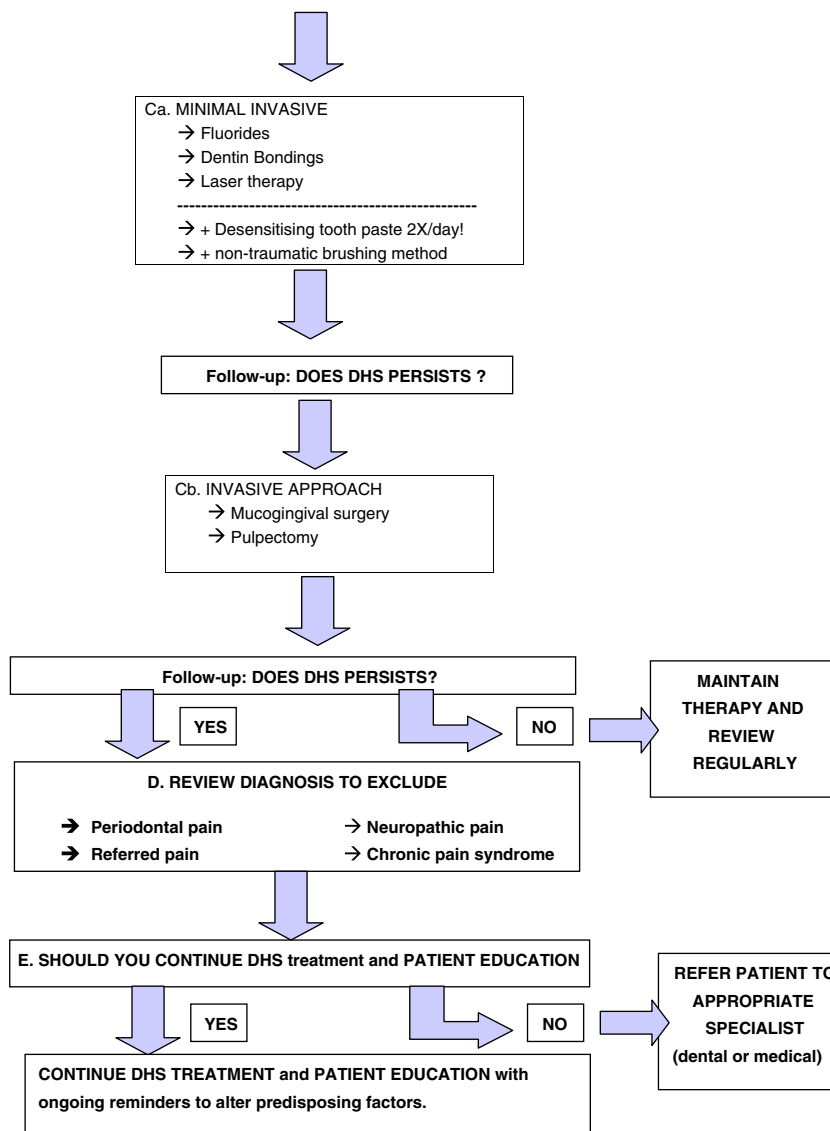


Fig. 2 (continued)



problem. While at-home treatment can be the first choice for generalized DHS, localized to one or two teeth practitioners may elect to use an in-office method as the first choice of treatment for DHS [13]. Regarding the dentists and caregivers, non-harmful professional dental care must be carried out. This must result in a well-considered choice and use of instruments and additional tools performing restorative dentistry.

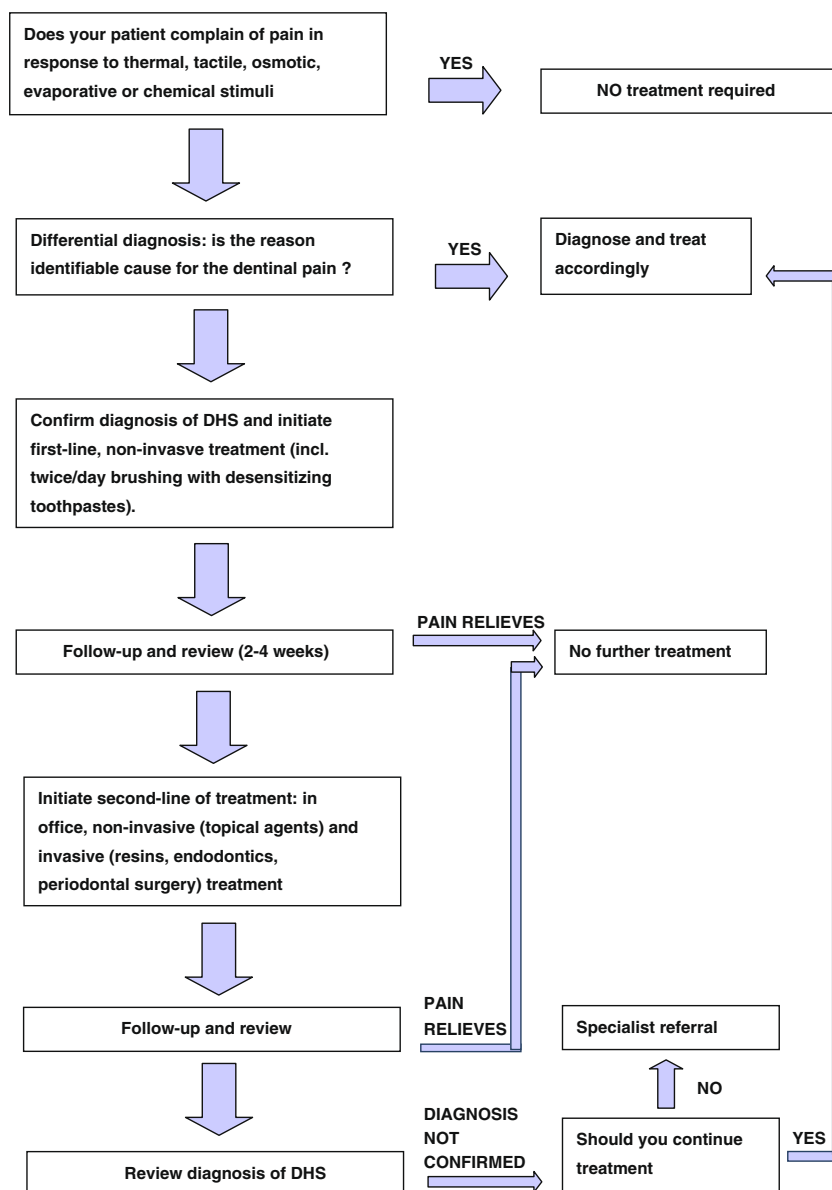
If, during follow up, symptoms are relieved or disappeared, improving the patient’s QoI, no further treatment is required. A well-maintained preventive management program must be followed. Besides eliminating etiological factors, it is strongly recommended to advise a regimen of brushing with desensitizing toothpastes twice a day. The latter is the only clinically supported method [18]. Regarding desensitizing toothpastes, two treatment approaches are well known: occluding dentinal tubules (plugging) or blocking the neural transmission to the pulp. These mechanisms will not further be

discussed within this manuscript as other authors did this in the same issue of this journal [4]. If necessary, a less traumatic brushing method may also be introduced.

If symptoms are confirmed, no pain relief present, or a further decrease of the patients’ QoI is present, treatment for DHS must be initiated. In this perspective, the non-invasive and invasive approach can be considered (Fig. 2 (Ca–Cb)).

It is recommended to start with minimal invasive in-office procedures such as the use of topical fluorides [19] and dentin bondings, which were discussed in the corresponding reports within this issue [4] or laser therapy [20]. Regarding the latter, apparently no significant reductions in sensitivity could be found. As a consequence, lasers are considered a more expensive and complex treatment modality. All procedures can be accompanied with the use of desensitizing toothpastes twice a day. When there is no long-term benefit of these minimal invasive procedures, more Invasive procedures can be carried

**Fig. 3** Flowchart for the diagnosis and management of dentin hypersensitivity (DHS) in daily practice (based on Ocharlsen and Gillam 2006 and on the Special topic nr 6 on Sensitive teeth by Colgate and the Adelaide University)



out after advanced diagnosis. Mainly mucogingival surgery and/or pulpectomy will then be the most appropriate choices.

If treatment is carried out successfully, one should maintain and review the therapy on a regularly basis. If treatment procedures did not result in pain relief, one should again start an advanced diagnosis based on exclusion (Fig. 2 (E)) and especially focussing on:

- Periodontal pain
- Referred pain
- Neuropathic pain
- Chronic Pain syndrome

Depending on the results, a decision must be made to continue DHS management and treatment or the patient must be referred to an appropriate dental or medical specialist.

Probably, for general dentists, the presented decision tree seems rather complicated. A more handy flowchart [11, 13] for daily use is also proposed (Fig. 3).

### Conclusion

DHS is a problematic clinical entity that may become an increasing clinical problem for dentists to treat as a consequence of patients retaining their teeth throughout life and improved oral hygiene practices. For that, it is strongly recommended to screen routinely all dentate patients for ECD and DHS. In this respect, underdiagnosis of the condition will be avoided and the preventive management can be initiated early. Active management of DHS usually will

begin with at-home therapy of which brushing with desensitizing toothpastes is the most important. Complete management will usually involve a combination of at-home and in-office therapies.

**Conflict of interest** The author declares that there is no conflict of interest.

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