



DENTIN HYPERSENSITIVITY IN CLINICAL PRACTICE

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Contents

Foreword v
Preface vii
Contributors xi
Acknowledgements xiii

Section 1

Chapter 1 **First principles** 3
David Gillam, Bryar Koyi

Chapter 2 **Examination and diagnosis** 13
David Gillam, Bryar Koyi

Chapter 3 **Management** 25
David Gillam, Bryar Koyi

Section 2

Case 1 **Clean mouths** 45
Wendy Turner, David Gillam

Case 2 **Periodontal disease and periodontal therapy** 51
Wendy Turner, David Gillam

Case 3 **Tooth wear problems** 59
Guy Lambourn

Case 4 **Bleaching sensitivity** 73
Peter Briggs, George Bourne

Case 5 **Restorative problems** 81
Bun San Chong, Pratik Kamalkant Shah

Case 6 **Atypical odontalgia** 91
John Buchanan

Index 105

3 Management

Several treatment principles for the management and treatment of dentin hypersensitivity (DH) have been published. However, they are difficult to implement and do not facilitate effective monitoring of DH over time in a general dental practice. Recently, a UK Expert Forum reviewed existing guidance and came to the conclusion that while the guidance had considerable merit in terms of content, there was a pressing need to produce simple and pragmatic guidelines for implementation in a general practice environment (Gillam et al. 2013).

A key conclusion in the existing guidelines is that no single desensitizing product, whether over-the-counter (OTC) or professionally applied, is capable of resolving all the presenting features of DH. Therefore, it may be necessary to utilize a range of products to resolve a patient's symptoms.

The successful management of DH involves correct diagnosis, followed by implementation of prevention strategies that either eliminate DH or limit further deterioration via appropriate treatment choices, dietary advice and monitoring. Simply providing or recommending a treatment such as a desensitizing toothpaste is inappropriate without first considering and discussing etiological and predisposing factors (Gillam & Ramseier 2015). There needs to be a willingness on the part of both the clinician and the patient to work together on strategies that help change predisposing behaviors and modify etiological factors. Patients have to accept that the necessary recommended changes may have an unavoidable impact on their lifestyle.

Treatment options

A scheme for overall evaluation and management of DH is shown in **Figure 3.1**. After identifying the cause, the keys to successful treatment are:

1. Explaining the cause to the patient so that he/she understands why a certain management approach is being proposed
2. Addressing causes amenable to treatment by the clinician, e.g. reducing sugary and acidic snacks and drinks or traumatic tooth brushing habits
3. Educating the patient on appropriate changes in diet, tooth brushing and other factors within the patient's control
4. Providing or recommending of appropriate toothpastes or mouth washes
5. Planning a maintenance or monitoring schedule

Each of these must be tailored to the individual patient and the cause(s) of his/her DH, as demonstrated for points 3–5 by the examples in **Table 3.1**.

There is a wide range of professionally applied (in office) and OTC products for treating DH (Orchardson & Gillam 2006), as shown in **Tables 3.1–3.8**. However, there is no 'one size fits all' philosophy,

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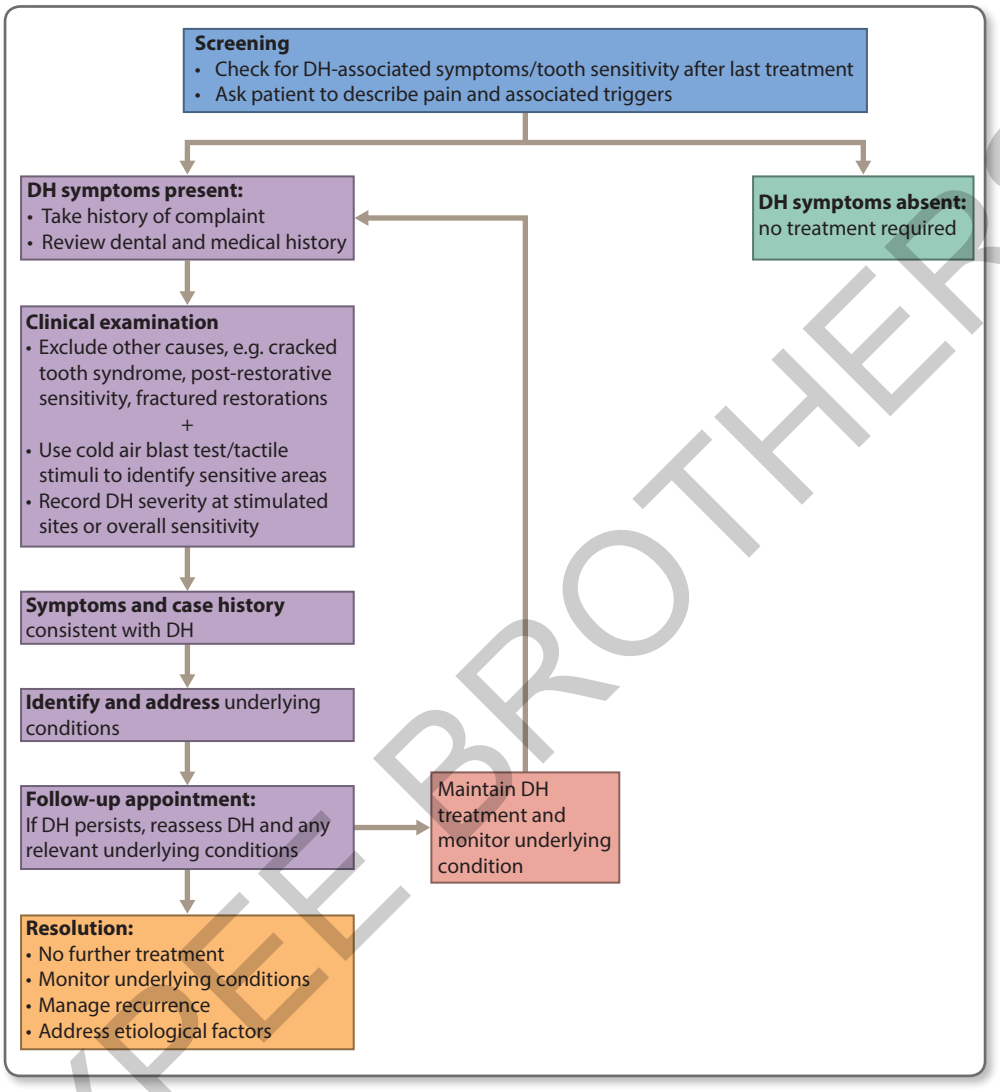

Figure 3.1 Diagnosis and management of dentin hypersensitivity.

contrary to claims made by manufacturers in the past (Gillam et al. 2013). Furthermore, as mentioned above, providing or recommending a product to the patient is only part of the solution. The most successful approach is a management strategy that is based on the clinical features of the individual patient, together with involvement of the patient in terms of encouraging personal motivation and changes in patient behavior (Gillam & Ramseier 2015). Identifying the cause of the patient's DH is key to divining the solution. For example, different management strategies for pain associated with DH are required in each of the following circumstances:

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Table 3.1 Management options for dentin hypersensitivity differ depending on the presenting features, as shown in these three examples

Component	Gingival recession	Tooth wear	Periodontal disease
Professionally applied (in office) treatment	Silicone gingival veneers Orthodontic treatment Restorative correction of recession defect and subgingival margins of fillings and crowns Polymers (sealants, varnishes, resins, dentine bonding agents) Laser obturation of dentinal tubules Desensitizing polishing pastes Pulpal extirpation (root canal treatment)	High fluoride remineralizing treatment (pre-emptive phase) Professional desensitizing treatment to relieve dentin hypersensitivity (DH) Ask patient to seek medical advice cause relates to working environment or reflux/excessive vomiting (psychiatric evaluation may be appropriate) Restorative correction (composite build up, crowns)	Nonsurgical periodontal procedure(s), including DH treatment (desensitizing polishing pastes, fluoride varnishes) If these fail, surgical periodontal procedure(s), e.g. guided tissue regeneration, coronally advanced flap + enamel matrix derivatives, along with DH treatment (as above) Subsequent maintenance with supportive periodontal therapy, and ongoing monitoring and DH treatment (as above)
Patient education	Show patient affected site(s) Explain probable cause for recession and factors triggering sensitive episodes Encourage modification of oral hygiene regimen to reduce gingival damage (e.g. reduced brushing force) Advice reduction of any excessive consumption of acid foods and drinks	Show patient tooth wear sites and explain causes Recommend oral hygiene regimen to minimize further wear Recommend reduced frequency of consumption of acidic food and drink	Reinforce oral hygiene needs Show patient site(s) affected by and explain cause of exposed dentin Advise on oral hygiene regimen Recommend general measures for reducing periodontal risk factors, e.g. relating to smoking or obesity
Home treatment	Implement oral hygiene and other advice given above Toothpaste [strontium chloride/strontium acetate; potassium nitrate/chloride/citrate/oxalate; calcium compounds (calcium carbonate and arginine and casein phosphopeptide, amorphous calcium phosphate); amine/stannous fluoride; nano/hydroxyapatite; bioactive glass; toothpaste containing fluoride in higher concentration (2800/5000 ppm, prescription)]		Implement oral hygiene and other advice given above Regular brushing with antibacterial toothpaste to aid plaque control Short term: 0.2% chlorhexidine solution for plaque control Desensitizing mouth rinse twice daily for DH control

DH, dentin hypersensitivity

- In the absence of obvious disease or pathology (a patient with a clean, healthy mouth might experience DH as a result of overzealous tooth brushing; see Case 1)
- In association with pathology (e.g. gingival recession; **Figure 3.2**)
- Following nonsurgical or surgical treatment by a clinician (e.g. **Figure 3.3**)
- In the presence of a tooth wear problem caused by a high-acid diet or bruxism (e.g. **Figure 3.4**)
- Following bleaching procedures (Case 4)
- Following restorative procedures (Case 5)

In Section 2, the diagnosis and management of DH in a number of patients with specific presenting features like these are discussed (see also **Table 3.1**).

Looking at the vast array of available products for treating DH, the problem is discerning which ones are effective in general and in specific circumstances (Cunha-Cruz et al. 2010). The clinician needs

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Figure 3.2 Gingival recession in a patient who has associated dentin hypersensitivity on the labial and buccal surfaces of the lower anterior, canine and premolar teeth.



Figure 3.3 This patient complained of dentin hypersensitivity following periodontal flap surgery performed on tooth UL6 to UL2. There is gingival recession and exposure of dentin on UL6, UL5 and UL2 areas. The sutures from the periodontal surgery can be seen in blue.



Figure 3.4 Excessive tooth wear with associated dentin hypersensitivity (courtesy of Guy Lambourn).

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to have confidence in the techniques and products that he/she uses on their patients. Although there is some evidence of efficacy for the products, there are problems in assessing the results due to differences in study design, the mechanism of action of desensitizing products as determined by in vitro evaluation, the duration of studies (short versus long term), assessment methodology, etc. (Orchardson & Gillam 2006).

Currently available products that have a known mechanism of action based on the hydrodynamic theory and have been reported to be effective in reducing DH do so through one of two methods:

1 A tubular occluding process
2 A nerve desensitizing process

In some instances, rather than treating DH, there are ways of preventing it in situations that would otherwise provoke it; e.g. some dental professionals recommend the use of desensitizing gels prior to and during the bleaching procedures to prevent or reduce bleaching sensitivity.

Over-the-counter products

Over-the-counter products, in the form of toothpaste, gels and mouth rinses, are recommended for the treatment of mild-to-moderate, generalized DH. For example, there are OTC toothpaste products containing stannous, strontium, potassium, arginine, oxalate, calcium sodium phosphosilicate (bioactive glass) and hydroxyapatite ingredients, and in published studies each of these toothpaste formulations have been reported to be effective in treating DH (Cummins 2010, Gillam 2014a, 2014b, Talioti et al. 2014, West et al. 2015). Generally speaking, these products take up to 4 weeks to be effective. If the symptoms persist after 4 weeks, the patient should see a clinician.

Evidence for efficacy (Tables 3.2–3.4)

In vitro evaluation has shown that the main mode of action of these formulations is either by tubular occlusion or potassium ion diffusion through the dentin tubules. The consensus is that there is supporting in vitro, in situ and in vivo evidence for the claims of efficacy for most of these OTC products (**Tables 3.2–3.4**). However, the main body of published clinical research is far from being unequivocal in pronouncing one superior desentizing product or application, which is due in part to a limited number of studies of sufficient quality to be included in systematic reviews (Karim & Gillam 2013, Talioti et al. 2014, Magno et al. 2015). In other words, there is currently no universally accepted 'gold standard' OTC product.

Problems that arise in assessing clinical studies include:

- Influence of both placebo and nonplacebo effects, which have a profound effect on results
- Variation in the methodology employed

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Table 3.2 Characteristics of selected tubule occluding toothpastes

Product	Composition	Proposed mode of action	Evidence
SensiStat	Arginine with Ca and bicarbonate/carbonate	Complex binds to tooth surface and allows the calcium carbonate to slowly dissolve and release calcium	Limited in vitro and in vivo studies support laboratory and clinical claims (Kleinberg, 2002)
Colgate Pro-Argin	Hydroxyapatite, sodium mono-fluorophosphate (MFP)	Same as Sensistat	In vitro and in vivo studies support laboratory and clinical claims (Ayad et al. 2009a; Ayad et al. 2009b, Cummins, 2009; Hamlin et al. 2012; Magno et al. 2015)
SensiShield NovaMin	Ca, P, Na and silica (calcium sodium phosphosilicate)	In contact with saliva and water, Na^+ ions in Novamin particles exchange with H^+ ions, allowing release of Ca^{2+} and PO_4^{3-} ions by Novamin and formation of a calcium phosphate layer that crystallizes into hydroxycarbonate apatite (exposed dentin acting as nucleation site for HCA formation, bypassing intermediate ACP phase)	In vitro studies support occlusion of dentin tubules; limited published clinical data supporting clinical efficacy (Talioti et al. 2014)
Amorphous calcium phosphate (ACP) [formerly in Enamelon toothpaste; currently in Enamel Care toothpaste (Church & Dwight)]	Ca and PO_4 supplied in a two-phase system	On mixing, soluble salts of Ca and PO_4 react to form ACP, precipitating onto tooth surface. ACP is highly soluble and susceptible to acid attack and as the ACP is not protected and has no delivery system it has lower substantivity	Limited and equivocal published data for effectiveness (Geiger et al. 2003; Talioti et al. 2014)
Recaldent (CPP–ACP)	Casein phosphate (CPP: peptides derived from milk protein casein, complexed with Ca and PO_4) and ACP	CPP binds to surfaces – plaque, bacteria, soft tissue, tooth surface – and ACP is released from tooth surface during acidic challenges; stabilization of ACP in an amorphous form by CPP ensures delivery of Ca^{2+} and PO_4^{3-} ions into the tooth structure before they crystallize, i.e. makes Ca^{2+} and PO_4^{3-} bioavailable at the tooth surface	Limited published clinical support in dentin hypersensitivity (studies support anti-caries benefit) (Talioti et al. 2014)
NanitActiv (Henkel)	Hydroxyapatite, MFP	Induces neomineralization: nanoparticles react with Ca^{2+} and PO_4^{3-} ions in saliva, forming new protective layer on tooth surface (1–2 µm)	No published studies at present

- Whether the stimuli used in the studies and the sensation they record are truly representative of the stimuli and sensation experience by patients and consumers in their day-to-day experience
- Whether the study population is truly representative of the individual suffering from DH in the general community

Although there is evidence in published studies that OTC products confer measurable positive improvements in terms of percentage reductions from baseline values, it is difficult to determine the clinical relevance of these reductions in general clinical practice. The true endpoint or ideal clinical outcome from these studies is either

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Table 3.3 Characteristics of selected tubular occluding toothpastes

Product	Composition	Proposed mode of action	Evidence
Elmex Sensitive Professional	Zinc carbonate hydroxyapatite (same ingredients as Colgate Pro-Argin; new product does not contain fluoride)	–	Limited published data (Arnold et al. 2016)
Sensodyne	Strontium chloride (original), no fluoride Strontium acetate, MFP	Hydrated technology	In vitro and in vivo studies support proposed mode of action and clinical effectiveness of acetate and chloride variants (Gillam et al. 1992; Gillam et al. 1996; Hughes et al. 2010; Mason et al. 2010; Karim & Gillam, 2013)
Crest ProHealth	Stannous fluoride	Anhydrous technology Uses hexametaphosphate to limit stains associated with the use of stannous ions	Published in vitro and in vivo studies (Arnold et al. 2016)
Gel-Kam	Stannous fluoride, potassium nitrate (5%) in dual chamber delivery system	Presence of K^+ suggests action as a nerve desensitizer; however, in in vitro studies show evidence of tubular occlusion	In vitro and in vivo studies support proposed mode of action and clinical effectiveness (Blong et al. 1985; Ellingsen & Rolla, 1987)
Elmex Sensitivity Professional	Amine fluoride (same composition as Colgate Pro-Argin; Olaflur)	Leads to formation of a calcium fluoride-containing protective layer on dentine, which helps promote remineralisation and tubular occlusion	Limited published data available (Renggli, 1997)

Table 3.4 Characteristics of potassium containing toothpastes

Product	Composition	Proposed mode of action	Evidence
Sensodyne	Potassium nitrate, sodium fluoride	Tubular occlusion in presence of K^+ ions Depolarization when K^+ ions applied to exposed dentine	Historical animal studies support desensitizing action (Markowitz et al. 1991; Markowitz & Kim, 1992; limited data from human studies: Orchardson & Gillam, 2000; Ajcharanukul et al. 2007) In vitro studies failed to support the action of K^+ in the presence of dentin disc model Studies suggest K^+ – containing toothpaste effective in reducing dentin hypersensitivity but no evidence this is via nerve depolarization
Colgate	Potassium nitrate, sodium mono-fluorophosphate (MFP)		
Crest	Potassium sodium fluoride		
Sensodyne	Potassium chloride, sodium fluoride		
Colgate	Potassium citrate, MFP		

(1) the complete absence of discomfort following in-office application of a procedure or (2) relief of discomfort over time when using an OTC product. However, a more realistic result is a reduction of symptoms to a level acceptable by the patient and compatible with their quality of life (QoL).

It should also be noted that despite the various claims for these products, in the published clinical studies for most patient groups the mean level of pain was still above zero, i.e. treatment was not entirely successful for everyone in the group.

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Professionally applied (in-office) products

According to Pashley (2000), there are five classes of professionally applied (in-office) products:

1. Products that do not polymerize: varnishes, precipitants and primers containing hydroxymethyl methacrylate (HEMA)
2. Products that undergo setting or polymerization reactions: conventional glass ionomer cements; resin-reinforced glass ionomers or compomers; adhesive resin primers; and adhesive resin bonding systems
3. Mouthguards
4. Iontophoresis combined with fluoride pastes or solutions
5. Laser treatment

The first two classes contain fluoride, aluminium, potassium or ferric oxalates, silica- or calcium-containing materials, or are based on protein precipitants that decrease dentin permeability or block the fluid movement through dentin. These products are generally recommended for localized sites (one or two teeth) where pain associated with DH is moderate to severe in nature. Although they are usually applied in the dental practice, they may also be given to the patient to use in combination with OTC products such as a recommended toothpaste.

Other treatment approaches have also been recommended, e.g. occlusal adjustment associated with cervical abfraction lesions, crown restorations, root coverage surgery, pulp extirpation, extraction, homeopathic remedies (Plantago), propolis (bee glue) and hypnosis. However, it should be noted that some restorative procedures also initiate post-operative sensitivity, e.g. crown preparations, restorations, restorative materials and nonsurgical (scaling) procedures.

Evidence for efficacy (Tables 3.5–3.8)

One anticipates that professionally applied (in office) procedures and products immediately eliminate or reduce DH, but this is not always the case. However, the consensus in the published literature is similar to that reported for the OTC products in that there is supporting in vitro, in situ and in vivo evidence for the efficacy claimed for most of these products. For examples of this, see the review by Orchardson & Gillam (2006) and the systematic review by West et al. (2015). There is, nevertheless, no consensus on the best material or procedure. A persistent problem in evaluating the effectiveness of desensitizing products is the variability in the methodology, sample size and duration of the published clinical trials.

A stepwise or minimally invasive approach

Although the UK Forum guidelines mentioned earlier provide a simplified management strategy for treating DH (see **Figure 3.1**), some clinicians still find it difficult or impractical to implement in general practice. Ultimately, the solution may be minimally invasive dentistry,

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Table 3.5 Studies supporting the efficacy of professionally applied solutions and products

Type	Constituents	Product name and supporting references
Fluorides	Sodium fluoride, stannous fluoride, hydrogen fluoride	Dentinbloc, Colgate Oral Pharmaceuticals, Canton MA, USA (Thrash et al. 1992; Morris et al. 1999)
Nerve desensitizers	1–15% potassium nitrate solutions	Hodosh, 1974; Hodosh et al. 1994
	5%, 10% potassium nitrate in gel	Frechoso et al. 2003
	Guanethidine monosulfate: 1% guanethidine monosulfate	Ismelin, Ciba-Geigy (Dunne & Hannington-Kiff, 1993)
Oxalates	3% Potassium oxalate	Protect, Sunstar Butler, Chicago, IL, USA (Camps & Pashley, 2003)
	3% Potassium oxalate	Oxa-gel, Art-dent Ltd, Araraquara SP, Brazil (Pillon et al. 2004)
	6.8% Ferric oxalate	Sensodyne Sealant, GSK, Jersey City NJ, USA (Gillam et al. 2004)
Calcium phosphates	1.5M calcium chloride + 1.0M potassium oxalate	ACP-CPP, GC corporation, Tokyo, Japan (Geiger et al. 2003; Rosaiah & Aruna 2011)

Table 3.6 Studies supporting the efficacy of professionally applied desensitizing pastes

Type, chemical/concentration	Product name and supporting references
Colgate sensitive Pro-Relief desensitizing paste with 8% arginine and calcium carbonate (Arg/$CaCO_3$)	Pro- Argin (Colgate Professional) (Hamlin et al. 2009; Schiff et al. 2009; Li et al. 2013; Yan et al. 2013)
Elmex Sensitive Professional desensitizing paste 15% calcium sodium phosphosilicate (CSPS; NovaMin)	Pro- Argin Formulation Gaba International Switzerland (Hamlin et al. 2012) Nupro Sensodyne prophylaxis paste (Dentsply International) (Milleman et al. 2012; Neuhaus et al. 2013)
MI Paste Plus containing casein phosphopeptide–amorphous calcium phosphate (CCP–ACP) with 0.2% sodium fluoride	MI Paste Plus (GC America Inc) (Li et al. 2013)

focussing on prevention and remineralizing techniques and strategies to protect the tooth. The aim is to limit removal of tooth structure when restoring the tooth to its normal condition. This prevents DH by limiting the exposure of dentin and cementum, hence less DH as a result of minimally invasive dentistry. A simplified stepwise approach, akin to the WHO pain ladder for controlling pain, has been created for treatment of DH depending on its extent, severity and underlying causes and is shown in **Figure 3.5** (Orchardson & Gillam 2006).

Changing patient behaviour

Changing the behavior of individuals is complex for a variety of reasons, e.g. lack of motivation, failures of compliance (adherence to instructions) or failure to see the need for change. An individual with diabetes who has a sedentary lifestyle and takes little exercise may comply with prescribed medication; however, if they fail to change in their behavior and lifestyle there will be less improvement in their

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Table 3.7 Studies supporting the efficacy of professionally applied adhesives, resins and cements.

Type	Product name and supporting references
Fluoride varnish	Duraphat, Colgate Oral Pharmaceuticals, Canton, MA, USA (Gaffar 1999, Corona et al. 2003, Merika et al. 2006) Fluoline, PD Dental, Altenwalde, Germany (Duran & Sengun 2004) Fluor Protect, Ivoclar Vivadent AG, Schaan Liechtenstein Protect (Ivoclar Vivadent) (Ritter et al. 2006)
Oxalic acid + resin	MS Coat, Sun Medical Co, Shiga, Japan (Prati et al. 2001) Pain Free, Parkell Co, Farmingale, NY, USA (Morris et al. 1999)
Sealants, primers	Seal & Protect, Dentsply Konstanz, Germany (Baysan & Lynch 2003) Dentin Protector, Vivadent, Germany (Schwarz et al. 2002) Gluma Desensitizer, Heraeus-Kulzer, Dormogen, Germany (Dondi dall' Orologio & Malferrari 1993; Duran & Sengun 2004; Dondi dall' Orologio et al. 2002; Kakaboura et al. 2005; Polderman & Francken 2007) Gluma Alternate, Heraeus Kulzer, Wehrheim, Germany (Dondi dall' Orologio et al. 1999) Health-Dent Desensitizer, Healthdent Inc, Oswego, NY, USA (Duran & Sengun 2004), Dondi dall' Orologio et al. 1999) HEMA+other, Hurri-Seal Dentin Desensitizer Beutlich Pharmaceuticals LLC Waukegan, IL, USA, HemaSeal & Cide (Germiphene Corporation, Canada) (Kolker et al 2002) Prime & Bond 2.1, Dentsply Caulk, Milford DE, USA (Swift et al. 2001) Scotchbond (Single Bond), 3M Dental Products, St Paul, MN, USA (Duran & Sengun 2004; Prati et al. 2001; Ferrari et al. 1999) One-Step Bisco Schaumburg IL, USA (Kakaboura et al. 2005)
Etch + primer	Scotchbond, 3M Dental Products, St Paul, MN, USA (Ferrari et al. 1999) Systemp.desensitizer, Ivoclar-Vivadent, Schaan, Liechtenstein (Stewardson et al. 2004)
Etch + primer + adhesive	Scotchbond Multi System, 3M Dental Products, St Paul MN, USA (Dondi dall' Orologio et al. 1999)
Primer + adhesive	SE Bond, Kuraray, Okayama, Japan (Duran & Sengun 2004)
Glass-ionomer cements/ resin-reinforced glass-ionomer	Vitrabond-like (3M-ESPE, St. Paul, Minnesota USA), Fuji VI1 (GC Asia Dental Pte Ltd, Singapore) (Hansen 1992; Tantbirojn et al. 2006; Polderman & Francken 2007)

Table 3.8 Studies supporting the efficacy of miscellaneous professionally applied techniques

Treatment modality	Supporting references
Iontophoresis	Gangarosa & Park 1978; Brough et al. 1985; Gupta et al. 2010; Aparna et al. 2010
Hypnotherapy	Starr et al. 1989; Eitner et al. 2010
Laser therapy	Renton-Harper & Midda 1992; Kimura et al. 2000; Yilmaz et al. 2011a,b; Umberto et al. 2012; Blatz 2012; Biagi et al. 2016

condition. Other examples where there is difficulty changing behaviors and lifestyles relevant to health are addictive behaviors such as alcohol, drugs, smoking obesity: dramatic changes are very challenging and may need multiple visits to see improvements.

To effect a change in a patient's behavior, the dentist must build up a rapport with them, show empathy and have a close working partnership with them. When providing information designed to implement changes in a patient's behavior or lifestyle, the patient should be involved in the treatment planning process. Excluding

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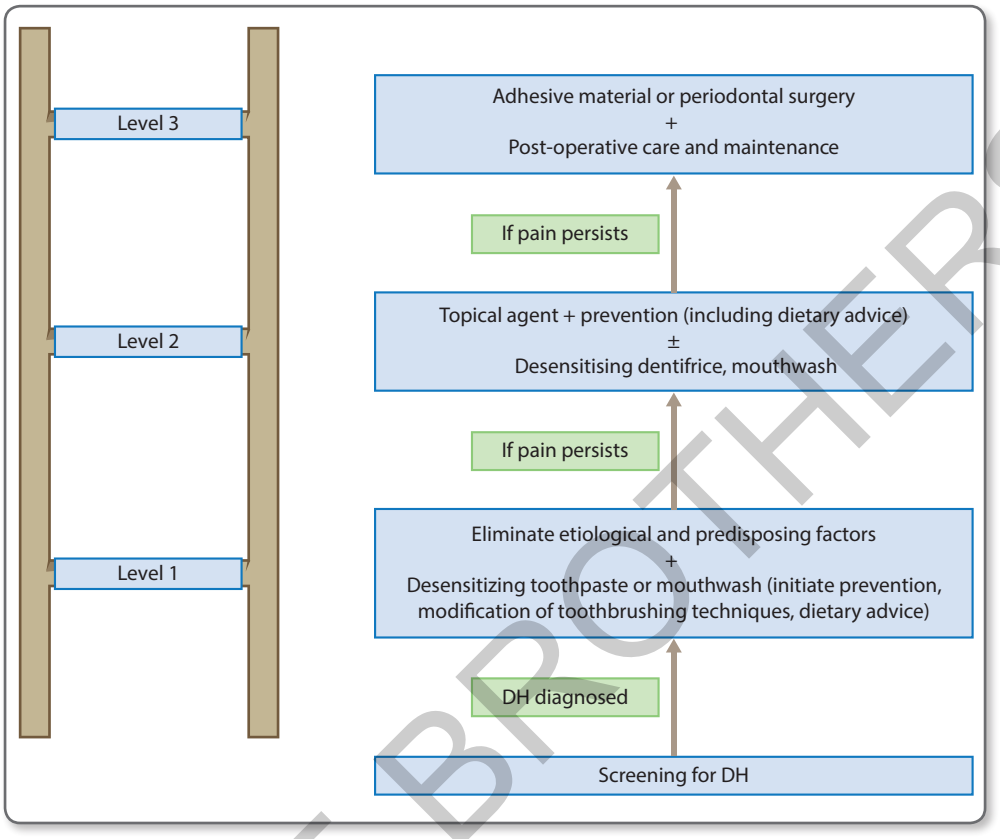

Figure 3.5 Example of a step-wise approach for treatment of dentin hypersensitivity, starting with a noninvasive approach, supplemented by preventive measures, and escalating to more invasive treatments if the pain is unresponsive or worsens or if the initial diagnosis was incorrect. Each level includes components of the previous levels. All but level 3 rely to some extent on the patient's willingness to engage in the process.

patients by making them mere observers of the transfer of information does not empower them to take ownership of the problem and thus does not create a readiness for change.

Motivational interviewing

The introduction of person-centered approaches such as motivational interviewing (William & Rollnick 2012), used previously in changing behavior in individuals with psychological or addictive behavior, may also be beneficial in changing behavior in the oral health environment. Specifically, several studies which have looked at improving plaque control and smoking cessation in periodontal disease have reported that an individual's behavior was critical for the success of periodontal therapy and in maintaining periodontal health. More generally, clinical studies and systematic reviews in both medicine and dentistry support the validity of motivational interviewing in clinical practice.

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It was at a conference in 2013 that Christian Ramseier proposed the use of motivational interviewing in the management of DH, for example where appropriate behavioral changes are required to reduce or eliminate any underlying problems that exacerbate DH, e.g. drinking fewer erosive (acidic) drinks particularly in association with brushing times. This approach was subsequently described in more detail (Gillam & Ramseier 2015).

Applying motivational interviewing

This is best illustrated by discussing a specific case, given than there is such a wide range of causes of DH.

The example is a theoretical patient who has been diagnosed with DH, in a situation where it was apparent from the clinical examination that there was tooth surface loss associated with an incorrect tooth brushing technique. On discussing the patient's dietary intake, the patient reveals that he consumes copious amounts of orange juice, drinking it at every meal. He also confirms that he always brushes his teeth immediately after drinking the orange juice. At the following visit he brings a diet sheet which indicates that he is consuming 3–4 large glasses daily. On the basis of this and the clinical evidence, the clinician explains to the patient that he is damaging his teeth and that if he does not reduce the amount of orange juice or modify his habits he will not only damage both the hard and soft tissue in his mouth but also be subjected to continuing discomfort associated with DH.

If the clinician is to work successfully with the patient to effect any change in the oral habits associated with DH, successful management of this problem depends on several factors. These include:

- The extent and severity of the clinical problem
- Gaining permission from the patient to discuss the proposed changes
- The availability of the patient
- The rapport between the clinician and patient
- Reflection by the patient
- The readiness or willingness of the patient to engage in the consultation process
- The patient being prepared to consider the advantages and disadvantages of accepting or rejecting the recommended changes in behavior
- The patient's motivation to change
- The patient's subsequent adherence to (compliance with) the clinician's recommendations for change in behavior
- The frequency of monitoring during the maintenance phase and subsequent reinforcement strategy in monitoring the patient's progress

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Involving the patient in resolving the problem

The patient does not recognize the need to change his lifestyle as he considers drinking orange juice to be part of enjoying a healthy diet: initially his response is thus one of rejection (in another patient it could be indifference). The clinician recognizes that she should simply ask whether the subject can be discussed again at the next visit. Because the patient responds in a positive manner, the issue can be raised at the next visit without asking for the patient's permission. At this visit, he confirms, he has considered the effects of drinking excessive amounts of orange juice and recognizes that this may be damaging his teeth. The clinician asks him to consider implementing changes in his diet, encouraging the patient to say that he will consider reducing his juice intake, i.e. that he will enter a stage of reflection.

At this stage, the patient needs to recognize the benefits of making the proposed changes in behavior. In this case, the patient should recognize that he is likely to experience less sensitivity in his teeth if he reduced his intake of orange juice and alters the timing of brushing his teeth, i.e. he is now in an *ambivalent state*. If progress is made at subsequent visits the clinician can ask about readiness to change, using a scale reflecting the patient's *desire* to change (0–5) and a scale determining the degree of *motivation* to make the change. At this stage, the clinician can ask the patient how he perceives the benefits of the proposed change, i.e. promote *self-efficacy*. The clinician affirms that implementing this change reduces future damage to the teeth. This in turn helps the patient increase his self-efficacy.

At a subsequent visit, the patient confirms that on reflection that he is willing to implement the necessary changes and asks for them to be repeated so he can note them down. They are:

- Waiting for a period after taking the orange juice before brushing his teeth, or
- Drinking the orange juice through a straw, or
- Reducing the amount of orange juice drunk on a daily basis

Also, he is advised that he should do any daytime tooth brushing before drinking juice, to reduce the potential for tooth surface loss when brushing teeth after acid challenge. At his next appointment, he confirms that approach 1 has become a regular habit and much of the time he succeeds in implementing one or other of the other two approaches. He is happy to report that he is now hardly ever affected by DH.

This shows the clinician must work with the patient who has shown a willingness to take ownership of an oral condition, and to set an agenda

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DENTIN HYPERSENSITIVITY IN CLINICAL PRACTICE

Dentin hypersensitivity is difficult to manage due to the variety of its causes. With a range of treatment options available, but with none more widely accepted than the other, clinicians are forced to adopt a trial and error approach to management, often with limited success.

Dentin Hypersensitivity in Clinical Practice gives practical guidance on the core principles of diagnosis and pain management, providing a comprehensive overview of the various treatment choices available to clinicians in their daily practice.

The first half of the book presents an overview of current knowledge and latest research on the causes and treatments of dentin hypersensitivity, while the second half features a collection of clinical cases designed to encourage readers to identify the cause of the pain in each scenario. Presented in a stepwise manner, each case guides the reader through taking a history, examining the patient and working through test results towards a differential diagnosis, then a definitive diagnosis and treatment options. Each case concludes with a personal perspective from a practicing clinician and a key points section that summarises the most important 'take home' messages arising from the scenario.

Dentin Hypersensitivity in Clinical Practice is the ideal companion for dental practitioners seeking to achieve pain-free outcomes for their patients presenting with this widespread condition.

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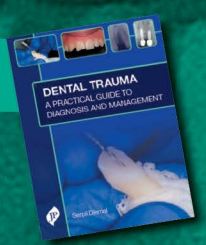

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