

## Review Article

# Pathogenesis, diagnosis, and management of dentin hypersensitivity

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## ABSTRACT

Dentin sensitivity is a problem characterized by brief sharp pain that occurs in response to things like changes in temperature, sweet or sour substances and mechanical factors. This condition significantly affects the lives of patients leading to restrictions and changes in oral hygiene routines. It is crucial for care to understand the causes, symptoms, diagnosis and management of dentin sensitivity. The development of dentin sensitivity is closely related to the structure of teeth which involves the exposure of tubes in the dentin that contain nerve endings sensitive to stimuli. Different theories, such as the theory and direct innervation theory provide insights into how this pain occurs. Diagnosis involves an evaluation of signs and symptoms along with patient history and specific tests to confirm sensitivity. Management options include adjusting behaviors using desensitizing toothpaste or fluoride applications utilizing bonding agents or even undergoing procedures like gingival grafts. These approaches aim to reduce pain and improve the quality of life for individuals affected by dentin sensitivity. Dental professionals play a role, in diagnosing, treating and educating patients about this condition to ensure results and better oral health.

**Keyword:** Dentin hypersensitivity, Tooth sensitivity, Dental pain, Tooth sensitivity management, Dental care

## INTRODUCTION

Dentin sensitivity is a problem that affects a significant portion of the population. It is characterized by pain when exposed to certain external triggers, like hot cold, sweet or acidic substances.<sup>1</sup> This condition can greatly impact a person's quality of life, leading to restrictions and avoiding foods and drinks. To fully understand dentin

sensitivity, it is important to explore its causes, methods of diagnosis and treatment strategies. The development of dentin sensitivity is closely linked to the structure of teeth. A tooth is composed of three layers; enamel, dentin and pulp.<sup>2,3</sup> Enamel acts as a layer for the tooth; however, when it becomes compromised due to factors like erosion, abrasion or gum recession the underlying dentin gets exposed. Dentin contains tubules that contain nerve endings which're sensitive to external stimuli. When these

tubules are exposed stimuli like changes in temperature or acidic substances can cause movement within them resulting in stimulation of nerve endings in the pulp and subsequent pain.<sup>4</sup> There have been theories put forward in an attempt to understand the causes behind the occurrence of dentin sensitivity. For example, the hydrodynamic theory suggests that external triggers alter flow, within the tubules which then stimulates nerve endings in the pulp causing pain.<sup>5,6</sup> According to the direct innervation theory when the protective enamel layer is damaged nerve endings, in the dentin become directly exposed. Recent studies have also explored the role of substances in amplifying the pain response, in dentin hypersensitivity shedding light on how it develops. To diagnose dentin hypersensitivity a thorough clinical evaluation is necessary which involves examining the patient's history conducting an examination and performing tests. Understanding the nature of the pain its triggers and how long it lasts is crucial when considering the patient's history.<sup>7</sup> During the examination, we identify exposed dentin, assess gum recession and evaluate dental conditions that could contribute to hypersensitivity. Diagnostic tests like using an air/water syringe or performing tactile or thermal tests with cold stimuli can help confirm if hypersensitivity is present.<sup>8,9</sup> Furthermore, insights from patients about how dentin hypersensitivity affects their lives are valuable. Managing dentin hypersensitivity focuses on relieving pain and reducing sensitivity while addressing its causes. The available treatments can differ based on the level of sensitivity experienced. We may recommend desensitizing toothpaste for home use containing compounds like potassium nitrate or strontium chloride. These toothpaste formulations work by blocking tubules, in exposed dentin to reduce movement and nerve stimulation. In office procedures can be used to offer relief, including the application of fluoride and dentin bonding agents. Fluoride aids, in the restoration and fortification of tooth enamel while bonding agents help seal off the exposed dentin tubules.<sup>10,11</sup> To address the issue of gum recession and protect the dentin in cases of tooth sensitivity procedures, like grafts may be considered. Tooth sensitivity, known as dentin hypersensitivity is a condition that affects a significant number of people and can cause distress. It is important to understand how it develops use methods and implement suitable management strategies to provide relief for those affected. The decision regarding the treatment options is influenced by factors, including the extent of the condition and the specific requirements of each patient. Our knowledge about dentin hypersensitivity continues to advance leading to improved management techniques that ultimately enhance the quality of life for individuals experiencing this discomfort. Dental professionals play a role in diagnosing, treating and educating patients about tooth sensitivity so that they can have a pain comfortable oral health experience. This study aims to examine how dentin hypersensitivity develops, methods for diagnosis and approaches, for its management.

## LITERATURE SEARCH

This review was conducted on November 21 2023 using research articles, from PubMed, Scopus, Wiley online library and Elsevier. It includes a range of terms and keywords such as "hypersensitivity," "pathogenesis," "diagnosis," and "management strategies." The focus of this review is on studies that involve subjects and were published in English from 2008 onwards. Its purpose is to provide an updated understanding of the causes, diagnostic methods and approaches, to managing hypersensitivity.

## DISCUSSION

The symptoms of hypersensitivity are characterized by sometimes unbearable pain caused by different external factors, such, as changes in temperature, sweet or acidic substances and mechanical triggers. This pain can greatly impact patient's daily lives leading to restrictions and adjustments in oral hygiene routines. Dental professionals have a role in diagnosing and addressing these symptoms using treatment strategies based on the severity of the condition. These strategies include toothpaste for sensitivity, applications of fluoride bonding agents for dentin and in cases surgical procedures like gingival grafts.<sup>12</sup> The comprehensive management approach aims to relieve pain and improve the quality of life, for individuals suffering from hypersensitivity.

### *Clinical manifestation*

Dentin hypersensitivity is a bothersome dental issue that has an impact, on patient's lives. This condition is characterized by signs and symptoms causing temporary pain in response to different external factors like hot or cold food, sweet treats or acidic substances. To fully understand dentin hypersensitivity, it's crucial to explore the manifestations that play a vital role in its diagnosis and treatment. The key indication of hypersensitivity is the sudden and often intense pain felt when exposed dentin comes into contact with triggers.<sup>3</sup> This pain is typically short lived but extremely unpleasant resembling a shock that shoots through the tooth or teeth. It's important to note that the discomfort associated with dentin hypersensitivity is usually confined to teeth or surfaces where the dentin is exposed distinguishing it from dental conditions. Temperature changes are one of the triggers for pain in dentin hypersensitivity.<sup>13</sup> Patients often complain of sensitivity to items like ice cream chilled beverages or even exposure to air. When these cold stimuli come in contact, with exposed dentin they can elicit shooting pain that subsides after removing the trigger. Likewise consuming foods and drinks such, as coffee or soup can cause discomfort, which's a common clinical symptom of this condition. Besides changes, in temperature the symptoms of dentin hypersensitivity can also be worsened by acidic substances.<sup>14</sup> When sugary foods and acidic drinks like citrus juices come into contact with the affected teeth they can cause discomfort.

The sugar or acid in these substances can further irritate the exposed dentin making the pain feel more intense. As a result, people, with dentin hypersensitivity might consciously reduce their intake of items to lessen the discomfort they feel. Mechanical factors also have an impact, on causing pain associated with hypersensitivity. When we brush our teeth with a toothbrush that has bristles or use abrasive toothpaste it can cause discomfort. The brushing action itself can cause movement in the exposed dentin tubules, which stimulates nerve endings and leads to the sensation of pain. Consequently, people may adjust their brushing techniques by choosing approaches or selecting toothbrushes with bristles to alleviate the discomfort. Gum recession is often responsible for the signs of hypersensitivity. As the gums recede, they expose the tooth roots which have enamel and are closer to the dentin. This increased exposure of dentin makes teeth more susceptible to triggers and intensifies the manifestations of hypersensitivity.<sup>15</sup> Individuals with gum recession may also notice that their teeth appear longer visually indicating this condition. In addition to pain sensations dentin hypersensitivity can have psychological and behavioral effects on those affected by it. The clinical signs of this condition can lead to heightened anxiety about choices. Patients may become anxious, about consuming foods and beverages that are known to trigger pain. This anxiety can result in restrictions and avoidance of items ultimately impacting their overall quality of life.<sup>16</sup> Moreover, people experiencing hypersensitivity often modify their oral care routines in order to address the pain and discomfort they experience. People who struggle with teeth may choose to brush their teeth gently or opt for toothpaste specifically designed for sensitive teeth.<sup>17,18</sup> These adjustments, in behavior are aimed at minimizing the impact of triggers on their condition. Dentin hypersensitivity is characterized by signs and symptoms such as temporary pain caused by external factors like temperature changes, sweet or acidic substances and mechanical stimuli. To ensure a diagnosis and the formulation of management strategies it is essential to possess a comprehensive understanding of these manifestations. Individuals dealing with dentin hypersensitivity not experience discomfort but also face emotional distress that can affect their food choices and oral hygiene habits. Dental professionals play a role in recognizing and addressing these manifestations to improve the quality of life, for people burdened by dentin hypersensitivity.

### **Management**

Dentin sensitivity, an issue causes brief and sharp pain when exposed to things, like hot cold, sweet or acidic substances. This discomfort greatly impacts a person's quality of life as it leads to restrictions and avoiding foods and drinks. To fully understand this condition, it's important to explore its causes, diagnosis and treatment. The development of dentin sensitivity is closely connected to the structure of teeth. A tooth consists of three layers: enamel, dentin and pulp. Enamel acts as the

layer; however, when it becomes compromised due to factors such as erosion or gum recession the dentin beneath becomes exposed. Dentin contains tubules that contain nerve endings which're sensitive to external stimuli. When these tubules are exposed fluid movements occur inside them in response to temperature changes or acidic substances. This stimulation affects the nerve endings in the pulp. Leads to pain. The theories explaining the development of dentin sensitivity include the theory which suggests that stimuli impact flow within the tubules and the direct innervation theory which proposes that nerve endings become directly exposed when dentin is compromised. Recent theories also consider mediator's role in intensifying pain in cases of dentin sensitivity. Diagnosing sensitivity requires a clinical assessment that takes into account patient history, clinical examination findings as well, as diagnostic tests. In order to understand the patient's history, it is important to gather information, about the type of pain experienced what triggers it and how long the symptoms last. During the examination, physician look for exposed dentin, assess gum recession and evaluate any dental issues that could potentially contribute to hypersensitivity.<sup>19</sup> Confirming hypersensitivity, in dentin involves using tests such as air/water syringe tactile tests and thermal tests using cold stimuli. Patients reported experiences provide insights into the impact of hypersensitivity. The goal of managing hypersensitivity is to alleviate pain reduce sensitivity and address the causes. Treatment options vary from using desensitizing toothpaste that contains compounds like potassium nitrate or strontium chloride to in-office treatments like application and dentin bonding agents.<sup>20</sup> In cases surgical procedures like grafts may be considered. Effectively managing hypersensitivity starts with a clinical assessment and diagnosis. Dental professionals rely on both patient-reported symptoms and clinical examination to identify and confirm the condition. Patients often describe a shooting pain when their exposed dentin comes into contact with triggers such as drinks or sweet foods. Gathering a patient history that includes information about the nature and duration of pain well as specific triggers is crucial as an initial step.<sup>21</sup> Clinical examination plays a role in diagnosing hypersensitivity and evaluating its severity. Dental professionals visually examine teeth for signs of exposed dentin such as gum recession or tooth wear. Tooth surfaces with exposed dentin are more prone, to hypersensitivity. Gently probing the teeth with an instrument can help pinpoint the areas where patients experience pain. Furthermore, dental experts may employ instruments, like air/water syringes, tactile examinations and temperature tests to validate the existence of hypersensitivity. These tests involve using controlled techniques to apply stimuli to the teeth replicating the patient's pain response. This helps in diagnosing and planning treatment for hypersensitivity. Dental experts stress the importance of maintaining hygiene to effectively manage dentin hypersensitivity. Patients are educated about brushing methods. Advised to choose toothbrushes with soft bristles. It is discouraged to use

toothpaste and patients are recommended to use toothpaste designed for teeth. Making changes in behavior also plays a role in management. Patients may be advised against brushing. Grinding their teeth as these habits can worsen dentin hypersensitivity. Additionally, dietary adjustments may be suggested to minimize exposure to trigger foods and drinks such as limiting the intake of sugary items. Desensitizing toothpaste is an element in managing hypersensitivity.<sup>22</sup> These types of toothpaste usually contain ingredients like potassium nitrate, strontium chloride or stannous fluoride. These compounds work by blocking the tubules in the dentin or nerve endings reducing sensitivity caused by stimuli and consequent pain. Patients are instructed to incorporate desensitizing toothpaste into their oral hygiene routine. It may take weeks of usage before patients notice significant relief. Dental professionals may recommend application as an in-office treatment, for addressing hypersensitivity. Fluoride helps strengthen enamel. Can aid in reducing sensitivity. This process involves the application of a gel or varnish that contains fluoride to the affected teeth. The fluoride is left on for an amount of time allowing it to penetrate the enamel and promote remineralization. Dentists usually perform applications during checkups and multiple treatments may be necessary, for long term effectiveness. In cases where there is sensitivity in the dentin dentin bonding agents or dental adhesives can be used as a management strategy. These agents are directly applied to the exposed dentin surface creating a barrier that seals off the tubules. Dentin bonding agents can provide relief from pain. Can be particularly helpful when other conservative measures are not enough. The procedure involves etching the tooth surface applying the bonding agent and then curing it with a light. If gum recession contributes to hypersensitivity, surgical interventions such as grafts might be considered. Gingival grafting involves taking tissue from another part of the mouth the palate and grafting it onto the exposed root surfaces. This procedure aims to cover and protect the exposed dentin reducing its exposure, to stimuli and relieving hypersensitivity. Periodontal specialists typically perform grafts, which may require some healing time. Taking care of your teeth at home is crucial, for managing hypersensitivity. It's important to follow the advice given by experts and be consistent with practices. Regularly using desensitizing toothpaste maintaining oral hygiene habits and making adjustments are all necessary, for long term management. Patients should also make it a point to regularly visit the dentist, for checkups in order to keep track of their condition and receive any treatments or adjustments to their personalized management plan. The clinical management of hypersensitivity takes into account aspects of this condition focusing on its specific clinical manifestations. Dental professionals play a role in diagnosing the condition and tailoring management strategies that cater to each patient's needs. Whether it's through modifications or using desensitizing toothpaste or even in office treatments like application and dentin bonding agents the ultimate goal is to alleviate pain and

enhance the overall quality of life for those affected by dentin hypersensitivity. Dental care is an effort between patients and dental professionals and, with the clinical approach patients can find relief from the discomfort associated with this condition.

## CONCLUSION

To sum up dentin hypersensitivity is a problem that has noticeable symptoms and significantly impacts the daily lives of patients. It is crucial to understand its causes utilize methods and implement suitable treatment strategies to bring relief to those suffering from this issue. Dentists play a role, in identifying, treating and educating patients about hypersensitivity to ensure they can have a pain free and comfortable oral health experience. The cooperation between patients and dental professionals is essential, for managing hypersensitivity and improving the overall well-being of affected individuals.

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