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Relato de Caso

Treatment of dentin hypersensitivity by association of chemical desensitizing agents: a case report

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Abstract

Background: Dentin hypersensitivity is an increasingly common complaint, especially among young people. It manifests as painful symptoms in areas of exposed dentinal tubules and is related to the patients' lifestyle. Aim: The present work aimed to address a protocol with chemical desensitizing agents in treatment of Dentin Hypersensitivity. Case report: The treatment was performed in a 22-year-old female patient who presented as the main complaint a moderate to intense degree sensitivity in anterior and posterior teeth. In the 1st and 2nd week, a neural action desensitizer based on potassium nitrate (Ultra EZ™ - Ultradent Products Inc) was used, while in the 3rd and 4th week, a desensitizer with an obliterating action based on calcium phosphates (Nano P™ - FGM Dental Products) was chosen. In the 5th week, another chemical occlusal desensitizer agent was applied, the 5% sodium fluoride varnish (Enamelast™ - Ultradent Products Inc). Results: The patient was successfully treated by the associative technique through neural and blocker desensitizers obtaining effective pain control in a18-month follow-up. Conclusion: The associative technique of different chemical desensitizers has shown extremely satisfactory results, which can be confirmed in the present case report.

KEYWORDS: Dentin hypersensitivity; Dentin sensitivity; Dentin desensitizing agents.

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Introduction

Dental hypersensitivity (DH) is an increasingly common complaint in dental offices, affecting approximately 1 in 3 adults worldwide[1] being more prevalent in young people, especially those in the third decade of life[1-3]. Clinically, it can be exhibited as repeated, localized, acute and short-term pain resulting from dentin exposure and mainly related to thermal, tactile, osmotic, chemical, or evaporative stimuli that cannot be attributed to any other form of dental defect or pathology[4,5].

Although different theories try to explain the pathophysiology of DH, the hydrodynamic theory from Brannstrom and Astrom[6] is the most accepted. Dentin and pulp form a highly sensitive and differentiated complex. Morphologically, there are in dentin million of tubules, which extend from the pulp to the amelodentinary limit. These tubules are filled by odontoblastic extensions with nerve endings and fluids that provide humidity to the tissue. Various stimuli (thermal, evaporative, tactile, osmotic or chemical) to this complex can generate a rapid movement of fluids and, consequently, activate nociceptors of pulp nerve endings, causing the painful response[2,3,5,6].

DH shows various degrees of pain and may affect the patient's daily life activities[3]. Proper treatment requires a consistent diagnosis since the symptoms from this condition can be confused with other clinical situations, such as fractures of restorations, caries, and pulp inflammatory processes[2]. Besides, personalized therapy should be given for patients, focusing in eliminating or minimizing the etiological factors (such as gingival recession, tension concentration, use of abrasive toothpaste and frequent acid challenge to the enamel) in addition to desensitizing approach using chemical or physical therapy[3].

There are different manners to treat DH, including home or in-office therapies. The in-office treatments are based on chemical or physical occlusion of dentinal tubules or even on nerve desensitization by chemical agents or photobiomodulation

(laser irradiation)[7]. The potassium nitrate and the low intensity laser can be placed into the group of nerve desensitization[8]. On the other hand, occluding dentinal tubules agents include many formulations based on fluorides (sodium fluoride, stannous fluoride and fluoro-silicates), oxalates, varnishes, adhesive resins, bioglass, Portland cement and more recently Casein-phosphopeptide-amorphous calcium phosphate (CPP)-(ACP)[8]. Also, the high intensity laser is considered a physical occluding dentinal tubules agent caused by the "melting" effect[9].

A systematic review has shown that the majority of the treatments for DH, including physical and chemical occlusion, photobiomodulation, and combined treatments have better outcomes than placebos[10]. The results of another meta-analysis demonstrate that among in-office treatments, dentinal chemical or physical tubule occlusion and nerve desensitization show the best results for control of dentin hypersensitivity[7]. However, the studies generally have a short follow-up, limiting the conclusions related to effectiveness of long-term success of treatments. Also, the successful of DH treatment is extremely dependent of a correct diagnosis and elimination of etiological agents[10].

Thus, considering the relevance and the high worldwide prevalence of DH, and also a gap in the literature regarding the approach of clinical cases on this topic, this case report aimed to relate the management of dentinal hypersensitivity through a novel approach based on an associative protocol of chemical desensitizing agents. The association of interventions that act in both obliterator and neural pain interception mechanisms seems to be an appropriate conduct for controlling DH.

Case report

A 22-year-old female patient attended a specialized center for the prevention and treatment of non-carious cervical lesions and dentin hypersensitivity with the main complaint of DH in anterior and posterior teeth especially with cold/hot stimulation.

After presenting the informed consent form giving the right of access to information, the patient was submitted to anamnesis. She informed previous use of desensitizing toothpaste but with no improvement in symptomatology. Besides, she reported previous orthodontic treatment for about 8 years and having an acidic diet with weekly consumption of cola-based soft drinks and daily consumption of lemon juice.

On extra-oral physical examination, clicking was detected in the temporomandibular joint on the right side and pain on palpation in the chewing muscles, bilaterally. In oroscopy, gingival recessions up to 2 mm were identified, with visible dentin exposure areas in upper canines and pre-molars (Figure 1). Dental calculus and fixed retainer were also observed in the lower incisors. Also, there was inadequate occlusion, with anterior open bite and premature contact on the lower right third molar, which was mesialized.

To check the degree of DH, a dehydration test was carried out as previously described[11]. Air blast from the dental syringe was directed on to the tooth for 1 to 2 seconds from a distance of approximately 1 centimeter protecting the adjacent teeth with a flexible polyester matrix strip. For all test stimuli, a 0-10 numerical rating visual analog scale (VAS) was applied. The patient was asked to provide a numerical VAS rating from 0 indicating "no pain" and 10 indicating "highly intense pain". The average result found was corresponding to grade 7, varying from 6 to 8 in teeth with hypersensitivity, which indicates a moderate to severe intensity of pain.

FIGURE 1 · Initial aspect of the patient.

Taking all into account, the treatment plan was proposed. The first approach was to elucidate and to control the etiological factors of HD. Some orientations and recommendations were given for the patient, including the use of a soft-bristled toothbrush, less abrasive toothpaste, and better consumption´s habits of acidic foods and drinks. Regarding the brushing technique, it was advised a less traumatic to the tissues, such as the Modified Stillman. It was also informed about the need for a new orthodontic treatment to correct the disocclusion guides.

Scaling and root planing of the lower incisors was performed, and a daily mouthwash of 0.05% sodium fluoride was prescribed for 7 days. In sequence, it was decided to use desensitizing agents in multiple sessions (Table 1). For that, a total of 5 sessions were performed with weekly applications and a new assessment by dehydration test before each procedure to identify the regression of pain and the result obtained. At each session, the materials were applied according to the manufacturer's protocol and described techniques in the literature. In addition, some means to reduce the contamination of fluids in the procedure were used, such as relative isolation with a cotton roller, use of the mouth opener and saliva suction.

In the 1st and 2nd week, a neural action desensitizer based on potassium nitrate (Ultra EZ™ - Ultradent Products Inc) was used on teeth affected by hypersensitivity, many of them showing gingival recession (Figure 2a). Initially, the prophylaxis of the teeth (Figure 2b) was performed with pumice stone and water

TABLE 1 · Multiple sessions desensitizing associative protocol for moderate to severe dentin hypersensitivity

Desensitizing associative protocol				
1st Session	2nd Session	3rd Session	4th Session	5th Session
Nerve desensitization	Nerve desensitization	Chemical occlusion	Chemical occlusion	Chemical occlusion
Ultra EZ (Ultradent)	Ultra EZ (Ultradent)	Nano P (FGM)	Nano P (FGM)	Enamelast (Ultradent)

using a micromotor and Robinson's brush. Then, retraction cord #000 (Ultrapack - Ultradent Products Inc) was introduced into the gingival sulcus (Figure 2c), without the addition of hemostatic fluid. The protocol corresponds to two applications of the desensitizer per session, the first application with the retractor cord and the second without it. The material was applied uniformly throughout the cervical area (Figure 2d) and actively rubbed using a disposable microapplicator, waiting a minimum time of 5 minutes to perform the second application. Between each application of the product and at the end, the excess was removed with a moistened gauze.

In the 3rd and 4th week, a desensitizer with an obliterating action based on calcium phosphates (Nano P™ - FGM Dental Products) was used. Similarly, the product was applied after the control of fluids in the oral cavity, prophylaxis, and insertion of the retractor cord as already described. Then, the first application was performed for 5 minutes (Figure 3a). After removing the retractor cord the product was removed with moistened gauze and the desensitizing agent was applied again and

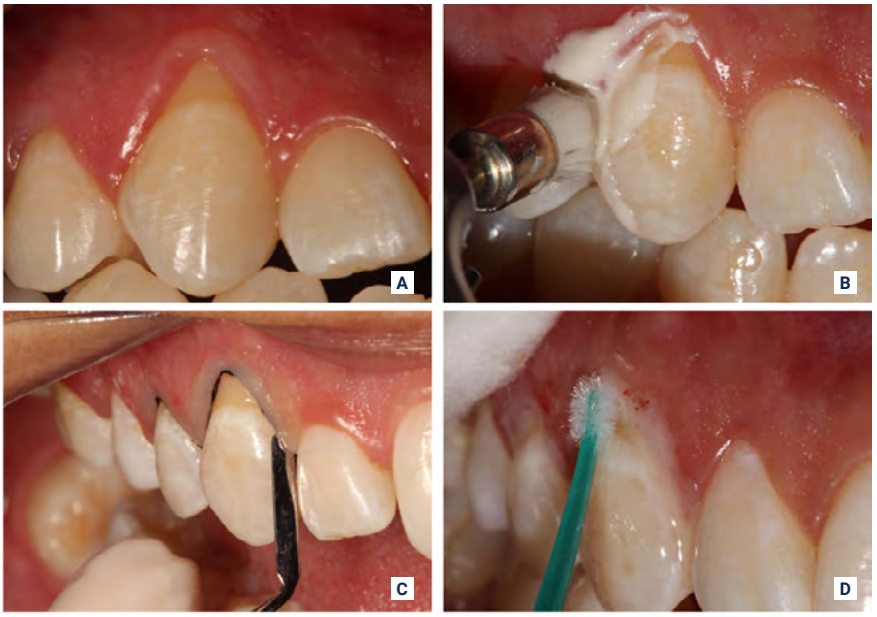

FIGURE 2 · (A) Canine gingival recession area; **(B)** Prophylaxis with pumice stone and water; **(C)** Insertion of the #000 retractor cord; **(D)** Application of the Ultra EZ™ Desensitizer (Ultradent)

spread towards the gingival sulcus, with friction intermittently and smoothly, using a microapplicator in the region of the cervical third. Finally, the excess of the product was removed with gauze and the patient was instructed not to eat or clean her teeth in the next 30 minutes.

In the 5th and last week, another chemical occlusal desensitizer agent was applied, the 5% sodium fluoride varnish (Enamelast™ - Ultradent Products Inc). Unlike the other sessions, the retractor cord was not used (Figure 3b). The product was placed with the proper manufacturer´s brush directly to the gingival sulcus, in order to guarantee the final obliteration of the dentinal tubules of the cervical region. When finished, the excess of the product was removed with a microapplicator and the patient was again instructed not to eat food or brushing teeth during the next 4 hours.

At the end of the treatment, a new measurement of hypersensitivity was performed using the same dehydration test, showing a degree of sensitivity 0 (zero) on the VAS for all teeth, corresponding to "no pain". After 18 months of desensitizing therapy, the patient remained without painful symptoms, which proves the effectiveness of the associative desensitization technique.

This case report was approved by the Research Ethics Committee of the State University of Montes Claros, Brazil (#4.101.296). Images and informations from participant were obtained through signed informed consent.

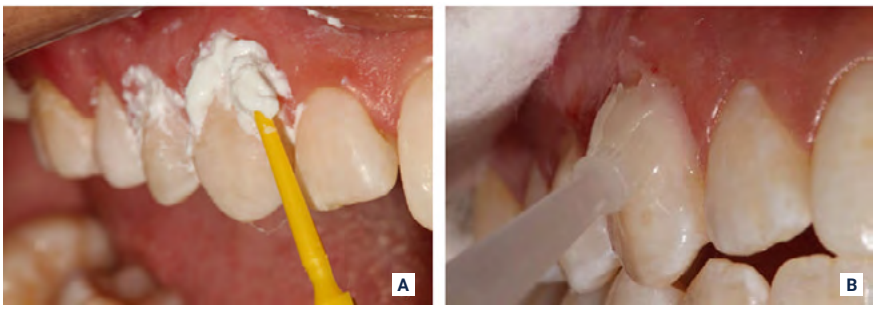

FIGURE 3 · **(A)** Application of the Nano P™ Desensitizer (FGM); **(B)** Application of the Enamelast™ Desensitizer (Ultradent)

Discussion

Currently, dentin hypersensitivity (DH) has been established as acute and short-term symptomology related to a multifactorial pathological process that requires stimuli, whether physical, chemical, osmotic, pressure or temperature, in dentinal tubules exposed above or subgingivals, also possible to occur in areas of enamel defects and cracks[4,8].

DH can occur in the presence or absence of non-carious cervical lesions (NCCL). Both conditions share the same aetiological factors, with DH considered the first clinical symptom of a future NCCL[12,13]. Several causal factors are involved in the pathogenesis of these conditions, including occlusal trauma, gingival recession (RG), incorrect brushing technique, an acid-rich diet, gastric and alimentary disorders, and parafunction. As observed in the case reported, the literature shows that the formation and progression of NCCL and DH usually occur through the association of biocorrosion (degradation by chemical, biochemical and electrochemical causes), tension (by occlusal stress) and friction (wear by endogenous and exogenous factors)[14]. Also, DH is an increasingly common condition among young patients, especially when associated with gingival recession[13], as indicated in the present case report.

DH has different treatments and its control still represents a great challenge for dentists because there is no definition of which technique is the most effective, although there is consensus regarding the objective of obliterating the exposed dentinal tubules[7,10]. Besides, it is essential to remove or control the causal factors for the best result of desensitizing treatment. Additional hypersensitivity control strategies include patient education related to brushing, eating habits, and possible concomitant therapies to the use of desensitizers, such as orthodontic treatment or medical treatments, like anxiety and gastroesophageal reflux management[12,14].

Among the alternatives of treatment of DH, it is possible to perform different desensitization methods, such as the use of specific dentifrices, fluoridated agents, dental adhesives, lasers, restorations, periodontal surgery, and endodontic treatment. However, there is no consensus on the most efficient technique in the long term[8]. Regarding dental office treatments, there are several available products to be used. Desensitizing agents such as those used in the present study have two main actuation mechanisms. The first, known as a neural action agent, acts in a way that interrupts the response of the pulp mechanoreceptors to pain stimuli with the interposition of ions in the nerve tubules. For that, a substance such as potassium is necessary, which, when released in ionic form, decrease painful transmission[15]. The Ultra EZ™ desensitizer, whose base is potassium nitrate acts exclusively to decrease the excitability of nerve components and relieve painful sensitivity[2,3].

The second mechanism is associated with the use of an obliterating agent. These agents promote the sealing of the dentinal tubules to reduce the hydrodynamic effect of pain, possible through products that contain substances such as strontium chloride, fluoride, potassium oxalate, inert ceramic particles such as silica, alumina, and arginine[8,16]. A product commonly used as a chemical agent with an obliterating action is Desensibilize Nano P™, which has good biocompatibility and high potential to bind to the dental structure. This product contains calcium phosphate, sodium fluoride, nanometric hydroxyapatite, and potassium nitrate. Such substances offer dentin sealing through the precipitation of calcium phosphate crystals, making it remineralized and resistant, in a similar way to the natural tooth, which then hinders the access of external stimuli to the pulp[15,17,18].

In the literature, it has been reported that right after the first application of Desensibilize Nano P™ there is a reduction in sensitivity and after the second and third applications may occur the

total elimination of pain, stabilizing for six months[19]. However, one of the product's disadvantages is the instability of some particles, such as calcium fluoride, which can dissociate easily, by brushing or when exposed to acidic solutions. In addition, disintegration of protective layer formed can occur because of a small diameter of particles[2,15].

Sodium fluoride-based obliterators are easily accessible and inexpensive. Recently, different types of fluoride have stood out in the treatment of DH because the main effect of decreasing the dentinal permeability by precipitation of calcium fluoride crystals inside the dentinal tubules[2,3,16]. There are numerous commercial presentations based on this substance, including varnish, which was used in this case report.

Although the vast majority of strategies available today show efficacy, they still have limitations as their ability to reduce painful stimuli over time[20]. Taking into account the different mechanisms of action of the desensitizing products, there must be an association of techniques to achieve greater effectiveness in terms of a longer-lasting treatment[21]. Thus, the association of different mechanisms of desensitization appears as an excellent therapeutic possibility, but still far from the clinical practice of most clinicians, especially due to the lack of information about the pathogenic processes related to diseases and knowledge of the pain mechanism and desensitizing agents[22].

In the present case report only chemical products were used. Although the laser therapy is recognized as an effective and exclellent alternative for the treatment of DH, either by disturbing the transmission of nerve impulses (Low intensity laser)[8] or by the fusion and resolidification of the peritubular dentin (High intensity laser)[23], dependind on the type of device the cost is expensive, not being accessible to most dentists, specially in public systems and academic settings.

The chemical associative protocol was chosen for this clinical case based on the advantage of acting in different mechanisms involved on the treatment of DH. In accordance with the positive results showed by various desensitizing protocols, there has been a tendency in the search for more efficient and long-lasting treatments[3,7,8,20,21]. The benefit of combining therapies has been demonstrated with different products and therapies[24,25]. The choice for a multiple session protocol is also an important point to take into account, since multiple application may increase in product effect[26].

This case report has some important limitations, like the study type, which does not allow testing and compare other techniques and products. Besides, it is necessary to take into account the individualities of each patient, not confirming the results for the general population. However, despite the aforementioned barriers, the present study has clinical importance for demonstrating the use and effectiveness of the associative technique, while achieving total pain control from dentin hypersensitivity in a18-month follow-up period.

Conclusion

Dentin hypersensitivity is an increasingly common condition, affecting a large part of the young population. Although exists a large number of products with different protocols of applications in the world market, there is no universally accepted protocol for DH treatment. This case report showed an associative technique of different chemical desensitizers with satisfactory results immediately and after 18 months of follow-up. It is important mention that the success of the therapy is dependent of the awareness of the patient regarding the condition and control of causal factors.

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Tratamento da hipersensibilidade dentinária pela técnica associativa de agentes dessensibilizantes químicos: um relato de caso

Resumo

Introdução: A hipersensibilidade dentinária é uma queixa cada vez mais comum, principalmente entre os jovens. Manifesta-se como sintomas dolorosos em áreas de túbulos dentinários expostos e está relacionado ao estilo de vida dos pacientes. Objetivo: O presente trabalho teve como objetivo abordar um protocolo com agentes químicos dessensibilizantes no tratamento da Hipersensibilidade Dentinária. Relato de caso: O tratamento foi realizado em uma paciente do sexo feminino, 22 anos, que apresentava como queixa principal sensibilidade de grau moderado ao intenso em dentes anteriores e posteriores. Na 1ª e 2ª semana foi utilizado um dessensibilizador de ação neural à base de nitrato de potássio (Ultra EZ™ - Ultradent Products Inc), enquanto na 3ª e 4ª semana foi utilizado um dessensibilizante de ação obliterante à base de fosfatos de cálcio (Nano P™ - FGM Dental Products) foi escolhido. Na 5ª semana, foi aplicado outro agente químico dessensibilizante oclusal, o verniz de fluoreto de sódio 5% (Enamelast™ - Ultradent Products Inc). Resultados: O paciente foi tratado com sucesso pela técnica associativa através de dessensibilizadores neurais e bloqueadores obtendo controle efetivo da dor em um seguimento de 18 meses. Conclusão: A técnica associativa de diferentes dessensibilizantes químicos apresentou resultados extremamente satisfatórios, o que pode ser confirmado no presente relato de caso.

PALAVRAS-CHAVE: Hipersensibilidade dentinária; Sensibilidade dentinária; Agentes dessensibilizantes da dentina.

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