Original article

MedInform

DOI: 10.18044/MEDINFORM.2025124.2236

ISSUE 4, 2025

Dentists' Awareness of Vital Pulp Therapy: A Questionnaire-Based Study

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Abstract

Objective. To assess dentists' awareness and use of vital pulp therapy for managing pulpitis.

Materials and Methods. A questionnaire-based survey was conducted among 378 dentists. A bespoke 17-item instrument was used; data were analysed statistically.

Results. Eighty-nine percent of respondents reported using vital pulp therapy, whereas 11% did not. Most dentists (85%) provide vital pulp therapy between once and five times per month. Use was more frequent among dentists with ≤5 years of experience and those with >25 years. For dentin wound conditioning after removal of infected dentin, the most common agents were normal saline (32.2%), 3% hydrogen peroxide (26.2%), and 2% chlorhexidine (20.6%). The most frequently selected pulp-capping materials were calcium silicate cements (59.4%), followed by calcium hydroxide cements (37.4%). Only 3% reported using platelet concentrates in practice, and none applied them for direct pulp capping in cases of pulpitis.

Conclusions. Bulgarian dentists are familiar with vital pulp therapy for pulpitis. Calcium silicate and calcium hydroxide cements remain the most commonly used materials, whereas autologous platelet concentrates have not yet been adopted for vital pulp therapy in routine practice.

Keywords: pulpitis; vital pulp therapy; pulp capping agents; platelet-rich fibrin (PRF); autologous blood–derived biomaterials; questionnaire survey

Introduction

The inflammatory process of the dental pulp can be reversible and irreversible, depending on the extent of tissue damage and the pulp's regenerative potential (1). Inflammation may be triggered by microorganisms, trauma, or iatrogenic factors—for example, accidental entry into the pulp chamber during cavity preparation. In its early stages, inflammation is confined to the superficial layers of the pulp. Clinically, the condition is characterized by short-lasting pain elicited by thermal and chemical stimuli, no spontaneous symptoms, and preserved pulp vitality. If the cause is not removed and the dentin wound is not protected, the inflammatory process progresses in depth, ultimately leading to loss of pulp vitality(2).

Over recent decades, dentistry has increasingly leveraged the regenerative potential of the dental pulp. Vital pulp therapy aims to avoid conventional endodontic treatment (pulpectomy) and to preserve pulp vitality. Although the pulp's regenerative capacity is limited, when blood supply is maintained and inflammation is minimal, dental pulp stem cells (hDPSCs) can differentiate into odontoblast-like cells and regenerate dentin tissue (3).

In recent years, a minimally invasive approach to caries removal has become more common. Rather than radical excavation of all demineralized dentin, a thin layer of demineralized but non-infected

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dentin is preserved because it can remineralize. This strategy reduces the risk of pulp chamber exposure and helps maintain pulp vitality (1,2).

In addition to mechanical preparation, conditioning of the dentin wound is critical for successful pulpal healing. Routine protocols include irrigation with distilled water, normal saline, or mild antiseptic solutions (e.g., 2% chlorhexidine, diluted sodium hypochlorite) to reduce the microbial load without cytotoxic effects on the pulp. A bioactive material is then applied to promote reparative dentin formation and restoration of the pulp–dentin complex (4).

In addition to traditional antiseptics, recent years have seen growing interest in ozone therapy as a contact-free, tissue-sparing method for disinfecting the dentin wound. Ozone exhibits broad-spectrum antimicrobial activity against bacteria, viruses, and fungi without damaging hard dental tissues or compromising pulp cell viability. It can be applied as an adjunct biological agent prior to placement of biomaterials to support regeneration of the pulp–dentin complex (5,6,7).

Contemporary endodontics is gradually shifting toward biologic and regenerative management of the pulp. To this end, bioactive materials are employed to provide hermetic sealing and controlled release of calcium and phosphate ions, thereby stimulating reparative dentin formation (8,9). Notable examples include calcium hydroxide–based materials, used for decades as pulp-capping agents, and calcium silicate cements—Mineral Trioxide Aggregate (MTA) and Biodentine™—which demonstrate excellent biocompatibility and the ability to promote cellular differentiation (10,11,12,13).

The newest and most promising agents for preserving dental pulp vitality are autologous platelet concentrates, also referred to as autologous blood biomaterials (14,15). Published evidence on their routine use in everyday dental practice is lacking (or remains very limited).

Aim

This study aims to determine dentists' awareness regarding the use of vital pulp therapy in routine practice.

Materials and Methods

Study design and setting

An observational, descriptive, cross-sectional survey was conducted among dentists in Bulgaria between February and April 2024 to assess attitudes, clinical practices, and real-world use of vital pulp therapy for managing pulpitis.

Participants

The dentists with varying years of experience were included n = 378. Inclusion criteria: active clinical practice in Bulgaria at the time of the survey and consent to participate. No personally identifiable data were collected.

Questionnaire instrument

A bespoke 17-item questionnaire comprising three sections:

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1. Demographics and professional profile (sex, age, years of experience);
2. Caries removal and material selection (excavation approach, extent of removal of affected dentin, dentin surface conditioning, use of biological agents—calcium hydroxide, MTA, Biodentine™, etc.);
3. Use of vital pulp therapy methods (routine application, follow-up in pulpitis and traumatic pulp injury, awareness/use of autologous platelet concentrates alone or in combination with calcium-silicate cements).

Procedure and ethics

The survey was distributed online and on paper. Participants were informed of the aims and anonymity of the study; completion of the questionnaire constituted informed consent. The study complied with the Declaration of Helsinki and the Ethical Code of the Bulgarian Dental Association.

Outcomes

Primary: frequency of use of vital pulp therapy methods; follow-up practices in pulpitis/trauma; awareness of autologous platelet concentrates. Secondary: preferred materials and clinical protocols for caries excavation and dentin conditioning.

Statistical analysis

Descriptive statistics were applied: mean (central tendency), absolute counts (N) and relative frequencies (%). Associations were tested using Pearson's chi-square (e.g., experience × use of biologic methods to preserve pulp vitality; experience × use in traumatic pulp injuries). Significance level $\alpha = 0.05$ ($p < 0.05$). Software: IBM SPSS Statistics 26; plots: Microsoft Excel 2010.

Results

A total of 378 dentists participated. The most frequently reported practice areas were general dentistry (26.7%) and operative/ restorative dentistry (26.5%), followed by prosthodontics (15.2%), paediatric dentistry (14.7%), oral surgery (7.9%), periodontology (6.5%), and orthodontics (2.4%).Overall, 85% of respondents reported performing vital pulp therapy 1–5 times per month. Across years-of-experience strata, the use of biologic methods remained high (84–89%), with the highest rates observed among the least and most experienced dentists (Figure 1).

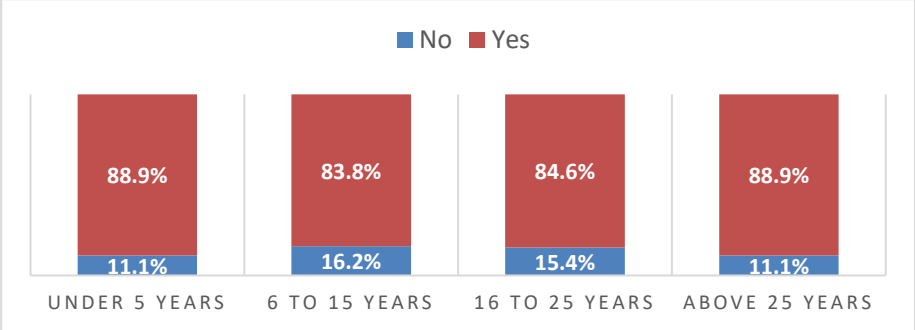

Figure 1. Association between years of professional experience and use of vital pulp therapy to preserve pulp vitality.

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For trauma-related indications, most dentists used biologic approaches regardless of experience; the highest proportion (92.3%) was observed in those with 16–25 years of practice. Pearson's chi-square indicated a significant association between experience and use (p = 0.017) (Figure 2).

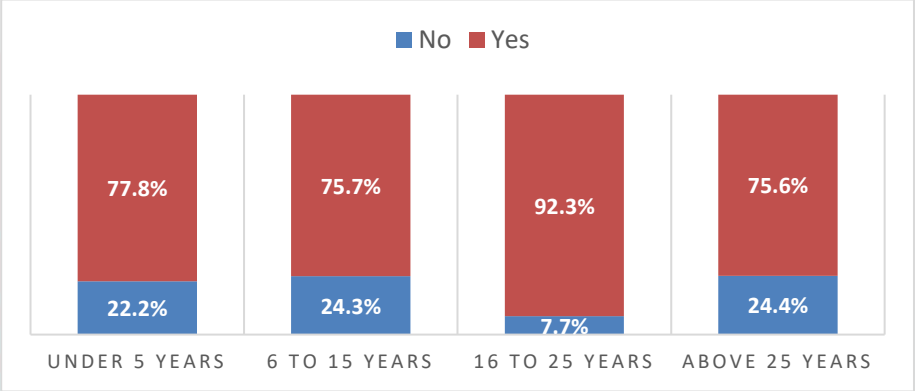

Figure 2. Association between years of experience and use of vital pulp therapy in traumatic pulp injury.

Regarding removal of necrotic tissue, rotary instruments were most common (74.8%), followed by chemical- mechanical agents (16.6%). Air abrasion (5.0%), laser ablation (1.9%), and sonic abrasion (0.6%) were less frequent. "Other" included hand excavation and "operative dentistry" (3 responses each). Multiple responses were allowed; on average, respondents selected 1.3 methods (Figure 3).

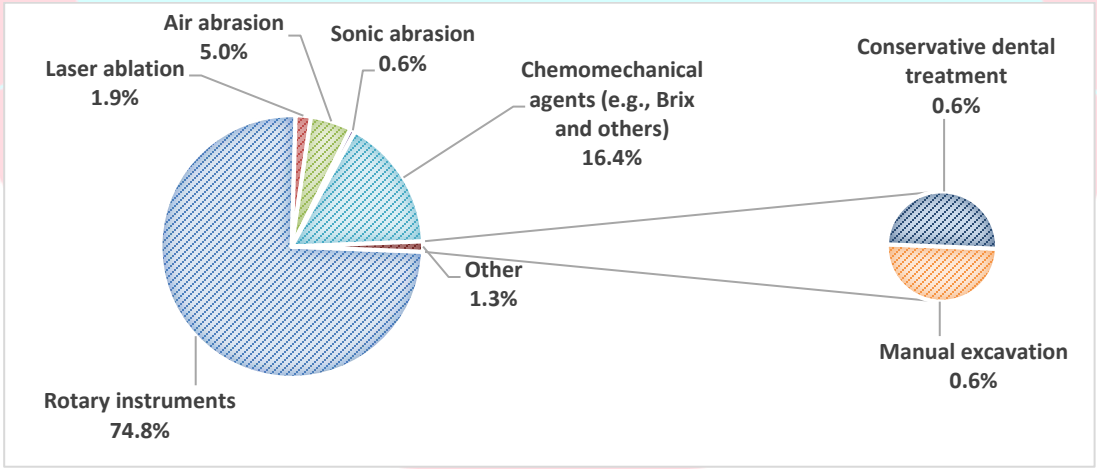

Figure 3. Methods used to remove necrotic tissue in deep caries.
Note: Minor discrepancies reflect rounding to one decimal place.

For extent of caries removal, 50.6% preferred complete excavation to sound dentin; 46.2% preferred removing infected dentin only while preserving affected dentin; 3.2% reported partial (selective) removal. Multiple responses were allowed (mean 1.3 approaches per respondent), confirming dominance of the first two strategies and suggesting case-by-case adaptation (Table 1).

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Table 1. Preferred approaches for the removal of deep dental caries.

Approach for caries removal	Number	Percentage
Complete removal to sound dentin	240	50.6%
Removal of infected dentin while preserving affected dentin	219	46.2%
Partial (selective) caries removal	15	3.2%
Total	474	100.0%

With respect to dentin wound conditioning, normal saline was most common (32.2%), followed by 3% hydrogen peroxide (26.2%) and 0.2% chlorhexidine (20.6%). Less frequent were 2% sodium hypochlorite (6.0%), ozone gas (5.2%), and 17% EDTA (5.2%); 37% phosphoric acid was least used (3.4%). "Other" included alcohol, laser, and high-energy laser with toluidine blue (3 responses each). Multiple responses were allowed; mean 1.9 agents per respondent (Figure 4).

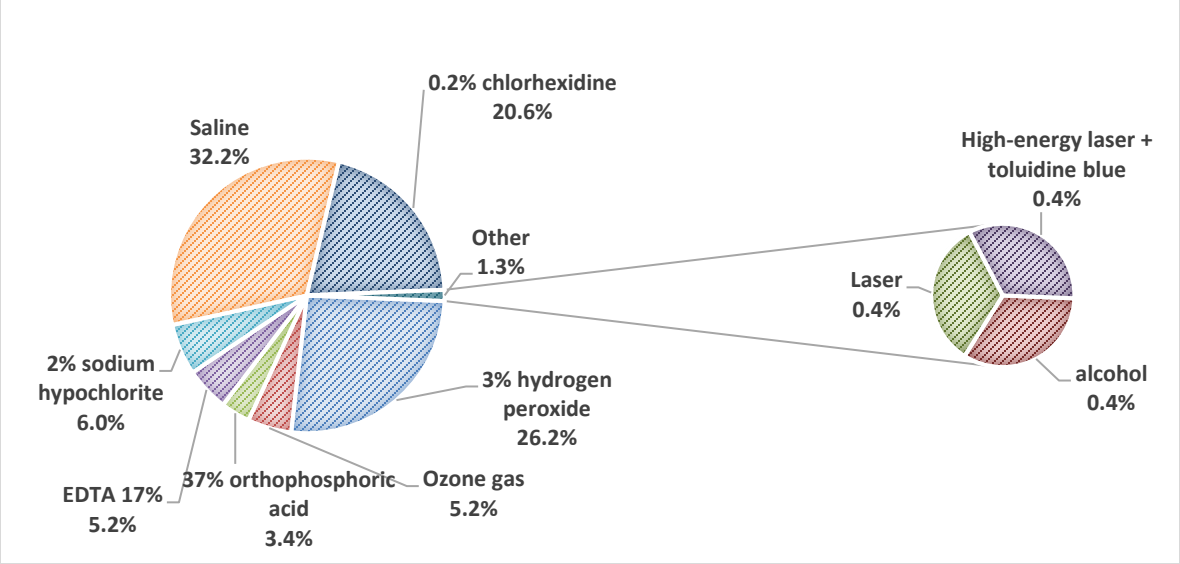

Figure 4. Agents used for dentin wound conditioning in deep caries.
Note: Minor discrepancies reflect rounding.

The most frequently used pulp-capping materials were Mineral Trioxide Aggregate (MTA) (38.5%) and calcium hydroxide cements (Dycal and analogues) (37.4%), followed by Biodentine™ (20.9%). "Other" included TheraCal LC and bioceramics (6 responses each), and Well-Root PT and NeoPutty Avalon (3 responses each). Multiple responses were allowed; average between one and two materials per respondent (Figure 5).

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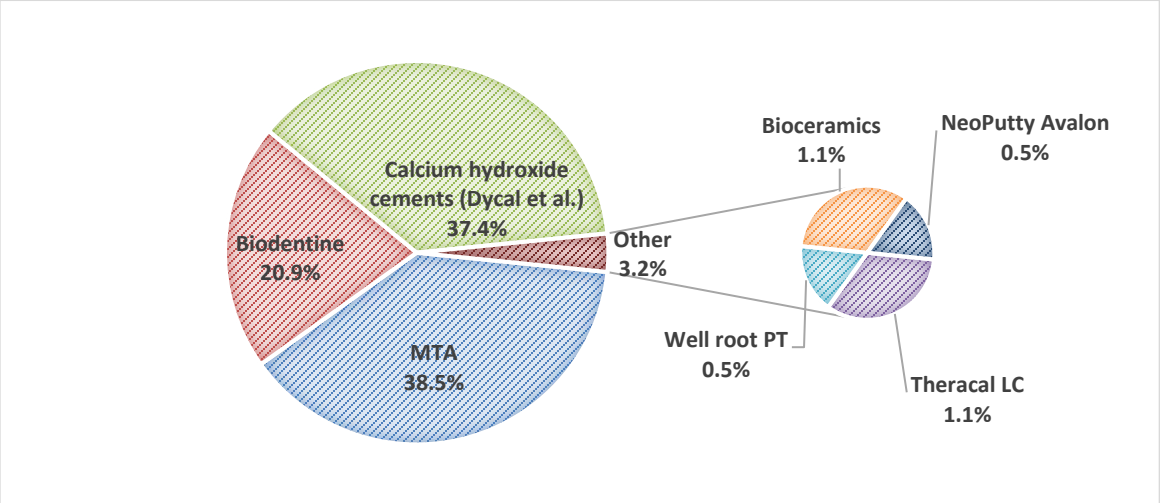

Figure 5. Materials used for vital pulp therapy of the dental pulp.

For follow-up after biologic treatment, radiography was most common (53.8%), followed by electric pulp testing (42.5%). Pulse oximetry and CBCT were each reported by 1.0%. "Other" included absence of sensitivity and percussion testing (3 responses each), medical history (6), and the cold test (9). Multiple responses were allowed; mean 1.6 methods per respondent.
Figures 6 and 7 show the prevalence and use of platelet concentrates among dentists in Bulgaria.

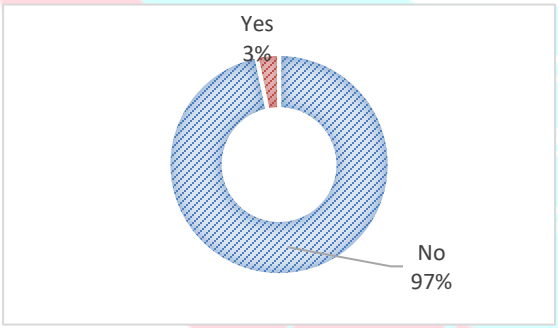

Figure 6. Use of platelet concentrates in clinical practice.

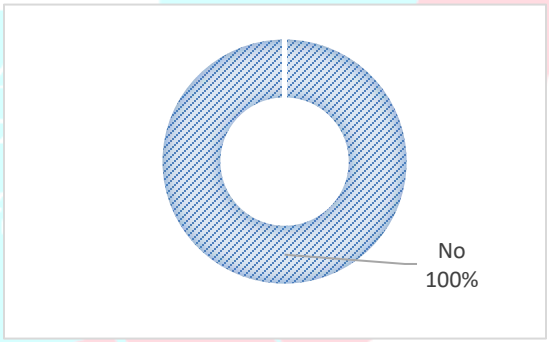

Figure 7. Use of platelet concentrates for direct pulp capping.

The survey results indicate very low awareness of autologous blood biomaterials (3%). None of the respondents use platelet concentrates for direct pulp capping.

Discussion

The findings indicate good awareness of vital pulp therapy, alongside variability in material selection and clinical approaches in daily practice. The high proportion of respondents performing biologic treatments (85%) suggests wide adoption in line with biologic and minimally invasive

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concepts (2,3). The association between years of experience and use of biologic methods shows more frequent use among both the youngest dentists and those with >25 years of practice—likely reflecting better exposure to new materials (younger cohort) and accumulated clinical confidence (most experienced cohort).

For necrotic tissue removal, rotary instruments predominate (74.8%), reflecting the prevailing role of conventional techniques. The use of chemical -mechanical agents (16.6%) signals a trend toward conservative protocols aimed at preserving demineralized but non-infected dentin (1).

Regarding dentin wound conditioning, normal saline, hydrogen peroxide, and chlorhexidine are most frequently used. Normal saline has no disinfecting effect. Despite their widespread use, the impact of these agents on pulp cell viability and dentin barrier formation remains equivocal; agent selection is not standardized, and disinfection is often an underemphasized step. Ozone is used less frequently—likely due to limited clinical experience—despite evidence for biologic advantages and potential regenerative effects (6,7). As also reported by Kirilova et al., ozone shows a marked disinfecting effect on the dentin wound; however, further studies are warranted to clarify its effects on cell viability and the regenerative potential of pulpal cells (16,17).

The most commonly used pulp-capping materials are calcium-silicate and calcium-hydroxide cements, which remain the standard in biologic pulp therapy. MTA offers high biocompatibility and promotes dense reparative dentin, yet it presents practical drawbacks (mixing difficulty, slow set, tooth discoloration). Calcium hydroxide often yields an incomplete, porous barrier with characteristic “tunnel defects,” facilitating microleakage and bacterial ingress (10). Newer calcium-silicate materials such as Biodentine™ and TheraCal LC demonstrate better hydration and more homogeneous reparative dentin (12), as well as improved handling and shorter setting times, although their use remains limited.

In parallel, interest is growing in autologous biomaterials, particularly platelet-rich fibrin (PRF), which offers a biologic approach to restoring the pulp–dentin complex. Despite the documented biological advantages of autologous blood–derived biomaterials (18,19), their routine clinical use remains limited. In this survey, only 3% reported using platelet concentrates, and none applied them for direct pulp capping—likely due to the need for specialized equipment (centrifuge), training with blood products, and insufficient awareness. The literature supports PRF as a promising regenerative material that has not yet been widely adopted in routine endodontic practice (18,19,20).

Conclusion

In summary, vital pulp therapy, management of pulpitis is well recognized among Bulgarian dentists, yet clinical application is concentrated on traditional materials (MTA, calcium hydroxide). Newer biomaterials such as PRF are not yet used for this indication, underscoring the need for more robust research and clearly defined clinical protocols. Further studies—particularly in teeth with complete root development—could facilitate broader adoption of regenerative approaches to preserve pulp vitality.

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Vladova R, Kirilova J. Dentists' Awareness of Vital Pulp Therapy: A Questionnaire-Based Study. J. Med. Dent. Pract, 2025; 12(4):2236-2244.