Knowledge, attitude, and practice on the use of desensitizing agents on reducing the dentinal hypersensitivity following vital tooth preparation among dental practitioners in and around Puducherry – A cross-sectional questionnaire survey

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Abstract

Background: Hypersensitivity is the most common clinical problem which is encountered by most of dental patients undergoing vital tooth preparation for fixed crown prosthesis. Evidence in the literature on the knowledge, awareness, and practice on the use of desensitizing agents in the management of hypersensitivity following tooth preparation is minimal.

Aim: The aim of this study is to evaluate the knowledge, attitude, and practice of the dentists on the use of desensitizing agents in reducing dentinal hypersensitivity following a vital tooth preparation.

Methodology: A cross-sectional survey was carried out among the general dentists using a questionnaire. The questionnaire was validated using subject experts and the final questionnaire, with 14 questions, was aimed to elicit the knowledge, attitude, and practice on the use of desensitizing agents. The questionnaire was distributed among 150 dentists and they were asked to submit responses within 3 weeks.

Results: Ninety-five general practitioners responded for the questionnaire and it was found that hypersensitivity is a common clinical sign among 66% of general practitioners, with 10–50% of patients reporting to them. Awareness of the use of desensitizers was more among the specialty group than the other groups, with potassium nitrate being more preferred (25.3%) followed by GLUMA and silver diamine fluoride.

Key words: Dentinal hypersensitivity, Desensitizers, Vital tooth preparation

Introduction

Hypersensitivity is a common problem, which is encountered by most of patients undergoing a vital tooth preparation following a fixed crown prosthesis.¹ Desensitizers are conventionally used as an application over the hypersensitive teeth due to caries, attrition, cervical abrasion, gingival recession, etc.; non-reliable data prevails in the literature in the prevalence of sensitivity. Chemical desensitizing agents such as potassium nitrate, glutaraldehyde, silver diamine fluoride, stannous fluoride, sodium fluoride, and sodium monofluorophosphates have been recommended to be used to reduce post-vital tooth preparation hypersensitivity.² The awareness of the use of such desensitizers following vital tooth preparation is not been prevalent and is rarely documented. The management of sensitivity following vital tooth preparation is crucial as it could affect the comfort of the patient. This questionnaire study aims in evaluating the knowledge, attitude, and practice (KAP) of dentists on the use of desensitizers in reducing dentinal hypersensitivity following vital tooth preparation.

Methodology

A cross-sectional study was carried out using a questionnaire survey. The questionnaire consisted of a set of 14 questions which was designed to assess the KAP of dentists on the use of desensitizers in reducing dentinal hypersensitivity following vital
Desensitizing agents for reducing the post-vital tooth preparation hypersensitivity

Savitha, et al.

Desensitizing agents for reducing the post-vital tooth preparation hypersensitivity Savitha, et al.

Journal of Advanced Clinical & Research Insights ● Vol. 7:5 ● Nov-Dec 2020

87

tooth preparation. The questionnaire was validated internally by the subject experts and the peer-reviewed questionnaire was distributed among the 150 general dentists of the town, of which 95 responded. The questionnaire was designed to assess the awareness among the dentists on the use of desensitizers which had 14 questions (Demographic details-5, Knowledge-3, Attitude-3, Practice-3 questions) [Annexure 1].

Data collection

The questionnaire was made into “Google” forms with the informed consent of the participants with an assurance of anonymity of the response. The forms were distributed among the 150 General dentists. Of 150 Google forms, 95 dentists responded (Response rate-63.3%). The data were collected coded in an excel sheet for further analysis.

Statistical tests

Chi-square test was used to compare between the sign of hypersensitivity and the qualification group. There is no statistically significant difference found between the two groups.

Results

After the questionnaire analysis, it was found that hypersensitivity is a common clinical sign among 66% of general practitioners [Table 1], with 10–50% of patients reporting to them [Table 2].

Awareness of the use of desensitizers was more among the prosthodontists and the endodontists specialty group than the other groups with potassium nitrate being more commonly preferred 25.3% [Table 3] followed by GLUMA and silver diamine fluoride.

Cement being preferred for luting the permanent crown by the general practitioners were glass ionomer cement (89.5%) followed by zinc polycarboxylate cement [Table 4] with the glass ionomer cement (32.6%) followed by zinc polycarboxylate cement causing post cementation hypersensitivity [Table 5].

Knowledge

About 43.2% of the dentists were aware of using the desensitizers following vital tooth preparation but have not used it, whereas 9.5% of the dentists were not been aware and never used it.

About 46.3% of the dentists were aware of the obtundant effect of eugenol, whereas 13.7% did not know about it.

About 73.8% of the dentists were been aware on the effect of permanent cement and its effect on sensitivity.

Attitude

About 57.8% of the dentists preferred zinc oxide eugenol cement for luting the temporary crown, whereas others preferred zinc phosphate (17.8%) cement and zinc polycarboxylate cement (11.1%) and non-eugenol zinc oxide cement (13.3%).

About 89.5% of the dentists preferred glass ionomer cement as a permanent luting agent, whereas others have used zinc polycarboxylate cement (5.3%) and zinc phosphate cement (2.1%).

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**Table 1:** Distribution of year of experience and common sign of hypersensitivity

| Years of practice | Yes | No | Total |
|-------------------|-----|----|-------|
| 0–5 years         | 33  | 13 | 46    |
| >5 years          | 33  | 16 | 49    |
| Total             | 66  | 29 | 95    |

**Table 2:** Qualification and percentage of patients reporting with hypersensitivity

| Qualification       | 0–10% | 10–25% | 25–50% | 50–75% | 75–100% | Total |
|---------------------|-------|--------|--------|--------|---------|-------|
| BDS                 | 23.9  | 30.61  | 26.0   | 1.33   | 0       | 46    |
| MDS                 | 30.61 | 36.73  | 26.0   | 0.06   | 0.020   | 49    |
| Total               | 27.4  | 34.73  | 25.26  | 0.11   | 0.020   | 95    |

**Table 3:** Use of desensitizers been preferred by the dentists (preference for desensitizers)

| Desensitizers               | Frequency | Percentage |
|-----------------------------|-----------|------------|
| Potassium nitrate           | 24        | 25.3       |
| Silver diamine fluoride     | 5         | 5.3        |
| GLUMA                       | 9         | 9.5        |
| Both potassium nitrate and SDF | 1      | 1.1        |
| Both potassium nitrate and GLUMA | 1     | 1.1        |
| Potassium nitrate, gluma, SDF | 1       | 1.1        |
| Other desensitizing agents  | 18        | 18.9       |
| None                        | 36        | 37.9       |

**Table 4:** Cement preferred for luting the permanent crown

| Luting cement               | Frequency | Percentage |
|-----------------------------|-----------|------------|
| Glass ionomer cement        | 85        | 89.5       |
| Zinc polycarboxylate cement | 5         | 5.3        |
| Both glass ionomer and polycarboxylate cement | 3 | 3.2 |
| Zinc phosphate cement       | 2         | 2.1        |
| Others                      | 0         | 0          |

**Table 5:** Cement and its effect on hypersensitivity

| Luting cement               | Frequency | Percentage |
|-----------------------------|-----------|------------|
| Glass ionomer cement        | 31        | 32.6       |
| Zinc polycarboxylate cement | 20        | 21.1       |
| Resin based cement          | 13        | 13.7       |
| Both GIC and zinc polycarboxylate cement | 1 | 1.1 |
| Both GIC and resin-based cement | 5 | 5.3 |
| Not aware of                | 23        | 24.21      |
| None                        | 2         | 2.1        |

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About 48.4% of the dentists used desensitizing agents on sensitivity patients following vital tooth preparation, whereas others prescribed analgesics/applied dentin bonding agent/did root canal treatment.

**Practice**

Hypersensitivity was found to be a common clinical sign following vital tooth preparation among 69.5% of the dentists, with 10–50% of the patients reporting to them. Use of desensitizers was more among the prosthodontists and endodontists specialty group than the other groups, with potassium nitrate being more commonly preferred (25.3%) followed by GLUMA and Silver diamine fluoride.

**Discussion**

Addy has defined hypersensitivity as a transient short and sharp pain which arises from the exposure to dentin in response to tactile, thermal, chemical, or osmotic stimulus that cannot be explained by any other category of diseases. It was not mentioned in the literature as a condition which requires immediate intervention or treatment. However, it was mentioned that there would be an apparent discomfort due to hypersensitivity which was treated by themselves most of the time with over-the-counter drugs.

In situations where the vital tooth is prepared to receive a crown, the dentin is exposed and left uncovered for a sufficient period of time till the temporary crown is fabricated. After the final prosthesis is ready, the temporary would be removed, residual cement sticking to the tooth structure would be removed. The final prosthesis made of either metal or ceramic material would be tried in the mouth several times to check the accuracy of fit, marginal adaptation, proximal contours, and occlusion. All the above-mentioned instances happen in regular clinical practice and the patient is comforted, stating that the sensitivity is a transient phenomenon.

During cementation of the prosthesis, acidic luting agents can sometimes increase the sensitivity and cause intolerable discomfort to the patient. The entire procedure becomes an uncomfortable experience for the patient. Using desensitizing agents for dentin exposure due to caries, attrition and other causes, as already mentioned, is very well recorded in literature. Following tooth preparation, many desensitizing agents have been recommended for use. Although hypersensitivity and desensitizing agents are not novel to the dental profession, its use following tooth preparation to handle post preparation sensitivity was not studied. We find many articles in the literature on the use of desensitizing agents to reduce hypersensitivity for other conditions like caries, root exposure, attrition, abrasion, erosion, and other non-caries lesions.

Very few evidence exists on the use of various desensitizing agents. In 2009, Jatalian et al. conducted a study to find out the effectiveness of the desensitizing agents in reducing the post-vital tooth preparation hypersensitivity and found that potassium nitrate used before cementation reduced post-operative vital tooth preparation sensitivity than GLUMA. The knowledge of such agents to be used for this purpose is also lacking amongst the practicing dentists. In regular practice, even in institutions, there is very little knowledge and practice on the use of desensitizing agents following vital tooth preparation. There are studies in literature which have compared the use of desensitizing agents following tooth preparation and their effect on the retention of crowns. Although it is known that the use of such agents does not affect the retention of the crowns or bridges, there is no evidence of prevalent practice among general practitioners.

In 1997, Swift et al. performed a study to find the effectiveness of desensitizing agents in retaining the crown and found that desensitizers increased the retention of the resin-based cement whereas decreased the retention when luted with zinc phosphate cement. Retention of crown luted with glass ionomer cement was greater when one step desensitizer was used. In 2000, Yim et al. did a study to find the effectiveness of the desensitizers and luting agents in retaining the crowns and found that resin-based cement and all Bond 2 desensitizer retained the crowns higher than the other cements with the zinc phosphate and GLUMA having the lower retentive strength.

Silver diamine fluoride solution was introduced as a therapeutic agent at a concentration of about 38% for the management of dental caries which has a pH between 8 and 9. By applying the solution topically on the exposed dentinal surface, it was found that it results in the formation of a squamous layer partially plugging the dentinal tubules, thereby reducing the dentinal hypersensitivity. However, its use as a desensitizer following vital tooth preparation is less among the general practitioners as they are not aware of the pros and cons of the material. Thus, we can conclude that there is a definite lack in the body of knowledge about the use of desensitizers following tooth preparation. Other than chemicals, lasers have been used with or without bonding agent to reduce sensitivity. Neodymium doped-Yttrium-Aluminum-Garnet (Nd-YAG), Carbon dioxide (CO\(_2\)), Er, erbium: yttrium- scandium-gallium-garnet, Gallium-Aluminum-Arsenide. Low-powered lasers like Nd-YAG are used in managing dentinal hypersensitivity. They act on the internal tubular nerve or sclerosing the dentinal tubules. It coagulates the proteins of the organic matrix in dentinal tubules due to “photo-bio-modulating” effect on the odontoblasts and melting and recrystallization of hydroxyapatite crystals. Since literature evidences are scarce On the use of desensitizing agents following vital tooth preparation, there is a need of more evidence in literature on the use of desensitizing agents following vital tooth preparation to create more knowledge and awareness among the general practitioners.

**Strength and limitations of the study**

To the best of our knowledge in the literature, no studies have been done to assess the KAP on the use of desensitizing agents following vital tooth preparation. Our study included general practitioners and the specialty dentists in Puducherry to assess the awareness of the use of desensitizing agents following vital tooth preparation.
Desensitizing agents for reducing the post-vital tooth preparation hypersensitivity  

Savitha, et al.

Desensitizing agents for reducing the post-vital tooth preparation hypersensitivity  

Savitha, et al.

Journal of Advanced Clinical & Research Insights  
● Vol. 7:5  ● Nov-Dec 2020

89

tooth preparation. The major limitation of this study is essentially the small number of participants.

Conclusion

Within the limitations of the study, it can be concluded that
1. Hypersensitivity is a common clinical sign among general practitioners, with most of the patients reporting to them
2. Knowledge and awareness on the use of desensitizers were more among the specialty group than the other groups
3. Potassium nitrate is being more commonly preferred followed by GLUMA and silver diamine fluoride
4. It was also found that there is a lack of knowledge and awareness on the use of the newer desensitizing agent silver diamine fluoride
5. Practice on the use of desensitizers following vital tooth preparation is been less among both the groups and the cement being preferred for luting the permanent crown by the general practitioners were glass ionomer cement followed by zinc polycarboxylate cement with the glass ionomer cement followed by zinc polycarboxylate cement causing post cementation hypersensitivity in most of the patients.

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Annexure

Annexure 1: Demographic details

1. Email address:
2. Where do you render your service at?
   a. Hospital/Dental institutions
   b. Private practitioner
   c. Consultant
   d. Others
3. Gender?
   • Male
   • Female
   • Third gender
4. Qualification?
   • Bachelor of dental surgery
   • MDS in prosthodontics
   • MDS in conservative dentistry and endodontics
   • MDS in periodontics
   • MDS in pedodontics
   • MDS in orthodontics and dentofacial orthopedics
   • MDS in oral and maxillofacial surgery
   • MDS in oral medicine and radiology
   • MDS in oral pathology
   • MDS in public health dentistry.
5. How long have you been in practice?
   • 0–5 years
   • 6–10 years
   • 11–15 years
   • 16 years and above

Practice-based questions

6. In your clinical practice, is hypersensitivity a common clinical sign following vital tooth preparation?
   • Yes
   • No
7. Mention the percentage of patients reporting to you with hypersensitivity after vital tooth preparation?
   • 0–10%
   • 10–25%
   • 25–50%
   • 50–75%
   • 75–100%
8. Which desensitizers have you been using to decrease the hypersensitivity following vital tooth preparation?
   • Potassium nitrate
   • Silver diamine fluoride
   • GLUMA
   • Other desensitizing agents
   • None.

Knowledge-based questions

9. Eugenol cement reduces hypersensitivity following post-vital tooth preparation?
   • Agree
   • Disagree
   • I am not aware of
10. Are you aware of using a desensitizer following post-vital tooth preparation?
    • Yes, have used it
    • Heard about it but not used it
    • Never heard and never used it
    • Used on sensitive areas other than post-vital tooth preparation. (Class 5, Attrition)
11. The following cement has an effect on sensitivity following vital tooth preparation?
    • Glass ionomer cement
    • Zinc polycarboxylate cement
    • Resin-based cement
    • Not aware of

Attitude-based questions

12. Which cement do you prefer for luting Temporary Crown following vital tooth preparation?
    • Zinc phosphate cement
    • Zinc oxide eugenol cement
    • Non-eugenol zinc oxide cement
    • Zinc polycarboxylate cement
13. Which cement do you prefer for luting permanent crown?
    • Glass ionomer cement
    • Zinc polycarboxylate cement
    • Zinc phosphate cement
    • Others
14. A patient reporting to you with the complaint of hypersensitivity following vital tooth preparation, What is your line of treatment?
    • I prescribe analgesic
    • I use desensitizing agent
    • I do not use desensitizing agent rather do root canal treatment
    • I apply dentin bonding agent
    • None