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Do Dentists in Ha'il Region Follow Contemporary Pulp Protection Protocols? A Saudi Based Study

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Abstract **Objective:** This study assessed the clinical implementation of contemporary pulp protection protocol among dentists in the Ha'il Region, Kingdom of Saudi Arabia (KSA). **Methods:** A cross-sectional, paper based survey was conducted among dentists in the Ha'il Region. An easy-to- answer questionnaire was distributed among 200 licensed dentists in the region and recollected after more than a month. **Results:** The response rate was 47.5% (95 n) with majority (70.2%) of male respondents. The mean age of participants was 35.65 years Analysis of data reveals that majority of the dental clinicians did not clinically implement the contemporary protocols for pulp protection. **Conclusion:** Most of the dentists practicing in Ha'il region, KSA were not following current pulp protection protocol during operative dentistry procedures.

Keywords: *pulp protection, cavity liners and bases, remaining dentin thickness (RDT)*

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1. Introduction

Dental caries is treated conventionally by drilling followed by restoration with some definitive restorative material. These materials have been considered irritant and toxic for a living dental pulp [1,2]. To protect the pulp from toxicity of restorative material, pulp protection protocol is carried out by the operating dentist after cavity preparation. Use of cavity bases and liners is recommended for this purpose as an integral part of an intra-coronal restorative procedure. Various dental cements and varnishes have been in use to apply as a base or liner under direct restorations of teeth irrespective of cavity depth [3].

It has now been proved that no constituent of direct restorative material causes damage to vitality of the pulp. Direct use of phosphoric acid for etching of the cavity with iatrogenically exposed pulp is a well recommended procedure mentioned in the dental literature [4]. If direct application of acid on the pulp doesn't cause any harm, how any other constituent of restorative material which doesn't come in direct contact with pulp, can cause any negative effect on pulp? The pulp readily endures effect of low pH of the applied etchant in absence of bacterial infection.

In fact, it is ingress of bacteria under leaky restorations which plays a fatal role to cause biological failure of a restoration [5]. Due to corrosion and percolation in dental amalgam and polymerization shrinkage in resin composites, marginal deterioration occurs at the cavity – restoration interface allowing influx of bacteria under the restoration [6] that causes pulp pathology [7]. Moreover, current knowledge on cariology has shown that thickness of remaining dentin (RDT) plays a significant role in the application of the bases and liners [8]. Bases have no role under direct restorations. They are used only for blocking undercuts for indirect dental restorations. No material that can be placed in a cavity provides better protection to the pulp than dentin itself. Dentin has brilliant ability to neutralize toxicity of acidogenic bacteria which produces caries. The RDT is the solitary most significant feature that protects pulp from external insults. Conservation of RDT is therefore, considered more important for pulp health than is replacement of lost tooth tissue with a cavity liner or base. A cavity having dentin thickness more than 1.5 mm doesn't require any liner or base. Application of a layer of sealer or dentin adhesive is enough to seal the dentinal tubules which get exposed during cavity preparation. In case of RDT less than 0.5mm, it should be lined by Calcium Hydroxide (CH) and covered with resin modified glass ionomer (RMGI) to compensate the weakness of former followed by application of sealer or dentin adhesive. Cavities with RDT between 0.5 and 1.5 mm should be lined by RMGI followed by application of dentin adhesive which also is a very good sealing agent. Its use under direct restorations is also advocated as a pulp protection measure [9].

Evidence indicates that undergraduate students of dentistry studying in KSA still follow the old traditional pulp protection protocols and new concepts are not either being taught or accepted. This fact is well revealed when clinical dental students are seen working during their clinical duties following the old philosophy of protecting

pulp. These clinical students after getting through their final examination become clinicians and continue practicing what they have learnt at their dental school as undergraduate student.

It was therefore, decided to conduct this exploratory study with cross sectional design among clinicians who are graduate of various dental schools around the world, working in public and private clinics in Ha'il Region, KSA. The rationale behind the study was to explore number and percentage of the dentists who follow contemporary pulp protection methods. A higher frequency of dentists not following the protocol would mean that either they are not familiarize with the updates of pulp protection procedures or they have been taught old concepts of lining and basing in their schools. The results of this study would provide recommendations for dentistry schools in the KSA to update operative dentistry curriculum for undergraduate students.

2. Materials and Methods

2.1. Sample

This study was a questionnaire based cross sectional survey. This study was approved by The Ethics Committee at University of Hail, KSA. The data were collected between January to April 2016. A list of all 200 licensed dentists practicing public and private clinics in Ha'il region, KSA, was obtained from the Saudi Commission of Health Specialties (SCHS). The questionnaire was distributed personally to all the dentists included in the list representing a convenience sample. The Informed consent cover letter was signed by participant. The dentists, who willingly decided to participate in the study, filled out the questionnaire and returned it back. The only inclusion criterion was practice of general or operative dentistry.

2.2. Survey Instrument Design

The data were collected through a self-administered questionnaire. The questionnaire was content validated by a panel of restorative dentistry faculty members at University of Hail, KSA. Ten Dentists not included in the final data analysis were asked to give their opinion about the questionnaire and the questionnaire was accordingly modified.

The questionnaire was one-page (single-sided) with informed consent cover letter including a brief explanation of the nature and objective of this study. Demographic variables included age, gender and length of clinical experience. The questionnaire consisted of questions about responders' clinical practice to save the vital pulp from iatrogenic damage through restorative material or restoration itself. The questions were concerned about responders' practice to protect pulp in three situations; when RDT is more than 1.5 mm, less than 1.5 mm but more than 0.5 mm and less than 0.5 mm. For all the three situations, with the final restoration, the dentists were asked about using base cement or Calcium Hydroxide liner or Resin Modified Glass Ionomer (RMGI) and dentin adhesive.

2.3. Data Analysis

Data were coded and analyzed using Statistical Package for the Social Sciences (SPSS), version 20. Descriptive statistics were assessed for each variable. Frequencies and percentages of responses were obtained.

3. Results

Overall, 95 of 200 practicing dentists in Ha'il region responded with a response rate of 47.5%. Most of the participants were males (70.2%). The average age of participants was 35.65 years. Most of the participants (78.1%) were aged 26-40 years. Around 90% of the participants were practicing dentistry less than 20 years (Table 1).

Table 1. Demographics of respondents (N=95)

	n (%)
Age (years)	
26-30	29 (30.5)
31-40	45 (47.4)
41-50	18 (18.9)
more than 51	3 (3.2)
Gender	
Male	67 (70.5)
Female	28 (29.5)
Clinical Exp. (years)	
1-10	60 (63.2)
11-20	25 (26.3)
>30	10 (10.5)

3.1. Practices of the Respondents when RDT is more than 1.5 mm:

RDT more than 1.5 mm is good enough to protect vital pulp and don't require any lining or base under a dental restoration. It is evident from the findings of this study that 45.3 % of respondents don't insert the composite restoration without essentially placing a cement base or CH lining. 18 % of them place cement base and 27.4 % place CH lining (Table 2).

Table 2. Protocol followed where RDT is more than 1.5 mm (n=95)

Restoration protocol	Yes n (%)	No n (%)
Cement base + Composite	17(18.0)	78(82.0)
CH lining + Composite	26(27.4)	69(70.6)
RMGI + Dentin adhesive + Composite	52(54.7)	43(45.3)

CH = Calcium Hydroxide, RMGI = Resin Modified Glass Ionomer.

3.2. Practices of the Respondents when RDT is less than 1.5 mm but more than 0.5 mm:

Cavities with RDT between 0.5 and 1.5 mm should be lined by resin modified glass ionomer cement (RMGI) under a composite restoration for pulp protection. It is noted that merely 30.5 % of the respondents perform the proper protocol when RDT is between 0.5 and 1.5 mm and the rest of 69.5 % place cement base or CH lining under the restoration (Table 3).

Table 3. Protocol followed where RDT is less than 1.5 but < 0.5 mm (n=95)

Restoration protocol	Yes n (%)	No n (%)
Cement base + Composite	26(27.3)	69(72.2)
CH lining + Composite	40(42.1)	55(67.9)
RMGI + Dentin adhesive + Composite	29(30.5)	66(69.5)

CH = Calcium Hydroxide, RMGI = Resin Modified Glass Ionomer.

3.3. Practices of the Respondents when RDT is less than 0.5 mm:

Contemporary recommendation for pulp protection is to line the cavity with CH and cover with RMGI to compensate the weakness of CH followed by application of sealer or dentin adhesive. This protocol is not being followed or accepted by 45 % of the responding dentists (Table 4).

Table 4. Protocol followed where RDT is less than 0.5 mm (n=95)

Restoration protocol	Yes n (%)	No n (%)
Cement base + Composite	26(27.3)	69(72.7)
CH lining + Composite	17(17.9)	78(82.1)
CH+ RMGI + Dentin adhesive + Composite	52(52.7)	43(45.3)

CH = Calcium Hydroxide, RMGI = Resin Modified Glass Ionomer.

4. Discussion

In order to save the vital pulp from post-operative dentine sensitivity and recurrent caries, dentists after completion of a cavity preparation used to place a cement lining or base under a composite or amalgam restoration. Evolution of newer restorative material and better understanding of the carious tissue removal technique contraindicate the use of conventional liners and bases under direct restorations [10]. Application of any material as a base or liner neither contribute in reduction of post-operative sensitivity [11] nor in incidence of secondary caries [12]. RDT was of no consideration in the past but now it is considered to have pronounced effect on pulp vitality. It is believed that minimum 0.5 mm of RDT is sufficient to reduce the injuriousness of a material on the pulp to save it from any irritational impairment [13]. It is recommended to treat deep cavities by applying CH in the deepest part, followed by base of RMGI and sealing with an adhesive but finding of this study show that 45.3 % of the respondents don't follow this protocol. A prepared cavity which has RDT 1.5 mm or more need not be lined or based [3] but findings of this study indicate that 54.7 % of participants apply resin modified glass ionomer and 18% utilize other cement as a base in such clinical situations whereas 27.4 % unnecessarily use CH under the direct composite restorations. It is also apparent from the results of present study that around 70 % of the responding dentists unreasonably apply CH under the restorations where RDT is between 1.5 mm and 0.5 mm. It has been established that CH is unsuitable for basing under a restoration because of its high solubility that results in softening of the applied lining and material loss under the restoration creating a gap between tooth and restoration interface [14]. Its use in deep cavity is not considered a responsible factor for successful accomplishment of treatment [15] as its only advantage is its high pH which helps in neutralization of acidity of bacterial products.

There is scarcity of published data on clinical practices of dental practitioners about applying liners and bases under direct restorations to compare the findings. Logical reason behind following old concepts of pulp protection and not adopting contemporary ones may be the way the dental students are taught at undergraduate level. Whatever the students learn at this level they continue practicing once qualify to practice. Evidence shows that undergraduate students are still cutting the old fashioned Black's cavities which involve inessential tooth cutting for the sake of retention and extension for prevention. The students are bound to carry out all these procedures because their teacher assess them during clinical examination on that basis. The students should be taught and made to practice concepts of minimal intervention dentistry which involves carious lesion- specific tissue removal. If they learn it in their schools, they will practice the same in the clinics. Cavities prepared with minimal intervention don't accommodate conventional lining and bases. Dental teaching institutes and continuous dental education activities can support updating the knowledge and practice of pulp protection measures in daily clinical practice.

Due to insufficient resources, it was not possible to conduct this survey in other parts of the Kingdom of Saudi Arabia. There is a need for further investigation of this subject for the students in dental schools in Saudi Arabia.

5. Conclusion

Most of the dental practitioners working in Ha'il region, KSA are still following old pulp protection measures. It might be a reflection of teaching trends on pulp protection in different dental schools where the responders belong to.

6. Recommendations

Keeping the findings in view, following is recommended;

1. The subject teacher should start deliberations on essential changes in curriculum.
2. Short courses and hands –on workshops should be conducted for the clinicians who still follow old concepts.
3. Clinical assessments of undergraduates should be directed towards new operative dentistry procedures.

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