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EVALUATION OF PERIAPICAL STATUS OF NON-ROOT FILLED TEETH RESTORED WITH COMPOSITE, AMALGAM AND LAB-FABRICATED CROWNS : A CROSS-SECTIONAL STUDY IN QASSIM PROVINCE SAUDI ARABIA

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ABSTRACT:

Introduction: Composite restorations produce pulpal inflammation when in contact with pulpal tissues in vitro studies. It may be responsible for periapical inflammation if used in vital teeth. **Aim:** To determine an association of periapical status of non–root-filled teeth restored with coronal restorations (composite resin, amalgam and laboratory-fabricated crowns) for patients attending dental clinics of Qassim University Kingdom of Saudi Arabia (KSA).

Methods: Total 400 digital OPG's from a randomly selected sample of 1104 OPG's of patients visiting dental clinics of Qassim University. The type of the coronal restorations was recorded and the periapical status was evaluated for all non–root-filled teeth using panoramic radiographs. The association between periapical status and type of the restorations was analyzed using the cross tabulation and chi-square test analysis.

Results: Lab-fabricated crowns presented with greater percentage of apical periodontitis (11%) than that of amalgam (2.3%) and composites (4.9%). There was a statistical significance association between PAI score and non-root filled teeth restored with amalgam, composite and laboratory fabricated crowns (X^2=33.885, df=2, p<0.000). A significant association was found between types of teeth, and no. of surfaces with the apical periodontitis. (P<0.000)

Conclusion: In the present study, the results support the hypothesis that presence of apical periodontitis in a non-root filled teeth significantly is associated with the coronal restorations.

Keywords: Coronal restorations, Apical periodontitis, Vital teeth, Non- root teeth filled

INTRODUCTION:

Composite restorative material and tooth preparation for lab-fabricated crowns both have been found to have an adverse effect on dental pulp tissues.(1) In vitro studies showed greater pulpal inflammation associated with composite restorations than amalgam restoration. (2) Resin monomers released from composite restorations may impair regenerative and reparative capacities of pulp.(3) Polymerization shrinkage associated with composite resin restorations may result in microbial leakage leading to pulpal inflammation, necrosis and apical periodontitis. (4) There are very few studies that evaluated periapical status of vital teeth restored with amalgam, composite or

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full crown. One study showed greater pulpal inflammation associated with composite resin restorations than amalgam restoration and in another study no significant difference in pulpal complications was found between composite and amalgam restorations. [1, 5] There are several follow-up studies from 2-25 years, on the periapical status of lab-fabricated crowns on vital teeth and reported frequency of AP vary from 3%-15%. [6-8] .

On the basis of *in*-vitro studies it can be hypothesized that teeth restored with composite restorations and lab-fabricated crowns may be associated with apical periodontitis more than those restored with amalgam restorations. The aim of this study was to evaluate the periapical status of non–root-filled teeth restored with resin composite, amalgam, or laboratory-fabricated crowns in Qassim province. No similar study has been done before in this region.

MATERIALS AND METHODS:

It was a retrospective cross-sectional study. The study was approved by the Ethical review committee (Approval No: 8Int). The study was conducted from Sep-Dec 2016. Sample size was calculated from the prevalence of AP in general population from the previous studies.[9-11] A total of 1104 digital Orthopantomographs (OPG) of patients attending dental clinics at the Qassim University from December 2015-September 2016 were retrieved. They were shuffled and every second was removed until 552 remained. Out of 552 OPGs, 470 were included into the study, while the rest were discarded according to exclusion criteria. Teeth with any one of the amalgam, composite, single lab-fabricated crowns and patients between 18 years to 50 years of age were included in the study. Third molars, apical periodontitis related to root-treated teeth, teeth with generalized periodontal disease, teeth with broken restoration and caries beneath restoration, restorations other than amalgam and resin composite and duplicated OPGs were excluded from the study. All OPG's were taken with Sorendex model No. b23926 (tuusula finland) with constant current of 10 mA and 11-second exposure. Images were recorded on digital radiographic and processed in digora soft- ware. Investigators were a well-trained intern and an endodontist (Norah & Durre). Scoring accuracy was checked prior to the study by using periapical index (PAI) according to Orstavik et al. [12] Both examiners evaluated radiographs in standard conditions, using computer screen placed in a dark room with a magnification (x2).

The periapical index (PAI) system was used to identify teeth with AP.[12] The system provides an ordinal scale of 5 scores ranging from 1 (healthy) to 5 (severe periodontitis with exacerbating features). Periapical lesions were classified using PAI, which was divided into five scores as follows: • score 1 – normal periapical appearance; • score 2

– small changes in bone structures; • score 3 – bone structure changes with small loss of minerals; • score 4 – periodontitis with well visible radiolucent area; • score 5 – advanced form of periodontitis with exacerbating appearance.

Apical periodontitis was assigned to the tooth for PAI scores 3, 4 and 5 while normal periapical status was scored for PAI values 1 and 2. If a tooth had more than one root, PAI value was allocated to the highest PAI score (worst root). In case of uncertainty, the periapical condition was considered to be normal. This approach minimizes the proportion of false-positive registrations.

Statistical Analysis: The data were entered into the Microsoft Excel database. Statistical analysis included descriptive statistics, *chi* square test and Pearson correlation. SPSS, version 21 was used and *P* value was considered significant at 0.05.

RESULTS:

In total 470 OPG, 1588 teeth were examined. Total 80 (5%) teeth were presented with apical periodontitis. Frequency and percentages of gender, types of restorations, types of teeth, numbers of surfaces involved during restorations and PAI score has been presented in Table-1. Significant association was observed between type of teeth, types of coronal restorations and no. of surfaces with the apical periodontitis (Table-2). High prevalence of apical radiolucency was observed in anterior teeth (n=27,8.6%) followed by premolars (n=26, 8.6%) and molars (n=27, 6.1%).

Regarding the association between type of restorations and apical periodontitis, lab-fabricated crowns presented with highest frequency of periapical radiolucency 11% (n=35) and amalgam showed least of all 2.3%(n=15).

Multiple surfaces involved in restorations are presented with highest frequency of apical periodontitis (n=60, 5%) than single surface teeth (n=20, 2.4%).

DISCUSSION:

The OPG's of this study constituted a random sample of adults attending Qassim Collage Dental Clinic. Because the sample size (400 OPG's ,1588 Teeth) was small, it is important to address the question of whether the sample examined represents the population and whether if it is too small to detect changes in the periapical lesion. However, because the aim of the study was to relate periapical status to restorative materials and not to describe the oral health of the subjects, the sample size can be considered adequate to detect any association between dependant and independent variables.

Type of restorations was found to be significantly associated with the apical periodontitis. Lab-fabricated crowns presented with greater percentage of apical periodontitis (11%) than that of amalgam (2.3%) and composites (4.9%). Our results

are similar to Dawson et, al. who found significant association of AP with the lab-fabricated crown (6.3%) and lab-fabricated crown repaired with filling material (10.3%).[13] Our results are also in agreement with many studies conducted on lab-fabricated crown and reported the development of AP ranged from 3%-15%. [6-8, 14] Development of AP in lab-fabricated crowns may be associated with physical trauma to the pulpal tissues due to extensive teeth preparation along with the presence of deep caries responsible for damaging effects on pulp-dentin complexes.

Applying panoramic radiography as the radiographic examination of choice can be considered as a limitation of the study as it has been shown that the image of AP on panoramic radiographs may result in underestimation compared with periapical radiographs. Consequently, a limitation in this study might be a relative underestimation of AP, as evidenced by the high frequency of non-assessable periapical structures, mainly because of overlapping of anatomic structures in the anterior region.

Significant association between restorations involved multiple surfaces with AP showed that extensive tooth preparation had adverse effects on dentin-pulp complex and may influence long term prognosis. A study done by Murray et, al reported adverse effects on pulp dentin complex associated with iatrogenic dentin removal. [15]

Least frequency of AP has been observed in teeth restored with amalgam restorations. Similar results found in systematic review conducted by Rasines Alcaraz et al found no adverse effects associated with amalgam restorations and composite restorations lead to higher failure rate and risk of secondary caries than amalgam restorations.[16] Contrary to this, another study (systematic review) showed low-quality evidence to suggest that resin composites lead to higher failure rates than amalgam restorations. [17]

A system review conducted by Dawson et,al. found no association between composite and AP and no difference exist between amalgam and composite with regard to endodontic complications. [18]

CONCLUSION:

- Lab-fabricated crown preparation has significant association with AP than amalgam and composite restorations
- Multiple surfaces restorations are significantly at high risk of developing AP
- Conservation of sound tooth structure should be taken into count while restoring with composite, amalgam and lab-fabricated crowns.

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TABLES:

Table-1: Frequency and Percentages of Gender, Types of teeth, Restoration types, No. of surfaces and PAI Score

Variables		Frequency n Total: n=1588	Percentage % Total: 100%
Gender	male	836	52.6%
	female	752	47.4%
Types of Teeth	molars	849	53.5%
	premolars	425	26.8%
	anteriors	314	19.8%
Restoration Types	amalgam	656	41.3%
	composite	613	38.6%
	lab-fabricated crowns	319	20.1%
No. of Surfaces	single surfaces	831	52.3%
	Multiple surfaces	757	47.7%
*PAI score	Normal periapical status	1508	95%
	Apical periodontitis	80	5%

*PAI: Periapical Index

Table-2: Association between Gender, Types of Teeth, Types of Restorations and Number of Surfaces with the presence of apical periodontitis in non-root filled teeth.

Variables		n (%): Total: n=1588 (100%)	Presence of Apical Periodontitis	P value
Gender	Male	836(52.6%)	40(4.8%)	0.355
	Female	752(47.4%)	40 (5.3%)	
Types of Teeth	Molars	849(53.5%)	27(3.2%	*0.00
	Premolars	425(26.8%)	26(6.1%)	
	Anteriors	314(19.8%)	27(8.6%)	
Types of Restorations	Amalgam	656(41.3%)	15(2.3%)	*0.000
	Composite	613(38.6%)	30(4.9%)	
	Lab-fabricated crown	319(20.1%)	35(11%)	
No of surfaces	Single surface	831(52.3%)	20(2.4%)	*0.000
	Multiple surfaces	757(47.7%)	60(5%)	

- Statistically significant association between the variables and apical periodontitis.