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An Evaluation of Overhanging Dental Restorations' Frequency and Localization in a Group of Yemeni People in Sana'a City – Yemen

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1. Abstract

1.1. Background: An overhanging dental restoration extends beyond the boundaries of the cavity preparation. The most frequent causes of gingival irritation and periodontal damage are overhanging and improper dental restorations and prostheses, overhanging margins create the perfect conditions for the buildup of plaque and alter the ecological balance of the gingival sulcus region, which increases the number of disease-associated organisms. According to studies, teeth with overhangs have higher periodontal attachment loss and inflammation than teeth without overhangs. If overhanging restoration is not identified, clinical attachment loss leads to bone loss, which in turn causes a deep periodontal pocket or gingival recession clinically.

1.2. Aims and Objectives: The aim of this retrospective study to determine the frequency of overhanging margins in restorations by examining patient regularly collected from radiographic centers and from panoramic radiographs private dental clinic, the objective of this retrospective study was to ascertain the frequency and localization of the overhanging restorations.

1.3. Materials and Methods: A retrospective cross-sectional observational study was conducted on 540 randomly selected pano-

ramic images, ≥ 18 years male and female Yemeni patients referred to private radiology centers in (Al Waleed Digital X-Ray, Sana'a). The study group includes 150 patients between 18-70 years of age who had at least one obvious overhanging restoration which could be evaluated properly at the panoramic radiographs. The overhang was evaluated regarding arch (upper or lower), side (right or left), tooth location, and tooth type (anterior teeth, premolar teeth, molar teeth). The evaluated surface points of class II and III restorations were MO, DO, MOD, and also R.C.T with coronal overhang restoration.

1.4. Results: Overhanging restorations were observed in patients with previously restored teeth. In the radiological evaluation of 150 patients in the study group, a total of 317 overhanging restorations were detected. Of those, 51.7% were in molars, 30% were in premolars and 18.3% were in anterior. Of all the overhanging restorations, 61.8% were observed in the maxilla. Most overhanging restorations were observed in the mandibular molar teeth (26.5%) while the least was observed in the mandibular anterior teeth (2.2%) ($P = 0.000$). There are statistically significant differences between location and tooth type of overhanging restorations.

1.5. Conclusion: The prevalence of class II restoration overhang

is considered high among Yemeni patients. Overhangs observed on class II restorations are more than those observed on class III restorations. Class II restoration overhangs are more commonly observed on the molar as well as the DO surface.

2. Introduction

An overhanging dental restoration is a restoration that extends beyond the boundaries of the cavity preparation (Brunsvold & Lane, 1990). After the dental cavity has been cleaned and prepped, restoration material is inserted. The purpose of restoration is to restore occlusion, esthetic function, and mastication by replacing the dental tissue that has been lost due to the caries process or other causes, preventing caries from relapsing, maintaining approximate space and contact point, and preventing caries from spreading. Amalgam, composite, or cast metal are utilized as restorative materials for approximate cavities (Summitt et al., 2006). The most frequent causes of gingival irritation and periodontal damage are overhanging and improper dental restorations and prostheses (Khalid & Hamdan, 2008) (Rodriguez-Ferrer et al., 1980). A dental restoration should fix a tooth's form, function, and appearance to stop periodontal and carious infections from returning. According to studies, overhanging restorations that are bulky and uneven may encourage periodontal illnesses because they cause localized bacterial plaque buildup rather than mechanical irritancy. These iatrogenic variables and the etiology of local periodontal diseases are closely related, according to epidemiological and clinical experimental research (Tervonen & Ainamo, 1986) (Jansson et al., 1994).

Restorations frequently overhang in the interproximal spaces because of working in a very constrained area of the mouth and having trouble reaching certain teeth. Due to anatomical limitations that result in insufficient polishing in these areas, the polishing treatments are challenging to carry out. Patients are prevented from maintaining proper oral hygiene in interproximal areas by poorly polished and overhanging dental restorations, which increases plaque buildup and alters the flora (Lang et al., 1983). Overhanging margins create the perfect conditions for the buildup of plaque and alter the ecological balance of the gingival sulcus region, which increases the number of disease-associated organisms (Yasar et al., 2010). According to studies, teeth with overhangs have higher periodontal attachment loss and inflammation than teeth without overhangs (Mullejans et al., 2003). The breadth of the soft tissue separating the coronal portion of the tooth from the top of the alveolar bone is known as the biological width. According to research done by Gargiulo et al (Gargiulo et al., 1961). The alveolar

cortex in humans has an average connective tissue attachment of 1.07 mm and an epithelial attachment that is only 0.97 mm below the gingival base. The biological width is calculated as the sum of these two distances. Due to the breach of the biological width, inflammation mostly affects the gingiva (Broadbent et al., 2007). If overhanging restoration is not identified, clinical attachment loss leads to bone loss, which in turn causes a deep periodontal pocket or gingival recession clinically (Padbury Jr et al., 2003). Iatrogenic dental restorations overhanging as a result of insufficient medical expertise is the most frequent reason. Gingival overgrowth caused by big amalgam restorations may be influenced by creep (Chan & Chung, 2009). Even when a careful restoration is established, there are times when a little adjustment of the restoration may not be possible. Marginal modifications may be challenging because to variations and abnormalities in root anatomy (Matthews & Tabesh, 2004). The most frequent causes of unsatisfactory restorations with overhang include varied morphologies in the tooth's cervical aspect, such as furcation, fluting, and concavities. These morphologies make it challenging to install a wedge and matrix band and to perform marginal adaptation (Chan & Chung, 2009) (Chan & Chung, 2009). overhanging restorations on posterior teeth are difficult to detect. Comparing clinical assessment with bite-wing radiographs to clinical examination alone, overhanging fillings are more difficult to detect (Quadir et al., 2014). The purpose of this study was to determine the frequency and localization of the overhanging restorations by investigating the routinely taken radiographs and to specify the teeth, cavity shapes, localization, and root canal treatment presence were frequently encountered with overhanging restorations and whether there were significant relationships among these variables.

3. Materials and Methods

A retrospective cross-sectional observational study was conducted on 540 randomly selected panoramic images, ≥ 18 years male and female Yemeni patients referred to private radiology centers in (Al Waleed Digital X-Ray, Sana'a). The study group includes a total of 150 patients between 18-70 years of age who had at least one obvious overhanging restoration which could be evaluated properly at the panoramic radiographs. The overhang was evaluated regarding arch (upper or lower), side (right or left), tooth location, and tooth type (anterior teeth, premolar teeth, molar teeth). The evaluated surface points of class II and III restorations were MO, DO, MOD, and R.C.T with coronal overhang restoration.



Figure 1: Panoramic images of overhanging maxillary left second molar and mandibular right second molar



Figure 2: Panoramic images of the overhanging mandibular left second molar

4. Data Management and Analysis

All data was collected and then analyzed by SPSS software, version 19 manufactured by IBM, Chicago Illinois USA, corporation is used to perform the statistical analysis. A statistical value of <0.05 is deemed to be significant

5. Results

Overhanging restorations were observed of patients with previously restored teeth. In the radiological evaluation of 150 patients in the study group, a total of 317 overhanging restorations were detected. Of those, 51.7% were in molars, 30% were in premolars and 18.3% were in anterior. Most overhanging restorations were observed in the mandibular molar teeth (26.5%) while the least was observed in the mandibular anterior teeth (2.2%) (Table 1) ($P=0.000$).

This table compares the distribution of overhanging restorations across different tooth types (molars, premolars, anterior) and jaw locations (maxillary, mandibular). The data is presented as frequencies (N) and percentages (%) within each category. The p-value (0.000*) obtained from the chi-square test indicates a statistically significant association between location and tooth type for United Prime Publications LLC., <https://acmcasereport.org/>

overhanging restorations.

In detail, maxillary teeth have a higher prevalence of overhanging restorations compared to mandibular teeth across all tooth types. Molars have the highest prevalence of overhanging restorations in both jaws, followed by premolars and anterior teeth.

This table shows the distribution of cavity designs (MO, DO, MOD, Class IV) in overhanging restorations by tooth type (molars, premolars, anterior).

- MO (Mesio-occlusal) cavities are the most common design, found in 20.8% of molars, 7.6% of premolars, and 12.6% of anterior teeth.
- DO (Disto-occlusal) cavities are the second most common design, found in 22.1% of molars, 15.8% of premolars, and 4.1% of anterior teeth.
- MOD (Mesio-occlusal-distal) cavities are less common, found in 8.8% of molars and 6.6% of premolars.
- Class IV cavities are the least common design, found in only 1.6% of molars.

The p-value (0.000*) indicates a statistically significant difference

in the distribution of cavity designs across tooth types.

The original title “R.C. T. of overhanging restorations” is not clear because it does not specify the outcome variable being investigated. The corrected title “Relationship between Root Canal Treatment (RCT) and Coronal Overhang Restoration” clarifies that the table is looking at the relationship between the presence of a root canal treatment (RCT) and the presence of a coronal overhang restoration.

In addition, the P value in the table indicates that there is a statistically significant relationship between RCT and coronal overhang restoration ($p < 0.05$). This means that the proportion of teeth with

a coronal overhang restoration is different between the teeth that have had root canal treatment and those that have not.

The table shows the distribution of overhang restoration procedures by location (maxillary or mandibular).

- A total of 317 overhang restoration procedures were performed.
- Out of these, 61.8% (196 procedures) were performed on the maxillary bone, while 38.2% (121 procedures) were performed on the mandibular bone.

The p-value (0.000) indicates a statistically significant difference in the distribution of overhang restorations between the maxillary and mandibular locations.

Table 1: Comparison of Overhanging Restorations by Location and Tooth Type

Location	Tooth type			p-value
	Molars	Premolars	Anterior	
	N (%)	N (%)	N (%)	
Maxillary	80 (25.2%)	65 (20.5%)	51 (16.1%)	0.000*
Mandibular	84 (26.5%)	30 (9.5%)	7 (2.2%)	

Chi-square tests were used to compare the data. * $p < 0.05$ is statistically significant.

Table 2: Distribution of cavity designs in overhanging restorations by tooth type.

Cavity Designs	Tooth type			p-value
	Molars N (%)	Premolars N (%)	Anterior N (%)	
MO	66 (20.8%)	24 (7.6%)	40 (12.6%)	0.000*
DO	70 (22.1%)	50 (15.8%)	13 (4.1%)	
MOD	28 (8.8%)	21 (6.6%)	Class IV 5 (1.6%)	

MO: Mesio-occlusal, DO: Disto-occlusal, MOD: Mesio-occlusal-distal Chi-square tests were used to compare the data. * $p < 0.05$ is statistically significant.

Table 3: Relationship between Root Canal Treatment (RCT) and Coronal Overhang Restoration

R.C.T of overhang restoration	N	%	P value
R.C.T with coronal overhang restoration	131	41.30%	0.000*
R.C.T without coronal overhang restoration	186	58.70%	
Total	317	100%	

Chi-square tests were used to compare the data. * $p < 0.05$ is statistically significant.

Table 4: Distribution of Overhang Restoration by Location.

Location of overhang restoration	N	%	P value
Maxillary	196	61.80%	0.000*
Mandibular	121	38.20%	
Total	317	100%	

Chi-square tests were used to compare the data. * $p < 0.05$ is statistically significant.

6. Discussion

There have always been worries about replacing lost tooth structures from trauma, caries, abrasion, erosion, attrition, or multifactorial causes. Restorative techniques, whether direct or indirect, offer benefits and drawbacks (Parameswaran, 2013). There have been many challenges in each case to restore the ideal form and function related to proximal surface tooth architecture (Parameswaran, 2013). Restorations frequently overhang in the inter-

proximal spaces because of working in a very constrained area of the mouth and having trouble reaching certain teeth. Due to anatomical limitations that result in insufficient polishing in these areas, the polishing treatments are challenging to carry out. Patients are prevented from maintaining proper oral hygiene in interproximal areas by poorly polished and overhanging dental restorations, which increases plaque buildup and alters the flora (Lang et al., 1983).

Overhanging margins create the perfect conditions for the buildup of plaque and alter the ecological balance of the gingival sulcus region, which increases the number of disease-associated organisms (Yasar et al., 2010).

The fact that bitewing or periapical X-ray are more successful in the interface evaluation and diagnosis overhanging restoration, the present study has a limitation because of evaluation of existing panoramic radiographic in order not to expose patient to extra radiation. Besides only the panoramic radiographic were evaluated and oral examination were not done in this study to detect overhang restoration.

The panoramic x-ray is a simple and effective diagnostic tool for dentists. It is rapid, comfortable, and offers a low radiation dose for the patient to take. The dentist may see the patient's nasal cavity, sinuses, jaw joints, teeth, and surrounding bone on the panoramic x-ray. It can show bone abnormalities, cancers, and cysts, among other issues (Said et al., 2006).

6.1. Findings of the study

- Overhanging restorations were identified in a significant portion of the sample (150 out of 540 patients).
- The location of overhanging restorations was noted, including the arch (upper or lower), side (right or left), tooth location, and tooth type.
- The study highlights the potential of panoramic radiographs for identifying overhanging restorations, although they may not be as accurate as bitewing or periapical X-rays.

Overall, the study provides some interesting insights into the prevalence and location of overhanging dental restorations. However, the limitations of the study design mean that the findings should be interpreted with caution. Further research is needed to confirm the accuracy of panoramic radiographs for diagnosing overhanging restorations and to investigate the risk factors associated with their development.

6.2. Prevalence of Overhang Restorations

- The majority of panoramic X-rays (72.2%) showed no Class II or III restorations, suggesting a relatively low prevalence of potential overhangs.
- However, a significant portion (27.8%) did have overhang restorations, highlighting the need for further evaluation.

6.3. Characteristics of Overhang Restorations

- Tooth Type:** Molars were the most common location for overhang restorations (51.7%), followed by premolars (30%) and anterior teeth (18.3%). This may be due to the complex anatomy of molars with multiple cusps, making it challenging to achieve ideal margins during restoration procedures.

- Cavity Design:** Disto-occlusal cavities were the most frequent type associated with overhangs (42%), followed by mesio-occlusal (41%) and mesio-occluso distal (17%). This suggests a potential association between specific cavity designs and the risk of overhang formation.

- Location:** Overhang restorations were significantly more prevalent in the maxilla (61.8%) compared to the mandible (38.2%). The reason for this difference is unclear and requires further investigation.

- Side:** The upper jaw (left and right combined) had a higher frequency of overhangs compared to the lower jaw. This asymmetry might be related to the handedness of the dentist or patient positioning during restoration procedures.

- Root Canal Treatment (RCT):** Teeth without RCT had a higher prevalence of overhangs (58.7%) compared to those with RCT (41.3%). This could be because RCT procedures might necessitate more conservative restorations, reducing the risk of overhang formation.

- Comparison between Location and Tooth Type:** The analysis revealed a clear pattern:

- Most overhangs were found in maxillary molars (26.5%).
- The least were observed in mandibular anterior teeth (2.2%).

This reinforces the link between tooth type and location, with molars in the upper jaw being most susceptible to overhang formation. The study design was retrospective and cross-sectional, meaning it cannot establish cause-and-effect relationships.

7. Conclusion

In summary, restorations must be based on tooth anatomy and take into account factors like quality, proximal surface condition, shape, embrasures, and the level of the margins at the end, to make the perfect proximal restoration we should know the anatomy and morphology of tooth and use of matrix system with a wedge to make perfect restoration without overhangs restoration.

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