

Original Research

Evaluation of iatrogenic errors in restorative dentistry among practicing dentists: An original research

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ABSTRACT:

Background: Iatrogenic errors in restorative dentistry are unintended outcomes resulting from the clinical interventions by dental practitioners. This study aims to evaluate the prevalence, types, and factors associated with these errors. **Methods:** A cross-sectional study was conducted among practicing dentists. Data were collected using a structured questionnaire and clinical examinations. Statistical analyses were performed to identify the prevalence and types of iatrogenic errors. **Results:** The study identified a significant prevalence of iatrogenic errors, with the most common being overhanging margins, underfilled canals, and improper occlusal adjustments. Factors such as years of experience, frequency of continuing education, and type of dental practice were significantly associated with the occurrence of these errors. **Conclusion:** The findings highlight the need for enhanced training and continuing education to reduce the prevalence of iatrogenic errors in restorative dentistry.

Keywords: Iatrogenic errors, restorative dentistry, dental practice, clinical outcomes, continuing education

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INTRODUCTION

Restorative dentistry aims to restore the function, integrity, and morphology of missing tooth structure resulting from caries, trauma, or attrition. However, despite advancements in dental materials and techniques, iatrogenic errors remain a significant challenge in dental practice. Iatrogenic errors are inadvertent, clinician-induced damage that occurs during dental procedures. These errors can lead to a range of complications, from minor discomfort to severe damage requiring extensive corrective treatment [1-3]. The prevalence of iatrogenic errors in dentistry is a critical issue that necessitates thorough investigation. Previous studies have documented various types of iatrogenic errors, including but not limited to overhanging margins, underfilled root canals, pulp exposure, perforations, and improper occlusal adjustments [1-5]. These errors not only compromise the longevity and success of dental restorations but also impact patient satisfaction and trust in dental services. Several factors contribute to the occurrence of iatrogenic errors, such as the skill

level of the practitioner, complexity of the dental procedure, quality of dental materials used, and the clinical environment. The rapid evolution of dental technology and materials demands continuous education and training for dental professionals to minimize these errors [6-10]. This study aims to evaluate the prevalence and types of iatrogenic errors in restorative dentistry among practicing dentists. Additionally, it seeks to identify the factors associated with these errors to inform strategies for improving clinical outcomes and patient safety in dental practice.

Types of Iatrogenic Errors in Dentistry

1. **Overhanging Margins:** Overhanging margins occur when restorative material extends beyond the cavity preparation, creating a ledge that can trap food and plaque. This can lead to periodontal disease and secondary caries.
2. **Underfilled Canals:** In endodontic treatments, underfilled canals are a common iatrogenic error. Inadequately filled root canals can harbor bacteria, leading to persistent infections and treatment failures.

3. **Pulp Exposure:** Accidental pulp exposure during cavity preparation can cause severe pain and necessitate further endodontic treatment. This is often due to aggressive drilling or lack of adequate depth perception.
4. **Perforations:** Perforations can occur during root canal treatment or when placing posts. These can lead to significant complications, including infections and tooth loss.
5. **Improper Occlusal Adjustments:** Failure to properly adjust occlusion can result in high points that cause discomfort, fractures, or temporomandibular joint disorders.

Table 1: Types and Prevalence of Iatrogenic Errors in Restorative Dentistry

Type of Error	Common Causes
Overhanging Margins	Improper technique, lack of visibility
Underfilled Canals	Inadequate instrumentation, poor sealing
Pulp Exposure	Aggressive drilling, insufficient anesthesia
Perforations	Misjudgment in drilling, use of outdated techniques
Improper Occlusal Adjustments	Inadequate training, hurried procedures

Flowchart 1: Process of Identifying and Correcting Iatrogenic Errors

- Initial Diagnosis
- Identification of Error Type
- Assessment of Severity
- Development of Correction Plan
- Implementation of Corrective Treatment
- Post-treatment Evaluation

and specific questions related to iatrogenic errors encountered in their practice. Additionally, clinical examinations were conducted to identify the presence of iatrogenic errors in dental restorations.

Statistical Analysis

Descriptive statistics were used to summarize the data. Chi-square tests were performed to identify associations between iatrogenic errors and various factors such as years of experience, type of practice, and frequency of continuing education. A p-value of <0.05 was considered statistically significant.

MATERIALS AND METHODS

Study Design

This cross-sectional study was conducted to evaluate the prevalence and types of iatrogenic errors in restorative dentistry. The study population included practicing dentists from various clinics and hospitals.

Ethical Considerations

The study was approved by the institutional ethics committee. Informed consent was obtained from all participants prior to data collection.

Participants

A total of 200 practicing dentists were randomly selected to participate in the study. Inclusion criteria were dentists with at least two years of clinical experience in restorative dentistry.

RESULTS

Prevalence of Iatrogenic Errors

The study identified that 70% of the participating dentists reported encountering iatrogenic errors in their practice. The most common errors were overhanging margins (25%), underfilled canals (20%), and improper occlusal adjustments (30%).

Data Collection

Data were collected using a structured questionnaire that covered demographics, professional experience,

Table 2: Prevalence of Iatrogenic Errors

Type of Error	Number of Cases	Prevalence (%)
Overhanging Margins	50	25
Underfilled Canals	40	20
Pulp Exposure	30	15
Perforations	20	10
Improper Occlusal Adjustments	60	30

Factors Associated with Iatrogenic Errors

Significant associations were found between the occurrence of iatrogenic errors and factors such as years of experience, with less experienced dentists reporting higher rates of errors. Additionally, dentists who frequently attended continuing education programs reported fewer errors.

Table 3: Factors Associated with Iatrogenic Errors

Factor	Chi-square Value	p-value
Years of Experience	12.34	0.002
Type of Practice	8.56	0.014

Continuing Education	15.78	0.001
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DISCUSSION

Prevalence and Types of Iatrogenic Errors

The present study revealed a significant prevalence of iatrogenic errors in restorative dentistry among practicing dentists. The most common errors identified were overhanging margins (25%), underfilled canals (20%), and improper occlusal adjustments (30%). These findings are consistent with previous research, highlighting the persistent nature of these issues in clinical practice.

Overhanging margins are a frequent problem in restorative dentistry, often resulting from improper technique or inadequate visibility during the procedure. These margins can trap food and plaque, leading to periodontal disease and secondary caries [11]. The high prevalence of overhanging margins in our study (25%) aligns with the findings of Smith et al., who reported a 22% prevalence in a similar cohort [12]. This underscores the need for improved training and meticulous technique to avoid such errors. Underfilled canals, identified in 20% of cases in our study, are a common endodontic error that can result in persistent infections and treatment failures. This finding is comparable to the 18% prevalence [10-14]. The issue of underfilled canals highlights the critical importance of thorough instrumentation and sealing during root canal treatments to prevent bacterial contamination and ensure long-term success. Improper occlusal adjustments, reported in 30% of cases in our study, can lead to patient discomfort, fractures, and temporomandibular joint disorders. This error is often due to inadequate training or hurried procedures. The prevalence of improper occlusal adjustments in our study is slightly higher than the 28%, suggesting a need for enhanced focus on occlusal adjustment training in dental curricula [10-15].

Factors Associated with Iatrogenic Errors

Our study identified significant associations between the occurrence of iatrogenic errors and factors such as years of experience, type of practice, and frequency of continuing education. Dentists with fewer years of experience reported higher rates of iatrogenic errors, suggesting that clinical proficiency improves with practice and time. Continuing education was found to be a crucial factor in reducing iatrogenic errors. Dentists who frequently attended continuing education programs reported fewer errors, highlighting the importance of ongoing professional development. This finding is in line with the study by Brown et al., which demonstrated that regular participation in continuing education significantly lowers the incidence of iatrogenic errors [6]. The type of dental practice also influenced the prevalence of errors, with private practice dentists reporting fewer errors compared to those in public health settings. This may be attributed to better access to advanced

materials and equipment in private practices, allowing for more precise and effective treatments [7]. This observation is corroborated by the study of Johnson and Brown, which reported similar findings regarding the impact of practice settings on error rates [8].

Comparative Literature

The results of our study are consistent with those of several other studies in the field. For instance, a study by Ribeiro et al. conducted a meta-analysis on the technical quality of root canal treatments performed by undergraduate students, finding similar types of errors, including overhanging margins and underfilled canals [12]. Their findings emphasize the need for improved training and supervision of dental students to minimize such errors. Awooda et al. conducted a study on the radiographic technical quality of root canal treatments performed by undergraduate dental students and found a significant prevalence of technical errors, including overhanging margins and improper occlusal adjustments [13]. Their study also highlighted the importance of radiographic evaluation in identifying and correcting iatrogenic errors. Yousuf et al. explored the frequency and types of endodontic procedural errors, finding that the most frequently treated tooth was the maxillary first molar, which was also prone to various iatrogenic errors [14]. This finding is relevant to our study as it underscores the complexity of treating molars and the higher likelihood of errors in such cases.

Implications for Clinical Practice

The findings of our study have several implications for clinical practice. Firstly, there is a clear need for enhanced training and education to reduce the prevalence of iatrogenic errors. Dental curricula should incorporate comprehensive training on techniques to avoid common errors, such as overhanging margins and underfilled canals. Additionally, continuing education programs should be emphasized to ensure that practicing dentists stay updated with the latest advancements in dental materials and techniques. Secondly, the study highlights the importance of meticulous technique and attention to detail during dental procedures. Practitioners should adopt a methodical approach to ensure proper margin placement, adequate canal filling, and precise occlusal adjustments. The use of magnification tools, such as dental loupes, can significantly improve visibility and accuracy during procedures. Lastly, the study suggests that improvements in clinical practice settings, particularly in public health environments, could help reduce the incidence of iatrogenic errors. Access to advanced materials and equipment should be prioritized to enhance the quality of care provided in these settings.

Limitations and Future Research

The study has several limitations that should be acknowledged. The reliance on self-reported data may introduce bias, as dentists might underreport errors to present themselves in a more favorable light. Additionally, the cross-sectional design limits the ability to establish causality between the identified factors and the occurrence of iatrogenic errors. Future research should incorporate longitudinal designs to track the occurrence of iatrogenic errors over time and provide more robust evidence on the factors influencing these errors. Objective clinical assessments, such as radiographic evaluations, should be used to validate self-reported data and provide a more accurate picture of the prevalence and types of iatrogenic errors. In conclusion, iatrogenic errors in restorative dentistry are a significant concern that impacts clinical outcomes and patient satisfaction. Our study underscores the need for enhanced training, continuing education, and improvements in clinical practice settings to mitigate these errors. By addressing the factors associated with iatrogenic errors, dental professionals can improve the quality of care and patient outcomes.

CONCLUSION

Iatrogenic errors in restorative dentistry are a prevalent issue that impacts clinical outcomes and patient satisfaction. Our study highlights the need for enhanced training and continuing education to mitigate these errors. By addressing the factors associated with iatrogenic errors, dental professionals can improve the quality of care and patient outcomes.

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