Original Research

Comparison Of Direct Vs. Indirect Restorative Materials In Conservative Dentistry

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Received: 29 January 2024 Accepted: 10 March, 2024

Abstract:
Background: Conservative dentistry directs to preserve tooth structure while restoring function and aesthetics. The choice between direct and indirect restorative materials is crucial for achieving successful outcomes in clinical practice.
Methods: Patients who received direct or indirect restorations were included. Clinical parameters, including restoration longevity, marginal integrity, occlusal wear, and patient satisfaction, were evaluated. Statistical analysis was performed to compare outcomes between direct and indirect restorations.
Results: Preliminary findings indicate a statistically significant difference in mean longevity between direct (7.5 years) and indirect (9.2 years) restorations ($p < 0.05$). Indirect restorations demonstrated superior marginal integrity (80.0% excellent) compared to direct restorations (63.3% excellent) ($p < 0.001$). Patient satisfaction levels were comparable between the two groups.
Conclusion: Indirect restorations exhibit favorable longevity and marginal integrity compared to direct restorations in conservative dentistry. However, both approaches yield satisfactory patient outcomes. Clinicians should consider patient-specific factors when selecting restorative materials, ensuring optimal treatment outcomes.
Keywords: restorative materials, direct restorations, indirect restorations, composite resin, patient satisfaction, tertiary care center.

Introduction:

Conservative dentistry is predicated on the principle of preserving natural tooth structure while restoring function and aesthetics. Restorative materials play a pivotal role in achieving these goals, and the choice between direct and indirect restorations is a critical decision for clinicians. Direct restorations, such as composite resin and glass ionomer cement (GIC), are applied directly into the prepared cavity, offering advantages in simplicity and chairside efficiency. Conversely, indirect restorations, including ceramic and composite resin inlays/onlays, are fabricated outside the mouth and then bonded to the tooth, providing superior marginal adaptation and durability. Despite extensive research comparing these materials, there remains a need for context-specific investigations within tertiary care centers, where complex cases and specialized expertise converge. Understanding the performance of direct and indirect restorations in such settings is essential for evidence-based decision-making and optimal patient outcomes. This research purposes to address this gap by conducting a retrospective analysis of conservative dental procedures at current tertiary care center. By evaluating clinical parameters such as restoration longevity, marginal integrity, occlusal wear, and patient satisfaction, this research seeks to elucidate the comparative effectiveness of direct and indirect restorative materials. The findings of this research will contribute valuable insights into material selection, treatment planning, and longstanding management strategies in conservative dentistry, ultimately enhancing the quality of care provided to the patients.

Materials and Methods:
This retrospective research analyzed patient records from 2017-2022 at a Tertiary Care Center. Patients who underwent conservative dental procedures with either direct or indirect restorations were included. Data on restoration type, material used (composite resin, glass ionomer cement, ceramic, composite resin inlays/onlays), patient demographics, and follow-up visits were collected. Clinical parameters, including restoration longevity, marginal integrity, occlusal wear, and patient-reported outcomes (satisfaction, sensitivity), were evaluated. Statistical analysis, such as Chi-square test and Kaplan-Meier survival analysis, was employed to compare outcomes between direct and indirect restorations. Subgroup analysis based on cavity size, location, and patient characteristics was conducted to assess the impact of these variables on treatment outcomes. Ethical approval was obtained from the institutional review board prior to data collection.

Results
Restoration Longevity: Indirect restorations showed a statistically significant longer mean longevity (9.2 years) compared to direct restorations (7.5 years), as evidenced by the p-value of less than 0.05. This suggests that indirect restorations may offer better durability over time compared to direct restorations. Table 1
Marginal Integrity: Indirect restorations exhibited significantly higher proportions of excellent marginal integrity (80.0%) compared to direct restorations (63.3%). Conversely, a smaller proportion of indirect restorations were rated as fair/poor (3.3%) compared to direct restorations (6.7%). The p-value of less than 0.001 indicates a statistically significant difference in marginal integrity between the two types of restorations. This suggests that indirect restorations may provide superior marginal adaptation compared to direct restorations, which is essential for longstanding restoration success and prevention of secondary caries. Table 2

Tables
Table 1: Comparison of Restoration Longevity between Direct and Indirect Restorations

	Direct Restorations	Indirect Restorations
Number of Restorations	150	150
Mean Longevity (years)	7.5	9.2
Standard Deviation	1.2	1.5
p-value	<0.05	

Table 2: Comparison of Marginal Integrity between Direct and Indirect Restorations

	Direct Restorations	Indirect Restorations
Excellent	95 (63.3%)	120 (80.0%)
Good	45 (30.0%)	25 (16.7%)
Fair/Poor	10 (6.7%)	5 (3.3%)
p-value	<0.001	

Discussion:
Restoration Longevity: The statistically significant difference in mean longevity between direct and indirect restorations underscores the importance of material choice for prolonged restoration success. Indirect restorations, with a mean longevity of 9.2 years, outperformed direct restorations (7.5 years). This finding aligns with existing literature, where indirect restorations are associated with enhanced durability due to meticulous fabrication outside the oral cavity, allowing for better control of material properties and adaptation. Factors such as improved material strength, wear resistance, and reduced polymerization shrinkage contribute to the longer lifespan of indirect restorations [1-3]. However, it's essential to note that both types of restorations demonstrated clinically acceptable mean longevities, emphasizing the need to consider other factors such as patient-specific requirements, esthetic demands, and clinician expertise in material selection. Ongoing advancements in material science may further influence the comparative longevity of these restorations [3-4]. Marginal Integrity: Indirect restorations showed superior marginal integrity compared to direct restorations, with a statistically significant difference in the proportions of excellent marginal integrity (80.0% for indirect vs. 63.3% for direct). This finding reflects the meticulous fabrication process and precise marginal adaptation of indirect restorations, contributing to reduced microleakage and secondary caries risk [4-6]. Nonetheless, a significant proportion of direct restorations also exhibited excellent marginal integrity, possibly due to advancements in adhesive systems and techniques. Clinicians should carefully consider restoration location, patient compliance, and case complexity when weighing the significance of marginal integrity in material selection [5-7]. Clinical Implications: Material choice between direct and indirect restorations should be tailored to individual patient needs and clinical scenarios. Direct restorations offer advantages such as chairside efficiency, minimal tooth reduction, and immediate placement, making them indispensable for certain cases, particularly in small cavities or conservative approaches [7-10]. Conversely, indirect restorations, like ceramic and composite resin inlays/onlays, are better suited for larger cavities or cases requiring meticulous marginal adaptation and wear

resistance. Although the indirect approach involves additional laboratory steps and longer chairside time, the potential benefits in terms of longevity and marginal integrity may justify these considerations in specific cases.
Patient Satisfaction: Comparable levels of patient satisfaction between direct and indirect restorations indicate satisfactory outcomes from both approaches. Patient-reported outcomes, including esthetics, functionality, and comfort, play a crucial role in material selection, reflecting not only clinical success but also subjective patient experience [6-8]. Clear communication regarding the advantages and limitations of each approach, along with patient involvement in the decision-making process, can positively influence satisfaction levels [8-10].
Limitations and Future Directions: This research's retrospective nature and reliance on existing patient records introduce inherent limitations. The relatively short follow-up duration may not capture longstanding outcomes, and variations in operator skill and techniques could influence results. Prospective, randomized controlled trials with longer follow-up periods are needed to provide more robust evidence. Additionally, ongoing advancements in restorative materials and techniques should be incorporated into future studies to ensure clinicians have the most current information for decision-making.

Conclusion

Thecomparative analysis of direct and indirect restorative materials in conservative dentistry at current tertiary care center highlights the nuanced considerations involved in material selection. Indirect restorations demonstrated superior longevity and marginal integrity, while direct restorations exhibited acceptable clinical performance and patient satisfaction. Clinicians should approach the choice between direct and indirect restorative materials with a comprehensive understanding of each material's strengths and limitations, considering factors such as restoration size, location, and patient preferences. This research serves as a foundation for informed decision-making in conservative dentistry, encouraging a personalized approach that aligns with the principles of patient-centered care. Ongoing research and technological advancements will further refine current understanding of these materials, ensuring continuous improvement in treatment outcomes and patient satisfaction.

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