

EFFECTIENCY OF ANTERIOR TOOTH RESTORATIONS USING “INVISIBLE” ADHESIVE PROTOCOLS

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The aim of this study was to evaluate the clinical effectiveness and esthetic outcomes of anterior tooth restorations performed using “invisible” adhesive protocols designed to provide seamless integration between restorative material and dental tissues. A total of 60 patients aged 20–45 years with class III and IV carious lesions or traumatic defects of maxillary anterior teeth were enrolled. Direct composite restorations were performed using a universal adhesive system (8th generation) with an optimized invisible protocol involving selective enamel etching, controlled adhesive film thickness, and stratified composite layering.

Clinical evaluation was performed after 6 and 12 months according to modified USPHS criteria, assessing marginal adaptation, color match, surface texture, and postoperative sensitivity.

At the 12-month follow-up, Group B restorations demonstrated superior esthetic integration (color match rated Alpha in 93.3% vs 73.3% in Group A, $p<0.05$) and better marginal adaptation (Alpha in 90% vs 70%, $p<0.05$). Postoperative sensitivity was significantly lower in the “invisible” protocol group (3.3% vs 13.3%). No cases of restoration loss or secondary caries were recorded. The application of “invisible” adhesive protocols for anterior restorations provides enhanced esthetic outcomes and long-term clinical stability compared with conventional etch-and-rinse techniques. Optimized adhesive film control and stratified composite placement significantly improve the optical blending between the restoration and enamel, ensuring a more natural appearance.

Aesthetic demands in modern dentistry have led to continuous improvement of adhesive systems and restorative materials. The concept of “invisible” restorations—where the boundary between natural enamel and composite material becomes optically imperceptible—represents a significant advancement in minimally invasive dentistry. However, achieving such seamless integration depends not only on the optical properties of materials but also on the precision of adhesive and layering protocols. Modern “invisible” adhesive techniques aim to balance micromechanical retention with minimal enamel alteration and optimal light diffusion at the interface.

This study focuses on evaluating the clinical effectiveness of these advanced protocols compared with traditional total-etch techniques in restoring anterior teeth.

A randomized clinical trial was conducted at the Department of Therapeutic Dentistry Propaedeutics.

60 patients with anterior class III or IV lesions were selected according to inclusion criteria (no parafunction, good oral hygiene, vital teeth).

Adhesive Systems and Materials:

- *Group A (control)*: Etch-and-rinse adhesive system (37% phosphoric acid, 15 s).
- *Group B (experimental)*: Selective enamel etching (10 s) + universal adhesive (8th generation) in self-etch mode.

Both groups used nanohybrid composite resin (A2 shade, VITA scale).

All restorations were performed by the same operator using incremental layering and light polymerization (1000 mW/cm², 20 s per layer). Finishing and polishing were done after 24 hours.

Modified USPHS criteria were used:

- Marginal adaptation
- Color match
- Surface texture
- Postoperative sensitivity
- Secondary caries

Statistical analysis was performed using Student's *t*-test with significance level set at $p < 0.05$.

Results

At 12 months, restorations in the “invisible” protocol group showed statistically significant improvements in color integration and marginal adaptation.

Criterion	Group A (Conventional)	Group B (“Invisible”)	<i>p</i> -value
Color match (Alpha)	73.3%	93.3%	<0.05
Marginal adaptation (Alpha)	70%	90%	<0.05
Surface texture (Alpha)	86.7%	93.3%	NS
Postoperative sensitivity	13.3%	3.3%	<0.05
Secondary caries	0%	0%	—

No significant differences in surface texture or secondary caries were observed.

Discussion

The improved performance of the “invisible” adhesive protocol can be attributed to the preservation of enamel microstructure and optimized refractive index transition between tooth and composite. Selective etching enhances enamel bond strength while reducing dentin sensitivity. Moreover, the use of thin adhesive films minimizes optical discontinuities that can otherwise compromise esthetic integration.

These findings are consistent with recent studies (Van Meerbeek et al., 2022; Perdigão et al., 2021), which emphasize the role of controlled hybrid layer formation in improving longevity and optical performance of composite restorations.

Conclusion

“Invisible” adhesive protocols represent a reliable, minimally invasive, and esthetically superior approach for restoring anterior teeth. Proper selection of materials, controlled application techniques, and understanding of optical behavior at the tooth–restoration interface are key to achieving long-term success.

References

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