CASE SERIES

Direct aesthetic restoration of black triangles in anterior teeth with a bio clear matrix: case series

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Abstract

The black triangle, a V-shaped gap between anterior teeth, affects both dental aesthetics and self-esteem. It can negatively impact dental aesthetics and patients' self-esteem. This study presents a series of cases in which a novel Bioclear matrix system was used for the direct aesthetic restoration of black triangles in anterior teeth. Three patients were treated at Hefei Stomatological Hospital, China, in 2023. The procedure involved cleaning, etching, applying a bonding agent, using a bioclear matrix to inject the resin composite, and light curing. Twelve-month follow-ups revealed intact restorations with no significant issues. Using the bioclear matrix provides a non-invasive and predictable method for correcting black triangles.

Keywords: Bioclear matrix, black triangle, direct aesthetic restoration.

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Introduction

The black triangle, also known as the open gingival embrasure space, is characterized by a triangular-shaped gap that appears between the anterior teeth. It is a major aesthetic concern in dentistry, with reported prevalence rates ranging from 38% to 58%, depending on the underlying cause. Its etiology is multifactorial and includes periodontal disease, crown lengthening procedures and orthodontic treatment.[1] This condition negatively impacts dental aesthetics, pronunciation, patient self-esteem and smile satisfaction.[2] Recently, the market introduced a black triangle matrix system (Bioclear Matrix, 3 M ESPE) featuring significant improvements in design, curvature, and usability. This matrix is uniquely designed for self-stabilization and minimal sealing at the papillary level without wedges. This allows flowable resin-based composites to be injected directly into black triangles, eliminating any overhanging margins.[3]

We applied a bioclear matrix for anterior tooth aesthetic restoration in patients with black triangles. These patients were treated by the Department of Periodontology and Endodontic Dentistry, Hefei Stomatological Hospital, Anhui Medical University, China, in 2023. The treatment procedures were approved by the Ethics Committee of Hefei Stomatological Hospital.

Case series

Patient-1: A 52-year-old female patient developed a significant gap between her lower front teeth after periodontal treatment. She was referred to our hospital on April 7th. The clinical examination and radiographs revealed no significant abnormalities in the periapical areas of teeth 42, 41, 31, and 32. However, horizontal alveolar bone resorption was observed, extending to approximately one-third of the root length. Each black triangle was cleaned and etched with 37% phosphoric acid for 15 s, then rinsed, dried, and treated with a bonding agent (Universal Bond, 3 M ESPE) without light curing. A bioclear matrix was used, and a flowable resin composite (Z350 Flowable, 3 M ESPE) was injected and light-cured for 20 seconds. The labial and proximal surfaces were finished and polished meticulously.

Postoperative care instructions were provided, and follow-up appointments were scheduled. After Six months, the morphology and function of the restorations remained in good condition (Figure 1).

Patient 2: A 39-year-old female patient visited our hospital for a consultation on March 4th, seeking treatment for aesthetic problems of the anterior teeth following orthodontic therapy a decade ago. Clinical examination and X-ray imaging revealed no significant abnormalities in her teeth. The treatment options included minimally invasive porcelain veneers or direct resin restoration using a bioclear matrix. Considering the cost and potential risk of tooth damage associated with veneers, the patient opted for direct resin filling.

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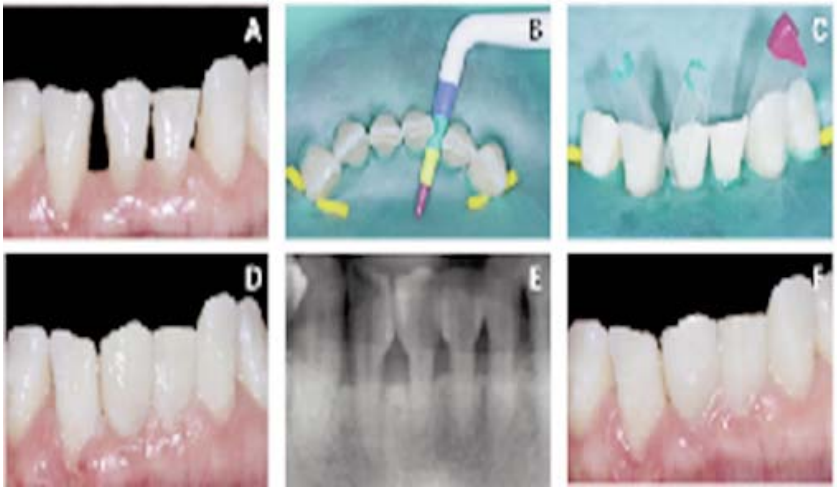

Figure-1: A: Preoperative photograph; B: Matrix indicator; C: Bioclear matrix series; D: Postoperative photograph; E: Postoperative radiograph; F: At six-month review.

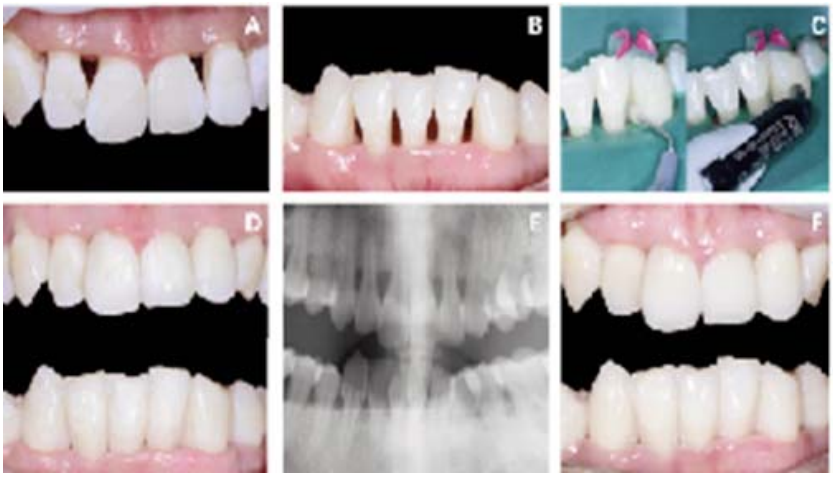

Figure-2: A&B: Preoperative photograph; C: Injected resin-based composite; D: Postoperative photograph; E: Postoperative radiograph; F: Twelve-month review.

Figure-3: A: Preoperative photograph; B: Mucogingival surgery with tunnel incision; C: After surgery; D: Bioclear matrix series; E: Postoperative radiograph; F: At twelve-month review.

A twelve-month follow-up examination revealed that the resin restoration maintained excellent appearance with good functionality. Microscopic assessment showed no signs of marginal microleakage, indicating the success of the treatment. Figure 2 (A-F) demonstrates the preoperative and postoperative outcomes, including the twelve-month review.

Patient 3: A 40-year-old female patient presented to our department on January 20th, complaining of Miller Class III gingival recession in the lower anterior teeth, which affected their aesthetics. Despite undergoing mucogingival surgery six months earlier, the loss of proximal attachment prevented full coverage of exposed root surfaces postoperatively.

To improve aesthetics, direct resin restoration was performed using a bioclear matrix to fill the black triangle areas. A 12-month follow-up confirmed no significant gingival recession, with the restoration remaining intact and functional. The margins blended seamlessly, achieving a desirable "pink-and-white" aesthetic and facilitating optimal oral health maintenance. Figure 3 (A-F) shows the preoperative and postoperative results.

Discussion

Black triangles can cause aesthetic and functional problems. In the above three cases, we used a novel bioclear matrix for direct resin restorations in the black triangle regions. This approach successfully closed gaps, guided gingival papilla morphology, and improved periodontal health. The twelve-month follow-up revealed intact restorations and stable tissues.

In recent years, various surgical and nonsurgical treatments have been developed to address gaps between anterior teeth, particularly black triangles.[1] Nonsurgical options include restorative therapy, orthodontic treatment and periodontal management.

Traditional celluloid matrix is widely used because of its minimally invasive nature. Compared with the traditional matrix, the bioclear system offers better operability and results.[4] Before application, precise measurements of the black triangle's dimensions and curvature are necessary for a customized fit with a bioclear matrix tailored to the patient's unique anterior tooth anatomy. This customization minimizes marginal microleakage, ensuring predictable and reliable restoration outcomes.[5] Using a bioclear system can also reduce the distance from the interproximal contact point to the alveolar ridge to less than 5 mm, promoting long-term periodontal health.[6] Additionally the smooth proximal surface reduces plaque buildup and staining, maintaining long-term aesthetics.[7] In our study, none of the three patients experienced restoration failure, marginal staining, food impaction, or speech issues during follow-up, leading to high patient satisfaction.

Traditional celluloid strips can be challenging to manipulate, requiring an optimal balance of tightness for successful outcomes. Interventional restorative and orthodontic treatments often require high levels of technical skill and can be expensive.[8] In contrast, the bioclear matrix uses its unique bottom curvature to gently fit into the gingival sulcus by approximately 1 mm, simplifying restoration with resin injection. This method reduces the chairside time and is more accessible for novice practitioners. After light curing, excess material can be easily removed without extensive finishing. The material is exceptionally smooth, eliminating the risk of burrs or overhangs, which promotes tissue health.[9] These benefits highlight the value of the bioclear matrix in modern dental practices.

However, within the realm of "white" and "pink" aesthetics, the bioclear system primarily focuses on "white aesthetics". Excessive use of white materials for black triangles can lead to abnormal crown heights. For patients with partial gingival recession or elongated teeth, achieving a normal crown height through mucogingival surgery or orthodontic intrusion is essential for optimal "pink aesthetics".[10]

Due to its excellent biomimetic shape, ease of use, superior aesthetics, and clinical effectiveness, the bioclear method provides a non-invasive, predictable, and efficient solution for black triangle correction. In the future, we aim to conduct more clinical research on bioclear materials and explore their combined use with multidisciplinary treatments for complex cases.

Written consent was obtained from all the patients for the publication of this case series.

Conclusion

These cases show that the bioclear matrix system effectively repairs black triangle gaps, achieving both aesthetic and functional restoration. This series highlights a novel, non-invasive, predictable, and user-friendly direct restoration method with positive clinical outcomes.

Disclaimer: None.

Conflict of Interest: None.

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AUTHOR'S CONTRIBUTION:
HZ: Writing and periodontal system treatment.
FZ: Cases design and treatment planning.
AW: Cases nursing.
HT: Data collection and organisation.
YC: Data collection and restorative treatment.
LZ: Restorative treatment, writing and scheme design.