ORIGINAL RESEARCH PAPER
Volume - 15 | Issue - 06 | June - 2026 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

MANAGEMENT OF PEG-SHAPED MAXILLARY LATERAL INCISORS USING MONOLITHIC ZIRCONIA CROWNS: A CASE REPORT

Prosthetic Dentistry

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ABSTRACT

Peg-shaped maxillary lateral incisors are developmental anomalies that may compromise smile esthetics and adversely affect patient confidence because of their reduced mesiodistal width and altered crown morphology. Increasing esthetic demands and recent advancements in restorative dentistry have encouraged the use of treatment approaches that provide predictable esthetic and functional outcomes. Interdisciplinary coordination between orthodontic and prosthodontic treatment plays an important role in achieving optimal space redistribution and harmonious anterior esthetics. The present case report describes the esthetic rehabilitation of bilateral peg-shaped maxillary lateral incisors using monolithic zirconia crowns following orthodontic space redistribution.

KEYWORDS

Peg-shaped Lateral, Esthetic Rehabilitation, Prosthodontic Rehabilitation, Monolithic Zirconia

INTRODUCTION

In modern restorative dentistry, patients' aesthetic expectations regarding their smiles have increased dramatically.[1] Achieving a well-proportioned smile is a key objective, heavily guided by modern principles of macro- and micro-aesthetics.[2,3] Because the maxillary central and lateral incisors dominate the anterior aesthetic zone, any structural, volumetric, or morphological deviation in this region is instantly noticeable to the patient and laypeople alike.[4,5] Peg-shaped lateral incisors are common developmental anomalies that can compromise smile esthetics and adversely affect patient confidence due to their reduced dimensions and tapered morphology.[6] This anomaly is a primary etiology for the development of a prominent midline central diastema and generalized spacing across the maxillary anterior segment.[7] Orthodontic treatment is frequently initiated to close these spaces. However, orthodontics alone cannot resolve the structural volume deficit. When fixed brackets are utilized to close the midline central gap, the biomechanical forces naturally shift, aggregate, and concentrate the remaining space directly onto the mesial and distal aspects of the peg-shaped lateral incisor.

To prevent an unnaturally wide or poorly proportioned final restoration, an interdisciplinary approach is vital. The orthodontist must achieve complete midline closure and maintain rigid structural stability while the prosthodontist shapes the microdontic tooth to correct anatomical ratios. Once the space is closed, full-coverage monolithic zirconia crowns offer an outstanding alternative to partial-coverage options. They provide superior flexural strength, high fracture toughness, exceptional masking capabilities, and clean emergence profiles with long-term structural predictability.[13,14]

CASE REPORT:

A 23-year-old female patient was referred to the Department of Prosthodontics crown and bridge following orthodontic correction for esthetic rehabilitation of the maxillary anterior region. Pre-orthodontic clinical examination had revealed generalized spacing in the maxillary anterior segment with the presence of midline diastema and peg-shaped lateral incisors (**Figure 1**). Orthodontic treatment had been carried out to achieve alignment and appropriate redistribution of the anterior spaces prior to definitive prosthodontic rehabilitation.

At the time of prosthodontic evaluation, orthodontic space redistribution had been successfully completed, and the patient exhibited bilateral peg-shaped maxillary lateral incisors with residual spaces strategically maintained for definitive esthetic rehabilitation (**Figure 2**). Close interdisciplinary coordination was maintained with the department of orthodontics throughout the treatment planning and execution. The passive stabilizing archwire helped maintain the redistributed space and prevent relapse or unintended space closure before definitive cementation.

Considering the patient's high esthetic expectations and the compromised morphology of the peg lateral incisor, a full-coverage monolithic zirconia crown was selected as the definitive restorative treatment. A comprehensive diagnostic wax-up was performed, followed by an intraoral mock-up to evaluate esthetics, contours, and functional integration before tooth preparation. Subsequently, conservative tooth preparation was carried out with maximum preservation of enamel structure. The definitive restoration was digitally designed and fabricated using advanced CAD/CAM technology and was finally cemented using an optimized adhesive resin bonding protocol.

CLINICAL STEPS

Step 1: Diagnostic impression

- A diagnostic impression were made using irreversible hydrocolloid impression material (alginate), and diagnostic casts were obtained.

Step 2: Diagnostic Wax-Up

- A diagnostic wax-up was performed to evaluate proposed tooth morphology and final outcome which satisfied the patient. (**Figure 3**)

Step 3: Mock-Up Transfer

- An intraoral mock-up was fabricated using a silicone putty index and bis-acryl provisional material to assess esthetics, phonetics, and patient acceptance prior to definitive prosthesis.

Step 4: Shade selection

- Shade selection was performed under natural lighting conditions prior to tooth preparation. (**Figure 4**)

Step 5: Tooth preparation

- Tooth preparation was performed to provide adequate space for the definitive restorations while maintaining optimal esthetics and functional harmony. (**Figure 5**)

Step 6: Final Impression

- After tooth preparation, definitive impressions were obtained using irreversible hydrocolloid impression material. (**Figure 6**)

Step 7: Temporization

- Provisional restorations were fabricated and cemented using non-eugenol temporary cement to maintain esthetics and function. (**Figure 7**)

- As the patient was under active orthodontic management, the orthodontic archwire assembly was retained throughout the provisional phase until cementation of the definitive monolithic zirconia restorations.

Step 8: Laboratory Procedures

- Monolithic zirconia prosthesis were fabricated using CAD-CAM technology.

Step 9: Try-In and Cementation

- Following clinical verification of fit, contour, and occlusion, the restorations were cemented using dual-cure resin cement.

- The intaglio surface of the zirconia crown was air-abraded and treated with MDP-containing primer. After tooth surface conditioning, the crown was seated under uniform pressure and cemented using dual-cure resin cement under proper isolation. Excess cement was removed, final curing was completed, and occlusion was evaluated. (**Figure 8**) The patient expressed high satisfaction with the final esthetic outcome and smile appearance (**Figure 9**).

Figure 1: Pre-orthodontic intraoral photographs

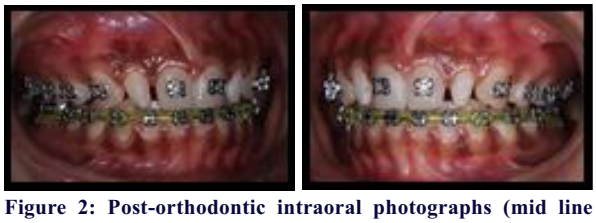

Figure 2: Post-orthodontic intraoral photographs (mid line diastema closure)

Figure 5: Tooth preparation

Figure 4: Shade selection

Figure 6: Final Impression

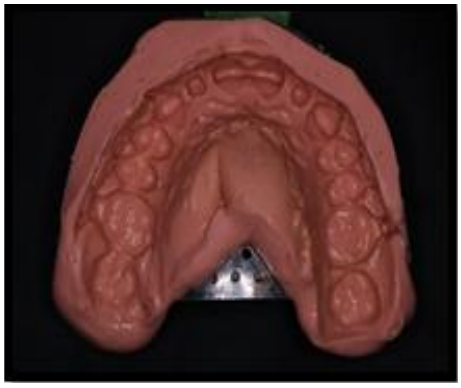

Figure 7: Temporization

Figure 8: Post-cementation intraoral photograph

Figure 9: Smile of Satisfaction

DISCUSSION

The management of peg-shaped maxillary lateral incisors requires

careful consideration of the patient's esthetic expectations, functional requirements, and the clinician's experience. Treatment selection depends on several factors including occlusion, space availability, tooth position, need for extractions, canine relationship, and the possibility of interdisciplinary coordination between orthodontic and restorative treatment modalities. Orthodontists can either attempt to close the spaces completely or open them to create an ideal space for a prosthetic replacement.

Closing the space completely by moving the maxillary canine mesially into the lateral incisor position is often highly discouraged. Canines are typically larger, more saturated in yellow chroma, and have a more prominent root prominence than lateral incisors. Moving them forward severely compromises the patient's smile arc and destroys functional "canine guidance" during lateral excursions, predisposing the patient to posterior occlusal interference.[5,9] Therefore, orthodontically maintaining or opening the space to allow for a anatomically correct prosthetic crown remains the gold-standard approach.

While direct hybrid composite resins provide an immediate, conservative treatment option following orthodontic debonding, they remain susceptible to marginal staining, microleakage, and lower resistance to long-term wear over extended periods when compared to dental ceramics.[8,11] Partial-coverage ceramic restorations, such as labial veneers, are excellent alternatives but their structural predictability depends almost entirely on an extensive enamel substrate for adhesive bonding.[12] If the orthodontically shifted tooth presents with any remaining axial discrepancies or specific insertion path conflicts, veneer preparations can require non-uniform, aggressive reduction on line angles, which compromises the enamel boundary.[14]

By selecting a full-coverage crown designed through advanced CAD/CAM software, the clinician can correct the clinical profile while achieving optimal esthetic and functional outcomes.[14,15] Monolithic zirconia represents an ideal material selection for this approach; its excellent mechanical properties allow for adequate material thickness to while providing superior masking capabilities and a smooth emergence profile.[10,13]

CONCLUSIONS

The full-coverage CAD/CAM zirconia crown following orthodontic space optimization is a highly reliable, predictable, and esthetically superior solution for managing peg-shaped lateral incisors. Its selection should be determined by taking into consideration interdisciplinary space management, occlusal clearance, and aesthetic demands.

REFERENCES:

[1] R. Kallala, M. H. Chaouch, K. Nasr, and T. Courset, "Step-by-Step Esthetic Rehabilitation with Chairside System," Case Reports in Dentistry, vol. 2011, Article ID 5558158, 2011.

[2] K. Rehman, F. R. Khan, and M. Rahman, "Assessing the perception of smile attractiveness in young adults," Journal of the Pakistan Dental Association, vol. 4, pp. 206-210, 2011.

[3] C. Sriphadungporn and N. Chamnannidiadha, "Perception of smile esthetics by laypeople of different ages," Progress in Orthodontics, vol. 18, no. 1, p. 8, 2017.

[4] A. W. Machado, "10 commandments of smile esthetics," Dental Press Journal of Orthodontics, vol. 19, no. 4, pp. 136-157, 2014.

[5] D. M. Sarver, "The importance of incisor positioning in the esthetic smile: the smile arc," American Journal of Orthodontics and Dentofacial Orthopedics, vol. 120, no. 2, pp. 98-111, 2001.

[6] N. Mittal and A. Mohandas, "Management of peg-shaped lateral with new minimal invasive restorative technique-componeer: a case report," Journal of Dental Advance, vol. 10, no. 1, pp. 53-55, 2018.

[7] L. Saatwika, B. Anuradha, V. Prakash, B. Anuradha, and A. Subbiya, "Esthetic correction of Anteriors: a case report," European Journal of Molecular & Clinical Medicine, vol. 10, no. 11, p. 2826, 2019.

[8] P. Migne and U. C. Belser, "Porcelain versus composite inlays/onlays: effects of mechanical loads on stress distribution, adhesion and crown flexure," The International Journal of Periodontics & Restorative Dentistry, vol. 23, pp. 543-555, 2003.

[9] T. Nakamura, A. Imanishi, H. Kashima, T. Ohyama, and S. Ishigaki, "Stress analysis of metal-free polymer crowns using the three-dimensional finite element method," The International Journal of Prosthodontics, vol. 14, p. 401, 2001.

[10] H. J. Conrad, W. J. Seong, and I. J. Pesun, "Current ceramic materials and systems with clinical recommendations: a systematic review," The Journal of Prosthetic Dentistry, vol. 98, no. 5, pp. 389-404, 2007.

[11] C. Novelli, M. Pascadopoli, and A. Scribante, "Restorative treatment of amelogenesis imperfecta with prefabricated composite veneers," Case Reports in Dentistry, vol. 2021, Article ID 3192882, 11 pages, 2021.

[12] S. Y. Chai, V. Bennani, J. M. Aarts, and K. Lyons, "Incisal preparation design for ceramic veneers: a critical review," The Journal of the American Dental Association, vol. 149, no. 1, pp. 25-37, 2018.

[13] R. Kallala, M. Salhi Daly, Y. Gassara et al., "Rationalizing indication of ceramic veneers: a systematic review," EAS Journal of Dentistry and Oral Medicine, vol. 3, no. 2, pp. 51-58, 2021.

[14] A. Farias-Neto, F. C. D. de Medeiros, L. Vilanova, M. Simonetti Chaves, F. Batista, and J. J. de Araújo, "Tooth preparation for ceramic veneers: when less is more," International Journal of Esthetic Dentistry, vol. 14, no. 2, pp. 156-164, 2019.

[15] M. B. Golberg, S. C. Siegel, and N. Rezakani, "Unique CAD/CAM three-quarter crown restoration of a central incisor: a case report," General Dentistry, pp. 36-40, 2013.