Advancing Patient-Centered Dentistry: A Case Study Of Digital Smile Design In Managing Midline Diastema

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Abstract:

Introduction: Digital Smile Design (DSD) has emerged as an integral tool in modern esthetic dentistry, offering a patient-centered, digitally guided approach to treatment planning. By integrating facial analysis, intraoral scanning, and computer-aided design, DSD enhances precision and predictability, especially in cases requiring esthetic rehabilitation.

Case Description: A 28-year-old female presented with a long-standing midline diastema between her maxillary central incisors. Clinical evaluation confirmed a 3 mm spacing between teeth 11 and 21, with normal vitality and no signs of tenderness or pathology. A high labial frenum was identified as a contributing factor.

Methods: Following a laser-assisted frenectomy, high-resolution facial photographs and intraoral digital scans were obtained and processed using Exocad software. A virtual diagnostic wax-up was created, simulating ideal tooth morphology and alignment. After patient approval of the digital mock-up, conservative tooth preparation was performed. Updated scans were used to finalize the veneer designs, which were subsequently fabricated using a CAD/CAM-based 3D printing protocol.

Treatment and Results: Custom ceramic veneers were cemented onto the prepared teeth under adhesive protocol. The restoration achieved complete closure of the diastema with optimal esthetic integration. Post-treatment evaluation showed improved smile harmony, excellent marginal adaptation, and high patient satisfaction.

Discussion: The use of DSD and CAD/CAM technology allowed for accurate visualization, precise planning, and patient engagement throughout the treatment. Compared to conventional techniques, this digital workflow minimized invasive procedures and maximized esthetic outcomes. Addressing the etiological factor via frenectomy further supported the long-term stability of the result.

Conclusion: This case highlights the effectiveness of DSD and CAD/CAM-fabricated veneers in managing midline diastema. A digitally guided, minimally invasive approach resulted in a highly esthetic and predictable outcome, underscoring the value of digital workflows in dentistry.

Keywords:

Digital Smile Design, CAD/CAM, Exocad, Veneers, Midline Diastema, 3D Printing, Esthetic Dentistry, Frenectomy, Intraoral Scanning, Minimally Invasive Dentistry.