



DIGITAL SMILE DESIGN-GUIDED INTERDISCIPLINARY REHABILITATION OF THE MAXILLARY ANTERIOR ESTHETIC ZONE: A CASE REPORT

Prosthodontics

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ABSTRACT

Esthetic rehabilitation of the maxillary anterior region is demanding when spacing, missing anterior teeth, discoloration, gingival asymmetry, and a high smile line occur together. This case report describes the interdisciplinary management of a 26-year-old female patient who reported dissatisfaction with gaps and the appearance of her upper front teeth after previous orthodontic treatment. Clinical examination revealed anterior diastemas, missing maxillary lateral incisors, discolored central incisors, malaligned anterior teeth, gingival asymmetry, and a high smile line. Treatment was planned using Digital Smile Design, which allowed facially guided visualization of the proposed result before definitive procedures. Endodontic management of the devitalized central incisors, gingival recontouring, diagnostic mock-up, mock-up-guided tooth preparation, intraoral scanning, provisional evaluation, and definitive IPS e.max ceramic restorations were completed in a staged manner. The diagnostic mock-up helped evaluate esthetics, phonetics, lip support, and patient acceptance before irreversible procedures. The final restorations improved tooth proportion, gingival harmony, incisal display, phonetics, and patient confidence. This case highlights the value of combining digital planning with endodontic, periodontal soft-tissue, and prosthodontic procedures for predictable anterior esthetic rehabilitation.

KEYWORDS

Digital Smile Design, Esthetic Rehabilitation, Ips E.max, Interdisciplinary Prosthodontics

INTRODUCTION

The maxillary anterior region is one of the most demanding areas in restorative dentistry because minor discrepancies in tooth proportion, gingival level, incisal edge position, shade, and axial inclination are readily visible. These factors become more critical in patients with a high smile line, where both teeth and gingival margins are displayed during smiling. Successful treatment therefore requires coordinated planning of pink esthetics, white esthetics, function, phonetics, and patient expectations.

Digital Smile Design (DSD) is a facially guided planning method that uses photographs, videos, intraoral scans, and digital design software to evaluate the proposed restorative outcome in relation to facial and dentolabial references. It improves communication between the clinician, patient, and laboratory and allows the proposed treatment to be tested through a diagnostic mock-up before definitive procedures are carried out [1,2]. This case report describes DSD-guided interdisciplinary rehabilitation of a young female patient with anterior spacing, missing lateral incisors, discolored central incisors, gingival asymmetry, and high esthetic demands.

CASE REPORT

A 26-year-old female patient reported with the chief complaint of dissatisfaction with gaps and the appearance of her upper front teeth. She stated that she was conscious of her smile during photographs and conversations and wanted her teeth to look natural and esthetic.

The patient had previously undergone fixed orthodontic treatment for excessive proclination and spacing in the maxillary anterior arch. Treatment had continued for approximately two years, after which spacing was partially corrected and space for fixed prosthetic rehabilitation was created. However, treatment was discontinued after symptoms suggestive of devitalization appeared in the maxillary anterior teeth.

Extraoral examination revealed a high smile line with adequate lip mobility and complete incisal display during smiling. Intraoral examination showed a diastema between 11 and 21, spacing in the regions of 12 and 22, missing maxillary lateral incisors, discoloration of the maxillary central incisors, malalignment of anterior teeth, and gingival asymmetry. The high smile line made the gingival margin position and tooth proportions especially important in treatment

planning. The pre-treatment records and digital diagnostic planning are shown in Figure 1.

The treatment objectives were to restore smile esthetics, preserve function and phonetics, improve gingival harmony, restore natural tooth proportions, and enhance the patient's confidence. An interdisciplinary plan was formulated involving endodontic management, periodontal soft-tissue correction, digital esthetic planning, and definitive prosthodontic rehabilitation.

TREATMENT PROCEDURE

Digital records were obtained using extraoral smile photographs, intraoral photographs, full-face smile analysis, and intraoral scans. Digital Smile Design was performed using facial and dental reference lines, including the facial midline, dental midline, incisal curve, smile arc, and proposed gingival zenith positions. The virtual design was used to plan the final tooth form, gingival outline, and restorative contours.

Endodontic consultation was obtained for the discolored and devitalized maxillary central incisors. Endodontic treatment was completed where indicated before definitive prosthetic rehabilitation. Gingival recontouring was planned to improve the symmetry of the gingival margins and establish a more balanced gingival frame. No hard-tissue periodontal surgery was performed.

A 3D-printed diagnostic mock-up was fabricated from the approved digital design and transferred intraorally. The mock-up was evaluated for tooth display, incisal edge position, phonetics, lip support, smile arc, and patient acceptance. This step helped the patient visualize the expected outcome and allowed the clinician to verify the design before definitive tooth preparation.

Tooth preparation was performed with the mock-up as a guide. Depth orientation grooves were prepared according to the required ceramic thickness, and conservative reduction was attempted wherever enamel support could be preserved. Radial shoulder finish lines were prepared. Gingival retraction was carried out using a dual-cord technique to allow proper margin exposure during scanning.

An intraoral scan was made using a Medit i700 scanner. Shade selection was performed using a VITA shade guide supported by digital photographic documentation. Provisional restorations were

fabricated from the DSD-approved design and evaluated for esthetics, phonetics, occlusal harmony, and patient comfort.

The definitive restorations were fabricated using IPS e.max lithium disilicate ceramic. CAD/CAM design followed the approved tooth forms. Incisal translucency, surface texture, and final characterization were customized to achieve a natural appearance. At the try-in appointment, marginal fit, shade match, proximal contacts, occlusion, and incisal display were verified. The restorations were cemented using adhesive resin cement, followed by finishing, polishing, and final photographic documentation.

The final outcome showed improved anterior tooth proportion, gingival harmony, translucency, incisal guidance, phonetics, and overall smile confidence. The patient reported improved comfort while smiling and interacting socially. The clinical workflow and post-treatment outcome are shown in Figure 2.

DISCUSSION

Anterior esthetic rehabilitation requires careful integration of facial, dentolabial, gingival, dental, and functional parameters. In this case, the main challenge was not a single esthetic defect but the combined presence of missing lateral incisors, residual anterior spacing, discolored central incisors, malalignment, gingival asymmetry, and a high smile line. Treating these problems without digital visualization and mock-up verification could have increased the risk of an artificial or disharmonious final result.

Digital Smile Design was useful because it allowed the restorative plan to be developed from the patient's face rather than from isolated tooth morphology. The diagnostic mock-up served as a reversible clinical trial. It allowed the patient and clinician to assess the proposed tooth length, width, incisal edge position, lip support, phonetics, and smile harmony before definitive treatment. This reduced uncertainty and improved patient communication.

The periodontal soft-tissue phase was limited to gingival recontouring. This procedure was performed only to refine the soft-tissue outline, harmonize the gingival zeniths, and improve gingival margin symmetry in a patient with visible gingival display. The wording was kept specific to the procedure performed because no hard-tissue periodontal surgery was carried out [3].

Endodontic management of the devitalized central incisors allowed preservation of natural tooth structure and created a stable foundation for definitive restorations. Mock-up-guided preparation helped control ceramic space and avoid unnecessary tooth reduction. IPS e.max lithium disilicate was selected because of its favorable esthetics, translucency, and suitability for anterior ceramic restorations when adhesive protocols are followed [4,5]. The use of provisional restorations provided an intermediate phase to evaluate the digital plan under clinical conditions before definitive cementation.

The limitation of this report is that it presents a single case and does not include long-term follow-up. The outcome was assessed clinically and subjectively rather than with a validated esthetic or oral-health-related quality-of-life score. Longer follow-up is needed to evaluate gingival stability, marginal integrity, ceramic performance, and patient satisfaction over time.

CONCLUSION

A DSD-guided interdisciplinary approach provided a predictable method for managing a complex anterior esthetic case involving missing lateral incisors, spacing, discolored central incisors, gingival asymmetry, and high smile line. The combination of digital planning, diagnostic mock-up, endodontic treatment, gingival recontouring, conservative preparation, provisional evaluation, and IPS e.max ceramic restorations resulted in an esthetic and functional outcome acceptable to the patient. The case emphasizes that successful anterior rehabilitation depends on coordinated planning rather than restorative material alone.

FIGURE LEGENDS

Figure 1: Pre-treatment assessment and digital planning. (a) Pre-treatment smile during fixed orthodontic therapy; (b) frontal extraoral smile view at presentation; (c,d) lateral extraoral profile views; (e) preoperative intraoral frontal view showing anterior spacing, missing lateral incisors, discolored central incisors, and gingival asymmetry; (f) maxillary occlusal view; (g,h) right and left lateral intraoral views;

(i) Digital Smile Design planning using facial and dental reference lines.

Figure 2: Treatment workflow and post-treatment result. (a) preoperative radiographic/endodontic assessment; (b) gingival recontouring of the maxillary anterior region; (c) prepared maxillary anterior segment before definitive restoration; (d,e) digital smile design and scan-based restorative planning; (f) definitive IPS e.max ceramic restorations; (g) restorations evaluated on the cast; (h) intraoral post-cementation frontal view; (i-m) postoperative extraoral smile and profile photographs showing improved tooth proportion, gingival harmony, and smile confidence.

DECLARATIONS

Patient consent: Written informed consent was obtained from the patient for treatment and for academic use of de-identified clinical photographs and case details.

Conflict of interest: The authors declare no conflict of interest.
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FIGURES FOR SUBMISSION

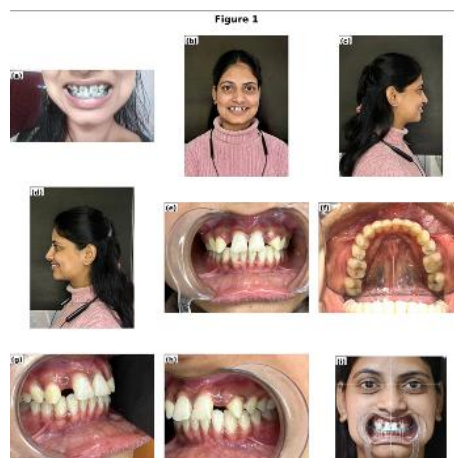


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