

The aesthetic management of a midline diastema with direct composite using digital smile design, putty index and button shade technique: A case report

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ABSTRACT

Background: A diastema is the distance or space between two or more adjacent teeth. This abnormality can interfere with the aesthetics of a patient, and 97% of diastemas occur in the maxilla. Various treatments can be performed for diastema closure in patients, one of which is composite resin restoration. **Purpose:** To explain the aesthetic procedure for diastema closure. **Case:** A 20-year-old female patient presented with complaints of the distance between her anterior teeth (Class I Angle occlusion with normal overjet and overbite). The labial frenum associated with the diastema was normal in size and position. The patient was not amenable to invasive procedures. **Case Management:** Management of midline diastema closure using the direct composite technique with DSD, the putty index method and button shade technique. **Conclusion:** The closure of a midline diastema with direct composite using DSD, the putty index method and button shade technique provides aesthetic results with less cost and time due to the absence of laboratory procedures.

Keywords: anterior teeth; diastema closure; direct composite

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INTRODUCTION

A diastema is the distance or space between two or more adjacent teeth. The midline diastema is the distance or space between the first incisors of the maxilla or mandible.¹ The presence of a midline diastema can be of special concern to patients, particularly with regard to aesthetics. One study found that 97% of maxillary midline diastemas was more common than mandibular. The aesthetic appearance of the teeth is part of the overall profile that is closely related to facial aesthetics because facial symmetry and midline coordination are important criteria for achieving facial alignment and balance.^{2,3}

The aetiology of a diastema is considered to be multifactorial and include various factors of influence, such as the labial frenulum, microdontia, mesiodens, post lateral incisors, agenesis and cysts in the midline area. In addition, a midline diastema can be caused by habits such as thumb sucking, tongue thrusting, and/or lip sucking, dental

malformations, genetics, proclination in the maxillary incisor, jaw discrepancy and an imperfect fusion of the interdental septum. These spacings can cause an unaesthetic smile, phonetic disorders and hindrance in maintaining oral hygiene.⁴⁻⁶

Various alternative treatment plans are available for a diastema closure, such as orthodontic appliances, restorative techniques, prosthodontic treatment or combination of procedures; among which include the use of conservative and more practical direct composite resin restorations.⁷ Determining the appropriate treatment techniques and materials for patients are also based on time constraints and any physical, psychological and economic problems. In the case of a diastema closure, the composite resin makes it easier for dentists to control the patient's natural smile.⁸

The latest aesthetic resin composite materials have physical and mechanical properties similar to natural teeth, i.e. similar in terms of tooth colour and structure with a compressive strength similar to enamel and dentine.

Composite resins include a range of colours and opacities specifically designed for coating techniques.^{9,10} The use of index putty is an innovation in dentistry to restore the anterior teeth using resin composites. The index putty technique is used for a midline diastema closure because it can correct the anatomical contour of the tooth, thereby reducing the need for further adjustments and saving time in the restoration process.¹¹ The colour of the composite resin is selected using the button shade technique, which involves selecting a slightly different colour on the facial surface of the tooth to be restored.¹²⁻¹⁴ This case report presents the aesthetic management of a midline diastema using the direct composite technique along with digital smile design (DSD), the putty index method and button shade technique.

CASE

A 20-year-old female patient presented to the Department of Conservative Dentistry, Universitas Airlangga Dental and Oral Hospital with the chief complaint of anterior teeth spacing, categorised as an Angle's Class I occlusion with normal overjet and overbite. The labial frenum associated with the diastema was normal in size and position. Various treatment modalities were discussed with the patient. The patient was not willing to undergo any invasive procedure. Therefore, a minimally invasive approach using a direct composite resin restoration was chosen to restore the diastema. A treatment plan was explained to the patient, including the selection materials and treatment procedure.

CASE MANAGEMENT

On the first visit, a subjective examination was acquired from the patient's history. The patient complained of the distance between her anterior teeth and no complaints of pain, swelling or interfering with eating and speaking activities. Subsequently, an objective examination identified a gap between teeth 11 and 21, no change in tooth colour, and negative results of both a percussion test and bite test (Figure 1). The posterior occlusion was in a cusp to fossa state, while the anterior occlusion was characterised as an overbite and overjet of 1 mm; thus, the classification of the malocclusion in this case was Class I Angle. In this case, no radiographic examination was performed, and pulp was determined to be normal.

Furthermore, vitality tests were performed on teeth 11 and 21. Upon electric pulp testing (EPT) for tooth 11, both the control tooth and test tooth reacted to number 3, which indicated that tooth 11 was vital. Upon EPT for tooth 21, both the control tooth and test tooth reacted to number 3, which indicated that tooth 21 was vital. The saliva examination showed a satisfactory result; i.e. hydration within 12 seconds, watery viscosity, a pH of 7.8, quantity >5 ml/minutes, and a buffer capacity of 13. After several examinations, the dentist made a DSD, a diagnostic wax-up, and silicone guides (Figure 2).

On the second visit, a rubber dam was placed on teeth 11 21 to isolate the work area. Then, shade taking was performed using the button shade technique (Figure 3A). The composite resin was placed slightly (like a button) on the facial surface of the tooth, whereby the dentin colour was placed in the cervical area and the enamel colour was



Figure 1. Clinical smile of the patient showed a central diastema (A and B).



Figure 2. Digital smile design (A), diagnostic wax-up and silicon guide (B).

placed in the incisal area¹⁴. The next step involved tooth surface preparation using a Sof-Lex disc (Coarse, 3M, USA; see Figure 3B). After preparation, etching was applied for 15 seconds, and bonding was then applied via light-curing for 20 seconds (Figure 3C). Next, a palatal shell with an OA1 composite (Palfique LX5, Tokuyama, Japan; see Figure 3D) was constructed. Then, metal matrix bands (GC New Metal Strips, GC Corporation, Tokyo, Japan) were installed on the interproximal teeth 11 and 21 (Figure 3E). Finally, the A1 colour composite (Palfique LX5, Tokuyama, Japan) was applied to the dentin and enamel. After all stages were completed, the composite resin was finished and polished using a fine finishing bur (Komet Dental, Gebr. Brasseler, Germany), a disc (Coarse, 3M, USA) and polishing system (Diacomp Plus, EVE America Inc., Naples, FL, USA; see Figure 3F).

On the third visit, the patient returned to the Department of Conservative Dentistry, Universitas Airlangga Dental and Oral Hospital without any complaints or extraoral abnormalities. Upon intraoral examination, the gingiva was normal, the composite was still satisfactory (and did not change colour) and the vitality of teeth 11 and 21 were normal. Figure 4 show the images on teeth 11 and 21 after central diastema closure using digital smile design, putty index and button shade technique.

DISCUSSION

One of the advantages of using a direct composite resin is that it can be done in one visit, as they often do not require a pre-model or wax-up and also do not require

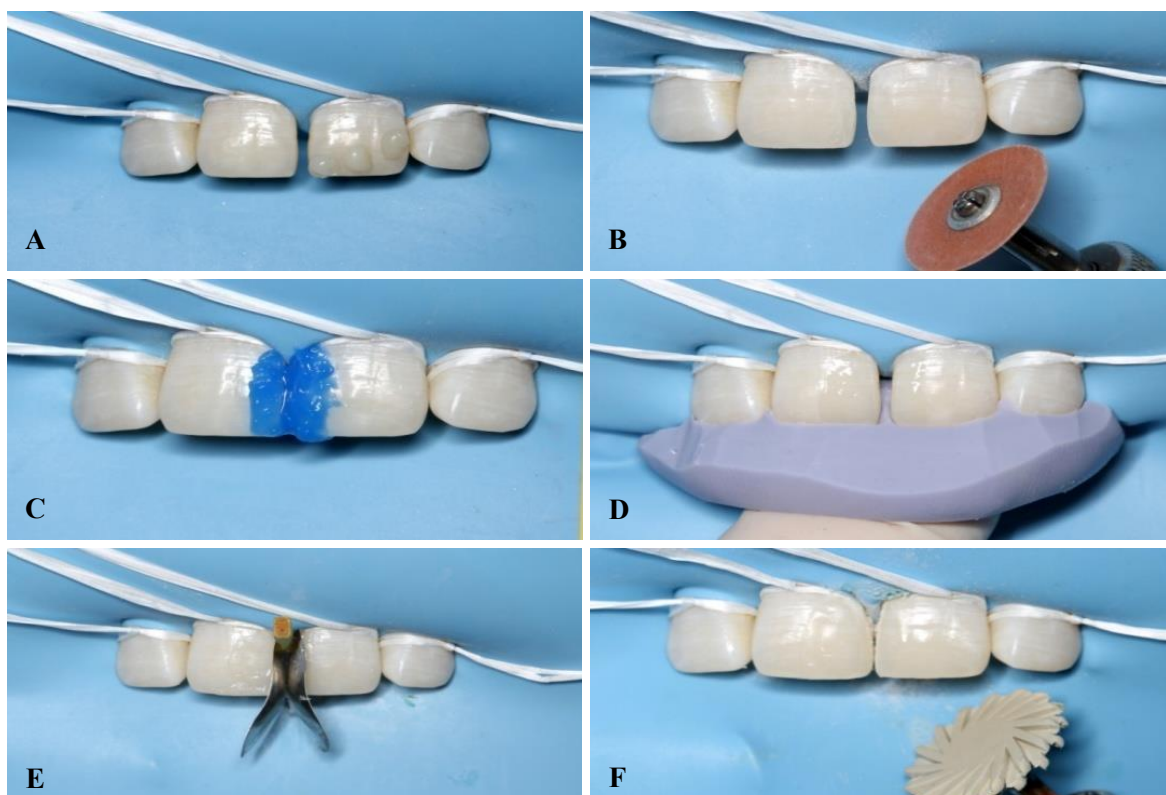


Figure 3. Serial clinical treatment procedure begin with shade taking using the button shade technique (A), minimal preparation of the teeth (B), etch & bond (C), palatal shell with silicone index (D), matrix interdental placement & direct composite manipulation (E) and finishing & polishing (F).

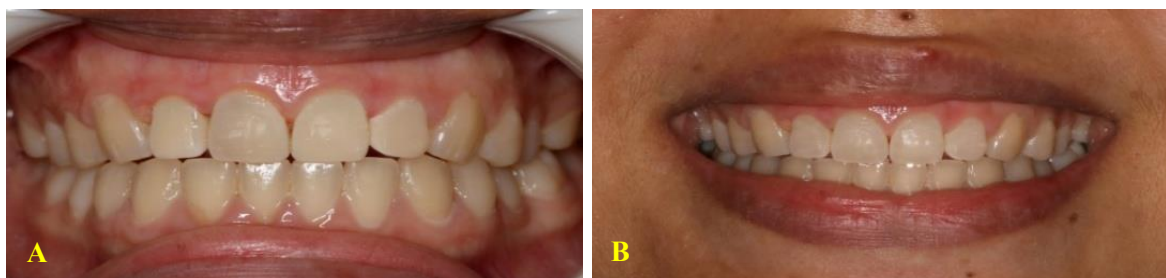


Figure 4. Clinical smile of the patient showed a central diastema closure after the treatment (A and B).

expensive laboratory costs. In aesthetic dental treatment, this restoration has many advantages over other treatments such as ceramic veneers and orthodontic treatments: they are more compatible with antagonistic teeth than ceramic materials, and if there is a fracture, it will be easier to repair because it does not require additional time and cost.^{15–17} However, composite resins also have several disadvantages, including shrinkage during polymerisation, a low wear resistance, poor long-term durability, post-operative sensitivity and (in clinical use) direct composite resins have the potential to become secondary caries and fracture.^{18,19}

Digital smile design is a digital aesthetic planning tool in dentistry that is used to evaluate the aesthetic relationship between the teeth, gingiva, smile and face. The use of DSD tools provides a new perspective for diagnosis and treatment planning and facilitates communication between dentists, technicians and patients. Using DSD design tools makes it easier to create and project a new smile design to get a pre-visualisation of the final treatment plan result.^{20,21}

According to several studies, the putty index method can reduce shrinkage due to the dimensional stabilisation of the mould that results from polymerisation. The putty setting material and contraction of the wash impression material results in minimal dimensional changes. The putty material in the one-step putty/wash technique also tends to push the wash impression material away from the prepared tooth and from important areas such as the finish line, which can be obscured by the putty material and thus cannot record detail satisfactorily.^{22–24} The disadvantage of the putty index method is that some of the wash impression material can spread occlusally when the putty impression material is placed back or when the wash material is introduced. This can cause distortion that reduces dimensional accuracy.²⁵

A diastema of the anterior teeth can interfere with aesthetics and reduce the patient's self-confidence.²⁶ Closure of the diastema using a composite resin is the main treatment plan offered, but in the case of large spaces between the teeth, simple closure may not provide a natural and pleasant solution for the patient. Direct composite restoration is the simplest of all procedures for diastema closure.²⁷ Closure of a wide midline diastema uses an index putty because it can form a detailed palatal contour specific to the shape, size and inclination that has been made previously.¹¹ Metal matrix bands were chosen in this case because they can provide a detailed contour area on the proximal teeth specific to the anatomical requirement not found on a transparent matrix.²⁸

Dentists and patients have complete control over the formation of a natural smile. Digital smile design can make it easier for dentists to visualise a patient's smile to form a treatment plan and provide knowledge about the procedure to patients.²⁹ However, sometimes an interdisciplinary approach is needed to achieve better aesthetic results. The control treatment results were evaluated on the third visit, in which the patient returned after 1 month for an evaluation of the results of the direct resin restoration.³⁰

The control results showed no abnormalities on extraoral and intraoral examination. Restoration using the direct composite looked good and there was no discolouration; the colour around the gingival teeth was normal, the vitality of teeth 11 and 21 were normal. In this case, the diastema closure was successfully performed using the direct restorative technique and the patient was very satisfied with the results. In conclusion, closure of a diastema using the direct composite technique provides good aesthetic results with less cost and time due to the absence of laboratory procedures. A clinical evaluation at a 1-month follow-up showed a good restoration condition and no discoloration. The patient was satisfied with the results.

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