Midline diastema closure with direct-bonding restorations

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Midline diastemata (MD) are spaces of varying magnitude between the crowns of fully erupted maxillary and mandibular central incisors. Keene describes MD as anterior midline spacing greater than 0.5 mm between the proximal surfaces of adjacent teeth. Incidences of maxillary and mandibular MD are 14.8 and 1.6%, respectively. MD can occur in temporary, mixed or permanent dentition and may be considered normal for many children during the eruption of the permanent maxillary central incisors. When incisors first erupt, they may be separated by bone and the crowns incline distally because of the crowding of the roots. With the eruption of the laterals and permanent canines, the MD reduces or even closes completely.

Etiological factors
The etiological factors of MD are described by various researchers. Angle concludes the presence of an abnormal frenum to be the cause of MD/a view that has been supported by other researchers. According to Tait, the frenum is the effect and not the cause of the incidence of diastemata. He reports causes such asankylosed central incisors, flared or rotated central incisors, anodontia, macroglossia, dento-alveolar disproportion, localized spacing, closed bite, facial type, ethnic and genetic characteristics, inter- and intra-alveolar suture and midline pathology. Weber lists the causes for spacing between maxillary incisors as the result of high frenum attachment, macroodontia, macroglossia, supernumerary teeth, peg laterals, missing lateral incisors, cleft palate, habits such as thumb sucking, mouth breathing and tongue thrusting.

Therefore, the etiological factors can be summarised as follows:
1. developmental: microdontia, missing laterals, mesiodens, macroglossia, macro hypertrophic fibrous frenum;
2. pathological: midline cysts, tu- mours and periodontitis;
3. neuromuscular: oral habits, such as tongue thrusting during speech, swallowing or abnormal pressure during rest.

Clinicians must be prepared for patients visiting the dental office with the aim of having their diastema closed in order to fulfill their psychological (aesthetic and beauty enhancement), functional (pronunciation of ‘f’ and ‘s’ sounds and cutting foods with anterior teeth) and/or health (oral health maintenance) problems.

Treatment options for diastema closure Treatment modalities depend on the etiological factors and complexity of the MD. It is suggested that treatment of a MD should be delayed until the eruption of the permanent canines. However, the pathological causes should be ruled out and treated at an early stage, for example extraction of supernumerary teeth (mesiodens) and surgical treatment for the removal of midline cyst, tumour and periodontal pathologies. Surgical, orthodontic (comprehensive/short term), periodontal, direct bonding and indirect restorations are the treatment modalities that can be used alone or in combination to achieve harmony in terms of a patient’s aesthetics, function and health.

MICD by definition is “a holistic approach that explores the smile defects and aesthetic desires of a patient at an early stage and treats them using the least intervention options in diagnosis, treatment and maintenance technology by considering the psychology, health, function and aesthetics of the patient.” The MICD concept as the professional movement that encourages all clinicians to select diagnosis, treatment and maintenance modalities that are the least invasive in order to preserve healthy oral tissues while still achieving the natural aesthetics outcome in the best interests of the patient’s health and happiness.

Following, I will demonstrate the clinical use of MICD TP (minimally invasive cosmetic dentistry treatment protocol) to close or reduce the diastema in clinical practice (Fig. 1). The direct-bonding procedure with the application of the Flowable Frame Technique (FFT) is presented here as a special technique.

Case presentation
A 20 year-old female patient presented with the complaint that she did not like her smile because of the large gap between her upper front teeth. The patient was very concerned about her smile aesthetics and also aware of her speech difficulties.

Phase 1: Understand
In the first step of Phase I, the patient’s perception, lifestyle, personality, and desires were explored in a personal interview and through completion of the MICD self smile-evaluation form. The patient, who exhibited a high dental IQ, evaluated her smile as below satisfactory.

After the interview, the disease, force element and aesthetic defects of her smile were explored.
Phase II: Achieve

In the first step, the patient’s health, function and a healthy lifestyle were established. The patient's smile was graded as Grade B. The established parameters of her oral health and function were within normal limits, the aesthetic parameters were below the accepted level and enhancement treatment was to improve her aesthetic parameters further. Hence, in this case, it was not necessary to undertake the appropriate treatment (like orthodontic, periodontal, occlusal adjustments, etc.) before proceeding to the aesthetic enhancement step. According to MiCD TP the desire of the patient in this case was need-based or naturo-mimetic smile enhancement.

Direct-bonding restoration

The direct-bonding restoration technique represents the preferred therapeutic option in MiCD. It preserves maximum tooth structure and helps to restore function and aesthetics in only a single visit. In addition, the technique is economical and the possible need for further indirect restoration can be postponed. Direct-bonding restorations demand excellent clinical skills. The clinician is required to incorporate various clinical techniques, tips and tricks. Following, I would like to demonstrate a simple technique that I have applied since 2005 in various clinical scenarios and find helpful for the upgrade of clinicians’ restorative skills.

The Flowable Composite Technique

The FFT is a simple restorative technique developed to speed up the placement and simplified refinement of material when restoring challenging anterior aesthetic cases such as large Class IV or Class III defects and diastema closure or reduction. As the name suggests, this technique requires flowable composite to make the resin frame, a plastic strip, composite brush and other usual instruments for direct resin restorations.

Clinical steps in the Flowable Composite Technique

The following steps are to be taken:

Step 1: After the completion of etching, priming and bonding of the tooth surfaces, insert a simple plastic strip to the level of gingival attachment of the tooth to be restored (Fig. 2).

Step 2: Support the plastic matrix strip lingually with your index finger to create a lingual contour (Fig. 3).

Step 3: Inject the flowable composite on the proximal region and smooth it to a thin layer with a finishing instrument or a composite brush if necessary (Fig. 4).

Step 4: Light-cure the flowable composite and remove the plastic strip. A flowable frame is now ready (Figs. 5,6).

Step 5: Shape and thickness of the flowable frame can be adjusted using the sharp edge of the hand instrument or a diamond point if required.

The advantages of the FFT are:

- time and cost saving (no direct or indirect mockup required);
- thickness of the layer of restora-
tion (dentine, enamel and opaque group) can be predetermined;
- as with the silicone template method, an opaque halo, ma-
nuscript, and transparent areas in the proximal and incisal areas can be created;
- smooth, papillary surface is achieved with minimal finishing;
- smooth adaptation of the restora-
tions can be achieved even in the gingival sulcus;
- it is the most suitable lingual frame creation technique for di-
astema reduction or closure.

Material selection and clinical steps for diastema closure

Material selection for diastema closure should be guided by optical properties (light transmis-
sion and diffusion characteristics) and tissue responses of the materials (restoration in dias-
tema closure normally touches the gingival tissue and sulcus). Amongst the various materials available, gions are amongst the latest shade A1 and enamel shade. They have also been found to be effective in possess anti-plaque formation properties. Hence, gioner direct-restorative materials and adhesive systems were selected to close the MD in this case.

Beautifil Flow Shade #A
t with gioner adhesive system FLoBond II (SHOFU Inc.) and Super-Nap Rainbow Technique (both SHOFU Inc.) were used in FFT to create the lingual frame. Beautifil II (SHOFU Inc.) dentine shade A1 and enamel shade were used to restore the defects using the bi-layered shading technique to achieve the desired aesthetics with an invisible restoration. The Direct Cosmetic Restoration Kit and the Super-Snap Rainbow Technique Kit (both SHOFU Inc.) were used to prepare the teeth and polish the final restorations (Figs. 7–22).

Conclusion

Diastema closure or reduction in clinical practice requires detailed case analysis. The suc-
cess of the treatment depends on etiological factors, size and extent of the diastema, and the patient’s affordability in terms of time and costs involved. The MiCD TP guides the clinician and the pa-

tient and helps both to understand, plan and complete the clinical case using diagnosis and treatment modalities that are the least invasive in order to preserve sound tooth structure and achieve natural aesthetics considering the patient's best interest.

Editorial note:

A complete list of references and the MiCD forms are available from the publisher.

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