

DIRECT BONDING IN DIASTEMA CLOSURE HIGH DRAMA, IMMEDIATE RESOLUTION: A CASE REPORT

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ABSTRACT:

Introduction: One of the main problems in esthetic dentistry is closing diastema between teeth with a direct technique without creating the black triangle (gingival embrasure lacking papilla). Black triangle will ruin the patients' smile and is not desirable. Composite resin used to close diastema should have adequate convexity from gingivo-incisal direction to avoid this problem. Various techniques have been introduced to close diastema, some of which are time-consuming or cannot provide proper contour.

Case detail: This article describes a case in which diastema between two teeth was closed with direct composite resin with minimum amount of time. Although closing diastema with direct composite depends on operator skill in most part, this technique is probably less dependent on operator skill compared to other techniques.

Conclusion: Closing diastema between anterior teeth with composite resin with direct technique is conservative and timesaving, and the presented technique which provides adequate contour can be carried out very easily by many dental practitioners

Key words: Diastema, Anterior teeth, Direct composite.

INTRODUCTION:

Anterior diastema may compromise the harmony of a patient's smile. Among the suggested options for diastema closure such as orthodontics, restorative dentistry, and prosthodontics, it is appreciable that restorative approach is the simplest, fastest, most predictable, and lowest solution. ^[1] But, handling composite freehand requires skillful practice and it may be considered as a

disadvantage to some operators. Also, one of the difficulties encountered is closing diastema without creating "black triangles" ^[2]. It is especially difficult with wide gingival embrasure and thick gingival biotype. To prevent the formation of a black triangle between the teeth when closing diastema, it requires careful considerations in the gingival architecture based on the concepts of cervical contouring and location of the contact point.

A number of studies were conducted to investigate the factors that influence the presence of the interdental papilla [3,4]. It has long been known that the distance from the contact point (CP) to the alveolar bone crest (BC) is a significant determinant in whether a papilla will fill the interdental space.

Tarnow et al. reported that interdental papilla were often present when the CP-BC distance was 5 mm [5,6]. In order to determine the appropriate location of the contact point, a non-invasive method to measure the distance between the bone crest and the gingival crest was accomplished. Also, the traditional technique using Mylar strip was modified to increase the emergence profile with natural contours at the gingival-tooth interface. This paper is to describe a case report in which the diastema closure was accomplished using direct adhesive restorations and gingival tissue recontouring technique.

Helvey enumerated the various causes of diastema which are as follows [4]:

1. Transient malocclusion: Diastema occurs due to incipient malocclusion, which is usually a selfcorrecting one. Parents worry about the anterior spacing of their child around the age of 9 or 10, this is called 'Ugly duckling stage' which occurs due to eruption process of canine, and once the canine erupts spaces will close in most of the cases.
2. Discrepancy in the tooth size and arch length: Diastema occurs when the arch length exceeds the total mesiodistal width

of all teeth, when there is missing teeth and there is drifting of the adjacent teeth in the missing tooth space.

3. High frenum attachment: A thick and fleshy labial frenum attached high on the labial alveolar bone will resist the approximation of the two incisors resulting in midline diastema.

4. Habits: Chronic pressure habits like thumb sucking and tongue thrusting will predispose to midline diastema, which results in generalized anterior spacing with proclination of maxillary anteriors.

5. Pathology: Any kind of soft tissue or bone pathology in the jaw like cysts, tumors, osteoclastoma and unerupted mesiodens may result in diastema

6. Iatrogenic: Rapid maxillary expansion is one of the most frequent orthodontic treatments which will result in diastema.

7. Racial and genetic: Some races like Negroids have bigger jaw bone resulting in diastema. Midline diastema is also seen associated with genetic inheritance.

CASE DETAIL:

A 21 years female was referred to Center For Dentistry&Aesthetics,Jatt,Israe,I with chief complaint of spacing in upper anterior teeth. Diastema was observed in upper anterior teeth & preoperative photograph was taken. It was emphasized that all treatment considerations (including no treatment) were studied before restoring immediately to composite augmentation. Line drawings, photographs, computer imaging, models

with spaces filled & or direct temporary additions of wax & composite uncured material on the natural unetched teeth were done as preliminary procedures. No relevant medical history was found. (Fig1,2,3)

The correction of a diastema between teeth is described. After the teeth were cleaned and the shade selected, the proximal surfaces were observed starting with midline. We assumed that incisors were of equal size, symmetrical additions can be ensured by using half of the total measurement of the diastema. Cotton rolls. All restorations began below the gingival crest to appear natural and to be confluent with tooth contours.

The retraction cord (Ultradent # "00") was inserted for One The correction of a diastema between teeth is described. After the teeth were cleaned and the shade selected, the proximal surfaces were observed starting with midline. We assumed that incisors were of equal size, symmetrical additions can be ensured by using half of the total measurement of the diastema. Cotton rolls, instead of rubber dam were recommended for isolation because of importance of relating the contour of the restoration directly to the proximal surfaces. All restorations began below the gingival crest to appear natural and to be confluent with tooth contours.

The retraction cord (Ultradent # "00") was inserted for one tooth at a time to prevent seepage from the crevice. To enhance retention of composite, a flat end tapering fissure diamond bur was used to roughen the proximal surfaces

extending from the facial line angle to lingual line angle. More extension was needed to correct facial & lingual contours, depending on the anatomy & position of individual tooth. A gel etchant (37% phosphoric acid; Ivoclar Vivadent, Schann, Liechtenstein) was then applied with a syringe to prepared surface, approximately 0.5 mm beyond the cavo-surface margins onto unprepared tooth.

The acid was rinsed & air dried to achieve a frosty matt appearance. A 2x2 inch gauze was draped across the mouth & tongue to prevent inadvertent contamination of the etched preparations by the patient. In our case wedge could not be used. The celluloid strip (Mylar matrix strip) was held on the lingual aspect of tooth to be restored with index finger while facial end was reflected for access. After the bonding agent (Excite, Dimethacrylate, alcohol, phosphoric acid acrylate, HEMA, SiO₂, initiators, stabilizers, Batch#63821, Ivoclar 2Vivadent, Schaan, Liechtenstein) application & light curing for 20 seconds Nanofill composite material was inserted with Teflon coated hand instrument (Dentsply) to ensure confluence with the lingual surface. The matrix (Mylar matrix strip) was then gently closed facially beginning with the gingival aspect. Care was taken not to pull the strip too tightly, to prevent under contouring of restoration. light curing system was used. (Fig4,5,6)

The curing of material was done from labial & lingual sides for minimum of 20 seconds for a total 40 seconds. It was initially over contoured in order to

facilitate finishing to an ideal contour. After completion of polymerization the celluloid strip was removed. Contouring & finishing were achieved with appropriate flame shaped carbide finishing burs or abrasive finishing strips & discs by shofu (Shofu dental corporation, Sanmarcosca, USA). Final polishing was differed until completion of the contra lateral restoration. Overhangs must not be present. Removal of the gingival retraction cord facilitated inspection & smoothing of gingival area. If there is no fraying of floss it verifies that the gingival margin is correct & smooth. It was important for first restoration to establish correct mesiodistal dimension before starting second restoration. After etching, rinsing, drying & bonding application the next teeth were restored & similarly all teeth were restored one by one (Fig7,8,9,10,11,12). A tight proximal contour was achieved by displacing the second tooth in distal direction with holding matrix with thumb & index finger. Contouring was given by carbide bur & finishing cups (Astropol, Ivoclar, Vivadent). Again unwaxed floss was used to detect any excess material or overhang.

A silicon carbide brush can also be used . The final polish is accomplished with a soft goat-hair brush and fluffy cloth wheel mop with diamond finishing paste. (Fig13,14,15)

DISCUSSION:

Diastemas due to missing teeth or hypodontia may be orthodontically closed and/or reconstructed with fixed dentures [4] , removable dentures or implants. [1,3,6]

Dental osseointegrated implants have been considered successful worldwide and all longitudinal studies corroborate this fact. One of the main advantages of implants is the rehabilitation of the edentulous space with maintenance of the height and width of the alveolar bone⁹; however, cost has been their major drawback. [1,7]

As the industry evolved and developed new materials, there was an increase in the flexural strength of these materials, which allowed the indication of fiber-reinforced ceramics or resins for these restorations. Other cases may be treated by directly bonded restorative procedures after redistribution of the available space.

Diastemas due to discrepancies in the shape and size of teeth have a very favorable prognosis for restorative and prosthetic treatment³. However, clinical planning should thoroughly investigate the patient's characteristics to achieve a good prognosis, such as his/her occlusion, length of edentulous space, occlusal height of abutment teeth, and presence of parafunctional habits.

Problems of multiple anterior diastemas may be solved by teamwork, when more than one discipline comes together to complement and improve the outcome that could be reached by each specialty by itself. Coinciding dental and facial midline, especially in the maxillary arch, is esthetically essential for the restoration of a pleasant smile. The key to success is the correct positioning of the teeth to be restored. The present case did not present midline deviation, so tooth positioning

could be corrected in a simple and fast manner by placement of orthodontic elastics for better space distribution, which contributed to a better outcome of the restorative treatment.

De Araujo et al [6] inserted a needle into the gingival tissue until reaching the bone crest. A rubber stop was used to indicate the penetration depth of the needle in the tissue. But, this method is needed to anesthetize, and is painful. The method using a soft temporary radiopaque restorative material and periapical radiographs is non-invasive and more useful.

Lee et al. [10] validated a method of measuring the length of the interdental papilla non-invasively, using radiopaque material and a periapical radiograph.

They used a 5 mm metal ball attached to the teeth for reference material. Martegani et al. [8] used a self-made resin device carrying the 5 mm radiographic metal piece. In this case, the actual length of study model was used to verify magnification. Study model was also used for a correct diagnosis and treatment planning.

The narrowed Mylar strip and cotton pellet were useful for controlling emergence and gingival contour. The narrowed Mylar strip was easy to access of resin instrument and improved visibility. A small cotton pellet reduced capacity to relapse into original gingival shape and provided some additional working time for composite placement.

Therefore, this modified approach is acceptable for the clinical situation.

Frazier-Bowers and Maxbauer listed various treatment options for diastema closure which are as follows [11]:

1. Keep the diastema
2. Diastema closure with direct composite resin
3. Orthodontic treatment to move the teeth and close the diastema
4. Use porcelain veneers to close the diastema
5. Crown and bridge to close the diastema, which is usually done in adults
6. Make the patient aware of the habit and plan for habit breaking appliance
7. Remove the underlying pathology surgically, and then continue with closure of diastema with restorative material

Schwartz et al explained the Biomimetic Rules to create natural appearing diastema closure [12,13,14]. According to the author, anatomically, the cusp of an anterior tooth is governed by the rule of three; which states that each cusp is composed of three developmental lobes mesial, distal and central; and each lobe possesses character that defines itself and its control over its anatomic position.

First the space in between the teeth is measured, then that measurement is divided into half. The quotient is added to the existing width of each tooth which gives the new tooth width. This new width

is divided into thirds, mesial lobe will occupy one third, and central and distal lobe will occupy the remaining two thirds. Author also stated that the width of the maxillary incisors are two millimeters less than their length, the contact of the anterior teeth is in lingual half of buccolingual dimension and the most apical aspect of anterior contacts should be between three to five millimeters to the interdental crestal bone to avoid black triangles and impingement of the biologic width.^[12,13]

In cases which involve closure of complex diastema, Determining the proper proportions dictates the amount of distal proximal reduction; whether to completely veneer the teeth or add to the interproximal zone; the number of teeth to be treated; and the position of prominences and concavities¹⁰. Special attention must be made if there are any occlusal concerns like bruxing or deep bite as direct restorations may not be successful⁹. To close the complex diastema indirect techniques are used, they generally require multiple visits to enable proper placement of the laminates, crowns, or bridgework, and such procedures may also involve significant financial expenses^[10,15].

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With the recent improvements in shade stability and bond strength, diastemas may be closed simply by direct placement of restorative material, with the advantages of reversibility, reduced cost and short treatment duration^[12].

In many instances, the socioeconomic status of the patient leads the dental professional to search for alternative options for solving aesthetic problems without changing the function.^[16]

CONCLUSION:

The closure of diastemas in the anterior zone to improve the patient's smile has been presented with direct composite resin bonding. A layered approach that mimics the polychromaticity of teeth allows us to build natural restorations. These restorations are practically invisible and blend harmoniously with the natural dentition. Correct hue, value, chroma, translucencies and opalescence provided with modern resin materials like Venus (Heraeus Kulzer) allow us to copy nature's beauty. The development of form, function and aesthetics with direct resin can be achieved with proper and meticulous technique to provide the patient with a natural looking smile with minimal economic and biologic cost (Figures 18-23).

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FIGURES:



Fig1: Straight on



Fig2: Left view



Fig3: Right view



Fig4: Mesial 1/3 of #8 lightly roughened with a coarse diamond. Greater Curve in place. Matrix is subgingival and exposing subgingival enamel



Fig5: The unfilled resin wets the surface and allows the flowable to knife edge against the matrix and tooth. The COMPOSITE is pushed into the unfilled resin flowable mixture. All composite cured at one time.



Fig6: Composite after band removed. I desire to have excess compsite to shape. Gives me ample composite to shape so 1) I can control the emergence contour, (2) get the midline parrallel to the long axis of the face, and 3) adjust so 8&9 will have the same width



Fig7: #8 completed



Fig8: Before I bond #9 I quickly place unbonded composite on the mesial of #9 to see if I have the width and midline correct. Takes seconds to do. This way you know it will look right



Fig9: Greater Curve around #9 and marked the contact point with an explorer.



Fig10: Contact cut away with a small football finishing carbide.



Fig11: Matrix placed. Teflon tape placed. (Teflon tape optional. I place it when I can do it quickly.) Sequence of composite placement the same



Fig12: For tooth #10 the space was too large for the Greater Curve to traverse. To get the matrix to warp further, a slot was cut at the distal, and the retainer was rotated into the tooth. Rotating the matrix makes the mesial portion of the band flare more toward the distal of #9.



Fig13: Straight on view after Diastema Closure. (I rounded the mesial corner of #8 before the patient was excused.



Fig14: Right side



Fig15:Left side. Also bonded mesial # 12.