

An Interdisciplinary Approach for Improved Esthetic Results in the Anterior Maxilla Diastema

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ABSTRACT: Maxillary midline diastema is usually the part of normal dental development during mixed dentition which requires no active treatment. But the continuing presence of it in an adult is an esthetic problem. The effective treatment of midline diastema depends on the etiological factors, size and extent of diastema. This clinical report describes a patient with uneven interdental space between anterior maxillary teeth, improper clinical crown lengths, tooth size discrepancies, and malocclusion.

Key words: Diastema closure, midline diastema, Orthodontic treatment, Porcelain laminate veneers, Interdisciplinary approach

I. Introduction

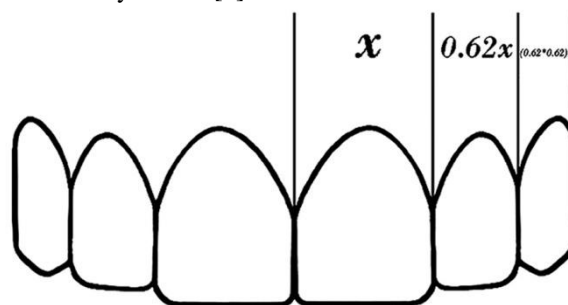
Aristotle said "Beauty is a greater recommendation than any letter of introduction". A statement that is true nowadays where attractive people have a much better chance of being successful. Dentists and orthodontists can greatly contribute to enhancing patient's smile, appearance, and subsequently self-confidence.

The presence of a midline diastema or spaces in between anterior teeth can be a major esthetic concern for patients [1]. The esthetic appearance of teeth forms a part of an overall picture, interacting closely with facial esthetics. Since a pleasant smile is governed largely by symmetry, asymmetry at the midline creates an unacceptable esthetic presentation for both patients and observers.[1,2,3]

There are various treatment options available for diastema closure in adults like orthodontic movement, restorative and prosthodontic treatment. Amongst these, the use of direct resin restorations seems to be conservative and more practical [2,3]. This type of treatment has several advantages over the rest such as its overall low cost, no tooth preparation, no need for anaesthesia and reversibility of the procedure. Numerous studies have investigated the frequency/prevalence of diastema. Consequently, there was a wide range of findings from 1.6% to 25.4% in adults and an even greater range in groups of young people Differences in epidemiological

study findings may be attributed to the increased number of factors contributing to midline diastema, to the definitions used to explain its presence and to gender and race differences in the distribution of the hereditary feature in question.[4,5,6,7]

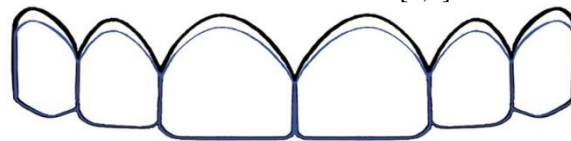
Diastema can be a normal characteristic during primary and mixed dentition and generally gets corrected by the time maxillary canine erupt.[2] However in some cases midline diastema does not close spontaneously even after the eruption of permanent maxillary canine.[3]



Golden Proportion

Fig.1 Golden Proportion Smile

The treatment modality and approach for midline diastema correction varies from case to case. Correct diagnosis of its etiology and subsequent treatment approach is essential for positive outcome. An interdisciplinary approach involving orthodontist, restorative dentist and maxillofacial surgeon is necessary in most of the cases to enhance the aesthetic and functional outcome.[6,7]



Preferred 78% W/L Ratio

Natural 86% W/L Ratio

Fig.2. Preferred vs Natural W/L ratios

This article elucidate a case of midline diastema treated successfully using either orthodontic or prosthodontic approach.

II. Case Reports

A 42-year-old woman visited to my private dental clinic, with a chief complaint of "desire to improve esthetics" because of the existing space between anterior maxillary teeth. The patient had uneven space between anterior maxillary teeth and showed deep bite Angle class II malocclusion. The problem list of patient's anterior maxillary part was as followed: asymmetrical zenith lines, abnormal incisal profile with disharmonious tooth axes and imbalances in tooth positions. The midline was deviated and the maxilla was canted to the right. The proportion of tooth size was asymmetrical and there was wide diastema between central incisors, approximately 2 mm [Fig.1]. On the first visit, irreversible hydrocolloid impressions of both maxillary and mandibular arches were taken, and diagnostic wax up was performed. To produce the most esthetic result, recurring esthetic dental (RED) proportion was used to establish the widths of the anterior six teeth as viewed from the frontal.6 The author has defined the RED proportion as the proportion of successive widths of the teeth viewed from the frontal, remaining constant as one moves distally. As it is well known, the golden proportion is limited to 62%, however, the RED proportion gives greater flexibility, as the dentist can define desired RED proportion, and an [Fig.2]approximate 70% is preferred. Based on the RED proportion of 70%, diagnostic wax-up was performed, and the favorable results were predicted by space redistribution. If the right central incisor would be moved toward mesial and incisal directions 1 mm respectively, the left lateral incisor would be moved toward incisal direction 1 mm. [8][Fig.3a,b]

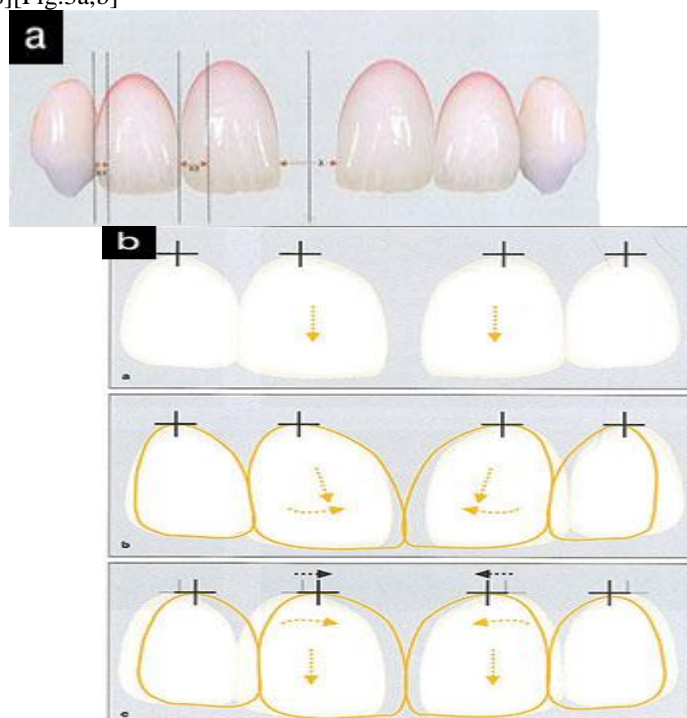


Fig.3a,b; 3a,b; Gürel's illustration of interproximal reduction technique. (With permission to reprint. Gürel G. Porcelain laminate veneers for diastema closure.

Deciding as for the treatment option, the MBT brackets were bonded to the anterior maxillary teeth according to their related positions, and the brackets of the right central incisor and the left lateral incisor were bonded in slightly cervical positions for extrusion [Fig.4]. Then open coil spring was inserted between the right central incisor and the right lateral incisor in order to move the right central incisor in mesial direction. On the other hand, closed coil springs were inserted between the right central incisor and the left central incisor and between the right lateral incisor and the right canine, with keeping in mind not to overclose of the diastema and not to take the wrong distal direction for the right lateral incisor. [Fig.5] .



Fig.4. Pretreatment intra-oral photograph.

After the spring and wire were inserted, all of the brackets and 016 stainless-steel round wire were ligated tightly and activation of teeth movements had begun. The recall checks were carried out with two weeks intervals. The careful observation of teeth movements was fulfilled and open coil spring had been changed, if necessary.



Fig.5; The brackets were bonded as considered the teeth movements

The occlusal adjustment of extruded right central incisor and the palatal surface of the left lateral incisor was carried out to remove occlusal interferences. The minute examination was performed for evaluating favorable teeth movements 6 weeks after brackets bonding procedure. Because the teeth were in proper positions in the maxillary dentition, all brackets and wire were removed, and the teeth surfaces were cleaned and polished. The fixed retainer was bonded to avoid the relapse of the moved teeth.



Fig.6 Porcelain laminate veneer preparation

On the next visit, porcelain laminate preparation was performed with the silicone index attained from the diagnostic wax-up cast. Immediate dentin sealing was carried out for achieving improved bond strength, fewer gap formations, decreasing bacterial leakage, and reducing dentin sensitivity. The final impression was taken with polyvinyl siloxane impression material using 1-step technique. Shade was carefully decided considering the prepared teeth and opposite mandibular incisors with shade guide. The provisional restorations were fabricated directly with premade silicone index attained from the diagnostic wax-up cast. [Fig.6] [Fig.7]



Fig 7. Veneer restorations for maxillary lateral and central incisors on master model. The palatal aspect demonstrates wrapped preparation design.

After 2 weeks, the final restorations were completed and tried in the mouth, all margins, contacts were verified. The final restorations were bonded using resin cement. After delivery, as shown in , the gingiva was healthy and showed harmonious shapes and contours. The proper esthetics was obtained that the shade of surrounding tissues was stable and shown balanced properties, the proportion of tooth size was favorable and satisfied .



Fig 8; Frontal view of definitive porcelain laminate veneers

The retainer was bonded for maximum retention of new teeth positions. The following check-ups of the patient were performed for 3 months after placement of the definitive prosthesis, and oral hygiene was maintained in excellent state and tooth alignment was stable. The patient was very satisfied with the appearance and the function.[Fig.8]

III. Discussion

Before the practitioner can determine the optimal treatment, he or she must consider the contributing factors. These include normal growth and development, toothsize discrepancies, excessive incisor vertical overlap of different causes, mesiodistal and labiolingual incisor angulation, generalized spacing and pathological conditions[6,7]. A carefully developed differential diagnosis allows the practitioner to choose the most effective orthodontic and/or restorative treatment. Diastemas based on tooth-size discrepancy are most amenable to restorative and prosthetic solutions. The most appropriate treatment often requires orthodontically closing the midline diastema.[8]

Treatment of diastema varies and it requires correct diagnosis of its etiology, and early intervention relevant to the specific etiology. Correct diagnoses include radiological and clinical examinations and possibly tooth size evaluation. It is an error to surgically remove the frenum at an early age and then delay orthodontic treatment in the hope that the diastema will close spontaneously. If the frenum is removed, while there is still a space between the central incisors, scar tissue forms between the teeth as healing progresses, and a long delay may result in a space that is more difficult to close than it was previously.[9,10,11]

If the space is large and frenal attachment is thick, it may not be possible to completely close the space before surgical intervention. The space should be closed at least partially and the orthodontic movement to bring the teeth together should be resumed immediately after the frenectomy, so that the teeth are brought together quickly after the procedure. When this is done, healing occurs with the teeth together and the inevitable post-surgical scar tissue stabilizes the teeth instead of creating obstacles to final closure of the space. [6,7,12,13,14]

In our case, closure of a maxillary midline diastema or other diastemas in the maxillary anterior region may be achieved with minimal preparation veneers or through teeth restorations with composite resin. However, the long-term prognosis of these therapeutic approaches must be further investigated.

In particular, the cases where these options can be performed are when:

- a) The patient does not want to undergo orthodontic treatment,
- b) There are other aesthetic problems present as well (e.g. amelogenesis imperfecta or discoloration), and
- c) Treatment requires combined orthodontic and restorative treatment, in cases with a very large diastema.[13]

Broadbent described the maxillary midline diastema in growing children as non-esthetically pleasing and characterized it as the "ugly duckling" stage of dental development. He considered this stage as a transitional phase for the maxillary interincisal diastema, indicating the space available for the erupting permanent dentition. Broadbent also described the closure of this diastema with complete eruption of lateral incisors and canines as a normal stage of occlusal development.[16]

Weyman found that midline diastema in a sample of 751 children was present in 56.8% following eruption of permanent central incisors, in 38% following eruption of the lateral incisors, in 7.4% after canine eruption and in 5.7% between 14 and 16 years of age. The author concluded that the developmental stage of the dentition rather than age per se is a more accurate basis for treatment planning.[17]

Sanin et al. developed a method that could predict, with an accuracy of 88%, whether the space would be spontaneously corrected in the developing dentition. The prediction is based on millimeter measurement in the early mixed dentition. The possibility of space closure without treatment is inversely proportionate to diastema size. For a 1 mm space in the early mixed dentition, the possibility of spontaneous space closure is reported to be 99%, for a 1.5-mm space 85%, 50% for a 1.85-mm diastema and for 2.7 mm of space the possibility of closure without treatment decreases to 1%. The authors note that the measurement should be performed at the time when eruption of lateral incisors is complete. Attempts for similar predictions at an earlier stage were proved to be totally inaccurate [18].

Only diastemas larger than 2 mm and diastemas in patients with generalized spacing are at risk of not closing with normal development.[7] It is important for dentists to recognize this often abnormal-appearing maxillary dental arrangement and not treat what is, in fact, normal development.[6,7]

The restorative closure of physiologic spacing can be achieved by using any of the techniques mentioned; direct composite veneers, indirect composite veneers, porcelain laminate veneers, all ceramic crowns, metal ceramic crowns and composite crowns [11,19,20]. Composite resin and porcelain are the most frequently used veneering material for physiological space closure conservatively. Smaller space can be closed with micro filled and hybrid resins if the spacing is about 1- 1.5 mm in dimension. Composite resin is easy to use, requires less appointment and is economic but offers less wear resistance and surface staining, which makes it inferior to dental porcelain. Conservation of tooth structure is a major factor in determining the long term prognosis of any restorative procedure[13,20,21,22,23]. One of the most important advantages of bonded porcelain veneers is that they are extremely conservative in terms of tooth reduction. In the current case, only 0.5 mm reduction on the labial surface was done. The highly glazed surface of the porcelain laminates prevents plaque accumulation, considered important to attain a healthy periodontal response. Excellent esthetics could also be achieved due to appearance of porcelain and scattering effect of the luting cement[21,22,23].

Correct diagnosis of etiology, its intervention or removal and timing of the treatment play a vital role in effective correction of midline diastema. Detailed medical and dental history, clinical and radiographic examination of both the jaws and toothsize

arch length analysis will bring us to a correct diagnosis. Treatment options can then be chosen according to the severity/ complexity of the case.

IV. Conclusion

There are many innovative treatment procedures available varying from restorative build up, porcelain veneers and orthodontic approach. Composite restorations are very conservative, less time consuming and mimic the natural tooth structure. Traditional porcelain laminate veneers, although provide an excellent aesthetic result; require removal of natural tooth structure. But for moderate to severe cases an orthodontic or multidisciplinary approach is essential for stable and aesthetic results. Patient's motivation and compliance factor should be kept in mind when opting for orthodontic correction due to its long duration.

References:

- [1] Nanda R, Kapila S. Current therapy in orthodontics 1st Edition, St. Louis, Mosby 2010.
- [2] Campbell A, Kindelan J. Maxillary midline diastema: A case report involving a combined orthodontic and maxillofacial approach. *JO*.2006;33:22-7.
- [3] Fields HW. Treatment of non skeletal problems in preadolescent children: Proffit WR, Fields HW, Sarver DM (edi) Contemporary orthodontics. 4th ed. St Louis: Mosby 2007:433-95.
- [4] Bishara SE. Management of diastemas in orthodontics. *Am J Orthod* 1972; 61:55-63.
- [5] Gkantidis N, Kolokitha O, Topouzelis N. Management of maxillary midline diastema with emphasis on etiology. *Pediatr Dent* 2008; 32(4):265-272.
- [6] Abdulgani Azzaldeen¹, Watted Nezar², Abu-Hussein Muhamad³ DIRECT BONDING IN DIASTEMA CLOSURE HIGH DRAMA, IMMEDIATE RESOLUTION: A CASE REPORT. *Ijdh*2014.1(4):430-435
- [7] Azzaldeen A, Muhamad AH. Diastema Closure with Direct Composite: Architectural Gingival Contouring. *J Adv Med Dent Scie Res* 2014;3(1):1-6.
- [8] Gürel G. Porcelain laminate veneers: minimal tooth preparation by Dental Clinics of North America 2007; 51:419-31.
- [9] Kovacs BO, Mehta SB, Banerji S, Millar BJ. Aesthetic smile evaluation--a non-invasive solution. *Dental Update*. 2011; 38:452-4.
- [10] Koorra K, Muthu MS, Prabhu R. Spontaneous closure of midline diastema following frenectomy. *J Indian Soc Pedod Prev Dent*. 2007;23-6.
- [11] Banker CA, Berlochar WC, Mueller BH. Alternative methods for the management of persistent maxillary central diastema. *Gen Dent*.1982;30:136-9.
- [12] Garber DA, Goldstein RE, Porcelain laminate veneers, chicago; Quintessence 1988;14-35
- [13] Galip Gurel; The science & art of porcelain laminates & veneers. Quintessence publishing co ltd. 2003: 369-90
- [14] Claman L, Alfaro MA, Mercado A. An interdisciplinary approach for improved esthetic results in the anterior maxilla. *J Prosthet Dent* 2003;89:1-5.
- [15] Chu CH, Zhang CF, Jin LJ. Treating a maxillary midline diastema in adult patients: a general dentist's perspective. *J Am Dent Assoc*. 2011; 142(11):1258-64.
- [16] Broadbent BH. Ontogenic development of occlusion. *Angle Orthod*, 1941;11: 223-241.
- [17] Sanin C, Sekiguchi T, Savara BS. A clinical method for the prediction of closure of the central diastema. *ASDC J Dent Child* 1969;36:415-8.
- [18] Weyman J. The incidence of median diastema during the eruption of the permanent teeth. *Dent Pract Dent Rec* 1967;17:276-8
- [19] Kumar LN, Nagmode P. Midline Diastema: treatment Options. *J Evolution of Medical and dental Science*.2012; 1(6):1262-6.
- [20] Qazi SH, Attaullah K. Treatment of midline diastema – multidisciplinary management: a case report. *Pak ortho J*.2009;1(1):23-7.
- [21] Hwang SK, Ha JH, Jin MU, et al. Diastema closure using direct bonding restorations combined with orthodontic treatment: a case report. *Restor Dent Endod*. 2012;37(3):165-69.
- [22] Mihram W and Murphy N. The Orthodontist's role in 21st century periodontic-prosthetic therapy. *Semin Orthod*2008;14:272-289.
- [23] Sharma AA, Park JH. Esthetic considerations in interdental papilla: remediation and regeneration. *J Esthet Restor Dent*. 2010 Feb;22(1):18-28.