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Diastema Closure in Conservative Dentistry

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Abstract

Diastema, or gaps in the front teeth, is unsightly and can have a detrimental effect on an individual's self-confidence and ability to make professional connections in social and professional settings. Therefore, examining the patient's wants, desires, and aesthetic concerns is important to evaluate the treatment plan to get optimal results. Modern eons have seen an upsurge in the need for interdisciplinary relationship between orthodontics, restorative dentistry, and periodontology to achieve an effective treatment plan and consequence. The black triangle (gingival embrasure without papilla), which occurs when a diastema is closed directly, is a major issue in aesthetic dentistry. The black triangle will ruin the patients' smiles; therefore, it is best to avoid it. The composite mastic used to seal diastemas should have sufficient convexity in the gingivo-incisal direction to prevent this issue. Closing a diastema can be done in several ways, some of which take a long time or do not give a good contour.

Keyword: Diastema Closure and Conservative Dentistry

1. Introduction

Diastema refers to separating two or more front teeth with dark spots on them. Adults often experience this unsightly dental issue, which may be a source of great embarrassment and self-consciousness about how they look when they smile. Small midline diastemas may not warrant therapy if they do not negatively impact the patient's self-perception. Therefore, it is important to examine the soft tissue shape and the etiology of the diastema before treatment planning to provide the best possible results [1, 2].

Possible causes of diastema include tooth size and form imbalances that disrupt bite harmony. Diastema in adult dentition can have a variety of causes. Therefore, it is crucial to conduct a thorough examination and diagnosis before deciding on a course of therapy [1, 3, 4]. Diastema treatment options comprise orthodontics, restorative dentistry, prosthodontics, or a mixture. Diastema closure may need periodontal surgery, such as frenotomy crown expansion, or both, for lasting harmony amid the final repair and soft tissue morphology. Therefore, the practitioner could identify the optimum treatment approach in each situation [1, 3] through comprehensive diagnosis, a painstakingly created action idea addressing the causes of diastema, and discourse through the patient.

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Even though it takes longer and costs more than other choices, orthodontic treatment is the gold standard for closing a diastema and is often regarded as very successful by patients. However, this kind of therapy may be ineffective in some circumstances, especially those involving large gaps. Therefore, therapy must also include restorative procedures, such as periodontal surgery, for the best possible results. However, restorative procedures such as resin composite restorations or porcelain laminate veneers offer indirect approaches to the problem. Effective restorative therapies with less invasive diastema closure operations [2, 3, 4].

This research aimed to offer a multidisciplinary approach to diastema closure, involving periodontics, restorative dentistry, and orthodontics, and to address the most effective management development concerning the etiology of diastema.

Diastema is described as an opening between teeth bigger than 0.5 millimeters. When it occurs amongst the maxillary central incisors, it is called a "midline diastema," and once it occurs among many teeth in the dental arch, it is called a "polydiastema" (Fig. 1). [5, 6].

Concerns about appearance, mental health, and function all point to the need for diastema treatment. However, the medial outbreak of the maxillary adjacent incisors and canines in infantile typically results in a reduction or closure of the maxillary midline diastema since this is a usual development characteristic of kids during the main and mixed dentition phases. However, the gaps persist even after the last teeth have come in for other people [5, 6].

Fig. 1. (a) Midline diastema: space between maxillary central incisors, (b) polydiastema: generalized spacing between teeth

To begin, here are two types of diastema: false and true. During the transition from a temporary to a permanent bite, it is common to have a false diastema. This is a common and healthy occurrence in young children. The diastema often closes on its own by the time the teeth have completely erupted. True diastema is shown in a steady bite and does not go away without intensive dental work [5].

The symmetry or asymmetry of the diastema depends on the site of the interdental space in relative to the mid-sagittal plane. Both central incisors are displaced laterally by the same amount in a symmetrical diastema; in an asymmetric diastema, one incisor is in its usual position while the other is greatly displaced laterally [6]. Another system divides diastemas into three groups based on the direction in which the crowns of the teeth are tilted relative to their roots:

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- Diastemas in which only the crowns of the central incisors are angled laterally,
- Diastemas in which the central incisors' bodies are displaced laterally, and (3) diastemas in which the crowns are angled medially and the roots are angled laterally.

The incisor crowns may be in a normal position (without rotation along the axis) or rotated laterally the axis in either the vestibular or oral route [6].

2. Aetiology of Diastema

2.1 Physiological Development of the Dentition

Primitive and mixed dentition typically exhibit spacing between the front teeth. Permanent teeth remain bigger than their predecessors, and the spacing of the key dentition indicates the distance that will allow for space and good position of the permanent teeth [7, 8].

Standard main interdental distances are 3 millimeters in the mandible and 4 millimeters in the maxilla. In most situations, the lateral incisors and canine eruption will reduce or close this physiological diastema. Spontaneous closure is expected if there is no obstructing pathologic or physiologic state [9, 10, 11].

A diastema in the maxilla's midline is uncommon and may last till the end of diverse dentition. The growing canines shove the roots of the central too lateral incisors mesially during this stage of development, which causes the crowns to displace distally and creates a diastema in the midline of the maxilla. This is the "ugly duckling stage." If the diastema is less than 2 millimeters in width, it will close when the permanent canines emerge, forcing the incisor crowns to shift mesially [12, 13]. However, a diastema wider than 2 millimeters will certainly require orthodontic treatment.

2.2 Ethnicity and Heredity

It has been established that diastema runs in families, suggesting a genetic predisposition. Studies exposing the genetic base of hypodontia and microdontia [7, 14] corroborate the idea that their hereditary nature is attributable to the genetic regulation of teeth size is the most prevalent etiological determinants of dental distancing.

Revealed a discrepancy in heritability between ethnic groups and indicated a possible for maxillary midline diastema, autosomal dominant inheritance is the norm. Environmental variables may have a larger impact on maxillary midline diastema in the black population, which might explain why it has a lower heritability than the white population [15, 16].

2.3 Variations in Dentoalveolar Discrepancies

The most prevalent origins of diastema in adults are conditions related to arch length discrepancies and teeth size, which lead to unevenness flanked by the breadth of the teeth and the arch length. This can occur due to increasing arch dimensions, hypodontia, or microdontia. In other words, diastema develops when the dental arch is too long relative to the mesiodistal breadth of the anterior teeth or

when the anterior teeth, especially the maxillary lateral incisors, are too short relative to the arch length. It has been found that the most prevalent tooth size discrepancy among the tooth size anomalies is small-sized or peg-shaped maxillary lateral incisors.

Depending on the severity of the distal relocation of the central incisors into the gap generated at the mesial of the lateral incisors, this might cause localized distance in the lateral incisor area or even maxillary midline diastema. When the lateral incisors are missing from birth or injury, the surrounding teeth will shift to fill the gap. In addition, those who are born without their lateral incisors are more likely to have wider gaps between their teeth since their central incisors will be smaller than average. The literature [7, 9, 10, 13, 14, 16] has uncovered a link between hypodontia and microdontia.

2.4 Expansion of the Labial Frenum

The maxillary midline frenum has been linked to an enlarged labial frenum on the maxilla. The aberrant frenum was blamed for the maxillary midline diastema at the turn of the century. Shashua and Artun's research has connected the development of diastema to an expanded labial frenum. After the maxillary lateral incisors and canines have erupted, it is possible for a physiological gap to form between the maxillary central incisors; this space may subsequently close on its own, and the labial frenum may atrophy. On rare occasions, however, the maxillary central incisors might explode in significantly disparate positions. When the labial frenum attaches to the indentation in the alveolar bone, it can cause a diastema by creating a densely fibrous tissue mass flanked by the central incisors [8, 12, 13, 14, 16, 17].

2.5 Muscular Imbalance Caused by Poor Habits

In both resting and active states, the teeth are subjected to navies generated by tooth contacts, soft tissue pressures (from the lips, cheeks, and tongue muscles), and intrinsic pressures (from the periodontal ligament and gingival fibers). The teeth remain in their relaxed state due to a balance of forces. Teeth movement is expected to happen if this equilibrium is disturbed by conditions such as macroglossia, oral syndrome, flaccid lip muscle, and tongue push Without intervention to correct or alleviate these imbalances, tooth movement will occur, resulting in diastema. Possible equilibrium impacts include the patient's chronic and persistent oral behaviors (such as digit sucking). The unnatural pressure from persistent bad practices might cause the incisors to recede.

A dentition gap can occur when the normal equilibrium of navies flanked by the "lips, cheeks, and tongue" is disturbed. The appearance of a supernumerary tooth in the mouth creates a diastema between the two central incisors. Some researchers have suggested that the tongue's size, placement, and functions affect how space appears between teeth. However, the link between the tongue and malocclusion is debatable. It has been speculated that tongue thrusting contributes to the expansion of a diastema [14, 15].

3. Patient Assessment and Diagnosis

3.1 Smile Design

Smile design is a methodical approach to modifying a patient's soft and hard tissues within the constraints of their anatomy to produce biomimetic restorations that are both functional and

aesthetically pleasing. face harmony achieved by maintaining the teeth, gums, and lips in good structural condition. necessitates interdisciplinary methods when designing an aesthetically pleasing smile [13, 15], as displayed in Fig. 2.

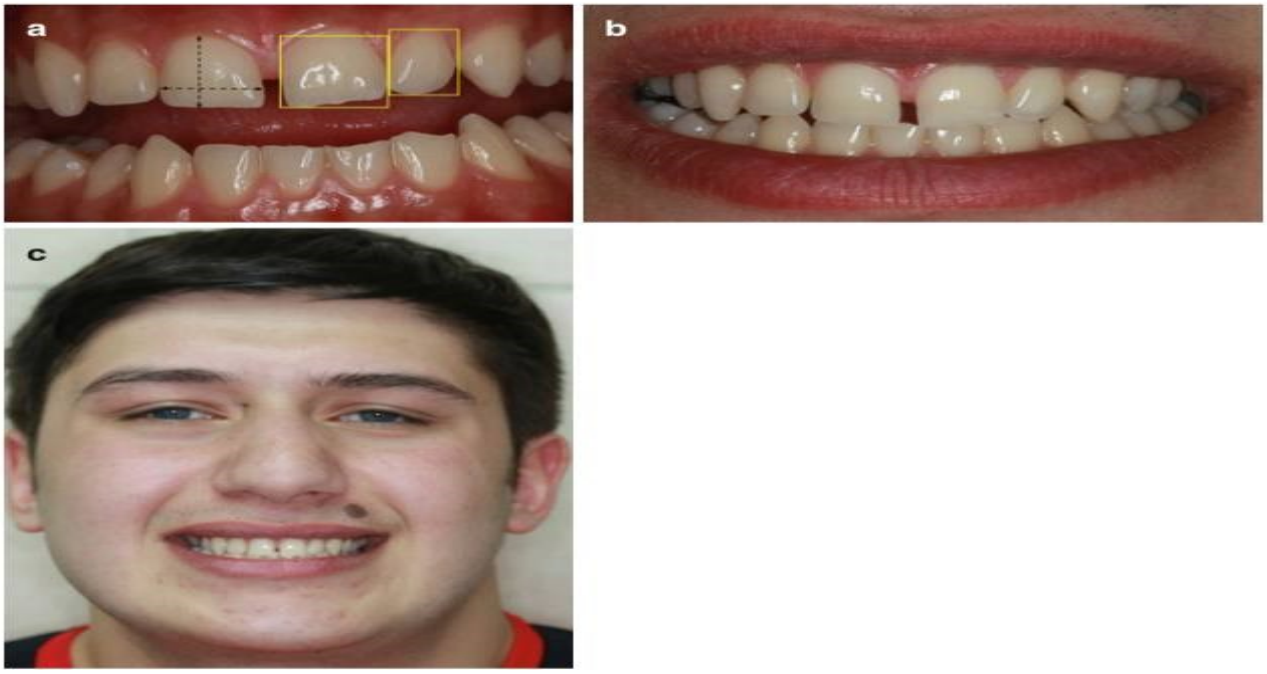

Fig. 2 Design of a Smile (a) Analyzing the size and positioning of each tooth concerning the others. (B)Analysis of how well teeth and gums work together. (c) Analyzing how well your teeth and features complement each other

3.2 Lip and Face Analysis

Facial analysis at a macro level, dentofacial analysis (the tooth's arch and midline in relation to the face), dentilabial analysis (how the teeth interact with the lips), gingival analysis (how the teeth interact with the gums), and dental analysis all play a role are all necessary for a thorough evaluation of a patient's smile. Correctly transferring all of this information to help fabricate final restorations depends on the clinician's familiarity with the shape, features, and color of the teeth and their links to the surrounding anatomy [1, 4, 5].

3.3 Dental Examining Methods

The impact on the smile and aesthetics profoundly affects the aesthetic idea and the smile. Patients with diastemas in the anterior region of their mouth (median or poly-diastemas) may be self-conscious about their appearance because of the differences in tooth size, proportion, and even morphology that result from the condition. Therefore, in addition to the aforementioned clinical evaluations, the clinician must assess the tooth size, shape, intra- and inner-tooth proportions, and occlusion to provide a natural and aesthetically pleasing result [16].

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3.4. Diastasis Management and Soft Tissue Considerations

3.4.1 The Papilla

Contact between the lateral walls of adjacent teeth or restorative structures and healthy periodontal tissues must be at the base for the interdental papilla to form and look normal. With a gap of 4 mm or less between the interdental contact point and the alveolar crest, papillae were identified in all instances. As the space between the contact and the alveolar crest widened by 1 mm, papillae disappeared in 2% of the instances. When the space between the alveolar crest and the bone is less than 5 mm, papillae are present in nearly all instances. However, when this distance is 6 mm, only 27% of instances are seen to have a papilla, and 42% of those cases do not have a papilla when the distance is 7 mm. The relevance of the vertical space between the papilla's base and the point of contact between adjacent surfaces is demonstrated here [17].

3.4.2 The Marginal Gingiva

The most apical point of the buccal marginal gingiva is the gingival zenith. The cementoenamel junction of the tooth, the shape of the root surface, and the alveolar bone along the gum line all affect where the zenith is in healthy gingival tissues. The placement and arrangement of the teeth can also affect the zenith. The zenith of the central incisors is typically 1 mm distal to the midline of the anatomical crown (Fig. 3), even though tooth shape and contour determine the gingival margin's undulations. Although the argument over where the zenith lies in the other anterior teeth continues, it is always simpler to make clinical choices when a sister tooth exists in the cross arch. While the zenith point of the lateral incisors is often reported to be at the midline, reports of the zenith point of the canine vary between the midline and distal to it [17].

Fig. 3. The anatomical crown's midpoint is about 1 mm distant from the zenith of the central incisors.

4. Treatment of Diastema

4.1 Treatment of diastema in the mixed dentition

Most central inter-incisive diastemas during the mixed dentition stage are merely a transitory physiological quirk of the "ugly duckling phase" that will close over time as the permanent lateral incisors and the permanent canines erupt. However, there are circumstances where orthodontic intervention is warranted. [18, 19] (F 5.1.1 Getting Out of the Rut).

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Tooth movement, leading to overbites, underbites, and other malocclusions, is a common consequence of an imbalance brought on by an aberrant oral behavior like finger sucking. When the aberrant habit is broken before the permanent teeth come in, the normal pressures of the cheeks and lips can restore the bite and correct the misalignment of the teeth [20, 21].

4.2. Diastema therapy for adults with full sets of teeth

4.2.1 Orthodontic Care, Version

The orthodontic procedure can be carried out for several reasons, the most common of which are to either close the diastema or redistribute the gaps in preparation for a posterior re-anatomization of the anterior teeth. Additionally, [22, 23] (Fig. 4) can be treated with orthodontic care. A diastema of 2 millimetres or less may not require medical attention. Small but unsightly (less than 2 millimetres), which may be remedied by bringing the central incisors closer together, and larger (more than 2 millimetres), which can be remedied by removing superfluous teeth, correcting a tongue push, or using a tongue crib, crowns, or composite fillings.

Fig. 4: a) Prior to orthodontic treatment; b) Following orthodontic treatment

5.2.2 Frenectomies and Orthognathic Surgery Frenectomies

When the labial frenulum is enlarged and situated close to the gingival margin, this is abnormal. Some authors recommend performing frenectomy after orthodontic closure of the gap because diastema closure and interdental papilla compression may act as a stimulant to cause atrophy of the fibrous tissue interposed between the incisors [24] (Fig. 5).

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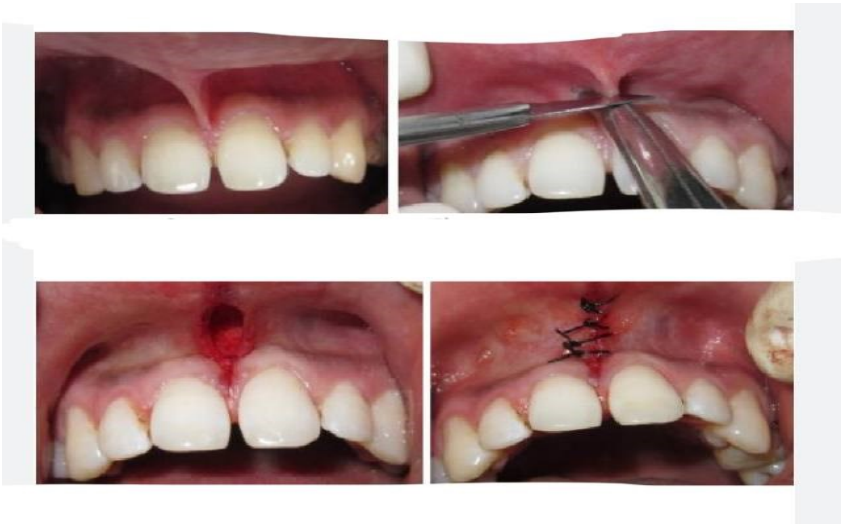

Fig.5 Labial Frenectomy

5.2.3 Conservative and Prosthetic Replacement

Peck argued that teeth are ideal structures because of their inherent perfection. However, a malocclusion can develop from a single abnormal tooth. The authors argue that orthodontists should learn more about the scope of orthodontic therapy and the benefits of operations that alter the appearance of teeth. The only proven method for successful therapy [25, 26]

The direct-bonding repair method is the gold standard in aesthetic care. It helps restore function and aesthetics in as few clinical visits as possible while preserving as much of the natural tooth as possible. In addition, the method is cost-effective, allowing advanced indirect restoration to be put off if necessary. Restorations done with direct bonding need high levels of clinical expertise. The doctor must make use of several clinical strategies, methods, and procedures [27].

5.2.3.1 Materials and methods for direct composite restoration.

Diastema closure with "no preparation" or "minimal preparation" of the tooth is possible with direct restorations using next-generation composite resins or indirect restorations using composite resins or PLVs. The distance between the two central incisors is initially measured. The breadth of the diastema and the individual teeth are measured using a Boley gauge or any appropriate calliper after cleaning and shade selection [28, 29] Fig. 6.

Fig. 6. Shows the calliper used to measure the gap between teeth and the dimensions of the central incisors.

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The cervical aspect of the composite restoration must be flawlessly smooth and incessant with the tooth structure to promote healthy gingiva. No overhangs are allowed. Gingival retraction cord removal allows for easier gingival examination and smoothing. Gingival embrasures between two central incisors can be cleaned of extra composite with unwaxed floss [30].

5.2.3.2 Restoration of Indirect Composite Materials

A porcelain veneer is a tiny porcelain shell bonded to the front of a tooth to improve its appearance. They cover up flaws, both big and small, and any inherent discolouration. Clinically, diastema closure might be difficult to treat aesthetically. Thin ceramic shells, called porcelain laminate veneers (PLV), are among the most popular treatments for these issues [31,32]. PLVs are glued to the front of the tooth using modern bonding agents and dual-cure types of cement (Fig. 7).

Fig. 7 Closing Gaps with Porcelain Veneers

5.2.3.2.2 Full Coverage Crowns

Before the development of laminates, the only restorative alternatives for closing a diastema were direct composite resin bonding and full coverage crowns. Crowns are recommended when the condition of the damaged teeth warrants the use of a highly durable extra-coronal repair. Full-coverage restoration designs can effectively fix teeth that lack sufficient enamel for bonding operations [33, 34].

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