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# Midline Maxillary Diastema: Clinical Guidelines

**Juliana Da Silva Guimarães**

**Dissertação conducente ao Grau de Mestre em Medicina Dentária (Ciclo Integrado)**

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# Midline Maxillary Diastema: Clinical Guidelines

**Trabalho realizado sob a Orientação de** Mafalda Maria Calheiros Lobo Duarte Pinto Guimarães

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Eu, Juliana Da Silva Guimarães, declaro ter atuado com absoluta integridade na elaboração deste trabalho, confirmo que em todo o trabalho conducente à sua elaboração não recorri a qualquer forma de falsificação de resultados ou à prática de plágio (ato pelo qual um indivíduo, mesmo por omissão, assume a autoria do trabalho intelectual pertencente a outrem, na sua totalidade ou em partes dele). Mais declaro que todas as frases que retirei de trabalhos anteriores pertencentes a outros autores foram referenciadas ou redigidas com novas palavras, tendo neste caso colocado a citação da fonte bibliográfica.

## AGRADECIMENTOS

Quero agradecer a todos os que de alguma forma tornaram a minha viagem académica mais bonita.

Quero agradecer aos meus pais que sempre acreditaram e lutaram pelos meus sonhos. Espero que estejam orgulhosos da pessoa que formaram. Tenho a sorte de chamar pai ao Super-Homem e mãe à Supermulher.

Quero agradecer à minha irmã gémea, ao meu namorado João e á minha avó Ana por me apoiarem incondicionalmente em todos os meus projetos.

Às minhas amigas Ana Gomes, Márcia Rocha e Mariana Lima por me terem acompanhado de forma tão sorridente durante estes anos.

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Sem todos vós, nada disto seria possível, obrigada a todos.

## RESUMO

**Introdução:** Por definição, segundo Keene, diastemas são espaços interdentários que excedem os 0,5mm, que apresentam uma etiologia bastante ampla, como microdontia, mesiodens, incisivos conóides, freio labial, agenesia, cistos na região da linha média, pro-inclinação dos incisivos superiores, discrepâncias de tamanho entre o esqueleto e os dentes, bem como fatores genéticos e mesmo hábitos não funcionais, como chupar o polegar.

**Objetivo**: Esta dissertação tem como objetivo a realização de uma revisão da literatura sobre diastemas na linha média maxilar assim como os diferentes métodos de abordagem terapêuticas para esta condição clínica.

**Materiais e Métodos:** Recorrendo à base de dados da *PubMed* foi realizada uma pesquisa utilizando as seguintes palavras-chave: *"Diastema"*, *"Linha média maxilar", "Restaurações diretas em compósito", "Facetas", "Tratamento híbrido", "Estética".* No decorrer da pesquisa encontraram-se 58 artigos, dos quais foram selecionados, pela sua relevância, apenas 29, 4 dos quais foram obtidos pela bibliografia de artigos de relevo. Pesquisa manual realizada através do livro: Dentística Saúde ,2 nd ed. Artmed 2007.

**Discussão:** Os espaços negros não são percecionados por todos como uma falha estética, existindo mesmo grupos culturais onde são considerados uma referência de beleza jovial. A medicina dentária conseguiu solucionar os diastemas de diversas formas, com resinas compostas, com facetas cerâmicas e ainda através da combinação de aparelhos ortodônticos com resinas compostas.

**Conclusão:** A literatura recomenda que os diastemas com 0.5mm a 2 mm devem ser fechados com recurso a resinas compostas ou facetas em cerâmica, já nos diastemas com mais de 3mm é aconselhado o uso de resinas compostas combinadas com aparelhos ortodônticos.

## ABSTRACT

**Introduction:** By definition, according to Keene, diastemas are interdental spaces that exceed 0.5 mm, which have a very broad etiology, such as microdontia, mesiodens, conical incisors, labial frenum, agenesis, cysts in the midline region, proclination of upper incisors, size discrepancies between skeleton and teeth, as well as genetic factors and even non-functional habits such as thumb sucking.

**Objective:** The purpose of this dissertation is to review the literature on midline maxillary diastema and the different therapeutic approaches for this clinical condition.

**Materials and Methods:** Using the *PubMed* database, a search was performed using the following keywords: *"Diastema", "Maxillary midline", "Direct composite restorations", "Veneers", "Hybrid treatment", "Esthetics"*. During the search 58 articles were found, of which only 29 were selected for their relevance. Manual research carried out through the book: Dentística Saúde ,2 nd ed. Artmed 2007.

**Discussion:** Black spaces are not perceived by everyone as an aesthetic flaw, and there are even cultural groups where they are considered a reference of youthful beauty. Dentistry has managed to solve diastemas in various ways, with composite resins, with ceramic veneers, and also through orthodontic braces combined with composite resins.

**Conclusion:** The literature recommends that diastemas with 0.5 mm to 2 mm should be closed using composite resins and ceramic veneers, whereas in diastemas with more than 3 mm it is advisable to use composite resins combined with orthodontic braces.

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## TABLE INDEX

## 1.INTRODUCTION

Diastemas are interdental spacings.[1] According to Keene, midline diastemas are spaces that exceed 0.5 mm between the proximal surfaces of adjacent teeth. [2]

These interdental spaces have a very broad etiology, such as microdontia, mesiodens, conical incisors, labial frenum, agenesis, cysts in the midline region, pro-inclination of the upper incisors, size discrepancies between the jaw bone and the teeth, as well as genetic factors and even non-functional habits such as thumb sucking and even breastfeeding.[1,3]

Midline maxillary diastemas are seen as a trend in Nigeria's beauty standards, it is known to be more recurrent in Black population compared to the Caucasian ethnic group.[4,5] Nigerians tend to produce diastemas on their teeth to feel more beautiful.[4] Therefore, diastemas are not an aesthetic problems, but a dental conditions, welcomed by some, and a nightmares for others.[6]

For those who see diastemas as a flaw in their image there are alternatives that appease their aesthetic deficiencies. Dentists can make teeth recover or regain their harmony. [7]

To do this, dentists have armed themselves with different techniques in several areas, such as, orthodontics, prosthetic rehabilitation, and even the conservative area. These fields, join hands in search of a so-called "normal" appearance that is recognized by a good majority as a beautiful smile.[8–11]) Orthodontists propose the use of braces to close the interdental spaces by moving the adjacent dental pieces.[12] Prosthodontists try to close these gaps with crowns, veneers, whether partial, laminated or full, small or large.[13] They also try to reduce these spaces with implants when the diastema comes from agenesis.[8] In aesthetic dentistry, the solution is direct composite restorations. [14] Some diastemas can only be overcome with the help of surgery, such as when a frenectomy is needed, or even the removal of a midline cyst or a mesiodens.[15,16]

The truth is that when diastases are large, there is a tendency to bind more than one area.[10] Thus, we see that several protocols are coming together in an attempt to help us with this issue. There are articles that advocate a multidisciplinary combination for a more harmonious result that better mimics nature. [8–11]

Veneers and resins are the two less-expensive techniques.[14,17] On the other hand, orthodontic treatment approaches are much more usual, but also more expensive.[11]

There are authors that confirm that direct composite resin restorations are more popular for several reasons: because they are cheaper than veneers, can solve the diastema in a single visit, and do not require the dental prosthetic help. Although this method has many advantages, it cannot be used for patients with bruxism.[14]

In addition to the advantages listed above, there is the aesthetic aspect, according to several articles, composite resins can promote a more natural look and are easy to restore.[2,14,18] They are recommended in spaces that veneers cannot cover because of the space they require for placement.[19]

However, studies have shown that veneers are more responsive to shear and compression forces, meaning that they have a higher resistance to fracture.[13,19] Sometimes the use of only one technique produces aesthetically unsatisfactory results.[8,10] The best results come in a multidisciplinary approach where the dentist tries to reduce the spaces between the teeth, with orthodontics, and then finish with composite resins or veneers to ensure that the teeth maintain their proportion. [9]

This dissertation aims to show, in a more conservative approach, some of the ways to close excessive space between the teeth. The use of direct composite restorations, veneers and even a hybrid approach with orthodontic treatment will be contrasted.

# 2.OBJECTIVE

## 2.1 MAIN OBJECTIVE

The aim of this dissertation is to formulate a clinical guideline, easily and quickly accessible, that will allow direct consultation of the best treatments to be performed according to the type of diastema presented by the patient.

The goal of treatment is always to restore aesthetics. However, there is not an optimal treatment for all diastemas, but a perfect treatment for each case individually. We will try to schematize the best treatment for a specific interdental gap.

## 2.2 SPECIFIC OBJECTIVES

- Identify the clinical relevance in the different types of diastemas.
- Identify advantages and disadvantages of each technique.
- Establish a clinical protocol using direct composite resins.
- Schematize a clinical choice workflow.

## 3.MATERIALS AND METHODS

This work is characterized as an integrative systematic review study, based on a literature search in the *PubMed* database.

The aim was to collect as much information as possible on the subject, using the following keywords: *"Diastema", "Maxillary midline", "Direct composite restorations", "Veneers", "Hybrid treatment", "Esthetics"*, in isolation and combined using the Boolean operators AND and OR, so that the largest possible number of articles is obtained.

Manual Search: performed with the aim of further investigation, indexed journals were manually consulted to identify studies that could meet the search criteria.

### 3.1 INCLUSION CRITERIA

As inclusion criteria, all follow-up articles, systematic reviews, and literature reviews were accepted. Articles in Portuguese and English were accepted.

All articles that approached the closure of diastemas in a unique way or even with a hybrid form, were also accepted. Publication date: articles published from 2011 to 2021. Articles in PDF available in full text.

### 3.2 EXCLUSION CRITERIA

As exclusion criteria, all articles that did not demonstrate usefulness either by their title and/or abstract.

The lack of a clear approach to the keywords and articles older than ten years were used as exclusion criteria. Also excluded are all articles that addressed only orthodontics. Closures that used prosthodontics and surgery were also excluded.

## 3.3 ARTICLE SELECTION

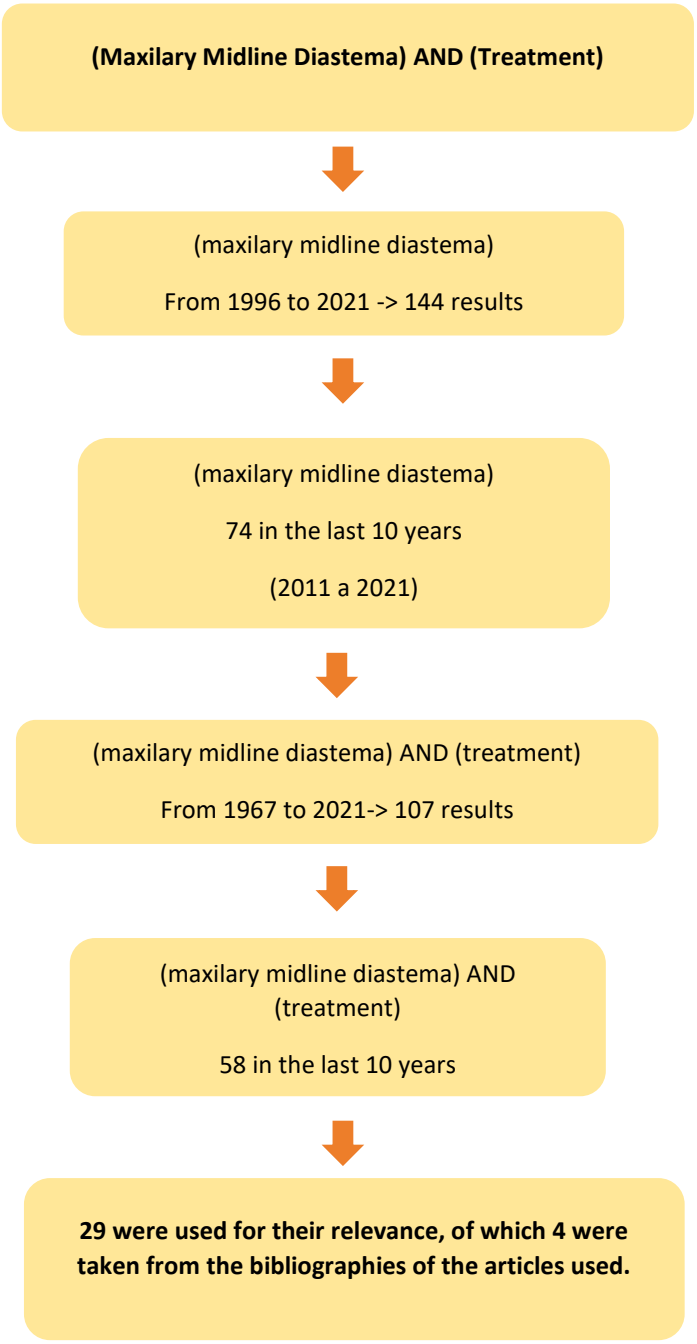


**Table 1: Flowchart**

## 4.RESULTS

Based on the data obtained of the twenty-nine articles included for the review, fifteen are "literature reviews", ten are "case reports", two are "follow-up studies", one is a "comparative study" and one is a "meta-analysis".

The fifteen "case study" articles describe the different protocols for performing anterior direct reconstructions, from planning to final restoration.

The inclusion criteria for this work is based on a time period including the last 10 years. We examined: one article from 2011, three from 2012, two articles from 2013, four articles from 2014, one article from 2015, five articles from 2016, two articles from 2017, one article from 2018, three articles from 2019, four articles from 2020 and one article from 2021.

All articles belong to indexed publications (Table 2).

| Author | Title | Relevance | Study type | Abstract |
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| Jepson, Nohl, Carter,Gillgras, Meechan, Hobson, Nunn | The interdisciplinary management of hypodontia: restorative dentistry | Article rich in different approaches for hypodontia cases that cause interdental diastemas. | Literature review | The paper describes the restorations common in those with hypodontia and also shows the variety of restorative techniques available in the restorative management of hypodontia and oligodontia. |
| C.H. Chu, MAGD, ABGD; C.F. Zhang, DDS, MDS; L.J. Jin, DDS, MDS. | Treating a maxillary midline diastema in adult patients | This article shows us the effectiveness of orthodontic braces in closing diastemas, as well as denoting some aesthetic impediments for those who have them. | Literature review | The authors present five cases of midline maxillary diastema in adults to show a range of restorative and orthodontic treatment options. |
| Soon-Kong Hwang,Jung-Hong Ha, MyoungUk Jin, Sung-Kyo Kim, Young-Kyung Kim | Diastema closure using direct bonding restorations combined with orthodontic treatment: a case report | This article shows us an interdisciplinary use in closing diastemas. We tried to bridge the aesthetic difficulty that some restorations provide when we change the dental proportions with the use of an orthodontic brace, thus shortening the spaces to be restored. | Literature review | Closure of interdental spaces using proximal composite resins is considered practical and conservative. however, a comprehensive approach combining two or more areas for treatment may be necessary to improve esthetics. |
| Santosh Kumar, Sumit Gandhi, | Perception of smile esthetics | Another important article to address, once again, the | Comparative Study | The focus of this study was to compare the impressions of |

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| Ashima Valiathan | among Indian dental professionals and laypersons. | aesthetic perception . This time through the perspective of the Indian population. | | orthodontists, general dentists, and laypersons regarding smile aesthetics after symmetrical and asymmetrical changes in the anterior teeth and their supporting tissues. |
| A O Arigbede , A.Adesuwa | A case of quackery and obsession for diastema resulting in avoidable endodontic therapy. | This article talks about an obsession with having a diastema. Some individuals try to produce these spaces between the teeth. sometimes these spaces are not produced in the best way which leads to problems later on. | Case Reports | This paper aims to elucidate a case of pulp necrosis involving maxillary and mandibular central incisors as a result of a poorly executed tooth modification in an attempt to create upper and lower midline diastemas. |
| Antonio Signore, Vassilios Kaitsas, Alessandra Tonoli, Francesca Angiero, Armando Silvestrini-Biavati, Stefano Benedicenti | Sectional porcelain veneers for a maxillary midline diastema closure: a case report | Relief article for using veneers as an option for closing the interdental spaces. | Case Reports | The article describes the case of a maxillary midline diastema closure in a healthy dentition using sectional porcelain veneers simply cemented on natural teeth and without dental preparation. |
| Mridula Tak, Ramesh Nagarajappa, Archana J Sharda, Kailash Asawa, Aniruddh Tak , Sagar Jalihal , Gauri Kakatkar | Prevalence of malocclusion and orthodontic treatment needs among 12-15 years old school children of Udaipur, India | The midline diastema showed that there are significant differences between the sexes, being predominant in men . | Case Reports | The aim of the study is to assess the prevalence of malocclusion and orthodontic treatment needs among 12-15 year old school children in Udaipur, India. |
| Pilar España, Beatriz Tarazona, Vanessa Paredes | Smile esthetics from odontology students' perspectives | Another important article as it once again addresses aesthetic perception. | Literature review | To determine if there are differences in the perceived esthetics between dental students in different years of dental school in determining the use of braces and their impact on esthetics. |
| Reji Abraham, Geetha Kamath | Midline diastema and its aetiology | Relevant article that mentions the etiology of diastemas.<br>it is of particular relevance with the hint that when the diastema is greater than 1.8 mm, after the eruption of the lateral incisors, an orthodontic intervention will be necessary. a treatment with resins or veneers will not be enough | Literature review | The purpose of this article is to understand the etiology and to try to help the clinician diagnose and solve the different diastemas. |
| Juliana | Postretention | This article talks about | Literature | The aim was to evaluate the |

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| Fernandes de Morais,Marcos Roberto de Freitas, Karina Maria Salvatore de Freitas Guilherme Janson, Nuria Castello Branco | stability after orthodontic closure of maxillary interincisor diastemas | recurrence and has a different opinion , it states that the recurrence of midline diastema was statistically significant as it occurred in 60% of the study sample, while the lateral diastema closure remained stable after treatment. | review | stability of interdental space closure in maxillary incisors and the association of its recurrence , as well as interincisor width, overjet, overbite and root parallelism. |
| Kylie C Lewis, Martyn Sherriff , E Stewart Denize | Change in frequency of the maxillary midline diastema appearing in photographs of Caucasian females in two fashion magazines from 2003 to 2012 | Article with a different approach to the aesthetic problem. This article refers to the diastemas of fashion models, which are not seen as an aesthetic problem, but rather as a defining characteristic. Which may make diastemas more accepted in the near future. | Case Reports | This article arose in an attempt to verify whether there has been a change in the frequency of appearance of midline maxillary diastema in two important women's fashion magazines over a 10-year period |
| Prabhu, Bhaskaran, Geetha Prabhu, Eswaran, Phanikrishna, Deepthi | Clinical evaluation of direct composite restoration done for midline diastema closure - long-term study | This article discusses the durability and strength of composite resins. They exhibit satisfactory survival rates placed with recommended placement protocols and without occlusal loading. | Case Reports | The objective of this study was to clinically evaluate the performance of composite resin used to restore midline diastemas between maxillary and mandibular central incisors. |
| Ayama Umanah ,Abdul-Azeez Omogbai,Babato,Osagbemiro | Prevalence of artificially created maxillary midline diastema and its complications in a selected nigerian population | This article was extremely useful to us for it helped us understand that standards of beauty vary from region to region. In Nigeria it is believed that central diastemas are a pontiff of young beauty. However, some of these young people are not born with diastemas and so they resort to artificial methods to get them, which can lead to dental problems. | Literature review | This paper focused on determining the prevalence of artificially created maxillary midline diastema as well as its complications in a selected Nigerian population. |
| Jin-Seok Jeong , Seung-Youp Lee, Moontaek Chang | Alterations of papilla dimensions after orthodontic closure of the maxillary midline diastema: a | Article of particular interest because it talks about a change of papillae during the closing of diastemas. | Literature review | The present study aimed to evaluate the changes in papilla dimensions after orthodontic closure of the diastema between the maxillary central incisors. |

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| | retrospective longitudinal study | | | |
| Mandava Prasad , Mitta Manoj-Kumar , Singaraju Gowri-Sankar , Nellore Chaitanya , Ganugapanta Vivek-Reddy , Nettam Venkatesh | Clinical evaluation of neodymium-iron-boron (Ne2Fe14B) rare earth magnets in the treatment of mid line diastemas. | We use this article to show that there are innovative ways to use in diastema closures, such as Ne2Fe14B magnets. | Literature review | This article attempted to evaluate the closure of midline diastemas using Neodymium-Iron-Boron magnets and to compare the duration of orthodontic treatment versus regular orthodontic treatment. |
| Abdullah M Zakria Jaija, Amr Ragab El-Beialy, Yehya A Mostafa | Revisiting the Factors Underlying Maxillary Midline Diastema | Relevant article reminding that diastemas are caused by more than one etiologic factor. | Literature review | The aim of this study is to analyze the etiological factors behind the presence of maxillary midline diastema in a sample of patients who underwent orthodontic treatment. |
| Bora Korkut, Funda Yanikoglu, and Dilek Tagtekin | Direct Midline Diastema Closure with Composite Layering Technique: A One-Year Follow-Up | Article of relevance to the topic, as it shows us a case of a 3 mm central diastema that is solved with a direct resin restoration.<br>It also mentions advantages and disadvantages of this technique compared to the placement of veneers and also about orthodontic braces. | Case report Follow-up study | This article shows very well the whole etiology behind diastemas.<br>In this article an attempt has been made to show a case of successful diastema closure in just one appointment without prior preparation. |
| L.Ousehal a, H. Aghoutan a,, S.Chemlali b, I. Filali Anssari a, N. Talic c | Perception of altered smile esthetics among Moroccan professionals and lay people | This article supports the definition of esthetics. This article posed several challenges to the laws of esthetics such as gingival exposure, tooth disproportion and diastemas. All the participants agreed that diastemas were an esthetic barrier that should be treated. | Literature review | This article focused on trying to evaluate and compare the impact of altered smile characteristics on the perception of smile aesthetics among Moroccan dentists and laypersons. |
| Eugene H Bass | Combined Orthodontic and Restorative Approach to Esthetic Treatment of Maxillary Peg Lateral Incisor in Adolescent Female Patient: Case Report | Very important article for the dissertation because it shows a hybrid way to close the diastema. It uses composite resin restorations and orthodontic braces. | Case Report | This article illustrates a combined orthodontic and restorative approach. a hybrid technique with the ambition to achieve better results. |

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| Célia Regina Maio Pinzan-Vercelino, Caroline Chavier Pereira, Lucyneide Rocha Lima,Júlio Araújo Gurgel, Fausto Silva,Bramante, Alex Luiz Pozzobon Pereira, Darlon Martins ,Matheus Coelho Bandéca | Two-Year Follow-up of Multidisciplinary Treatment Using Digital Smile Design as a Planning Tool for Esthetic Restorations on Maxillary Midline Diastema | This article argues that we should use a tool like digital smile designe to be able to manage the expectations of diastema closures with whatever method is chosen. | Follow-up study | The clinical case illustrates an approach to space distribution with the help of the digital tool, allowing for proper restorative procedures. The protocol used proved to be very efficient. |
| Mario F. Romero, DDS,a Courtney S. Babb, DMD,b Christian Brenes, DDS, MS,c and Fernando J. Haddock, DDS | A multidisciplinary approach to the management of a maxillary midline diastema: A clinical report | This article was used because it proves that composite resins are one of the least invasive solutions for diastema closure, but sometimes it only makes sense when combined with another area of dentistry, such as orthodontics. | Case report | The present article shows the closure of a 3 mm maxillary midline diastema using a combination of orthodontics and direct composite resin restorations. |
| Zaki Hakami , Roby Cherian | Mandibular incisor extraction: A treatment alternative for large maxillary midline diastema | This article is important because it addresses an unusual method of diastema closure.<br>The patient presented a class 3, what was done was an extraction of a dental piece and then the movement of the teeth to a class 1, which ended up closing the diastema. | Literature review | This article shows an unusual form of diastema closure. The treatment included an extraction of the mandibular incisors, followed by incisor retraction. |
| Montserrat Boronat-Catalá, Carlos Bellot-Arcís, José-María Montiel-Company, José-Manuel Almerich-Silla, Montserrat Catalá-Pizarro | Does breastfeeding have a long-term positive effect on dental occlusion? | This article raises the question of whether breastfeeding can cause diastemas, among other types of occlusion deficiencies.<br>However, studies show that there is no link between diastemas in permanent teeth and breastfeeding, but breastfeeding can cause diastemas in deciduous teeth. | Literature review | The aim of this paper was to evaluate the long-term effects of breastfeeding on the occlusal growth of children.. |
| Nazmiye Şen, Sabire Işler | Multidisciplinary Management of a Severe Maxillary | Extremely relevant article because it shows a case of successful closure of the diastem with 4 mm.This | Case report | This case report presents a multidisciplinary treatment plan for the management of a 4.0 mm MMD using limited |

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| | Midline Diastema: A Clinical Report | closure was only possible with a multidisciplinary approach, where the orthodontic and conservative/prosthodontic areas were involved. | | orthodontics combined with periodontal and prosthetic treatment. |
| Wesley F Vasques, Thamir A Sá, Felipe V Martins, Edgard M Fonseca | Composite resin CAD-CAM restorations for a midline diastema closure: A clinical report | Very interesting article using CAD CAM restorations for closing diastemas. | Case report | This article shows a closure of a maxillary midline diastema with computer-aided design and computer-aided manufacturing (CAD-CAM) of composite resin. A digital tool that helps us design a smile. |
| Claudio Novelli , Andrea Scribante | Minimally Invasive Diastema Restoration with Prefabricated Sectional Veneers | This article is very useful for our topic, since it uses veneers.<br>They present veneers as a low-trauma, affordable treatment with excellent aesthetic results.<br>This article states that dentists have the responsibility to select the best treatment for each patient. | Case report | The present report illustrates a case with a new technique for sectional veneer fabrication and diastema restoration with a prefabricated composite veneer. |
| Patricia Maria Pizzo Reis,a Pedro Lima,b Fernanda Cristina Pimentel Garcia,c and Jorge Faberd | Effect of maxillary median diastema on the esthetics of a smile | This is an extremely important article since it was concerned with determining what a group of laypersons, orthodontists and prosthodontists thought about the closing of diastemas.<br>They concluded that all agreed that the closing of large diastemas with composite resins violates the principle of proportion, which is so important for esthetics. They indicate that diastemas larger than 1 mm should be closed with braces in order to preserve the teeth, to avoid having to change restorations, and to keep the teeth looking harmonious and natural. | Literature review | The article attempted to show the effects of midline maxillary diastemas and their restorations on the aesthetics of a smile and to determine the effects on aesthetic perceptions among 3 different groups of patients: orthodontists, prosthodontists, and laypersons. |
| Marcos J Carruitero, Aron Aliaga-Del Castillo, Daniela Garib, Guilherme | Stability of maxillary interincisor diastema closure after extraction | With this article we raise one more problem.<br>After diastema closure, is there a possibility of relapse? This article states that yes, although the | Literature review | This article aims to understand the stability of diastema closure as well as the relapse telation that presents |

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| Janson | orthodontic treatment | probability is very small. | | |
| Yingying Wang Yingshuang Song \| Qi Zhong ,Chun Xu DDS, | Evaluation of influence factors on the width, length, and width to length ratio of the maxillary central incisor: A systematic review and meta-analysis | With this article we conclude that the prevalence of diastemas can occur according to the size of the incisors and they can vary significantly when comparing different ethnicities. | A systematic review and meta-analysis | This article was concerned with analyzing some data such as symmetry of the left and right sides, width, length of the central incisors for better treatment planning in such an esthetic area. |
| Viswambaran ,Gen,S.M. Londhe, Vijaya Kumar | Conservative and esthetic management of diastema closure using porcelain laminate veneers | This article shows several clinical cases of diastema closures using laminate veneers, making the case for the most aesthetic and conservative treatment for their dental interdental spaces. | Case report | The concept of aesthetics is a judgment about beauty and the sublime. Diastema can be one of the most negative factors in self-perceived dental appearance. Treatment is primarily for aesthetic and psychological reasons, rather than for so-called functional reasons. |
| Elisha R. Richardson, Malhotra, Henry,Little, Coleman. | Biracial Study of maxillary midline diastemas | This article shows a more historical approach to diastema closure. the first treatment was described by Farrer in the year 1882. he tried to show the different prevalence of diastema in different ethnicities and sexes. | Literature review | A relevant study regarding the prevalence of diastemas in different ages, genders, and ethnicities. They argue that diastemas are more common in black ethnicities and in men over 8 years of age. |
| M. Peumans, B.Van Meerbeek, P. Lambrechts, G. Vanherle. | Porcelain veneers: a review of the literature | This article advocates a search for knowledge about the longevity of veneer treatment on unaesthetic teeth in the anterior sector, such as maxillary midline diastemas. | Follow-up study | Porcelain veneers are steadily growing in popularity among today's dentists for the conservative restoration of unaesthetic anterior teeth |
| Ayush Goyal, Vineeta Nikhil, and Ritu Singh | Diastema Closure in Anterior Teeth Using a Posterior Matrix | The presence of diastema between the anterior teeth is often considered a costly aesthetic problem. Several treatment modalities are available for diastema closure. However, not all diastemas can be treated in the same way in terms of modality or timing. The extent and etiology of the diastema must be properly evaluated. Proper case selection is of paramount | Case Report | In this case report, diastema closure was accomplished with direct composite restorations. A bottle of etch-and-rinse glue was used and a single shade was used to close the diastema. A contoured posterior cutting matrix was used to achieve an anatomical contour. |

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| | | importance for successful treatment. | | |
| Thaiana Damasceno Cunha,Ivone de Oliveira Salgado, Leonardo César Costa, Tuélita Marques Galdino, Cecília Salgado | Proporção Áurea Em Dentes Permanentes Anteriores Superiores. | .The proportionality between the teeth is an important factor in the appearance of the smile and depends on the the relationship that exists between the length and width of the teeth as well as their disposition in the arch and the configuration of the smile. | A systematic review | In the esthetic restorative treatment of maxillary anterior teeth, the can be used as a guide, efficiently restoring the harmony of the smile, however, it does not guarantee the beauty of the smile, since this the beauty of the smile, since this is a very subjective concept. |
| Lee W. Boushell, DMD, MS | Diastema | Very important article in theoretical terms regarding the definition of a diastema. | Literature review | Dentists use the term "diastema" to describe the abnormal interdental space that results when a tooth in the dental arch is when a tooth in the dental arch is not in contact with an adjacent tooth. |
| Luís Coelho Silva, Catarina Matos, Teresa Oliveira, Paulo Melo, Mário Jorge Silva | Encerramento de Diastemas. Revisão de Conceitos Teóricos a Propósito de um Caso Clínico | Relevant article as it describes step by step the restoration of several anterior diastemas. | Case report | Achieving good results in closing diastemas depends on a well-established protocol. A clinical case of a patient with multiple diastemas in the anterior region of the upper arch that was arch and that was corrected in a direct manner with composite resins, the etiology of the diastemas is discussed and notions of dental and facial aesthetic notions that are very important for the final result are reviewed. |
| Paulo V. SOARES, Lívia F.ZEOLA, Paola,G. Souz, Fabrícia,A. PEREIRA, Giovana,A. MILITO,Alexandre, MACHADO | Reabilitação Estética do Sorriso com Facetas Cerâmicas Reforçadas por Dissilicato de Lítio | groundbreaking article that attempts to understand the use of lithium in veneers in order to make them more reliable rehabilitation techniques | Case report | Veneers stand out as a treatment option for esthetic rehabilitation in clinical practice because they provide more conservative procedures and mimic dental structures. dental structures. The development of new lithium disilicate reinforced ceramic systems and self-adhesive resin cements has favored the increase of longevity and clinical performance of indirect esthetic restorations. |
| Kristine Broka, Aldis Vidzis, | The Influence of the Design of | This is an extremely important article in order | Literature review | The aim of this study was to review literature on voice |

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|---|---|---|---|---|
| Juris Grigorjevs, Janis Sokolovs, Guntis Zigurs | Removable Dentures on Patient's Voice Quality | to understand the influence of rehabilitations on anterior teeth and their impact on phonetics. | | quality and the way it can be affected after the insertion of removable dental prostheses and to research the literature describing the ways how voice quality can be improved. |
| Chaitanya Dev Jain, Dara John Bhaskar, Chandan Agali, Harender Singh, Rajat Gandhi | Phonetics in Dentistry | This is another extremely relevant article. it enlightens us to the interference that we can cause in the phonetics with a restoration or rehabilitation of a previous space. | Literature review | This article provides a correlation between occlusion and speech, since the time these two factors are mostly not considered related to each other. |
| ROBERT ROTHMAN, D.D.S. | Phonetic comsideration in denture prothesis. | Another important article on phonetics and the power of rehabilitation to change it | Literature review | A working knowledge of this information enables the dentist to fabricate a denture with which speech is clearer, and it gives him a series of phonetic tests useful in complete denture registrations. |

**Table 2:Table of Results**

## 5.DISCUSSION

Diastema is the clinical name used to describe separated teeth.[20] Diastemas are one of many situations of tooth malposition which most often occurs in the anterior teeth of the upper jaw.[20–22]) In a diastema, the teeth are separated, leaving a gap or space between them, which tends to be more unaesthetic the larger the "hole" is. It may even interfere with a patient's self-esteem, especially in cases of separated front teeth, being less relevant in situations of inferior or lateral diastema.[23]

Diastemas can be related to: mouth breathing, habit of lingual interposition, thumb sucking, labial frenum (in the maxilla low insertion or in the mandible high insertion), presence of unerupted supernumerary teeth, congenital absence of anterior teeth, conoid lateral incisor, macroglossia, hereditary or ethnic factors, retained temporary teeth, tongue piercings, other factors.[1,24]

Contrary to common believe, diastemas are as random as one might think.(4) In children, age 6, there is a prevalence of 98%; at age 11 it reduces to only 49%; at age 12-18 still 7%, and in adults there is a prevalence of 1.6%-25.4% in the different populations studied. [25]

Diastemas are more present in the maxilla (14.8%) than in the mandible (1.6%) and have a higher prevalence in Black population compared to Caucasian, Asian or Hispanic populations. Besides ethnicity, it is also important to mention that there is a difference according to the individual's gender, affecting more females.[26] Europeans agree that diastemas are oral aesthetic flaws.[6,27,28] Professionals and laypeople both agree that these interdental spaces are seen as a defect.[6]

As time goes by, and especially in the fashion world, everything that was once seen as strange is now seen as a distinguishing quality. A female model with diastemas is no longer seen as a model with an aesthetic flaw, but rather a woman who distinguishes herself among the rest.[25]

There are still people in central Nigeria who struggle to have the centrals incisors separated, as they believe that the black spaces between the teeth are a symbol of beauty among the young.[4,5,27]

So diastemas can be seen in different ways, dentistry has been busy providing answers for those who seek them, in an attempt to make their smiles more harmonious.[15,21,27]

## 5.1 WAYS TO CLOSE DIASTEMAS

Nowadays, all types of diastema are possible to close.[18,28] This study attempts to show the best and the easiest clinical solution for both the patient and the general dentist to do. Many times, the clinical needs to lower the patient's expectations and explain that there are limits for the treatment, make them understand that what they want aesthetically is not always the best for their health.[2,29]

Therefore, the dentist must take into consideration not only the aesthetic, but also the biological, functional, and ethical aspects that will result in the best prognosis for our patients. [8,12,16]

It means that sometimes it is better to opt for a more time-consuming approach that provides more security and better results.[2] The concept of an excellent restoration in contemporary dentistry encompasses criteria of minimal biological cost, good longevity and successful aesthetic integration, as well as factors such as ease of treatment, possibility of intraoral repair, reduced soft tissue trauma and affordable cost.[2,19]

It is up to the dentist to balance all these factors and select the best treatment for the patient. Not forgetting that diagnosis is an essential step in the successful closure of the diastema. [20,30,31]

## 5.2 COMPOSITE RESINS

Composite resins are one of many ways to close diastemas.[9,14] They give teeth a natural and satisfactory look due to the wide range of colors available on the market.[11,20]

On a clinical level, they are very advantageous for dentists, since they can solve the diastema in a single appointment, without having to rely on the help of a dental laboratory. They are an inexpensive and long-lasting solution.[2]

One of the major disadvantages of restorations are changes in coronal proportions. Sometimes the natural and aesthetic dimensions of the central incisors are lost with resin augmentations on the interproximal surfaces. As well as poor shear and compressive strength, so they are not recommended in high stress areas.[2,10,19]

Direct composite restorations remain one of the most popular and less invasive treatment options for closing the anterior spacing and restoring the natural appearance of the smile.[7,14]

However, the technique requires the dentist to have great carving and finishing skills to achieve a restoration that is both aesthetic and meets the patient's wishes. As a way to overcome these limitations, some dentists prefer to rely on laboratory fabricated ceramic veneers, especially for large diastemas that are more difficult to close with a direct technique.[19,32]

Since closing diastemas, a minimally invasive technique, almost no grinding is required, and can only use for harmonization, if necessary. Recent studies have concluded that in patients with favorable occlusion, direct composite restorations can be considered aesthetic, functional and stable restorations.[9,23,32]

In case the patient is a smoker or has poor oral hygiene, the use of resins is also limited since tobacco and poor hygiene favor the degradation of the organic matrix of the resin and the consequent change in color and texture.[2,20]

In the literature there are three criteria for successful diastema closure: an increased emergence profile with natural contours at the interface between the gingiva and tooth; a completely closed gingival margin ; and a smooth subgingival margin that does not catch or tear dental floss.[7,18,33]

The presence of diastemas is one of the causes of the absence of interdental papillae, the so-called black triangles. It is then necessary to work on the gum

architecture based on the concepts of cervical contour and location of the interproximal contact point.[29]

## INDICATIONS AND CONTRAINDICATIONS FOR COMPOSITE RESIN CLOSURE

Composite resins are indicated for cases in which the diastema does not exceed 3 millimeters, otherwise the notions of incisor proportion can be lost [10] (which should be 8.9 mm on average when we talk about central incisors, and 6.4 mm for lateral incisors).[23]

Composite resins are indicated for cases in which the teeth present some alteration in shape, size, and even in some cases of slight changes in position. They are also indicated for cases in which the diastema has conoid teeth as its etiology.[2,8,14]

However, they are completely contraindicated in patients with bruxism, since they have difficulties in resisting strong occlusal loads on anterior teeth.[16,21,30]

## THE DIFFERENT TECHNIQUES

There are different techniques within this low invasive technique.[9,14] The direct technique which may or not contain the use of silicone key[2], and the indirect technique.[11]

The clinical have to choose the technique according to the case at hand.[30] The pre-made silicone guide can be used when the need arises to lengthen the incisal edge and/or change tooth shape and positioning along with diastema closure with composite resin.[2]

Some studies argue that the use of the silicone key provides better predictability during the diastema closure process. However, many practitioners use the techniques without silicone key and claim to achieve good aesthetic and functional results. (Using the book: Dentística Saúde e Estética, 2nd ed. Artmed;2007).[9]

**CLINICAL PROTOCOL**

According to protocols considered in some articles:[2,9,10,14,15]

1- Prior adjustment with scaling or periodontal surgical intervention;

2- Molding for making study models;

3- Diagnostic waxing up for the patient to visualize the final result of the treatment;

4- Making the silicone guide with laboratory condensation silicone;

5- Prophylaxis of anterior teeth;

6- Selection of the composite resin color to be used of both dentin and enamel with the teeth hydrated;

7- Absolute isolation of the operative field with rubber dam;

8- Protection of adjacent teeth with Teflon tape;

9- Total acid etching for 30s with 37% orthophosphoric acid;

10- Wash and lightly air dry;

11- Apply an adhesive system compatible with the total acid etching technique;

12- Light cure for 20s;

13- Application of the first resin layer corresponding to the palatal enamel on the silicone guide;

14- The composite resin must be inserted carefully so as not to extravasate laterally;

15- After removing the silicone guide, the resin layer must be checked for flaws;

16- Insertion of the composite resin referring to the dentin in order to conceive opacity to the body of the restoration and to define the mamelons;

17- Insertion of a clear resin between the mamelons to provide a translucent effect;

18- Finalizing the restoration with a thin layer of color already determined previously for the enamel;

19- Photopolymerization of each layer using a halogen lamp for 30s;

20- Final polymerization for 60s, per vestibular;

21- Removal of absolute isolation;

22- Finishing and polishing.

## 5.3 COMBINED TREATMENT: COMPOSITE RESINS AND ORTHODONTIC APPLICATIONS

The literature states that closing a diastema of more than 3mm should be done with the use of an orthodontic braces in order to maintain the proportion and a harmonious smile.[8,10]

Orthodontics can align teeth and even close spaces using removable braces, clear dies or brackets to move teeth. This area is evolving exponentially, with Invisalign being the latest update.[12] It usually involves an uncomfortable and expensive long-term treatment.[12,29,34]

The conclusion of an orthodontic treatment without restorative intervention, in specific clinical cases, may result in an unexpected result, either due to the dissatisfaction demonstrated by the patient with the aesthetic result, or by relapse after tooth movement.[8]

The combination of orthodontic treatment and composite resin restorations can increase the dimension of the tooth to close the space while the root position remains the same, and can be performed with composite or porcelain placed interproximally to close spaces.[12] The restorative material can be placed on the buccal surface as well as interproximally if the tooth color or shape also needs to be improved.[9,10]

Although the literature advocates a multidisciplinary approach whenever diastemas exceed 3 mm, this is not a standard rule. We may have a diastema of only 2 mm or even 1 mm that requires the use of orthodontic braces simultaneously with composite resins.[8–11]

**AND WHEN IS THIS COMBINATION RECOMMENDED?**

Whenever we have a patient who:[11]

- Presents with upper dental midline deviations in relation to the facial midline.
- Lower dental midline misaligned from the upper dental midline.
- Conoid teeth that are too far from where they should be.
- Irregular interdental spaces.

When diastema closure is performed, the dental midline, as well as the occlusal relationship and aesthetic proportion of an individual tooth must be considered and must coincide with the midline of the face.[8,11,12]

Orthodontics can be allied to more than one area, such as prosthodontic surgery if the diastema is caused by a lip frenum, impacted teeth or other causes.[35]

Orthodontics alone is increasingly rejected by adult patients as they want quicker and less expensive results. This is why veneers are gaining prominence in the closure of diastemas compared to longer treatments.[19]

## 5.4 INDIRECT CERAMIC VENEERS

While direct composite resin techniques can be more economical and successful, they present limitations in producing satisfactory clinical and aesthetic results.[2] The traditional placement of porcelain veneers can provide an extraordinary aesthetic result and make it possible to reproduce a beautiful and natural smile.[17,19,32]

Veneers are increasingly used for aesthetic improvement because of the wide range of anomalies they can conceal.[17] In addition to being used to correct the shape and color of teeth, ceramic veneers, along with all-ceramic crowns and composite resin restorations, are the most commonly indicated for use in spaces between 0.5 and 3 mm in size.[19]

There are always pros and cons of each method of diastema closure. While composite resins are more susceptible to fracture and wear, veneers have filled this gap.[2,17,32] They are resistant to wear, and they also retain their color better, which is very important for aesthetic areas such as midline diastemas.[31]

But we can not say that veneers are better than composite restorations; they simply offer advantages in some respects and disadvantages in others. Veneers do not have the advantage of being minimally invasive procedures.[21]

A major disadvantage compared to composite resins is the price and also the number of appointments that will be required. While resins require only one visit to fill the aesthetic incident, veneers need at least two visits and the cooperation of a dental laboratory, as they have the disadvantage of friability and pre-cementing.[17,19]

In case of fracture veneers also require higher costs and more complex procedures for both the dentist and the prosthodontist.[32]

According to the literature, veneers are not the first choice in completely healthy teeth, as well as teeth with insufficient remaining structure, and in cases where there is some kind of impediment to perfect enamel chemical bonding.[17]

Some articles argue that they are not potential methods of solution in patients with bruxism or Angle Class III, purely and simply because of occlusion problems.[19]

**AFTER THE DIASTEMA IS CLOSED, WE MUST ALWAYS PAY ATTENTION TO THE PHONETICS**

One should always be careful to inform the patient that the phonetics may change because the passage of air during speech also undergoes changes, especially in the pronunciation of the "F" and "V" sounds. [36]

The "F" and "V" correspond to labiodental sounds that can be affected by the positions of the upper anterior teeth.[37]

They are sounds that can be affected by the lack of touch of the upper teeth with the lower lip. As well as the position of these same teeth which can be more vestibular or more lingual.[38]

But it's not only the "F" and "V" phonemes that suffer with the change in teeth. We must also be aware of the alteration of the "S" phoneme, which can be altered when there is a change in the VOD (vertical dimension of occlusion); in these cases what should sound as "S" will sound as "SH" and in more extreme cases "TH".[36,37]

The “T” and “D” phonemes can also be affected since they are dento-lingual phonemes.[38]

We have to take these aspects into account so that when we close the diastema, with whatever technique, we can make sure that the patient can speak normally. [36,38,39]

## 6.CONCLUSIONS

For successful treatment, it is not enough to master the techniques of diastema closure. It is essential to make a correct diagnosis and to understand the various etiological factors behind the interdental spaces.

The closing techniques are vast, and from several areas. Veneers, orthodontic braces, and composite resins dominate the ways of closing maxillary midline diastemas.

The literature praises all composite resin restorations as they have many advantages in terms of price, simplicity of technique, and minimalistic approach.

This is valid for diastemas that do not require tooth movement, that do not have occlusion problems, Angle class II, convex profile or midline deviation where the first line treatment is fixed orthodontics and also in cases where there is no pigmentation or any adjacent esthetic problems, where ceramic veneers are highlighted.

According to some authors, a diastema that has an indication for closure with composite resins, with a space of more than 3 mm, should be combined with orthodontics, in order not to lose the notions of aesthetics. Thus, providing a more harmonious and proportional smile.

In conclusion, there is no ideal treatment for diastemas, but there is always an indicated treatment for each patient. However, composite resins are the most advantageous measure, even though it presents some contraindications.

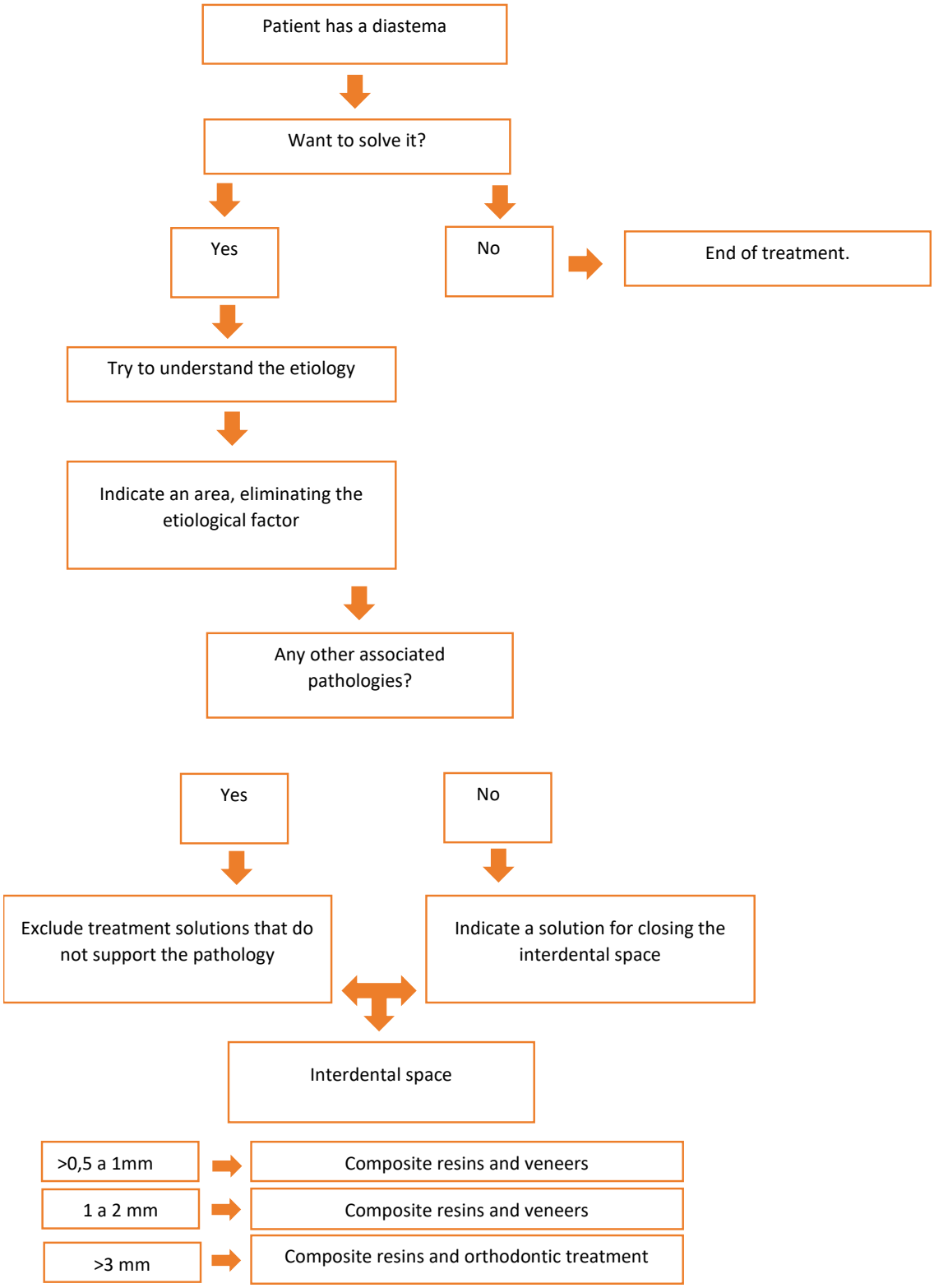


Table 3: Clinical choice workflow.

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