

Lithium disilicate ceramic fragments in maxillary midline diastema

Fragmentos cerâmicos à base de dissilicato de lítio em diastema da linha média maxilar

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Gabriela Alves de Cerqueira

Mestranda em Clínica Odontológica - Dentística
Faculdade de Odontologia da Universidade Estadual de Campinas
Rua Prudente de Moraes, 261; Edf Itapoã, 124. Centro – Piracicaba-Sp
gabrielaac3@gmail.com

María Jesús Arenas-Márquez

Especialista em Dentística, Mestra em Gerontologia, Doutoranda em Epidemiologia
Pontificia Universidad Católica de Chile
8 oriente, casa 3240, Talca, Región del Maule Chile
arenasmárquez@gmail.com

Josúe Junior Araújo Pierote

Especialista em Dentística, Mestre e Doutor em Clínica Odontológica – Dentística
Faculdade de Odontologia da Universidade Estadual de Campinas
Av. Limeira, 901 - Areião, Piracicaba – SP
josuepierote@hotmail.com

Luis Alexandre Maffei Sartini Paulillo

Mestre em Materiais Dentários, Doutor em Clínica Odontológica – Dentística
Faculdade de Odontologia da Universidade Estadual de Campinas
Av. Limeira, 901 - Areião, Piracicaba – SP
xandao@unicamp.br

ABSTRACT

Maxillary midline diastema is one of the main smile esthetic complaints by the population. Considering the positive effect that an esthetically harmonious smile can produce, in the view of conservative adhesive dentistry, ceramic fragments have been highly requested as a resolute therapeutic option in cases of closure of the maxillary midline diastema. Therefore, this study presents a clinical case report in which ceramic fragments based on high-translucency (HT) lithium disilicate were used in units 11 and 21 to close the midline diastema in a young adult patient. Before the restorative procedure, a study model, diagnostic wax-up for the mock-up and provisional pieces were produced. After a conservative tooth preparation, the teeth and ceramic fragments were conditioned following pre-established protocols, and a photoactivated resin cement was used as a cementing agent. The ceramic fragments met the expectations of patients and were indicated for being a conservative, safe, and effective esthetic treatment.

Keywords: Esthetics, Cementation, Ceramics, Diastema.

RESUMO

Maxillary midline diastema is one of the main smile esthetic complaints by the population. Considering the positive effect that an esthetically harmonious smile can produce, in the view of conservative adhesive dentistry, ceramic fragments have been highly requested as a resolutive therapeutic option in cases of closure of the maxillary midline diastema. Therefore, this study presents a clinical case report in which ceramic fragments based on high-translucency (HT) lithium disilicate were used in units 11 and 21 to close the midline diastema in a young adult patient. Before the restorative procedure, a study model, diagnostic wax-up for the mock-up and provisional pieces were produced. After a conservative tooth preparation, the teeth and ceramic fragments were conditioned following pre-established protocols, and a photoactivated resin cement was used as a cementing agent. The ceramic fragments met the expectations of patients and were indicated for being a conservative, safe, and effective esthetic treatment.

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1 INTRODUCTION

The search for a harmonious and attractive smile has increasingly grown in recent years (PIEROTE et al., 2020). An esthetically pleasing smile has been considered a “gateway” to social interaction and better professional opportunities (AFROZ et al., 2013; PIEROTE et al., 2020; TJAN; MILLER; THE, 1984) and it is linked to important personal characteristics such as friendliness, confidence, and happiness (PIEROTE et al., 2020). It also has major relevance to the self-esteem of individuals (MIRANDA et al., 2013).

Among the most common esthetic complaints indicated by individuals is the maxillary midline diastema, which is one of the most negative factors in smile appearance (VISWAMBARAN; LONDHE; KUMAR, 2015), generating a resolving need for esthetic and psychological issues (AFROZ et al., 2013). Maxillary midline diastemas are gaps of 0.5 mm or more between upper central incisors (VISWAMBARAN; LONDHE; KUMAR, 2015). This gap can be considered normal in the transition from deciduous to permanent dentition and is usually closed when upper canines erupt (HUANG; CREATH, 1995; VISWAMBARAN; LONDHE; KUMAR, 2015). However, this gap is not always closed spontaneously (CHU; ZHANG; JIN, 2011; HUANG; CREATH, 1995) and, in some cases, the restorative technique is indicated, mainly because it may be an additive procedure with minimal or no preparation of the dental structure (HASAN, 2017; ÖZTÜRK et al., 2012).

Considering the development of good adhesive restorative materials and the aesthetic demand from patients (ÖZTÜRK et al., 2012; PASCOTTO et al., 2012), both composite resins and indirect restorations with ceramics represent two excellent treatment options for closing diastemas (FARIAS-NETO et al., 2015; HASAN, 2017; PIEROTE et al., 2020). However, although composite resins are highly recommended for being a simple and conservative technique and presenting low cost (HASAN, 2017; PIEROTE et al., 2020), ceramics have gained prominence for presenting good resistance to compression and abrasion, biocompatibility, longevity, and for being a conservative technique with

high color stability when compared to composite resins (COSENZA et al., 2020; HASAN, 2017; MIRANDA et al., 2013; ÖZTÜRK et al., 2012; PASCOTTO et al., 2012). Ceramic materials, especially ceramic fragments, can be a great option for closing diastemas (MIRANDA et al., 2013) due to the satisfactory characteristics of the ceramic material and, in most cases, for being a very conservative additive technique in the concept of minimally invasive dentistry (OKIDA et al., 2012; PASCOTTO et al., 2012).

In recent years, ceramic materials have improved and lithium disilicate-based ceramics have been extensively used due to their excellent esthetic properties, offering different levels of translucency and optical effects similar to natural teeth (ÖZTÜRK et al., 2012; QUEIROZ et al., 2020). Ceramic fragments are fixed on the teeth with a cementing agent. A photopolymerizable cement is more suitable for esthetic cases (ÖZTÜRK et al., 2012; PEGORARO; DA SILVA; CARVALHO, 2007), guaranteeing greater stability of the final color of the restoration because it does not present tertiary amines, such as self-curing and dual cement, which when reacted with benzoyl peroxide causes the yellowing of restorations, both after polymerization and in the long term (JUNG et al., 2006; LEAL et al., 2016; ÖZTÜRK et al., 2012).

In cases of maxillary midline diastemas, lithium disilicate ceramic fragments are recommended as a therapeutic intervention, mainly because they are highly esthetic elements associated with a conservative technique and present greater color stability in the medium and long term. Therefore, considering ceramic fragments as a recommended treatment option with satisfactory clinical performance, this study describes a case report in which lithium disilicate ceramic fragments were used in units 11 and 21 to close the midline diastema, offering the patient an esthetically harmonious smile.

2 CASE REPORT

Male patient, 35 years old, attended the Dental Clinic of the State University of Campinas (Piracicaba, São Paulo, Brazil) with the main complaint of “a gap in the middle of the teeth” (Figure 1). After the clinical examination, radiographic evaluation, and treatment discussion, it was decided to close the diastema in the region of teeth 11 and 12 using ceramic fragments based on high-translucency (HT) lithium disilicate.

Figure 1: Initial aspect of the patient's smile with diastema between teeth 11 and 21



Source: authors

Initially, molding with addition silicone (Futura AD, DFL, Brazil) was performed to obtain a study model, which was made with a special stone plaster (Durone, Dentsply, Brazil). Subsequently, a diagnostic wax-up was performed (Figure 2a), from which a guide was produced for the mock-up. A bis-acrylic resin (Protemp4, 3M ESPE, USA) was applied to the guide and then the set was inserted over the teeth (Figure 2b). After the setting time, the guide was removed and the patient visualized the new shape and size of the teeth (Figure 2c). This process also served for closing the temporary diastema, remaining in the mouth until cementing the final facets.

Figure 2: (2a) Diagnostic waxing in the mesial of teeth 11 and 21 in a study model. (2b) Guide filled with bisacrylic resin positioned on the anterior teeth. (2c) Aspect of teeth 11 and 21 just after removing the guide.



Source: authors

In a subsequent session, a very subtle tooth preparation was performed from a guiding groove with a diamond tip 1112 (KG Sorensen, Brazil) on the proximal and incisal surfaces of teeth 11 and 21, smoothing the angles. Next, a retraction wire 00 (Pro-retract, FGM, Brazil) was inserted in the prepared dental elements so that a new impression with addition silicone could be produced to obtain a working model, which was sent to the laboratory. The pieces were made with ceramics reinforced by high-translucency (HT) lithium disilicate, in color A2 (Figure 3), which were tested to assess the adaptation.

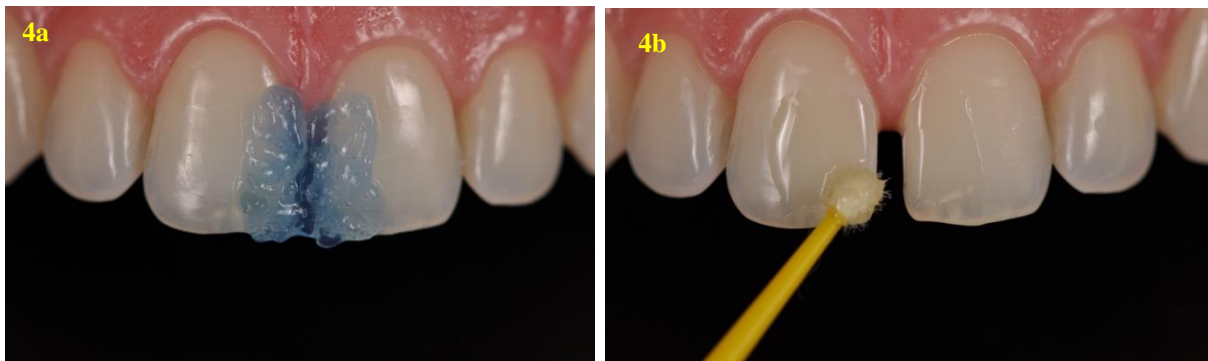
Figure 3: Ceramic fragments based on high translucency lithium disilicate (HT), in color A2.



Source: authors

For cementing the final facets, the teeth were etched with 37% phosphoric acid (Condac 37, FGM, Brazil) for 30 seconds (Figure 4a), followed by washing with water and drying by air blasts. After this stage, the adhesive was applied (Ambar, FGM, Brazil) on the surface (Figure 4b) and air-blasted. The prosthetic parts were prepared with 10% hydrofluoric acid (Condac porcelain, FGM, Brazil) for 20 seconds on the internal surface and then washed with water. Silane (Prosil, FGM, Brazil) was applied aided by a microbrush and the adhesive was applied.

Figure 4: (4a) Application of 37% phosphoric acid to teeth 11 and 21. (4b) Application of the adhesive to teeth 11 and 21.



Source: authors

As a cementing agent, the Relyx Veneer photoactivated resin cement (3M ESPE, São Paulo, Brazil) was used, which was applied to the internal surface of the fragments and then positioned on the teeth. After light-curing for five seconds, the excess cement was removed with hand instruments and the prosthetic parts were again light-cured for 40 seconds on each side. Finishing was performed with a diamond tip 3118 (KG Sorensen, Brazil), continuing with polishing using rubber tips in the shape of abrasive cups and discs (Figure 5).

Figure 5: Final aspect of the smile after finishing and polishing the ceramic fragments cemented in teeth 11 and 21.



Source: authors

3 DISCUSSION

The individualized assessment of the patient along with a diagnostic wax-up and mock-up provides the dentist and the patient with the predictability of the final result because this stage allows verifying the new shapes and sizes of the teeth, periodontal setting, and tooth/periodontium ratio (CALAMIA; PANTZIS, 2015; FARIAS-NETO et al., 2015; PIEROTE et al., 2020). In the clinical case hereby presented, the mock-up offered the patient a new smile perspective, which ended up generating patient enthusiasm and satisfaction to conclude the treatment, considering the main complaint had been resolved, and providing the possibility of corrections in the planning.

Considering the improvement and development of adhesive dentistry, teeth have been prepared more conservatively, as in preparations for ceramic veneers, in which wear is greatly reduced to preserve the dental enamel and ensure good adhesion of ceramic pieces (MIRANDA et al., 2013; PASCOTTO et al., 2012). Previous studies show that fracture failures can happen in cases of ceramic veneers without prior preparation of the dental unit due to insufficient space for the piece (GUREL et al., 2013; PASCOTTO et al., 2012). However, considering that the bonding force between the adhesive material and dental enamel is considerably higher than in dentin (DE MUNCK et al., 2005; FEDERIZZI; GOMES; PUGILATO, 2016), invasive preparations with great enamel removal and consequent dentin exposure may generate adhesive failure (PASCOTTO et al., 2012), promoting microleakage and detachment (GUREL et al., 2013). Cases of the closure of maxillary midline diastemas are usually additive cases that may only require the elimination of retentive areas and the creation of an insertion axis in the ceramic pieces (FARIAS-NETO et al., 2015). In this clinical case, a minimum enamel preparation was performed to promote the smoothing of angles, better settlement of ceramic fragments, and good adhesion at the tooth/fragment interface, respecting the maintenance, biology, function, and esthetics of the dental enamel.

Ceramic laminates have high representation rates and effective, conservative, and aesthetic procedures (BEIER; DUMFAHRT, 2012; GUREL et al., 2013; PASCOTTO et al., 2012; ROTOLI et al., 2013). The present study selected ceramic fragments based on high-translucency (HT) lithium disilicate due to the satisfactory esthetic performance and mechanical properties provided, corroborating previous studies that also used ceramic reinforced with lithium disilicate due to excellent esthetics, bond, wear resistance, and biocompatibility (COSENZA et al., 2020; DA CUNHA et al., 2013; HASAN, 2017; VISWAMBARAN; LONDHE; KUMAR, 2015). Furthermore, it is known that a ceramic piece must promote adequate light transmittance throughout its length to reach the cementing agent under it (PASCOTTO et al., 2012). Therefore, it appears that more translucent ceramic pieces tend to facilitate the photoactivation of resin cement below the restoration (QUEIROZ et al., 2020; RUNNACLES et al., 2014). High-translucency (HT) ceramics tend to have a higher degree of conversion (CALGARO et al., 2013), which contributes to the longevity of the restorative treatment.

This clinical case used a photoactivated cementing agent because among the resin cement options available in the market, the photoactivated resin cement provides the dentist longer working hours, good mechanical properties, and greater color stability in the restorative treatment (MARCHIONATTI et al., 2017; PEGORARO; DA SILVA; CARVALHO, 2007; QUEIROZ et al., 2020). The literature reports that this color stability must be required mainly in very thin ceramic pieces such as ceramic fragments (JUNG et al., 2006; ÖZTÜRK et al., 2012), considering that a self-curing or double-curing cement could compromise the esthetic result of the restoration due to the presence of tertiary amine in its composition (LEAL et al., 2016; PIEROTE et al., 2020). Therefore, photoactivated cement is more suitable for these cases (RADZ, 2011).

4 CONCLUSION

The demand for an esthetic smile, especially in cases involving the closure of the maxillary midline diastema, is present in dental offices. The use of ceramic fragments to solve these cases is an effective, safe, conservative, and well-accepted alternative for patients, guaranteeing not only esthetics but also the return of self-esteem and self-confidence.

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