Reporte de Casos
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Aesthetic restoration of fractured anterior teeth following an episode of dentoalveolar trauma: case report

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Abstract: Direct restoration with composite resin is a treatment option to restore the aesthetics and function of anterior teeth with coronal fracture after an episode of dentoalveolar trauma. The present study aimed to present and discuss the direct composite resin restoration in a pediatric dentistry patient with a crown fracture of the permanent upper central incisor due to dentoalveolar trauma. A female patient, 8 years old, was referred to the Dental Residency program in the area of Dentistry at the State University of Londrina (UEL) for restorative treatment of tooth 11. On the intraoral physical examination, a coronal fracture involving enamel and dentin was diagnosed, without pulp involvement. Radiographically, no periapical involvement or root fracture was observed. After planning the case and obtaining the legal guardian's consent, direct restoration was performed with composite resin using the free-hand technique. At 1-year clinical follow-up, the aesthetic and functional results were considered satisfactory by the patient, family members, and professionals. Based on the case presented, it can be concluded that direct restoration with composite resin, using the freehand technique, is a viable alternative mainly due to its low cost and reduced clinical time. In addition, the success of the treatment depends on factors related to the properties of the materials, the patient's oral habits, and the professional's knowledge and clinical skills.
Key words: Composite resins, dental restoration, permanent, esthetics, dental, pediatric dentistry, tooth injuries.

Restauración estética de diente anterior fracturado como resultado de episodio de trauma dentoalveolar: reporte de caso

Resumen: La restauración directa con resina compuesta es una opción de tratamiento para restaurar la estética y la función de los dientes anteriores con fractura coronal después de un episodio de traumatismo dental. El presente estudio tuvo como objetivo presentar y discutir la técnica de restauración directa, con resina compuesta, en un paciente infantil con fractura de corona del incisivo central superior permanente debido a traumatismo dentario. Paciente del sexo femenino, 8 años de edad, fue encaminada al programa de Residencia Odontológica en el área de Odontología de la Universidad Estatal de Londrina (UEL) para tratamiento restaurador del diente 11. Durante el examen físico intraoral se diagnosticó una fractura de corona involucrando esmalte y dentina, sin compromiso pulpar. Radiográficamente no se observó afectación periapical ni fractura radicular. Luego de planificar el caso y obtener el consentimiento del tutor legal, se realizó la restauración directa con resina compuesta utilizando la técnica de manos libres. En un seguimiento clínico de 1 año, los resultados estéticos y funcionales obtenidos fueron considerados satisfactorios por el paciente, familiares y profesionales. Con base en el caso presentado, se puede concluir que la restauración directa con resina compuesta, mediante la técnica de manos libres, es una alternativa viable principalmente por su bajo costo y reducido tiempo clínico. Además, el éxito del tratamiento depende de factores relacionados con las propiedades de los materiales, los hábitos bucales del paciente y los conocimientos y habilidades clínicas del profesional.

Palabras clave: Estética dental, odontología pediátrica, resinas compuestas, restauración dental permanente, traumatismos de los dientes.

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Restauração estética de dente anterior fraturado decorrente de episódio de traumatismo dentoalveolar: relato de caso

Resumo: A restauração direta com resina composta é uma opção de tratamento para restabelecer a estética e a função dos dentes anteriores com fratura coronária após episódio de traumatismo dentário. O presente trabalho teve como objetivo apresentar e discutir a técnica de restauração direta, com resina composta, em um paciente odontopediátrico com fratura coronária do incisivo central superior permanente devido a um traumatismo dentário. Paciente do sexo feminino, 8 anos de idade, foi encaminhada ao programa de Residência Odontológica na área de Dentística da Universidade Estadual de Londrina (UEL), para tratamento restaurador do dente 11. Ao exame físico intraoral, foi diagnosticada fratura coronária envolvendo esmalte e dentina, sem comprometimento pulpar. Radiograficamente, não foi observado envolvimento periapical ou fratura radicular. Após planejamento do caso e anuência da responsável legal, foi realizada restauração direta com resina composta por meio da técnica da mão livre. Em proservação clínica de 1 ano, os resultados estéticos e funcionais obtidos foram considerados satisfatórios pela paciente, familiares e profissionais. Com base no caso apresentado, pode-se concluir que a restauração direta com resina composta, por meio da técnica da mão livre, é uma alternativa viável principalmente pelo baixo custo e pelo tempo clínico reduzido. Além disso, o sucesso do tratamento depende de fatores relacionados às propriedades dos materiais, hábitos bucais do paciente, conhecimento e habilidades clínicas do profissional.

Palavras-chave: Estética Dentária; Odontopediatria; Resina Composta; Restauração Dentária Permanente; Traumatismos Dentários.

Introduction

Dentoalveolar trauma (DT) is considered a public health problem, with fractures of permanent upper central incisors, without compromising the pulp tissue, occurring with greater prevalence.[1] Sex, age, environment, and type of activity performed by the patient are determining factors for DT.[1,2] In addition to compromising the aesthetics of the smile and the functions of the stomatognathic system, such as speech and cutting food, anterior teeth DT can impact the psychosocial well-being of the patient and their family members. [3,4]

The prognosis of restorative treatment of teeth with DT depends on the extent of the compromised dental area, the time between the trauma episode and the first consultation, and the level of aesthetic impairment.[5-7] In addition to factors related to the DT episode, the professional's competence and ability to plan and perform the procedure are essential for achieving satisfactory results.[5]

Among the possible techniques to restore the aesthetics and function of anterior teeth compromised by DT, the professional can opt for direct techniques, either by bonding the tooth fragment when present and in inadequate conditions, or by performing a direct composite resin (CR) restoration.[8,9] Compared to the indirect restoration technique, direct restoration with CR presents advantages related to reduced cost to the patient, greater conservation of mineralized tissues, and the possibility of the procedure being performed in a shorter clinical time[10,11], a favorable aspect when providing pediatric dental care.

When choosing rehabilitation through direct restoration with CR, the professional may, depending on their clinical skill, aesthetic sense, available time, patient

cooperation, and the size of the area to be restored, opt for the insertion of CR using the free-hand technique[11,12], with the aid of spatulas and brushes. In addition to these materials, the professional may use a matrix to assist in creating the palatal surface. This guide matrix can be made with a polyester matrix strip or with condensation or additional silicone, using the plaster model from the previous molding of the fractured tooth and waxing the portion to be restored.

Considering the high prevalence of DT in children and the need for restorative aesthetic treatment, the objective of this study is, through the report of a clinical case of a child patient, with a crown fracture of the permanent upper central incisor due to an episode of DT, to present the discussion on direct restorative treatment with CR.

Case report

An 8-year-old female patient was referred to the Dental Residency Program in the area of Dentistry at the State University of Londrina (UEL) for restorative treatment of the upper right central incisor due to a crown fracture approximately 2 months ago. On the intraoral physical examination, an extensive coronal fracture involving approximately 50% of the clinical crown was diagnosed, without exposure of the pulp tissue (Figure 1). The response to the vertical and horizontal percussion test was not suggestive of endodontic and periodontal alterations, respectively. Periodontal attachment involvement was

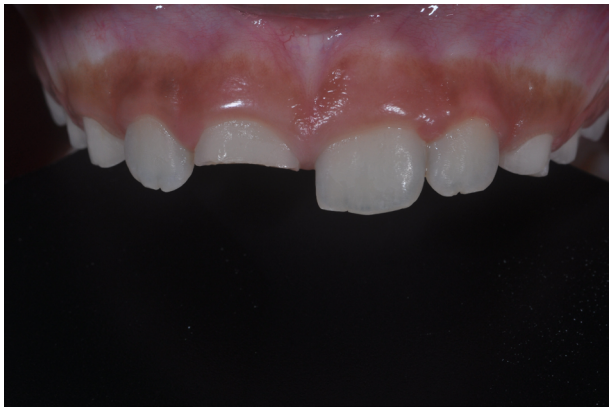

Figure 1. *Initial clinical aspect of the anterior region of the maxilla.*

also ruled out by means of the mobility test in the vestibular-palatal direction. The radiographic examination confirmed the absence of periodontal and periapical involvement, as well as the absence of root fracture (Figure 2).

During the anamnesis, when questioned, the patient's parents/legal guardians reported that the tooth had already been restored three times with CR, but “the

Figure 2. *Periapical radiograph of the region of permanent upper incisors.*

restorations fell out". Furthermore, to aid in retaining the CR restorative material, the professionals presented the need to perform endodontic treatment and cement an intraradicular post to enhance retention.

After planning the clinical case and with the consent of the legal guardians, direct restoration of the upper right central incisor with CR was performed in the second clinical session. The restorative clinical sequence covered: 1) Infiltrative anesthesia, with 2% mepivacaine (adrenaline vasoconstrictor 1:100,000); 2) Veneer-type preparation of the vestibular surface of the coronal remnant, in enamel, with diamond bur #2135F (American Burrs), mounted at high speed, under refrigeration, with chamfered cervical end and finishing (bevel), in enamel, of the vestibular and lingual cavosurface angle with diamond bur #1190F (American Burrs) (Figure 3); 3) Prophylaxis of the anterior superior teeth with pumice paste and water, with the aid of a Robson brush (Ultra-soft, American Burrs, Palhoça-SC, Brazil); 4) Modified rubber dam isolation with the aid of cyanoacrylate-based material (Super Bonder, Henkel Ltda); 5) Acid etching of enamel and dentin with 37% phosphoric acid (Figure 4) (Biodinâmica, Ibiporã-PR, Brazil), for 30 seconds on enamel and 15 seconds on dentin; 6) Rinsing with a water jet to remove the conditioning agent, for 30 seconds; 7) Drying the operative field with an air jet and the conditioned dentin, with a paper filter (Melitta, São Paulo-SP, Brazil); 8) Application of two layers of the adhesive system(AS)(AdperSingleBond2,3MESPE, Sumaré-SP, Brazil), with the aid of a micro-applicator brush (Cavi brush regular, FGM, Joinville-SC, Brazil), actively, for 15

Figure 3. *Clinical aspect after coronary preparation.*

Figure 4. *Conditioning with 37% phosphoric acid.*

seconds; 9) Removal of excess AS with the aidofaclean micro-applicator brushand time interval for solvent evaporation; 10) Light cure of the AS with a Radii-Call-SDIdevice (Southern Dental Industries, São Paulo-SP,Brazil),with an irradiance of 1200 mW/cm^2, for 20 seconds; 11) Positioning of the polyester matrix (TDV) for restoration of the palatal face. At this stage, CR in enamel shade A1 (A1E, Z350 XT Filtek, 3M ESPE) was inserted and the polymerization was light-cured with the same LED-based device for 40 seconds (Figure 5); 12) Using the incremental

technique, with the aid of an insertion spatula and brush, the area corresponding to the dentin was restored with CR A1 dentin (A1D, Z350 XT Filtek, 3M ESPE), with characterization of the volume and anatomy (development grooves) of this substrate (Figure 6); 13) The light-cure of all increments was performed with the same LED-based device, for 40 seconds; 14) Immediate finishing of the proximal surface with a scalpel blade #12 (Feather Safety Razor), of the palatal surface with a diamond tip #3168FF (Invicta, American Burrs) and of the vestibular surface with sandpaper discs (Praxis, TDV).

One week after the restorative session, the vestibular surface was characterized (textured) with a diamond bur #3195F (American Burrs). The final polishing was performed using a sequence of abrasive discs (DhPro) and a felt disc (Diamond Flex, FGM), in association with polishing paste containing aluminum oxide (Diamond R, FGM) (Figure 7).

Considering her age and need for multidisciplinary intervention, the patient was referred to the Integrated Children's Clinic for preventive, educational, and curative treatment. Concomitantly, clinical monitoring sessions for the restorative procedure were performed at 30 (Figure 8), 180 (Figure 9), and 365 days (Figures 10 and 11), demonstrating satisfactory aesthetic and functional results. In radiographic follow-up after 365 days, no image suggestive of loss of adhesion, root resorption, or any potential complication inherent to DT was observed.

Figure 6. *Characterization of development grooves.*

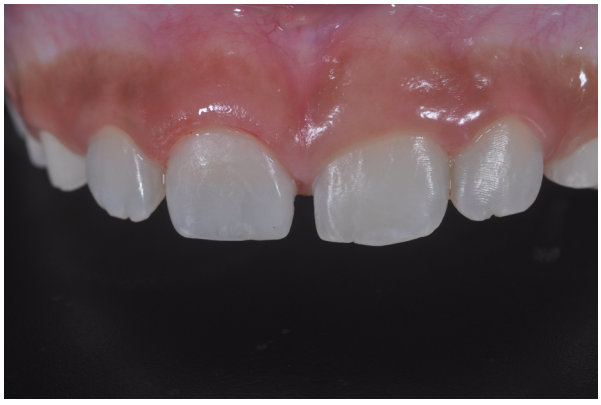

Figure 7. *Clinical condition after finishing and polishing.*

Figure 5. *Making the palatal surface in composite resin.*

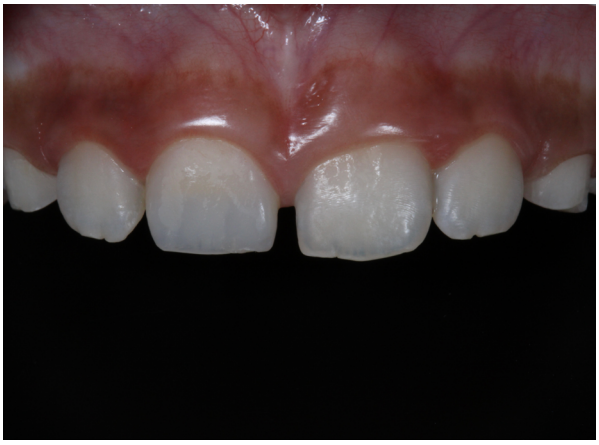

Figure 8. *Clinical follow-up for 1 month.*

Figure 9. *Clinical follow-up for 6 months.*

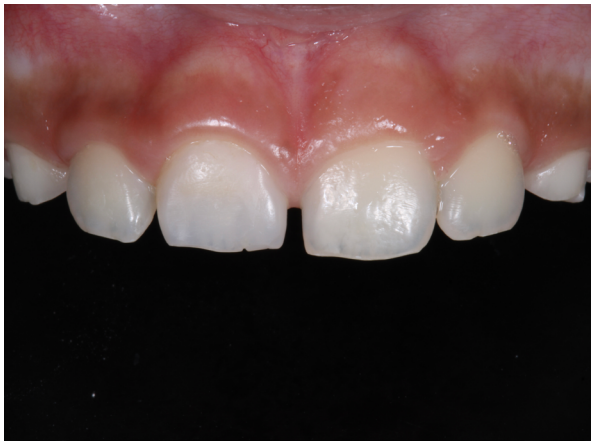

Figure 10. *Clinical follow-up for 1 year.*

Figure 11. *Periapical radiograph 1 year after restorative procedure.*

Discussion

The favorable results observed in the present clinical case during the preservation sessions illustrate the restorative potential of a direct freehand restorative technique. The approach performed enabled natural and functional aesthetic restoration while preserving the remaining dental structures, without the need for pulp therapy, with reduced clinical time and low cost. In this sense, the success of the treatment required the operator to have clinical competence to plan and correctly execute the procedure, especially regarding knowledge of the properties and advantages of the restorative materials, as well as the ability to achieve a dry operating field without risk of salivary contamination.

The clinical case presented confirms the high prevalence of traumatic injuries to

hard tissues in permanent teeth resulting from DT episodes.[13,14] At this stage, children are more active, exhibit more intense behavior and play, and this, in combination with inadequate lip sealing and overjet with protrusion, leaves the anterior teeth more susceptible to traumatic injuries.

For the aesthetic and functional restoration of fractured anterior teeth, the professional can choose to perform a direct restoration in CR or an indirect restoration in CR or ceramic. In the present report, the restorative decision was to perform a direct restoration in CR based on the following factors: patient age, vitality, and volume of pulp tissue, preservation of the quantity and quality of the remaining dental substrate, clinical time, additional operational cost to the patient, and possibility of longitudinal repair.[10,15] Although ceramic materials have greater resistance to wear, in addition to the longitudinal maintenance of polishing and surface shine, the selection of this material would imply the need for additional wear of the remaining tooth, production of a provisional restoration, an increase in the number of clinical sessions, costs to the patient's legal guardians and the impossibility of repair in the event of a fracture.[16,17]

Although CR treatment is a commonly performed clinical procedure, potential restoration failures may occur.[15] Among the reasons, we can highlight the fracture of the restoration, which may be partial or total.[18] The failures of previously manufactured restorations, reported by the patient's parents, may have been due to failure of adhesion of the CR to the dental substrates due to unsatisfactory isolation of the operating field, the unsatisfactory quality of the conditioning pattern of the enamel and dentin dental substrates, the error in the application of the AS, insufficient photoactivation of the polymerization of the AS and CR, the type of resin selected and/or the lack of adjustment of the restoration to the occlusal functions.[15,18]

To increase the exposure area of the enamel prisms to the action of the enamel conditioning agent and, consequently, increase the adhesion area of the CR[9], a veneer-type preparation was performed on the vestibular surface, with a slightly chamfered cervical end, with a diamond tip #2135F (American Burrs), and finishing of the vestibular and lingual cavosurface angle, with a diamond tip #1190F (American Burrs). This stage of the treatment was based on factors such as the amount of remaining tooth structure after the fracture, the history of failures in previous restorations, and the preservation of pulp vitality without the use of an intraradicular post. Through this minimally invasive technique, an adequate surface for CR adhesion was created, reducing the risk of operative failures. The preparation involved minimal enamel removal, followed by the application of a conditioning agent and an AS, ensuring stable bonding between the restorative material and the remaining tooth structure. Furthermore, the execution of the bevel in the vestibular and lingual cavosuperficial angle favored the aesthetic result achieved, as it increased the insertion area of the CR

on the conditioned dental enamel, a fact that contributed to better marginal sealing, finishing, and final polishing of the restoration.[9]

Rubber dam isolation of the operating field in pediatric patients is challenging to perform and depends on the patient's cooperation.[19] Despite this, this step is essential to increase the success rate of the treatment, since the contamination of the mineralized tissues by saliva, after acid conditioning, makes it difficult for the resin to infiltrate and the monomer to convert, reducing the micromechanical bond strength of the AS.[20] To provide greater comfort to the child and offer adequate control of humidity in the operating field, modifications to the isolation technique may be necessary.[20] In the clinical case reported, absolute isolation was performed using a modified technique, in agreement with other studies.[11,21] Regardless of the isolation technique used, it is essential that the operating field be free of contamination and that the tooth to be restored be dry, so as not to influence the adhesive strength and longevity of the restoration.

In turn, regarding the degree of translucency of the CR used, the first dentin CR was inserted to restore the substrate above. Because it is more opaque, the aforementioned CR was also inserted over the beveled enamel to mask the restoration/tooth transition line, which provided greater naturalness to the restoration.[22]

To protect the dentin-pulp complex, a conventional two-step AS was selected, with acid conditioning of the enamel and dentin at different times. The choice of an AS, rather than protection with cement, whether based on calcium hydroxide and/or glass ionomer, was made based on the quantity and quality of remaining dentin and the patient's lack of spontaneous and/or provoked sensitivity to the exposed dentin. It is important to emphasize that protection with cement would prevent the infiltration of the AS into the dentinal tubules, that is, it would reduce the quality of the seal and the bond strength of the CR.[23]

The literature is controversial regarding the longevity of extensive CR restorations in fractured anterior teeth, which typically last 5 years.[15,18,23] In the present study, after 365 days of follow-up, the restoration was clinically satisfactory based on the maintenance of adhesion, polishing, and surface shine. Radiographically, to date, there is no image suggestive of loss of adhesion, root resorption, or periapical lesion. Furthermore, no potential complications or sequelae of DT were observed.

Conclusion

Although there are several treatments for DT, direct restoration in CR remains an excellent treatment, as it is a minimally invasive technique, low cost, and requires

little clinical time. For this approach, the professional must have restorative clinical skills and knowledge of the materials and techniques to be used. Ultimately, it is essential that the professional monitor the prognosis of these restorations, as potential long-term complications can occur.

Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Ethics Statement

The authors declare that the parents provided consent for the images and clinical information from the case to be reported in scientific publications. Parents understand that the child's name and initials will not be published, and efforts will be made to conceal the child's identity. This article complies with the Research Ethics Committee protocols of the State University of Londrina.

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