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Case Report

Aesthetic-functional reconstruction of dental fracture and its impact on the psychosocial aspect

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Abstract: Traumatic dental injury (TDI) constitutes a public health concern. This injury occurs mainly in anterior teeth and brings disadvantageous psychosocial consequences that affect adolescents, as well as impairing their speech and eating habits. A healthy smile and facial aesthetic have an influence on social interaction, especially in the way individuals are seen, felt, and perceived by other people. Therefore, this paper aimed to report a dental trauma injury and its impact on the Oral Health-Related Quality of Life (OHRQoL). A 14-years old boy was referred to a Dental Trauma Care Program in a Brazilian Public University after falling from his own height. The patient had a crown fracture involving enamel and dentin without pulp exposure in the upper left central incisor. The oral rehabilitation was performed by using a composite resin associated with the silicone guide technique. Taking into account the integrality of the patient, the OHRQoL was assessed before and after the rehabilitation treatment with the application of the Brazilian version of the Child Perceptions Questionnaire (CPQ11-14)-Impact Short Form (ISF: 16). TDI in the anterior tooth had a negative impact on the social wellbeing of this adolescent. After the oral rehabilitation, the patient showed improvement on OHRQoL demonstrating autonomy and self-confidence in his reintegration into the social environment.

Keywords: Adolescents, dental trauma, oral health, quality of life, tooth injury

Introduction

Traumatic dental injuries (TDIs) in deciduous or permanent dentition are a very common condition [1, 2] and considered a public health concern [3-5]. Crown fracture involving enamel and dentin is the second most prevalent TDI [1, 5] and the anterior teeth are the most affected [6]. If the fragment of the fracture tooth is well preserved, immediate reattachment may be done. Nevertheless, the tooth fragment is not always available, requiring a restorative procedure to regain functional integrity of the fracture tooth [7]. Owing to the aesthetic appearance and position in the arch, trauma in the anterior teeth may cause not only physical-mental strain and stress, but also affect the emotional and psychological of the individuals leading to a negative impact on their oral health-related quality of life (OHRQoL) [6, 8].

Beautiful, healthy smiles associated with harmonic facial aesthetics are attributes that contribute to the well-being of any patient [9]. A healthy smile has a considerable influence on social interaction, especially in the way individuals are seen, felt and perceived by others [10]. During adolescence social relations are being established, characterized by the acceptance of individuals in a group. Adolescents are worried about building up interpersonal relationships and self-esteem and the dento-facial aesthetics play an important role in this regard [11, 12].

In order to solve and mitigate the damage caused by dental fracture, new approaches have emerged to reconstruct teeth in a minimally invasive way and so, to re-establish the functionality and the aesthetic appearance of the tooth [7, 13]. Composite resins stand out in this sense, since these materials provide excellent esthetic and mechanical results and do not need dental wear. Besides, they provide favorable optical characteristics to the dental structure allowing the reproduction of the natural characteristics of the dental tissues, such as opacity and translucency. Moreover, it has the

advantages of low cost and a short treatment course, when compared to full-crown restorations [7].

Several techniques can be used to perform aesthetic dental reconstructions with composite resin, among which we can highlight: free-hand direct insertion and composite resin using the layering or anatomical technique [14-19], direct fragment reattachment technique [20-24] and direct restoration by composite build-up using a reference silicone guide [25-27] (**Table 1**).

Treatment for individuals with crown fracture is of fundamental importance, as such ensures the integrity of the fractured tooth and contributes to the patient's healthy development from physical, social, and emotional standpoints. Based on this assumption, the aim of this study was to report a TDI and its impact on the OHRQoL before and after the rehabilitation treatment reporting the psychosocial aspect involving an adolescent that suffered TDI of the anterior tooth.

Case report

A 14-years old boy was referred to the Dental Trauma Care Program (DTCP) in a Brazilian Public University after a late dental trauma due to a falling from his own height at school. This program was approved by a local ethical committee of the Fluminense Federal University by the number CAAE 70872117.8.00005626. After registration at the DTCP, a signed, written informed consent form was obtained from the patient's caregiver. According to the patient's caregiver, the dental trauma had occurred fifteen days after they decided to look for a dental care.

During the anamnesis, the patient related pain during tooth brushing and his emotional state remained shaken after the trauma. At DTCP, the adolescent was clinically and radiographically evaluated. The TDI diagnostic was uncomplicated crown fracture (enamel-dentin fracture) without pulp exposure in the upper left central incisor (21) presenting a Black's class IV (**Figure 1**). A periapical and panoramic radiographies confirmed the enamel and dentin loss without the occurrence of pulp exposure (**Figure 2**). The dental pulp sensibility testing was performed with endo ice spray in the upper left central incisor to investigate any pulp injury. The adjacent teeth were also evaluated to rule out possible traumas. There was no pulp injury in the fractured tooth and adjacent teeth as they responded positively to the cold test. Based on the anamnesis and the clinical exams, the following treatment plan was prepared and authorized by the patient's family: 1-temporary restoration with glass ionomer cement; 2-restoration with composite resin using the casting, waxing and rehabilitation technique by using a silicone guide; 3-patient follow-up after 6-8 weeks and 1 year [1].

At the first appointment, taking into account the integrality of the patient, the OHRQoL was assessed before starting the treatment. It was applied the Brazilian version of the Child Perceptions Questionnaire (CPQ11-14)-Impact Short Form (ISF: 16) composed of 16 items distributed among four subscales: oral symptoms (OS), functional limitations (FL), emotional (EWB) and social wellbeing (SWB). Each item addresses the frequency of events as applied to the teeth, lips, jaws and mouth in the previous three months. A five-point Likert scale is used, with the following options: "Never" = 0; "Once/twice" = 1; "Sometimes" = 2; "Often" = 3; and "Everyday/almost every day" = 4 [28-30]. It was observed that all domains presented impact on OHRQOL (OS = 7 points; FL = 6 points; EWB = 9 points; SWB = 3 points). The EWB domain was the most affected by the TDI. The adolescent claimed to present bad breath, mouth sores, food caught between teeth; difficulty chewing firm foods, drinking or eating hot or cold foods; felt irritable/frustrated, shy and concerned about what people think of his teeth/mouth and because of it avoided smiling/laughing. After applying the questionnaire, a temporary restoration was performed with glass-ionomer cement (GICs) (MaxxionR, FGM) in order to use its properties to nourish the affected tooth and minimally replace the tooth structure since GICs do not have positively relevant aesthetic characteristics. The choice of this material was due to its biocompatibility, bioactivity, fluoride release, excellent coefficient of linear thermal expansion/contraction and modulus of elasticity, as well as being the only restorative material capable of chemically bonding to the tooth structure [31]. Then, alginate impression of the upper arch was taken, the model was poured using dental stone

Table 1. Major treatments for uncomplicated crown fractures (enamel + dentin fracture without pulpal involvement)

Major treatments	Indications	Advantages	Disadvantages
Direct reattachment of the fragment [20-24]	If the fractured fragments of the tooth are well preserved	Conservative technique Easy to perform (one-visit) Excellent aesthetic and functional results Regaining color and size of the original tooth Being worn away in a similar proportion to adjacent tooth without trauma giving an emotionally and socially positive response due to the protection of natural tooth structure	Fragments are not always available Require fragment hydration
Direct restoration by resin composite build-up using a reference silicone guide [25-27, 36]	Extensive crown fractures without tooth fragment	Allows to create easily the reference in size, width and harmony with the adjacent teeth Makes the tooth reconstruction easier to perform	Require multiple sessions The technique entails additional costs as it involves more clinical sessions and materials
Free-hand direct resin composite insertion using the layering or anatomical technique [14-19]	Small crown fracture without tooth fragment Favorable technique to mimic the lost tooth structure	Satisfactory aesthetic and functional results Reduced number of sessions	Require professional skills Susceptibility to staining, color instability, wear and adhesion failures

Figure 1. Crown fracture involving enamel and dentin without pulp exposure in the upper left central incisor.

(**Figure 3**) to subsequent waxing-up (**Figures 4** and **5**), from which the silicone guide was acquired in a second appointment (**Figure 6**). For this purpose, the high viscosity addition silicone was provided according to the manufacturer's recommendations, following a ratio of 1:1, with manipulation for 60 seconds. Subsequently, the material was accommodated on the vestibular region of the wax-up to obtain of the vestibular guidance guide. For this purpose, the high viscosity addition silicone (Scan Putty Denso, Yller, Pelotas, RS, Brazil) was provided according to the manufacturer's recommendations, following a ratio of 1:1, with manipulation for 60 seconds. At the end of the material setting reaction, the guide was removed. Excess of material in the cervical region was removed using a no. 15 scalpel blade. The silicone guide was tested directly in the patient's mouth to check its adaptation (**Figure 7**). Next, a relative isolation was carried out and 35% phosphoric acid was applied to the tooth with total-etch technique (Total Etch, Ivoclar Vivadent). After 30 seconds, the acid was removed with an air-water spray and the surfaces were dried gently with polyurethane pellets. The dentin bonding agent (Adper TM Single bond 2, adhesive; 3M ESPE AG, Seefeld, Germany) was applied to the tooth surface with a microbrush, spread over delicately with an air spray for 3-5 s and cured with visible light for 20 seconds. Then, the silicone guide was correctly positioned in the mouth and the palatal, proximal and incisal aspects were built with small increments of the composite restorative material (Filtek Z250; 3M ESPE AG, Seefeld, Germany) (**Figure 8**). This was followed by building up the facial surfaces. Occlusion was checked to prevent the stress from the patients' protrusive interference. Final finishing and polishing of the composite was done (**Figure 9**).

After treatment the OHRQoL was assessed again and the Brazilian version of the Child Perceptions Questionnaire (CPQ11-14)-Impact Short Form (ISF: 16) was applied. It was observed that all domains did not present any impact on OHRQOL (OS = 0 points; FL = 0 points; EWB = 0 points; SWB = 0 points). The patient reported no longer having bad breath and food debris between his teeth; in addition, he reported no mouth sores or pain in his teeth, lips, jaw, or mouth. (**Tables 2**-**5**) The patient did not return to any of the follow-up appointments.

Discussion

The present case report sought to deal in an exemplified and resolute way aspects that constantly touch society. The impact generated by a dental fracture at an age of social insertion is highly negative. The appearance and its influence on individuals' lives exert a great importance regarding the social and psychological aspect [32]. In this case report, it is possible to observe how important was for the patient to have his social identity back. The present study demonstrates that the main concerns of this adolescent involve social interactions and are related to the perception of others regarding his dental appearance. Similar findings were described by Bendo *et al.* [33] in which the impact of TDI on the quality of life was stronger regarding to social wellbeing than others aspects.

The treatment of TDI is crucial to ensure the integrity of the affected tooth, consequently facilitating healthy social and emotional development of the individual. Different approaches can be considered for the reconstruction of fractured anterior teeth. In this case report it was performed the tooth restoration with composite resin with casting, waxing and rehabilitation technique by using a silicone guide. This technique is used in order to assist the professional in obtaining an adequate shape and contour for the tooth to be restored [27]. It requires at least two clinical sessions, as a working model is necessary for the waxing to be performed and, later, the guide is made on it. This, however, allows for predictability as to the

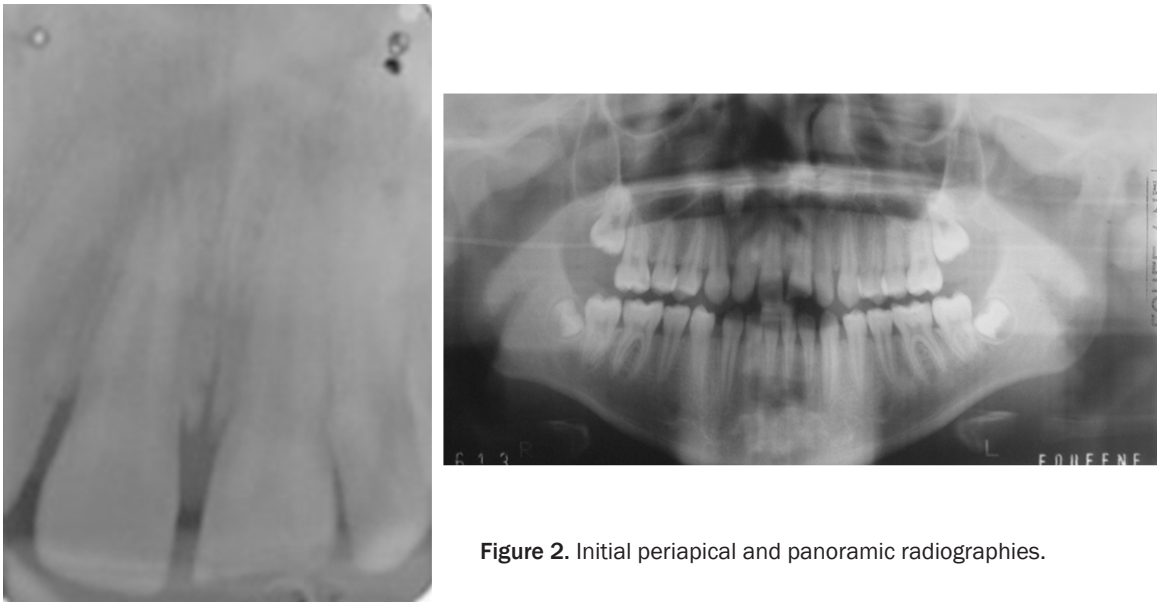

Figure 2. Initial periapical and panoramic radiographies.

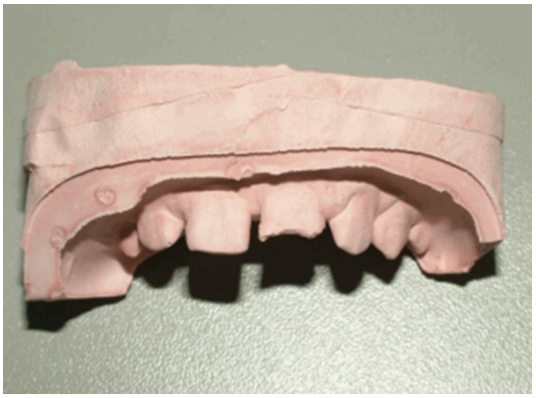

Figure 3. The model obtained to laboratory wax up and silicone guide.

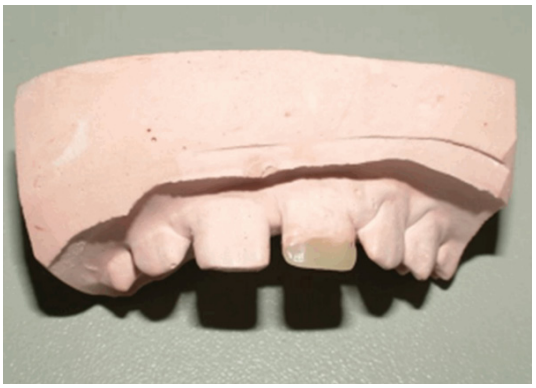

Figure 4. Front view of the waxed model.

Figure 5. Palatal view of the waxed model.

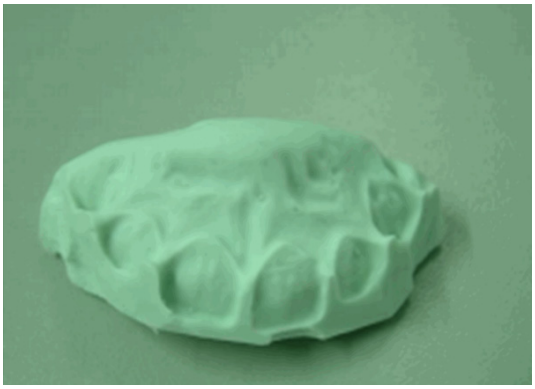

Figure 6. Silicone guide with excess removed.

shape and size of the teeth, which facilitates the execution of the restorative treatment and reduces the clinical time necessary for the execution of all the steps of the restoration [34-36]. The case reported demonstrates that the

Figure 7. Checking the silicone guide directly in the patient's mouth.

Figure 8. Palatal, proximal and incisal aspects being built with small composite increments.

rehabilitation treatment with composite resin carried out with the help of a silicone guide can be considered an alternative to the treatment of crown fractures. Thus, this technique promotes an adequate aesthetic due to the ability to modulate color and shape of the tooth in a minimally invasive approach.

To evaluate the impact of oral health some instruments have been developed. The use of solid instruments for measuring the impact of OHRQoL is essential once it allows concluding that the restorative treatment of TDIs has a real benefit on people's lives [37]. One such instrument is the Child Perceptions Questionnaire (CPQ11-14)-Impact Short Form (ISF: 16) developed for 11-14-year-old children. This instrument has to be proven valid, reliable and used on Brazilian children [30].

In a systematic review, Antunes *et al.* [38] concluded that the impact of TDI on OHRQoL in early adolescents aged 11 to 14 was significant in every assessed domain CPQ11-14. This is in accordance with the present case report where is possible to observe when the adolescent presented untreated TDI in the upper incisors, he had more difficulty in chewing and avoided smiling. There was an impact on the social well-being subscale, as well as, an impact on functional and emotional well-being. However, this study has some limitations, once it does not represent society as a whole. It is important to highlight the importance of dental trauma care programs (DTCP). The literature shows that children aged 8 to 14 years who attended a TDI center [39] and their families [40] had improvements in their OHRQoL after TDI treatment. Milani *et al.* [41], also concluded that there was a reduction in the impact of TDI on OHRQoL after the attendance of patients and their families in a DTCP. It becomes necessary the development of public health interventions tailored to the different contexts [38, 42]. The DTCP has wide relevance in the context of the local population and its surroundings, treating and monitoring patients who have suffered TDI.

Figure 9. Final restoration of the upper left central incisor and final smile of the adolescent.

TDI in the anterior tooth had a negative impact on social wellbeing of this adolescent, mainly with regard to avoiding smiling or laughing and being concerned about what other people may think or say. It is relevant to dental professionals to understand the influence of aesthetic and functional reconstruction of dental fractures in anterior teeth mainly on the psychosocial aspect of the patient. And last but not least, to see the patient in an integral way.

Conclusion

TDI in the anterior tooth had a negative impact on the social wellbeing of this adolescent. After

Table 2. Short forms of the Child Perceptions Questionnaire for 11-14-year-old children (CPQ11-14): oral symptoms

CPQ_{11-14} questionnaire										
Oral symptoms: In the past 3 months, how often have you ... (had/been) ... because of your teeth/mouth?										
ISF specific questions	BEFORE					AFTER				
	(0)	(1)	(2)	(3)	(4)	(0)	(1)	(2)	(3)	(4)
1-Pain in teeth/mouth	X					X				
2-Bad breath		X				X				
3-Mouth sores				X		X				
4-Food caught between teeth				X		X				

Scale: "Never" = 0; "Once/twice" = 1; "Sometimes" = 2; "Often" = 3; and "Everyday/almost every day" = 4.

Table 3. Short forms of the Child Perceptions Questionnaire for 11-14-year-old children (CPQ11-14): functional Limitations

CPQ_{11-14} questionnaire										
Functional Limitations: In the past 3 months, how often have you ... (had/been) ... because of your teeth/mouth?										
ISF specific questions	BEFORE					AFTER				
	(0)	(1)	(2)	(3)	(4)	(0)	(1)	(2)	(3)	(4)
1-Taken longer to eat a meal	X					X				
2-Difficulty chewing firm foods				X		X				
3-Difficulty saying words	X					X				
4-Difficulty drinking or eating hot or cold foods				X		X				

Scale: "Never" = 0; "Once/twice" = 1; "Sometimes" = 2; "Often" = 3; and "Everyday/almost every day" = 4.

Table 4. Short forms of the Child Perceptions Questionnaire for 11-14-year-old children (CPQ11-14): emotional well-being

CPQ_{11-14} questionnaire										
Emotional well-being: In the past 3 months, how often have you ... (had/been) ... because of your teeth/mouth?										
ISF specific questions	BEFORE					AFTER				
	(0)	(1)	(2)	(3)	(4)	(0)	(1)	(2)	(3)	(4)
1-Felt irritable/frustrated				X		X				
2-Felt shy				X		X				
3-Upset	X					X				
4-Concerned what people think about your teeth/mouth				X		X				

Scale: "Never" = 0; "Once/twice" = 1; "Sometimes" = 2; "Often" = 3; and "Everyday/almost every day" = 4.

Table 5. Short forms of the Child Perceptions Questionnaire for 11-14-year-old children (CPQ11–14): social well-being

CPQ_{11-14} questionnaire										
Social well-being: In the past 3 months, how often have you ... (had/been) ... because of your teeth/mouth?										
ISF specific questions	BEFORE					AFTER				
	(0)	(1)	(2)	(3)	(4)	(0)	(1)	(2)	(3)	(4)
1-Avoided smiling/laughing				X		X				
2-Argued with children/family	X					X				
3-Teased/called names	X					X				
4-Other children asked about your teeth, lips, jaws and mouth?	X					X				

Scale: "Never" = 0; "Once/twice" = 1; "Sometimes" = 2; "Often" = 3; and "Everyday/almost every day" = 4.

the oral rehabilitation, the patient showed improvement on OHRQoL demonstrating autonomy and self-confidence in his reintegration into the social environment.

Disclosure of conflict of interest

None.

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