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Case Report

The impact of traumatic dental injury on sensory perception and oral health-related quality of life of a child/adolescent before and after the treatment with aesthetic prosthesis: case report

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Abstract: Children and adolescents are most frequently affected by Traumatic Dental Injuries (TDIs). Scientific evidence shows that TDIs have a negative impact on the oral health-related quality of life (OHRQoL) of children/adolescents and their families. This article aimed to report two cases of avulsion and how the treatment influenced the oral sensory perception and OHRQoL. Two patients (8 and 14 years) from a "Dental Trauma Care Program" (DTCP) presenting avulsion were evaluated. The stereognosis test assessed oral sensory perception. This test obtains the average of right and wrong answers, as well as the time spent to perceive 6 silicone objects with different geometric shapes. Child Perceptions Questionnaire (CPQ) was applied to evaluate the OHRQoL through interviews. Based on the two reports, it was possible to observe a satisfactory improvement in the OHRQoL of the child/adolescent and their families. TDI influenced negatively the oral sensory perception of both patients. Since the aesthetic prosthesis did not entirely improve the patients' oral tactile perception, it may be considered a temporary solution.

Keywords: Traumatic dental injury, child, adolescent, oral stereognosis, quality of life, oral health

Introduction

TDIs are a very common oral involvement presenting high rates of occurrence in several countries [1]. Scientific evidence shows that TDIs have a negative impact on the oral health-related quality of life (OHRQoL) of children/adolescents [2] and their families [3]. Avulsion is the most acute type of TDI and to assess how its treatment may influence the OHRQoL is extremely important, once it may improve the patient's quality of life [4].

Quality of life is defined as individuals' subjective perceptions about their position into the social and cultural sphere, the value systems in which they live, taking into consideration their goals, expectations, standards and concerns [5]. Oral health is an integral part of health. OHRQoL has a multidimensional character reflecting on the comfort of the individual when eating and sleeping, on social interactions, on self-esteem, and on oral health satisfaction [5].

The oral cavity plays an important role in recognizing the environment. It has an ample capacity and intensity to detect different stimuli, due to a large number of neural receptors present in numerous oral structures, such as oral mucosa and tongue. These oral structures are fundamental to the oral stereognosis mechanism [6].

Stereognosis is the mental perception of depth or three-dimensionality by the senses, usually in reference to the ability to perceive the form of solid objects by palpation. This concept was extended to the oral stereognosis. It involves a motor activity through the manipulation of forms intraorally observing their identification or not by the patient when in contact with lips,

Figure 1. Patient 1 before treatment.

Figure 2. Patient 1 after treatment.

tongue and teeth [7]. Some factors and parameters may influence the oral stereognosis, such as: edentulism, temporomandibular joint problems, visual impairment, hyposalivation, fixed dentures, complete dentures, cleft palates and malocclusion [8-14].

Few studies assessed the influence of TDI treatment on OHRQoL of children/adolescents and family [3, 4, 10, 13, 15-17]. To the best of our knowledge, there is no study in the literature assessing how TDI may affect the sensory function. The present study aimed to report two clinical cases of avulsion with the respective treatment and their impact on the oral sensory perception and oral health-related quality of life.

Clinical report

The clinical cases reported in this paper belong to the project entitled "Dental Trauma Care Program (DTCP): evaluation of clinical care, oral health-related quality of life and casuistic". The project was registered by the CAAE number 025470-872117.8.0000.5626 and approved by a local Research Ethics Committee protocol n° 2.320.329. The patients signed the informed consent.

A single examiner specialized in Pediatric Dentistry with extensive experience in traumatology carried out the patients' clinical examination to assess their oral conditions. The examiner also recorded data such as sex, age and dental trauma history from both children. The rehabilitation treatment planned was aesthetic prosthesis.

The patients answered the Brazilian version of the Child Perceptions Questionnaire 11-14 (CPQ11-14) [18] to assess the impact of the oral health conditions on the quality of life of children aged from 11 to 14 years. A previous study confirmed that this questionnaire is effective for children aged from 8 to 14 years (CPQ All) [19]. This instrument has 16 items divided into 4 subscales: i) oral symptoms, ii) functional limitations, iii) emotional well-being, iv) social well-being.

Oral sensory perception was assessed using the oral stereognosis test and performed according to Hirano's criteria [20]. Six addition silicone objects with different geometric shapes (square, rectangle, triangle, semi-circle, circle and ellipse), and dimensions of 8×8×2 mm were used [20].

To make the oral stereognosis test, the patient seated comfortably in an upright position on a dental chair. The subject remained with the eyes closed to do not visualize the shape and size of the objects. The test has consisted in six objects used in random order, placed on the dorsum of the tongue and a digital stopwatch started as soon as the object made contact with the tongue. Up to this moment, the volunteer freely moved the object inside the mouth to identify the shape [13]. The patient tried each shape just once. Then, received a record containing illustrations of all objects' shapes, opened the eyes and pointed out the tested object at that time. The final score ranged from 0 to 12 considering the correct answers. How long the patient spent to identify the forms was also recorded.

Case report 1

Patient A.Y.S.O, male, 08 years old attended our Dental Trauma Care Program clinic three days after the trauma occurrence due to a falling from his own height. Clinical and radiographic examination showed absence of tooth 21 (avulsion) (**Figure 1**). The treatment was the insertion of an aesthetic prosthesis (**Figure 2**).

The OHRQoL and the oral stereognosis tests were performed before and three weeks after the treatment. Regarding the OHRQoL, the score obtained before treatment was 21 and 03 after treatment (impact reduction of 18 points) (**Table 3**). Concerning the oral stereognosis test with and without the aesthetic prosthesis, the patient obtained 08 points. The average to identify the forms was 12.28 seconds before and 08.46 seconds after treatment.

Case report 2

Patient M.N.P., male, 14 years old attended our Dental Trauma Care Program clinic six months after the trauma occurrence due to a cycling accident. Clinical and radiographic examination showed absence of the elements 11 and 21 (avulsion). The treatment was the insertion of an aesthetic prosthesis (**Figure 3**). This patient entered a clinical and radiographic monitoring program until reaching the ideal age to place an implant. The OHRQoL and the oral stereognosis tests were performed before and three weeks after the treatment. Regarding the OHRQoL, the score obtained before treatment was 29 and 05 after treatment (impact reduction of 24 points) (**Table 3**). Concerning the oral stereognosis test with and without the aesthetic prosthesis, the patient obtained 08 points. The average to identify the forms was 17.16 seconds before and 12.35 seconds after treatment (**Figure 4**).

Discussion

TDIs are considered a public health problem due to the high prevalence [21, 22]. This high prevalence justifies this study since untreated TDI generates a significant negative impact on OHRQoL [23]. Besides, up to this moment, there are no studies assessing TDIs and their possible changes in oral stereognosis. This clinical report is the first study designed for this purpose.

Two questionnaires were applied (CPQ) to evaluate the OHRQoL. Both instruments were used in several studies associated with TDI [2, 3, 19], and its treatment [3, 4, 15-17]. In the two cases presented in this report, TDI caused a negative impact on the OHRQoL of both children and their families. After treatment, we observed an improvement on the OHRQoL (**Table 1**).

Dental avulsions may generate aesthetic discomfort, notably in older children, and sometimes, psychosocial involvement. These facts may lead to some problems, such as difficulty in pronouncing certain words, the discomfort of eating, difficulties in social relationships, and bullying.

In the present study, the type of TDI is one of the factors that could justify the high negative impact on sensory perception and the OHRQoL. In both avulsion cases, the definitive tooth loss generated high negative scores on the OHRQoL. Another factor to be pointed out is the time for seeking care. The longer the patient takes to seek care, the worse is the prognosis. It was not possible to confirm this fact in this study. Both patients had the worst scores. This fact suggests that the type of TDI influences more than the time to seek care.

Oral stereognosis is a simple test and quick to perform. It does not extend the child's appointment, which is of paramount importance, especially in Pediatric dentistry. Extended treatments may cause stress and loss of behavior management. The methodologies for assessing oral stereognosis follow an easy protocol. They vary according to the type of the material, such as metal [9] or addition silicone [20]. Regarding the number of objects, some studies reported 6 pieces [12, 13, 20], 7 [9] or 12 [24]. About the shapes, some authors used different geometric shapes [12, 13, 20, 24]. In the present study, addition silicone material was preferable since it is easy to manipulate and has a simple scheme of 6 geometric shapes, as suggested by Hirano [20].

Oral stereognosis test uses lips, tongue, and teeth to determine the object's shape, size, and texture placed in the oral cavity [6]. As observed in this study, when TDI occurred, it affected part of the sensory perception reducing the ability to perceive and identify shapes and textures. Oral stereognosis tests applied after the oral rehabilitation treatment of children with enamel or enamel and dentin fractures showed an improvement of these patients to identify the objects. Cases of enamel or enamel and dentin fractures may generate sharp edges causing injuries to the tongue and lips tissues.

Table 1. Studies evaluating TDI and its treatment on OHRQoL of children, adolescents and family

Author, year	Type of study	Sample	Conclusion
Antunes et al., 2020 [2]	Systematic review and meta-analysis	Children, adolescents and family.	Impact of TDI on OHRQoL in children under age 10 was only significant in the symptom domain. The impact of TDI on OHRQoL in early adolescents aged 11 to 14 was significant in every assessed domain.
Antunes et al., 2013 [3]	Non-randomized clinical trial (before and after study)	Family	It was observed positive decrease in the impact on OHRQoL after TDI treatment. The responsiveness of the FIS (Brazilian version) in detecting the family's change in QoL after TDI treatment was confirmed by standardized response means.
Antunes et al., 2013 [4]	Systematic Review	Children and adolescents.	Evidences detected changes in the impact on the quality of life of children and adolescents younger than 14 years old after interventions related to oral health.
Antunes et al., 2011 [15]	Non-randomized clinical trial	Children, adolescents and family.	Impact of TDI on OHRQoL in children under age 10 was only significant in the symptom domain. The impact of TDI on OHRQoL in early adolescents aged 11 to 14 was significant in every assessed domain.
Berger et al., 2009 [16]	Non-randomized clinical trial (before and after study)	Children, adolescents and family.	Severe TDI produce initial and ongoing pain. Detrimental effects on the OHRQoL of both children and parents are still present at one-year and these long-term effects are different for children and parents.
Magno et al., 2019 [17]	Non-randomized clinical trial (before and after study)	Children, adolescents and family.	CPQ and FIS showed that restorative treatment of crown fracture involving enamel and dentin increases the OHRQoL of children and adolescents, but not influence the OHRQoL of their families.
Antunes et al., 2013 [23]	Case control	Children and adolescents.	Children and adolescents who suffered TDI showed negative experiences and greater functional and emotional impact.

Table 2. Studies assessing the oral stereognosis on oral sensory functions

Author, year	Type of study	Factor Evaluated	Conclusion
Agrawal et al., 2011 [8]	Randomized clinical trial	Fixed prosthesis	Oral stereognostic level was found to be higher in younger than older subjects. The level of satisfaction was found to be higher in older subjects than younger subjects. The acceptance of fixed prosthesis also depends upon patient's oral perception and discriminatory skill for external morphology.
Dalaya et al., 2014 [9]	Non-randomized clinical trial	Denture and no denture wearers	Oral stereognostic level of completely edentulous subjects was higher than subjects with denture wearers. There were no significant differences in edentulous persons with or without denture. Stereognostic score was low in most satisfied denture wearers and was high in dissatisfied denture wearers.
Fukutake et al., 2018 [10]	Cross-sectional	Complete denture wearers	Oral stereognostic ability was significantlyassociated with intake of greenand yellow vegetables in older complete denture wearers.
Meenakshi et al., 2014 [13]	Non-randomized clinical trial (before and after study)	Denture and no denture wearers	Oral stereognostic scores was significantly increased 1 month post-treatment compared to 30 min post-treatment ($p < 0.05$). It is a reliable test for measuring patients' oral stereognostic perception and may be used as one of the clinical aids in appreciating the functional limitations imposed by the prostheses.
Ikebe et al., 2007 [24]	Non-randomized clinical trial	Denture wearers	Reduced oral sensory function, low occlusal force, and hyposalivation appear to be associated with impairment of masticatory performance in aged complete denture wearers.

Table 3. Oral health-related quality of life assessed by CPQ11-14 (child impact)

Patient		Total score	Oral symptoms	Functional Limitations	Emotional well-being	Social well-being
Nº 1	Before	21	12	5	2	2
	After	3	1	1	1	0
Impact reduction (points)		18	11	4	1	2
Nº 2	Before	29	2	9	13	5
	After	5	2	2	0	1
Impact reduction (points)		24	0	7	13	4

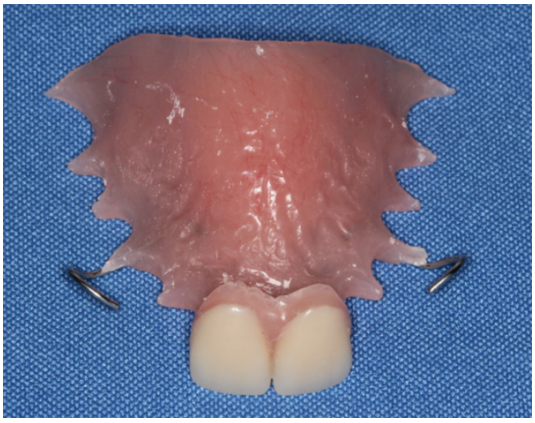

Figure 3. Patient 2 aesthetic prosthesis.

This situation impairs the perception of the shapes, and consequently, the sensory function.

The treatment proposed in the two cases of avulsion presented in this study was the placement of an aesthetic prosthesis. We observed no changes in the scores with and without it. On the other hand, the time to identify each piece increased, which is following a previous study.performed by Dalaya [9] that found no significant difference in the scores of patients with and without prosthesis.

The prosthetic area largely evaluated oral stereognosis [8-10, 13] (**Table 2**). However, up to this moment, the oral stereognosis tests have not been applied for TDI evaluation yet. For this reason, as a limitation of this study, it was not possible to compare our results with previous ones. We observed that TDI affected the patients' stereognosis capacity, which improved after oral rehabilitation. Previous studies observed that patients who suffered tooth loss presented a negative change in the patterns of oral stereognosis [9, 12, 13, 24].

Figure 4. Patient 2 with aesthetic prosthesis.

We strongly suggest replicating this preliminary report. Studies with a larger sample to obtain more representative results may demonstrate the importance of applying the stereognosis tests in patients who suffered TDI.

We observed an improvement in the OHRQoL after the patient's treatment. This is the first report in the literature evaluating the stereognosis test in children/adolescents who suffered TDI. The aesthetic prosthesis is really a temporary solution, as it did not improve completely the patients' oral tactile perception after treatment. These findings are extremely important to evaluate clinical indicators related to DTCP. They emphasize the importance of oral health care programs, which are scarce regarding TDI [25].

Conclusions

Based on the two reports, it was possible to observe a satisfactory improvement in the OHRQoL of child/adolescent and their families. TDI negatively influenced the oral sensory perception of both patients. Since the aesthetic prosthesis did not entirely improve the patients' oral tactile perception, it may be considered a temporary solution.

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Disclosure of conflict of interest

None.

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