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Avaliação da capacidade de futuros Odontólogos em elaborar planos de tratamento no traumatismo dentário

Assessment of the capacity of future Dentists to elaborate treatment plans for dental trauma

Capacidad de los futuros Dentistas para desarrollar planes de tratamiento para el trauma dental

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Resumo

O prognóstico do traumatismo dentário depende de profissionais com conhecimento sedimentado e atualizado. O objetivo foi avaliar a capacidade dos estudantes de graduação em odontologia para elaborar planos de tratamento para traumatismos dentários. Este estudo

transversal, observacional e quantitativo teve uma amostra de 242 participantes. Foi selecionado um caso clínico envolvendo avulsão do dente 11 e fratura coronoradicular complexa do dente 21. Todos os dados referentes aos exames do paciente foram adicionados a uma ficha clínica, que foi entregue aos alunos do último ano do curso de graduação em odontologia por três anos consecutivos. Os alunos foram instruídos a elaborar um plano de tratamento para este caso. Os fatores mais considerados nos planos de tratamento da avulsão foram: como, quando e onde ocorreu o trauma, idade do paciente e condição sistêmica. Dos estudantes, 39,7% elaboraram um plano de tratamento adequado, sendo o principal erro a falta de ajuste oclusal. Além disso, 9,9% dos estudantes apresentaram um plano de tratamento adequado para a fratura coronoradicular. A recuperação do espaço biológico periodontal e a indicação de retentores intrarradiculares foram as principais dificuldades. Conclui-se que os estudantes do curso de graduação em odontologia tiveram grande dificuldade em formular planos de tratamento adequados para casos mais graves de trauma dentoalveolar que envolvem diversas especialidades.

Palavras-chave: Traumatismos dentários; Planejamento de assistência ao paciente; Assistência odontológica integral; Ensino.

Abstract

The prognosis of dental trauma depends on professionals with solid and updated knowledge. The objective was to evaluate the ability of undergraduate dentistry students to develop treatment plans for dental trauma. This cross-sectional, observational, quantitative study had a sample of 242 participants. A clinical case involving avulsion of tooth 11 and complex coronary root fracture of tooth 21 was selected. All data relating to the patient's exams were added to a clinical record, which was delivered to students in the final year of the undergraduate dentistry course for three years consecutive. The students were instructed to develop a treatment plan for this case. The factors most considered in avulsion treatment plans were: how, when and where the trauma occurred, the patient's age and systemic condition. Of the students, 39.7% developed an adequate treatment plan, the main mistake being the lack of occlusal adjustment. In addition, 9,9% of students had an adequate treatment plan for coronary artery fracture. The recovery of periodontal biological space and the indication of intraradicular retainers were the main difficulties. It is concluded that undergraduate dentistry students had great difficulty in formulating treatment plans suitable for more severe cases of dentoalveolar trauma involving several specialties.

Keywords: Tooth injuries; Patient care planning; Comprehensive dental care; Teaching.

Resumen

El pronóstico del trauma dental depende de profesionales con conocimientos sólidos y actualizados. El objetivo era evaluar la capacidad de los estudiantes universitarios de odontología para desarrollar planes de tratamiento para el trauma dental. El estudio transversal, observacional y cuantitativo tuvo una muestra de 242 participantes. Se seleccionó un caso clínico con avulsión del diente 11 y fractura de raíz coronaria compleja del diente 21. Todos los datos relacionados con los exámenes del paciente se agregaron a un registro clínico, que se entregó a los estudiantes en el último año del curso de odontología de pregrado durante tres años. consecutivo. Los estudiantes recibieron instrucciones de desarrollar un plan de tratamiento para este caso. Los factores más considerados en los planes de tratamiento de avulsión fueron: cómo, cuándo y dónde ocurrió el trauma, la edad del paciente y la condición sistémica. De los estudiantes, el 39.7% desarrolló un plan de tratamiento adecuado, el error principal fue la falta de ajuste oclusal. Además, el 9.9% de los estudiantes tenían un plan de tratamiento adecuado para la fractura de la arteria coronaria. La recuperación del espacio biológico periodontal y la indicación de retenedores intraradiculares fueron las principales dificultades. Se concluye que los estudiantes universitarios de odontología tuvieron grandes dificultades para formular planes de tratamiento adecuados para casos más graves de trauma dentoalveolar que involucraban varias especialidades.

Palabras clave: Lesiones dentales; Planificación de la atención al paciente; Atención dental integral; Ensenãnza.

1. Introduction

Dentoalveolar traumas often involve complex lesions that modify the function, aesthetic and comfort of the patient (Andreassem, et al.,2012). In most cases, first aid is needed (Upadhyay, et al., 2012) to ensure better support for the patient and an improved prognostic, which requires that both the general public and professionals possess knowledge of the appropriate treatment strategies (Traebert, et al., 2009).

The classification, treatment and prognostic of different types of dentoalveolar trauma are presented as isolated injuries (Andreassem, et al.,2012), although many clinical cases show an association between them. Therefore, it is the practitioner's responsibility to make treatment plans based on the particularities of each situation. The procedural sequence of the consultation is the ideal moment to develop and employ these plans, considering that they

directly influence the prognostic and avoid future complications, including the loss of teeth (de Castro, et al., 2010).

General practitioners are considered the best qualified professionals to perform most of the necessary procedures and coordinate the team that will treat the patient (Baker, 1968). The fragmentation of dental treatment into various specialties, however, too often leads to an inferior end result for patients (Kostopoulou & Duggal, 2005). This problem is even more manifest in trauma cases, where the dentist that performs the initial diagnostic usually doesn't perform the subsequent treatment or follow-ups. As a result, patients can lose teeth or otherwise suffer avoidable damage. Therefore, a greater emphasis on this particular area in under- and postgraduate education is recommended (Kostopoulou & Duggal, 2005).

Few surveys assess the qualification of dental students for the treatment of dental trauma. Since this field of action is not considered an area of dental specialization, it is considered necessary to know the ability of dentistry students to perform this care (Andersson, et al., 2012). In this context, the purpose of this study was to evaluate the capacity of undergraduate students to elaborate adequate treatment plans for dentoalveolar trauma with avulsion and complex crown-root fracture.

2. Methodology

The study was initiated only after approval by the Ethics Committee of the Dentistry School of Araçatuba (Process FOA-2004-01772).

The participants of this study were recruited among undergraduates students of the last year of the dentistry course subject Integrated Clinic at the Dentistry School. All participants gave informed consent.

This cross-sectional, observational, quantitative study (Pereira, et al. 2018) was conducted with a convenience sample of 242 participants, mean age 23 years old, from a university where dental trauma receives both theoretical and practical attention; the latter in a faculty clinic that serves the local community.

Inclusion criteria were: to be enrolled in the last year of the dentistry course, with sufficient grades in prior and related subjects.

This study was conducted in three consecutive years (2014-2016) with 80, 79, and 83 students, respectively, totalling 242 students, in the completion period of the dentistry course. The questionnaires were applied in group in a classroom. The supervisor followed a pre-established set of instructions in order to standardise the procedure. The research aims were

explained to the students, instructions about how to respond were given and anonymity guaranteed. Next, it was verified if all participants had understood the instructions, thus decreasing the probability of errors or questions left unanswered.

For the purpose of the study, a clinical case presenting avulsion of tooth 11 and complex crown-root fracture of tooth 21 was selected. All data related to the patient's exams, including photographic and radiographic images, were added to a clinical record, with a space for the elaboration of one or more treatment plans (Figure 1).

Figure 1. File with clinical case of tooth avulsion and complicated root coronal fracture presented to undergraduate students for the preparation of one or more treatment plans.

CLINICAL CASE

I. IDENTIFICATION:

GENDER: Male AGE: 18 years MARITAL STATUS: Single RACE: White

II. MEDICAL HISTORY: N/A

III. MAIN COMPLAINT:

1. Prior dental trauma: N/A

2. Present dental trauma:

Date: 07/06/14 Time: 07:00 Location: Av. Vitória Ré How? Bicycle accident

The patient told that the tooth was found in the collar of his shirt on arrival at the ER. Until that moment, he had not noticed that his tooth was out of place. The tooth was therefore kept dry for 30 minutes, after which it was put in a container with saline. The patient received a tetanus vaccinationand pain relief medication (Dipyrone – 1 tablet every 8 hours, and diclofenac sodium – 30 drops every 8 hours). Next, the patient was referred to the clinic of the Dentistry School for further treatment. The time between the accident and the consultation was 2h30.

IV. EXTRABUCCAL EXAM:

The patient has abrasion in the upper lip and chin, as well as injury and bruising to the labial mucosa.

V. INTRABUCCAL EXAM:

1. SOFT TISSUE: lesions to the mucosa and gingiva – type and localisation

The patient has gingival lacerations around tooth 11 and in the upper and lower labial mucosa.

VI. HARD TISSUE:

Teeth sensitive to the touch, cold/hot and occlusion; fracture of other dental elements – type and extension; root fracture.

11. Avulsion

21. Crown-root fracture with exposed pulp and involvement of the periodontal biological space

VII. RADIOGRAPHIC EXAM:

Image of the empty socket, region tooth 11

VIII. DIAGNOSTIC:

11. Avulsion

21. Complex crown-root fracture

IX. ILLUSTRATIONS

ELABORATE A TREATMENT PLAN FOR THE PROPOSED CLINICAL CASE:

Source: Authors.

Figure 1 shows the data used by undergraduate students to develop treatment plans for dental trauma cases. The form contains all detailed examinations and trauma history, being essential for the elaboration of the treatment.

The data was considered as cited or not, and right or wrong according to the protocol used. They were just considered adequate when it was cited and right for the clinical cases presented.

Data related to the treatment plan for avulsion were tabulated in accordance with the treatment protocol proposed by the discipline of Integrated Clinic, which consists of treatment of the socket and tooth surface, endodontic treatment dental splinting, antibiotic therapy, tetanus vaccination (Andersson, et al., 2012) and occlusal adjustment.

The treatment of choice for this specific case of avulsion is replantation, which, due to the long extra-alveolar period is classified as delayed replantation. The adequate treatment protocol consists of treatment of the: 1) tooth socket by removing the coagulum from the socket with a stream of saline and root surface; 2) the treatment of tooth surface that consist in remove attached non-viable soft tissue carefully; 3) root canal treatment to the tooth can be carried out prior to replantation or later, 4) dental splint for 4 weeks using a flexible splint, 5) administer systemic antibiotics and check of tetanus vaccination (Andersson, et al., 2012) and 6) occlusal adjustment. The data regarding complex crown-root fracture treatment plan were tabulated according to three main phases, such as, periodontal biological space recovery; pulp treatment; and crown restoration (Diangelis, et al., 2012).

For the presented case of complex crown-root fracture the appropriate treatment consisted of: 1) recovery of the biological space of the periodontium through periodontal surgery or orthodontic traction, 2) endodontic treatment as a pulpectomy and a 3) direct composite filling, bonding of dental fragments or fixed partial prosthesis, provided that an intra-radicular retainer is previously placed.

Statistical analyses were conducted using SPSS 20.0 (IBM Corporation, New York, USA). For comparison of the number of adequate answers about the clinical cases between the groups (2014, 2015 and 2016) was used the Kruskal-Wallis test ($\alpha = 5\%$) and quantitative analysis in percentiles of all answers cited by the respondents was made.

3. Results and Discussion

The data were obtained from the treatment plan for the clinical case that was selected for the students (Figure 1). There was no significant difference between the number of adequate treatment plans between 2014, 2015 and 2016 groups for the case of avulsion ($p = 0.054$) and complex crown-root fracture ($p = 0.796$).

The factors that were considered for the assessment for the avulsion in the proposed clinical case are outlined in Table 1.

Table 1. Factors considered for the treatment plan of the dental avulsion clinical case.

Considered Factors	Number	Percentage (%)
How, when and where did the accident occur	178	73.5
Age of the patient	100	41.3
Systemic condition	79	32.6
Rhizogenesis stage	61	25.2
Time elapsed after trauma	60	24.8
Type and intensity of the trauma	54	22.3
Pulp condition	49	20.2
Contamination	38	15.7
Degree of hygiene	24	9.9
Occlusion	20	8.3
Periodontal condition	10	4.1

Source: Authors.

In the treatment plans for avulsion, all but one of the students suggested replantation. A total of 96 students (39.7%) made satisfactory treatment plans; the rest was considered inadequate (146 students – 60.3%). Sixteen students (6.6%) considered the replantation as immediate, whereas a large majority of 219 students (90.5%) correctly identified it as delayed replantation, however the complete treatment protocol were not attended (Table 2). A 54.1% majority followed nearly all the steps of the protocol, but failed to appreciate the necessity of occlusal adjustments following replantation of the tooth (Table 3). Moreover, few participants (15.7%) cited the necessity to apply tetanus vaccination (Table 3).

Table 2. Treatment plans for the delayed replantation.

Conduct	Proposed treatment plan	Number
Adequate	Treatment of the socket	
	Root surface treatment	
	Endodontic treatment	
	Containment	
	Antibiotic therapy	
	Occlusal adjustment	
Total		**96**
Inadequate	Protocol for immediate replantation	16
	Did not indicate replantation	01
	Failed to perform one of the steps of the delayed replantation protocol, as described above	129
Total		**146**

Source: Authors.

Table 3. Number of participants that indicated each stage of the treatment protocol for avulsion.

		Assessment groups			
Stages of the treatment plan	**Classification of the treatment**	**2014 n=80**	**2015 n=79**	**2016 n=83**	**Total n=242**
Did not replant	I	0	1	0	1
Immediate replantation	I	3	2	11	16
Delayed replantation	A	78	72	69	219
Socket treatment	A	76	73	69	218
Root canal treatment	A	76	70	66	212
Surface treatment	A	74	70	61	205
Containment	A	76	75	72	223
Antibiotic therapy	A	73	71	55	199
Tetanus vaccination	A	2	35	1	38
Occlusal adjustment	A	31	50	30	111

A=Adequate; I=Inadequate.

Source: Authors.

With regard to the second type of trauma included in the study; complex crown-root fracture, only 24 students (9.9%) came up with an adequate treatment plan for this case, as is shown in Table 4.

Biological restoration using periodontal surgery was suggested by 28.5%, followed by orthodontic traction (25.6%). Furthermore, Table 5 shows that 99 treatment plans (40.9%) did not contemplated biological restoration.

Pulpectomy was the treatment of choice of a 61.1% majority, although a small number of participants considered intra-radicular retention an important factor in restoring the crown (16.5%, Table 5). The most commonly suggested treatments for the crown restoration were bonding of dental fragments (42.6%) and direct composite filling (35.1%). However, if the placement of an intra-radicular retainer was not pointed out, the answer was considered inadequate (Table 5).

Table 4. Proposed treatment plans for the complex crown-root fracture, adequate and some examples of inadequate ones.

Conduct	Proposed treatment plan	Number
Adequate	Periodontal surgery + endodontic treatment + composite filling with intraradicular retainers	04
	Periodontal surgery + endodontic treatment + prosthesis with intraradicular retainers	09
	Orthodontic traction + endodontic treatment + composite filling with intraradicular retainers	04
	Orthodontic traction + endodontic treatment + prosthesis with nucleus	07
Total		**24**
Inadequate	Periodontal surgery + endodontic treatment + bonding of dental fragments	17
	Periodontal surgery + endodontic treatment + composite filling	20
	Periodontal surgery + pulpotomy + composite filling	10
	Periodontal surgery + capping + composite filling	08
	Surgical traction + endodontic treatment + composite filling with intraradicular retainers	01
	Surgical traction + endodontic treatment + prosthesis	04
	Orthodontic traction + endodontic treatment + bonding of dental fragments	08
	Orthodontic traction + endodontic treatment + composite filling	17
	Orthodontic traction + pulpectomy + composite filling	14
	Orthodontic traction + capping + composite filling	05
	Surgical traction + endodontic treatment + bonding of dental fragments	01
	Surgical traction + endodontic treatment + composite filling	02
	Surgical traction + pulpotomy + composite filling	02
	Surgical traction + capping + composite filling	01
	Others	108
Total		**218**

Source: Authors.

Table 5. Choice of treatment technique for each phase of the complex crown-root fracture.

Phases of the treatment plan		Classification of the treatment for the case	Evaluation groups 2014 n=80	2015 n=79	2016 n=83	Total n=242
Biological restoration	Surgical traction	I	6	6	0	12
	Orthodontic traction	A	18	24	20	62
	Periodontal surgery	A	22	19	28	69
	Did not plan biological restoration	I	34	30	35	99
Pulp treatment	Capping	I	5	5	8	18
	Pulpotomy	I	29	23	17	69
	Pulpectomy	A	46	51	51	148
	Did not plan treatment for pulp exposition	I	0	0	7	7
Crown restoration	Composite filling with intraradicular retainers	A	5	2	7	14
	Composite filling	I	29	27	29	85
	Bonding of dental fragments	I	41	30	32	103
	Prosthesis with intraradicular retainers	A	3	14	9	26
	Did not plan restoration	I	2	6	6	14

A=Adequate; I-Inadequate.

Source: Authors.

Although they involve routine procedures, treatment plans for dental trauma can be challenging due to the variety in types of trauma, which often require specialist knowledge about the repair of each of the related structures; periodontal ligament, pulp and bone tissue. Thus, knowledge of the classification and repair process of dental trauma is an important factor in the success of the treatment (Mamaladze, et al., 2017).

Medical and dental findings related or unrelated to the trauma are of crucial importance for the treatment plan (Andreassem, et al., 2012; Trope, 2011). The respondents of this study took care to consider the patient's age and how, where and when the trauma occurred. Nevertheless, a great majority neglected to mention the impact of complete rhizogenesis, the absence of bone loss and periapical lesions, good dental positioning and oral hygiene, perhaps because they did not consider these items relevant for the proposed treatment.

In cases of avulsion, the extra-alveolar time and storage of the tooth are fundamental factors in determining the viability of the periodontal ligament and opting for the correct treatment protocol. This detail makes all the difference for the durability of replanted teeth in

the long term. Whenever it is possible to maintain the viability of the periodontal ligament, there is a chance that this structure can be regenerated, thus avoiding the main sequel of avulsion, i.e. external root resorption (Andreasem, et al., 2012; Panzarini, et al., 2013).

The results show that a minority of the participants (39.7%) did come up with a sound treatment plan, even making the correct diagnosis of delayed replantation. Most plans did not verify occlusion, which, by the way, is also not referred to in the protocol published by the IADT (Andersson, et al., 2012).

The students also had great difficulty establishing treatment plans for the other type of clinical trauma present in this clinical case of a fracture involving enamel, dentin, cement and pulp. Here, the main problems were restoration of the periodontal biological space and crown fracture.

Orthodontic traction is considered the best technique for periodontal biological space restoration because it is quick and promotes the stretching and readjustment of periodontal fibres, thus avoiding notable bone remodelling due to rapid movement (Faria, et al., 2015; Heithersay, 1973; Ingber, 1976). According to Benenati & Simon (1986) extrusion presents the lowest risk of root resorption, because only the fibres of the periodontal ligament oppose movement, avoiding contact between the root surface and bone walls. Since external root resorptions are the main sequel of dental trauma (Andreassem, et al., 2012), this is of fundamental importance. However, when there is a possibility of bonding of dental fragments, using extrusion is not recommendable because this technique alters the incisal line and occlusion (Oesterle & Wood, 1991).

Despite being an efficient technique, periodontal surgery is hard to apply in anterior teeth due to the risk of compromising the patient's aesthetic (Bajaj, et al., 1991).

Furthermore, surgical traction is indicated as a last resort to save a tooth, although its use is restricted to cases where there is sufficient remaining dental structure to attach the tooth to. This type of treatment causes the fibres of the periodontal ligament to rupture, which can negatively influence the repair process if one considers that the tooth has already suffered a trauma to the ligament (Andreassem, et al., 2012).

Important factors in the treatment of pulp include its health (Mamaladze, et al., 2017) and the quantity of remaining dental structure, which in the analysed case was not much, so a root canal treatment was needed to retention of the dental restoration.

The fact that the patient had already completed rhizogenesis facilitated this option, because in younger patients can extrapolated dental material indication in an attempt to complete rhizogenesis.

With reference to the dental restoration, the direct composite filling stood out. This contributed to a large number of inadequate treatment plans, because despite the proprieties of adhesive materials and technological advances, in this area it is still the quantity of dental structure left that determines the choice for a restoration type (Pantaleón, et al., 2017).

Bonding of dental fragments is a conservative technique that preserves dental structures and offers aesthetic advantages for the patient. Therefore, it should be the preferred treatment where possible (Giudice, et al., 2012; Martos, et al., 2017). However, in this specific case periodontal surgery was needed to restore the periodontal biological space, which may interfere in the aesthetics, as well as root reinforcement with intraradicular retainers to provide extra support; something that none of the participants pointed out (Phebus, et al., 2014; Skupien, et al., 2016).

The other options to restore the fractured tooth were a direct composite filling in combination with intra-root reinforcement and a fixed partial prosthesis. When possible, adhesive restoration techniques are preferred, because in addition to several scientific arguments that favour their use, they allow for the preservation of healthy dental tissue (Coelho-de-Souza, et al., 2015).

The literature has shown that in general, dentists' knowledge of dental trauma is currently insufficient (Costa, et al., 2014; Menezes, et al., 2015; Akhlaghi, et al., 2014; Fujita, et al., 2014). Although most professionals have been exposed to this content at some point during their formation, the low level of contact with trauma cases in everyday dental practice means that the majority of dentists do not keep up this knowledge. As a result, they often struggle to elaborate adequate treatment plans for such cases (Menezes, et al., 2015; Manfrim, et al., 2007; Baginska & Wilczynska-Borawska, 2013). Hence, a quick way to improve the prognostic of patients who have suffered dental trauma would be to increase the presence of dentists specialised in trauma at first aid centers, health posts and hospitals (de Castro, et al., 2010; Akhlaghi, et al., 2014; Needleman, et al., 2013; Abu-Dawoud, et al., 2007).

Even though trauma is included in the dentistry course, it was a lack of clinical practice that prevented most participating students from formulating appropriate treatment plans.

4. Final Considerations

It is possible to conclude that undergraduate students had difficulty producing adequate treatment plans for a more severe case of dentoalveolar trauma that involves various specialities.

References

Abu-Dawoud, M., Al-Enezi, B., & Andersson, L. (2007). Knowledge of emergency management of avulsed teeth among young physicians and dentists. *Dental Traumatology*, *23*(6), 348-355. doi:10.1111/j.1600-9657.2006.00477.x

Akhlaghi, N., Nourbakhsh, N., Khademi, A., & Karimi, L. (2014). General dental practitioners' knowledge about the emergency management of dental trauma. *Iranian endodontic journal*, *9*(4), 251. Retrieved from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4224761/

Andersson, L., Andreasen, J. O., Day, P., Heithersay, G., Trope, M., DiAngelis, A. J., ... & Hicks, M. L. (2012). International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 2. Avulsion of permanent teeth. *Dental Traumatology*, *28*(2), 88-96. doi:10.1111/j.1600-9657.2012.01125.x

Andreasen, J. O., Lauridsen, E., Gerds, T. A., & Ahrensburg, S. S. (2012). Dental Trauma Guide: A source of evidence-based treatment guidelines for dental trauma. *Dental Traumatology*, *28*(5), 345-350. doi:10.1111/j.1600-9657.2011.01059_1.x

Baginska, J., & Wilczynska-Borawska, M. (2013). Continuing dental education in the treatment of dental avulsion: Polish dentists' knowledge of the current IADT guidelines. *European Journal of Dental Education*, *17*(1), e88-e92. doi:10.1111/j.1600-0579.2012.00765.x

Bajaj, P., Chordiya, R., Rudagi, K., & Patil, N. (2015). Multidisciplinary approach to the management of complicated crown-root fracture: a case report. *Journal of international oral*

health: JIOH, *7*(4), 88. Retrieved from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4409806/

Baker, B. R. (1968). Dental auxiliary teacher education--a bachelor of science degree program. *The Dental assistant*, *37*(2), 10-15. Retrieved from: https://europepmc.org/article/med/5240925

Benenati, F. W., & Simon, J. H. (1986). Orthodontic root extrusion: its rationale and uses. *General dentistry*, *34*(4), 285-289. Retrieved from: https://europepmc.org/article/med/3527862

Coelho-de-Souza, F. H., Gonçalves, D. S., Sales, M. P., Erhardt, M. C. G., Corrêa, M. B., Opdam, N. J., & Demarco, F. F. (2015). Direct anterior composite veneers in vital and non-vital teeth: A retrospective clinical evaluation. *Journal of Dentistry*, *43*(11), 1330-1336. doi:10.1016/j.jdent.2015.08.011

Costa, F. W. G., de Oliveira, E. H., Bezerra, M. F., Nogueira, A. S., Soares, E. C. S., & Pereira, K. M. A. (2014). Dental trauma: knowledge and attitudes of community health workers. *Journal of Craniofacial Surgery*, *25*(5), e490-e495. doi:10.1097/SCS.0000000000000916

De Castro, M. A. M., Poi, W. R., De Castro, J. C. M., Panzarini, S. R., Sonoda, C. K., Trevisan, C. L., & Luvizuto, E. R. (2010). Crown and crown–root fractures: an evaluation of the treatment plans for management proposed by 154 specialists in restorative dentistry. *Dental Traumatology*, *26*(3), 236-242. doi:10.1111/j.1600-9657.2010.00871.x

DiAngelis, A. J., Andreasen, J. O., Ebeleseder, K. A., Kenny, D. J., Trope, M., Sigurdsson, A., ... & Lenzi, A. R. (2012). International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 1. Fractures and luxations of permanent teeth. *Dental Traumatology*, *28*(1), 2-12. doi:10.1111/j.1600-9657.2011.01103.x

Faria, L. P. D., Almeida, M. M. D., Amaral, M. F., Pellizzer, E. P., Okamoto, R., & Mendonça, M. R. (2015). Orthodontic Extrusion as Treatment Option for Crown-Root

Fracture: Literature Review with Systematic Criteria. *The journal of contemporary dental practice*, *16*(9), 758-762. doi:10.5005/jp-journals-10024-1753

Fujita, Y., Shiono, Y., & Maki, K. (2014). Knowledge of emergency management of avulsed tooth among Japanese dental students. *BMC oral health*, *14*(1), 34. doi:10.1186/1472-6831-14-34

Heithersay, G. S. (1973). Combined endodontic-orthodontic treatment of transverse root fractures in the region of the alveolar crest. *Oral Surgery, Oral Medicine, Oral Pathology*, *36*(3), 404-415. doi:10.1016/0030-4220(73)90220-x

Ingber, J. S. (1976). Forced eruption: part II. A method of treating nonrestorable teeth—periodontal and restorative considerations. *Journal of Periodontology*, *47*(4), 203-216. doi:10.1902/jop.1976.47.4.203

Kostopoulou, M. N., & Duggal, M. S. (2005). A study into dentists' knowledge of the treatment of traumatic injuries to young permanent incisors. *International journal of paediatric dentistry*, *15*(1), 10-19. doi:10.1111/j.1365-263X.2005.00588.x

Giudice, G. L., Lipari, F., Lizio, A., Cervino, G., & Cicciù, M. (2012). Tooth fragment reattachment technique on a pluri traumatized tooth. *Journal of conservative dentistry: JCD*, *15*(1), 80. doi:10.4103/0972-0707.92613

Mamaladze, M., Nizharadze, N., & Vadachkoria, O. (2017). The peculiarities of treatment of uncomplicated and complicated dental injuries caused by trauma. *Georgian medical news*, (262), 28-32. Retrieved from: https://europepmc.org/article/med/28252424

Manfrin, T. M., Boaventura, R. S., Poi, W. R., Panzarini, S. R., Sonoda, C. K., & Sundefeld, M. L. M. M. (2007). Analysis of procedures used in tooth avulsion by 100 dental surgeons. *Dental Traumatology*, *23*(4), 203-210. doi:10.1111/j.1600-9657.2005.00432.x

Martos, J., Pinto, K. V., Miguelis, T. M., & Xavier, C. B. (2017). Management of an uncomplicated crown fracture by reattaching the fractured fragment—Case report. *Dental Traumatology*, *33*(6), 485-489. doi:10.1111/edt.12369

Menezes, M. C., Carvalho, R. G., Accorsi-Mendonça, T., De-Deus, G., Moreira, E. J., & Silva, E. J. (2015). Knowledge of dentists on the management of tooth avulsion injuries in Rio de Janeiro, Brazil. *Oral Health Prev Dent*, *13*(5), 457-60. doi:10.3290/j.ohpd.a33923

Needleman, H. L., Stucenski, K., Forbes, P. W., Chen, Q., & Stack, A. M. (2013). Massachusetts emergency departments' resources and physicians' knowledge of management of traumatic dental injuries. *Dental Traumatology*, *29*(4), 272-279. doi:10.1111/j.1600-9657.2012.01170.x

Oesterle, L. J., & Wood, L. W. (1991). Raising the root. *The Journal of the American Dental Association*, *122*(7), 193-198. doi:10.14219/jada.archive.1991.0229

Panzarini, S. R., Okamoto, R., Poi, W. R., Sonoda, C. K., Pedrini, D., da Silva, P. E., ... & Sedlacek, P. (2013). Histological and immunohistochemical analyses of the chronology of healing process after immediate tooth replantation in incisor rat teeth. *Dental Traumatology*, *29*(1), 15-22. doi:10.1111/j.1600-9657.2012.01127.x

Pantaleón, D. S., Morrow, B. R., Cagna, D. R., Pameijer, C. H., & Garcia-Godoy, F. (2018). Influence of remaining coronal tooth structure on fracture resistance and failure mode of restored endodontically treated maxillary incisors. *The Journal of prosthetic dentistry*, *119*(3), 390-396. doi:10.1016/j.prosdent.2017.05.007

Pereira, A. S. et al. (2018). *Metodologia do trabalhocientífico*. [*e-Book*]. Santa Maria. Ed. UAB/ NTE/UFSM. Available at: https://repositorio.ufsm.br/bitstream/handle/1/15824/Lic_ Computacao_Metodologia-Pesquisa-Cientifica.pdf?sequence=1. Accessed on: July 19, 2020.

Phebus, J. G., Owens, B. M., Davis, A., & Johnson, W. W. (2014). Fracture resistance of permanent anterior incisors using fiber-reinforced composite posts. *General dentistry*, *62*(2), 37-42. Retrieved from: https://europepmc.org/article/med/24598493

Skupien, J. A., Cenci, M. S., Opdam, N. J., Kreulen, C. M., Huysmans, M. C., & Pereira-Cenci, T. (2016). Crown vs. composite for post-retained restorations: a randomized clinical trial. *Journal of dentistry*, *48*, 34-39. doi:10.1016/j.jdent.2016.03.007

Traebert, J., Traiano, M. L., Armênio, R., Barbieri, D. B., De Lacerda, J. T., & Marcenes, W. (2009). Knowledge of lay people and dentists in emergency management of dental trauma. *Dental Traumatology, 25*(3), 277-283. doi:10.1111/j.1600-9657.2009.00779.x

Trope, M. (2011). Avulsion of permanent teeth: theory to practice. *Dental Traumatology, 27*(4), 281-294. doi:10.1111/j.1600-9657.2011.01003.x

Upadhyay, S., Rokaya, D., & Upadhyaya, C. (2012). Knowledge of emergency management of avulsed teeth among general dentists in Kathmandu. *Kathmandu University Medical Journal, 10*(2), 37-40. doi: 10.3126/kumj.v10i2.7341

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