# Knowledge and attitudes of dentists regarding traumatic dental injuries



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## Abstract

**Aim T**he aim of this study was to evaluate the knowledge levels of dentists regarding the treatment of several dental injuries.

**Methods** Study design: Cross-sectional study. A structured questionnaire was validated and sent electronically to the Professional Dental Schools of each Spanish region and subsequently to the affiliated dentists. The survey collected the dentists' demographic data and asked 11 questions regarding traumatic dental injuries and their potential complications and treatments. The relationships between the demographic data and the correct/incorrect answers regarding dental injuries were estimated by means of Pearson's chi-squared test and post hoc testing.

**Results** The survey was answered by 1532 dentists. None of the demographic variables was related to better knowledge. However, men, older dentists and more experienced dentists were related to having a self-evaluation of knowledge as comprehensive; 64.1% of the answers given by the respondents were correct. Surprisingly, having more clinical dental experience and a postgraduate degree were not related to better knowledge. The results revealed an uneven knowledge among dentists depending on the type of dental trauma injury. Questions on treatment of avulsion of immature teeth and complicated fractures had a correct answer frequency higher than 70%, while questions regarding intrusion and lateral luxation had a knowledge lower than 60% and less than 30%, respectively. More than 50% of dentists would apply splinting after replantation for more than 14 days.

**Conclusion** Dentists need to improve their knowledge regarding the treatment of tooth intrusion, lateral luxation and avulsion of mature teeth as well as the use of splinting.

KEYWORDS Dental trauma; Knowledge; Traumatic dental injuries.

## Introduction

Dental trauma is an impact injury to the teeth and/or other hard and soft tissues within and around the vicinity of the mouth and oral cavity and represents a significant threat to dental and general health in children and adolescents due to its frequency and impact on the quality of life [Lam, 2016; Borges et al., 2017]. Its effects on teeth depend on the magnitude and direction of the trauma, and it may cause the displacement of the tooth from its alveolus, including complete extrusion or avulsion [Costa da Silva et al., 2004; Ritwik et al., 2015], and/or the exposure of the dental pulp [Lam et al., 2008], which could lead to pulp necrosis, infection of the periapical tissues and tooth loss [Andreassen and Kahler, 2015].

Treatment guidelines for dental injuries have been created and published by the International Association of Dental Traumatology to promote correct treatment [Diangelis et al., 2017; Andersson et al., 2017]. However, dental trauma treatment remains challenging for dentists. Previous studies have shown that knowledge among general dentists in some Western countries is rather poor, while self-assessment of their knowledge is inaccurately high [Duncan et al., 2019]. Several studies have shown that emergency treatment of some dental injuries is often inappropriate or inadequate with regard to emergency management of the exposed pulp, provision of a hermetic coronal seal [Maguire et al., 2001] and replantation of avulsed teeth [Zhao and Gong, 2010], among others. Moreover, one study found that approximately half of the patients with dental trauma had received unsatisfactory immediate treatment [Zhao and Gong, 2010]. Yet, to date a non-negligible percentage of dentists would replant primary teeth or use rigid splint after avulsion [Zhao and Gong, 2010].

Dentists knowledge of how to treat traumatic dental injuries, among several other determinants [Rozi et al., 2017], is a key factor influencing the prognosis of the traumatised tooth [Frujeri and Costa, 2009]. Correct advice to patients going to the dental clinic following avulsion, early and correct treatment in the dental clinic and close follow-up can significantly improve tooth prognosis and patient quality of life [Frujeri and Costa, 2009]. As a result, studies evaluating dentists' knowledge of dental trauma treatment often advise the need to continue dental education in order to improve the knowledge [Qazi and Nasir, 2009; Menezes et al., 2015].

The objective of this survey-based study was to evaluate the knowledge levels of Spanish dentists regarding the treatment of several dental injuries, such as avulsion, lateral luxation, intrusion and pulp exposure. Determinants of better or worse level of knowledge were also analysed.

## Methods

The study was approved by the Ethics Committee of the Bellvitge Hospital, University of Barcelona (Spain).

A structured electronic questionnaire, used in previous studies [Zaleckiene et al., 2018] was translated into Spanish. The questionnaire was later validated in a pilot study (n=10) and subsequently revised for clarity. The survey was composed of two parts. The first part recorded the dentists' demographic

| | | Self-evaluation of dental trauma knowledge | | | |
|---|---|---|---|---|---|
| | | Don't know % | Insufficient % | Sufficient % | Comprehensive % |
| Gender | | | | | |
| Male | 30.2 | 0 | 9 | 73.4 | 17.7* |
| Female | 69.8 | 0.4 | 12.9* | 77.3* | 9.4 |
| Age | | | | | |
| <30 | 23.6 | 0 | 17.8* | 74.7 | 7.5 |
| 31-40 | 36 | 0.4 | 11.7 | 78.4* | 9.5 |
| 41-50 | 22.1 | 0.6 | 8.7 | 75.5 | 15.2* |
| >51 | 18.3 | 0 | 7.6 | 74.1 | 17.9* |
| Years in dental practice | | | | | |
| <4 | 17.4 | 0.4 | 21.8 | 72.2 | 5.6 |
| 5-10 | 25 | 0 | 12.6 | 79.6 | 7.9 |
| 11-25 | 39.8 | 0.5 | 8.7 | 76.8 | 14* |
| >26 | 17.7 | 0 | 7.1 | 74 | 19* |
| Academic postgraduate | | | | | |
| No | 28.9 | 0.5 | 10.4 | 80.7 | 8.4 |
| Yes | 70.8 | 0.2 | 12.2 | 74.2 | 13.3 |
| Professional postgraduate | | | | | |
| No | 17.4 | 0.8 | 15.8* | 74.7 | 8.7 |
| Yes | 81.4 | 0.2 | 10.8 | 76.3 | 12.7* |

TABLE 1 Demographic data of the 1,532 surveyed dentists and the relationship with the self-evaluation of their dental trauma knowledge. *statistically significant differences.

data, such as gender, age, self-evaluation of their dental trauma knowledge and years in dental practice. The second part of the survey was composed of 11 closed-ended questions regarding the most common traumatic dental injuries and their potential complications and treatments (Table 1). Dentists were asked to mark only one answer which best aligned with their knowledge and the treatment they would apply in each case scenario. The correct answer was acquired from evidence-based literature.

The survey was sent electronically using a survey website (SurveyMonkey.com) to the Professional Dental Schools of each Spanish autonomous region and subsequently to the affiliated dentists, and collected in 2018 and 2019.

### Statistical analysis

The statistical analysis was performed by a blinded operator. The completed questionnaires were coded and missing or multiple answers to the same question were treated as missing values. Data were analysed using the SPSS v. 22.0 statistics software (SPSS, Chicago, USA). Descriptive statistics were calculated for the different variables using absolute frequencies and percentages (Table 1). The relationships between the demographic data and the correct/incorrect answers regarding traumatic dental injuries were estimated with Pearson's chi-squared test and post hoc testing (Table 2). A value of $P<0.05$ was selected as the threshold for statistical significance. Linear multiple regression was used to test variation in trauma knowledge in relation to age, gender, self-evaluated dental trauma-related knowledge and years of practice.

## Results

The survey was answered by 1,532 dentists, mostly women (69.3%), aged between 31–40 years (35.7%), and who had practiced dentistry for 11–25 years (39.8%) (Table 1). Being a man, over 41 years of age and more than 11 years of practice is statistically related to having a self-evaluation of knowledge as comprehensive (Table 1); however, in the overall analysis none of these variables was related to better knowledge (Table 2). Table 3 shows the overall analysis of correct answers by demographic variable; 64.1% of the answers given by the respondents were correct. Having a self-evaluation of the knowledge as comprehensive is statistically related to a better knowledge. Table 2 shows 10 scenarios and responses to each trauma scenario by gender, age and years in dental practice. Only two scenarios had a correct answer higher than 90% among respondents. These were treatments of avulsion of an open-apex tooth which has already been replanted by the parents, where x rays, splinting and instruction about plaque and diet control was the most recommended treatment by surveyed dentists, and recommendations to the parent/guardian of a child with an avulsed tooth when the patient was not at the dental clinic, where most dentists would recommend replanting the tooth and if not possible, storing it in saliva or milk and immediately going to the dental office (Table 2). Knowledge regarding treatment for pulp exposure and prognosis of an avulsed tooth was also high among most dentists (>70%, Table 2), who would recommend a direct pulp capping or partial pulpotomy depending on the size of the exposure and the time since injury, and that the best prognosis for an avulsed tooth would be given by the replantation as soon as possible, instead of delaying replantation. However, very low knowledge (less than 30% of correct answers) was evident regarding theoretical concepts, such as the concept of replacement resorption, which was wrongly associated with external inflammatory root resorption by 42.5% of respondents, and the effects of a lateral luxation injury occurring 1 year prior and associated with periapical lesion, the aetiology of which was wrongly associated with apical external inflammatory resorption by 35.4% of respondents. The knowledge of this last question improved as age increased. There was no statistical relation between knowledge and gender of the respondents in any question. The age is related to the level of knowledge in five questions. Dentists under 30 years of age had statistically better knowledge on how to treat pulp exposure of >2mm; however, they had statistically less knowledge on how to treat intrusion and lateral luxation compared to dentists aged 41–50 and >60 years, respectively. The years in dental practice was statistically related to better knowledge in three questions. Dentists with less than 4 years of practice had better knowledge in two questions than dentists with longer practice (Table 2).

| Scenarios | Answers (correct answers presented in bold) | Gender | | Age | | | | Years in practice | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | M | F | <30 | 31-40 | 41-50 | >50 | <4 | 5-10 | 11-25 | >26 | |
| 1. A 7-y-old child arrives with a complicated crown fracture of an immature front tooth, where pulp exposure was less than 1 mm and the time elapsed since the trauma was less than 1 h. What procedure is indicated? | **Direct pulp capping** | **89.3** | **88.6** | **87.1** | **89.6** | **91.5** | **86.2** | **86.3** | **87.7** | **91** | **88.3** | **88.9** |
| | Partial pulpotomy | 8.7 | 9.6 | 11.9 | 9.3 | 7.4 | 10.5 | 12.8 | 9.7 | 7.6 | 9.2 | 9.3 |
| | Pulpectomy and endodontic treatment after 10–14 d | 1.1 | 1 | 0.7 | 1.1 | 1.1 | 1.4 | 0.5 | 1.9 | 1 | 0.5 | 1.1 |
| | Endodontic treatment in one session | 0.8 | 0.1 | 0 | 0.5 | 0 | 1 | 0 | 0 | 0.4 | 1 | 0.3 |
| | I don't know | 0 | 0.6 | 0.3 | 0.5 | 0 | 1 | 0.5 | 0.6 | 0 | 1 | 0.4 |
| 2. A 7-y-old child arrives with a complicated crown fracture of an immature front tooth where pulp exposure was more than 2 mm and the time since injury was more than 1 h. What procedure is indicated? | Direct pulp capping | 10.4 | 11 | 3.7 | 13.3 | 13.3 | 12.3 | 3.2 | 10.4 | 14.3* | 11.6 | 10.8 |
| | **Partial pulpotomy** | **71.6** | **70.4** | **76.9*** | **67.1*** | **69.7** | **71.1** | **76.8*** | **71.7** | **67** | **71.5** | **70.7** |
| | Pulpectomy and endodontic treatment after 10–14 d | 12.6 | 13.4 | 15.9 | 14 | 10.7 | 10.9 | 17.7* | 13 | 12.6 | 10.1 | 13.2 |
| | Endodontic treatment in one session | 4.8 | 3.4 | 2.4 | 4.1 | 4.4 | 4.3 | 1.4 | 3.3 | 4.5 | 5.3 | 3.8 |
| | I don't know | 0.6 | 1.8 | 1 | 1.6 | 1.8 | 1.4 | 0.9 | 1.6 | 1.6 | 1.4 | 1.5 |
| 3. Complete the following sentence: Partial pulpotomy in a permanent tooth after a complicated crown fracture… | **Is a successful procedure, but only for teeth with open apices** | **63.8** | **61.8** | **65.1** | **57.1** | **67.5** | **63** | **63.2** | **60.4** | **62.3** | **63.8** | **62.3** |
| | Is not indicated as a treatment method | 12.1 | 12.5 | 12.2 | 13.9 | 10.7 | 11.8 | 13.2 | 13.3 | 12 | 11.1 | 12.3 |
| | Does not maintain the vitality of the tooth | 3.9 | 2.8 | 1.7 | 3.4 | 3 | 4.7 | 0.9 | 3.6 | 3.5 | 3.9 | 3.1 |
| | Offers high success rates for teeth with mature roots | 13.8 | 14.3 | 14.2 | 15.5 | 12.9 | 12.8 | 14.5 | 14.3 | 14.5 | 13.4 | 14.3 |
| | I don't know | 6.5 | 8.6 | 6.8 | 10.1 | 5.9 | 7.6 | 8.2 | 8.4 | 7.7 | 7.7 | 8 |
| 4. Intrusion of an immature central incisor (approx. 5 mm) occurred 2 h ago. What procedure is indicated? | Surgical repositioning of the tooth using forceps | 31.8 | 23.1 | 26.8 | 28.4 | 21.6 | 23.2 | 25.5 | 28.3 | 25.8 | 20.8 | 25.5 |
| | **It is likely the tooth will re-erupt spontaneously** | **50.7** | **58.8** | **52.9*** | **54.5** | **61.9*** | **58.3** | **54.1** | **54.1** | **57.2** | **60.9** | **56.5** |
| | Repositioning of the tooth by orthodontic means | 13.2 | 10.7 | 14.9 | 9.2 | 9 | 14.7 | 14.5 | 10.4 | 9.4 | 14.5 | 11.4 |
| | I don't know | 4.2 | 7.4 | 5.4 | 7.9 | 7.5 | 3.8 | 5.9 | 7.2 | 7.6 | 3.9 | 6.5 |
| 5. A lateral luxation injury of the anterior tooth occurred 1 y ago and the tooth is not responding to thermal tests. The x-ray reveals periapical bone destruction. It is related to: | An apical external inflammatory resorption | 32.1 | 36.7 | 44.4 | 36.4 | 28.5 | 29.9 | 48.9* | 36.5 | 31 | 29.5 | 35.4 |
| | **Infection in the root canal system of the tooth** | **30.1** | **28** | **23.9*** | **25.8** | **32.6** | **36*** | **21** | **27.7** | **29.4** | **35.7*** | **28.5** |
| | The luxation injury having not yet healed | 1.7 | 0.8 | 1 | 1.8 | 0 | 0.9 | 0.5 | 1.6 | 1.2 | 0.5 | 1.1 |
| | Sterile necrosis, because microbes cannnot penetrate the canal system through an intact crown | 33 | 26.4 | 24.2 | 28.1 | 31.9 | 29.9 | 22.8 | 274 | 30.6 | 30.9 | 28.4 |
| | I don't know | 3.1 | 7.9 | 6.5 | 7.9 | 6.7 | 3.3 | 6.8 | 6.8 | 7.6 | 3.4 | 6.5 |
| 6. Replacement resorption is associated with: | Necrosis of the pulp | 6 | 6.3 | 5.1 | 5 | 7.2 | 9.1 | 4.6 | 6.9 | 4.6 | 10.3* | 6.2 |
| | External inflammatory root resorption | 46.3 | 40.9 | 41.2 | 42.3 | 43.2 | 43.8 | 42 | 39.7 | 44.4 | 43.1 | 42.5 |
| | **Necrosis of the perio-dontal ligament cells** | **27.8** | **27.9** | **31** | **28** | **28** | **23.1** | **29.2** | **28.9** | **28.4** | **23.5** | **27.8** |
| | I don't know | 19.6 | 24.7 | 22.1 | 24 | 21.2 | 24 | 23.7 | 24.3 | 22.4 | 23 | 23.2 |

TABLE 2 A Percentage of answers to each scenario given by dentists and relation to gender, age and years of practice.
*Correct answers are highlighted in bold. * statistically significant relationship.*

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7. The best prognosis for an avulsed tooth in dry conditions is when it is replanted… | **As soon as possible, <30 minutes after trauma** | **80.6** | **81.8** | **84.7** | **82** | **76.8** | **81.5** | **83.6** | **83.4** | **7.2** | **81.6** | **81.5** |
| | 30-60 min after the trauma | 7.3 | 9.2 | 7.1 | 10.6 | 8.1 | 8.1 | 7.7 | 9.4 | 9.4 | 7.2 | 8.7 |
| | Within 3 h of the trauma | 3.1 | 2.3 | 2 | 1.8 | 3.7 | 3.3 | 2.3 | 1.6 | 2.6 | 3.9 | 2.5 |
| | During the first 24 h | 0.8 | 1.3 | 2 | 0.4 | 2.2 | 0 | 1.4 | 1.3 | 1.4 | 0 | 1.1 |
| | No difference | 6.5 | 3 | 2 | 2.9 | 6.3 | 5.7 | 2.7 | 2.3 | 4.9 | 5.8 | 4 |
| | I don't know | 0.6 | 1.4 | 1 | 1.3 | 1.1 | 0.9 | 1.4 | 1 | 1.2 | 1 | 1.1 |
| 8. A mother calls the dental office explaining that her child had just "knocked out" a permanent anterior tooth. Your recommendation is to: | Wrap the tooth in a clean napkin and immediately go to the dental office | 1.1 | 0.8 | 0.3 | 0.9 | 0.4 | 2.4 | 0.5 | 1.3 | 0.2 | 2.4* | 0.9 |
| | Store the tooth in a bag with ice and immediately go to the dental office | 2.2 | 0.2 | 0 | 0.7 | 0.7 | 2.4 | 0 | 1 | 0.2 | 2.9* | 0.8 |
| | **Replant the tooth; if this procedure cannot be performed the tooth should be stored in saliva or milk and immediately go to the dental office** | **95.5** | **98.1** | **99.3** | **98** | **97.8** | **92.9*** | **99.1** | **97.1** | **98.8*** | **92.3** | **97.3** |
| | Replant the tooth; if this procedure cannot be performed the tooth should be stored in tap water and immediately go to the dental office | 1.1 | 0.6 | 0 | 0.4 | 0.7 | 2.4 | 0 | 0.3 | 0.8 | 2.4* | 0.8 |
| | I don't know | 0 | 0.2 | 0.3 | 0 | 2.4 | 0 | 0.5 | 0.3 | 0 | 0 | 0.2 |
| 9. A child arrives at the dental office with an avulsed tooth with an open apex which had already been replanted within 30 min of the trauma occurring (at the place of the accident). You will perform: | Thermal tests, x-rays and endodontic treatment | 6.4 | 3.7 | 5.4 | 2.7 | 4.8 | 6.6 | 6.4 | 3.6 | 3.3 | 6.8 | 4.5 |
| | **X-rays, splinting and instructions about plaque and diet control will be given** | **93.6** | **96** | **94.2** | **97.3** | **94.5** | **93.4** | **93.2** | **96.1** | **96.5** | **93.2** | **95.3** |
| | I don't know | 0 | 0.3 | 0.3 | 0 | 0.7 | 0 | 0.5 | 0.3 | 0.2 | 0 | 0.2 |
| 10. An avulsed tooth with a closed apex was replanted within 30 minutes of the trauma occurring. You will perform: | Immediate root canal treatment | 17.2 | 12.9 | 13.3 | 12 | 16.3 | 6.2 | 13.2 | 13.4 | 14.8 | 15.5 | 14.2 |
| | Root canal treatment is contraindicated during the first month | 15.5 | 17.5 | 14 | 16.5 | 15.9 | 13.3 | 14.6 | 15.6 | 16 | 23.2* | 16.9 |
| | **Root canal treatment within 7-10 d** | **52.7** | **51** | **57.3** | **51** | **53.3** | **41.7*** | **56.2** | **53.4** | **50.8** | **44.9** | **51.4** |
| | Root canal treatment will not be performed | 8.2 | 7.8 | 6.5 | 9 | 5.6 | 10.9 | 7.8 | 7.2 | 7.6 | 10.1 | 7.9 |
| | I don't know | 6.5 | 10.8 | 8.9 | 11.5 | 8.9 | 7.1 | 8.2 | 10.4 | 10.9 | 6.3 | 9.5 |
| 11. How long should splinting be used in the case of an avulsion? | **7-14 d** | **40.9** | **42.9** | **45.8** | **44.3** | **39.5** | **36.7** | **50.9*** | **43.8** | **39.9** | **36.4** | **42.3** |
| | More than 14 d | 16.5 | 16.1 | 18 | 14.6 | 17 | 16.2 | 14.1 | 16.9 | 16.7 | 16.5 | 16.2 |
| | 1 mo | 38.1 | 36 | 32.2 | 34.4 | 38.7 | 45.2 | 31.8 | 32.5 | 37.9 | 45.1* | 36.7 |
| | I don't know | 3.9 | 4.5 | 3.4 | 6.1 | 4.4 | 1.9 | 2.7 | 6.2 | 4.9 | 1.9 | 4.3 |

TABLE 2 B Percentage of answers to each scenario given by dentists and relation to gender, age and years of practice.
*Correct answers are highlighted in bold. * statistically significant relationship.*

## Discussion

The current study analysed the knowledge of 1,532 dentists practicing in Spain on how to treat intrusion, lateral luxation, avulsion and complicated fractures in permanent dentition. The overall analysis showed moderate knowledge, with no statistical differences regarding any demographic variable.

Surprisingly, having more experience as a dentist was not related to better knowledge. The current study evaluated the years of dental experience, not the experience in treating dental trauma injuries specifically, which could explain the lack of relationship. As shown by a previous study, a dentist's experience in treating dental trauma is considered an important determinant associated with the acquisition of knowledge [Zaleckiene et al., 2018]; however, only a very small proportion of dentists treat dental trauma on a regular basis [Zaleckiene et al., 2018], and more than half have treated fewer than 4 cases [Hartmann et al., 2018]. Similarly, having academic or clinical postgraduate studies was also not related to better knowledge, possibly due again to this study not measuring studies in dental trauma specifically. Previous studies have also shown this lack of relationship [Zhao and Gong, 2010; Hartmann et al., 2018]. This suggests that practice in dental trauma treatment must be present in continuing dental education to achieve an effective

| Demographic variables | | % correct |
|---|---|---|
| Gender | Male | 63.5 |
| | Female | 64.3 |
| Age | <30 | 65.4 |
| | 31-40 | 63.3 |
| | 41-50 | 65.1 |
| | >50 | 62.3 |
| Years in dental practice | <4 | 65 |
| | 5-10 | 64.2 |
| | 11-25 | 63.9 |
| | >26 | 63 |
| Academic postgraduate | No | 63.6 |
| | Yes | 63.1 |
| Professional postgraduate | No | 69.3 |
| | Yes | 65.5 |
| Self-evaluation of their dental trauma knowledge | Do not know | 40.9 |
| | Insufficient | 61.6 |
| | Sufficient | 63.6 |
| | Comprehensive | 69.7* |

TABLE 3 Overall analysis showing the percentage of correct answers by gender, age, years in dental practice, postgraduate studies, and self-evaluation of the knowledge.

*statistically significant differences.

retention of knowledge. In general, the knowledge regarding treatment of avulsion of immature permanent teeth was very high (above 80% of answers correct), which is consistent with previous reports [Zhao and Gong, 2010]. Most dentists are aware that replantation should be done as soon as possible. Thus, 97.3% of dentists would recommend that the child's parent/guardian immediately replant the tooth at the place of the accident and only if this procedure cannot be performed immediately store the tooth in saliva or milk and go to the dental office, allowing a rapid replantation of the tooth. The time between avulsion and replantation is one of the most important factors influencing the prognosis of avulsed teeth [Andreasen et al., 1995], given that the risk of replacement resorption and inflammatory root resorption are greater [Andreasen et al., 1995; Flores et al., 2004]. Moreover, storing a tooth in milk has been proven to be the most effective medium to maintain periodontal ligament cell viability [Adnan et al., 2018; Osmanovic et al., 2018] and consequently avoid ankylosis or root resorption when storing dry or in non-physiological solutions [Andreasen et al., 1995; Lauridsen et al., 2020]. Once at the dental office, most surveyed dentists would perform x-rays, splinting and instructions about plaque and diet control instead of the endodontic treatment of the tooth, which agrees with current evidence and guidelines [Andersson et al., 2017]. However, most dentists (52.9%) would apply the splinting for longer periods of time than recommended by current guidelines [Andersson et al., 2017]. Evidence supports short-term, flexible splints since periodontal and pulpal healing is promoted if the replanted tooth is allowed to have a slight motion and the splinting time is not too long (more than 14 days) [Andersson et al., 2017]. Regarding treatment of complicated fractures in immature permanent teeth, the knowledge shown by the respondents was relatively high, which is in line with previous studies [Zaleckiene et al., 2018]. Most dentists would apply direct pulp capping or partial pulpotomy depending on the size of the exposure and time since exposure. Young pulps maintain the healing capacity due to an enhanced pulpal blood supply, open root apices and pulps free of age-related changes, and conservative treatments, such as direct pulp capping or pulpotomy, present satisfactory pulp survival rates [Wang et al., 2017]. Most dentists, however, indicate that pulpotomies are also effective in permanent teeth with an open apex. Some clinical trials [Asgary et al., 2017] and the Position Statement [Duncan et al., 2019] published very recently by the European Society of Endodontology presented a shift in the management of deep and penetrating caries in mature permanent teeth, which are generally treated with root canal treatment. They advise the possibility of applying direct pulp capping, partial or total pulpotomy after a careful consideration of each case, with successful clinical outcomes [Duncan et al., 2019]. This Position Statement does not include guidelines on the treatment of complicated fractures; however, a shift to a more conservative treatment of this traumatic dental injury may occur in the future. The knowledge regarding lateral luxation and intrusion were the lowest among surveyed dentists, which is consistent with previous reports [Hartmann et al., 2018]. This could be because lateral luxation and intrusion have a relatively low frequency [Lam et al., 2008], and therefore most dentists have little or no experience with their treatment.

## Conclusion

The results revealed an uneven knowledge among dentists depending on the type of dental trauma injury. Dentists need to improve their knowledge regarding how to treat tooth intrusion, lateral luxation and avulsion of mature teeth and the use of splitting, since only half or fewer would apply correct treatments. By contrast, knowledge regarding the treatment of immature avulsed teeth and complicated fractures is satisfactory.

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