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Dentists' management of dental injuries and dental trauma in Australia: a review

REVIEW ARTICLE

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Abstract – This article reviews the available literature on the investigation of dentists' management of dental trauma injuries and their perceptions of barriers to providing care. The levels of knowledge demonstrated by surveys of dentists were not high and dentists perceive inadequate financial remuneration as the main barrier to trauma management. With only a limited number of new dental traumatic injuries occurring annually, dentists may not be competent in providing appropriate care. The management of dental trauma and any hesitations that dentists might have in terms of knowledge and skills are important to investigate to formulate an approach to overcome their reluctance. There is a deficiency of literature on this subject.

The aim of correct management of dental injuries to permanent teeth is to ensure that preteenage children do not experience the loss of traumatized teeth because of inaccurate diagnosis and poor treatment (1). Clinicians have an obligation to manage appropriately or refer patients with acute oral traumatic injuries as dictated by the complexity of the injury and the referring practitioner's training, knowledge and experience (2). Guidelines for the evaluation and management of traumatic dental injuries have been developed by the International Association of Dental Traumatology (3), the American Academy of Paediatric Dentistry (2) and the American Association of Endodontists (4). In the State of Victoria (Australia), Dental Health Services Victoria (DHSV) implements such guidelines (5).

Management of injuries to the primary and permanent dentitions differs significantly and separate guidelines have been developed in the overall management of trauma patients (2–4, 6). However, very few studies have evaluated the level of skill possessed by dentists in the management of trauma, or examined the barriers to providing care (7). Those studies that have been published were conducted as survey questionnaires investigating general dental practitioners either in private practice or community dental clinics.

With the introduction of mandatory continuing professional development (CPD) requirements for dental care providers in the State of Victoria and in the Australian Capital Territory in Australia, continuing dental education courses in dental traumatology, if provided, should equip dentists with the appropriate minimum background knowledge for the safe delivery of dental trauma services.

Dental trauma in Australia

The majority of studies concerning dental traumatic injuries in Australia have specifically concentrated in environments such as school dental services (8), suburban areas (9), after-hours clinics (10, 11), emergency departments at hospitals (12) and high schools (13). One study reported all trauma cases seen by members of the Australian Society of Endodontology over a 2-year period from April 1977 but the findings may not reflect the widest incidence of such injuries in the Australian community (14). However, it is important to establish the frequency and causes of dental trauma in Australia to implement preventive strategies (15), increase public awareness concerning first aid and develop appropriate emergency clinics to provide initial treatment (16).

Dental injuries can be the result of either direct or indirect trauma. Direct trauma occurs when the tooth itself is traumatized and indirect trauma occurs when the lower dental arch is forcefully impacted against the maxillary teeth (17). Contact sports continue to be a major cause of dental trauma, but leisure activities are also becoming increasingly associated with traumatic injuries (16). A review article by Bastone et al. (15) on the epidemiology of dental trauma, reported the limited amount of data in the field of dental and oral trauma in Australia. Comparing and accumulating data from different trauma studies is very difficult due to differences in definitions and classifications (15). Andreasen et al. classification (18), Garcia-Godoy's classification (19) and the Ellis classification (20), are all modifications of the World Health Organization's classification of oral trauma (15).

Whilst oral injuries can occur at any time, the Australian Dental Association (Inc.) (6) has developed management protocols for oral injuries which aim to prevent physical injury, particularly to the teeth and associated structures. For the management of dental trauma, clinical guidelines prepared by DHSV also exist for dentists in the public sector to refer to for more information (5).

Accidents because of falls appear to be the most common cause of dental injuries in Australia (8, 10, 11). Other possible causes include sports (mainly rugby and football) and bicycle accidents (9–11, 13, 14), assaults and fights (10, 11), and contact with concrete, metal or ground (13, 14). The most common type of injury was uncomplicated enamel and dentine fracture, followed by subluxation (9–11, 14). The precise prevalence and incidence of dental injuries is difficult to determine (16). The prevalence varies among studies because of different methods of survey used, the population surveyed, the variation in trauma classification, the dentition studied and behavioural differences between studies and countries (15). The prevalence of dental trauma in Australia has been reported to be around 6% (13), and the dental trauma incidence to the anterior permanent teeth in 6- to 12-year-old children was 1.7 patients/100 children/year, while involving 2.1 teeth/100 children/year (8). Most studies probably underestimate incidences because many minor injuries go unreported (16).

Most of the traumatic dental injuries in Australia occurred outdoors, at home or at school (8, 9, 14). An examination investigating 12 287 high school students in Sydney recorded approximately 6% of the students had suffered trauma to anterior teeth and majority of these teeth were still vital (13). Significant differences existed between the places of occurrence and the number of teeth traumatized per incident. Multiple traumas were common at school (8), and the mean number of teeth injured per patient was approximately 2.0 (9–11). No significant differences were reported in the frequency of trauma observed for different days of the week (8, 9).

Studies have reported that the highest frequency of trauma occurred in the 6- to 12-year-age group in certain Australian cities (9, 11, 14), while others recorded the highest occurrence of trauma in the 12–17 years group (11), or the 18–23 years group (10). Dental trauma involving anterior teeth treated after working hours tend to involve more teeth per patient and usually affects older patients (10, 11). In the permanent dentition, the majority of the injuries involve hard dental tissue and pulp (9), with many more upper than lower anterior teeth being involved (8, 10, 11, 13, 14). Boys experienced significantly more dental injuries to the permanent teeth than girls (13, 14), but girls receive proportionately more trauma to the maxillary teeth than boys (8).

Paediatric dentoalveolar trauma seen at a children's hospital seems to be more serious in nature, involving tooth displacement and injuries to the periodontium (12), compared with those presenting to suburban dental clinics, which commonly reported uncomplicated enamel and dentine fracture (9). After-hours dental services are more likely to encounter luxation injuries, followed by crown fracture without pulp exposure, and then subluxation injuries (10, 11). The reported incidence of avulsion cases ranges between 1.9% (13) and 11.2% (11) of all traumatic injuries to the permanent dentition. Nearly four times as many tooth avulsions were treated in the after-hours clinics (10, 11), compared with those treated in the private practice study (14).

Dentists' knowledge and perception of barriers in managing dental trauma

Pubmed/Medline, Embase and Google Scholar searches identified only four published studies investigating dentists' knowledge of the management of dental trauma injuries and their perception of barriers to providing care (7, 21–23), and one study investigating dentists' experience and confidence in treating dental trauma (24). These studies (Table 1) were conducted as questionnaire surveys.

The study by Kostopoulou and Duggal (22) in West/North Yorkshire and Humberside, UK, showed that dentists' overall knowledge of emergency treatment of dentoalveolar trauma was inadequate. This confirmed the findings of Hamilton et al. (21), demonstrating that dentists in the primary care sector had insufficient knowledge to treat dental trauma, and the vast majority of dentists indicated that they had minimal experience in treating traumatized teeth (24). Initial management of dental trauma is not often well handled (16), and if handled inappropriately, may affect the prognosis for many dental injuries (1).

Dentists who attended further training or education courses on dental traumatology had a more thorough knowledge than those who did not (22, 23), but the overall levels of knowledge demonstrated by surveys of dentists were not high (21, 22). Dentists employed in group practices had a more up-to-date knowledge (21), as did younger and more recently graduated dentists (22). Hu et al. (23) reported a high level of knowledge by Brazilian general dentists on certain trauma scenarios, e.g. in the case of emergency treatment of avulsed incisors, 99.3% of dentists knew that the best storage medium for avulsed teeth was milk or saline, however, certain other trauma cases was less satisfactory e.g. the type of splints used and the splinting duration (23). Although there is much written about dental injuries, confusion about the appropriate emergency treatment for different types of injury exist (1). Stewart and Mackie (24) reported approximately 40% of the patients presenting at the trauma clinic were referred after difficulty was encountered following initial management by the dentist, and approximately 50% of patients had received unsatisfactory or inappropriate treatment prior to referral (24). This seems to reflect the lack of knowledge or experience in the management of dental injuries by the dentist.

Perceived barriers in the treatment of dental trauma may influence the optimum management of dental trauma (7). Both Hamilton et al. (21) and Kostopoulou and Duggal (22) reported that financial disincentives are perceived as the major barrier to treating trauma. The majority of general dental practitioners (69%) agreed that 'involvement in treatment of traumatic injuries to

Table 1. Studies on knowledge base and barriers to treating dental trauma

Citation	Group studied	Sample size (*n*)	Survey area	Knowledge of dental trauma	Barriers to treating dental trauma
Hamilton et al. (21)	GDPs and CDOs	229	UK	Insufficient knowledge to treat dental trauma Dentists who attended postgraduate trauma courses had a higher knowledge scores	Fees inadequate Treatment time too long
Stewart and Mackie (24)	GDPs and CDOs	26	UK	Majority of dentists had very little experience treating dental trauma to permanent incisor teeth	Cooperation of the child Lack of confidence with the diagnosis and knowledge of appropriate care
Kostopoulou and Duggal (22)	GDPs and CDOs	1023	UK	Treatment knowledge of dentoalveolar trauma in children was inadequate Dentists who attended continuing dental education courses had a more thorough knowledge	Financial Difficulties and delays in dental trauma treatment
Jackson et al. (7)	GDPs	417	UK	GDPs were not confident to manage complex trauma cases Dentists who attended postgraduate dental trauma courses were more confident	Inadequate remuneration Time constraints to long-term management of trauma cases
Hu et al. (23)	GDPs and endodontists	300	Brazil	Poor knowledge among surveyed dentists Dentists who attended postgraduate dental trauma courses showed improved knowledge	Not reported

GDP, general dental practitioner; CDO, community dental officer.

young permanent teeth is not cost-effective on the National Health System' in the UK (22), and 85.6% of dentists considered the treatment fees to providing care to be inadequate (21). A more recent study by Jackson et al. (7) showed a general consensus of dentists, despite inadequate payment, were willing to undertake trauma management because of their professional obligation. Most dentists often commenced the initial treatment, but will still refer the patients to a dental trauma clinic if subsequent problems occur because of perceived barriers (24).

Other possible barriers to caring for patients with dental trauma injuries are clinician knowledge and skills, time constraints and cooperation when dealing with children (21, 22). Treating uncooperative children was felt to be difficult and was perceived as a barrier to providing emergency treatment by 70% of dentists (22). Hamilton et al. (21) reported 72% of community dentists believed the treatment of trauma occupied too much clinic time, and the fees are too low for long-term monitoring (7). It has also been observed that general dental practitioners see only a few cases of dental trauma each year (7, 21, 24). This fact is demonstrated in a series of longitudinal outcome studies on luxation injuries was undertaken in Toronto, Canada (25–27). Between June 1988 and June 1995, a total of only 79 extruded permanent maxillary incisors were recorded (26), and between June 1988 and June 1998, a total of 97 laterally luxated permanent incisors was identified (27), and a total of 47 intruded permanent incisors recorded (25) respectively.

Dentists may find it difficult to retain the theoretical knowledge taught in their undergraduate dental training or from their limited experience encountered in their working life. Dentists who graduated within the last 5 years treated too few cases of dental trauma to be competent and these findings were statistically significant (7). In addition, the survey findings showed that some of the dentists recognized their own lack of knowledge, skill and experience with regard to management of these injuries (24).

Any hesitation that dentists might have in managing dental trauma is important to investigate to develop ways to overcome dentists' reluctance to deal with dental trauma (22). It may be unreasonable to expect dentists to be competent in dealing with all aspects for treating dentoalveolar trauma. Jackson et al. (7) reported a high self-perceived ability of general dentists to manage simpler forms of dental trauma, such as uncomplicated and complicated crown fractures. Confidence was lower for complex or less often encountered trauma cases such as root fractures and avulsion injuries (7), but educational and financial initiatives should concentrate on improving the front line care to trauma (21). One possible way could involve the introduction of a formal protocol for treatment of avulsed permanent teeth and other dental injuries (28).

Competence is being increasingly assessed, and will have relevance both to the teaching of undergraduates and revalidation of those who have already qualified (29). The General Dental Council in the UK (30) in its 2005 booklet on 'Standards for Dental Professionals', describes levels of professional knowledge and competence desirable for dentists, such as developing and updating knowledge and skills throughout their working life, continuously reviewing knowledge and professional performance, keeping up-to-date with current best practice, and providing a good standard of care based on the best available evidence.

Conclusions

Prompt, accurate diagnosis and appropriate initial management would improve the prognosis for many dentoalveolar injuries (1), and the management guidelines available may assist clinicians in delivering the best care possible to the patient (2–6). With only a limited number of new injuries occurring annually (7, 21, 23, 24), dentists may find it difficult to handle dental trauma confidently. The overall levels of knowledge demonstrated by surveys of dentists was not high (21–23), and they had very little experience of treating children with traumatized permanent incisor teeth (24). Despite the main perceived barrier being the inadequate payment for treating dentoalveolar injuries, this did not prevent dentists from managing trauma cases (7).

With the introduction of compulsory CPD requirements for dentists in the state of Victoria and the Australian Capital Territory in Australia, future continuing education courses in dental traumatology may provide dentists with appropriate long-term skills and knowledge to manage dental trauma injuries (22). This review has identified a serious deficiency of information concerning the level of knowledge and barriers to treatment of dental trauma by dentists worldwide. Consequently, further research is indicated in this area.

References

1. Dewhurst MC, Roberts GJ. Emergency treatment of orodental injuries: a review. Br J Oral Maxillofac Surg 1998;36:165–75.
2. American Academy of Paediatric Dentistry. Guideline on management of acute dental trauma. Council of Affairs. Reference Manual 2002–2003; Chicago: American Academy of Paediatric Dentistry; 2001. p. 91–93.
3. Flores MT, Andreasen JO, Bakland LK. Guidelines for the evaluation and management of traumatic dental injuries. Dent Traumatol 2001;17:1–4.
4. American Association of Endodontists. Recommended guidelines of the American Association of Endodontists for the treatment of traumatic dental injuries. Chicago, IL: AAE; 2004.
5. Victoria Dental Health Service. Management of trauma guideline number: CG-A003-01. Vic., Australia: Victoria Dental Health Service; 2003, Effective September 2003.
6. Australian Dental Association (ADA). Community oral health promotion, prevention & management of oral injuries. St Leonards: ADA Inc.; 2005.
7. Jackson NG, Waterhouse PJ, Maguire A. Management of dental trauma in primary care: a postal survey of general dental practitioners. Br Dent J 2005;198:293–7.
8. Stockwell A. Incidence of dental trauma in the Western Australian School Dental Service. Community Dent Oral Epidemiol 1988;16:294–8.
9. Wood EB, Freer TJ. A survey of dental and oral trauma in south-east Queensland during 1998. Aust Dent J 2002;47:142–6.
10. Liew VP, Daly CG. Anterior dental trauma treated after hours in Newcastle, Australia. Community Dent Oral Epidemiol 1986;14:362–6.
11. Martin IG, Daly CG, Liew VP. After hours treatment of anterior dental trauma in Newcastle and Western Sydney: a four-year study. Aust Dent J 1990;35:27–31.
12. Batstone MD, Waters C, Porter SAT, Monsour FNT. Treatment delays in paediatric dento-alveolar trauma at a tertiary referral hospital. Aust Dent J 2004;49:28–32.
13. Burton J, Pryke L, Rob M, Lawson JS. Traumatized anterior teeth amongst high school students in Northern Sydney. Aust Dent J 1985;30:346–8.
14. Davis GT, Knott S. Dental trauma in Australia. Aust Dent J 1984;29:217–21.
15. Bastone EB, Freer TJ, McNamara JR. Epidemiology of dental trauma: a review of the literature. Aust Dent J 2000;45:2–9.
16. Moloney L. Initial management of dental trauma. In: Royal Children's Hospital Melbourne, 1998. http://www.ada.org.au/media/Societies/ASE/Documents/Trauma Article.pdf
17. Welbury R. Paediatric dentistry. Oxford, UK: Oxford University Press; 1997, p. 235–51.
18. Andreasen JO, Andreasen FM, Skeie A, Hjørting-Hansen E, Schwartz O. Effect of treatment delay upon pulp and periodontal healing of traumatic dental injuries, a review article. Dent Traumatol 2002;18:116–28.
19. Garcia-Godoy F. A classification for traumatic injuries to primary and permanent teeth. J Pedod 1981;5:295–7.
20. Ellis R. The classification and treatment of injuries to the teeth of children, 5th edn. Chicago, IL: Year Book Medical Publishers; 1970.
21. Hamilton FA, Hill FJ, Holloway PJ. An investigation of dentoalveolar trauma and its treatment in an adolescent population. Part 2: Dentists'knowledge of management methods and their perceptions of barriers to providing care. Br Dent J 1997;182:129–33.
22. Kostopoulou MN, Duggal MS. A study into dentists' knowledge of the treatment of traumatic injuries to young permanent incisors. Int J Paediatr Dent 2005;15:10–9.
23. Hu LW, Prisco CRD, Bombana AC. Knowledge of Brazilian general dentists and endodontists about the emergency management of dento-alveolar trauma. Dent Traumatol 2006;22:113–7.
24. Stewart SM, Mackie IC. Establishment and evaluation of a trauma clinic based in a primary care setting. Int J Paediatr Dent 2004;14:409–16.
25. Humphrey JM, Kenny DJ, Barrett EJ. Clinical outcomes for permanent incisor luxations in a pediatric population. I. Intrusions. Dent Traumatol 2003;19:266–73.
26. Lee R, Barrett EJ, Kenny DJ. Clinical outcomes for permanent incisor luxations in a pediatric population. II. Extrusions. Dent Traumatol 2003;19:274–9.
27. Nikoui M, Kenny DJ, Barrett EJ. Clinical outcomes for permanent incisor luxations in a pediatric population. III. Lateral luxations. Dent Traumatol 2003;19:280–5.
28. Holan G, Shmueli Y. Knowledge of physicians in hospital emergency rooms in Israel on their role in cases of avulsion of permanent incisors. Int J Paediatr Dent 2003;13:13–9.
29. Evans A. Assessing competence in surgical dentistry. Br Dent J 2001;190:343–6.
30. General Dental Council. Standards for dental professional. London: General Dental Council; 2005.