The Dental Trauma Guide: An evidence-based treatment guide

EVA LAURIDSEN, LARS ANDERSSON¹, NANDINI SURESH²

Dental Trauma Guide Competence Center, Copenhagen University Hospital, Rigshospitalet, Denmark, ¹Department of Oral and Maxillofacial Surgery, Malmö University, Malmö, Sweden, ²Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Meenakshi Academy of Higher Education and Research, Meenakshi Ammal Dental College, Chennai, Tamil Nadu, India

ABSTRACT
Dental trauma is complex, as it includes a wide range of different injury types with each type requiring specific considerations. It constitutes the fifth-most prevalent disease, and nearly 900 million individuals from 7 to 65 years of age are affected. The Dental Trauma Guide (DTG) project was initiated by Dr. Jens Andreasen in 2008 with the intention that all dentists around the world should be able to get access to the best available evidence regarding diagnosis, treatment, and prognosis for a patient with dental trauma within a few minutes. The DTG has been a global success, and today, 40,000 colleagues visit the DTG website every year. The website displays the treatment guidelines developed by the International Association of Dental Traumatology as well as visualized with film animations to make it easy and appealing for the users. The dentist can connect to the DTG Copenhagen database to compare his/her case with similar cases from the database, providing guidance to emergency treatment. Furthermore, DTG provides prognosis estimates for each individual injury type, as well as prognosis estimates for teeth with combinations of fracture and luxation injuries. Today, the DTG is a nonprofit organization with the aim of improving the level of care for dental trauma patients worldwide. Therefore, the DTG team has decided to offer free access for students at all dental schools in India.

Keywords: Avulsion, dental trauma, luxation, traumatic dental injury

INTRODUCTION
The Dental Trauma Guide
Patients with acute trauma often show up in the clinic without an appointment. The patient is in pain, and the treatment situation may be stressful for the patient as well as the dentist, especially if the dentist does not treat this type of injury every day. Dental trauma is a complex discipline, as it includes a wide range of different types of injury with each type requiring specific considerations. Dr. Jens Ove Andreasen observed many examples of dentists who, in the best intention, had performed a treatment that did not benefit the patient. Therefore, he initiated The Dental Trauma Guide (DTG) project in 2008 with the intention that all dentists around the world should be able to get access to the best available evidence regarding diagnosis, treatment, and prognosis within a few minutes.¹

The website “www.dentaltraumaguide.org” displays the treatment guidelines, developed by the International Association of Dental Traumatology (IADT)²⁻⁵ visualized with film animations, to make it easy and appealing for the users. Furthermore, DTG provides prognosis estimates for each individual injury type, as well as prognosis estimates for teeth with combinations of fracture and luxation injuries.⁶⁻⁷

For the first 8 years, the DTG was free of charge. It was funded by generous contributions from several dental associations and private funds. Among these were the IADT,
the American Association of Endodontics, the European Academy of Pediatric Dentistry, the American Academy of Pediatric Dentistry, the Hellenic Society of Pediatric Dentistry, the Swedish and Danish Pediatric societies, and many more. The largest contributors were the Velux Foundations and the Danish Regional Fund. However, in 2017, it became clear that a total reprogramming of the website was necessary. The website includes nearly 300 pages, and it was not possible to raise money for this. Jens, therefore, decided that it was time to convert the free website into a paid-for service. However, the price for becoming a member of DTG was kept very low. Dr. Andreasen was then 83 years old, and his greatest wish was to secure the long-term viability of his life work. Therefore, he consolidated the DTG as a nonprofit organization. Thanks to Dr. Andreasen's timely action, the work continues, and the vision remains in the spirit of Dr. Andreasen to improve the level of care for dental trauma patients worldwide by increasing the knowledge about dental trauma treatment. Today, DTG is a nonprofit organization. Any revenue will be used for research and further development of the guide. The DTG is located at the University Hospital Copenhagen, Rigshospitalet, Denmark, and is managed by a board of directors. The web address is www.dentaltraumaguide.org.

The functionality of the guide
The DTG website has multiple sections that enable the dentist to diagnose and plan the treatment for traumatic dental injuries such as (a) etiology, (b) treatment, and (c) prognosis. We can illustrate the functionality of these sections with the following example:

A 9-year-old girl who has suffered a traumatic dental injury visited a dental clinic and a single tooth displacement was observed on clinical examination [Figure 1]. The trauma pathfinder on the DTG website enables the dentist to confirm the diagnosis [Figure 1]. On answering a series of questions, the dentist will be guided to the correct diagnosis. It was observed that in this case, the tooth had suffered a lateral luxation.

Etiology section
The etiology section provides information on which dental tissues are involved and aids in thorough comprehension of the extent and nature of the injury. In the above-mentioned example, it is observed that there is a fracture of the buccal cortical plate, the root apex is entrapped in the fracture line, and the neurovascular supply to the tooth is severed. This may create minor areas of compression of the periodontal membrane and the root surface in the apical area. Furthermore, there is a separation of the periodontal membrane along the palatal aspect of the root [Figure 2a]. This information will give you an understanding of how the root apex must be released before the tooth can be gently repositioned.

Treatment section
Under the treatment section, a video showing the recommended treatment of a lateral luxated tooth is available [Figure 2b]. The video details the method to reposition and splints the tooth as well as the subsequent time intervals for follow-up scheduling of the patient. Alongside, DTG displays the written treatment guidelines developed by the IADT.[25]

Prognosis section
Based on the most important predictors for prognosis, the estimated risk of various healing complications such as pulp necrosis, pulp canal obliteration, repair-related root resorption, infection-related root resorption, ankylosis-related root resorption, and marginal bone loss are projected in this section [Figure 3]. In the above-mentioned example of lateral luxation, the prognosis estimate will be given according to the stage of root development of the injured tooth as well as the presence of a concurrent crown fracture. In this case, the tooth has an immature root development, and no associated crown fracture is observed.

The research behind the Dental Trauma Guide
Dr. Jens Andreasen initiated a prospective collection of data on dental trauma patients in the early 1970s. This collection of data expanded over many decades, and today, we collect data according to similar principles at the hospital. The culmination of this mammoth effort has resulted in a database that includes 4000 patient case portfolios with a long-term follow-up. This database covers all kinds of dental trauma as well as combination injuries in permanent and primary teeth. Data collection included structured datasheets, standardized radiographs, and clinical photos as well as a predefined protocol for treatment. Initial treatment and follow-up were performed in the same department.[16] The risk of various healing complications such as pulp necrosis, pulp canal obliteration, repair-related root resorption, infection-related root resorption, ankylosis-related root resorption, marginal bone loss, and tooth loss was estimated based on survival analysis.[17] These statistical analyses were performed in collaboration with the Department of Biostatistics, University of Copenhagen, and the observations were published in a series of articles, of which some examples are cited here.[6-19]

Research anchoring is important, and development is seen toward long-term clinical follow-up studies today to verify or...
reject the findings of earlier experimental *in vivo* and *in vitro* studies that were carried out in the 1980s and 1990s.

Textbooks and manuals are not always available in all places around the world. However, the ease of availability of the Internet enables the clinician to access the Internet-based DTG easily and allows a direct comparison of the patient with the outcome of similar cases in the database in Copenhagen. By doing this, the clinician will be guided on managing the trauma patient in the very best way in the emergency situation as well as aid in assessing the expected complications and take measures to proactively avoid it. This is a unique way to share the experience worldwide for the benefit of our dental trauma patients.

**The Dental Trauma Guide as a tool for education**

An important future development is to introduce the DTG at the undergraduate level in dental schools. A recent study in

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**Figure 1: Webpage of trauma pathfinder in the Dental Trauma Guide**

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<table>
<thead>
<tr>
<th>Trauma pathfinder</th>
<th>Patient examination</th>
<th>Trauma pathfinder</th>
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### Find trauma diagnosis:

If the main fracture or luxation injury has not yet been identified, use the questions below to find the correct trauma diagnosis.

- **Is there tooth displacement?**
  - No displacement
  - Displacement
  - Total displacement

- **Tooth is displaced / Is there abnormal tooth mobility?**
  - Yes
  - No

- **No abnormal tooth mobility / What is the direction of the displacement?**
  - Intrusive
  - Protrusive/retro intrusive
  - Lateral luxation

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### Go directly to trauma diagnosis:

If the trauma has already been identified, you can go directly to a secondary diagnostic pathway to identify the secondary injury.

- Crow fracture
- Crow-root fracture
- Concussion
- Subluxation
- Intrusion
- Lateral luxation
- Extrusion
- Anomalous fracture
- Avulsion
Sri Lanka using an objective structured clinical examination questionnaire has demonstrated the benefits of using the DTG in the undergraduate trauma education program and concluded that the Internet-based DTG is an excellent tool in dental teaching aid and enhanced the overall knowledge of the students. Therefore, the DTG team has decided to offer free access for all life members of Indian Endodontic Society and students of all dental schools in India for an year. To be included in this, a senior person from the dental school is requested to sign up on behalf of the students through the following link: https://dentaltraumaguide.org/membership-india/.

**Role of Dental Trauma Guide play in India**

India is a vast country with a population of 1.3 billion, and the prevalence of noncommunicable diseases is known to have variations based on culture and region. The prevalence of TDI in India is 13% involving individuals of 3–60 years of age, and the cause is predominantly attributed to falls, sports injuries, and road traffic accidents. A recent questionnaire-based survey on knowledge of the general dental practitioners in relation to the emergency management of avulsion has emphasized the need for educational programs to enhance the knowledge of clinicians. India has nearly 300 dental schools which offer both undergraduate and postgraduate dental education. It is essential that the dental trauma guidelines have to be included as a part of the curriculum to the students. Creating an awareness toward the DTG web version will enable ease of mentoring the students, and the visual depictions of the treatment aspect of TDI will enhance the understanding and knowledge of the students. Increasing awareness about the DTG among clinicians, students, and specialty dentists in India should...
be motivated. In the future, studies on effective knowledge gain by incorporating DTG in the dental curriculum in dental schools in India can be assessed.

It has been observed that the clinical experience of handling traumatic dental injuries proves to have a positive effect; whereas the number of years after graduating affects the treatment planning negatively.\(^ {24,25} \) This creates the need for the clinician to continuously update the current guidelines. While handling such emergency clinical situations, gathering knowledge on diagnosis, treatment, and prognosis cannot be immediate. Access to DTG might prove to be extremely useful to students, clinicians, and specialist dentists in providing prompt and appropriate dental care.

**CONCLUSION**

DTG is a nonprofitable organization developed with the intent of access to knowledge on evidence of diagnosis, treatment, and prognosis of traumatic dental injuries to all dentists globally. It is available to everyone at a nominal fee and will be a useful tool for clinicians to handle emergency situations in practice as well as an adjunct method in teaching dental students about the evidence and management of traumatic dental injuries.
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Conflicts of interest
There are no conflicts of interest.

REFERENCES