

# Appropriate management of traumatic dental injuries at the hospital emergency department provides a positive impact on patient outcomes: exemplar case study

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## CASE STUDY

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## ABSTRACT

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The objective of this case study is to highlight the importance of medical doctors' management of acute dental trauma. Correct diagnosis and treatment techniques are essential for an optimal long-term prognosis of restored function and aesthetics for the patient. The aim of correct management of acute traumatic dental injuries (TDI) to permanent teeth is to protect patients from inaccurate diagnosis, poor treatment by clinicians and to stabilize the condition before referring to a dentist for permanent dental care. This case shows that appropriate management of acute dental injuries by the emergency doctor prevented the loss of teeth at an earlier age.

### Key Words

Dental trauma, traumatic dental injury, emergency doctor, dental trauma management, avulsion, luxation and splinting

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## Implications for Practice:

### 1. What is known about this subject?

Dental trauma can range from simple concussions to extensive maxillofacial damage with root displacements or tooth avulsion.

### 2. What new information is offered in this case study?

Emergency doctors helped prolong the survival rate of injured teeth by repositioning displaced teeth and replanting an avulsed tooth before referring to a dentist.

### 3. What are the implications for research, policy, or practice?

Medical doctors receiving appropriate dental trauma education at undergraduate or postgraduate courses would have the necessary knowledge and skills on assessment and management of TDI.

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## Background

Dental traumatology is the study of dental trauma and involves injury to teeth, gums and jaw bones.<sup>1</sup> Guidelines for the assessment and management of dental trauma have been developed by several organisations<sup>2-4</sup> and are accessible to dentists and medical doctors online. While dentists are trained at dental school to assess and manage dental trauma,<sup>5</sup> this is often not the case for medical doctors.<sup>6-8</sup> Medical doctors are often ill prepared to manage dental emergencies due to a lack of knowledge and skills training in this subject area.<sup>9</sup> Studies report the non-existence or minimal teaching of dental education in medical schools<sup>10</sup> or the absence of specific training courses in managing dental injuries during their medical studies.<sup>11</sup> Moreover, there is a lack of formal dental education for emergency doctors.<sup>6</sup> In reports assessing emergency doctors, nearly all respondents agreed on the importance of medical doctors having knowledge in managing traumatic

dental injuries (TDI)<sup>12</sup> since they are often the first to assess TDI presentations in the Emergency Department.<sup>13</sup> Taken together, these reports suggest that medical educators should have some knowledge and skills in dental trauma and include it as a clinical subject in medical education programs.

### Case details

Patient

Age: 19-year-old

Gender: Female

Occupation: University student

### Presenting symptoms

The patient suffered a traumatic dental injury at her university campus and was experiencing pain from her displaced teeth, tearing of the gingivae, lacerations of the upper lips and bruising to her face.

### History of problems

The patient presented at the hospital emergency department (ED) with multiple dental injuries following a generalised epileptic seizure where she fell onto the floor. The Emergency Department Discharge Referral recorded the patient's history of events and the emergency care received (Figure 1). This was the patient's first major dental trauma associated with her epileptic medical condition.

### Investigations

- Periapical radiographs of teeth 11, 21 and 22 were taken (Figures 2-4).
- Electric pulp and cold tests were performed on all her upper and lower front teeth.

### Diagnoses

Based on the characteristic appearance of the tearing of the gums and the cuts along the lips, a clinical diagnosis of "gingival rupture and laceration of the lips" was made (Figures 5 and 6).

Based on the ED discharge referral letter for missing tooth 21, the clinical diagnosis was "tooth avulsion". The emergency doctor had placed a material to stabilize the traumatized teeth (Figure 7).

The material used at the emergency department to stabilize the injured teeth was removed (Figure 8). Based on the characteristic appearance of displaced tooth 11, out of the alveolar bone socket, the clinical diagnosis was "combined extrusive and lateral luxation".

For tooth 22, displaced laterally in a labial direction, the clinical diagnosis was "lateral luxation".

### Treatments

- Emergency doctor provided immediate replantation of the avulsed tooth and stabilized the mobile displaced teeth with a splint.
- Plastic registrar sutured the cuts and laceration with sutures.
- Neurology team prescribed medication to control the epileptic fit.
- General dentist reassured the patient and referred her to a dental specialist endodontist.
- Endodontist repositioned the avulsed and luxated teeth into the correct position and checked with a periapical radiograph (Figure 9). The repositioned teeth were first held initially with composite resin material (Figure 10) and the area was then cleansed before permanently splinting the injured teeth with a wire (Figure 11). Root canal treatments were required for all three teeth, based on the evidence in support of endodontic intervention.

### Timeline

- Emergency department 17<sup>th</sup> Oct 2017
- Endodontist clinic 18<sup>th</sup> Oct 2017
- Splint placed 18<sup>th</sup> Oct 2017
- Root canal treatment (RCT) started 21<sup>st</sup> Oct (teeth 11 and 21)
- RCT started and splint removed 31<sup>st</sup> Oct 2017 (tooth 22)
- RCT completed 24<sup>th</sup> Nov 2017 (tooth 21)
- RCT completed 16<sup>th</sup> Dec 2017 (tooth 11)
- RCT completed 2<sup>nd</sup> Feb 2018 (tooth 22) (Figures 12 and 13).
- Review appointment 20<sup>th</sup> June 2018 showed the lips and teeth are clinically stable (Figures 14 and 15)
- Review appointment 22<sup>nd</sup> March 2019, teeth are clinically stable (see Figure 16).

### Discussion

This case study demonstrates how a continuation of care, starting with the emergency medical doctor through to being managed by the endodontist, impacts on patient outcomes. This case exemplifies how appropriate input from an emergency medical doctor, by providing correct management of acute dental trauma, can make a significant difference to the dental specialist treatment plan and have

a positive impact on patient outcomes. Had this dental trauma patient not received appropriate emergency care by the emergency doctor, it is likely the patient would have lost all three of her damaged upper front teeth, and experienced significant extra treatment costs involving bone grafting, ridge augmentation, periodontal surgery (gingivoplasty), surgical placement of dental implants and multiple crown restorations. In addition, the negative impact of extended dental treatment has the potential to affect the patient's social and psychological state.

The aims and principles of treating TDI will depend on the type of dental trauma diagnosed by the medical doctor following initial assessment and can be broadly categorized into: a) emergency management, b) intermediate management, and c) permanent management.<sup>14</sup> Medical doctors' knowledge of assessment and management TDI is important,<sup>15</sup> although generally they are only required to manage the emergency phase of TDI treatment before referring to a dentist, endodontist, or oral and maxillofacial surgeon for continual care. In this particular case, the avulsed tooth 21, and the luxated teeth 11 and 22 would all be classified as real emergencies and need to be managed within the first few hours of the injury<sup>16</sup> and the attending emergency doctor correctly managed the patient.

Unfortunately, many medical doctors are not confident in managing TDI, probably due to a lack of education and training in the area of dental trauma<sup>10,15,17</sup> and this suggests that few doctors would be able to provide appropriate emergency treatment to victims of dental injuries.<sup>18</sup> Indeed, studies have reported that medical doctors do have a lack of exposure to, and experience of, the full variety of dental trauma injuries.<sup>10,15,19</sup> When doctors do encounter dental trauma, their clinical experiences may be limited because of a lack of treatment time made available in clinic and inadequate resources available to manage an array of different cases.<sup>20,21</sup> It has been reported that nearly 99 per cent of medical doctors are dissatisfied with the level of dental trauma knowledge they possess,<sup>20</sup> and more than half of specialist doctors and medical residents perceive themselves to have a low-level of knowledge on managing dental injuries.<sup>15</sup> These self-perceived inadequacies can affect medical doctors' confidence in dealing with dental trauma injuries.<sup>10,15,17,19-21</sup> Medical doctors would benefit from having more basic knowledge of dental anatomy, including the structure of the tooth and surrounding tissues, before learning about how to diagnose and manage TDI for patients.

Luxation injuries are the most common of all dental injuries and the severity of damage to the periodontal tissues is dependent on the type of injury sustained e.g., concussion being the least to intrusive being the most.<sup>22</sup> Tooth luxation is the dislodgement of the tooth from its normal position in the alveolar bone and will cause some damage to the PDL, sometimes to, the pulp as well.<sup>23</sup> The clinical outcome of such traumatized teeth depends not only on the damage, but also the health of the pulp and periodontal ligaments (PDL). Pulpal health will depend on whether partial disruption has occurred or total rupture of the neurovascular supply.<sup>24</sup> This will dictate whether the pulp will return to its normal state or become necrotic. With regards to PDL health, monitoring is required to detect for evidence of root resorption. Root resorption following TDI, whether located along the root surface or within the root canal, appears to be a sequel to wound healing events, where a significant amount of PDL or pulp has been lost due to the effect of acute dental trauma.<sup>25</sup> Root resorption following luxation injuries can present as surface resorption (which often occurs with concussion, extrusive and lateral luxation); inflammatory resorption (typically occurring with intrusive and avulsion luxation); replacement resorption (frequently seen in intrusive luxation and replantation of an avulsed tooth); and transient marginal breakdown (often associated with lateral and intrusive luxation).<sup>16</sup> The most severe dental trauma that this patient experienced was the avulsion of her upper left central tooth 21. An avulsion is the complete disarticulation of a tooth from its bone socket<sup>26</sup> and maxillary incisors are the teeth most affected by avulsion because their normal labial projection, relative to that of the mandibular incisor, makes them more susceptible to direct facial trauma.<sup>11</sup> Treatment of avulsed teeth is extremely time sensitive and requires prompt management.<sup>27</sup>

The role and responsibility of the medical doctor, whether at the emergency department or in a private clinic, is to reposition displaced luxated teeth to their normal position as soon as possible since rapid management may facilitate pulp and periodontal healing, remove any possible occlusal interferences and improve aesthetics for the patient.<sup>24,28</sup> For avulsed teeth, immediate replantation is the best approach and medical doctors can replant an avulsed tooth without much difficulty and this should be done at the emergency appointment. If medical doctors can replant an avulsed tooth within 5 minutes, the long-term survival rate and periodontal healing is much better.<sup>29,30</sup> If replantation is impossible or impractical, then the tooth should be rinsed

with saline and stored in milk.<sup>31</sup> Much of the confusion about the ideal transport media centres on a lack of understanding of the importance of keeping the PDL around the tooth/root surface vital.<sup>32</sup> If there is loss of the PDL tissue, root resorption may occur because the antiresorptive factors residing in the PDL are no longer protecting the root surface against osteoclastic activity.<sup>25</sup>

As a general rule, all luxated teeth that have been repositioned require splinting.<sup>31</sup> This treatment principle implies repositioning the tooth facilitates PDL healing and the splinting time is governed by the type of injury.<sup>33</sup> Where teeth are displaced without bone fractures (e.g., subluxation, extrusive, lateral and avulsion), 1–2 weeks splinting would be required; and when root and alveolar fractures occur (e.g., intrusive, root fracture and alveolar fractures), 1–4 months splinting would be needed.<sup>31</sup>

The existence of any observable signs of inadequate knowledge on dental trauma by medical doctors should provide the catalyst to establish an education plan to introduce dental traumatology. This will help to prevent any undesired outcomes on the victims of dental trauma.

## Conclusion

The learning points and take-home messages from this case study are:

1. Medical doctors would benefit from knowing how to diagnose and manage the different types of luxation injuries.
2. Medical doctors have an important role and responsibility to reposition a displaced tooth.
3. Medical doctors should preserve an avulsed tooth and practice the concept of immediate replantation in their management plan because this will affect the long-term prognosis.
4. When injuries to the gingival and oral mucosa area are present, medical doctors should know that these soft tissue lacerations should be closed expediently with sutures.
5. Medical doctors competent in managing emergency procedures in dental trauma can provide a higher standard of treatment care.

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**PEER REVIEW**

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**CONFLICTS OF INTEREST**

The authors declare that they have no competing interests.

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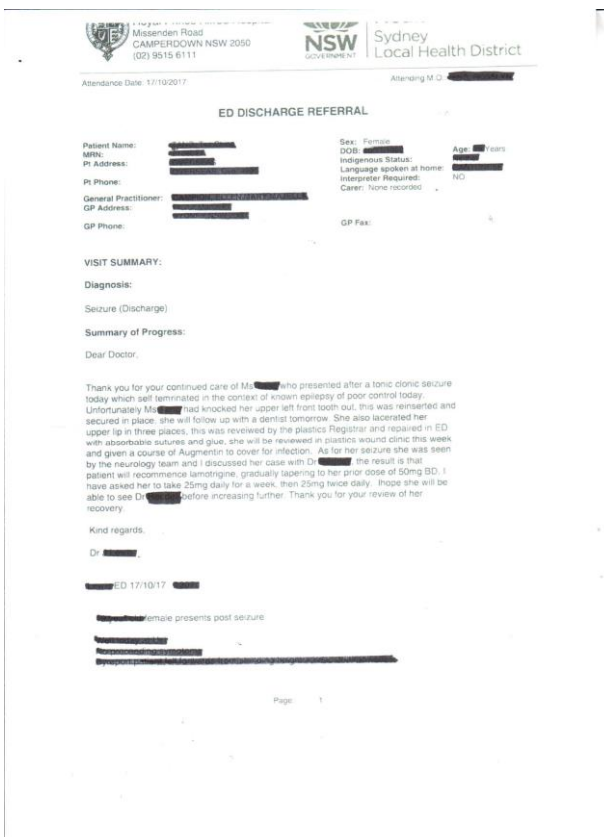
None

**PATIENT CONSENT**

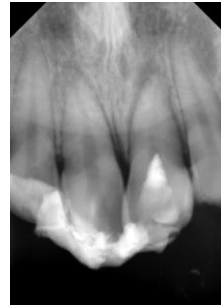
The authors, Yeng T, O’Sullivan AJ, Shulruf B, declare that:

1. They have obtained written, informed consent for the publication of the details relating to the patient(s) in this report.
2. All possible steps have been taken to safeguard the identity of the patient(s).
3. This submission is compliant with the requirements of local research ethics committees.

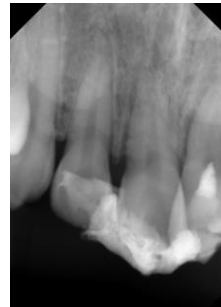
**Figure 1: Emergency Department Discharge Referral letter**



**Figure 2: Periapical radiograph of teeth 12,11,21 and 22**



**Figure 3: Periapical radiograph of teeth 13,12,21 and 22**



**Figure 4: Periapical radiograph of teeth 21,22 and 23**



**Figure 5: Soft tissue injuries of the gingivae and upper lips**



**Figure 6: Soft tissue injuries upper and lower lips**



**Figure 7: Stabilisation of the teeth by the Emergency Doctor**



**Figure 8: Removal of the material and the displaced upper front traumatized teeth (11, 21 and 22)**



**Figure 9: Periapical radiograph confirming the repositioning of the luxated teeth**



**Figure 10: The repositioned teeth held with composite resin material to allow the injured area to be cleaned**



**Figure 11: Teeth 11, 21 and 22 repositioned. The teeth are splinted with a semi-rigid wire**



**Figure 12: Post treatment radiograph after completing root canal treatment for teeth 11, 21 and 22**



**Figure 13: Post treatment radiograph after completing root canal treatment for teeth 11, 21 and 22**



**Figure 14: Post trauma review at 6 months**



**Figure 15: Post trauma review at 16 months**

