

# Anaesthesia and dental trauma

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## Abstract

Damage to the teeth during general anaesthesia is a frequent cause of morbidity for patients and a source of litigation against anaesthetists. Most injuries occur as a result of laryngoscopy. The use of an oropharyngeal airway as a bite block can increase the risk of dental damage and should be avoided. Bite blocks should be made from an appropriate material and placed between molar teeth rather than incisors. Patients should be advised about the possibility of dental trauma during anaesthesia and should be advised to have preoperative dental treatment to minimize dental factors that increase the risk of injury. Children in a mixed dentition phase (between the ages of about 5–12 years) are a high-risk group. Anaesthetic departments should have local protocols to refer patients for dental treatment postoperatively in the event of trauma.

**Keywords** anaesthesia; dental; laryngoscopy; trauma

## Incidence and pattern of damage

The reported incidence of dental trauma has varied considerably; recent large retrospective studies have estimated that between 1 in 2805 (0.04%) and 1 in 2073 (0.05%) individuals undergoing a general anaesthetic risk dental damage.<sup>1,2</sup> Whilst this incidence sounds low, it is the most frequent cause of anaesthesia-related medico-legal claims.<sup>3</sup>

Dental damage ranges from loosening or fracture of a tooth to the loss of a restoration or the complete displacement of a tooth from its socket. The incidences are shown in Table 1. Dental injuries tend to occur most frequently in the upper anterior region, and in particular, to the left central incisor because of the damage caused by the position of the laryngoscope in the oral cavity.<sup>4</sup>

Whilst most dental damage is identified by the anaesthetist at the time of intubation, a number of cases can be missed. In a retrospective study of 161,687 anaesthetic cases, 14% of dental damage was identified first by the patient or a member of the recovery staff.<sup>2</sup> Damage to the dentition is highlighted in this article but injuries to the lips and gingivae also occur. The incidence of these conditions are hard to quantify, but probably occur with much greater frequency than damage to the dentition.

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## The causes of 85 cases of dental injury<sup>2</sup>

Cause	Proportion of cases
Enamel fracture	32.1%
Loosening or subluxation of the tooth	21.1%
Luxation or avulsion	12.8%
Crown fracture	7.7%
Crown and root fracture	1.3%
Missing tooth or teeth	10.3%
Other injury <sup>a</sup>	21.0%

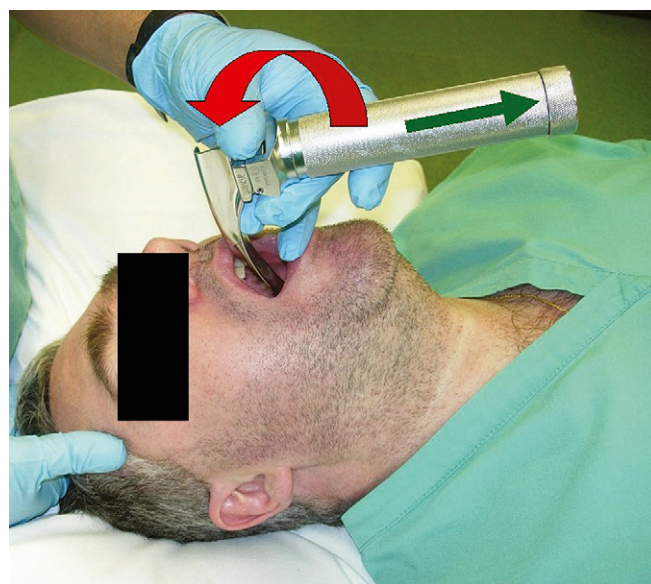
<sup>a</sup>Includes damage to dental restorations, prosthetic crowns, fixed partial dentures and dislodgement of veneers

**Table 1**

## Causes of dental trauma

### Anaesthetic factors

**Direct trauma:** the highest incidence of dental trauma occurs in patients undergoing an endotracheal intubation for a general anaesthetic. Those who present with a difficult airway are approximately 20.8 times more likely to suffer dental trauma than those with a straightforward airway.<sup>2</sup> This is thought to be largely due to the anaesthetist inadvertently using the upper teeth as a fulcrum for the laryngoscope when a satisfactory view of the glottis is difficult to obtain (Figure 1). Tooth contact is associated with a high Mallampati score (3 or 4), poor mandibular subluxation, limited head and neck movement (<90°) and a limited inter-incisor gap (<5 cm). For example, patients with a Mallampati score of 3 and prominent 'buck' teeth have been reported to experience blade-tooth contact in more than 90% of intubations.<sup>5</sup> The use of a modified low-height flange on a Macintosh



**Figure 1** Laryngoscope causing direct trauma to the upper incisors. Red arrow demonstrates using the incisors as fulcrum. Green arrow demonstrates correct line of traction of laryngoscope.

blade can reduce the frequency of direct contact between the blade and upper teeth by more than 80%.<sup>5</sup>

In cases of difficult endotracheal intubation the McCoy blade has been shown to provide better views than conventional blades and may therefore reduce tooth contact during difficult intubation.

**Damage due to biting:** biting is a common occurrence during the emergence from anaesthesia and generates considerable forces that are concentrated on incisors when oropharyngeal airways are used as bite blocks. Specially designed bite blocks or gauze rolls should be used and all bite blocks inserted between the molar teeth to dissipate forces throughout as many teeth as possible. To re-iterate, oropharyngeal airways should not be used as bite blocks.

### Dental factors

A number of dental factors increase the risk of damage to the teeth (Table 2). As the prevalence of caries continues to decrease, patients with isolated, retained teeth are increasing. These patients usually have partial dentures, which when removed leave isolated teeth exposed. Whilst some anaesthetists prefer to leave dentures in situ to make intubation easier, there is a risk that they may become dislodged if left in place for prolonged periods of time.<sup>6</sup> The authors suggest that partial dentures should be left in place during laryngoscopy to protect native teeth, and removed following intubation. A nasopharyngeal airway can be inserted to avoid potential damage of exposed isolated teeth during the recovery phase. It is also worth noting that children with mixed dentition (aged 5–12 years) have an increased risk of injury.

### Minimizing dental trauma

Any patient who is awaiting an elective surgical procedure requiring a general anaesthetic should be advised to attend their dentist first. Preoperative dental treatment can address some

#### Dental factors that render teeth more susceptible to injury

- Children in the mixed dentition phase (aged 5–12 years with a mixture of primary and permanent teeth)
- Carious teeth
- Periodontal or gum disease
- Large anterior restorations
- Veneers, crowns, bridgework and implants
- Protruding upper incisors
- Extensive tooth surface loss
- Endodontically or root treated teeth
- Isolated teeth
- Structural abnormalities (such as enamel (amelogenesis imperfecta) or dentine (dentinogenesis imperfecta) abnormalities)
- Previously traumatized teeth

Table 2

dental risk factors. This might include the restoration of carious lesions, replacement of any lost or loose anterior restorations, splinting or extraction of any mobile teeth and the provision of a guard for use during surgery. Unfortunately mouth guards do not necessarily prevent dental damage and should not be relied on exclusively.

During the preoperative assessment the anaesthetist should enquire about loose teeth, unstable crowns, veneers, bridgework and any intra-oral prostheses (dentures or orthodontic appliances). Whilst there is no standardized method for recording this, a simple diagram and a brief written description may be satisfactory.<sup>7</sup> The patient should be warned about the potential for dental damage and its incidence (see above), and any particular risk factors, either anaesthetic or dental, should be identified and explained to the patient.

Clearly, it falls upon the anaesthetist to minimize direct dental trauma. Laryngoscopes should be used carefully and where possible instrumentation of the airway should be avoided. In those at high risk of dental trauma, either a laryngeal mask airway or a fibre-optic approach to airway management may be preferred. Oro-gastric tubes, suction catheters, endoscopes and oesophageal Doppler probes are all potential sources of dental trauma and care should be taken when inserting them.

### Management of dental trauma

Despite all appropriate measures being taken, dental trauma can still occur. Anaesthetic departments should have a protocol for this, which should include the following points.

- All dental fragments need to be accounted for. In the event of any missing fragments, a chest radiograph is necessary to exclude aspiration. However, it should be remembered that some dental prostheses are not radio-opaque and direct visualization may be required.
- Although most dental fragments will pass through the gastrointestinal tract without causing harm, large prostheses have the potential to obstruct and perforate as they pass through. Surgical or endoscopic removal may be required in these cases.
- In children, the loss of a primary tooth does not require treatment. Indeed, the return of an avulsed primary tooth into its original socket can damage the underlying permanent successor. If a permanent tooth is displaced from its socket, it should be stored in cool, fresh milk or normal saline until a time when it can be splinted or fixed back in place.
- When the patient is sufficiently awake, a full explanation must be given. This should include a clear apology and a description of the events that led up to the damage and the efforts made to minimize any complications. The presence of a relative, a member of the nursing staff or a patient liaison officer is often very useful in this situation. Similarly, from the junior anaesthetist's point of view, the attendance of a senior colleague is invaluable and should be sought.
- All actions and discussions should be clearly documented in the patient's records.
- It is the responsibility of the anaesthetist to organize an urgent dental assessment and arrange subsequent treatment. The patient should not leave hospital without a clear written treatment plan and arrangements for follow-up. A contact telephone number and address should also be provided. ◆

## REFERENCES

- 1 Warner ME, Benenfield SM, Warner MA, et al. Perianaesthetic dental injuries: frequency, outcomes and risk factors. *Anesthesiology* 1999; **90**: 1302–5.
- 2 Newland MC, Ellis SJ, Reed Peters K, et al. Dental injury associated with anaesthesia: a report of 161,687 anaesthetics given over 14 years. *J Clin Anesth* 2007; **19**: 339–45.
- 3 Givol N, Gerhtansky Y, Halamish-Shani T, et al. Peri-anaesthetic dental injuries: analysis of incident reports. *J Clin Anaesth* 2004; **16**: 173–6.
- 4 Chen JJ, Susetio L, Chao CC, et al. Oral complications associated with endotracheal general anaesthesia. *Anaesth Sinica* 1990; **28**: 163–9.
- 5 Lee J, Choi JH, Lee YK, et al. The Callander laryngoscope blade modification is associated with a decreased risk of dental contact. *Can J Anaesth* 2004; **51**: 181–4.
- 6 The Medical Protection Society. Damage to teeth during general anaesthesia. London: Medical Protection Society, 1991.
- 7 Buffington CW. A simple preanaesthesia dental examination. *Anesthesiology* 2006; **104**: 212–13.

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