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Dental trauma to general anesthesia: Does the anesthesiologist perform a pre-anesthetic dental evaluation

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Abstract
Aims: The aim of this study was to assess the awareness among anesthetists regarding prevention and management of injuries to the teeth and their associated structures during anesthesia.
Materials and Methods: Anesthetists practicing in various hospitals in Indore participated in this study. A questionnaire was devised and distributed among them. The completion of the questionnaire by the respondents was taken as their consent to participate in the study.
Results: The results showed that the injury to the oro-dental tissues is a common finding during anesthesia. The maxillary incisors underwent injuries more commonly than the mandibular incisors. Padding of the teeth was the most common precaution taken to prevent injuries to the teeth which, however, is not adequate. The management for such injuries was inadequate and in many cases, the patients' referral to a dentist was not considered post-operatively.
Conclusion: Pediatric dentists can play a major role in creating the awareness among the anesthesia providers regarding prevention of oro-dental injuries during anesthesia as they deals with both aspect.

Keywords: Dental trauma, anesthesiologist, pre-anesthetic dental evaluation

1. Introduction
Anesthesiologists' work often involves the mouths of patients; however, they may not have received comprehensive education about teeth, surrounding tissues, and intraoral prosthesis. Perioperative dental damage is one of the most common anesthesia-related adverse events and is responsible for the greatest number of malpractice claims against anesthesiologists.
One of the causes of traumatic injuries to teeth is during general anesthesia. Injuries to teeth during anesthesia happen most frequently during laryngoscopy. Injuries to lips and other soft tissues are also common during these procedures. Many studies have been found in literature about injuries during anesthesia and precautions to be taken for prevention and management of such injuries [1, 2-6].
Injuries to the teeth have been associated commonly with general anesthesia and specially during endotracheal intubation [2]. Trauma to the teeth have been suggested to occur during laryngoscopy or from use of airways, mouth openers, props, or gags [3].
The likelihood of perioperative dental trauma increases with the vulnerability of a patient's dentition and the presence of anesthesia-related risk factors. Therefore, it is crucial that anesthesiologists have a detailed knowledge regarding dental anatomy and pathology. The level of training of an anesthesia resident reportedly has no effect on the risk of dental injury, and the level of experience of the anesthesiologist was not a major determinant of dental injuries in patients with healthy dentition. Minimizing perioperative dental trauma begins with the anesthesiologist's preoperative assessment of the patient's dentition and intraoral tissues. Clearly documenting patient's preoperative dental condition and notifying the patient of potential dental damage will minimize the cost of related postoperative dental treatment. Upon discovery of a dental condition that can be potentially damaged during anesthesia, a dental consultation should be considered before proceeding with the surgical procedure.
Dental injuries have been said to occur during 1% of general anesthesia. Although the injuries are most commonly reported to be sustained during laryngoscopy, they require intervention in only 2% of cases [2]. The incidence of peri-operative dental damage as per some retrospective studies has been found to range from 0.02% to 0.07% [2]. However, one prospective study has reported a much higher frequency of dental trauma as much as 12.1% and overall incidence of oral injuries as 18% [5].

Although there has been a lot of progress in intubation techniques, damage to teeth has been reported as the commonest cause of complaint against anesthetists abroad [1, 2]. Certain pre-conditions like dental caries, periodontal disease, restored teeth, presence of crowns, or fixed partial dentures increase the risk of the teeth to injuries. Some age groups also predispose teeth to such injuries [3].

It is suggested that although pre-operative assessment of dentition may guide anesthetists about risk of dental injury; the majority of the incidents are not associated with predicted difficult intubation [6].

As a pediatric dentist while working on children under anesthesia, we can prevent and manage such injuries successfully. However, as general anesthesia is given to children more commonly for many other medical reasons, a dentist may not be present during such procedures. It would be, therefore, appropriate to increase the awareness regarding the management of traumatic injuries to the teeth during anesthesia among the anesthetists. As we interact frequently with anesthetists, we can be of utmost importance to create awareness among the anesthetists to reduce the incidence of such complications. Studies have been carried out abroad addressing the prevalence and incidence of traumatic injuries to the teeth during anesthesia. However, to our knowledge, a few studies has been reported in India to assess the awareness of the anesthetists related to prevention and management of such injuries. Therefore, it was decided to conduct a survey among the anesthetists practicing in Indore to assess their awareness regarding dental injuries during anesthesia and to create awareness among them regarding the same.

2. Materials and method

The study was conducted among anesthetists (students pursuing post-graduation or diploma in anesthesia, anesthetists not attached to any hospital, registered anesthetists and practicing in various hospitals) which made a total number of 150 anesthetists in Indore district. A questionnaire was devised and distributed among anesthetists, with a request to reply the anonymously filled proforma within one week. The questionnaire was designed in such a way that the first four questions were to know their experiences related to traumatic injuries to teeth and their associated structures during anesthesia. Questions four to nine was devised to assess the practices they followed to manage such an injury. And the last question was to know if they would be interested to update their knowledge regarding the same. A reminder was sent to the non-respondents. The completion of the questionnaire by the respondents was taken as their consent to participate in the study. (Annexure 1)

3. Results

Almost 86.67% responded in stipulated time frame.

- Collected data was summarized by descriptive statistics (Frequency & Percentage).

All the anesthetists encountered trauma during induction of anesthesia (graph 1). Almost 76.92% of anesthetist perform risk assessment prior to induction of anesthesia and all of them advice removal of grade III mobile teeth before starting of the procedure. According to their experience the most common type of oral injury associated with general anesthesia is loosening of teeth followed by trauma to the palate, gums and lips respectively. 66%of the respondents felt that injury to the teeth and its associated structures was seen most commonly during laryngoscopy procedure, 30% felt that injury happens during the endotracheal tube biting, and only 4% felt that the airway removal was a common cause of dental injury.

Respondents answered that the teeth which were injured most commonly were the maxillary left incisors, maxillary right incisors (80%), mandibular right incisors (30%), and the mandibular left and right incisors (10%) respectively.

For the prevention of injuries to the teeth 79% of anesthesiologists uses aids. In which 61.53% used mouth prop, 23.07% occlusal gutter and only 15.38% used padding. For subluxated tooth during anesthesia procedure, 69.23% did complete self-removal of the tooth, 15.38% left the subluxated tooth without doing anything, and 15.38%sought dentist's assistance. For an avulsed tooth, 46.15% handed over the teeth to the relatives, 23.07% asked for dental assistance, 15.38% disposed the teeth, and stored it in media respectively. With regards to the measures taken after the dental injury, 30.76% sought dental assistance, 69.23% gave non emergency care for the dental injury. It was observed that all the anesthetists thought that they required to upgrade their knowledge and awareness regarding the prevention and management of injuries to the teeth and associated dental structures during anesthesia.

4. Discussion

Twenty-nine per cent of all successful malpractice claims against anaesthetists are sought as a result of dental injury [7]. Though anesthesiologists always operate intraorally, they might not have extensive education of oral, perioral tissues, and intraoral prostheses. The chances of perioperative dental injury increase with poor dentition along with associated anesthesia-related risk factors [8].

In correct use of mouth-openers, props, and mouth gags as well as endotracheal intubation, laryngoscopy, use of oro-pharyngeal airways, during the induction and withdrawal of general anesthesia can commonly lead to various dental injuries [1].

In the present study, almost all of the anesthetists felt that the dental injury occurs at during general anesthesia induction maximum while laryngoscopy followed by endotracheal intubation. Some anesthetists felt that the injury occurs during extubation. Similar results have been found in a study by Monaca *et al.* [9]

Earlier straight blades laryngoscopes were used to perform endotracheal intubation. This approach was described by Macgill in 1930. Miller laryngoscope was used for intubation in 1941. In 1943 Macintosh introduced curved laryngoscope [8].

Bucx reported that the force applied on the maxillary incisors during laryngoscopy in adult patients was 49 Newtons on an average (4.99661 kg force) [10]. Most of the anesthetist marked laryngoscope as the anesthetical equipment which causes dental trauma. High incidence of dental insult following conventional laryngoscopy has also been reported by Mourão *et al* [11].

Most of the anesthetist use teeth as fulcrum to depress the tongue that's leading to damage to the teeth [12]. Careless placement of the laryngoscope blade can cause lacerations of the lips, palate, and cheeks, and this can be very uncomfortable for the patient postoperatively. It has been suggested that soft paraffin ointments be applied to any cuts to minimize post-operative discomfort [13, 14].

In our study it was observed that the most common injury was loosening of teeth (84.61%) followed by injuries to palate (7.6%), lips and gums (3.8%) respectively.

According to Lockhart and colleagues and Jaw-Jen Chen *et al*., the teeth at risk were in the following order: Maxillary central incisors left, right, maxillary lateral incisors left, right, maxillary canines left, right respectively but we found out according to the anesthetists of indore maxillary central incisors right 80%, left 30%, and mandibular incisors both left and right 10% each was the sequence of trauma to the tooth [1].

Before starting of general anesthesia evaluation of dental state is made with any degree of difficulty in intubation is recorded [15]. Nowadays fibro scope is used as it reduces the risk of damage to the teeth and associate structures. However, they may not be practically available in every set up. Some authors have advocated the attachment of a strip of poly foam to its flange to cushion the teeth and oral soft tissues [16]. Gauze rolls and folded tape may reduce the chance of chipping teeth. Role of mouth guard remains controversial as it has being observed that their use has no significant role in association to dental trauma [17].

Tooth injuries are said to range from micro fractures of the natural tooth substance, actual avulsion, pulp necrosis, damage to crowns, and bridges.

Certain recommendations to prevent injuries to the oro-dental tissues during anesthesia have been given: [1]

- Deciduous teeth about to exfoliate should be removed to prevent accidental dislodgement or otherwise their presence should be recorded.
- Utmost care needs to be taken to avoid displacement of the newly erupted permanent incisors of children.
- Teeth with multi-surface restorations are also at a risk and may fracture easily under force applied by a prop or mouth gag.
- Presence and position of crowns and bridges should be recorded.
- Proclined teeth are also susceptible to a levering effect when oro-pharyngeal airways are in place so care must be taken.
- In case of any dental injury, itis advisable to seek dental advice and document the findings.
- If there is avulsion of teeth, they must be retained and kept in normalsaline as possibility exists that they can be re implanted if treatment is provided within hours.

Burton proposes that if the tooth is subluxated, they can be returned back to their position by digital pressure and bone on either side be compressed and patient referred for dental opinion immediately. It has been said that a some proportion of dental injuries occur at the time of extubation in patients who have occluded their tracheal tube through biting, and this situation can be avoided by inserting a bite block [17].

Before planning for extubation, a soft roll of gauze can be placed on the biting surface of the patients mandibular molar and premolar region and should be large enough to be retrieved. Mouth props and retractors should be placed carefully to prevent impinging on the tongue or other soft tissues. Suctions should be used carefully. A complete dental check up to rule out dental injury should be carried out after extubation and recovery [18].

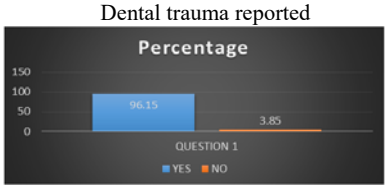
It has been highly recommended that the risk of damage to teeth should always be explained to the patient and in our case guardians also. As pediatric dentist works frequently on the children under general anesthesia, we can play a major role to reduce the incidence of such injuries in children by creating awareness among anesthesiologists.

In our study, the filling of the questionnaire itself was a factor for all the participants to realize that the need to update themselves regarding the precautions that can be taken to reduce incidence of such injuries. They were also told to inform patients to seek dental assistance for injuries, which can have impact if left untreated. However, creating awareness regarding such injuries on a large scale is warranted.

5. Conclusion

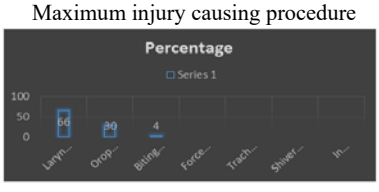
Anesthesiologists must conduct a thorough preoperative evaluation of a patient's mouth. To help identify the dentition at risk, the evaluation should include a review of the patient's dental history; a specific discussion with the patient about any existing dentures or crowns; and an oral/dental examination, particularly of the patient's upper incisors—the teeth most likely to be injured during the perioperative period—including an inspection of the teeth for any pre-existing damage. Any existing conditions such as chips or missing teeth must be noted. In addition to pre-anesthetic evaluation, anesthesiologists must also take intra procedural precautions and have knowledge of the measures required to be taken in case of any damage. All procedures and choice of the anesthetic equipment with their risks and benefits must be adequately discussed with the patient. These steps are necessary to minimize dental trauma and the costs and consequences associated with them, and require the involvement of the patient as well as dentists and anesthesiologists.

Dental trauma reported

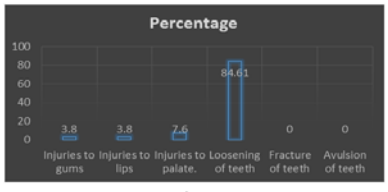


Graph 1

Maximum injury causing procedure

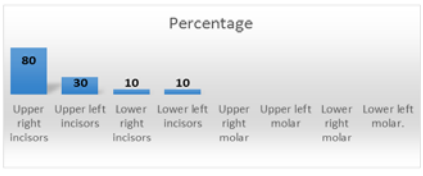


Graph 2



Graph 3

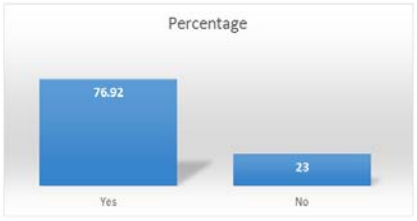
Type of trauma



Graph 4

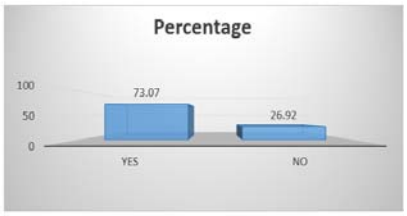
Teeth affected most commonly

Anesthetist advising dental check up



Graph 5

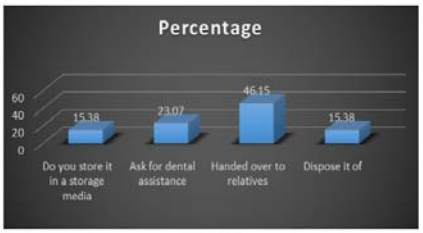
Advised removal of mobile teeth



Graph 6

Graph 7

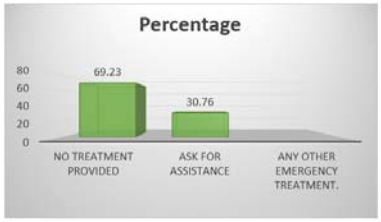
Management after trauma



Graph 8

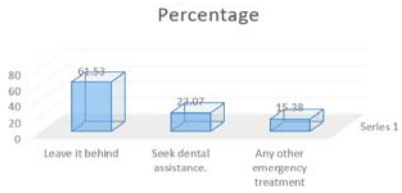
Management after avulsion

After subluxation

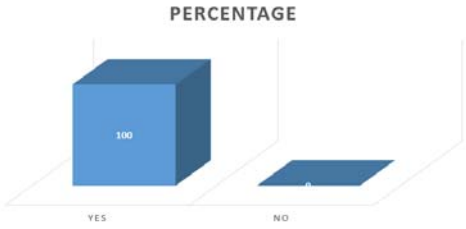


Graph 9

After chipping of enamel



Graph 10



Graph 11

Anesthetist seeking update

6. Questionnaire form

1. Do you carry out a pre-operative risk assessment of teeth before providing general anesthesia? (Mobile teeth, crowns, dentures, fillings, gingival inflammation others).

a. Yes
b. No

2. Which are the most common dental injuries encountered during anesthesia procedures?

a. Loosening of teeth
b. Fracture of teeth
c. Avulsion of teeth
d. Injuries to gums
e. Injuries to lips
f. Injuries to palate.

3. During which part of providing general anesthesia, dental injuries are most commonly encountered?

a. Laryngoscopy
b. Oropharyngeal airway placement
c. Biting down on endotracheal tube/LMA
d. Forceful removal of airway/FTT/LMA during emergence
e. Tracheal extubation
f. Shivering leading to masseter spasm
g. In recovery room.

4. In your experience, which teeth suffer from injuries most often?

a. Upper right incisors
b. Upper left incisors
c. Lower right incisors
d. Lower left incisors
e. Upper right molar
f. Upper left molar
g. Lower right molar
h. Lower left molar.

5. During PAC, if loose teeth (grade III) are identified, do you advice their removal preoperatively?

a. Yes
b. No

6. Do you take any specific measures for preventing injuries to dental tissues?

a. Yes
b. No.

If yes, in what form (Mouth props Mouth guards Padding of teeth any other specify……

7. While providing anesthesia, if a tooth is subluxated (Grade III loose) to prevent its aspiration,

a. Do you remove it completely on your own?
b. Leave it behind
c. Seek dental assistance.

8. In case of avulsion (complete removal of teeth from socket) of teeth,

a. Do you store it in a storage media
b. Ask for dental assistance
c. Handed over to relatives
d. Disposed of

9. What measures are taken after any other dental injuries (chipping of teeth, subluxated teeth)?

a. No treatment provided
b. Ask for assistance
c. Any other emergency treatment.

10. Would you like to have awareness regarding dental management of peri-anesthetic injuries?

a. Yes
b. No

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