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Perceptions regarding the occurrence and prevention of orofacial injuries during general anesthesia

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Abstract: Orofacial trauma can occur during general anesthesia. Protective measures should be taken to prevent or minimize such injuries. We evaluated perceptions regarding the occurrence and prevention of orofacial injuries during general anesthesia among 74 professionals who perform this procedure. All participants were from Rio de Janeiro, Brazil, and information was collected in interviews, using a semi-structured questionnaire administered during an academic conference. The data were tabulated and analyzed, frequencies were calculated, and the chi-square test ($P < 0.05$) was used to assess relationships between variables of interest. Most participants (77.0%) had witnessed orofacial trauma during general anesthesia, and the most frequent type of dental injury was fracture (54.4%). Although most participants (64.9%) considered mouthguard use to be important during such procedures, only three reported using mouthguards to protect against patient injury. The likelihood of a dentist referral after injury was significantly associated with participant age ($P = 0.03$), length of time since graduation ($P = 0.02$), and area of specialization ($P \leq 0.01$). Although most participants had witnessed orofacial injuries, mouthguards were not routinely used for injury prevention. (J Oral Sci 57, 263-267, 2015)

Keywords: orofacial injury; dental trauma; general anesthesia; oral health.

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Introduction

Orofacial trauma, dental caries, periodontal disease, and oral cancer are important public health concerns (1), as these diseases affect physical integrity and psychological well-being and degrade patient quality of life (2). Dental trauma is associated with several factors, including automobile accidents, falls, and accidental impacts during sports (3). However, accidents can also occur while intubating or extubating patients during procedures requiring general anesthesia (4). Endoscopy and general anesthesia involve instrumentation that can injure soft, supporting, and dental tissues (5). Numerous medicolegal surveys and case reports have reported that orofacial trauma is frequently caused by laryngoscope use during general anesthesia (4,6-10).

The incidence of intubation-related dental injuries during general anesthesia is reported to be 0.17-12.1% (7). Several factors are related to the incidence of orofacial injuries during orotracheal intubation, including tooth and support tissue condition, instrument impact against the dental arch, emergency interventions, and lack of anesthesiologist experience (4,5). Gaudio et al. (4) reported that if intubation is difficult and there is no

other way to obtain a good view of the glottis, the upper teeth may be used as a fulcrum—principally in cases of difficult airway management—through application of pressure with the hard metallic blade of the laryngoscope. Thus, patients scheduled for general anesthesia should undergo a pre-anesthetic evaluation (10,11). In addition, mouthguards have been suggested as a means to prevent orofacial trauma (12-14).

In this study, we evaluated the perceptions that health professionals who administer general anesthesia have regarding the occurrence and prevention of orofacial injuries during such procedures.

Materials and Methods

Ethical considerations

This study was conducted with the approval of the Committee for Ethical Research of the Fluminense Federal University, Nova Friburgo, RJ (CAAE-30420214.7.0000.5626/2014). In accordance with ethical guidelines, this study was preceded by a detailed explanation for professionals who perform general anesthesia. Informed consent was obtained from all participants.

Participants and study design

This cross-sectional study enrolled 74 health professionals who administer general anesthesia (orotracheal intubation and/or extubation) during elective or emergency procedures. Persons who were unwilling to participate in the study, those who did not sign the informed consent form, and those who did not provide completed questionnaires were excluded from the study.

The sample was calculated by estimating the prevalence of dental injuries during general anesthesia, which was reported to be 1% (15), with a 3% error and a 95% confidence interval. To compensate for a possible cluster effect, the sample size was increased by 40% (design effect = 1.4), for a total of 60 participants. This value was then increased by 20% to compensate for any withdrawals. The minimum sample size was thus 72 subjects. Seventy-four health professionals were randomly selected during an academic congress, to ensure that they were representative of the original population.

The assessment tool used in this study was a self-administered questionnaire, which was completed by the participants during a national congress on anesthesiology during April 2014, in Rio de Janeiro, Brazil. This questionnaire was based on a preexisting model (10). Because there is no standard, validated questionnaire for such purposes, this questionnaire was adapted and used. Before the main study, the questionnaire was evaluated for ease of comprehension in a pre-test completed by 10 health professionals and was pre-tested again 1 month later. The 10 professionals were not included in the final sample. The brief pilot was used outside the study area. The results led to a number of minor changes to the questionnaire wording.

The questionnaire is divided into three parts. Part I comprises items on general information, including age, gender, area of specialization, and length of time since graduation. Part II includes items on the causes and extent of potential occurrences of orofacial trauma during orotracheal intubation and extubation. Part III includes items on knowledge and importance of patient mouthguard use.

Table 1 Dental trauma during general anesthesia

Contributing factors (n = 57)	
Laryngoscopy	19 (33.3%)
Incorrect technique	16 (28.1%)
Difficult airway	11 (19.3%)
Poor dental condition	11 (19.3%)
Limited mouth opening	5 (8.8%)
Insufficient sedation	3 (5.3%)
Inadequate preparation of patient	2 (3.5%)
Types (n = 57)	
Dental fracture	31 (54.4%)
Avulsion	28 (49.1%)
Dislocation/luxation	18 (31.6%)
Preventive measures (n = 74)	
Use correct orotracheal intubation technique	38 (51.4%)
Preparation and correct positioning of patient	13 (17.6%)
Careful laryngoscopy	12 (16.2%)
Adequate sedation	10 (13.5%)
Pre-anesthetic evaluation	9 (12.2%)
Satisfactory dental condition	6 (8.1%)
Use of mouthguard	3 (4.1%)
Bronchoscopy	2 (2.7%)

Statistical analysis

For quantitative analysis of the results, the data were entered into statistical software (SPSS 17.0, SPSS Inc., Chicago, IL, USA) in a single typing session and then tabulated. This method increases the reliability and credibility of the study. Frequencies were calculated, and the chi-square test was used to analyze relationships between variables of interest. A P value of <0.05 was considered to indicate statistical significance.

Results

Data were collected from 74 participants; 56.8% were men, and mean age was 36.2 (±12.4) years. The median

Table 2 Association of dental trauma-related factors during general anesthesia with age, time since graduation, and area of specialization

	Total	Age			Time since graduation			Area of specialization		
		≤36 years	≥37 years	*P* value	≤11 years	≥12 years	*P* value	Anesthetist	Other	*P* value
Observed occurrence of dental trauma during orotracheal intubation										
Yes	57 (77%)	34 (73.9%)	20 (80%)	0.56	31 (73.8%)	21 (80.8%)	0.51	29 (74.4%)	27 (79.4%)	0.61
No	17 (23%)	12 (26.1%)	5 (20%)		11 (26.2%)	5 (19.2%)		10 (25.6%)	7 (20.6%)	
Observed occurrence of dental trauma during extubation										
Yes	12 (16.2%)	6 (13%)	5 (20%)	0.50	5 (11.9%)	7 (26.9%)	0.18	8 (20.5%)	4 (11.8%)	0.31
No	62 (83.8%)	40 (87%)	20 (80%)		37 (88.1%)	19 (73.1%)		31 (79.5%)	30 (88.2%)	
Patient referred to dentist after dental trauma										
Yes	34 (59.6%)	17 (48.6%)	15 (78.9%)	0.03*	15 (48.4%)	16 (80%)	0.02*	27 (93.1%)	7 (25.9%)	≤0.01*
No	23 (40.4%)	18 (51.4%)	4 (21.1%)		16 (51.6%)	4 (20%)		2 (6.9%)	20 (74.1%)	
Consider mouthguards to be protective										
Yes	48 (64.9%)	27 (60%)	19 (79.2%)	0.10	25 (61%)	19 (76%)	0.20	23 (60.5%)	24 (72.7%)	0.27
No	26 (35.1%)	18 (40%)	5 (20.8%)		16 (39%)	6 (24%)		15 (39.5%)	9 (27.3%)	

*statistically significant difference ($P < 0.05$)

length of time since graduation was 11.7 (±12.6) years, and 39 of the 74 participants (52.7%) were anesthetists.

Fifty-seven participants (77%) had observed the occurrence of dental trauma during general anesthesia. The main reported cause was laryngoscope use (33.3%), followed by a failure in general technique. Regarding the type of dental trauma, 31 participants cited dental fracture (54.4%) as the most frequently observed type of trauma. Correct execution of orotracheal intubation was cited as the most effective preventive measure by 51.4% of participants (Table 1).

Dental trauma during intubation was reported by 57 (77%) participants; 12 participants (16.2%) reported that trauma occurred during extubation. Regarding management after dental trauma, 34 participants (59.6%) referred the patient to a dentist, and 48 participants (64.8%) considered a mouthguard to be important in protecting against dental trauma during general anesthesia.

Table 2 shows associations of dental trauma-related factors during general anesthesia with age, length of time since graduation, and area of specialization. The likelihood of dentist referral after occurrence of injury was significantly associated with participant age ($P = 0.03$), time since graduation ($P = 0.02$), and area of specialization ($P \leq 0.01$).

Although most participants (64.9%) regarded mouthguards as an important safety feature in preventing dental trauma during general anesthesia, only 3 (4.1%) had actually used one for this purpose. In these three cases, the mouthguards were made of high-density silicone.

Discussion

Orofacial injuries sometimes occur during general anesthesia. However, the incidence of such injuries can be substantially reduced by addressing risk factors and using protective equipment. A complete dental evaluation of the patient is recommended during pre-anesthesia appraisal. Adjustment and application of dental protectors before intubation is recommended in order to reduce the incidence of dental trauma (4).

Dental injuries during general anesthesia are an important cause of negligence complaints against participating anesthesiologists. Litigation risk can be substantially reduced be fully disclosing possible trauma risks to the patient or person responsible for the patient and by having them sign all necessary waivers (4,10).

Although several studies have reported low incidences of dental trauma during anesthesia (4,5,7), we found that most of the present participants (77%) had witnessed dental trauma during general anesthesia. This discrepancy suggests that additional studies of this issue are needed and that information should be distributed to patients and healthcare professionals, to reduce their respective risks.

Gaudio et al. (4) observed that approximately 90% of injuries were caused by the laryngoscope blade; other injuries were caused by contact between teeth and a Guedel cannula and by hasty intubation. Tiku et al. (10) reported that dental injuries and damage to corresponding dental structures occurred during laryngoscopy procedures in 96% of their study participants; 2% reported that injuries occurred during endotracheal intubation, and 2% noted that airway removal was the cause of dental trauma. These findings are consistent with the present results, which indicate that the main culprit is laryngoscopy technique, followed by use of incorrect operative technique.

Several studies reported that the condition of the oral cavity is an important factor in the occurrence of dental

trauma during anesthesia. Gaudio et al. (4) reported 83 cases of dental trauma; nine patients had severe periodontal diseases and 14 had less severe dental problems at the time of surgery. Another study by Gaudio et al. (8) revealed that, in 66% of reported cases, the most significant risk was pre-existing conditions such as nonspecific dental problems, caries, prostheses, damaged teeth, oral diseases, and/or functional problems. Vogel et al. (7) reported that pre-existing conditions (caries, periodontitis, and restorations) were present in 66 of 104 (63.5%) of patients who suffered dental trauma during anesthesia. In contrast, Skeie and Shgwartz (5) found that, among 75 patients who suffered trauma during general anesthesia, 25 had healthy teeth, without loss of support by maxillary bone, caries, or preceding dental problems. This contradicts the previously mentioned findings and suggests that trauma is not associated with the state of the oral cavity. The present study found that only 19.3% of participants considered general oral health to be a contributing factor to dental trauma. This indicates a possible lack of awareness regarding the importance of adequate pre-anesthesia evaluation of general oral health.

Previous studies reported that dental trauma occurred even when anesthesiologists had examined the oral cavity of patients (7,10). In the present study, 12.2% of participants mentioned examination of the oral cavity during pre-anesthesia consultation as a method for preventing dental trauma. However, previous findings indicate that such examinations are not sufficient to prevent orofacial trauma. Additional measures, such as mouthguard use, are required. These findings should be widely distributed in order to increase interest in this topic and stimulate additional research.

There is consensus regarding the area most vulnerable to dental trauma. A number of studies have reported that the front upper teeth are most vulnerable to dental trauma during anesthesia procedures (4,5,7,10). The lowers incisors are also at substantial risk (10), as are teeth on the left side (7). We conclude that preventive measures that protect the front upper teeth should be adopted.

Dental fracture, avulsion, and subluxation/dislocation were reported to be the most common forms of trauma during general anesthesia (4,5,7,8), and this was confirmed in the present study. Regardless of the type of trauma, all necessary preventive measures should be employed, due to the complexity and severity of the required corrective treatment and follow-up procedures.

Protective measures should be used to avoid or minimize orofacial trauma during general anesthesia procedures. However, Skeie and Shgwartz (5) observed no change in the rate of dental lesions even when protective measures and equipment were utilized. Tiku et al. (10) reported that most anesthesiologists in India used soft material to cover the teeth. Only three participants in the present study used preventive measures.

When orofacial trauma occurs during general anesthesia, measures should be taken to avoid esthetic, functional, and emotional damage to the patient. According to Tiku et al. (10), 56% of professionals requested assistance from a dentist, 38% did not offer any type of emergency repair, and 6% conducted symptomatic treatment of loose tissue. In the present study, slightly more than half of the participants referred patients to specialty dental care after an episode of orofacial trauma. This highlights the importance of providing adequate information to anesthesiology professionals regarding measures to respond to dental trauma during general anesthesia.

Our study should be regarded as preliminary because it investigated the perceptions of healthcare professionals regarding dental trauma and mouthguard use as form of prevention. Our epidemiologic findings are important because they serve as a warning and as a useful source of information to support and guide preventive strategies. In addition, our findings should be useful for designing more-comprehensive studies that focus on informing anesthesiologists about the importance of mouthguard use and a preliminary oral-dental exam during a pre-anesthesia consultation.

In conclusion, we found that most participants had observed orofacial trauma during general anesthesia procedures, especially during orotracheal intubation. The most frequently recommended preventive measure was use of correct technique during orotracheal intubation. Most participants considered mouthguard use to be an important preventive measure during general anesthesia. Future studies with similar or larger study samples will be necessary to confirm our conclusions.

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