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Frequency And Level of Dental Injury Related to Conventional Direct Laryngoscopy: A Prospective Observational Study

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Introduction

Direct conventional laryngoscopy is an essential skill in airway management for endotracheal intubation. Although the majority of direct laryngoscopies are uneventful in experienced hands, it can be difficult and challenging in some situations such as limited mouth opening, limited mandibular protrusion, narrow dental arch, decreased thyromental distance, modified Mallampati class 3 or 4, decreased submandibular compliance, decreased sterno-mental distance, limited head and upper neck extension, and increased neck circumference (1,2). Due to these challenging situations, complications may occur due to unintended teeth, lips, gingiva, and oral tissue damage during laryngoscopy, particularly in patients with difficult intubation (3).

Dental injury is not only one of the most common complications in the oral cavity during laryngoscopy but also an important part of medicolegal claims against anesthetists (4,5). Enamel infractions or fractures, loosened or subluxated teeth, tooth avulsion, and crown or root fractures are commonly reported dental injuries with an incidence as high as 38.6% (6). Unfortunately, complications may still occur even in patients without known predictors of difficult intubation and some of these injuries are microscopic and cannot be noticed by the clinicians and diagnosed after the patients' complaints (5). Thus, dental damage may occur more often than estimated.

Visual inspection and radiography are the conventional diagnostic methods in the dental practice. However, with these methods, it is not always possible to diagnose dental problems in depth and definitively. Transillumination as a diagnostic tool in medicine refers to light transmission through parts of the body. Fiber-optic transillumination (FOTI) and near-infrared light transillumination (NILT) are the additional detection methods used for the diagnosis and assessment of dental caries (7). FOTI of teeth is an easy, well-tolerated, non-invasive, and non-irradiating technique and has been used for over 100 years (8).

This study aims to investigate especially minor dental traumas and associated damages instead of major traumas that can be directly seen due to conventional laryngoscopy using transillumination technique with cold light source.

Material and Methods

After the approval of the Selcuk University Local Institutional Ethics Committee (2017/05), 300 ASA I-III adult patients who underwent elective surgical operations under general anesthesia and underwent endotracheal intubation were included in this prospective, double-blinded study. Written informed consent was obtained from each patient during the preoperative anesthetic evaluation.

During the preoperative anesthetic evaluation, an anesthetist and dentist in the study team performed a detailed oral physical examination on all study patients. Demographic data such as age, gender, body weight, height, data related to airway management such as mallampati score, thromental distance, mouth opening size, and information about past anesthesia history, including previously described difficult intubation and medical condition, were questioned, and recorded. During a dental examination, all teeth, but particularly anterior 6 of maxillary and mandibular teeth, were examined regarding general dental hygiene and the existence of any missing teeth, tooth decay, plaque and stone formation, discoloration, gum problems such as recession and gingivitis, and tooth trauma. The patients with the presence of deformation due to a trauma or a congenital abnormality in the maxilla-fascial region, a swinging tooth, and a history of previous surgical operation regarding the maxilla-fascial region and oral cavity were not included in the study.

All patients were subjected to the same anesthetic process. None of the patients were given anesthetic premedication on the day of surgery. Anesthesia induction was achieved with 2.0 $mg.kg^{-1}$ iv propofol, 2.0 $mg.kg^{-1}$ iv fentanyl, and 0.6 $mg.kg^{-1}$ iv rocuronium after routine monitoring with ECG, non-invasive blood pressure, and SpO_2. Each patient was ventilated with a face mask with 100% O_2 for 2-3 minutes and intubated with a proper endotracheal tube by the same anesthetist using a conventional laryngoscope. All intubations were achieved by anesthesiologists with different statuses (senior assistants and consultants who were blind to the study). After the endotracheal intubation, the anesthesiologist included in the study recorded the data about intubation and airway management such as

Cormack-Lehane Score, laryngoscope blade type and size, difficulty in intubation, use of additional devices such as oral airway, intubating supraglottic airway device, video laryngoscope, and intubating guide in the airway management, and the number of intubating attempts by asking the practitioner.

The intraoperative dental evaluation was performed using a transillumination technique with a cold light source at two different time points: T1: Before anesthesia induction, and T2: After endotracheal intubation, before the start of the surgical operation. The same dentist performed all dental evaluations. Although all teeth were evaluated, the evaluation with the cold light source was particularly for every six teeth in the lower and upper jaws.

Statistical Analysis

The statistical analysis was performed using SPSS, version XX. The normality of continuous variables was assessed with the Kolmogorov-Smirnov test. Descriptive statistics were presented as mean ± standard deviation (SD) or median (interquartile range, IQR) for continuous variables and as frequency (n) and percentage (%) for categorical variables. Group comparisons were made using the Independent Samples t-test, Mann-Whitney U test, One-Way ANOVA, or Kruskal-Wallis test, depending on the data distribution. Categorical variables were compared using the Chi-square test or Fisher's exact test. The relationship between intubation variables and dental trauma was analyzed using logistic regression, and results were reported as odds ratios (OR) with 95% confidence intervals (CI). Paired sample t-tests or Wilcoxon signed-rank tests were employed to compare dental evaluations before and after intubation. A p-value < 0.05 was deemed statistically significant.

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