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RESEARCH ARTICLE

THE IMPORTANCE OF DENTIST IN ICU IN TRAUMA DENTAL CASE

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ABSTRACT

Endotracheal intubation although common, can cause an increase in dental buco trauma during general anesthesia or ICU admissions. This trauma can occur at the stage of intubation, as well as the resting phase due to inexperience and lack of knowledge of critical care teams. This literature work in indexed databases aims to demonstrate how frequent is the occurrence of this accident and emphasize the importance of a Dental Surgeon in the Intensive Care Unit for the guidance of the hospital staff in the proper handling of the dental element in the case trauma as well as a reduction of this type of trauma due to endotracheal intubation.

Key words:

Dental Trauma, Tracheal
Intubation, ICU, General
Anesthesia.

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INTRODUCTION

For a long time the dental injuries have been associated with general anesthesia, with great frequency during laryngoscopy. However, it has become a growing concern among health professionals and government agencies, and the main complaint against anesthesiologists, and litigation target. The incidence of dental lesions ranges from 0.06 % to 12 % of these values could have been underestimated [1]. Although anesthesiologists work daily around the oral cavity, know little about the teeth and the techniques used [3], making it important to cover the knowledge of every responsible professional in the act of performing each procedure.

The upper incisors are at greatest risk of injury [1,2,8,20,19,21]. In premature infants who require mechanical ventilation during the postnatal laryngos copy and mechanical changes due to an oral tube, may damage tooth buds of the first and second teeth and deformation of the jaw skeleton [4]. Through a retrospective study carried out between January 2005 and December 2008, it was declared seventy-two cases of dental injuries. In this study 65 % of patients had poor dental conditions, 37 % met the criteria for difficult intubation. The combination of the two factors was found in 20 patients [6].

Only 17% of patients were informed of the possible damage [6]. Healthy teeth are strong enough and designed to withstand huge pressures generated Durantes chewing [1], however, excessive force in removal of a device but also during manipulation or instrumentation within the mouth can cause lesions in the oral cavity [3]. Injuries of the teeth are thus slightly more often due to disease of the teeth of the errors during anesthesia [4].

The adult dentition as well as the children's teeth, is supported by two arcs of bone: the maxilla and mandible. The tooth is divided into two parts: the root and the crown, each having three layers: enamel, pulp and root. The periodontium is the tissue surrounding the tooth and gives you support and consists of the gums, alveolar bone and the periodontal ligament. Any disease that affects the crown, the root or alveolar bone makes the tooth more vulnerable to injury and more likely to be fractured or dislocated when it is applied pressure [1]. The most common disease that affects the teeth is decay [1,2]. The treatment is done by the removal of carious tissue, and filling with a restorative material, which leads to a more fragile and more prone to tooth damage.

Periodontal disease is known as inflammation of the gums,

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tartrate accumulation and gingival recession. It is an inflammatory process involving bacterial infection of the periodontium. The pathophysiological mechanism involves the slow dissolution of the bone that support the teeth and the periodontal ligament and leads to increased tooth mobility and thus the teeth are more vulnerable to subluxation or avulsion, even when subjected to slight forces [1,2]. The treatment of choice in this case would be extracted, thus avoiding possible damage during intubation avulsion. Patients presenting teeth with restorations, dentures, crowns, periodontal disease are patients who are classified as having existing changes, making necessary to exclude or stabilize structures that were involved.

To this end, it is important that anesthesiologists perform a pre surgical inspection of the individual anatomical conditions in the head and neck [4] has a comprehensive knowledge of the anatomy of the teeth, the structures that support them, the dental pathology and the techniques used in restoration tooth in order to be able to properly identify teeth that are at risk and define a prevention strategy [1]. All procedures and choice of anesthesia equipment with its risks and benefits should be adequately discussed with the patient [8]. However contact with colleagues in dentistry and the presence of a Dental Surgeon in the Intensive Care Unit (ICU) is made important and necessary.

Literature Review

Occurrence of Dental Injuries

Dental injuries occur mainly during laryngoscopy [1,8,2,17,19], but they occur less frequently during anesthetic maintenance or emergency phase of anesthesia [1]. However, insertion, manipulation, suction devices may also result in injury [1,17]. In addition, a retrospective study showed that the incidence of dental lesions associated with anesthesia was 1: 4537 and 50 % of the lesions occurred during laryngoscopy, 23% after extubation, 8 % during the emergency, and 5% in the context of regional anesthesia [17]. Usually only one tooth is subjected to injury, trauma but simultaneously to two, three and even four teeth have been described [1]. The upper incisors are at greatest risk of injury, especially those of left [19,20,21,24]. The lower incisors were more likely to be injured during an emergency intubation or due to manipulation of the airways [21]. Molar teeth are also visibly injured [8].

Types of dental lesions

Dental injuries are divided into six categories, as follows: Class I: enamel fracture - This is a fracture that is not harmful. It is usually painless and may require smoothing sharp edges or bonding materials to the chipped surface. Class II: dentin fracture - fracture This penetrates the second layer of the tooth revealing a yellow color. The tooth becomes sensitive to hot or cold temperatures, it is necessary to alert the patient. Class III: Fracture in the pulp - are very painful fractures. The pulp contains nervous tissue of the tooth, and removal due to extreme sensitivity is usually required. It is necessary to perform endodontic treatment, followed core and crown. Class IV: root fracture - is often difficult to detect. It is necessary extraction. Class V: Subluxation - The tooth is moved within

the alveolar bone. The treatment involves the replacement tooth to its original position. If there is periodontal loss is required extraction. Class VI: avulsion - The tooth is removed from the socket. Tooth replantation within 20 minutes provides the best prognosis [2].

Risk Factors

The main risk factors of dental trauma associated with laryngoscopy are difficult intubation and poor existing dental condition [1,12,20,26]. Bucx et al. (1994) [22] by means of a study measured the forces deposited on the upper incisors during routine laryngoscopy in 65 adult patients. The forces were measured by a sensor strain gauge positioned between the cable and the laryngoscope blade. Medical maximum force acting on the upper incisors was 49 N. In patients without maxillary incisors, the force acting on the gums was significantly lower at 21 N [22]. It demonstrated that dental injury is more likely in difficult intubation, possibly because anesthesiologists use the upper teeth as a fulcrum when they can not get a satisfactory view of the glottis [1].

According to Hardman *et al.*, [19] the dental lesions are not associated with difficult intubation, as Gaudio *et al* [23] also reported. The intensity of the forces exerted during laryngoscopy is related to dental lesions, especially in the presence of inadequate intubation technique or a more prolonged intubation. The presence of relevant upper incisors is attached to the increase in tensile strength and duration of laryngoscopy and contributes to increasing tooth injury [1,2]. Other factors described in the literature include restricted mouth opening [11], the presence of prostheses [14,16], decayed teeth, gum disease [16,27], isolated tooth, mixed dentition in children aged 5-9 years [16], aggressive suction [8]. Anesthesiologists should be aware of the diseases and medications that increase the likelihood of dental disease [14]. The use of a jaw clamp for light anesthesia, especially when used with an oropharyngeal airway, can put pressure on the teeth [8]. The possibility of dental injury does not appear to be influenced by lack of training and knowledge of the anesthesiologist. Damage can occur even with experienced professional [1,23]. However, in some studies lack of experience was given as important causal [1,33].

Pre-operative evaluation

The anesthesiologist is responsible for pre-anesthetic assessment of the patient, responsible for choosing the type of anesthetic, for surveillance during the procedure and the postoperative recovery. While it is necessary to perform dental appointment before the procedure, this query is often overlooked by surgeons and anesthesiologists. [8] During anesthetic consultation to identify the recognized medical history as factors that increase the fragility dental: dental trauma, radiation and chemotherapy in head, bruxism, diabetes and autoimmune diseases, age, smoking and early caries in childhood, among others [1,8,31]. The provision of information to patients, reporting their dental condition and the possibility of future harm, is necessary and indispensable [9,14]. Through a retrospective study, it was reported to the French group medical insurance, between the years 1990-1995, 511 cases of

dental damage, 40 % related to anesthesia. Some of the cases described as being connected mainly due to lack of dental examination and informed consent for pre-anesthetic evaluation. [13]

Another study conducted in 404 adult patients undergoing surgical procedures under general anesthesia facilitated by tracheal intubation, showed that 28 patients (6.9 %) were found with availability for oral trauma. Absence of teeth, crowns and residual roots were factors found Durantes evaluation and predisposes to complications [3]. In order to facilitate the documentation of the condition of each patient, Gatt *et al*, proposed the creation of a standardized dental chart, thus allowing anesthetists to document accurately the dental health of their patients. The dental chart is offered in the form of a "freeware" computer diskette or copyright-free adhesive and can be downloaded from the internet [5]. After the discovery of a dental condition that can be damaged during anesthesia, a dental consultation should be considered before proceeding with surgery. [8] The evaluation of the well-documented Surgeon Dentist, including patient education is an indispensable method [5,16].

Examination of the oral cavity

It is important that the anesthesiologist has comprehensive knowledge of the anatomy of the teeth, the structures that support them, the dental pathology and the techniques used in dental restoration [1,16], thereby, identifying teeth that are at risk and define a strategy prevention [1,8,15].

Anatomy and Pathology Dental

The adult dentition consists of 32 teeth, supported by two opposite arcs of bone: the mandible and maxilla. The dentition is divided into four quadrants each with eight teeth (central incisors, lateral incisors, a canine, two premolars and three molars). The children's teeth (deciduous or primary) consists of a maximum of 20 teeth and each quadrant has five teeth (central incisors, lateral incisors, a canine and two molars) [1]. The tooth is divided into two parts: the crown and the root, each composed of three layers [1,2]. The crown is the top part of the tooth is often the only visible part. The outermost layer of the crown is the enamel is the hardest, most mineralized tissue in the human body, but become soft if it has a good support for the dentine, which is the intermediate layer, yellowish and provides the frame Tooth [1]. The pulp is the soft tissue in the center of the tooth where the nerves and blood vessels. When the pulp is affected by caries, people usually feel pain. The periodontium is the name given to all the tissues involved in fixing the tooth to the bone. These tissues include the gingiva, alveolar bone, periodontal ligament, and cementum.

The most common disease that is afetas teeth decay. Tooth decay can be defined as tooth decay or destruction of dental tissue and tooth decay motivated by the action of bacteria. Treatment consists of removal of decayed tissue, followed by filling restorative material, providing greater fragility to the tooth [1,2]. Periodontal disease is usually painless and you may not know you have a problem until your gums and supporting

bone are seriously compromised. The mechanism involves the slow dissolution of the support bone and ligament tooth [2]. In the presence of advanced periodontal disease, tooth extraction treatment is usually chosen to avoid avulsion [1,35].

Preexisting Dental Changes And Type Of Resulting Injury

In a patient with healthy dentition the risk of injury is related to the difficulty of intubation. The fracture is commonly observed in such cases. Dental fissures go unnoticed during the evaluation, resulting in fracture risk of turning during laryngoscopy. Teeth have prostheses or restorations, the injuries are generally loosening of the prosthesis or a deterioration of the restorative material. In the case of periodontal disease injuries resulting from laryngoscopy are more likely subluxations or dislocations of teeth [1].

General Anesthesia In Pediatric Population

Patients admitted to the Pediatric Intensive Care Unit are at much greater risk of dental trauma than adults, because of the formation of their immature roots and the possibility of having the subluxated teeth Durantes teething phase. When the child finishes primary dentition and enters the transitional stage of mixed dentition, around 6-8 years, the underlying permanent incisor exerts its eruptive force and "softens" the corresponding deciduous. This can be challenging both for the child and for the intensive, because of the high probability of avulsion of deciduous teeth, with a chance of further damage to permanent teeth [18].

Dental Protectors

According Nouette-Gaulain *et al.*, The choice of an appropriate procedure for the special intubation is likely to prevent tooth breakage, and reduce the number of complaints and the amount of compensation. [9] Brosnan *et al.*, Conducted a study in order to investigate the common belief that the use of a tooth guard makes intubation more difficult. However, concluded that anesthesiologists should not ignore the use of the guards, one should think carefully before disregarding this simple protective device [32].

Already Monaca *et al.*, It states that the preformed dental shields are useful in reducing the forces applied on the teeth during larynges copy. However, cost is not favorable, making it impossible to general use of this device. Further studies are needed in order to evaluate the efficacy and safety of protective devices [29]. Still, Skeie *et al.*, Through the study does not recommend the routine use of mouth guards. As is recommended in cases where the anesthetist provides problems such as restricted mouth opening, extensive prosthesis you stay and extensive bone loss [30]. The dental protection gutters are devices made of different materials, which can be standard size or custom-made by an exact mold of the dental arch [1]. Further more, Dedititis *et al.*, It states through a study that dental protection despite being commonly used for the upper incisors, about 40% of the lesions occur in the lower jaw [36].

Positioning Of The Head And Neck

The theoretical barriers to visualize the glottis during

laryngoscopy are assigned to two groups later and fixed elements, which include the teeth of the upper jaw, and before and furniture, which include the tongue, the epiglottis and the jaw. The mobilization upward and front jaw and the tongue base, by simple extension of the neck performed routinely or "snifador position" made in the obese patient or of the column block increases the distance between the front obstacle and later and submandibular space facilitates laryngoscopy [1].

Blades

The number 3 Macintosh blade is used for tracheal intubation. Compared to Miller (straight) blades Macintosh facilitate intubation, May providing a space for the passage of the endotracheal tube in patients with difficult intubation criterion. However the straight blades have a better view of the glottis [1]. However other blades have shown significant advantages. Still, Watanabe *et al.*, States that the angled blade Belscope is blade of choice to reduce dental injuries in the upper arch [42]. Based on dental fracture models Itomam *et al.*, Claims that the plastic blades have a lower rate of fractures compared with metal blades. Thus, metal blades are suitable for anesthetists with experience in difficult intubation [25].

In addition, Maharaj, *et al.*, States that the laryngoscopy and intubation procedure is taught to many health professionals, it is an important life-saving procedure. However, it is a difficult skill to acquire. [41] Laryngeal masks are of different sizes, shapes and compositions [1]. Relatively, there is a higher incidence of dental lesions with use of masks as compared with tracheal intubation [40].

Legal Medical Implications

The tooth damage during anesthesia is a common cause of morbidity for the patient and a source of litigation against anesthetists [24]. Problem awareness and proper documentation are key factors for proper management liability cases [28,37]. According Laidooowoo *et al.*, The main two dental injury risk factors are identified with anesthesia consultation and are noted in the file. However, the information to patients about the risk are rarely reported [6]. Claims are commonly related to the high cost of dental repair and patients receiving the benefits is extremely low. However, the medical expertise is necessary and important in medical responsibility assessment. Without this evaluation there is no compensation paid [38]. Claims notified to the NHS Litigation Authority in England between 1995 and 2007 and filed under anesthesia were analyzed to explore lesion patterns and expenses related to the airway or respiratory events. The demand for dental damage contributed a numerically significant proportion (11%), but financially modest (0.5%) of credits [39].

DISCUSSION

The preoperative evaluation providing dental patient's condition and intra-oral tissues is vital and it is necessary to be documented [5,12,14]. A thorough evaluation may require the help of a dentist, the training of anesthetists, and allow the treatment needed to minimize the risks, say Fujimura *et al* and Johnson *et al* [8,16]. In addition, Sowmya *et al* and Cameron *et*

al., Claim that although anesthetists work constantly in the mouths of patients, they are not exposed to an integral education of the teeth, the surrounding structures of the prostheses on the restoration techniques and devices used to restore [2,12]. Still, Cameron, Fung and Sousa *et al* however, relates the importance of meeting the need for education and training of anesthesiologists in order to understand the normal anatomy and pathology of the mouth may help protect against legal liability [1-3].

Since Gaudio *et al.*, Refers to the most anesthetists as having sufficient training in the use of airway devices and awareness of the potential harm, stating that the dental damage can occur even in the absence of negligence [23]. Still, Adolphs Owen *et al*, described as no less important to know that patients with pre-existing damage dentoalveolar and prosthetics are the main risks related to general anesthesia [14,28]. According Folwaczny Hickel and the damage can be treated with functional and aesthetic results very satisfactory. However, in order to maintain conditions for the complete recovery of the injured teeth is recommended immediate dental therapy [4]. After the discovery of a potentially hazardous dental condition, a consultation with a dentist should be considered before proceeding with surgery, complemented Yasny [7].

Mir *et al*, in their review obtained as a means to reduce complications during endotracheal intubation which can cause damage to hard and soft oral tissues, most comprehensive courses and dedicated to the issue to colleagues in other subspecialties, providing more professional knowledge. However, says the dental appointment recommendation in the intensive care unit [18]. A study by Amaral *et al.*, Noted the importance of the multidisciplinary team of intensive care unit and dental surgeons attach to integrating a dentist to that team. The questionnaire was applied to 58 professionals who work directly in the ICU. Obtained as a result of the multidisciplinary team 57 % and 96 % of dental professionals responded that it is important the presence of the dentist. On the influence of dentists in improving the clinical picture of the patient; and 100% of the volunteers agreed that oral hygiene is important to efficiently [10].

CONCLUSION

It was concluded how complex are the risk factors influencing dental injuries. Lack of knowledge of the techniques, lack of proper handling and lack of knowledge on the teeth and surrounding tissues, demonstrate the importance of DDS in the Intensive Care Unit (ICU) and the importance of a dental evaluation before any surgical procedure. A thorough assessment and monitoring of Dental Surgeons, plus all technical and scientific knowledge on dentistry has significant number of improvements of soft tissue injuries and hard tissues. However, it also provides a reduction of medico-legal implications against anesthetists lack of comprehensive knowledge of dental pathology.

Competing interests

The authors declare que they have no competing interests.

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