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OROTRAQUEAL INTUBATION IN FORMALIZED CADAVERS: OBSERVATIONAL STUDY

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ABSTRACT

Introduction: Orotracheal intubation allows air to pass into the airways and is effective in patients with airway involvement. However, improper administration of the tube can lead to irreversible damage to the patient. Thus, proper training in cadavers provides mastery over the maneuvers and knowledge of the structures involved in order to achieve greater success in the procedure. **Objective:** To report the importance of mastering orotracheal intubation techniques in order to reduce the impacts caused by orotracheal intubation techniques, and to identify and allow the analysis of various structures involved during the method. **Methods:** The orotracheal intubation was performed in three cadavers. For this, it was necessary to dissect the thorax and mandibular branch, to better visualize the anatomical structures, allowing the recognition of which organs will be involved in the process. **Results:** There are several respiratory system structures that allow the passage of the tube and allow adequate aeration during the technique. In addition, it is also noted the lungs before ventilation and after ventilation, where it is possible to recognize abnormalities due to pre-existing pulmonary pathologies. During pulmonary ventilation, it was possible to identify several lung conditions, such as pulmonary infection, chronic obstructive pulmonary diseases: pulmonary bronchitis, pulmonary emphysema, and pulmonary anthracosis. In the same observation, it was noted that laryngeal lacerations occur in a large proportion of patients, which may progressively progress in patients who are intubated incorrectly or in the long term. Thus, it is found that learning, knowledge about the airways and the introduction of the orotracheal tube correctly allow a better survival of the patient, which will positively evolve in his recovery. **Conclusion:** Through the simultaneity between the anatomical findings and the correct performance of the maneuver, it is possible to perform orotracheal intubation in formalized cadavers to improve the technique for academics, residents and medical professionals in order to reduce serious consequences to patients submitted to these procedures.

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INTRODUCTION

Orotracheal intubation (OTI) is the introduction of a tube into the tracheal lumen to ensure air passage in the airways. It is considered one of the main lifesaving methods in patients with airway compromise, especially patients in intensive care units (ICU). However, OTI can cause risks and complications, which can be avoided with proper maneuvering and maintenance (Bair, 2002).

To avoid risks and complications, it is essential that the professional has the ability to maneuver and especially the anatomical knowledge of the airways for intubation, as it is essential for its success. Importantly, access to the airways without prior technical, anatomical and clinical knowledge can lead to severe patient injury (Benumof, 1979). One of the factors predisposing to airway injury is prolonged tube exposure. This exposure may cause damage to the oral cavity, pharynx, and larynx, causing problems such as difficulty in swallowing, progressing to malnutrition, further aggravating

the patient's condition (Cordeiro, 2006). Another factor is ischemia. It can be caused by high cuff pressure on the mucosa, and after extubation, it presents necrosis and superficial ulceration of the mucosa (Domino, 1999). It can usually affect damage to the upper teeth and jaw during the placement of the tube, so the importance of understanding the patient's specific needs and care, thus avoiding facial trauma.
Regarding medical practice in the face of orotracheal intubation, studies show that a large portion of professionals finds it difficult to perform the correct steps of the procedure, ie, there is no standardization in the use of OTI, which in turn can cause structural damage. and even functional to the patient (Fernandes, 2017). There are currently artificial dolls to simulate OTI, which is common in many educational institutions, both for its ease of handling and for the effectiveness in representing anatomical structures similar to those of humans (Fitzgerald, 1974). It is noteworthy that training in artificial dolls is different in training in the human body, and teaching time is not enough to prepare the academic and medical residents. However, the professional who will be highlighted is the one who has practical skills and anatomy clinical knowledge of orotracheal intubation. However, there is no undergraduate medical module or medical specialization program specifically for OTI training, so physicians learn to intubate in clinical practice, which may result in failure in the first attempts at intubation process (Gillum, 1987).

Thus, there will always be the first time of OTI in a human, which leads to the preference for intubation training in formalized cadavers, thus, the professional will be able to recognize the anatomical structures of his patient (Gomes, 2010). The use of human cadavers to perform orotracheal intubation has been the subject of several discussions in the health area, since the airway needs specific care, and thus practicing on a cadaver would be more beneficial and efficient, as it would bring patients closer together. students in emergency situations and enable them for real-life (Graeber, 2005). However, studies related to this technique in cadavers are limited, because according to the rules of the Code of Medical Ethics, the physician is forbidden to perform any procedure in the cadaver without the consent of the family, which becomes unviable at the time of loss. of a family member (Hutton, 2008). Thus, the study is prepared to stimulate the practice of orotracheal intubation in formalized cadavers, so that professionals can improve their skills and develop standardization of OTI techniques so that when performed on patients, they cause the least possible damage.

METHODS

This is a descriptive and observational study, developed in the human anatomy laboratory of the University Brazil, interior of São Paulo, conducted from February to October 2019. The study involved the maneuver of orotracheal intubation in three formalized human cadavers in order to that students train and develop the right techniques and recognition of anatomical airway elements. For the intubation process, dissection of the chest and mandible branch was required. To open the anterior chest wall, the 10th rib costal margin was incised from the lateral to the xiphoid process, ascending the midline incision of the sternal manubrium. In the jugular notch, the incision ran through the collarbone until it reached the acromion. In this place, the incision was descending in anterior axillary line to costal edge. The anterior cutis of the chest and neck was removed, along with the subcutaneous mesh and superficial fascia. In the ninth intercostal space on the right side to the left, the ribs, muscles and clavicles were cut using a costotome. To open the buccal cavity, with the lowering of the mandible, dissection of the facial expression and chewing muscles was performed, the masseter muscle of the zygomatic arch was folded, leaving the pedicle in its insertion into the mandible masseteric tuberosity. The temporal muscle was exposed with the folding of its fascia leaving exposed its muscle fibers and insertion of the tendon portion in the coronoid process of the mandible. After exposure of the mandible branch, three incisions were made in the same with a vibrating saw to promote the removal of the middle third. Two incisions weremade through the mandible notch, separating the condyle and the coronoid process from the branch, and the other at the limit of the middle third to the lower, allowing the removal of the middle third. The condyle of the mandible remained articulated in the mandibular fossa because the ligaments and the joint capsule were maintained. The coronoid process was rebated along with the temporal muscle tendon. After bending of the coronoid process and removal of the middle third of the mandible branch, an orbicularis and buccinator muscle incision was made from the angle of the mouth to the region of the lower second molar. With the above procedure it was possible to promote sufficient opening of the mouth for intubation. Intubation was performed with n°4 slide laryngoscope, n°6 endotracheal tube, 20 ml syringe and AMBU (Airway Maintenance Breathing Unit).

RESULTS

As a result, it is possible to observe important structures that indicate the passage from the tube to the respiratory system, to the rhyme of the glottis and esophagus. In Figure 1, in addition to the glottis and esophagus rhyme, other fundamental structures for the intubation process are observed, such as vocal and vestibular fold, interarytenoid notch, corniculate and cuneiform tubercle, aryepiglottic fold and epiglottis.

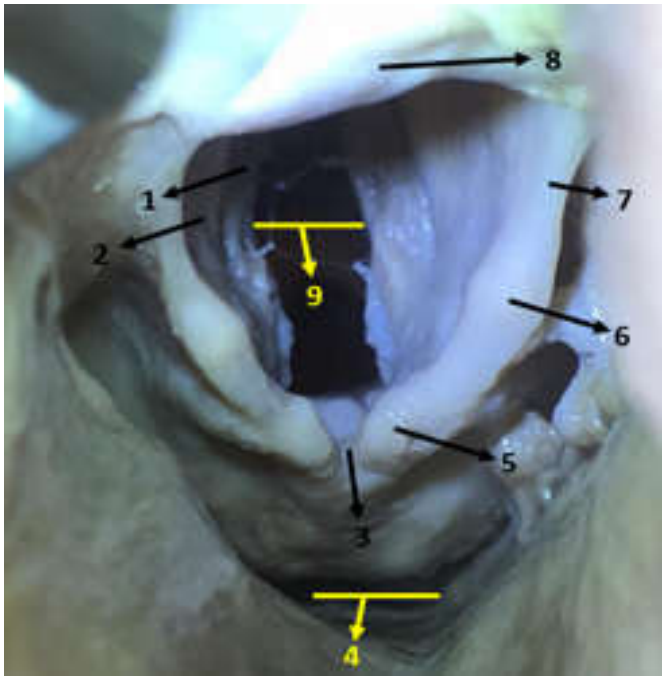

Figure 1. Visible structures during the intubation process: vocal fold (1) vestibular fold (2), interarytenoid notch (3), esophagus (4), corniculated tubercle (5) cuneiform tubercle (6), aryepiglottic fold (7), epiglottis (8) and glottis rhyme (9)

Figures 2, 4 and 6 show the unventilated lungs. The cuff of the tube was located before reaching the tracheal carina, allowing mechanical ventilation to go to both the right and left main bronchi, which is noticeable in Figures 3, 5 and 7 of the ventilated lungs. however, with abnormalities due to pre-existing diseases.

DISCUSSION

Through the analysis of Figures 1 and 2, it was found that it is possible to perform orotracheal intubation in formalized cadavers, which allowed for the improvement of the correct method of introduction of the laryngeal lamina and the tube,

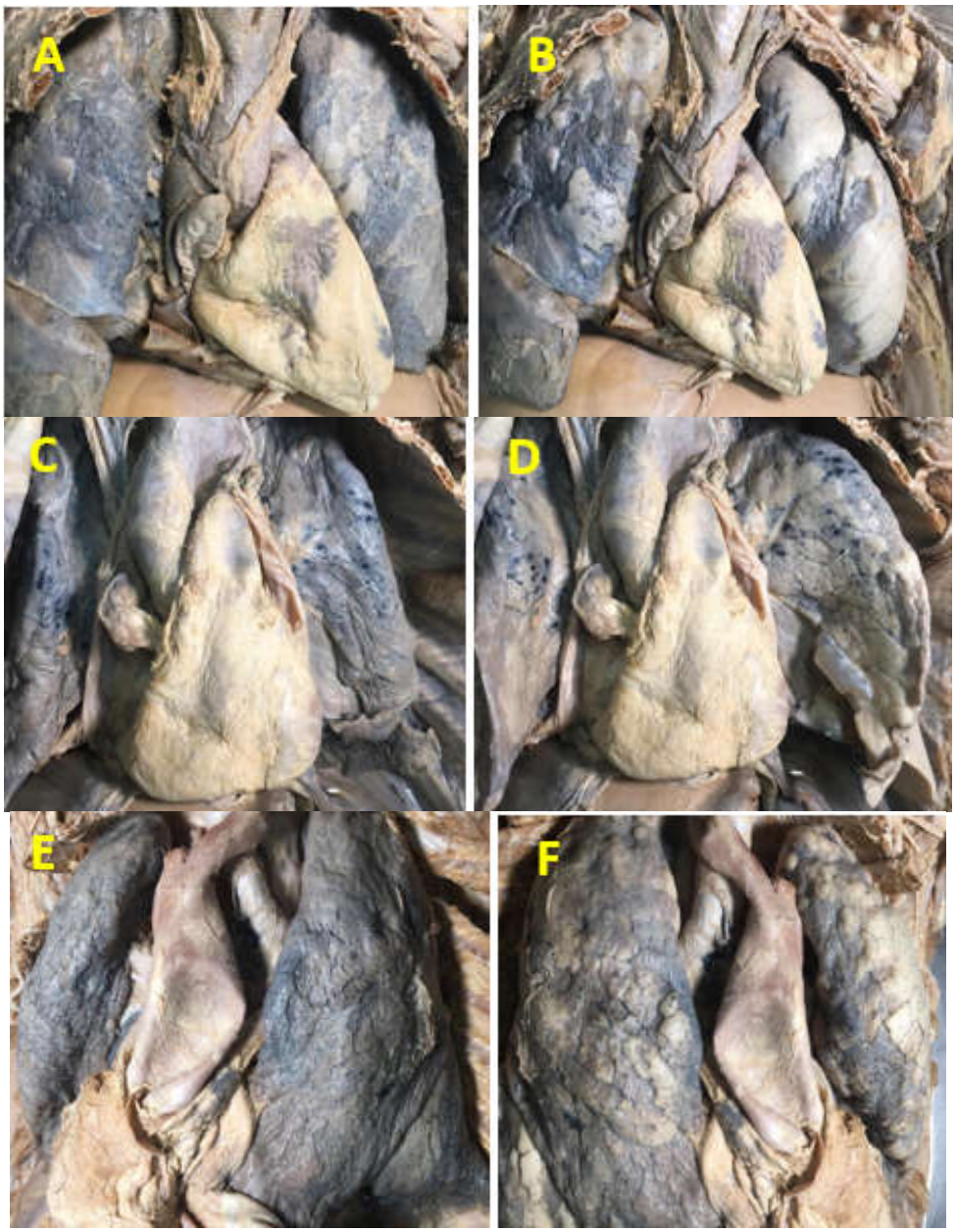

Figure 2. Images A, C and E show the unventilated lungs, while images B, D and F show the ventilated lungs

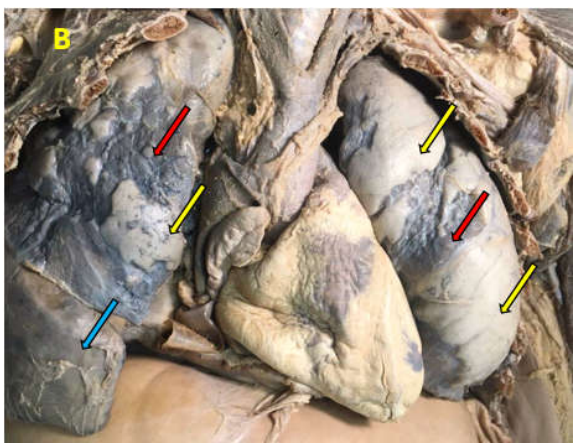

Figure2 2B.Yellow arrows indicate pulmonary infection, red COPD and blue arrows indicate pulmonary infarction

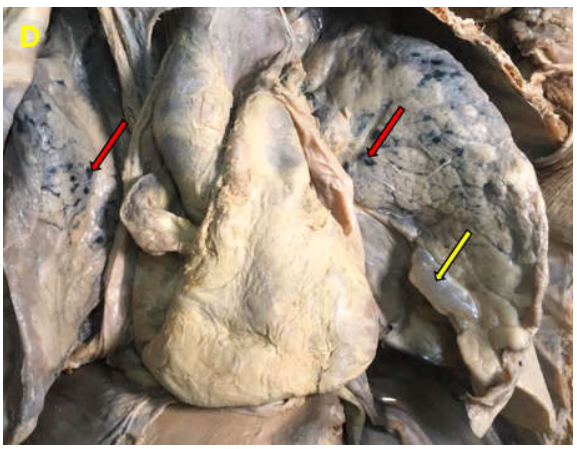

Figure 2D.Yellow arrow indicates bullous emphysema and red pulmonary anthracosis

and the findings of the anatomical structures. in the laryngeal region. It was also possible to observe in the images some pathologies in the lungs, especially during lung parenchyma expansion by mechanical ventilation. During pulmonary ventilation, it is noted in Figure 2B, pulmonary infection by the accumulation of purulent material (represented by the whitish part in the pulmonary parenchyma), which may be caused by fungi, viruses or bacteria (Issenberg, 2007). During ventilation, alveolar expansion was not possible in some regions of the parenchyma, which may be explained by chronic obstructive pulmonary disease (COPD). This disease sets in after there is a persistent picture of bronchitis or pulmonary emphysema, the first causes a permanent state of inflammation in the lungs, while the second destroys the alveoli and structures that promote hematosis (Jérémie, 2006). Still, in the same image, there is pulmonary infarction (dark part found in the pulmonary parenchyma), caused by the obstruction of some pulmonary vessels. This occurs when part of the necrotic lung tissue due to blockage of blood flow by a pulmonary embolus (Lacau Saint Guily, 2003). In Figure 2D, bullous emphysema was observed, which causes air bubble formation due to increased bronchioles space and loss of alveolar walls (Levitan, 2000). There is also the appearance of pulmonary anthracosis (characterized by pigmentation by the accumulation of coal particles). Anthracnose is a lung lesion characterized by the pigmentation of the tissue by coal particles, observed in miners, populations of large urban centers and smokers. It has an innocuous character, but its evolution can lead to severe pulmonary dysfunctions, such as the formation of pulmonary fibrosis (Marasco, 2007). In Figure 2F, bullous emphysema and collapse of the lungs were observed at alveolar emptying, called atelectasis. Bullous emphysema is characterized by permanent enlargement of air spaces distal to the terminal bronchioles, with loss of alveolar walls and consequent partial destruction of the capillary bed, which is generally associated with smokers (Martins, 2006). Atelectasis is a total or partial collapse of the lung or pulmonary lobe that occurs when the alveoli are emptying. This obstruction may be due to mucus accumulation, tumor, object aspirated to the bronchus, blood clots, narrowing of the main airways due to chronic, fungal infections, tuberculosis, pneumonia, pneumothorax, or external pressure (Martins, 2004).

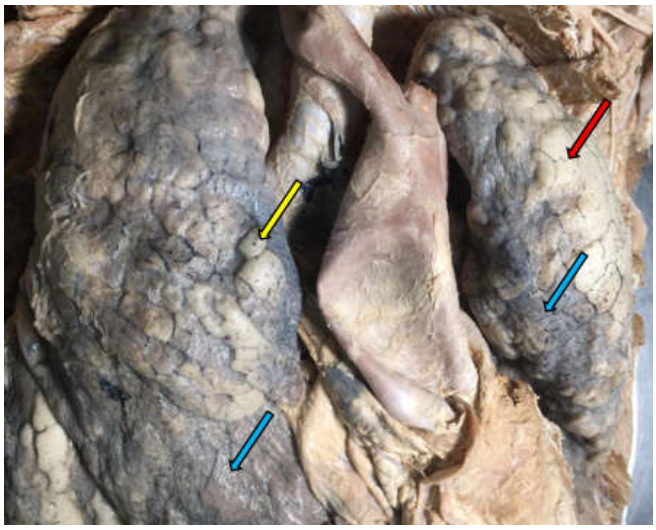

Figure 2F. Yellow arrow indicates bullous emphysema, blue atelectasis and red lung infection

The main complication involved in the incorrect performance of orotracheal intubation is laryngeal lesions (Martins, 2009). Immediately upon introduction of the oral cannula, lesions of the lip, tongue, epiglottic lacerations, vocal folds, esophagus, trachea, and arytenoid cartilage may occur. After a while, they may develop mucosal ulcerations, stenoses and granulomas (Matsumoto, 2007). Most laryngeal lesions resolve spontaneously by epithelial regeneration, but in more severe cases, such as failure of tissue perfusion and poor healing, the evolution of this process may worsen, resulting in high-severity damage (Medeiros, 2012), which may cause irreversible damage, evolving to cardiopulmonary arrest and death (Raghu, 2011). Thus, the proper training of these professionals is indispensable in medical practice, so the use of formalized cadavers is essential to enable them, so that professionals will be able to perform the procedure. It emphasizes that the anatomical knowledge of the airways is paramount to the success of orotracheal intubation. Thus, when performing it, several anatomical elements are observed, such as the valecula, larynx, epiglottis, vocal folds and arytenoid cartilage tubercles (Santos, 2002). Therefore, for the success of the procedure, it is necessary, in addition to mastery of the technique, to know and locate all structures under study, thus reducing the chances of harm to the patient.

Conclusion

It is essential to highlight the importance of the correlation between anatomical and clinical findings and the correct laryngoscope lever maneuver and tube placement. Based on the findings of the present study, it is possible to perform orotracheal intubation in formalized cadavers, allowing free access to the airways, especially visualization of fundamental anatomical elements for the intubation process, showing that the tube is in the correct path to the trachea. Therefore, intubation training in cadavers is essential, thus, to minimize the negative consequences of repeated laryngoscopy in living patients, and for the improvement of the academic, resident and medical professional, avoiding facial trauma and wrong placement of the esophageal tube.

Declaration of conflicts of interest: The authors declare nothing.

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