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Review

Airway management in patients with burn contractures of the neck

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ABSTRACT

Airway management of patients with burn contracture of the neck (PBC neck) is a challenge to the anesthesiologist. Patient evaluation includes history, physical and airway examination. A safe approach in the airway management of a patient with moderate to severe PBC neck is to secure the airway with the patient awake. The anesthesiologist should have a pre-planned strategy for intubation of the difficult airway. The choices advocated for airway management of such patients include awake fiberoptic-guided intubation, use of intubating laryngeal mask airway, intubation without neuromuscular blocking agents, intubation with neuromuscular blocking agents after testing the ability to ventilate by mask, pre-induction neck scar release under local anesthesia and ketamine or sedation followed by direct laryngoscopy and intubation and video-laryngoscope guided intubation, amongst others. Preparation of the patient includes an explanation of the proposed procedure, sedation, administration of antisialogogues and regional anesthesia of the airway. The various options for intubation of patients with PBC neck, intraoperative concerns and safe extubation are described. Back-up plans, airway rescue strategies and a review of literature on this subject are presented.

Contents

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1. Introduction

Airway management of patients with burn contracture of the neck (PBC neck) requires skill and competency. The airway may be difficult for one or several of the following reasons: restricted mouth opening (cicatrized angles of the mouth), obliterated nasal passages, decreased oropharyngeal space, fixed flexion deformity of the neck, limited atlanto-occipital joint extension, reduced submandibular space compliance or altered tracheal position. The fixed flexion deformity results in nonalignment of the oral, pharyngeal and laryngeal planes for intubation. In a patient undergoing multiple surgical procedures, release of the neck contracture is performed first so as to ensure easier airway control in subsequent surgeries. Several methods of management of airway difficulties in this patient population exist that are chiefly governed by institutional practice or personal preference. A literature search did not reveal previous articles that provide a comprehensive review of this subject. In this article, patient evaluation, strategies for airway management, intraoperative problems and concerns at extubation of patients with PBC neck are considered. The information is based primarily on data from published randomized clinical trials and case reports which were identified through Pubmed, Medline and Google Scholar databases. We also used our personal experience of practice. Search terms used included ''post burn'', ''neck'', ''contracture'', ''anesthesia'', ''airway'', ''difficult airway'', ''difficult intubation''. It is hoped that this review will provide clinicians with an understanding of the anesthetic aspects of airway management in patients with PBC neck.

2. Patient evaluation

Patient evaluation comprises history, physical and airway examination [1]. A history of the cause of burns (thermal, chemical or electrical), time (duration) and previous surgery under anesthesia should be obtained. History of snoring may indicate difficult mask ventilation following induction of anesthesia. History of inhalational injury may suggest tracheal stenosis that may hamper tracheal tube placement. Previous anesthesia records, if available, may yield useful information about airway management [1]. The airway of a burn patient progressively becomes more difficult with time as neck contracture worsens.

The airway examination assesses anticipated difficulty with ventilation, intubation, or both [1]. Some airway assessment parameters useful in evaluation of a difficult airway are not applicable in PBC neck patients. Classical Mallampati test is performed with the head in neutral position; in PBC neck this assessment (visibility of oropharyngeal structures) is possible only in the flexed neck position. Thyromental distance and ability to protrude the mandible are impossible to precisely measure though a rough estimate of sternomental distance is possible. Airway features such as the interincisor distance (<3 cm), Mallampati class (>2), sternomental distance (<12 cm), range of neck movement <80°, limitation of head extension and submandibular space compliance signify a difficult airway [1]. A non-compliant submandibular space prevents compression of the tongue during laryngoscopy, resulting in an anterior larynx. Traction forces caused by scar contracture may also pull the laryngeal structures anteriorly or laterally. Nasal patency should be checked. Neck X-ray (antero-posterior and lateral views) provides useful information about naso- or oro-pharyngeal space, deviation of the larynx or trachea and airway compression.

3. Classification of PBC neck

Onah [2] has described a clinical classification system for post-burn mentosternal contractures comprising four major groups based on the location of the contracting band and extent of flexion or extension away from the anatomical position of the neck and jaws. Each group is further sub-classified based on the contracting segment width. Jeong et al. [3] modified the Onah classification (Table 1) and found significant correlation between modified Onah class 2b and 3 and Cormack grade 3 and 4 laryngoscopic views (sensitivity and specificity 86.0% and 84.9%, respectively). The application of the modified Onah class can reduce the frequency of an unanticipated failure to visualize laryngeal structures and potential unnecessary interventions related to over-prediction of airway difficulty in patients with post-burn mentosternal contractures [3].

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