A descriptive study of blood in the mouth following routine oral endotracheal intubation

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Oral endotracheal intubation and extubation are two routine procedures performed by anesthesia providers which could lead to breaches of mucosal integrity and slight or moderate bleeding, thereby providing a vector for transmission of a blood-borne disease. This study was designed to determine the incidence of occult or overt blood in the oral and pharyngeal areas during the intubation and extubation periods.

A convenience sample of 163 patients from 18 to 70 years of age who underwent an oral endotracheal intubation for general anesthesia were included. Within 15 minutes of endotracheal intubation, the patients were tested at five designated sampling sites for the presence of overt or occult blood.

The results demonstrated that blood was present after 34% of the intubations, with 70% of those being positive in the oral/pharyngeal cavity and 52% exhibiting blood on the laryngoscope blade. Upon extubation 72% were positive, with 97% of those being positive at the distal tip of the endotracheal tube. The blood found during both these events was primarily occult.

The results suggest that the potential for blood, both overt and occult, to be present in the mouth of patients is significant enough to recommend that all practitioners adhere to the universal barrier precautions to limit their exposure to the transmission of potentially fatal blood-borne viruses.

Key Words: Airway management, blood in mouth, universal precautions.

Introduction

During the past decade, the acquired immune deficiency syndrome (AIDS) epidemic has forced healthcare workers to become more aware of the risk that they encounter from the transmission of blood-borne viral infections. The high rate of mortality and morbidity associated with AIDS has brought about an acute awareness of the potential modes of transmission of such deadly viruses as well as methods of circumventing their transmission.

Anesthesia providers are among those at highest risk for acquiring a nosocomial disease from patient care. A consequence of the everyday anesthetic management of patients is frequent contact with blood, blood products, and bodily secretions. Many times the anesthesia provider is required to care for patients with a known or unknown transmissible disease whose vector of transmission is one of these routes.

Because it is not always known whether a person is infected with blood-borne diseases such as hepatitis and human immunodeficiency virus (HIV), the Centers for Disease Control (CDC) has recommended and the American Association of...
Nurse Anesthetists (AANA) and the American Society of Anesthesiologists (ASA) have endorsed a policy for infection control known as universal blood and body fluid precautions. This policy assumes that each patient's blood or body fluids are capable of transmitting infectious agents. This system advocates the use of gloves for all situations involving indirect or direct contact with bodily secretions, as well as masks and protective eyewear.

Confusion surfaced following the issuance of these guidelines, so more specific situations for the use of the universal barrier system were set forth. Presently, the CDC recommends the use of universal precautions when exposed to body fluids containing lymphocytes such as blood, semen, and vaginal secretions. Body fluids such as sputum, sweat, tears, urine, saliva, and vomitus are not included unless there is visible blood. In addition, the AANA and ASA recommend that these precautions be observed when touching mucous membranes or open skin, i.e., laryngoscopy, intubation, or nasogastric tube insertion, as well as whenever aerosolization or splattering of blood/body fluids is anticipated, i.e., during laryngoscopy, laser treatment, wound irrigation, or extubation.

Anesthesia providers are routinely involved in airway management responsibilities which include intubation and subsequent exposure to fluids commonly found in the mouth. Although serious complications are rare, direct laryngoscopy with tracheal intubation may produce some damage that could result in the interruption of mucosa leading to overt and occult bleeding. Additionally, suctioning of oropharyngeal and tracheal secretions, as well as removal of the endotracheal tube at the end of the anesthetic, may cause mucosal trauma or bleeding.

The incidence of bleeding and the presence of occult blood in the mouth related to intubation and extubation are ill-defined. In one study, the presence of visible blood was found in 50 of 100 intubations, with 36 of the remaining 50 testing positive for occult blood by Chemstrip®. Only 14 intubations were considered bloodless.

Normally, the practitioner's intact skin provides some barrier protection. However, in the anesthetist, skin barriers are often not intact. Frequent hand-washing with depletion of natural oils causes cracking, and frequent opening of glass vials has been shown to cause microscopic cuts on the hands. HIV and hepatitis B viruses can potentially enter the body through cuts, scratches, and abrasions in the skin. In addition, the conjunctiva of the eyes or mucous membranes do not provide any natural barrier to protect against the entry of these organisms.

When skin or mucous membranes are breached, blood-borne viruses can gain access to deeper tissues and produce disease. Therefore, without barrier protection, such as gloves, masks, and protective eyewear, a potential mode of transmission from the patient to the anesthetist has been established for the HIV and hepatitis viruses.

The purpose of this study was to determine the incidence of mucosal breaches that resulted in occult or overt blood in the oral and pharyngeal areas which occurred following orotracheal intubation and extubation.

Methods

Data collected for this descriptive study was taken from a convenience sample of 163 patients ranging in age from 18 to 70 years who received an oral endotracheal intubation for the conduction of general anesthesia at a university medical center. Patients excluded from the study population were obstetrical patients and those having a known history of blood dyscrasias or coagulopathies, poor oral hygiene, or recent dental procedures, as well as those undergoing operative procedures that require direct surgical manipulation of the airway.

Following institutional approval, written informed consent was obtained from all study participants. Endotracheal intubation was performed by anesthesia providers who were aware of the intent of the study. Within 15 minutes following intubation, an assessment of mucosal integrity was made by the investigator. Sterile cotton-tipped applicators were utilized to atraumatically swab each of five designated sampling sites—cheeks, base of tongue, posterior soft palate, tip of laryngoscope, and open skin, i.e., laryngoscopy, intubation, or nasogastric tube insertion, as well as whenever aerosolization or splattering of blood/body fluids is anticipated, i.e., during laryngoscopy, laser treatment, wound irrigation, or extubation. When skin or mucous membranes are breached, blood-borne viruses can gain access to deeper tissues and produce disease. Therefore, without barrier protection, such as gloves, masks, and protective eyewear, a potential mode of transmission from the patient to the anesthetist has been established for the HIV and hepatitis viruses.

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necessary due to the lack of occult blood present by Gastroccult testing of the pilot study volunteers who were tested prior to brushing and flossing their teeth. Although it was judged unnecessary for this study, follow-up studies would be strengthened by an established baseline before airway manipulation.

**Results**

Chi-square analysis was performed in order to determine the significance \( P < .05 \) of selected variables on the frequency of positive blood found during the intubation or extubation period. The results indicated there was no significant relationship between the experience level of the intubator; ASA class; age; sex; preoperative airway class; type of laryngoscope blade; anesthetic technique, including oral airway placement, use of stylet, or rapid sequence induction and the presence or absence of blood.

The total percentage of patients who tested positive for blood during intubation was 34% (N = 56), with 27% (N = 44) of the blood found being occult and 7% (N = 12) overt. During extubation, blood was found in 72% (N = 117) of the patients sampled. In those who were positive for blood, 50% (N = 59) of the samples were positive for occult blood and the remaining 50% (N = 58) were positive for overt blood (Figure 2).

The majority (70%, N = 39) of the blood found following intubation was from the oral/pharyngeal cavity—sampling sites: cheeks, tongue, and posterior soft palate. However, in 52% (N = 29) of the patients, blood was present on the tip of the laryngoscope blade. Twenty-two percent (N = 12) of
these patients were positive for blood on the blade as well as other sampling sites within the oral or pharyngeal cavities. Upon extubation, 97% (N = 113) of the blood found was present on the distal tip of the endotracheal tube. This included 45% (N = 53) of patients who were also positive for visible blood during suctioning of the hypopharynx. In an additional 3% (N = 4) of patients, blood was seen only with suctioning and was not present on the tip of the endotracheal tube (Figure 3).

The majority of the intubations (82%, N = 134) included in this study were judged to be atraumatic, based on the laryngoscopy scoring system. The percentage of patients positive for either occult or overt blood within this group was 31% (N = 34) for intubation and 69% (N = 132) for extubation. For patients included in the potentially traumatic group, the percentage who were positive for either occult or overt blood was 50% (N = 28) following intubation and 86% (N = 28) upon extubation. Intubations judged as traumatic included only two patients and each of these patients was positive for visible blood following both intubation and extubation (Figure 4).

Discussion

These results have established the presence of blood in the mouth during the intubation and extubation periods, thereby providing a vector of transmission for blood-borne viruses. With some exceptions, the conclusions are similar to those revealed in the Kanefield study. In that study 86% of the patients sampled were positive for either occult or blood in the mouth following intubation and/or extubation. That percentage included both intubation and extubation, whereas this study examined the two separately. In addition, following extubation, the Kanefield study researchers soaked all instruments utilized in the airway in sterile water and then tested the solution with a Chemstrip to detect occult blood. By contrast, these study samples were collected and tested in situ. The fact that the anesthesia providers were unaware of their participation in the study, as well as the inclusion of all airway equipment in the sampling procedure, may well have accounted for the differences in results.

There are a number of limitations that must be acknowledged when interpreting the results of the present study. These include the possibility of the Hawthorne effect (i.e., the anesthesia provider's awareness of the purpose of the study) and instrument sensitivity. Based on the pilot study, the incidence of false positives was judged to be low and possibly nonexistent. Therefore, the instrument may not have detected blood in all patients who were actually positive for blood in the mouth. Each of these factors in concert may have led to an underestimation of the blood present. Despite these limitations, the percentage is nonetheless significant and should alert the anesthetist to the risk that can be encountered, even during routine intubations and extubations.

In conclusion, this study found a 34% incidence of blood present upon intubation and a 72% incidence upon extubation, which offers scientific support to validate the empirically developed guidelines which include wearing gloves, masks, and protective eyewear during these critical periods.

Visible blood cannot be relied upon to prompt the use of gloves and other protective equipment when infectious diseases can potentially be transmitted through inadvertent contact with patient secretions. Because inoculum size has not been determined for the establishment of these diseases, strict adherence to the CDC, AANA, and ASA infection control guidelines dealing with universal barrier precautions is recommended.
REFERENCES


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In 1990 the Trauma Nursing Coalition was organized by the Emergency Nurses Association (ENA) to address the nursing care components of an organized trauma care program. Together these six organizations—ENA, the National Flight Nurses Association (NFNA), the Association of Operating Room Nurses (AORN), American Association of Critical Care Nurses (AACN), Association of Rehabilitation Nurses (ARN), and the American Association of Nurse Anesthetists (AANA)—represent over 160,000 nurses. Representatives from these associations collaborated to describe the multiple aspects of care that patients require as they move through the trauma continuum from prehospital care to reintegration into society. The Resource Document for Nursing Care of the Trauma Patient is a product of their collaborative effort and is a testimony to the commitment of the nursing profession to decrease trauma patient morbidity and mortality.

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