Difficult Airway Management during General anesthesia in Robotic surgery for Endotracheal tube Dislodgement

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Objectives



Introduction



Risk Factors for Difficult Airway

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Background

- **Overview:** 47- male old male, Presenting robotic Assisted Laparoscopic Gastric Bypass and Hiatal Hernia Repair
- Past Medical History: HTN, GERD, Active Tobacco Smoker $(1/_2)$, Asthma
- Past Surgical History: Knee Arthroscopy, Wisdom Teeth Extraction
- Allergies: Penicillin, Latex, Ceclor
- Height and Weight: 67 inch (167.5cm)/ 105kg
- **BMI:** 37.5kg/m²
- ASA: ||
- Mallampati: III
- ECG/ CXR: NSR (68bpm), No acute processes on CXR
- Labs: H/H \rightarrow 13.2/40; PLT \rightarrow 194; K+ \rightarrow 4.3; Na+ \rightarrow 143, Creatinine \rightarrow 0.6

Induction and Intubation

- Midazolam 2mg, Fentanyl 100mcg, Lidocaine 100mg, Propofol 200mg, Vecuronium 7mg
- MAC #3, ETT Size 8.0 ETT, secured at 22cm. Grade II view
- Sniffing position utilized
- Maintenance with Sevoflurane 2.5%



Lines and Monitoring

- Standard Monitors (ECG, NIBP, Pulse Ox, Temp)
 - OG tube at 65cm (placed postintubation at Low Intermittent Suction)
- IV Gauge: 20 Gauge in Left Forearm



Critical Points

- Positioned in Reverse Trendelenburg with Da Vinci Robot arms docked toward patient face
- Starting ventilator settings: SIMV
 Mode: RR-12, TV- 625, FiO2- 60%,
 PEEP- 5; EtCO2- ~ 32
- Removal of OG tube met with NO resistance; introduction 60FR Bougie catheter to check anastomosis met with resistance and on removal, inadvertent dislodgement of ETT occurred

Case Analysis

Case Analysis

• Adverse Events

- On insertion, Bougie met resistance with ETT to herniate above the vocal cords and become dislodged. Audible ventilatory leak, inability to fill bellows and maintain adequate tidal volumes.
- Attempt to reinsert current ETT made by deflating the cuff blind reinsertion→ unsuccessful attempt (#1)
- Stylet inserted with MAC blade to displace tissue \rightarrow Unsuccessful attempt #2
- Complete removal of Endotracheal tube #1, with bag mask ventilation successful (+ mist in mask and end-tidal monitoring capnography, with Sevoflurane inhalational agent).
- Glidescope retrieved for attempt #3.
- Glidescope #3 with a new size 7.5 ETT inserted with no difficulty. Successful intubation confirmed with visualization of ETT through vocal cords, condensation, and positive capnometry on monitor.
- Post- intubation: patient received 2mg versed, 100mcg fentanyl and 8mg of decadron
- Bougie was then re-inserted with no difficulty (extreme caution), anastomosis was complete, bougie was removed, case completed with no difficulty

Case Analysis

Emergence

- Reversal: 200mg of Sugammadex
- Patient extubated; adequate tidal volumes, proper reversal of muscle relaxation, following commands, transferred to PACU
- No complaints of Pain, Nausea, vomiting or sore throat in recovery room

Upon chart review- no adverse events noted 24 hours post-operatively

• Error Analysis

- System Error
 - Appropriate size of Bougie Catheter
 - Surgeon did not stop during time of incident

- Provider Error
 - Inexperienced SRNA
 - Airway Manipulation with OG tube and Bougie insertion
 - Lack of concern with Bougie insertion and not direct stabilization of ETT
- Patient Errors
 - Anterior Airway
 - Increased redundant tissue and adipose skin, Elevated BMI

Vital Signs: Pre-Op vs Post-Op

- Pre-Op vitals
 - Heart rate: 68bpm
 - Blood Pressure: 156/72
 - Respirations: 16
 - Temperature: 97.4°F
 - Pulse Oximetry: 99%

- Post-Operative
 - Heart rate: 62bpm
 - Blood Pressure: 144/70
 - Respirations: 18
 - Temperature: 98.2°F
 - Pulse Oximetry: 1/10

Review of Literature

- Ideal position for intubation → under sedation, positive loss of consciousness, apneic, supine with no distraction in the surrounding environment
 - Sniffing Position
 - Oral, pharyngeal, Laryngeal axis alignment
 - HELP
 - Head Elevated Larygnoscopy Position
 - BURP
 - Backward, Upward, right Position for Cricoid Position displaces the larynx superiorly, posteriorly and rightward laterally to improve visualization

Review of Literature / Discussion

- Different Position comes with Different difficulties
 - Left Lateral has been met with increased difficulty and failure
 - Shifting the patient to the side alters the axis of the body and deteriorates the view of direct laryngoscopy
 - Intubation made in a non-supine position has been linked to longer intubation attempts, higher failure rates and higher association with hypoxia, aspiration, brain injury and death.
- Positioning to reduce adverse outcomes
 - Reverse Trendelenburg with 15 degrees head elevation
 - Trendelenburg Position, -15 degrees with pillow for sniffing position
 - Trendelenburg position, -15 degrees and full cervical spine extension

Review of Literature

- General Anesthesia attenuates upper airway reflexes
 - Purpose of reflexes are protective and physiological mechanisms to prevent regurgitation and aspiration
 - Light anesthesia with insufficient neuromuscular blockade evokes GI stimulation during laryngoscopy, increasing gastric pressure over LES pressure → resulting in aspiration
 - <u>Mannequin study</u> \rightarrow
 - Induction and intubation sequences → found that RSI with -15 degree head down tilt with full cervical spine extension DECREASED particulate amount for aspiration but INCREASED difficult cord visualization and time for intubation

Review of Literature

• Alexandrou Angle of Intubation (AAI)

- Tilts in-line visualization axis forward, resulting in less effort for lifting the epiglottis for laryngoscopy and intubation through vocal cords
- Decreases traumatic intubations along with oropharyngeal lacerations or broken teeth
- Ideal for use with patients of larger body habitus or respiratory distress who are unable to lay flat in order to preserve their own breathing effort
- Consequences: Watch use of AAI in those where extension of neck is contraindicated



ASA Difficult Airway Algorithm

- 2022 Updated \rightarrow ASA DAA divided into 3 main parts
 - 1. Pre-airway management decision making tool
 - 2. awake airway management
 - 3. Airway management after induction of anesthesia



ASA Difficult Airway Algorithm- Adults



Part 1- Pre-Intubation



Part 2: Intubation Attempt with Patient Awake



Part 3: Intubation after General Anesthesia Induction





Extubation of the Difficult Airway

- Risk of Difficult extubation is increased if you answer "yes" to any of the following
 - Was the airway abnormal or difficult during induction?
 - Did anything change during surgery that would make airway difficult to manage (edema, bleeding, restricted access) ?
 - Does the patient have risk factors for increased extubation risk (known difficult airway, aspiration risk, OSA, obesity, cardiopulmonary disease, metabolic abnormalities) ?

Position Specific Equipment

- Prone Positioning Tube (PPT)
 - Dual securement devices to ensure proper securement and attachment of ETT when being used in the prone position
 - In a study, PPT was found to not move when patient was placed in position as compared to standard ETT
 - PPT designed with a fixation device that is affixed to the tube to provide stabilization, providing a binding cord not affected by sterilizing fluids or secretions from naso-/oropharynx
 - Guarantees safe ventilation, does not interfere with surgical procedure

Alteration in patient's position can lead to ETT dislodgement and need of utilization of difficult airway management guideline

Conclusions

Reverse Trendelenburg position to intubate the patient can alleviate pressure of the abdomen and facilitate caudad spread of diaphragm and improve ventilation or intubation

Utilization of the ASA difficult airway algorithm can help providers through steps when a difficult ventilation/ difficult intubation / difficult airway is encountered

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