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Case Report

Accidental Extubation in the Prone Position during Surgery in a Patient with a Difficult Airway: Case Report

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ABSTRACT

Unintentional extubation during prone-position surgery is a rare but critical airway emergency in anesthetic practice. We report a case of a 41-year-old obese female with predictors of a difficult airway undergoing elective lumbar laminectomy. Intraoperative dislodgement of the endotracheal tube, likely due to inadequate fixation, was promptly identified. Prone mask ventilation with an oropharyngeal airway maintained oxygenation until safe repositioning and reintubation were achieved. This case highlights the importance of rapid recognition, effective prone ventilation, and coordinated team response in managing airway emergencies in non-supine positions to optimize patient outcomes.

Introduction

Accidental extubation in the prone position is a rare but high-stakes complication in anesthesia, necessitating immediate and skilled intervention. Airway management in patients with anticipated.

Difficult intubation is inherently challenging, and unplanned extubation in a non-supine position exacerbates this complexity [1]. Such events can lead to rapid physiological deterioration, requiring prompt recognition and corrective action. Repositioning to the supine position is often impractical due to time constraints, limited personnel, and the risk of compromising the surgical field, which may result in postoperative complications [2].

This report describes a case involving a 41-year-old woman with obesity and multiple predictors of a difficult airway who experienced accidental extubation during a lumbar laminectomy in the prone position. The case emphasizes the critical importance of thorough preparedness for airway emergencies, the application of advanced airway management techniques, and the prompt execution of effective interventions when managing complex airways in challenging surgical positions, such as the prone posture.

Case Report

A 41-year-old female (height: 162 cm, weight: 93 kg, BMI: 35.4 kg/m²) was scheduled for elective L4-L5 lumbar laminectomy in the prone position. The preoperative airway assessment revealed a number of challenging airway predictors, including Mallampati class III, a thyromental distance of approximately 5 cm, a short neck, and the patient's habitual snoring.

Additionally, the patient had no significant comorbidities, and the only surgery she had ever had was a cesarean delivery under regional anesthesia; no general anesthesia had ever been used in any of her prior surgeries. In the operating room, standard American Society of Anesthesiologists (ASA) monitoring was

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applied. Preoxygenation was followed by anesthesia premedication with midazolam (30 mcg/kg) and fentanyl (4 mcg/kg). General anesthesia was initiated with the administration of propofol at a dosage of 2 mg/kg, followed by atracurium at 50 mcg/kg. Orotracheal intubation was then successfully performed utilizing a Glidescope video laryngoscope, employing the BURP maneuver (Backward, Upward, Rightward Pressure) to facilitate the placement of a 7.5 mm internal diameter spiral endotracheal tube. Tube placement was confirmed by continuous waveform capnography and bilateral auscultation. The tube was secured with cotton tape (BPI Tebbi Shafa), and the patient was positioned prone. Anesthesia was maintained with isoflurane (0.8–1.2 MAC) in an oxygen-air mixture.

Approximately one hour into surgery, the anesthesia provider noted a sudden loss of the capnographic waveform, an $EtCO_2$ of zero, and a gradual decline in peripheral oxygen saturation (SpO_2). Accidental extubation was immediately suspected. The anesthesiologist alerted the surgical team, called for assistance, and initiated rescue maneuvers. While maintaining the prone position, a size 4 (10 cm, Supa company) oropharyngeal airway was inserted, and positive-pressure ventilation with 100% oxygen was delivered via face mask. Adequate chest rise and improving SpO_2 confirmed effective ventilation, which was sustained with capnographic monitoring until oxygenation stabilized.

The patient was then gently repositioned to the supine position, with the surgical site packed to minimize contamination and bleeding. Reintubation was carried out with a Glidescope, resulting in successful placement of a 7.0-mm reinforced endotracheal tube. Tube position was verified by capnography and bilateral auscultation. To reduce the risk of airway edema, dexamethasone (8 mg IV) was given. The patient was subsequently placed in the prone position, and the surgery was completed without any additional complications.

Atropine (30 mcg/kg) and neostigmine (60 mcg/kg) were used to reverse neuromuscular blockade after the procedure was finished. A neurological examination revealed no motor or sensory impairments, and the patient was extubated while completely conscious. After that, in stable condition, she was moved to the post-anesthesia care unit.

Discussion

Unintentional extubation in the prone position is an uncommon but potentially fatal airway emergency, particularly in patients with difficult airways. This case underscores the technical and decision-making challenges associated with airway loss in non-supine positions. Early intervention was made possible by the prompt detection of capnographic waveform loss and desaturation, which prevented critical hypoxemia.

The patient exhibited several anatomical indicators of a difficult airway, including obesity, a Mallampati class III view, a short thyromental distance, and a history of snoring, which heightened the risk of complications. The anesthesia team's rapid recognition of the loss of capnographic waveform and oxygen desaturation facilitated early intervention, preventing critical hypoxemia.

Evaluation indicated that the endotracheal tube was accidentally dislodged, probably because of a failure in the fixation method. The cotton tape used for securement, a conventional approach, likely absorbed oropharyngeal secretions, compromising its integrity over time. Moisture-related deterioration emphasizes a significant drawback in conventional securement methods. Systematic reviews emphasize that, although endotracheal tube fixation is crucial, there is no universally optimal or evidence-backed technique available, which continues to contribute to the ongoing risk of dislodgement. [3]. In this case, additional factors, such as movement during C-arm imaging and potential tension on the breathing circuit, may have further increased the likelihood of extubation.

Standard recommendations for managing unintentional extubation in the prone position generally advise quickly moving the patient to either the supine or lateral position to ease the process of reintubation. However, this approach poses difficulties, such as delays in procedures, the requirement for sufficient staff to safely move the patient, and the potential for neurological or infectious issues arising from disturbing the surgical area [4]. In this case, to reduce the risk of desaturation during the time required for surgical site packing and team coordination, proper ventilation was sustained in the prone position by using a face mask and/or oropharyngeal airway. Stable oxygen saturation and ongoing capnography verified sufficient ventilation, ensuring patient safety throughout this crucial period. Once optimal oxygenation was achieved, the patient was gently repositioned to a supine position for reintubation. This approach underscores the importance of sustained oxygenation and capnographic monitoring as a critical bridge to securing the airway in high-risk scenarios of accidental extubation during prone surgery.

The distinguishing aspect of this case is the success of the initial rescue intervention. The anesthesia team promptly placed a size 4 oropharyngeal airway and initiated mask ventilation with 100% oxygen while the patient continued to be in a prone position. Although mask ventilation in the prone position can be difficult and has been noted as ineffective in other cases, particularly in obese patients or those with difficult airways [5-6], it was surprisingly effective in this case. For comparison, Spond et al. presented a case involving a patient

diagnosed with Klippel-Feil syndrome and a known difficult airway undergoing cervical spine surgery in the prone position. In that instance, accidental extubation resulted in failed prone ventilation, requiring an urgent shift to the supine position and fiberoptic intubation. The success of prone ventilation in our case underscores the potential for this technique to serve as an effective interim measure, especially when applied with precision and supported by continuous monitoring. The successful outcome in our patient, despite anatomical predictors of a difficult airway, is probably due to several contributing factors. These encompass the quick recognition of the extubation event, the swift placement of a size 4 oropharyngeal airway, and skillful execution of mask ventilation by an experienced anesthesia team. The quick restoration of chest movement and improvement in oxygen saturation allowed for essential time to organize a careful repositioning, ensuring patient safety.

In contrast, Thiel et al. reported a case of unintended extubation in a patient with obesity and kyphosis, who presented with a challenging airway during cervical spine surgery in the prone position. Challenges with mask ventilation and initial intubation were noted, linked to the patient's anatomy and the existence of a beard, which required the utilization of a laryngeal mask airway (LMA) and eventual reintubation after repositioning to the supine position. This case underscores the common difficulties posed by complex patient anatomy and highlights the critical importance of a prepared approach, including the consideration of alternative airway devices and repositioning as rescue strategies.

Preventive Strategies and Preparedness

To reduce the risk of accidental extubation during surgeries performed in the prone position, it is essential to implement preventive measures.

Firstly, robust endotracheal tube fixation methods are crucial. Modern tube holders featuring water-resistant properties or layered fixation methods that utilize Tegaderm and elastic adhesives should be favored over traditional cotton ties, which are susceptible to deterioration from moisture. Additionally, performing proactive oral suctioning along with regular intraoperative checks of tube security can further reduce the risk of dislodgement.

Secondly, preoperative multidisciplinary discussions are essential for creating a common understanding among the anesthesia, surgical, and nursing teams.

These briefings should clearly define individual responsibilities and present a comprehensive step-by-step rescue plan for managing airway emergencies. Additionally, it is crucial to ensure that essential equipment, such as laryngeal mask airways (LMAs), video laryngoscopes, and fiberoptic bronchoscopes, is readily available. A recent simulation-based study demonstrated that all participants successfully inserted a supraglottic airway device (SAD) with significantly shorter insertion times compared to tracheal intubation, utilizing either a CMAC video laryngoscope or a fiberoptic bronchoscope. These findings suggest that SADs may represent a reliable and time-efficient option for emergency airway management [7]. Similarly, findings from Yamamoto et al.'s simulation study emphasize the efficacy of LMAs as a first-choice airway device for accidental extubation in the prone position, even with head-holding devices, due to their faster successful insertion times [8].

Thirdly, training through simulations is very effective for preparing anesthesia teams for infrequent but critical situations like unintentional extubation. Rehearsing airway crisis scenarios, especially when the patient is in the prone position, enhances response times, communication, and team performance under pressure.

Finally, hospital protocols addressing airway emergencies need to be frequently revised to provide clear instructions for non-supine surgical positions. The establishment of standardized algorithms for the management of airway loss in the prone position is critical to ensuring safer anesthetic care. These algorithms should incorporate escalation strategies, including prone ventilation, laryngeal mask airway (LMA) insertion, and patient repositioning.

Although the favorable outcome in this case shows the potential for successful prone ventilation, its applicability is not universal and depends on patient-specific and team factors. Future simulation studies and multicenter reports are needed to identify predictive factors for effective ventilation in the prone position and to refine management strategies.

Conclusion

This case demonstrates that inadvertent tracheal tube removal in the prone position is a serious complication, but can be managed in a controlled manner through rapid recognition, successful prone ventilation, and a coordinated team response. Accurate endotracheal tube fixation, organizational preparedness through simulation-based training, accessible airway equipment, and interprofessional collaboration are essential to minimize risks and optimize patient outcomes in such high-risk scenarios.

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