CASE REPORT

Remimazolam as the sole sedative for fiberoptic intubation of an apprehensive patient with a difficult airway

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Bekker A, Asad S. Remimazolam as the sole sedative for fiberoptic intubation of an apprehensive patient with a difficult airway. Anesthesiol Case Rep. 2022; 5(4):1-3.

ABSTRACT

Sedation for fiberoptic intubation of a spontaneously breathing patient remains challenging. Currently used sedatives such as propofol, midazolam, or opioids have their limitation. Remimazolam, a recently introduced ultra-short-acting benzodiazepine, has several desirable pharmacologic characteristics, including easily titratable levels of sedation, anxiolysis, minimal respiratory depression, and hemodynamic stability. Moreover, this drug has a unique pharmacokinetic profile that allows for a rapid transition between deep sedation and awake states. We report a successful asleep fiberoptic intubation in a patient with a difficult airway (Mallampati 4) sedated by remimazolam. The patient was spontaneously breathing throughout the procedure despite being deeply sedated. Conditions for intubation were excellent.

Key Words: *Fiberoptic intubation; Remimazolam; General anesthesia; Oral airway.*

INTRODUCTION

Fiberoptic Intubation (FOI) is an essential aspect of airway management and a critical element of several difficult airway algorithms [1-2]. Numerous pharynx and vocal cords topicalization methods and sedation techniques to secure the airway have been described [3-4]. The choice of strategy depends on the clinical merits and feasibility of keeping the patient awake or asleep and the preservation or suppression of spontaneous ventilation. The advantages of awake FOI include airway muscle tone and spontaneous ventilation, thus allowing alternatives if the technique fails. The technique, however, requires an adequately sedated but cooperative patient and is associated with untoward cardiovascular responses [5]. Oversedation leading to airway obstruction and loos of spontaneous ventilation is the ever-present hazard of the techniques [6-7].

Asleep FOI while maintaining spontaneous ventilation may circumvent some of the abovementioned issues and is advocated by some authors [8]. However, the method requires careful titration with drugs that can be easily reversed if needed. Commonly used sedatives are poorly fitted to achieve the goal. Propofol is a short-acting drug but has a narrow therapeutic window and is not reversible. Often used midazolam/ fentanyl combination may lead to disinhibition and non-cooperating patients. Both options may result in a loss of spontaneous ventilation. Dexmedetomidine is a viable alternative but is a long-acting drug with a slow onset of action. Moreover, it is irreversible. Remimazolam is a recently introduced ultra-short benzodiazepine with a rapid onset/offset of action [9-10].

Therefore, remimazolam's concentration in the plasma can be ideally controlled. The availability of flumazenil and weight-independent clearance further adds to its safety in case of overdose. Studies comparing remimazolam with propofol or midazolam/fentanyl combination suggest lower liability for hemodynamic perturbation and respiratory depression [11-12]. This report aims to demonstrate the suitability of remimazolam for FO intubation and to document the cardiovascular and respiratory effects during the procedure.

CASE PRESENTATION

The patient is a 70-year-old female diagnosed with a T4N1M0 Oropharyngeal Squamous Cell Carcinoma and a history of smoking ½ pack per day for 40 years, which she quit four months prior. ENT initially saw her with a complaint of a left neck mass of several months that had increased in size with associated throat and mouth pain. Flexible fiberoptic laryngoscopy revealed a base of tongue mass extending to the midline and hypopharynx. The patient's throat and mouth pain were significant enough to severely limit her mouth opening, causing her to lose 20 lbs since her diagnosis two months prior. Thus, the patient was scheduled for a PEG tube placement. On physical examination, the patient had a left-sided neck mass extending from the ear to the submental region, with minor tracheal deviation to the right. The patient could breathe without detectable obstruction; however, the active range of motion of the neck was limited, and mouth opening was limited to 1cm between incisors. The patient had a Mallampati score of IV, and thyromental distance was approximately three Finger Breadths.

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Received:28 June, 2022, Manuscript No. pulacr-22-5206, Editor assigned:29 June, 2022, Pre QC No. pulacr-22-5206 (PQ), Reviewed:11 July, 2022, QC No. pulacr-22-5206 (Q), Revised:16 July, 2022, Manuscript No. pulacr-22-5206 (R), Published:18 July, 2022, doi: 10.37532. pulacr.22.5.4.1-3.

Considering the patient's apprehension, the anesthesia team opted to attempt asleep fiberoptic intubation under deep sedation with short-acting sedatives. We planned to awaken the patient if unsuccessful and proceed with the awake FO technique. Preoperatively, the patient was treated with 5ml nebulized lidocaine 4% for 5 min. The patient was brought to the operating room, and monitors were applied (BP cuff, 5-lead EKG leads, SpO_2 sensor, et CO_2 connected to face mask). Baseline vitals were BP 149/74, HR 73, SpO_2 97% on room air, RR 16-18. The patient was pre-oxygenated for 5 min with 15L O_2 via a face mask. Cetacaine solution was sprayed in the patient's posterior pharynx, and the patient was made to gargle and swallow a small amount of the sprayed solution. Once the patient was adequately preo-xygenated, and the airway was anesthetized, the patient was induced with fentanyl 25 mcg, and Remimazolam 8 mg in 4 mg pushes over 2 min. While the patient was still spontaneously breathing, an Ovassapian Oral airway was inserted, and a fiberoptic scope was subsequently inserted through the oral airway. Once visualization of the vocal cords was obtained, Remimazolam 7 mg was given before advancing the scope past the vocal cords and ultimately advancing the 7.0 endotracheal tube. Correct placement was confirmed via fiberoptic scope, auscultation, and et CO_2 monitoring. The patient was given Fentanyl 75 mcg, Remimazolam 5 mg, and propofol 40 mg once correct tube placement was confirmed, and the patient was paralyzed with 30 mg of rocuronium. General anesthesia was maintained with Sevoflurane 2.0%. Throughout the procedure, the patient had been breathing spontaneously at a rate of 12-20, and the SpO_2 range was between 95%-100%. Heart rate increased to approximately 90 beats/min once the ETT was advanced past the vocal cords, through quickly returned to baseline after that, and BP remained near the baseline.

DISCUSSION

A significant challenge during fiberoptic intubation is to provide adequate sedation to ensure patient comfort while maintaining a patent airway and spontaneous ventilation. The sedation strategy depends on the clinical merit and feasibility of two management choices: keeping the patient awake or asleep and the preservation or ablation of spontaneous ventilation. Awake FOI with a spontaneously breathing patient allows for the maintenance of pharyngeal muscle tone and avoids potential morbidity associated with the failed intubation. This approach, however, is associated with patient distress and non-cooperation, hemodynamic instability, difficult mask ventilation of an agitated and uncooperative patient, desaturation, airway trauma, and, on rare occasions, a complete airway obstruction [13-15]. The advantages of asleep FOI with spontaneous ventilation include patient comfort, cardiovascular stability, minimal risk of laryngospasm, and an option to use pressure support ventilation if required [16]. However, the risk of oversedation and the ensuing "cannot intubate, cannot ventilate" scenario cannot be ignored. The advantages and disadvantages of asleep versus awake FOI are discussed elsewhere [17-18].

The ideal agent for FOI should preserve spontaneous ventilation, maintain hemodynamic stability, be titratable, short-acting, reversible, and ensure patient cooperation. Several classes of agents, including opioids, benzodiazepines, alpha-2 agonists, and propofol, have been used for sedation during FOI. Midazolam, in conjunction with fentanyl (or morphine in the older reports), is a commonly used technique. Numerous studies have reported its use for FOI [19-20]. The advantages include familiarity and widespread experience with the agents and reversibility of the drugs. Respiratory depression, hypoxemia (in some studies, up to 50% of patients) [21], disinhibition, coughing, non-cooperation, and subsequent inability to complete the procedure are commonly reported complications of the technique.

Remifentanil, an easily titratable ultra-short acting opioid, can be an excellent choice for brief but intensely stimulating procedures (i.e., FOI). Several studies assessed its use alone or in combination with midazolam [22-24]. Commonly reported complications to include a high incidence of recall (100% in one series) [22], respiratory depression (even at low doses), coughing, and hemodynamic instability. Propofol has been used for sedation during FOI, alone or in conjunction with other sedatives. As a sole sedative agent, propofol usage has been associated with a greater risk of over-sedation, coughing, and airway obstruction than other sedatives like remifentanil [24]. Finding the balance between underdosing (and thus having the patient move and cough) and overdosing (and thus having soft tissue collapse of the airway and risk of obstruction) can be challenging to achieve as it varies from patient to patient, which has been shown across multiple randomized controlled trials [22-24]. Overdosing propofol essentially defeats the purpose of fiberoptic intubation in a difficult airway, as the patent airway is effectively compromised.

Several studies evaluated the use of dexmedetomidine for FOI. The purported advantages of the drug include a unique "cooperative sedation," minimal respiratory impairment, moderate analgesia, and antisialagogue effects [25-27]. Dexmedetomidine, however, is a long-acting and not easily titratable drug. The loading dose for dexmedetomidine requires 10 min to infuse, and there is no reversal agent in case of overdose. Moreover, it provides no amnesia and may result in severe bradycardia and hypotension [27]. Remimazolam is a recently introduced ultra-short-acting benzodiazepine that can be easily titrated to ensure the timely transition from mild to deep sedation with the preservation of spontaneous ventilation [28]. Similar to other benzodiazepines, its pharmacological effects can be reversed by flumazenil.

In addition, remimazolam produces minimal cardiovascular and respiratory impairment, does not cause pain on injection, and does not require dose adjustment in patients with renal impairment. Thus, remimazolam offers pharmacological advantages compared with the commonly used sedatives, particularly its rapid onset and offset of action, short elimination half-life, and minimal tissue accumulation. Our patient presented with a large oropharyngeal squamous cell carcinoma that caused deviation of the trachea. The patient's mouth opening was limited to 1 cm. The patient was anxious and fearful of being awake during the procedure. We felt that remimazolam could be an ideal agent for this patient as it allows a rapid transition from asleep to awake states and could be reversed in case of an overdose. Moreover, the patient had coronary artery disease, and remimazolam blunts hemodynamic responses to intubation and is recommended for ASA 3 and 4 patients [29-30] During the intubation, the patient's SpO_2 remained above 95%, the heart rate varied from 70 beats-90 beats, and maximum systolic pressure was below 140 mmHg (149 mmHg on arrival). The use of remimazolam allowed us to safely sedate the patient while keeping her breathing spontaneously. We intubate her on the first attempt. The patient had no recall of the FO intubation and rated anesthesia management as excellent.

CONCLUSION

In conclusion, remimazolam, an ultra-short-acting benzodiazepine, provided deep sedation for FOI of an anxious patient. It afforded sedation, anxiolysis, hemodynamic stability, and amnesia with minimal respiratory depression. Additional studies are required to further clarify its role in managing the difficult airway.

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