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CASE REPORT

Dexmedetomidine Adjuvant in Awake Intubation as Difficult Airway Management for Submandibular Abscess with Mediastinum Infiltration

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ABSTRACT

Background: Maintaining a secure airway in difficult airway settings is important due to morbidity and mortality. Conventional intubation relies on benzodiazepines, opioids, and propofol which have a respiratory depression effect. Dexmedetomidine has a minimal to no central respiratory depression effect. A submandibular abscess can result in laryngeal edema which narrows or occludes the airway.

Case Ilustration: A 65-year-old male complained of difficulty breathing and shortness of breath accompanied by neck and right jaw pain that radiated to the right cheek. The patient also complained of a salty taste every time the patient swallows. Obtained blood pressure 112/73 mmHg on norepinephrine support syringe pump 0.1 mcg/kg/minute (5.4 cc/hour), pulse rate 120 bpm, respiratory rate 32 times per minute with the help of respiratory muscles. The patient's temperature was 36.7^{o}C. The patient's initial Glasgow Coma Scale was $E_3V_5M_6$. Difficult airway was observed due to submandibular mass, 1-2 finger mouth opening, trismus, mallampati was difficult to evaluate, limited neck motion due to pain, and missing teeth. Imaging showed a soft tissue mass in the neck region. The patient underwent awake intubation using a video laryngoscope and Nasoendotracheal tube number 6.5 was installed with 70 mcg of dexmedetomidine syringe pump in 10 minutes (with pump rate of 105 ml per hour) and lidocaine mouth rinse. The intubation process went smoothly and the patient was admitted to the Intensive Care Unit for further monitoring.

Conclusion: Management of difficult airway settings is important due to morbidity and mortality. The use of dexmedetomidine is considered safe and effective in securing the airway in patients with difficult airway.

Keywords : Awake intubation; Dexmedetomidine; Difficult airway; Submandibular abscess.

INTRODUCTION

Airway and respiratory function are important components of anesthetic procedures. The American Society of Anesthesiologists (ASA) claims that the cause of the majority of post-anesthesia morbidity and mortality is caused by respiratory-related events. Therefore, airway management and supporting respiratory function, especially in patients with difficult airways, are a top priority so that patients are not burdened with all the complications of inadequate airway management. Nowadays, awake intubation is gaining popularity among clinicians and patients in need due to improvements in techniques and studies to provide good safety measures to the procedures and drugs related[1].

Awake intubation procedures relied on conventional agents such as benzodiazepines, opioids, and propofol (which can cause respiratory depression, especially when used at high doses). Contrary to conventional trends, the anesthetic agent dexmedetomidine–alpha 2 adrenoreceptor agonist–has minimal to no central respiratory depression. This property of dexmedetomidine can be an advantage that can be given to patients with limited respiratory function (critical or unstable patients, or with difficult airways) when intubating using sedation will be performed[2].

A submandibular abscess generally speaks of an infection in the deep cervical fascia. Infection can run from the oral cavity (teeth) infiltrating the bone in the submandibular, submental, retropharyngeal, or lateral pharyngeal space. The formation of an abscess can induce movement of the temporomandibular joint and swelling (edema) of the larynx. Progression of laryngeal swelling can lead to narrowing of the airways and eventually complete closure[3].

Guidelines for difficult airway settings have been published by the ASA that focuses on intubation strategies and airway management that can be used when finding a difficult airway. With holistic planning and preparation, potential complications can be reduced for the outcome for the patient[4].

We present a case of a geriatric with a compromised airway caused by a submandibular abscess extended to the neck with septic shock and right unilateral pneumonia, and how the emergency airway management procedure was performed in order to secure the patient's airway.

CASE PRESENTATION

Sixty-five years old male (weight 72 kg and height 165 cm; BMI: 27.4 kg/m^2) complained of difficulty breathing with shortness of breath accompanied by pain in the neck and right jaw radiated to the right cheek. The patient also complained of a salty liquid every time the patient swallows. Examination of vital signs found blood pressure 112/73 mmHg with support norepinephrine syringe pump at a dose of 0.1 mcg/kg/minute (5.4 cc/hour), pulse rate 120 bpm regular, respiratory rate 32 times per minute. The patient's body temperature was 36.7^{o}C. The patient's initial level of consciousness was assessed using GCS with $E_3V_5M_6$.

Difficult airway was observed due to a mass in the submandibular area, 1-2 finger opening of the mouth, trismus, mallampati score that was difficult to evaluate, limited neck motion when painful, and missing teeth (as shown in Figure 1). Initial thorax examination showed subcostal and suprasternal retraction yet equal chest expansion despite the use of respiratory muscle during the inspection and coarse wet crackles were heard in the right lung.

Figure 1. Clinical photo of the patient before awake intubation procedures, patient's ability to open his mouth with 1-2 fingers, trismus, mallampati score that was difficult to evaluate, limited neck motion due to pain, and missing teeth.

Laboratory tests were to be within normal limits in addition to the presence of a leukocyte count of 14.4 and an electrolyte of potassium 3.2 (corrected with potassium chloride 50 meq).

Chest x-ray revealed unilateral pneumonia on the right lung and a soft tissue mass at the level of the 7th cervical vertebra to the 1st thoracic vertebra (as shown in Figure 2). ECG revealed a sinus tachycardia of 120 bpm, with right

axis deviation and RBBB (Right Bundle Branch Block) with right ventricle strain.

Figure 2. The patient's chest x-ray showed right unilateral pneumonia and a soft tissue mass at the level of the 7th cervical vertebra to the 1st thoracic vertebra.

While in the resuscitation room inside the Emergency Room (ER), the patient underwent awake intubation using a video laryngoscope and NET number 6.5 was chosen. Before the procedure began, premedication drugs were given (4mg ondansetron injection and 1gr paracetamol infusion). Subsequently, the patient was given a dexmedetomidine syringe pump with a dosage of 70 mcg in 10 minutes (with a pump rate of 105 ml per hour) then followed by a lidocaine spray. The procedure began shortly after dexmedetomidine had ended.

Before the intubation began, obtained blood pressure was 109/74 mmHg, pulse rate 110 bpm regular, and respiratory rate 32 times per minute. The patient's body temperature was 36.6oC. The patient's level of consciousness was E3V5M6. We ensured the patient reached Ramsay Sedation Scale (RSS) 2. The patient was still able to hear and understand commands given by the anesthesia team.

Nasoendotracheal (NET) tube (size 6.5) was lubricated with sterile gel first and then inserted carefully through the left nasal ostium (due to obstructed right side from the abscess). When NET tube was inserted, the patient was able to give an appropriate response to instructions (such as to take a breath and pain assessment). When the NET had already reached the pharynx, the patient was instructed to open their mouth for the laryngoscopy process using a videolaryngoscope to guide the NET correctly down the trachea. After the NET is at its exact location and desired depth, equal chest expansion, oxygen saturation, and breath sound were assessed on both lungs.

The patient's condition after the NET's put in place was reflected through the profoundly stable hemodynamic. A

spontaneous respiration was preserved with the absence of cough nor painful sensation after the procedure had finished. The patient shows no signs of discomfort with the already installed NET within their airway.

Figure 3. Clinical photo of the patient after awake intubation. NET number 6.5 was installed and connected to a mechanical ventilator with SIMV (Synchronized Intermittent Mechanical Ventilation) configuration pi 10 ps 10 PEEP (Positive End Expiratory Pressure) and 60% FiO2.

After successful initial airway management (Figure 3), the patient was transferred to the Intensive Care Unit (ICU) for suspected sepsis (qSOFA assessment in ER: altered level of consciousness, an increase of respiratory rate, systolic blood pressure >100 mmHg), intensive monitoring, and the need for mechanical ventilator access. The patient enlisted for an abscess drainage incision procedure eventually.

DISCUSSION

Deciding a correct and efficient intubation technique plays an important role in ensuring adequate airway and respiratory function. The most popular technique used to maintain a patent airway in the endotracheal tube is sedation. Several traditional agents such as benzodiazepines, opioids, and propofol can have a respiratory depression effect, especially when used at high doses. In cases with a difficult airway (A compromised airway, in this respect), it was necessary to amend the forthcoming risk of sedating the patient amid the intubation process.

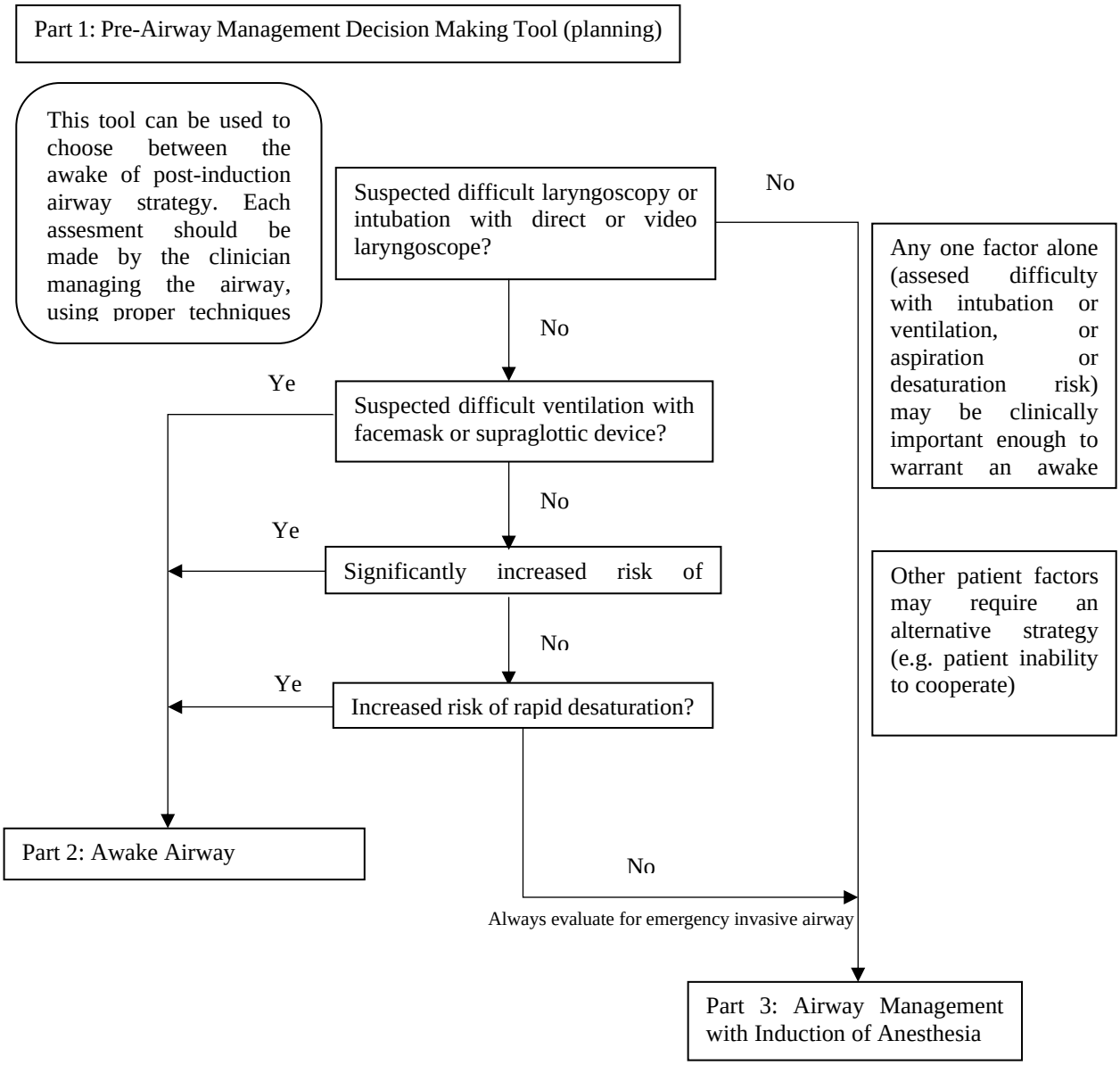

Figure 4. The 2022 American Society of Anesthesiologist Practice Guidelines for Management of Difficult Airway in Adults[5]

The American Association of Anesthesiologists (ASA) has published a guideline to manage difficult airways appropriately. The 2022 ASA Practice Guidelines have a specific pre-planning algorithm for difficult airway management processes. Pre-airway planning included suspected difficulty in laryngoscopy, suspected ventilation difficulty, and the risk of aspiration and desaturation (Figure 4). In this patient, laryngoscopy was difficult to perform (so it was necessary to use video-guided assistance), difficult ventilation due to trismus, and a high risk of aspiration and desaturation. Based on the

considerations that have been made, awake intubation was favored[1,3].

The Ramsay Sedation Scale is a scale that assesses the "depth" of a patient's sedation. In awake intubation, full sedation is not performed but it is sufficient to achieve RSS 4 (the patient can give a minimal response when light taps on the glabella or loud sound responses are made). The RSS 4 scale describes decreased consciousness but adequate respiratory function to support bodily functions during periods of rest, which are required for endotracheal intubation procedures, hence the "awake" intubation procedure was named after[1].

Application of awake intubation relates to the choice of anesthetic agent dexmedetomidine. The alpha two agonist drug–dexmedetomidine–has minimal to no central respiratory depression, in contrast to other drugs used for conventional intubation (benzodiazepines, opioids, propofol) which have respiratory depression effects[2,6]. This is the key to awake intubation. In this case, dexmedetomidine was used to facilitate awake intubation for the installation of NET number 6.5 and no opioid, benzodiazepine, or propofol derivative anesthetic agents were used and the intubation process went smoothly.

Dexmedetomidine is an adrenoreceptor agonist drug. The utilization of dexmedetomidine is common in emergency management for difficult airway management. The minimal to non-existent sedative effect without respiratory depression makes dexmedetomidine the drug for patients with airway and respiratory function who are at risk for desaturation or aspiration[2,3]. The administration of dexmedetomidine can also provide anti-anxiety and analgesic effects so it can also be given to patients with agitation or simply to reduce the patient's anxiety ahead operative procedure. Due to the aforestated benefits, dexmedetomidine is arbitrary for patients with critical airways[4,6].

There is also a concern about managing patients with critical hemodynamic status. Sedative use (either for facilitating or inducing anesthesia procedures) was found to have a considerable effect on patients' hemodynamics. The use of an opioid substitute, dexmedetomidine, appears to offer an edge for such group. Prior research reveals that dexmedetomidine infusion during the intubation process

can provide more stable hemodynamics than the use of conventional agents[7].

To estimate the cardiac output, the Windkessel formula of [CO=(PPxHR)*2ml] (CO: Cardiac Output; PP: Pulse Pressure; HR: Heart Rate) was used. Pulse pressure is defined as the difference between systolic and diastolic blood pressure numbers[7]. The patient's estimated cardiac output was [(112-73)*120]*2ml] 9360 ml/minute during the awake intubation process. Normal cardiac output ranges from 5 to 6 liters per minute in a person at rest. While exercising, an athlete can have a cardiac output of more than 35 liters per minute. A non-athlete's cardiac output will be lower than an athlete's but higher than when the non-athlete is at rest. In this case, calculating the patient's cardiac output was important to closely monitor the hemodynamic stability during the awake intubation procedure, especially given the patient's septic condition. Even though there was no significant cardiac complication, the presence of sepsis and difficult airway could potentially lead to cardiovascular instability.

Compared with the use of the traditional opioid-based agent, dexmedetomidine can give a minor (or in most cases none) effect on patients' hemodynamics[1,2]. Some studies addressed the effect of stimulating alpha 2 adrenoreceptors in multi-organ levels. It is known that the alpha-two receptors are scarcely distributed all over the body (central and peripheral nervous system, as well as cardiovascular and renal or musculoskeletal organs). Stimulation of alpha-two receptors in the nervous system can give various responses such as sedation, anxiolysis, or analgesia. In the cardiovascular system, stimulation of alpha-two receptors can induce vasodilatation, bradycardia and reduce the risk of tachycardia reflex[6]. There's also still ongoing research on whether the diuresis process regulated by the renal system is affected by the spoken proposed mechanism. Study shows that there is a risk for alteration in hemodynamic status regarding blood pressure. There are reports of a biphasic blood pressure response (a brief hypertensive period ensued by a period of hypotension) after dexmedetomidine was given[8]. Despite the proposed theory of the drug's mechanism of action. Blood pressure was within normal limits during this report.

Side effects of dexmedetomidine are minimal if the drug distribution

process is carried out properly. The use of dexmedetomidine as a substitute for sedation for awake intubation also needs to be added with other local anesthetic agents to provide maximum comfort to the patient[6]. The intubation process is a process that can trigger an uncomfortable sensation due to pain, especially if it is performed on a patient with a difficult airway. The use of adjuvant local anesthetics (which can be given 'spray and go') can provide a topical anesthetic effect on the airway thereby minimizing the transmission of painful stimuli[1,3,4].

The awake intubation procedure is similar to the traditional intubation process; a series of premedication, pre-oxygenation, sedation, and intubation processes. Before performing intubation, a doctor should be able to evaluate whether there is a difficult airway and consider the choice of alternative airway procedures. When it is decided to perform awake intubation, dexmedetomidine can be prepared by dissolving 2 mL of dexmedetomidine with 48 mL of normal saline. Dexmedetomidine can be started at 1 mcg/kg/minute for the first 10 minutes as a loading dose and continued with a syringe pump of 0.7 mcg/kg/hour. The intubation process can be started when the patient has reached RSS 2 (the patient is cooperative but calm and not agitated) or more. If the maintenance dose was already given and the patient has not yet reached RSS 2, rescue sedation with Midazolam 0.5 mg can be added (with a maximum dose of 0.2 mg/kg) until the RSS reaches 2 or more[8].

CONCLUSION

Awake intubation is crucial in difficult airway settings due to the associated morbidity and mortality, and the use of dexmedetomidine is considered a safe and effective method for securing the airway in such patients..

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