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Sedation for Management of Difficult Airway

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Abstract

Awake fiberoptic intubation (AFOI) is the gold standard of management of the predicted difficult airway. Sedation is frequently used to make the process more tolerable to patients. It is not always easy to strike a balance between patient comfort and good intubating conditions on one hand and maintaining ventilation and a patent airway on the other.

Keywords: Airway management, tracheal intubation, difficult airway, sedation.

Mini review article **Corresponding Author*, e-mail: emadelomami@gmail.com

1. Introduction

Awake intubation (AI) relies on the ability to secure a patient's airway and maintain spontaneous ventilation. Although awake intubation can be achieved using local anesthesia alone, sedation reduces the patient's discomfort and improves cooperation during the procedure. However, the practitioner must exercise caution to avoid oversedation, which can cause airway obstruction, respiratory depression or cardiovascular instability, and result in significant morbidity or mortality [1]**.** A second anesthetist responsible for managing drug injections should be present to avoid oversedation, and to reduce the cognitive load of the anesthetist performing AI [2]**.**
The ideal sedative for AFOI would provide anxiolysis and a degree of amnesia with a low incidence of recall of the procedure. It would have analgesic properties, suppress the cough and gag reflex, and be safe and easy to titrate with minimal respiratory and cardiovascular side effects. The use of several classes of drugs have been described, from benzodiazepines (e.g., diazepam and midazolam), to opioids (e.g., fentanyl and remifentanil), to alpha2 agonists (e.g., dexmedetomidine), and to intravenous induction agents (e.g., ketamine and propofol) [3]**.**

2.Benzodiazepines

Benzodiazepines are a class of molecules with a core consisting of fused benzene and diazepine rings. They target specific recognition sites in γ-aminobutyric acid$_A$ receptors **(GABA$_A$Rs)**, the primary inhibitory neurotransmitter receptor throughout the central nervous system [4]. Their sedative, hypnotic, anxiolytic, and anticonvulsant effects are used to treat a wide range of conditions, including anxiety, panic, insomnia, seizures, muscle spasms, and alcohol withdrawal [5]**.**

a. Midazolam

Midazolam is acting on the benzodiazepine receptor, it promotes the action of gamma-aminobutyric acid. Gamma-aminobutyric acid action promotes sedative, anxiolytic, and anticonvulsant properties. Midazolam has a faster onset and shorter duration of action than other benzodiazepines such as diazepam and lorazepam lending itself to greater flexibility in dosing than other benzodiazepines[6].

b. Diazepam

Diazepam is a slightly slower onset and longer duration of action than midazolam and has been shown to be a less potent amnestic [7]. It can cause pain on IV injection and has the added risk of thrombophlebitis [8].

c. Lorazepam

Lorazepam provides the most profound sedating and amnestic properties; however, it is more difficult to use, because these effects are slower in onset and longer lasting than with either midazolam or diazepam [7-8].

3. Opioids

Opioids, by way of their agonist effect on opioid receptors in the brain and spinal cord, provide analgesia, depress airway reflexes, and prevent hyperventilation associated with pain or anxiety. These properties make them a useful addition to the sedating regimen for AI. Although any opioid receptor agonist could theoretically be used for this

purpose, the synthetic phenyl piperidine class of opioids-fentanyl, sufentanil, alfentanil, and remifentanil are best suited to the task. These drugs are particularly useful due to their rapid onset, relatively short duration of action, and ease of titration [9].

a. Fentanyl

Fentanyl is a potent synthetic opioid. Clinically, its most common use is as a sedative in intubated patients and in severe cases of pain in patients with renal failure due to its primarily hepatic elimination [10].

b. Sufentanil

Sufentanil is an opioid analgesic, it is an analogue of fentanyl that has been used for the induction and maintenance of anesthesia and for postsurgical analgesia. It has shorter volume of distribution and elimination half-lives, and is a more potent analgesic than fentanyl. In clinical practice, however, intravenously administered sufentanil produces essentially equivalent anaesthesia to fentanyl and is a better anesthetic than morphine or pethidine (meperidine) for major surgery, but the duration of analgesia is shorter. Thus, sufentanil's primary place in therapy at this time would appear to be as high dose anaesthesia for major surgery such as cardiac surgery, and as low dose supplement to balanced anaesthesia in general surgery [11].

c.Alfentanil

Alfentanil is a synthetic, short-acting opioid analgesic classified as a small-molecule derivative of fentanyl. This medication is widely used as an analgesic supplement during various surgical procedures or as a primary anesthetic agent in high doses during cardiac surgery in hospital settings. In comparison to analogous anesthetics such as fentanyl and sufentanil, alfentanil has the fastest onset of action, and features the shortest duration of action [12-13].

d. **Remifentanil**

Remifentanil is a new synthetic opioid with direct action on mu-opioid receptors. It has a rapid onset and it is rapidly inactivated by esterases in both blood and tissues, resulting in a very short duration of action. The duration of action of remifentanil has been found to be short, even in patients with renal or hepatic failure [14].

3. Anesthetics medications:

a. Propofol

Propofol is a highly lipid-soluble alkylphenol derivative that can be injected in boluses, as a simple infusion, or as a target-control infusion **(TCI)**. The vast majority of studies looking at its use for sedation during awake intubation have been with TCI. Achieving the correct balance between undersedation and oversedation can be extremely challenging when using propofol as a sole sedative agent, with effect-site concentrations of >3µg/ml seemingly associated with increased likelihood of oversedation. Concomitant administration of opioids or benzodiazepines can improve efficacy. Current evidence would suggest that propofol is best used as TCI with effect-site concentrations up to 1 µg/ml, in conjunction with remifentanil [3]**.**

Target-controlled infusion (TCI) is a technique of infusing IV drugs to achieve a user-defined predicted ("target") drug concentration in a specific body compartment or tissue of interest. TCI systems use a different approach (different from weight-based infusion). Rather than setting the drug administration rate, the user sets a target concentration to achieve a user-defined predicted drug concentration in a specific body compartment or tissue of interest. By using well-understood pharmacokinetic (PK) principles, computers can calculate how much drug has accumulated in tissues during infusions and can adjust the infusion rate to maintain a stable concentration in the plasma or the tissue of interest, typically the brain. This is the basis of a third type of anesthetic drug delivery, target-controlled infusions (TCI). With TCI systems, the clinician enters a desired target concentration. The computer calculates the amount of drug, delivered as boluses and infusions, required to achieve the target concentration and directs an infusion pump to deliver the calculated bolus or infusion. The computer constantly calculates how much drug is in the tissue and exactly how that influences the amount of drug required to achieve the target concentration by using a model of the pharmacokinetics of the drug selected and the patient covariates [15]**.**

b.Dexmedetomidine

Dexmedetomidine is an imidazole compound that has specific α-2 adrenoceptor agonist activity. It is gaining popularity as a sedative agent for AFOI because of a number of favourable properties. In addition to sedation, it also provides anterograde amnesia, anxiolysis, and analgesia. Importantly, it also has minimal effects on respiration. It is injected as a bolus of 0.7–1 µg/kg over 10–20 min followed by an infusion of 0.3–0.7 µg/kg/h. Despite these numerous desirable characteristics, there is currently a lack of well-designed randomized controlled trials demonstrating any clear benefit over other agents [3].

c.Ketamine

Ketamine-induced anesthesia is associated with amnesia, nystagmus, and the potential for hallucinations and other undesirable psychological reactions. Ketamine has an opioid-sparing effect and produces analgesia that extends well into the postoperative period, because plasma levels required for analgesia are considerably lower than those required for loss of consciousness. Ketamine increases blood pressure, heart rate, cardiac output, and myocardial oxygen consumption via a centrally mediated stimulation of the sympathetic nervous system. Its successful use in awake intubation has been described in combination with benzodiazepines, Patients receiving ketamine sedation should always be pretreated with an antisialagogue, because ketamine causes increased airway secretions that can lead to upper airway obstruction or make visualization is difficult [15].

Anti-sialogogues

Administration of an antisialagogue such as glycopyrrolate (0.4 mg IM), scopolamine (0.4 mg IM) and atropine (0.5 mg-1mg IM) of about 30 to 60 minutes before the procedure to minimize oral and tracheobronchial secretions and dry the oropharyngeal secretions, to get more effective local anesthetic topicalization and better laryngoscopic visualization especially with fiber optic (FOB) approach. Excessive secretions interfere with the effects of local anesthetics. The lack of secretions probably minimizes dilution of the applied local anesthetic and also results in better intubating conditions. The duration of

glycopyrrolate vagolytic effect after IV dosing is 2 to 4 hours; its antisialagogic effect lasts longer. Glycopyrrolate is devoid of central nervous system effects because its quaternary amine structure prevents passage through the blood-brain barrier. Its pharmacologic profile makes it the drug of choice as a premedicant for awake intubation (AI). Scopolamine, in addition to being a very effective antisialagogue, has very potent central nervous system effects, with sedative and amnestic properties. In some patients, however, this may lead to restlessness, delirium, and difficulty waking after short procedures. Because it is the least vagolytic of the anticholinergics in clinical use, it may be the drug of choice for patients in whom tachycardia is contraindicated. The onset after intramuscular atropine (IM) dosing is 15 to 20 minutes. Atropine produces only a mild antisialagogic effect, but it causes significant tachycardia because of its potent vagolytic effects. As such, it is not an ideal drug for use in drying the airway. As a tertiary amine, it easily crosses the blood-brain barrier and causes mild sedation. It may occasionally cause delirium, especially in elderly patients [16]**.**

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