RESEARCH ARTICLE

Dissociative Conscious Sedation versus Airway Regional Blocks in Patients with Predicted Difficult Airway: Advantages and Disadvantages

Mihan Jafari Javid[1]*, Ghazale Khademian[1]

Background: Establishment of a patent airway and preserving spontaneous ventilation is a necessity in predicted difficult airway. Airway regional blocks are commonly used in predicted difficult airway but the known limitations of these techniques propose the need to suggest alternative methods. This study compares subcutaneous dissociative conscious sedation (sDCS); a recently reported method of conscious sedation versus airway regional blocks in patients with predicted difficult airway.

Methods: This study was conducted in 60 patients scheduled for direct laryngoscopic biopsy (DLB). Patients were randomly assigned into two groups: subcutaneous dissociative conscious sedation (sDCS) (n=30) and airway regional blocks (ARB) (n=30).
Patients were compared for direct laryngoscopy, insertion of endotracheal tube, hemodynamic changes, oxygen saturation, patient cooperation, patient comfort, hallucination, nystagmus, salivation and event of recall.

Results: Direct laryngoscopy was successfully performed in all patients in sDCS group and 28 patients in ARB group. Insertion of endotracheal tube was successfully done in 28 patients of sDCS group and failed in two cases. In group ARB, endotracheal intubation was successfully done in 26 patients. Despite the lower success rate in group, ARB it was not statistically significant. Patient cooperation was significantly higher in sDCS group. No event of recall was observed in sDCS group versus 8 in group ARB.

Conclusion: Subcutaneous dissociative conscious sedation (sDCS) is a safe anesthesia method for endotracheal intubation and it is comparable and even superior to airway regional blocks in some aspects.

Keywords: airway regional block; awake intubation; conscious sedation; difficult airway

In the presence of predicted difficult airway, a situation in which a pathological or anatomical restraint threatens patient safety, maintaining spontaneous ventilation and awake intubation is of great importance [1-2]. Airway regional blocks are commonly used techniques for awake endotracheal intubation but the known limitations of these techniques such as poor localization of tumours, burns and loss of access to landmarks propose the need to suggest alternative methods [3]. Laryngopharyngeal pathologies are among the most common causes of predicted difficult airway in which surgical diagnostic procedure is needed [4]. Direct laryngoscopic biopsy (DLB) through rigid bronchoscope, as a diagnostic surgery needs general anesthesia. In order to prevent mortality and morbidity, endotracheal intubation should be done while the patient is awake and breathes spontaneously.

In this regard, different methods have been reported to induce sufficient sedation [5-16]. Respiratory depression is one of the most important considerations for choosing anesthetics and anesthesia method. In this study we compared subcutaneous dissociative conscious sedation, a recently reported method of conscious sedation [17-21] with regional airway blocks as a conventional method.

Methods

Approval was obtained from the ethics committee of Tehran University of Medical Sciences and written consent was received from the patients who participated in this prospective study. Sixty male patients with the mean age of 62.3 ± 4.8 (40-79) years and average body weight of 63.4 ±5.4kg (48-85 kg), classified as ASA class I & II who were scheduled for direct laryngoscopic biopsy (DLB) were enrolled in this prospective randomized study. Patients with the history of coronary artery disease, psychological disorders, increased ICP and drug abuse were excluded from this study. Direct laryngoscopy and tracheal intubation was performed by the same anesthesiologist. Heart rate and blood pressure were recorded before laryngoscopy and on

From the [1]Department of Anesthesiology and Critical Care, Tehran University of Medical Sciences, Imam Khomeini Medical Center, Tehran, Iran.
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*Corresponding author: Mihan J Javid, MD. Department of Anesthesiology and Critical Care, Tehran university of medical sciences, Imam Khomeini Medical Center, Tehran, Iran. E-mail: mihanjavid@yahoo.com

the second and fifth minutes after laryngoscopy and intubation.

Routine monitoring including non-invasive blood pressure, pulse oximetry, capnography and ECG was established before anesthesia. Vital signs were recorded before and during the procedure. Patients were randomly assigned into two groups: sDCS group (n=30) and ARB group (n=30). Pre-oxygenation was performed in both groups. In sDCS group conscious sedation was induced by 0.6 mg/kg subcutaneous ketamine and 2-4µg/kg intravenous fentanyl. Intravenous fentanyl was injected and titrated incrementally in about 10 minutes. Tongue and pharynx were anesthetized topically by 1-2 ml lidocaine spray (4%). Spontaneous ventilation was supplemented by O_2 100% through face mask. Ten minutes after subcutaneous injection of ketamine and achieving a desirable level of conscious sedation, patients were asked to open their mouth, then laryngoscopy and endotracheal intubation was performed. The desirable level of conscious sedation is defined as an arouseable patient with proper response to verbal commands. Additional dose of 50-100 µg fentanyl was administered if the patient was not cooperative enough for the first try of tracheal intubation.

In ARB group, airway regional blocks including glossopharyngeal block, superior laryngeal and translaryngeal blocks were induced.

In both groups, an increase in systolic blood pressure of more than 20% and/or exceeding 170 mmHg, was controlled by incremental doses of TNG (Trinitroglycerine) 50 µg IV until the systolic blood pressure reached 140 mmHg. Hemodynamic stability, oxygen saturation, patient cooperation (obedience to open the mouth for laryngoscopy), patient comfort (remaining moveless), hallucination, nystagmus and salivation (need for aspiration before laryngoscopy) were compared in two groups. Major and minor adverse events were recorded as well.

Major adverse effects were defined as irreversible apnea (by verbal command and stimulation), hypoventilation and hypoxemia (Spo_2 < 90%), laryngospasm, and upper airway obstruction. The need for positive pressure ventilation, insertion of an oral or nasal airway, urgent endotracheal intubation or tracheostomy were declared as indicated major adverse events. Minor adverse events were defined as respiratory events requiring minimal intervention such as stimulation, supplemental O_2 and head repositioning.

Regarding the painful and severe sympathetic stimulating during laryngeal and tracheal manipulation, we needed an optimal level of sedation before laryngoscopy. To achieve this optimal level it is necessary to wait at least 10 minutes after administration of subcutaneous ketamine. Accurate subcutaneous injection into the layer of fat between the skin and muscle with needle angle 45º is of great importance; otherwise achieving appropriate level of anesthesia would not be possible. Local anesthesia of oropharynx is necessary as well. When the patient falls asleep (the eyes are closed while there is no stimulation) the patient is ready for laryngoscopy.

Data analysis was performed using SPSS Version16. P-value less than 0.05 was considered significant. T-test and chi-square test were used for quantitative and qualitative data analyses respectively.

Results

Demographic characteristics were similar in two groups (Table 1). There was no statistically significant difference in hemodynamic variables, respiratory depression or apnea, desaturation, salivation, respiratory events needing positive pressure ventilation, hallucination and nystagmus between groups. Patient cooperation was significantly higher in sDCS group (P = 0.02). All patients were cooperative and proper sedation was established in all patients in sDCS group while 6 patients were non-cooperative in ARB group. In sDCS group, tracheal intubation was successfully performed in 28 patients. Massive obstruction of the airway by laryngeal tumor was responsible for failed endotracheal intubation in two patients and tracheostomy was performed in failed cases. In ARB group, tracheal intubation was successfully done in 26 patients. 4 patients were not cooperative enough during endotracheal intubation and it failed. Despite the lower success rate of endotracheal intubation in ARB group, it was statistically non-significant (p = 0.76).

Recall of the events during laryngoscopy and tracheal intubation was significantly higher in ARB group (p = 0.005) (Table 2). Hallucination was comparable between groups.

Table 1- Demographic characteristics of patients

Characteristics	sDCS group	ARB group	P value
Age	62.4±11.9	62.2±9.7	0.78
Gender (male)	30(100%)	30(100%)	1
ASA I, II	30(100%)	30(100%)	1
Weight	63.1±4.3	64.5±3.9	0.84

Table 2- Clinical characteristics compared between two groups

Characteristics	sDCS group	ARB group	P value
Success rate of tracheal intubation	28(93%)	26(86%)	0.82
Patient cooperation	30(100%)	24(80%)	0.02
Recall	0	8(26%)	0.005
Hemodynamic changes	0	0	1
Desaturation (Spo2 <90%)	0	0	1
Nystagmus	25(60%)	17(40%)	0.04
Hallucination	0	1(3%)	0.94
Salivation	0	0	1
Laryngospasm	0	4(13%)	0.56
Irreversible Apnea	0	0	1

Discussion

In the presence of predicted difficult airway, a situation in which a pathological or anatomical restraint threatens patient maintaining spontaneous ventilation, awake intubation is of great importance [1-2]. Airway regional blocks are commonly used techniques to facilitate awake endotracheal intubation. The known limitations of these techniques such as poor localization of tumours, burns and loss of access to landmarks propose the need to suggest alternative methods [3]. Laryngopharyngeal pathologies are among the most common causes of predicted difficult airway [4] in which surgical diagnostic procedure is needed. Direct laryngoscopic biopsy through rigid bronchoscope as diagnostic surgery needs general anesthesia and in order to prevent mortality and morbidity endotracheal intubation should be done while the patient is awake and breathes spontaneously. In this regard, different methods have been reported to induce sufficient sedation [5-16]. Respiratory depression is one of the most important considerations for choosing anesthetics and anesthesia method. Dissociative conscious sedation, a recently reported method of conscious sedation [17-21] was defined as using low dose ketamine intravenously or subcutaneously in conjunction with narcotics to achieve an acceptable level of sedation, pain relief and amnesia [17].

Ketamine is an old anesthetic with known effects of analgesia and amnesia which has been used for years. Besides the usual routes intravenous or intramuscular, it has been administered as oral, rectal, intranasal, intradermal and subcutaneous [20-22]. Regarding the gradual absorption of ketamine while using it subcutaneously, the adverse effects of the drug such as hallucination and psychological effects attenuate while the desirable effects remain intact [23-25]. The ability of sDCS to provide parallel desirable effects of anxiolysis, analgesia and amnesia in the presence of spontaneous ventilation, patient cooperation and intact airway reflexes makes it a unique method of conscious sedation in all patients who are at risk for difficult intubation or ventilation. None of ketamine or narcotic agent is efficient enough singly to provide desirable level of conscious sedation for laryngoscopy or tracheal intubation [18,20-21]. The cumulative effect of ketamine on pain relieving effect of narcotics, outstanding analgesic and amnetic effects, and its stimulant effects on respiration specially in the presence of increased end tidal Co_2 are behind the appropriate situation existing during the laryngoscopy and tracheal intubation [26-27]. Regarding the high incidence of inadvertent depth of sedation, irreversible apnea and hypoxia [26-27] it has been recommended instantly to avoid using combination of midazolam, ketamine and narcotics in difficult airways [18,28-29]. Nystagmus is the most common benign side effect of ketamine which is seen in subcutaneous injection. Manifestation of nystagmus indicates accurate subcutaneous injection of ketamine and an optimal level of analgesia and amnesia would appear consequently.

Conclusion

Subcutaneous dissociative conscious sedation is a non-invasive anesthesia method comparable and even superior to airway regional blocks in the management of predicted difficult airway. Regarding the high success and low complication rate, this method is recommended to be used in compromised airway as a safe and undemanding method.

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