



Use of the Jaw Elevation Device in Deep Sedation

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INTRODUCTION

Patients undergoing painful diagnostic or therapeutic procedures are frequently given sedatives and analgesics so that they will be comfortable and not move during the procedure. All sedatives and analgesics used in such procedures can produce relaxation of the upper airway that frequently causes airway obstruction or collapse as the tongue falls back into the pharynx. To open the obstructed or collapsed airway, the clinician providing the sedation/analgesia must perform some maneuver that relieves the obstruction, the most common of which is a jaw thrust. To provide a jaw thrust, the provider uses his/her fingers to apply pressure behind the angle of the mandible, pushing it forward (anterior). This opens the airway by lifting the base of the tongue off the pharynx. Depending on the size of the patient, their airway anatomy, and the depth of sedation, the provider may only need to exert minimal pressure (sometimes only one hand is needed), and other times vigorous pressure must be applied. When performing the jaw thrust maneuver, the provider cannot attend to other duties (administration of drugs and fluids, charting of vital signs, and assistance with the procedure). To perform these duties, the provider typically temporarily stops performing the jaw thrust and allows the patient to obstruct while they quickly perform the task, and then return to the patient and reestablish an airway with a jaw thrust. This pattern of temporarily stopping and re-applying of a jaw thrust every time the provider must attend to other duties continues until the level of sedation falls enough that the patient can maintain their own airway. This can be distracting to the provider if a jaw thrust is required for more than a few minutes.

Multiple airway devices exist that can maintain a patent airway (oral airways, laryngeal mask airways, endotracheal tubes). All of these must be inserted into the oral cavity or trachea and require a deeper level of sedation or general anesthesia to be tolerated by the patient. To avoid airway obstructions and the need for internal airway devices; providers titrate the level of sedation so that no airway support is required. However, this often results in an uncomfortable patient or one who is moving too much to successfully complete the procedure.

INTRODUCTION

The Jaw Elevation Device (JED) maintains a patent airway by duplication of the jaw thrust maneuver. The JED consists of two arms that clip into a padded head rest and hold a cushioned pad, which is positioned behind the angle of the mandible. The arms adjust for width (lateral motion), height (anterior/posterior motion), and rotation (flexion/extension of the head). The base is placed underneath the patient's head after sedation has been administered, the arms are then positioned to place the cushioned pads behind the angle of the mandible and adjusted to lift the jaw (anterior motion) and rotate the head (extension). Once positioned the JED maintains a patent airway and the provider is free to perform other essential tasks.

METHODS

Following IRB approval an observational study was conducted. 50 research subjects were enrolled from patients scheduled to undergo transvaginal oocyte (egg) retrieval under deep sedation or MAC. Sedation for these procedures typically consists of intravenous administration of a combination of midazolam, fentanyl, propofol, and/or ketamine titrated until the patient is calm, while supplemental oxygen is provided by mask or nasal cannula. A continuous infusion of propofol is typically used to keep the patient sedated enough that they will lie still and breathe regularly, but still respond to commands or noxious stimuli (such as a sternal rub). Each patient was monitored with standard ASA monitors and ETCO₂. Anesthetic medication choice was left to the provider using the case. Each provider was provided a data sheet to collect the data in Table 1. The provider was instructed to provide a jaw thrust to open the patient's airway to restore adequate ventilation at the first sign of airway obstruction. After reestablishing a patent airway with a jaw thrust the provider was to apply the JED.

METHODS

Once the JED was placed the provider documented any additional airway obstructions and the number of times they manipulated the JED device to release the airway obstruction. If the anesthesia care provider felt that the JED could not be adjusted to successfully maintain the airway, the use of the JED was to be discontinued and the anesthesia provider could employ any airway management technique of their choice. Additionally, the time of initial placement, the length of use, and the total time the JED was used was recorded. The number of adjustments once the JED was in place and the duration of anesthesia administration was also recorded. Demographics data including age, height, weight, ASA, history of OSA and STOP BANG score was recorded. The anesthetic method including the type of medications used was also collected on the data sheet. Due to the high frequency of patients requiring airway assistance with egg retrieval procedures performed under deep sedation, the incidence of patients not requiring assistance is likely to be low and 50 patients was felt to be an adequate study size to describe the utility and efficacy of the JED in this setting.

Our subject exclusion criteria were adult female patients who were known to have allergies or intolerances to the sedative medications that were used as the primary anesthetic and patients who had an upper airway, facial, or jaw anatomic abnormality that the anesthesia provider determined would be inappropriate to use the JED. Data were analyzed with basic statistical tools using excel.

RESULTS

Of the 50 patients enrolled, 31 (62%) of the patient's airway obstructed during the course of the anesthetic (Table 2). The average length of the anesthetic was 37.4 minutes and average time to first obstruction was 7.6 minutes (Table 3). A jaw thrust relieved 100% of the obstructions. The JED was utilized in 28 cases with airway obstructions. An average of .64 adjustments per case were needed after the JED was placed. 1 case required use of additional airway intervention, positive pressure mask ventilation due to apnea. 3 cases broke protocol. Two used a neck rolls to prop open the airway without employing a JED. The third did not place the JED after providing a jaw lift without any further obstructions. No cases required conversion to general anesthesia (LMA/ET intubation). Two desaturation events below 90% were noted during the study averaging 4.5 seconds before the JED was placed.

Table 1: Patient Data Collected

Data Point	Method of Measurement
Date of procedure	DD/MM/YYYY
Patient gender	Population is all female
ASA class	1-4
Age	In years
Height	Inches
Weight	Kilograms
Sex	Female
Patient ethnicity	Free patient identifies
Patient history of OSA	Asked pre-operatively
STOP BANG score	Asked pre-operatively
Patient diagnosis	Infertility
Duration of anesthetic medication administration	Minutes:seconds
Medication used	Name of medication
Medication dose	mg, mcg
Medication infusion rate	mg/kg/2min
Time from initiation of sedation to first airway obstruction	Minutes:seconds
Obstruction relieved with jaw thrust	Yes/No
Success of JED placement	Return of patient airway
Time from JED placement to next airway manipulation	Minutes:seconds
Number of airway manipulations required after JED placement	Counting
Frequency of hypoxemia	SaO ₂ <90%
Duration of hypoxemia	Minutes:seconds
Complications	List complications
Conversion to GA	Yes/No
Method of GA	List method
Other airway devices used	List device

RESULTS

Table 2: Patient Demographics and Number of Obstructions

Subjects	ASA 1	ASA 2	Average Age	History of OSA	Airway Obstruction by Jaw Thrust	Obstructions Relieved
50	30	20	33.86	0	31	31

Table 3: Case Demographics

Average Anes Anesthetic Duration (Min)	Average Time to First Obstruction (min)	Cases using JED	Average JED Duration (Min)	Number of Adj Post JED	Frequency of Hypoxia	Avg Duration of Hypoxia (Sec)
37.4	7.6	28	33	16	3	4.7

DISCUSSION

It appears that the JED is a useful airway adjunct that successfully maintains a patent airway during deep sedation with minimal additional adjustment after placement by the anesthesia provider. In our study the JED required minimal additional adjustment once placed, freeing the anesthesia provider to attend to other patient needs during the cases. Most of the anesthesia providers in our study noted that the JED was easy to use and required only minimal attention while maintaining a patent airway. Additionally it did not limit the access needed to place other airway devices if needed. Several of the surgeons commented after the study that they noted improved operating conditions when the JED was in place because the patients were less likely to respond to stimuli. We did note some significant limitations to the JED. First it required the patient to remain in the supine position to operate properly. Secondly it provides no airway protection from aspiration. Further study is needed before generalizable conclusions or comparisons to other airway devices can be made. However in this patient population it appeared to be a reasonable option to helping maintain a patient's airway during deep sedation.

REFERENCES

There is no published literature related to the JED at the time of IRB approval.

Disclaimers: The views expressed herein are those of the author and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, nor the U.S. Government.