Original Article

Comparative study of intubating conditions and hemodynamic changes during awake fiber-optic intubation using midazolam with fentanyl versus dexmedetomidine in cases of difficult airway

ABSTRACT

Background: The aim of the study is to compare intubating conditions and hemodynamic changes during awake fiber-optic intubation (AFOI) using midazolam and fentanyl versus dexmedetomidine in cases of difficult airway.

Materials and Methods: A randomized prospective study was conducted in the department of oral and maxillofacial surgery, with a total of 60 patients, 18–55 years of age, ASA class I–II, of either sex with anticipated difficult airway planned for elective surgery. They were divided into two groups; group I patients received 1 μg/kg of dexmedetomidine and then an infusion of 0.5 to 0.7 μg/kg/hr of dexmedetomidine, whereas group II patients received 1 μg/kg of intra-venous (iv) fentanyl and 0.05 mg/kg of iv midazolam with additional doses of 0.02 mg/kg to achieve a Ramsay Sedation Scale score of ≥2. The ease of placement of the fiber-optic scope and the endotracheal tube and the patient's reaction to placement of the fiber-optic scope were assessed on a scale of 1–4 and were recorded as endoscopist satisfaction score and patient discomfort score, respectively.

Results: The endoscopy time ranged from 2.66 ± 1.00 (group I) to 3.90 ± 0.96 (group II) minutes and was found to be statistically significant ($p < 0.05$). Also, the patient discomfort score was recorded during endoscopy (1–4) and ranged from 1.3 ± 0.53 (group I) and 2.33 ± 0.66 (group II) and was found to be statistically significant (p value < 0.05). Patients undergoing the procedure who received dexmedetomidine were thus more comfortable than those who received fentanyl and midazolam combination.

Conclusion: Dexmedetomidine provided better intubating conditions, patient tolerance, higher endoscopist satisfaction, and reduced hemodynamic responses compared to fentanyl and midazolam combinations. Also, the major advantage of dexmeditomidine for preservation of airway with a lesser degree of respiratory depression allows for safer use of AFOI in cases of difficult airway.

Keywords: Dexmedetomidine, fentanyl and midazolam, fiber-optic intubation, hemodynamic changes

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Received: 04 October 2020, **Revised:** 24 December 2020, **Accepted:** 04 March 2022, **Published:** 15 July 2022

INTRODUCTION

Awake fiber-optic intubation (AFOI) has become the accepted gold standard technique for management of recognized difficult airway[1] as the larynx remains in a posterior position and the patient is able to protect the airway from soiling and can maintain the airway patency as well as spontaneous breathing efforts.

Access this article online	
Website: www.njms.in	Quick Response Code
DOI: 10.4103/njms.NJMS_208_20	

How to cite this article: Sachan M, Singh NK, Naithani B, Abbas H, Dube M, Naithani B. Comparative study of intubating conditions and hemodynamic changes during awake fiber-optic intubation using midazolam with fentanyl versus dexmedetomidine in cases of difficult airway. Natl J Maxillofac Surg 2022;13:201-7.

Awake intubation requires that the patient remains calm and cooperative and is provided with sufficient anxiolysis, analgesia, and topical anesthesia without compromising the airway. Several analgesics such as fentanyl and remifentanil and sedatives such as midazolam and propofol have been used for AFOI,[2-5] but these drugs may cause respiratory depression and altered sensorium, resulting in untoward adverse effects such as hypoxemia and airway obstruction.[6,7] Therefore, there is a need to find an alternative sedative adjunct to fiber-optic intubation under topical anesthesia without compromising on patient safety. In the past 3 decades, the use of several classes of drugs has been described, from benzodiazepines (e.g., diazepam and midazolam) to opioids (e.g., morphine, fentanyl, and more recently remifentanil), to alpha2 agonists (e.g., clonidine and dexmedetomidine), and to intra-venous (iv) induction agents (e.g., ketamine and propofol).

In the present work, an attempt has been performed to study the usefulness of dexmedetomidine in patients with anticipated difficult airway and to compare the efficacy of dexmedetomidine for AFOI with that of the sedation regimen of fentanyl and midazolam. 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 present study was carried out with an aim to compare intubating conditions and hemodynamic changes and intubating conditions during awake fiber-optic intubation using midazolam and fentanyl versus dexmedetomidine in cases of difficult airway.

MATERIAL AND METHODS

This randomized prospective study was conducted in the oral and maxillofacial surgery theaters of KGMU, Lucknow. After getting approval Ethical Clearance was obtained from KGMU Ethical Committee with Ref no. 0018/ Ethics/R.cell-14 dated 11/03/2014), and a written and informed consent from all patients, we recruited 60 patients, 18–55 years of age, ASA class I–II, of either sex with anticipated difficult airway planned for elective surgery. Exclusion criteria were as follows: patients' refusal for consent, nasal mass, bleeding disorder, patients allergic to study medication, uncontrolled hypertension, pregnancy, ischemic heart disease, hepatic or renal disorders, and history of recent nasopharyngeal surgery. The patients were allocated randomly (randomization by numbering) into the following groups [Table 1].

Three anesthesiologists were involved in this study; the first performed fiber-optic tracheal intubation, the second was responsible for recording the scores and vitals, and the third administered the drugs. Pschycological counseling of the patient was performed the night before surgery to explain the procedure and allay anxiety.

All patients were fasted at least for 6 hours before the surgery. Multi-channel physiologic monitors were applied, and baseline hemodynamic variables [heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), SpO_2, and electro-cardiogram] were recorded. The iv line was established, and each patient received lactated Ringer's infusion.

All patients were pre-medicated with 0.2 mg of glycopyrrolate, 4 mg of ondansetronintravenously, and two drops of intra-nasal 0.1% xylometazoline (as a nasal decongestant) into each nostril instilled 15 min before the start of the study.

Then, patients received topical anesthesia with 3 ml of nebulized 4% lignocaine for about 10–15 minutes.

Group I patients received 1 mcg/kg of dexmedetomidine and then an infusion of 0.5 to 0.7 mcg/kg/hr of dexmedetomidine to achieve a Ramsay Sedation Scale (RSS) score of ≥2.

Group II patients received 1 mcg/kg of iv fentanyl and 0.05 mg/kg of iv midazolam with additional doses of 0.02 mg/kg to achieve an RSS score of ≥2.

All patients were intubated awake using a fiber-optic bronchoscope (Fujinon Fiberscope FR-120FP). With the patient lying in the supine position, the fiber-optic bronchoscope was checked for illumination; the more patent nostril was chosen for intubation, and the other nostril was used for oxygen insufflation (3–4 L/min). Nasal fiber-optic intubation was performed with an armored tube (7 to 7.5 mm diameter in men and 6.5 to 7 mm diameter in women). After orientation and localization of the laryngo-epiglotic region, the fibroscope

Table 1: Group distribution of the patients

Group	Description	No. of cases	Percentage
I	Patients undergoing AFOI received dexmedetomidine (1.0 μg/kg) over 10 min and then infusion of 0.5 to 0.7 μg/kg/hr to achieve an RSS score of ≥2.	30	50%
II	Patients undergoing AFOI received fentanyl (1.0 μg/kg) and midazolam (0.05mg/kg iv) with additional doses of 0.02 mg/kg iv midazolam to achieve an RSS score of ≥2.	30	50%

was introduced through the glottic opening entering the trachea visualizing the tracheal rings and the carina, and then, the endotracheal tube was rail-roaded through the fibroscope into the trachea. After successful passage of the tube through the vocal cords and after identification of the carina, the cuff was inflated, and the tube was confirmed with capnography and secured. Propofol [1–2 mg/kg (iv)] and 0.08 mg/kg of vecuronium bromide was used to induce general anesthesia and establish mechanical ventilation.

Patients' vital signs including HR, SBP, DBP, mean blood pressure (MBP), oxygen saturation, and end tidal CO_2 were recorded at the baseline after sedating the patients to an RSS score of ≥2 as the zero-minute score and then every one-minute interval during the entire AFOI procedure until the tube position was confirmed with end tidal CO_2. The endoscopy time (from insertion of the fiberscope into the nostril to visualization of the carina), the intubation time (from insertion of the tracheal tube into the nose to confirmation of intubation with capnography), and the number of attempts at intubation were all recorded.

Any adverse events such as bradycardia (HR <60 beats/min) or hypotension [mean arterial pressure (MAP) < 60 mmHg] were recorded and treated accordingly (with anti-cholinergics or vasopressor drugs). Hypoxia (SaO_2 <92) necessitated the stoppage of the procedure for mask ventilation for correction of the de-saturation.The ease of placement of the fiber-optic scope and endotracheal tube was assessed on a scale of 1–4, where 1 is excellent; 2, good; 3, reasonable; and 4, poor, and was recorded as endoscopist satisfaction score. The patient's reaction to placement of the fiber-optic scope and the endotracheal tube was assessed on a scale of 1 indicating no discomfort; 2, probable mild discomfort, no patient resistance; 3, restless patient, minimal patient resistance; and 4, restless patient, severe patient resistance and was recorded as patient discomfort score.

Statistical analysis

IBM SPSS statistics, version 20 (IBM Corporation, New York, USA) was used for statistical analysis. All the averages/means of two independent or unrelated groups numerical data were compared by unpaired t test, the ordinal data were compared using the Mann–Whitney test and the categorical data were compared using a w2-test. A P value less than 0.05 was considered significant.

RESULTS

There was no statistically significant difference regarding age, gender, and ASA status between the two groups. First-end tidal CO_2 was recorded after tracheal intubation, which ranged from 37.10 ± 4.49 (group I) to 42.27 ± 4.62 (group II) mmHg and was found to be statistically significant ($p < 0.001$).

Endoscopist satisfaction score and patient discomfort score recorded during endoscopy were compared between the two groups. The score ranged from 1.87 ± 0.90 (group I) to 2.43 ± 0.935 (group II) and from 1.3 ± 0.53 (group I) to 2.33 ± 0.66 (group II), respectively, and this was statistically significant (p value < 0.001). The endoscopy time (from insertion of the fiberscope into the nostril to visualization of the carina) ranged from 2.66 ± 1.00 (group I) to 3.90 ± 0.96 (group II) minutes and was found to be statistically significant ($p < 0.001$).

The intubation time (from insertion of the tracheal tube into the nose to confirmation of intubation with capnography) ranged from 43.40±10.27 (group I) to 41.83±9.29 (group II) seconds. Statistically, this difference among groups was not significant (p value = 0.538) [Table 2].

There were no statistically significant differences between the baseline parameters (namely, HR, SBP, DBP, and MAP) [Table 3].

Regarding HR, statistically significant inter-group differences were observed in intervals from the start to 7 minutes

Table 2: Comparison of first-end tidal CO_2 values, endoscopist satisfaction scores, patient discomfort scores, and endoscoy times and intubation times in both groups

	Group I		Group II		*P*
	Mean	SD	Mean	SD	
First $ETCO_2$ value	37.10	4.49	42.27	4.62	<0.001
ENDOSCOPIST SATISFACTION SCORE	1.87	0.90	2.43	0.935	0.001
Patient DISCOMFORT SCORE	1.30	0.53	2.33	0.66	0.001
ENDOSCOY TIME (MINUTE)	2.66	1.00	3.90	0.96	0.001
INTUBATION TIME s (SECOND)	43.40	10.27	41.83	9.29	0.538

Unpaired *t* test for significance, Mann-Whitney test for significance

Table 3: Comparison of HR in both groups

	Group I			Group II			*P*
	n	Mean	SD	*n*	Mean	SD	
Heart Rate							
BASE LINE	30	98.47	12.17	30	99.00	10.96	0.859
AT START	30	85.77	8.19	30	96.40	10.22	<0.001*
1 MIN	30	86.73	8.99	30	100.20	11.81	<0.001*
2 MIN	29	87.38	8.79	30	102.20	12.58	<0.001*
3 MIN	8	86.30	11.82	25	101.60	19.92	<0.001*
4 MIN	6	82.83	12.67	20	106.37	13.13	<0.001*
5 MIN	2	85.00	12.02	7	108.87	12.78	<0.001*
6 MIN	0	NA	NA	2	111.57	9.44	NA
7 MIN	0	NA	NA	1	113.00	10.13	NA
8 MIN	0	NA	NA	0	NA	NA	NA

Applied unpaired t test for significance. *Significant

($p < 0.05$), and at all these intervals, group II had higher mean values than group I [Table 3].

Regarding SBP, statistically significant inter-group differences were observed in intervals from the start to 3 minutes ($p < 0.05$), and at all times, group II had higher mean values than group I [Table 4].

Regarding DBP and MBP, statistically significant inter-group differences were observed in intervals from 1 minute to 5 minutes ($p < 0.05$), and at all these intervals, group II had higher mean values than group I [Table 5].

Regarding SP02, from the baseline to 5 minutes, it was observed that at all these intervals, group II had slightly higher mean values compared to group I. Statistically, no significant difference was observed among both groups (p value > 0.05) [Table 6].

DISCUSSION

AFOI can be an unpleasant experience even with careful and meticulous application of local anesthetics. Conscious sedation is desirable not only to make the procedure more tolerable for patients but also to ensure optimal intubating conditions, particularly in the presence of abnormal laryngeal anatomy and pathology, whereas deep sedation can result in loss of airway with serious consequences. A major challenge during AFOI is to provide adequate sedation while maintaining a patent airway and ensuring spontaneous ventilation to prevent the risk of a 'cannot ventilate, cannot intubate' situation. Recently, dexmedetomidine, a highly potent selective alpha 2 agonist that provides both sedation and analgesia without causing respiratory depression or airway compromise, has been tried for AFOI.[8-10] It has multifarious advantages as it provides a unique form of sedation in which patients appear to be sleepy but, if stimulated, are easily aroused, cooperative, and communicative.[3] Second, dexmedetomidine has anxiolytic, amnestic, and moderate analgesic effects[4] as well as anti-sialagogue effects facilitating a decrease in salivary secretions, which is a desirable effect during fiber-optic intubation.[11] Third, dexmedetomidine has a respiratory-escape effect, even when administered in large doses[5] in spite of its ability to produce deep levels of sedation.[11-13] The purpose of this study is to review the evidence supporting the use of currently available drugs with specific reference to their efficacy and safety profile.

The age, sex, and ASA grade of patients between the two groups were comparable, and the difference between them was statistically insignificant (p value <0.05).

All patients received oxygen by nasal prongs, the saturation was maintained, and the respiratory rate was never below 10/min in both the groups. We recorded first end tidal CO_2 after intubation and compared among the two groups, which ranged from 37.10 ± 4.49 (group I) to 42.27 ± 4.62 (group II) mmHg. Statistically, this difference among groups was significant ($p < 0.001$). This result could be related to respiratory depression resulting in a lower tidal volume and CO_2 retention in the fentanyl–midazolam group. Similar findings were seen in a study conducted by Agaewal *et al*., 2014 to evaluate and compare the efficacy

Table 4: Comparison of SBP and DBP in both groups

	Group I			Group II			*P*
	n	Mean	SD	*n*	Mean	SD	
SBP in mmHg							
BASE LINE	30	130.93	8.10	30	132.33	10.96	0.576
AT_START	30	117.90	7.34	30	127.63	10.61	<0.001*
1 MIN	30	121.07	7.07	30	131.57	11.62	<0.001*
2 MIN	29	122.67	6.28	30	134.87	12.72	<0.001*
3 MIN	8	124.93	6.69	25	129.80	11.27	0.046*
4 MIN	6	126.67	6.58	20	129.23	15.92	0.418
5 MIN	2	126.62	7.36	7	132.40	14.61	0.061
6 MIN	0	NA	NA	2	133.25	13.17	NA
7 MIN	0	NA	NA	1	134.00	NA	NA
8 MIN	0	NA	NA	0	NA	NA	NA
DBP in mmHg							
BASE LINE	30	85.33	6.10	30	85.53	7.29	0.909
AT START	30	79.07	5.95	30	82.50	10.51	0.125
1 MIN	30	80.47	6.04	30	84.97	10.41	0.045*
2 MIN	29	81.27	5.99	30	86.57	10.27	0.018*
3 MIN	8	81.00	5.71	25	86.23	10.80	0.022*
4 MIN	6	82.37	5.33	20	87.80	9.85	0.01*
5 MIN	2	82.34	5.86	7	89.23	8.66	0.001*
6 MIN	0	NA	NA	2	90.00	8.13	NA
7 MIN	0	NA	NA	1	91.00	NA	NA
8 MIN	0	NA	NA	0	NA	NA	NA

Applied unpaired *t* test for significance. *Significant

Table 5: Comparison of MBP in both groups

	Group I			Group II			*P*
	n	Mean	SD	*n*	Mean	SD	
Mean Blood pressure in mmHg							
BASE LINE	30	100.53	4.65	30	101.13	7.72	0.717
AT START	30	92.01	4.14	30	97.54	8.92	0.003*
1 MIN	30	94.00	4.44	30	100.50	8.79	0.001*
2 MIN	29	95.07	4.49	30	102.67	9.37	<0.001*
3 MIN	8	95.64	4.44	25	100.76	10.12	0.014*
4 MIN	6	97.13	3.74	20	101.61	9.54	0.02*
5 MIN	2	97.10	4.72	7	103.62	8.61	0.001*
6 MIN	0	NA	NA	2	104.42	7.94	NA
7 MIN	0	NA	NA	1	105.00	NA	NA
8 MIN	0	NA	NA	0	NA	NA	NA

Applied unpaired *t* test for significance. *Significant

Table 6: Comparison of SpO_2 in both groups

	Group I			Group II			*P*
	n	Mean	SD	*n*	Mean	SD	
SpO_2							
BASE LINE	30	98.67	1.12	30	99.13	0.94	0.086
AT START	30	99.03	0.89	30	99.13	0.86	0.66
1 MIN	30	98.80	0.85	30	98.87	0.90	0.769
2 MIN	29	98.30	0.95	30	98.40	1.13	0.713
3 MIN	8	98.17	1.46	25	98.47	1.70	0.466
4 MIN	6	98.47	0.90	20	98.63	1.10	0.523
5 MIN	2	98.41	1.48	7	98.60	1.52	0.635
6 MIN	0	NA	NA	2	98.79	0.92	NA
7 MIN	0	NA	NA	1	98.00	NA	NA
8 MIN	0	NA	NA	0	NA	NA	NA

Applied unpaired *t* test for significance. Statistically, no significant difference was observed among both groups

of dexmedetomidine versus the fentanyl–midazolam combination for sedation during AFOI.[14]

There are a few studies to evaluate the level of patients' satisfaction and its related factors.[11,13] Every patient was properly counseled, explained the procedure, and re-assured. The patient discomfort score was recorded during endoscopy (1–4) and compared between the two groups. The score ranged from 1.3 ± 0.53 (group I) and 2.33 ± 0.66 (group II) and was found to be statistically significant (p value < 0.05). Patients undergoing the procedure who received dexmedetomidine were thus more comfortable than those who received the fentanyl and midazolam combination. This effect could be attributed to better ability of dexmedetomidine in sedating patients and relieving their anxiety. In consonance with our findings, Sergio *et al*., 2010 evaluated the efficacy of dexmedetomidine with midazolam (DEX-MDZ) versus midazolam only (MDZ) for sedation during AFOI.[11] Ans surmised that DEX-MDZ patients were significantly calmer and more cooperative, had fewer adverse reactions, and were more satisfied with AFOI than did the MDZ patients. The scores that quantified the patients' tolerance (reactions) to endoscopy and intubation and judge the quality of the intubation conditions were significantly lower (better) in patients receiving dexmedetomidine alone than in patients receiving fentanyl/midazolam combinations.[15] These findings are not consistent with another study between opioid and dexmeditomidine, where Liu e*t al*., 2015 assessed the effect of remifentanil (Rem) or dexmedetomidine (Dex) during awake fiber-optic orotracheal intubation (AFOI). The comfort scores and airway events during intubation did not significantly differ between the two groups. However, the Rem group experienced less coughing, and less time was required for tracheal intubation when compared with the Dex group.[15]

The quality of endoscopic procedures at our center where the study was conducted is at par with international standards with an acceptable complication rate and good patient satisfaction. The endoscopist satisfaction score was recorded during endoscopy (1–4) and compared between the two groups. The score ranged from 1.87 ± 0.90 (group I) to 2.43 ± 0.935 (group II). This was statistically significant (p value < 0.05). This could be because of better patient cooperation and anti-sialagogue effects of dexmedetomidine. Similar reports were provided in the study performed by Bergese *et al*., 2010 as discussed above[11] and by Masoud *et al*., 2014.[13]

The endoscopy time (from insertion of the fiberscope into the nostril to visualization of the carina) was recorded and compared between the two groups. The endoscopy time ranged from 2.66 ± 1.00 (group I) to 3.90 ± 0.96 (group II) minutes. Statistically, this difference among the groups was significant (p < 0.05). This shows that dexmedetomidine provides better endoscopy conditions. This finding is different from the study performed by Liu e*t al.*, 2015 discussed above, where the study group receiving opioids was intubated in less time than the dexmeditomidine group.[15]

The intubation time (from insertion of the tracheal tube into the nose to confirmation intubation with capnography) was recorded and compared between the two groups. The intubation time ranged from 43.40 ± 10.27 (group I) to 41.83 ± 9.29 (group II) seconds. Statistically, this difference among the groups was not significant (p value = 0.538).

Comparing the hemodynamic variables, at the baseline, statistically no significant difference was observed in HR, SBP, DBP, and MAP among both groups (p value > 0.05). Regarding HR, statistically significant inter-group differences were observed in intervals from the start to 7 minutes (p < 0.05). When recording SBP, statistically significant inter-group differences were observed in intervals from the start of the procedure to 3 minutes (p < 0.05). Regarding DBP and MAP, statistically significant inter-group differences were observed in the interval from 1 minute to 5 minutes (p < 0.05). It was observed that at all these intervals, group II had higher mean values than group I.

Comparison of oxygen saturation of hemoglobin revealed that at the baseline, until 5 minutes, at all these intervals, group II had slightly higher mean values of SpO_2 compared to group I. Statistically no significant differences were observed among both groups (p value > 0.05).

Karaaslan *et al*. (2007) conducted a prospective, randomized, double-blind, clinical study on patients undergoing

septoplasty or endoscopic sinus surgery. Patients received iv dexmedetomidine/midazolam. Similar to our findings, they also found that all hemodynamic parameters were significantly higher in the midazolam group compared with the dexmedetomidine group from the onset of the surgery to the discharge time. A higher, although not statistically significant, prevalence of adverse events (i.e., hypotension, bradycardia, and perioperative nausea and vomiting) was observed in the dexmedetomidine group[16] as opposed to our study.

There were no episodes of hypotension (MBP <60 mm Hg) or bradycardia (HR < 60/minute) in the dexmedetomidine group of our study, although they were on the lower side, which is suggestive of hemodynamic stability in group I patients.

Sergio *et al*.[11] evaluated the efficacy of dexmedetomidine with midazolam (DEX-MDZ) versus midazolam only (MDZ) for sedation during AFOI. There were no significant hemodynamic differences between the two subject groups unlike our findings.

Scheinin *et al*. (1993), in a randomized, double-blind study, compared intra-muscular dexmedetomidine and intra-venous saline placebo given before induction with a combination of intra-muscular midazolam/intravenous fentanyl or a combination of intra-muscular dexmedetomidine and intra-venous fentanyl. They found that pre-treatment with a single intra-muscular injection of dexmedetomidine (2.5 μg/kg) is efficacious but significantly increases the incidence of intra-operative hypotension and bradycardia.[17] These effects of dexmeditomidine can be attenuated and controlled with its titrated use in infusion.

Cattano *et al*.[18] compared remifentanil and dexmedetomidine as AFOI anesthetics. The REM group received a loading dose of 0.75 μg/kg, followed by an infusion of 0.075 μg/kg/min. The DEX group received a loading dose of 0.4 μg/kg, followed by an infusion of 0.7 μg/kg/hr. The time to sedation, the number of intubation attempts, and the RSS score were recorded. All 30 patients were successfully intubated by AFOI (22 oral intubations/8 nasal). The first-attempt success rate with AFOI was higher in the REM group than in the DEX group, 72% and 38% (P = 0.02), respectively. They concluded that dexmedetomidine seems to be a useful adjunct for patients undergoing AFOI but is dependent on dosage and time. In our study, the success rate was equal in both groups, and this could be because we used a higher loading dose of dexmeditomidine.

Similarly, Liu *et al*.[15] started an observational study to assess the effect of remifentanil (Rem) or dexmedetomidine (Dex) during awake fiber-optic orotracheal intubation (AFOI). No statistically significant differences were observed in the changes to the MAP and HR at any time point between the two groups, as opposed to our study.

Masoud *et al*.,[16] compared the efficacy and safety of dexmedetomidine as a sole sedative versus the conventionally used propofol/midazolam and fentanyl/midazolam combinations during AFOI. The dexmedetomidine group showed more favorable respiratory changes than the other two groups. Dexmedetomidine alone appears to be a more suitable agent for sedation during AFOI compared with either propofol/midazolam or fentanyl/midazolam combinations, which seconds our findings.

CONCLUSION

Dexmedetomidine provided better intubating conditions, better patient tolerance, higher endoscopist satisfaction, and reduced hemodynamic responses compared to fentanyl/midazolam combinations.[19] It has anxiolytic, sedative, and analgesic properties that can add to the comfort of patients, enabling greater tolerance of the procedure. Also, the major advantage of preservation of airway with a lesser degree of respiratory depression would allow us for safer use of AFOI in cases of difficult airway and cervical spine instability.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. Popat M. Practical Fiberoptic Intubation. 1st ed. Oxford: Butterworth-Heinemann Publishers; 2001. p. 75-95.
2. Song JW, Kwak YL, Lee JW, Chang CH, Kim HS, Shim YH. The optimal effect site concentration of Remifentanil in combination with intravenous Midazolam and topical Lidocaine for awake fiberoptic nasotracheal intubation in patients undergoing cervical spine surgery. Minerva Anestesiol 2012;78:521-6.
3. Dhasmana S, Singh V, Pal US. Awake blind nasotracheal intubation in temporomandibular joint ankylosis patients under conscious sedation using fentanyl and midazolam. J Maxillofac Oral Surg 2010;9:377-81.
4. Bergese SD, Patrick Bender S, McSweeney TD, Fernandez S, Dzwonczyk R, *et al*. A comparative study of Dexmedetomidine with midazolam and midazolam alone for sedation during elective awake fiberoptic intubation. J Clin Anesth 2010;22:35-40.
5. Zhang X, He W, Wu X, Zhou X, Huang W, Feng X. TCI remifentanil vs. TCI Propofol for awake fiber-optic intubation with limited topical anesthesia. Int J Clin Pharmacol Ther 2012;50:10-6.
6. Bailey PL, Pace NL, Ashburn MA, Moll JW, East KA, Stanley TH. Frequent hypoxemia and apnea after sedation with Fentanyl and Midazolam. Anesthesiol 1990;73:826-30.
7. Rai MR, Parry TM, Dombrovskis A, Warner OJ. Remifentanil target-controlled infusion vs Propofol target controlled infusionfor

conscious sedation for awake fiberoptic intubation: A doubleblinded randomized controlled trial. Br J Anaesth 2008;100:125-30.
8. Abdelmalak B, Makary L, Hoban J, Doyle DJ. Dexmedetomidine as sole sedative for awake intubation in management of the critical airway. J Clin Anesth 2007;19:370-3.
9. Grant SA, Breslin DS, MacLeod DB, Gleason D, Martin G. Dexmedetomidine infusion for sedation during fiberoptic intubation: A report of three cases. J Clin Anesth 2004;16:124-6.
10. Bergese SD, Khabiri B, Roberts WD, Howie MB, McSweeney TD, Gerhardt MA. Dexmedetomidine for conscious sedation in difficult awake fiberoptic intubation cases. J Clin Anesth 2007;19:141-6.
11. Bergese SD, Bender SP, McSweeney TD, Fernandez S, Dzwonczyk R, Sage K. A comparative study of dexmedetomidine with midazolam and midazolam alone for sedation during elective awakefiberoptic intubation. Randomized Controlled Trial 2010;22:35-40.
12. Sadhasivam S, Boat A, Mahmoud M. Comparison of patient-controlled analgesia with and without dexmedetomidine following spine surgery in children. J Clin Anesth 2009;21:493-501.
13. Masoud SM, El-Tohamy SA, Amin AA. Dexmedetomidine versus midazolam/propofol or midazolam/ fentanyl for conscious sedation during awake fiberoptic Intubation.Ain-Shams J Anesthesiol 2013;6:30-7.
14. Amit A, Jadon A, Parida SS, Chakraborty S, Sinha N, Chandra O. Comparative evaluation of Dexmedetomidine and Fentanyl – Midazolam combination as sedative adjunct to fibreoptic intubation under topical anaesthesia. American J Adv Med Sci 2014;2:29-37.
15. Hui-Hui L, Zhou T, Wei JQ, Ma WH. Comparison between remifentanil and dexmedetomidine for sedation during modified awake fiberoptic intubation. Exp Ther Med 2015;9:1259-64.
16. Karaaslan K, Yilmaz F, Gulcu N, Colak C, Sereflican M, Kocoglu H. Comparison of dexmedetomidine and midazolam for monitored anesthesia care combined with tramadol via patient-controlled analgesia in endoscopic nasal surgery: A prospective, randomized, double-blind, clinical study. Curr Ther Res Clin Exp 2007;68:69-81.
17. Scheinin H, Jaakola ML, Sjovall S,Ali-Melkkila T, Kaukinen S, Turunen J, *et al*. Intramuscular dexmedetomidine as premedication for general anesthesia. A comparative multicenter study. Anesthesiology. 1993:78;1065-75.
18. Cattano D, Lam NC, Ferrario L, Seitan C, Vahdat K, Wilcox DW. Dexmedetomidine versus remifentanil for sedation during awake fiberoptic intubation. Anesthesiol Res Pract 2012;2012:753107.
19. Aantaa R, Kantoj, Scheinin M, Kallio A, Scheinin II. Dexmedetomidine, an 2-adrenoceptor agonist, reduces anesthetic requirements for patients undergoing minor gynaecologic surgery. Anesth Analg 1990;73:230-5.