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Original Article

Anaesthesia Section

Comparison of Haemodynamic Changes and Intubation Conditions during Awake Fiberoptic Oral Intubation using Conscious Sedation with Either Dexmedetomidine or Fentanyl: A Prospective Interventional Study

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ABSTRACT

Introduction: Awake Fiberoptic Intubation (AFOI) is the preferred intubation technique in cases of anticipated difficult airway or unstable cervical spine injury. The patient will not be comfortable if it is performed without the appropriate sedative. AFOI achieves a better safety profile and a higher success rate due to preserved muscle tone and minimal risk of desaturation.

Aim: To compare the effects of fentanyl and dexmedetomidine on haemodynamic changes and intubating conditions during AFOI in patients scheduled for elective cervical spine surgery.

Materials and Methods: In this prospective interventional study conducted at Fortis Hospitals, Bengaluru, Karnataka, India, 84 patients aged 18 to 60 years with American Society of Anaesthesiologists (ASA) grade I or II, scheduled for elective cervical spine surgery requiring AFOI, were randomly assigned to two groups. Group A received dexmedetomidine at a dose of 1 µg/kg intravenously over 10 minutes, while Group B received fentanyl at a dose of 2 µg/kg intravenously over 10 minutes. Sedation levels were assessed using the Ramsay Sedation Score (RSS), and intubation was performed when the score reached 2 or higher. Intubation conditions were evaluated based on the cough score during bronchoscopy and the postintubation score. Statistical analysis, including appropriate tests such as t-tests or Chi-square tests, was conducted to assess differences in changes in pulse rate, Mean Arterial Pressure (MAP), and oxygen saturation during AFOI between the two groups and to evaluate the occurrence and significance of any adverse effects.

Results: The mean age of the patients was 41.12±3.73 years in Group A and 40.21±3.03 years in Group B. Group A showed superior RSSs compared to Group B. Additionally, Group A demonstrated more favourable cough and postintubation scores in comparison to Group B. During the intubation and postintubation phases, Group B experienced a notable increase in pulse rate and MAP, whereas these haemodynamic parameters remained stable in Group A. Furthermore, Group A exhibited no significant desaturation events in contrast to Group B.

Conclusion: Dexmedetomidine proved to be more effective than fentanyl for AFOI, providing superior intubating conditions by ensuring better patient comfort, which was assessed and confirmed through favourable scores on RSS (score of 2), cough score (score of 1), and postintubation score (score of 1). These advantages make dexmedetomidine the preferred choice for AFOI, offering a more favourable balance of sedation, haemodynamic stability and oxygenation.

Keywords: Bronchoscopy, Heart rate, Mean arterial pressure, Oxygen saturation, Patient comfort

INTRODUCTION

The AFOI has become increasingly favoured for intubating patients with anticipated difficult airways, particularly in cases of unstable cervical spine injuries. Unlike conventional laryngoscopy, which can pose significant risks due to neck movement, AFOI offers a safer alternative. It maintains muscle tone, prevents airway collapse and allows the patient to breathe spontaneously, thereby reducing the risk of airway obstruction and minimising the likelihood of desaturation [1].

Undergoing AFOI without proper sedation can be an uncomfortable and unpleasant experience for the patient. For a smooth AFOI, the patient should be comfortable, co-operative, sedated and able to maintain a patent airway. An ideal sedative agent should provide these conditions along with stable haemodynamics and attenuated airway reflexes, along with antitussive effects. There has been extensive research to find such an ideal agent. Various drugs and their combinations have been used, including benzodiazepines, propofol, opioids, α2 agonists and ketamine [2]. Benzodiazepines, propofol and opioids are the most common drugs used for procedural sedation. However, these drugs can cause respiratory depression and loss of upper airway tone, especially with larger doses, which can be disastrous in the case of a difficult airway [2].

Fentanyl is widely used for procedural sedation at doses ranging from 1-2 µg/kg. It offers mild sedation and analgesia while maintaining stable haemodynamics, making it suitable for AFOI. However, it can cause adverse effects such as nausea, vomiting and respiratory depression. Administering a larger bolus dose may lead to chest wall rigidity, complicating airway management during procedures [2].

Dexmedetomidine has several properties, including anxiolysis, analgesia and sedation with minimal respiratory depression [3], making it close to an ideal agent for AFOI [4-6]. However, it can cause hypotension and bradycardia. The recommended dosage is a 1 µg/kg infusion over 10-15 minutes for the loading dose, followed by a 0.2-0.7 µg/kg/hr infusion for maintenance [3].

Present study investigated dexmedetomidine and fentanyl in AFOI due to their promising profiles, with dexmedetomidine offering minimal respiratory depression and fentanyl providing mild sedation and analgesia. This study aimed to investigate the effects of dexmedetomidine and fentanyl on intubating conditions and haemodynamic changes during AFOI in patients scheduled for elective cervical spine surgeries.

MATERIALS AND METHODS

A prospective interventional study was conducted at Fortis Hospitals, Bengaluru, Karnataka, India, over a one-year period from January 2021 to January 2022. Institutional Ethical Committee (IEC) approval (No. IEC/002/2021 dated 15/01/2021) and informed written consent from participants were obtained.

Inclusion criteria: 84 patients aged 18 to 60 years with ASA physical status I and II, who were scheduled for elective cervical spine surgery were included in the study.

Exclusion criteria: Patients with any allergies to the study drugs, poor lung compliance, pregnancy, or significant cardiac disease were excluded from the study.

Sample size: Based on a study conducted by Eldemrdash A et al., the sample size was estimated to be 11 in each group to obtain a significant difference in the post-intubation score at 80% power and a 95% confidence interval [7]. To reduce sample error and attrition, present study included 42 patients in each group, as there was no upper limit for sample size.

Study Procedure

Group A received an intravenous infusion of dexmedetomidine at a dosage of 1 µg/kg over 10 minutes, while Group B received an infusion of fentanyl at a dosage of 2 µg/kg over the same duration [7]. Prior to surgery, patients underwent preanaesthetic evaluation, during which the procedure was explained to them. Routine blood investigations were conducted and patients adhered to fasting guidelines by refraining from oral intake. Additionally, all patients received 0.5 mg of Tab Alprazolam the night before surgery. Standard ASA monitors, including ECG, non invasive blood pressure, and pulse oximetry, were connected, and baseline data were recorded in the operating room. Using an 18 G cannula, intravenous access was established. Glycopyrrolate (0.2 mg) was administered intravenously. A glossopharyngeal nerve block was performed at the base of the anterior tonsillar pillar using 2.5 mL of 2% lignocaine. A superior laryngeal nerve block was administered with 2.5 mL of 2% lignocaine on each side. Depending on the assigned group, the test drug was given as an intravenous infusion over 10 minutes: Group A received dexmedetomidine 1 µg/kg in 100 mL normal saline, while Group B received fentanyl 2 µg/kg in 100 mL normal saline. Sedation was evaluated using RSS at the conclusion of the drug infusion [6]. AFOI was performed by an experienced senior neuroanaesthesiologist. When the RSS was two or higher, a flexible Fiberoptic Bronchoscope (FOB) (adult 5 mm) preloaded with a reinforced endotracheal tube was introduced orally. When the vocal cords were visualised, 5 mL of 2% lignocaine was sprayed over the cords from the injection port of the fiberoptic and the endotracheal tube was pushed down the cords while the FOB was withdrawn.

Assessment: The cough score during bronchoscopy and the postintubation score [7] following the successful insertion of the endotracheal tube into the trachea were used to assess the intubating conditions. The patient was positioned and given general anaesthesia with 2 mg/kg of Propofol and 0.1 mg/kg of vecuronium following intubation. Pulse rate and Mean Arterial Blood Pressure (MAP) were recorded at baseline, at five minutes and ten minutes after the start of drug infusion, at the time of intubation and five minutes postintubation. Saturation was monitored throughout the procedure. RSS levels, cough scores and postintubation scores were used to assess patient responses [Table/Fig-1].

S. No.	RSS	Cough score	Postintubation score
1	Anxious, agitated or restless	No cough	Co-operative
2	Co-operative, oriented	Slight cough (no more than 2 coughs in sequence)	Minimal resistance
3	Sedated but responds to commands	Moderate cough (3-5 coughs in sequence)	Severe resistance
4	Asleep, brisk glabellar reflex, responds to loud noise	four=severe cough (more than five coughs in sequence)	
5	Asleep, sluggish glabellar reflex or responds to loud noise		
6	Asleep with no response to a painful stimulus		

[Table/Fig-1]: RSS levels, cough scores and postintubation scores to assess patient responses.

STATISTICAL ANALYSIS

All the data were entered into a Microsoft Excel sheet. Statistical analysis was conducted using Statistical Package for the Social Sciences (SPSS) version 22.0 software. Continuous variables were expressed as the mean with standard deviation and categorical data were presented in frequencies and proportions. The Independent t-test and Chi-square test were used to compare quantitative and qualitative variables, respectively. A p-value of <0.05 was considered significant.

RESULTS

A total of 84 patients were included in the study and divided into two groups of 42 each. They were comparable in terms of demographic data such as age, sex, weight, and ASA physical status [Table/Fig-2]. A Chi-square test was used to analyse the data, and the results showed that there was no statistically significant difference in the distribution between these groups.

Variables		Group A (n=42)	Group B (n=42)	p-value
ASA-PS	I	37	39	0.457
	II	5	3	
Sex	Male	26	28	0.648
	Female	16	14	
		Mean±SD	Mean±SD	
Age (years)		41.12±3.73	40.21±3.03	0.226
Weight (kg)		60.9±3.36	60.4±1.85	0.40

[Table/Fig-2]: Demographic profile.

The difference in RSS, cough score, and postintubation score between Group A and Group B was statistically significant according to the Chi-square test (p-value <0.001) [Table/Fig-3]. There was no significant desaturation in Group A when compared to Group B. The saturation at intubation in Group A was 97.02±1.76, while in Group B it was 93.52±1.17. An independent t-test indicated that this difference was statistically highly significant (p-value <0.001) [Table/Fig-4].

Variables		Group A n (%)	Group B n (%)	χ^2	p-value
RSS	2	7 (16.67)	36 (85.71)	40.25	0.0001
	3	33 (78.57)	6 (14.29)		
	4	2 (4.76)	0		
Cough score	1	1 (2.4)	0	48.939	0.0001
	2	36 (85.7)	5 (11.9)		
	3	5 (11.9)	35 (83.3)		
	4	0	2 (4.76)		
Postintubation score	1	30 (71.4)	3 (7.14)	36.385	0.0001
	2	12 (28.6)	39 (92.86)		

[Table/Fig-3]: Variables to assess sedation and intubating conditions.

In Group B, there was a significant increase in pulse rate at intubation and five minutes postintubation, while in Group A, there was no

SpO_2	Group A Mean±SD	Group B Mean±SD	p-value
Baseline	98.64±0.48	98.67±0.48	0.821
Intubation	97.02±1.76	93.52±1.17	<0.001

[Table/Fig-4]: Mean SpO_2 Comparison between two groups at different intervals.

significant change in pulse rate at intubation and five minutes post-intubation [Table/Fig-5]. The difference was statistically highly significant (p-value <0.001) according to the independent t-test. Clinically significant bradycardia was not observed in either group. Compared to Group A, Group B exhibited a substantial rise in MAP at intubation and five minutes postintubation [Table/Fig-6]. The statistical significance of this difference was considerable (p-value <0.001).

Heart rate	Group A Mean±SD	Group B Mean±SD	p-value
Baseline	80.62±5.8	80.81±4.73	0.869
5 mins	77.24±5.42	79.38±4.98	0.063
10 mins	73.98±6.07	77.67±5.07	0.003
Intubation	82.29±7.4	102.62±4.1	<0.001
5 min after intubation	74.98±7.28	99.6±4.01	<0.001

[Table/Fig-5]: Mean heart rate comparison between two groups at different intervals.

MAP	Group A Mean±SD	Group B Mean±SD	p-value
Baseline	89.17±2.79	89.71±3.5	0.43
5 mins	87.24±2.28	87.6±3.6	0.588
10 mins	86.29±2.56	85.83±3.56	0.506
Intubation	91.71±4.94	108.26±2.73	<0.001
5 mins after intubation	87.45±4.26	105.48±2.73	<0.001

[Table/Fig-6]: Mean MAP Comparison between two groups at different intervals.

DISCUSSION

Advances in airway management, including improved laryngoscopes, video laryngoscopes and FOB have enabled anaesthesiologists to secure challenging airways using less invasive methods. In cases where a difficult airway is predicted, awake FOB-guided intubation is considered the gold standard for airway management. Both the patient and the anesthesiologist often find it extremely uncomfortable to perform AFOI on a conscious patient. During AFOI, several medications have been utilised to sedate the patient, maintain spontaneous breathing and keep them calm [2]. Selective α2 agonist dexmedetomidine causes arousability, specific respiratory-sparing effects, haemodynamic stability, analgesia, sedation and amnesia [8-10]. Under difficult airway conditions, it has been employed as an excellent sedative for AFOI [11]. Fentanyl induces sedation, haemodynamic stability and analgesia, which are helpful in AFOI; however, it also has the potential to cause vomiting, nausea, chest wall rigidity and respiratory depression as adverse effects [12,13].

This study examined the effects of dexmedetomidine and fentanyl on AFOI. The following metrics were measured and compared: SpO_2, pulse rate, MAP, cough score, postintubation score and RSS. Based on institutional practice, suggested dosages and several investigations on AFOI, the dosages of fentanyl (2 µg/kg) and dexmedetomidine (1 µg/kg) were determined [11-13].

In this study, the dexmedetomidine group exhibited a better RSS, indicating superior sedation and anxiolysis compared to the fentanyl group. This finding aligns with the study by Boyd BC and Sutter SJ regarding the safety of dexmedetomidine for sedation during presurgical instrumentation and insertion in patients with difficult airways due to severe odontogenic cervicofacial infections. They reported that dexmedetomidine provided safe and effective sedation and anxiolysis [14,15].

In this study, a cough score of two or less was achieved in 37 patients in Group A, compared to only five patients in Group B. Additionally, a postintubation score of one was reached in 30 patients in Group A, while only three patients in Group B achieved this score. These results are consistent with the findings of Chu KS et al., who observed better tolerance of endotracheal intubation in the dexmedetomidine group compared to the fentanyl group [16]. Similarly, Mondal S et al., found that dexmedetomidine was more effective than fentanyl in terms of intubation conditions and the incidence of desaturation during AFOI [13]. Yadav U et al., also concluded that dexmedetomidine-midazolam infusion provided better endurance and more stable haemodynamics than fentanyl-midazolam infusion for AFOI [17].

In Group B, there was a significant change in pulse rate and MAP from baseline to postintubation, while Group A showed no significant changes. Notably, in Group A, the pulse rate decreased postintubation compared to baseline. This can be attributed to dexmedetomidine's reduction in centrally mediated sympathetic tone and an increase in vagal activity. Peden CJ et al., observed bradycardia and sinus arrest in young volunteers following dexmedetomidine bolus and infusion [18].

In present study, the use of glycopyrrolate for its antisialogogue effect may have mitigated dexmedetomidine's impact on heart rate. Alfieri A et al., found that dexmedetomidine could be a beneficial drug for awake intubation, reducing patient discomfort without significantly affecting respiratory function and having minimal impact on the cardiovascular system [19].

Similarly, Tang ZH et al., reported that dexmedetomidine provided stable haemodynamics during AFOI compared to remifentanil [20]. Verma AK et al., reached the same conclusion when comparing dexmedetomidine with a fentanyl-ketamine combination [21]. These findings support the results of present study.

Significant desaturation events were not observed in the dexmedetomidine group. All these results correlate with studies conducted by Tsai CJ et al., Hassan ME et al., and Sonsale AR and Kale J where dexmedetomidine provided better intubating conditions while preserving a patent airway [22-24].

Limitation(s)

A limitation of present study was the administration of a fixed dose of the drug for all cases without titration. Further studies are needed to determine the optimal dosage of dexmedetomidine alone or in combination with fentanyl for AFOI [25].

CONCLUSION(S)

This comparative study evaluated the efficacy of dexmedetomidine and fentanyl for conscious sedation in patients undergoing AFOI. The results showed that dexmedetomidine provided superior sedation and intubation conditions compared to fentanyl. Patients receiving dexmedetomidine had significantly better RSS, cough scores and postintubation scores. Dexmedetomidine resulted in less desaturation and more stable haemodynamic parameters compared to fentanyl. Overall, dexmedetomidine appeared to be a more effective and safer choice for conscious sedation in AFOI.

REFERENCES

[1] Dwarkadas KB, Vandana VL. Understanding anaesthetic equipment and procedure- a practical approach. 3rd ed. Jaypee Brothers Medical Publishers. 2021. P. 254-274.
[2] Johnston KD, Rai MR. Conscious sedation for awake fibreoptic intubation: A review of the literature. Can J Anaesth. 2013;60:584-99. Doi: 10.1007/s12630-013-9915-9.
[3] Ebert T, Maze M. Dexmedetomidine: Another arrow for the clinician's quiver. Anaesthesiology. 2004;101:568-70. Doi: 10.1097/00000542-200409000-00003.
[4] Abdelmalak B, Makary L, Hoban J, Doyle DJ. Dexmedetomidine as sole sedative for awake intubation in management of the critical airway. J Clin Anaesth. 2007;19:370-73. Doi: 10.1016/j.jclinane.2006.09.006.
[5] Maroof M, Khan RM, Jain D, Ashraf M. Dexmedetomidine is a useful adjunct for awake intubation. Can J Anaesth. 2005;52:776-77. Doi: 10.1007/bf03016576.

[6] Ramsay MA, Savege TM, Simpson BR, Goodwin R. Controlled sedation with alphaxalone-alphadolone. Br Med J. 1974;2:656-59. Doi: 10.1136/bmj.2.5920.656.
[7] Eldemrdash A, Gamaledeen N, Zaher Z, Salem A. A comparative study between dexmedetomidine versus fentanyl on intubating conditions and side effects during awake fiberoptic nasal intubation under topical anaesthesia in patients underwent elective surgical operation. Open J Anaesthesiol. 2017;7:415-25. Doi: 10.4236/ojanes.2017.712043.
[8] Yazbek-Karam VG, Aouad MM. Perioperative uses of dexmedetomidine. Middle East J Anaesthesiol. 2006;18:1043-58.
[9] Jooste EH, Ohkawa S, Sun LS. Fiberoptic intubation with dexmedetomidine in two children with spinal cord impingements. Anaesth Analg. 2005;101:1248. Doi: 10.1213/01.ane.0000173765.94392.80.
[10] Avitsian R, Lin J, Lotto M, Ebrahim Z. Dexmedetomidine and awake fiberoptic intubation for possible cervical spine myelopathy: A clinical series. J Neurosurg Anaesthesiol. 2005;17:97-99. Doi: 10.1097/01.ana.0000161268.01279.ba.
[11] Grant SA, Breslin DS, MacLeod DB, Gleason D, Martin G. Dexmedetomidine infusion for sedation during fiberoptic intubation: A report of three cases. J Clin Anaesth. 2004;16:124-26. Available from: https://doi.org/10.1016/j.jclinane.2003.05.010.
[12] Bergese SD, Candiotti KA, Bokesch PM, Zura A, Wisemandle W, Bekker AY; AWAKE Study Group. A Phase IIIb, randomized, double-blind, placebo-controlled, multicenter study evaluating the safety and efficacy of dexmedetomidine for sedation during awake fiberoptic intubation. Am J Ther. 2010;17:586-95. Doi: 10.1097/mjt.0b013e3181d69072.
[13] Mondal S, Ghosh S, Bhattacharya S, Choudhury B, Mallick S, Prasad A. Comparison between dexmedetomidine and fentanyl on intubation conditions during awake fiberoptic bronchoscopy: A randomized double-blind prospective study. J Anaesthesiol Clin Pharmacol. 2015;31:212-16. Doi: 10.4103/0970-9185.155151.
[14] Boyd BC, Sutter SJ. Dexmedetomidine sedation for awake fiberoptic intubation of patients with difficult airways due to severe odontogenic cervicofacial infections. J Oral Maxillofac Surg. 2011;69:1608-12. Doi: 10.1016/j.joms.2010.11.004.
[15] Bergese SD, Patrick Bender S, McSweeney TD, Fernandez S, Dzwonczyk R, Sage K. A comparative study of dexmedetomidine with midazolam and midazolam alone for sedation during elective awake fiberoptic intubation. J Clin Anaesth. 2010;22:35-40. Doi: 10.1016/j.jclinane.2009.02.016.
[16] Chu KS, Wang FY, Hsu HT, Lu IC, Wang HM, Tsai CJ. The effectiveness of dexmedetomidine infusion for sedating oral cancer patients undergoing awake fibreoptic nasal intubation. Eur J Anaesthesiol. 2010;27:36-40. Doi: 10.1097/eja.0b013e32832e0d2b.
[17] Yadav U, Yadav JBS, Srivastava D, Srivastava S. A randomized controlled study comparing dexmedetomidine-midazolam with fentanyl-midazolam for sedation during awake fiberoptic intubation in anticipated difficult airway. Anaesth Essays Res. 2020;14:271-76. Available from: https://doi.org/10.4103/aer.aer_44_20.
[18] Peden CJ, Cloote AH, Stratford N, Prys-Roberts C. The effect of intravenous dexmedetomidine premedication on the dose requirement of propofol to induce loss of consciousness in patients receiving alfentanil. Anaesthesia. 2001;56:408-13. Doi: 10.1046/j.1365-2044.2001.01553.x.
[19] Alfieri A, Passavanti MB, Franco SD, Sansone P, Vosa P, Coppolino F, et al. Dexmedetomidine in the management of awake fiberoptic intubation. The Open Anaesth J. 2019;13:01-05. Doi: 10.2174/2589645801913010001.
[20] Tang ZH, Chen Q, Wang X, Su N, Xia Z, Wang Y, et al. A systematic review and meta-analysis of the safety and efficacy of remifentanil and dexmedetomidine for awake fiberoptic endoscope intubation. Medicine (Baltimore). 2021;100(14):e25324. Doi: 10.1097/MD.0000000000025324.
[21] Verma AK, Verma S, Barik AK, Kanaujia V, Arya S. Intubating conditions and haemodynamic changes during awake fiberoptic intubation using fentanyl with ketamine versus dexmedetomidine for anticipated difficult airway: A randomized clinical trial. Braz J Anaesthesiol. 2021;71:259-64. Doi: 10.1016/j.bjane.2021.01.005.
[22] Tsai CJ, Chu KS, Chen TI, Lu DV, Wang HM, Lu IC. A comparison of the effectiveness of dexmedetomidine versus propofol target-controlled infusion for sedation during fibreoptic nasotracheal intubation. Anaesthesia. 2010;65:254-59. Doi: 10.1111/j.1365-2044.2009.06226.x.
[23] Hassan ME, Mahran E. Evaluation of different doses of dexmedetomidine alone versus the combination of dexmedetomidine and fentanyl in sedation during awake fiberoptic intubation in oral cancer surgery patients: A prospective, randomized, double-blind clinical trial. Saudi J Anaesth. 2017;11:196-202. Doi: 10.4103/1658-354X.203013.
[24] Sonsale AR, Kale J. To evaluate the efficacy of dexmedetomidine infusion versus fentanyl infusion for sedation during awake fibreoptic intubation. Indian J Clin Anaesth. 2020;7:233-37. Doi: 10.18231/j.ijca.2020.042.
[25] Sikchi SP, Alapure RG, Chaudhari SA. Evaluation of intubating conditions using dexmedetomidine-fentanyl combination versus dexmedetomidine alone for awake nasal fiberoptic intubation. MedPulse Int J Anaesthesiol. 2019;9(1):68-73.

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