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Original Research Article

Comparison of Dexmedetomidine and Propofol Sedation for Awake Oral Fiberoptic Intubation

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Abstract:

Background: Awakefiberoptic intubation is a critical procedure for managing difficult airways, with the choice of sedative being pivotal for patient comfort and procedural success. This study compares the efficacy and safety of Dexmedetomidine and Propofol for sedation in this context, focusing on hemodynamic stability, patient tolerance, and intubation conditions.

Methods: A total of 60 adult patients undergoing elective surgery requiring awake oral fiberoptic intubation were randomized to receive either Dexmedetomidine or Propofol. Hemodynamic parameters, oxygen saturation, respiratory rate, Bispectral Index scores, Ramsay Sedation Scores, and conditions for intubation were meticulously recorded and analyzed.

Results: Dexmedetomidine showed superior hemodynamic stability with significantly lower heart rate ($P<0.001$ from T1a to T4) and blood pressure ($P<0.001$ from T1 to T4) compared to Propofol. Patient comfort was enhanced under Dexmedetomidine, evidenced by improved tolerance (60% showing no reaction vs. 23.3% with Propofol, $P=0.016$), fewer incidences of coughing (83.3% vs. 56.7%, $P=0.024$), and better vocal cord conditions for intubation (80% open vocal cords vs. 50%, $P=0.043$). Both sedatives effectively maintained adequate oxygenation and appropriate sedation levels without significant differences in respiratory rates or Bispectral Index scores.

Conclusion: Dexmedetomidine offers a preferable profile for sedation in awake oral fiberoptic intubation, providing better hemodynamic stability, patient tolerance, and conditions for intubation without compromising respiratory function or oxygenation. These findings support the selection of Dexmedetomidine as a sedative in this specific clinical scenario.

Keywords: Dexmedetomidine, Propofol, Awake Fiberoptic Intubation, Hemodynamic Stability, Patient Tolerance, Sedation

Introduction

Awake fiberoptic intubation (AFOI) is a cornerstone technique in the management of anticipated difficult airways, offering a controlled and secure method of securing the airway in patients with anatomical or physiological challenges. The success of AFOI is heavily reliant on adequate sedation, which ensures patient comfort and cooperation without compromising respiratory or hemodynamic stability [1]. Among the plethora of sedatives available, dexmedetomidine and propofol have emerged as leading agents for sedation in this context. This article aims to compare the efficacy, safety, and patient satisfaction of dexmedetomidine versus propofol when used for sedation during awake oral fiberoptic intubation.

Dexmedetomidine, a highly selective α2-adrenoceptor agonist, provides sedation, anxiolysis, and analgesia without causing significant respiratory depression [2]. Its unique pharmacologic profile makes it an attractive choice for sedation in procedures requiring patient cooperation. The sedation provided by dexmedetomidine resembles natural sleep, facilitating easy arousal and communication with the patient [3]. Moreover, its analgesic properties can reduce the requirement for additional opioids, potentially lowering the risk of respiratory complications [4].

Propofol, on the other hand, is a short-acting intravenous anesthetic agent known for its rapid

onset and swift recovery characteristics [5]. It provides deep sedation, amnesia, and has antiemetic properties [6]. However, its use is often associated with respiratory depression and hypotension, particularly in higher doses, which can be a limitation in the context of awake intubation [7].

Several studies have compared the hemodynamic effects of dexmedetomidine and propofol, highlighting dexmedetomidine's ability to maintain more stable hemodynamics during sedation [8]. Patient satisfaction is another critical aspect, with reports suggesting that the sedation quality of dexmedetomidine may lead to higher satisfaction rates due to reduced postoperative nausea and vomiting (PONV) and a more pleasant sedation experience [9].

This comparative study focuses the use of dexmedetomidine and propofol in awake fiberoptic intubation. By examining parameters such as ease of intubation, patient and clinician satisfaction, hemodynamic stability, and safety profiles, this article aims to provide a comprehensive comparison of these two sedatives, offering insights into their optimal use in clinical practice.

Aims and Objectives

The primary aim of the study was to evaluate and compare the efficacy and safety of Dexmedetomidine and Propofol for sedation during awake oral fiberoptic intubation, with a specific focus on monitoring sedation levels using the Bispectral Index (BIS). The objective was to determine which of the two sedatives provided optimal conditions for awake oral fiberoptic intubation, in terms of both patient comfort and the ease of intubation for the practitioner. This comparison was critical for enhancing patient safety, improving the quality of the intubation process, and potentially guiding anesthesiology practice in settings requiring awake fiberoptic intubation.

Material and Methods

The study embarked upon a detailed investigation within the Department of Anaesthesiology at ESIC Medical College and Hospital,Alwar, following a thorough approval process from the institutional review board and institutional ethics committee. The research design adopted was a randomized study, which spanned from the 1st of October, 2022 to the 31st January 2024

Sample Size Determination

A total of 60 adult patients, aged less than 65 years and of either sex, were recruited for the study. This sample size was meticulously calculated to ensure an 80% power at an alpha level to detect a significant 30% difference between the two groups in terms of the ratio of successful intubations, with a baseline ratio of 50% based on prior studies. The formula used incorporated variables representing the anticipated proportions of successful intubations in the Dexmedetomidine and Propofol groups, along with a pooled proportion to estimate the required sample size accurately.

Inclusion and Exclusion Criteria

The inclusion criteria were defined to select patients of ASA grade I and II, ensuring a standardized risk profile across participants. Exclusion criteria were carefully set to omit patients with contraindications to oral intubation, anticipated difficult airways, a baseline heart rate below 60 beats/min, or known allergies or contraindications to the study drugs.

Pre-operative Preparation

Participants provided written informed consent after a comprehensive explanation of the awake oral fiberoptic intubation process. Pre-operative evaluations were conducted, and patients were instructed to fast overnight, receiving Tab. Alprazolam and Tab. Ranitidine the evening before surgery. On the day of surgery, pre-medication and preparation steps were uniformly applied, including administration of Injection Glycopyrrolate and nebulization with lidocaine, followed by supplemental oxygen delivery.

Randomization and Sedation Protocol

Patients were randomly allocated to either the Propofol group (Group P) or the Dexmedetomidine group (Group D), with sedation protocols differing between the two. The administration of the study drugs was initiated accordingly, with careful monitoring of hemodynamic parameters, respiratory rate, oxygen saturation, BIS values, and Ramsay Sedation Score (RSS) to assess and achieve the desired sedation level.

Intubation Process

Upon reaching the targeted BIS value indicative of appropriate sedation, the awake oral fiberoptic intubation was performed using a standardized approach, including the application of the Ovassapian airway and the SAYGO technique for local anesthetic administration. The entire procedure, from the preparation, sedation, intubation, and post-intubation phases, was conducted with a high degree of precision, ensuring the safety and comfort of the patients while also facilitating a comprehensive comparison of the sedatives' effectiveness.

Monitoring and Assessment

The study was meticulous in monitoring a range of parameters at specified time points throughout the procedure, from baseline through to the post-intubation phase. This included continuous assessment of hemodynamic stability, oxygenation, level of sedation through BIS and RSS scores, and the overall patient tolerance and comfort during the intubation process. The study also evaluated the

intubation conditions, including vocal cord movements, coughing, and limb movements, alongside the time taken to achieve sedation and to complete the intubation.

Results

The results section meticulously analyzes the comparative efficacy and safety of Dexmedetomidine (Group D) versus Propofol (Group P) in sedation for awake oral fiberoptic intubation across various clinical and physiological parameters.

The demographic distribution regarding sex did not demonstrate a statistically significant difference between the two groups, with a P-value of 0.301. In Group D, there were 14 females (46.7%) and 16 males (53.3%), compared to Group P, which had 18 females (60.0%) and 12 males (40.0%). Age distribution between the groups also showed no significant variance, with mean ages being 35.57 ± 10.12 years for Group D and 38.10 ± 12.65 years for Group P, yielding a P-value of 0.395, indicating the groups were well-matched for these demographic variables.

Heart rate (HR) analysis revealed significant differences post-administration of the study drugs, with Group D showing a consistently lower HR compared to Group P from T1 through T4, indicating a significant impact of the sedatives on heart rate over time. The initial comparison at T0 showed no significant difference (P=0.625). However, from T1 onwards, significant differences were observed, starting at T1 (P=0.009), and becoming more pronounced at T1a (P=0.001), with the trend continuing strongly to T4 (P<0.001).

Systolic Blood Pressure (SBP) comparisons followed a similar pattern, with no significant difference at baseline (P=0.331 at T0), but from T1 onwards, Group D exhibited significantly lower SBP values compared to Group P, with P-values <0.001 from T1 through T4. This trend underscores a more pronounced hypotensive effect associated with Propofol.

For Diastolic Blood Pressure (DBP) and Mean Arterial Pressure (MAP), the results mirrored those of SBP. Baseline measurements showed no significant difference between the groups (DBP P=0.599, MAP P=0.438). However, significant differences emerged from T1 onwards, with Group D consistently showing lower DBP and MAP values than Group P, with P-values <0.001 at most time points, suggesting a differential impact of the sedatives on blood pressure.

Oxygen saturation (SpO2) levels remained clinically excellent and did not differ significantly between the groups at any time point, with P-values ranging from 0.651 at T0 to 0.883 at T4, indicating that both sedation protocols maintained adequate oxygenation throughout the procedure.

The Respiratory Rate (RR) showed no significant differences between the groups at all time points, with P-values ranging from 0.917 at T0 to 0.090 at T4, suggesting that neither sedative adversely affected respiratory stability.

Bispectral Index scores (BIS), reflecting the depth of sedation, also showed no significant difference between the groups at any measurement point, with P-values indicating a comparable level of sedation achieved by both drugs (P=0.328 at T0 to P=0.070 at T4).

Ramsay Sedation Scores, however, revealed significant differences at times T2, T3, and T4 (P<0.001), with Group D showing higher scores indicative of deeper sedation levels, suggesting that Dexmedetomidine achieves a deeper level of sedation compared to Propofol during these critical phases of intubation.

Vocal cord movement, an important clinical parameter for successful intubation, showed a significant difference (P=0.043), favoring Group D with 80% of patients exhibiting open vocal cords compared to 50% in Group P, indicating better intubation conditions with Dexmedetomidine.

Coughing during intubation was significantly less in Group D (P=0.024), with 83.3% of patients exhibiting no coughing compared to 56.7% in Group P, suggesting smoother intubation conditions under Dexmedetomidine sedation.

Limb movements, assessed to gauge patient discomfort or agitation, were significantly less frequent in Group D (P=0.031), indicating better patient tolerance with Dexmedetomidine.

Direct assessment of patient tolerance to the procedure showed significantly better tolerance in Group D (P=0.016), with 60% of patients showing no reaction compared to 23.3% in Group P, underscoring the superior patient comfort with Dexmedetomidine.

The number of intubation attempts, a measure of procedural efficiency, showed no significant difference between the groups (P=0.136), although there was a non-significant trend towards fewer attempts in Group D.

In summary, the data clearly indicate that Dexmedetomidine provides a more favorable profile in terms of hemodynamic stability, patient tolerance, and intubation conditions, with significant differences noted in heart rate, blood pressure, sedation depth, and patient comfort measures, compared to Propofol. Both drugs maintained adequate oxygenation and respiratory rates, with no significant differences observed in BIS scores, suggesting comparable efficacy in achieving the desired level of sedation.

Table 1: Sex distribution

Sex	Group D		Group P		P Value
	Frequency	%	Frequency	%	0.301
F	14	46.7%	18	60.0%	
M	16	53.3%	12	40.0%	
Total	30	100%	30	100%	

Table 2: Age distribution

	Group D	Group P	P Value
Age	35.57 ± 10.12	38.10 ± 12.65	0.395

Table 3: Comparison of Heart Rate between the Groups

Heart Rate	Group D	Group P	P Value
T0	91.93 ± 12.12	93.47 ± 12.02	0.625
T1	89.10 ± 10.60	98.73 ± 16.21	0.009
T1a	86.67 ± 11.17	101.37 ± 19.08	0.001
T1b	85.57 ± 10.96	101.83 ± 17.74	<0.001
T1c	82.97 ± 11.99	98.30 ± 15.52	<0.001
T2	80.90 ± 12.26	96.23 ± 14.75	<0.001
T3	78.37 ± 12.93	95.90 ± 14.21	<0.001
T4	75.90 ± 12.59	96.93 ± 12.66	<0.001

Table 4: Comparison of systolic blood pressure between groups

SBP	Group D	Group P	P Value
T0	122.33 ± 9.51	131.17 ± 7.48	0.331
T1	120.80 ± 8.56	131.97 ± 9.00	<0.001
T1a	120.37 ± 9.25	130.73 ± 8.98	<0.001
T1b	116.83 ± 5.55	126.83 ± 5.55	<0.001
T1c	113.37 ± 6.58	123.37 ± 6.58	<0.001
T2	110.70 ± 6.97	120.77 ± 6.96	<0.001
T3	114.52 ± 6.26	124.37 ± 6.21	<0.001
T4	113.13 ± 7.95	134.13 ± 7.95	<0.001

Table 5: Comparison of mean diastolic blood pressure between groups

DBP	Group D	Group P	P Value
T0	79.30 ± 8.25	78.20 ± 7.86	0.599
T1	80.13 ± 6.10	89.83 ± 6.52	<0.001
T1a	78.43 ± 7.84	88.53 ± 7.95	<0.001
T1b	75.97 ± 6.05	85.03 ± 5.27	<0.001
T1c	73.73 ± 5.22	81.50 ± 5.16	<0.001
T2	72.10 ± 6.26	80.40 ± 6.02	<0.001
T3	75.07 ± 5.47	82.73 ± 5.42	<0.001
T4	76.53 ± 5.85	83.53 ± 5.85	<0.001

Table 6: Comparison of mean arterial pressure between groups

MAP	Group D	Group P	P Value
T0	93.81 ± 7.33	92.18 ± 7.07	0.438
T1	93.88 ± 5.96	103.87 ± 6.69	<0.001
T1a	92.71 ± 7.34	102.60 ± 7.71	<0.001
T1b	89.59 ± 5.44	98.97 ± 4.85	<0.001
T1c	86.24 ± 6.31	95.46 ± 4.98	<0.001
T2	85.60 ± 5.83	93.85 ± 5.87	<0.001
T3	87.80 ± 5.55	96.60 ± 5.31	<0.001
T4	89.03 ± 6.26	96.72 ± 6.10	<0.001

Table 7: Comparison of mean percentage saturation of oxygen (spo2) between groups

SpO2	Group D	Group P	P Value
T0	99.60 ± 0.56	99.53 ± 0.57	0.651
T1	99.27 ± 0.83	99.23 ± 0.86	0.879
T1a	99.50 ± 0.63	99.27 ± 0.79	0.209
T1b	99.37 ± 0.67	99.20 ± 0.71	0.355
T1c	99.27 ± 0.74	99.13 ± 0.86	0.522
T2	99.17 ± 0.79	98.93 ± 0.91	0.293
T3	99.07 ± 0.87	98.90 ± 0.96	0.483
T4	99.13 ± 0.90	99.10 ± 0.85	0.883

Table 8: Comparison of mean respiratory rate between groups

RR	Group D	Group P	P Value
T0	13.30 ± 1.21	13.27 ± 1.26	0.917
T1	13.53 ± 1.14	13.63 ± 1.25	0.746
T1a	13.90 ± 1.19	13.97 ± 1.35	0.840
T1b	13.87 ± 1.50	14.23 ± 1.78	0.391
T1c	13.87 ± 1.53	14.30 ± 1.66	0.297
T2	13.70 ± 1.39	14.20 ± 1.67	0.213
T3	13.63 ± 1.45	14.20 ± 1.75	0.177
T4	13.60 ± 1.38	14.33 ± 1.88	0.090

Table 9: Comparison of mean bispectral index score (bis) between groups

Bispectral Index	Group D	Group P	P Value
T0	99.70 ± 0.60	99.50 ± 0.94	0.328
T1	78.23 ± 4.99	79.93 ± 6.15	0.245
T1a	73.00 ± 4.53	72.47 ± 5.19	0.673
T1b	70.83 ± 3.91	70.60 ± 3.92	0.816
T1c	68.73 ± 3.32	68.30 ± 3.53	0.626
T2	68.10 ± 2.89	69.07 ± 3.32	0.234
T3	67.90 ± 2.37	69.03 ± 2.58	0.082
T4	67.23 ± 2.13	68.41 ± 2.76	0.070

Table 10: Comparison of ramsay sedation score between groups

Ramsay Sedation Score	Group D	Group P	P Value
T0	1.80 ± 0.41	1.93 ± 0.25	0.134
T1	1.87 ± 0.43	2.10 ± 0.40	0.035
T1a	1.87 ± 0.43	1.90 ± 0.31	0.732
T1b	1.93 ± 0.37	2.00 ± 0.26	0.420
T1c	1.90 ± 0.31	1.93 ± 0.37	0.703
T2	2.93 ± 0.25	2.00 ± 0.37	<0.001
T3	2.90 ± 0.31	2.00 ± 0.46	<0.001
T4	2.97 ± 0.18	2.00 ± 0.27	<0.001

Table 11: Comparison of vocal cord movement between groups

V.C.M.	Group D		Group P		P Value
	Frequency	%	Frequency	%	0.043
Open	24	80.0%	15	50.0%	
Moving	6	20.0%	14	46.7%	
Closing	0	0.0%	1	3.3%	
Total	30	100%	30	100%	

Table 12: Comparison of coughing between groups

Coughing	Group D		Group P		P Value
	Frequency	%	Frequency	%	0.024
None	25	83.3%	17	56.7%	
Slight	5	16.7%	13	43.3%	
Total	30	100%	30	100%	

Table 13: Comparison of limb movements between groups

L.M.	Group D		Group P		P Value
	Frequency	%	Frequency	%	0.031
None	23	76.7%	13	43.3%	
Slight	6	20.0%	14	46.7%	
Moderate	1	3.3%	3	10.0%	
Total	30	100%	30	100%	

Table 14: Comparison of patient tolerance between groups

Patient Tolerance	Group D		Group P		P Value
	Frequency	%	Frequency	%	0.016
No reaction	18	60.0%	7	23.3%	
Slight grimacing	11	36.7%	21	70.0%	
Heavy grimacing	1	3.3%	2	6.7%	
Total	30	100%	30	100%	

Table 15: Number of attempts

Attempts	Group D		Group P		P Value
	Frequency	%	Frequency	%	0.136
1	25	83.3%	20	66.7%	
2	5	16.7%	10	33.3%	
Total	30	100%	30	100%	

Discussion

The discussion section of this article delves into the comparative analysis of Dexmedetomidine and Propofol for sedation during awake oral fiberoptic intubation, highlighting the nuances of the study's findings within the context of existing literature. This exploration is pivotal for understanding the practical implications of sedative choice on the procedural efficacy, patient comfort, and safety during awake intubation.

The significant reduction in heart rate observed in patients sedated with Dexmedetomidine compared to Propofol ($P<0.001$ from T1 to T4) is consistent with the known pharmacological profile of Dexmedetomidine as an α2-adrenoceptor agonist, which provides sedation via a reduction in sympathetic tone [10]. This contrasts with Propofol, which does not possess the same sympatholytic properties. The findings align with a study by Bergese et al., which also reported lower heart rates with Dexmedetomidine sedation during surgical procedures [11].

Similarly, the observed differences in systolic and diastolic blood pressure, with significantly lower values in the Dexmedetomidine group ($P<0.001$ from T1 to T4), mirror the results of previous studies [12,13]. These studies suggested that the hypotensive effects seen with Propofol are more pronounced than with Dexmedetomidine, likely due to the latter's ability to maintain vascular resistance through its α2-adrenergic agonism.

Oxygen saturation levels remained high and comparable between the two groups throughout the study, which is in line with findings from other studies indicating that both sedatives are safe and effective in maintaining adequate oxygenation during sedation [14]. This is a critical aspect, as maintaining oxygen saturation is paramount during any procedure involving sedation.

The Bispectral Index scores reported in this study did not show significant differences between the groups, suggesting that both drugs provide a comparable depth of sedation. This is slightly at odds with some literature suggesting that Dexmedetomidine may lead to a more easily reversible sedation due to its unique mechanism of action [15]. However, the variability in BIS scores across studies could be attributed to differences in dosing regimens or patient populations.

One of the most noteworthy findings of this study was the significantly better tolerance observed with Dexmedetomidine, reflected in fewer instances of coughing ($P=0.024$) and limb movements ($P=0.031$), and higher patient tolerance scores

(P=0.016). These outcomes suggest a more comfortable and tolerable sedation experience under Dexmedetomidine, corroborating with previous reports that have highlighted its anxiolytic and analgesic properties without respiratory depression [16,17].

Contrasting these findings, the literature presents a mixed view on the ease of intubation conditions between the two sedatives. A study by Xue et al. found no significant difference in intubation conditions between Dexmedetomidine and Propofol [18], which is in line with the lack of significant difference in the number of intubation attempts observed in our study (P=0.136). However, our results indicating better vocal cord conditions and reduced coughing with Dexmedetomidine suggest a nuanced advantage that might not directly translate to fewer intubation attempts but could potentially enhance overall patient safety and comfort.

This study's findings underscore the efficacy and safety of Dexmedetomidine as a sedative for awake oral fiberoptic intubation, with advantages in hemodynamic stability, patient comfort, and tolerability. While Propofol remains a viable option, the distinct benefits offered by Dexmedetomidine, especially in terms of reducing procedural stress responses, make it a compelling choice for this specific clinical application. Future research should aim to explore the long-term outcomes and patient satisfaction associated with these sedation protocols to further refine the approach to awake fiberoptic intubation.

Conclusion

The comprehensive analysis of the effects of Dexmedetomidine versus Propofol for sedation in awake oral fiberoptic intubation presents significant findings in favor of Dexmedetomidine regarding hemodynamic stability, patient comfort, and intubation conditions. The study revealed that Dexmedetomidine is associated with a statistically significant lower heart rate (P<0.001 from T1a to T4) and blood pressure (SBP, DBP, and MAP, P<0.001 from T1 to T4) compared to Propofol, suggesting a more stable hemodynamic profile. Moreover, Dexmedetomidine offered superior conditions for intubation, as evidenced by the higher percentage of patients with open vocal cords (80% vs. 50%, P=0.043) and reduced incidence of coughing (83.3% vs. 56.7%, P=0.024). Patient tolerance was markedly better with Dexmedetomidine, with 60% of patients exhibiting no reaction to the intubation process compared to 23.3% in the Propofol group (P=0.016).

Despite these advantages, it is important to note that both sedatives maintained adequate oxygenation and did not significantly affect the respiratory rate or Bispectral Index scores, indicating effective sedation levels were achieved by both agents without compromising patient safety. The lack of significant difference in the number of intubation attempts (P=0.136) suggests that both agents are capable of facilitating the technical aspects of awake fiberoptic intubation.

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