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Comparison of Dexmedetomidine Vs Midazolam for Conscious Sedation During Awake Fibreoptic Intubation in Patients with Anticipated Difficult Intubation

Dr. Rajeev Singh[1], Dr. Shobha Ujwal[2]

[1](3rd year Resident), Dr S N Medical College, Jodhpur
[2](Professor), Dr S N Medical College, Jodhpur

Corresponding author: Dr Rajeev Singh email: jiyacharan@gmail.com

INTRODUCTION

The American Society of Anaesthesiologist (ASA) Task Force defined a difficult airway as "*The clinical situation in which a conventionally trained anesthesiologist experiences difficulty with mask ventilation, difficulty with tracheal intubation, or both*." The Task Force further noted that the *"difficult airway represented a complex interaction between patient factors, the clinical setting, and the skills and preferences of the practitioner*".

Awake Fiber Optic Intubation (AFOI) has become the accepted gold standard technique for management of recognized difficult airway[1]. Adequate sedation without compromising safety is an integral part of any awake intubation. It is expected that an ideal sedative drug for awake intubation should ensure that the patient remains reasonably conscious to protect the airway and maintain spontaneous ventilation. Several analgesics such as fentanyl, remifentanil and sedatives like Midazolam and propofol have been used for AFOI [2-5].

It is always feared that 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 alternative sedative adjunct for fibreoptic intubation under topical anaesthesia without compromising patient safety. Recently, Dexmedetomidine, a selective α_2 agonist, that provides sedation, analgesia and anxiolysis without causing respiratory depression or airway compromise has been tried for AFOI[8-10].

Material and Method: This prospective randomized double blind study was conducted in MDM Hospital, Department of Anesthesia and Critical Care, Dr. S.N. Medical College, Jodhpur after getting approval from Ethical Committee of the Hospital. In this study 60 patients was enrolled and divided into two groups after taking informed and written consent. Patients with American Societyof Anaesthesiologist (ASA) grade 1 and 2, Patients of age group 18 to 55 years of either sex undergoing surgery under general anesthesia ,Patients with anticipated difficult intubation with MP Grade 3 or 4 Patients were excluded were who refused, Emergency operation, impaired LFT/RFT, PT/INR, BT, CT, patients on medications like hypnotics, narcotic analgesics, α_2 agonists, calcium channel blockers, β blockers, patients intubated after more than 1 attempt or more than 5 min, patients with ASA grade 3 or more.

Every patient was assessed properly in Pre Anaesthetic check up clinic one day prior to surgery. Routine investigations was performed in each case and whenever required, specific tests like X-ray, ECG, LFT etc was asked for. Patients was interviewed for drug history and past history of anaesthesia or related complications. Patients was instructed to undergo overnight fasting before surgery.

The randomization was done using aComputer generated randomization table and two groups was made;Group-D (Dexmedetomidine) and group-M (Midazolam) with 30 patients in each group. Prior to surgery in preoperative area, an intravenous (IV) access was established, crystalloid infusion was started and Inj. Glycopyrrolate 0.2 mg was administered after establishing monitoring system for Electrocardiogram (ECG), non-invasive blood pressure (NIBP) and Arterial Oxygen Saturation (SPO_2) and baseline values was recorded. All the vitals shall also be recorded during infusion as well as during intubation and post intubation. Patency of nostrils was checked and two drops of xylometazoline (0.1%) was instilled in the nostrils. Then, patients was nebulized with 4% lidocaine (4ml) through ultrasonic nebulizer . An anaesthesiologist prepared the study drugs as per the randomization table not having any further involvement with the study to ensure blinding. To make sure the study remains doble blind the intubator entered in operating room after drugs was infused by that anaesthesiologist.

Patients in **Group-D**: Infusion (Dexmedetomidine /Normal saline) was commenced in a double blind fashion. Dexmedetomidine infusion was prepared by mixing 1 ml (100 µg) of Dexmedetomidine in 24 ml of normal saline resulting in 4 µg/ml solution as recommended. The infusion rate was adjusted in infusion pump as per the weight of the patient before starting the infusion at the rate of 1µg/kg over 10 minutes and then 0.1 µg/kg/hr titrated to 0.7 µg/kg/hr to achieve RSS>or=2.

Patients in **Group M**: Infusion (Midazolam /Normal saline) was commenced in a double blind fashion. Midazolam infusion was prepared by mixing 10 ml (10 mg) of Midazolam in 15 ml of normal saline resulting in 0.4 mg/ml solution as recommended. The infusion rate was adjusted in infusion pump as per the weight of the patient before starting the infusion at the rate of 0.05 mg/kg was given over 10 minutes and then 0.01 mg/kg/hr to the patients to achieve a Ramsay Sedation Scale (RSS) score of >or= 2.

RAMSAY SEDATION SCALE[53]

SCORE	RESPONSE
1	Patient is anxious and agitated or restless, or both
2	Patient is co-operative, oriented, and tranquil
3	Patient responds to commands only
4	Patient exhibits brisk response to light glabellar tap or loud auditory stimulus
5	Patient exhibits a sluggish response to light glabellar tap or loud auditory stimulus
6	Patient exhibits no response

Use of rescue drug (Inj. Propofol) or any adverse effects observed during the study was recorded. Immediately after the end of the study drug infusion, awake fiberoptic intubation was performed with the Oxygen (6 liter/min) connected to the injection port of fiberscope. Once the glottis structures are identified, 1 ml 2% lidocaine was sprayed (through a three-way tap in the oxygen tubing) on to the vocal cords.

About a minute later, the fiberscope was advanced into the trachea and lubricated tracheal tube was advanced over the fiberscope. A total dose of lidocaine was used below its toxic level, 3 mg/kg, during this procedure. General anaesthesia was induced after confirming appropriate positioning of the tracheal tube with fiberoptic visualization, capnography waveform and auscultation for bilateral equal air entry.

The anesthesiologist rated AFOI ease of placement. Two observers rated patients' comfort and reaction to placement at three time points: preoxygenation, at introduction of the fiberoptic laryngoscope, and at introduction of the Endotracheal Tube (ET) before surgery. Following surgery, patients was asked if they recalled the AFOI and also to rate their satisfaction with the intubation.

Values were also recorded for primary outcome measures included the hemodynamic responses to the process of intubation and any complication arising during the study. Values were recorded for secondary outcome measures included the patient comfort score during fiberoscopy, post intubation score as well as the intubator's perception of ease of performing the fiberoscopy and intubation.

COMFORT SCORE BASED ON FIVE PARAMETERS

Parameter	1	2	3	4	5
Sedation	Awakens to voice (eye opening /contact) >10sec	Light sedation, Briefly awakens to voice(eye opening/contact	Moderate sedation, movement or eye opening. No eye contact	Deep sedation, No response to voice, but movement or eye opening to physical stimulation	Un-arousable, no response to voice or physical stimulation
Agitation	Alert and Calm	Anxious, apprehensive, but not aggressive	Frequent Non purposeful movement	Pulls or removes tube (s); aggressive	Combative, violent
Respiratory Response	Spontaneous respiration	Occasional cough	Coughing regularly	Frequent coughing or choking	Cough preventing insertion of scope ETT
Physical Movement	No movement	Occasional slight movement	Frequent slight Movements	Vigorous movement limited to the extremities	Vigorous movements including torso and head
Facial Tension	Facial muscle tone normal, no facial muscle tension evident	Tension evident in some facial muscles	Tension evident throughout facial muscles	Facial muscles contorted and grimacing	Grimacing and crying

Fiberoscopy and intubation comfort was assessed based on five different parameters; sedation, agitation, respiratory response, physical movement and facial tension. Each response shall be evaluated on the scale of 1 to 5 . Comfort scores categorized into four groups where a score of 5-6 represented excellent, 7-13 good, 14-18 poor and >19 very poor.

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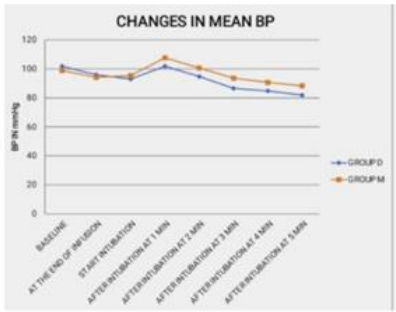
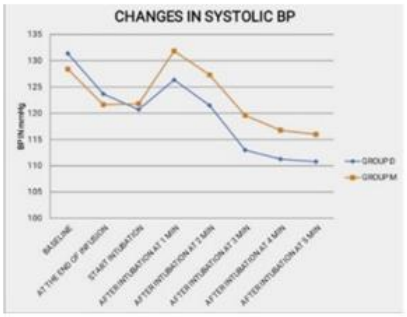
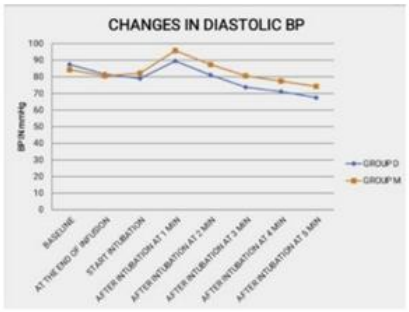
INTUBATOR'S PERCEPTION OF EASE OF PERFORMING INTUBATION

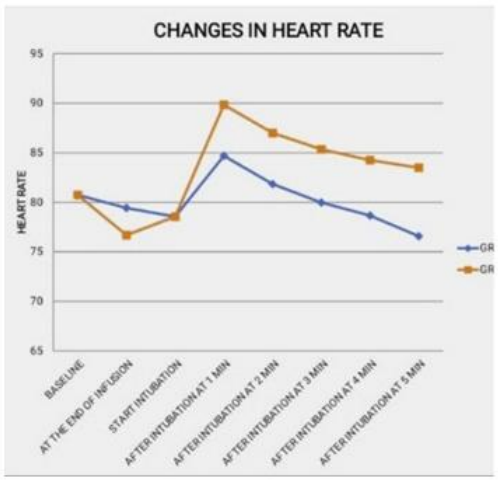
GRADES	CONDITION	DESCRIPTION
1	Optimal	No collision (hold-up) encountered
2	Suboptimal	Hold-up, relieved by rotation of the tube once
3	Difficult	Hold-up, requiring more than one rotation of the tube or alteration in the patient's head or neck position
4	Failure	Failure of the attempt at FOB guided tracheal intubation

RESULT









There was even distribution of age groups in both groups. The patients selected in present study belong to the age group between 18 to 55 year. A random allocation of patients was done in different groups. However, as is evident from table number-1 of observation, the mean age of the patients in the group D and Group M were 31.43 years (SD of 11.46) and group M was 31.36 years (SD of 10.52) respectively, did not show significant difference.

Therefore clinically insignificant variation in each simply helped us to alleviate these confounding factors like distribution, metabolism, excretion, excretion and action of different drugs.There is female preponderance in Group D and Male majority in Group M. But this discrepancy had no clinical relevance on result of our study. Majority of the patients in all two groups belonged to maxillofacial surgeries.

Heart rate Baseline heart rate (HR) were 80.65 ±7.59 in Group D and 80.71 ± 8.88 in Group M, which were having insignificant difference. At the end of infusion Group D had HR of 79.34 ±7.85 and Group M of 76.62 ± 8.63. At the Start intubation Group D 78.53 ±7.93 which fell a bit from baseline and so was the response in Group M also which

showed fall 78.53 ± 8.75. After intubation At 1 min there was slight increase of HR in Group D 84.68 ± 7.11and Group M 89.84 ± 8.38. After intubation at 2 min Group D 81.84 ± 8.58 Group M 86.96 ± 9.03. After intubation at 3 min Group D 79.87 ± 7.60 Group M 85.25 ± 8.08. After intubation at 4 min Group D 78.65 ± 8.18 Group M 84.15 ± 6.89 After intubation at 5 min Group D 76.53 ± 6.89 Group M 83.40 ± 7.76. As we could ascertain that there was clear shifting of HR to baseline in Group D but not in Group M in which HR was higher than baseline values.

Systolic blood pressure
Baseline systolic blood pressure (SBP) was 131.25 ± 7.44 in Group D and 128.34 ± 8.07 in Group M, which were having insignificant difference. At the end of infusion Group D had SBP of 123.54 ± 6.20 and Group M of 121.48 ± 6.19. At the Start intubation Group D had SBP of 121.48 ± 6.19 which fell a bit from baseline and so was the response in Group M also which showed fall 121.48 ± 6.19. After intubation At 1 min there was slight increase of SBP in Group D 126.25 ± 8.61 and Group M 131.79 ± 7.48. After intubation at 2 min Group D 121.40 ± 6.78 Group M 127.17 ± 7.68. After intubation at 3 min Group D 112.87 ± 6.66 Group M 119.56 ± 7.67. After intubation at 4 min Group D 111.15 ± 5.52 Group M 116.62 ± 7.82. After intubation at 5 min Group D 110.68 ± 5.37 Group M 115.86 ± 7.56. As we could ascertain that SBP tends to fall in both groups.

Disatolic Blood Pressure Baseline Diastolic Blood Pressure (DBP) was 87.22±9.79 in Group D and 83.78±8.78 in Group M, which were having insignificant difference. At the end of infusion Group D had DBP of 81.32±10.01 and Group M of 80.18±8.25. At the Start intubation Group D had DBP of 78.81±7.56 which fell a bit from baseline and so was the response in Group M also which showed fall 81.87±9.68. After intubation At 1 min there was slight increase of DBP in Group D 89.38±12.17 and Group M 95.56±8.59. After intubation at 2 min Group D 81.06±8.81 Group M 87.25±8.41. After intubation at 3 min Group D 73.32±9.22 Group M 80.18±6.34. After intubation at 4 min Group D 71.10±8.12 Group M 77.01±7.55. After intubation at 5 min Group D 67.16±7.96 Group M 73.81±8.03. As we could ascertain that DBP fell in both groups.

Mean Blood Pressure Baseline Mean Blood Pressure (MBP) was 101.54±8.26 in Group D and 98.65±7.90 in Group M, which were having insignificant difference. At the end of infusion Group D had MBP of 95.70±8.11 and Group M of 93.84±6.75. At the Start intubation Group D had MBP of 92.51±6.94 which fell a bit from baseline and so was the response in Group M also which showed fall 95.21±9.58. After intubation At 1 min there was slight increase of DBP in Group D 101.67±10.73 and Group M 107.53±7.03. After intubation at 2 min Group D 94.51±8.71 Group M 100.55±6.86. After intubation at 3 min Group D 86.51±8.56 Group M 93.31±5.89. After intubation at 4 min Group D 84.45±6.50 Group M 90.21±5.19. After intubation at 5 min Group D 81.66±7.50 Group M 87.82±5.09. As we could ascertain that MBP fell in both groups.

Arterial Oxygen Saturation (SPO_2) Baseline Arterial Oxygen Saturation (SPO_2) was 99.03±1.13 in Group D and 99.03±1.09 in Group M, which were having insignificant difference. At the end of infusion Group D had SPO_2 of 98.50±1.32 and Group M of 98.20±1.40. At the Start intubation Group D had SPO_2 of 98.37±1.26 which fell a bit from baseline and so was the response in Group M also which showed fall 98.36±1.44. After intubation At 1 min there was slight increase of SPO_2 in Group D 98.59±1.17 and Group M 98.23±1.66. After intubation at 2 min Group D 99.15±0.94 Group M 99.01±1.01. After intubation at 3 min Group D 99.93±1.08 Group M 98.73±1.05. After intubation at 4 min Group D 99.15±0.94 Group M 99.02±1.01. After intubation at 5 min Group D 99.34±0.73 Group M 99.23±0.79. As we could ascertain that SPO_2 did not change much between both groups.

DISCUSSION

The Flexible Fiberoptic Bronchoscope (FOB) is the most widely-used, versatile, indirect laryngoscopy device. Since the first use of fiberoptics for airway management in 1967, Flexible Intubating Scope (FIS), including the FOB, have become invaluable tools for endotracheal intubation in both awake and anesthetized patients. There are various clinical scenarios within which Flexible Scope Intubation (FSI) provides a superior technique for airway management, as compared with Direct Laryngoscopy or alternative airway devices. FSI of the awake, spontaneously ventilating patient is well-accepted as the gold standard for the management of the difficult airway. [54]

The standard FOB consists of thousands of flexible glass fibers approximately 8 to 10 μm in diameter that are capable of transmitting reflected light along their length. Light is transmitted from an external light source to the distal end of the FOB; the light reflecting off the object to be viewed is transmitted back along the length of the FOB to an eyepiece or video camera at the proximal end of the scope.

Indications for FSI essentially include any indication for endotracheal intubation. However, FSI may be the airway management technique of choice in any one of the following clinical scenarios[55]:

- Known or anticipated difficult airway (i.e., cannot intubate or cannot ventilate [CICV])
- Undesirable extension of the neck (e.g., unstable cervical fracture, severe cervical stenosis, vertebral artery insufficiency, Chiari malformation)

- Increased Risk of dental damage (e.g., poor dentition, fragile dental work)
- Limited mouth opening (e.g., TMJ disease, mandibular-maxillary fixation, severe facial burns)

No specific contraindications exist for FSI; however, in certain clinical situations, successful FSI is unlikely. Severe airway bleeding can obscure anatomic landmarks and soil the tip of the FIS with blood, making visualization of the larynx extremely difficult.

Obstruction or severe stenosis of the airway, resulting in the inability to pass a FIS can also make FSI impossible. FSI provides several advantages over direct laryngoscopy:

- Allows for a more complete visual examination of the airway before intubation.
- Provides confirmation of tube placement, avoiding esophageal and endobronchial intubation.
- Eliminates the need for three-axis alignment; therefore FSI is among the techniques least likely to result in cervical spine movement.
- Is well-tolerated in awake patients; results in less tachycardia and hypertension.
- Has less of a potential for airway and dental trauma.
- Can be performed in multiple positions.

FSI can be performed in the awake or anesthetized patient. Indications for an awake FSI are generally those situations during which ventilation via a mask is anticipated to be difficult, when a postintubation neurologic examination is needed, or when induction of general anesthesia could cause adverse hemodynamic or respiratory consequences.

The major technical disadvantage to performing FSI under general anesthesia is the loss of pharyngeal muscle tone, which can lead to upper airway collapse and difficult fiberoptic laryngoscopy. Before its use, the anesthesia practitioner or skilled assistant must ensure that the FIS, light source, and video monitor are in proper working condition and that all components have been fully prepared for use. This preparation includes focusing the image if using a FOB, ensuring proper view orientation if using a video camera, lubricating the distal third of the flexible insertion cord, applying antifogging solution to the tip of the scope, and connecting a suction line or oxygen source to the suction port.

The Endotracheal Tube (ETT) should be prepared by placing it in a warm water bath, which softens the plastic, easing passage into the trachea and minimizing airway trauma. FSI is usually performed in the supine or sitting (i.e., beach-chair) position, although emergency FSI in the lateral decubitus or prone position has also been described.[56]

When performing FSI in the supine position, the anesthesia provider stands at the head of the patient. Advantages to this position are that the laryngeal view through the FIS is in the same orientation as during Direct Laryngoscopy (DL), and the patient and physician are already in the optimal position to perform mask ventilation or other airway maneuvers, if necessary. When performing FSI with the patient in the sitting or beach-chair position, the practitioner should stand facing the patient at the patient's side. This position may be the position of choice in awake FSI as a result of improved ventilation and greater patient comfort. In addition, the sitting position optimizes airway anatomy and prevents airway collapse in patients who are obese, in patients with obstructive sleep apnea, and in patients with anterior extrinsic airway obstruction.[57]

Before FSI, unless contraindicated, an antisialagogue, such as glycopyrrolate 0.2 mg IV, should be administered to dry airway secretions. Both the orotracheal and nasotracheal routes can be used for FSI. While weighing the advantages and disadvantages, the clinician should determine which approach is best-suited for the clinical situation. Whichever route is chosen, however, essentially two steps to FSI must be taken:

- Indirect laryngoscopy and endoscopy are performed, obtaining a view of the glottis with the FIS and maneuvering the FIS through the vocal cords into the trachea.
- The ETT is advanced over the FIS into its proper position in the trachea, and the FIS is removed.

Frequently, especially with orotracheal intubation, resistance is met as the tip of ETT reaches the glottic inlet. Often, this resistance has been shown to be attributable to the bevel of the ETT impinging on the right arytenoid. A slight withdrawal of the ETT and a counterclockwise 90-degree turn, orienting the bevel posteriorly, usually resolves this issue. For nasotrachealintubation, a clockwise 90-degree turn, ensuring that the bevel is oriented anteriorly, can prevent the tip of the ETT from impinging on the epiglottis. Alternatively, the Parker Flex-Tip ETT (Parker Medical, Englewood, CO), which has a bull-nosed tip directed toward the center of the distal lumen, can be used. This ETT has been shown to have a high first-pass success rate when being advanced over a FIS.[58]

CONCLUSION: Baseline Heart rate was almost similar in both groups. But after intubation, a significant increase was found in Group M than Group D. Heart rate remained near baseline in Dexmedetomidine group as compared to Midazolam group.. Baseline SBP, DBP and MAP were almost similar in both groups. But after intubation, significant

increase was found in group M that was significantly greater than group D. The increase in blood pressure at different intervals after intubation was found lower in Dexmedetomidine group than Midazolam group, which was significant. It suggests that Dexmedetomidine had more protective effect than Midazolam against haemodynamic responses.No significant difference in Spo2 was found in all three groups.

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