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COMPARATIVE STUDY BETWEEN DEXMEDETOMIDINE AND MAGNESIUM SULPHATE AS SEDATIVES IN AWAKE FIBEROPTIC INTUBATION IN CONTROLLED HYPERTENSIVE ADULT PATIENTS

By

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ABSTRACT

Background: Flexible bronchoscopy has become the "gold standard" for managing the expected and unexpected difficult airway. Several drugs have been used to provide adequate sedation to optimize adequate fiberoptic intubation.

Objective: To compare the sedative effects of dexmedetomidine and magnesium sulphate during awake fiberoptic nasal intubation in controlled hypertensive adults undergoing elective surgeries.

Patients and methods: Sixty controlled hypertensive patients intubated using awake fiberoptic. They were divided into 2 equal groups: Patients received dexmedetomidine infusion at dose of 1ug/kg, and the other patients received magnesium sulphate at dose of 30mg/kg. Topicalization of airway was done using lidocaine "spray as you go technique". After completing the loading dose, Ramsay score was assessed before intubation. The 2 groups were compared according to Ramsay score, cough score, facial grimace and hemodynamic changes. This study was done at Al-Azhar University Hospitals after approval of the medical ethical committee, from May 2019 till November 2020.

Results: Ramsay score, cough score and facial grimace were favorable with less hemodynamic effects in dexmedetomidine group than magnesium group.

Conclusion: Dexmedetomidine was effective sedative agent for awake fiberoptic intubation in controlled hypertensive patients in comparison with magnesium sulphate.

Keywords: Awake fiberoptic intubation, dexmedetomidine, magnesium sulphate.

INTRODUCTION

Awake fiberoptic intubation is indicated for patients with expected difficult airways where ideal positioning for laryngoscopy is challenging to attain. Patients should be prepared prior to awake intubation. Preparation includes decrease of airway reflexes and proper sedation together with preservation of the open airway and sufficient ventilation *(Tsukamoto et al., 2018).*

Many drugs could be used to provide sufficient sedation prior to awake fibreoptic intubation, but with side effects such as respiratory depression *(Mondal et al., 2015).*

Dexmedetomidine is a selective α2 adrenoceptors agonist. It initially results in hypertension accompanied by reflex bradycardia, that effect is followed by hypotension and bradycadia. It provides adequate sedation without respiratory compromise, so it can be used before awake fiberoptic intubation *(Weerink et al., 2017).*

Magnesium Sulphate is NMDA receptor blocker. It has analgesic, anticonvulsant and sedative effects. It inhibits release of catecholamine due to sympathetic stimulation. It antagonizes calcium and decreases release of histamine and acetylcholine. Also, it has cardiac and neurological protective effects *(Hyun-Jung et al., 2020).*

This study aimed to compare between dexmedetomidine and magnesium sulphate to provide good sedation before awake fiberoptic nasal intubation in controlled hypertensive patients.

PATIENTS AND METHODS

Sixty controlled hypertensive patients, scheduled for elective surgeries under general anesthesia were enrolled in this randomized prospective double-blind study after approval of the medical ethical committee at Al-Azhar University Hospitals, Department of Anesthesia, and after patients gave written consents. Information about the study were given by the patients in oral and written forms.

The study was performed from May 2019 till November 2020. Patients were divided into 2 equal groups according to airway assessment using El-Ganzouri score *(Klimov et al., 2018),* and were randomized according to computer generated randomization technique:

- Dexmedetomidine Group: Patients received a bolus dose of dexmedetomidine at 1 mcg / kg over 10 min in 100 mL normal saline followed by continuous infusion of dexmedetomidine at 0.5 mcg/kg/h till intubation.
- Magnesium Group: Patients received magnesium sulphate IV (30 mg/kg in 100 ml of 0.9% normal saline) through 10 min followed by a maintenance dose 10 mg/kg/h till intubation.

Inclusion criteria: Adult patients of both sexes with controlled hypertension aged 20–65 years, scheduled for elective surgeries necessitating endotracheal intubation with general anesthesia.

Exclusion criteria: Uncooperative patients with nasal pathology, ASA ≥ 3, severe airway trauma, coagulopathy, patients with cardiac or respiratory diseases as COPD or emergency operation.

Evaluation and preparation: On the day before surgery evaluation carried out by history, examination and required investigations. The technique discussed with the patients and their cooperation. A venous cannula was inserted into the patient, a monitor connected. Patients pre-medicated with intramuscular atropine 0.5 mg and intravenous Famotidine 20 mg 30 minutes preoperatively, oxygen (3L/min) administered via the nasal cannula. Decongestant nasal drops were used as and both nostrils were filled with cotton swabs immersed in 2% lidocaine with adrenaline to anaesthetize the mucosa of the nose.

Technique of fiberoptic intubation: Fiberoptic intubation started once the

Ramsay score ≥ 2 by spray as you go technique, lidocaine 2% injected through the side port of the bronchoscope till visualization of the epiglottis. The fiberoptic bronchoscope positioned under the epiglottis to see the vocal cords, then anesthetized with 2 mL of lidocaine 2%. After entering the trachea, the endotracheal tube advanced over the bronchoscope. Capnogram was connected and general anesthesia was inducted.

The following parameters were assessed: Sedation score assessed by Ramsay sedation scale, cough score, facial grimace score, duration of tracheal intubation, intubation attempts, oxygen saturation and hemodynamic response to intubation: (HR, MAP, SpO2) which assessed at four different time intervals (baseline, 3 min after sedation, after advancing the ETT through the nasopharynx and 3 min after endotracheal intubation).

Statistical analysis: Recorded data were analyzed using the statistical package for the social sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean± standard deviation (SD), median and interquartile range (IQR). Qualitative data were expressed as frequency and percentage. T-test was used in order to compare proportions between two qualitative parameters. P-value <0.05 was considered significant.

RESULTS

There was no statistically significant difference between two groups regarding their demographic data **(Table 1)**.

Table (1): Comparison between Dexmedetomidine Group and Magnesium Group according to demographic data

Groups / Demographic data	Dexmedetomidine Group (n=30)	Magnesium Group (n=30)	p-value
Age (years)			
Mean±SD	44.83±4.14	44.50±3.60	0.740
Range	38-55	38-51	
Sex			
Female	13 (43.3%)	14 (46.7%)	0.795
Male	17 (56.7%)	16 (53.3%)	

There was a statistically significant increase of median in dexmedetomidine group compared to magnesium group according to Ramsay score **(Table 2)**.

Table (2): Comparison between Dexmedetomidine Group and Magnesium Group according to Ramsay sedation score

Groups / Ramsay score	Dexmedetomidine Group (n=30)	Magnesium Group (n=30)	p-value
1	0 (0.0%)	21 (70.0%)	<0.001
2	2 (6.7%)	9 (30.0%)	
3	18 (60.0%)	0 (0.0%)	
4	10 (33.3%)	0 (0.0%)	
Median (IQR)	3 (1)	1 (1)	<0.001
Range	2-4	1-2	

There was a statistically significant decrease of mean in dexmedetomidine group compared to magnesium group according to mean arterial blood pressure at 3m after sedation, after advancement ETT and at 3m after intubation **(Table 3)**.

Table (3): Comparison between Dexmedetomidine Group and Magnesium Group according to mean arterial blood pressure

Groups / Mean arterial blood pressure (mmHg)	Dexmedetomidine Group (n=30)	Magnesium Group (n=30)	p-value
Baseline			
Mean±SD	93.13±3.55	93.27±2.91	0.874
Range	85-99	85-98	
At 3m after sedation			
Mean±SD	80.20±1.61	85.53±2.11	<0.001
Range	76-89	82-89	
After advancement ETT			
Mean±SD	78.90±1.86	86.57±1.72	<0.001
Range	74-82	84-89	
At 3m after intubation			
Mean±SD	72.43±2.13	84.47±2.26	<0.001
Range	70-78	80-89	

There was statistically significant decrease of mean in dexmedetomidine group compared to magnesium group according to heart rate at 3m after sedation, after advancement ETT and at 3m after intubation **(Table 4)**.

Table (4): Comparison between Dexmedetomidine Group and Magnesium Group according to heart rate

Groups / Heart rate	Dexmedetomidine Group (n=30)	Magnesium Group (n=30)	p-value
Baseline			
Mean±SD	81.70±4.27	82.13±5.91	0.746
Range	75-90	70-90	
At 3m after sedation			
Mean±SD	72.33±2.11	77.53±4.38	<0.001
Range	70-78	70-88	
After advancement ETT			
Mean±SD	70.10±0.92	88.47±3.48	<0.001
Range	69-73	84-96	
At 3m after intubation			
Mean±SD	68.90±0.96	76.37±3.08	<0.001
Range	67-71	70-83	

There was a statistically significant decrease of median in dexmedetomidine group compared to magnesium group according to cough score **(Table 5)**.

Table (5): Comparison between Dexmedetomidine Group and Magnesium Group according to cough score

Groups / Cough score	Dexmedetomidine Group (n=30)	Magnesium Group (n=30)	p-value
None	6 (20.0%)	1 (3.3%)	<0.002
One gag or cough only	20 (66.7%)	11 (36.7%)	
>1 gag or cough, but acceptable conditions	4 (13.3%)	13 (43.3%)	
Unacceptable conditions	0 (0.0%)	5 (16.7%)	
Median (IQR)	2 (0)	3 (1)	<0.001
Range	1-3	1-4	

There a statistically significant decrease of median in dexmedetomidine group compared to magnesium group according to facial grimace **(Table 6)**.

Table (6): Comparison between Dexmedetomidine Group and Magnesium Group according to facial grimace

Groups / Facial grimace	Dexmedetomidine Group (n=30)	Magnesium Group (n=30)	p-value
No grimace	6 (20.0%)	0 (0.0%)	<0.001
Minimal grimace	13 (43.3%)	3 (10.0%)	
Mild grimace	10 (33.3%)	10 (33.3%)	
Moderate grimace	1 (3.3%)	17 (56.7%)	
Severe grimace	0 (0%)	0 (0%)	
Very severe grimace	0 (0%)	0 (0%)	
Median (IQR)	2 (1)	4 (1)	<0.001
Range	1-4	2-4	

There was statistically significant difference between 2 groups according to intubation **(Table 7)**.

Table (7): Comparison between Dexmedetomidine Group and Magnesium Group according to intubation time

Groups / Intubation time	Dexmedetomidine Group (n=30)	Magnesium Group (n=30)	p-value
Mean±SD	7.07±0.29	7.40±0.36	<0.001
Range	6.5-7.5	7-8	

There was no statistically significant difference between 2 groups according to SPO2% **(Table 8)**.

Table (8): Comparison between Dexmedetomidine Group and Magnesium Group according to SPO2%

Groups / SPO2%	Dexmedetomidine Group (n=30)	Magnesium Group (n=30)	p-value
Baseline			
Mean±SD	96.63±0.56	96.73±0.52	0.475
Range	96-98	96-98	
At 3m after sedation			
Mean±SD	95.67±0.48	95.50±0.51	0.197
Range	95-96	95-96	
After advancement ETT			
Mean±SD	97.93±0.45	97.87±0.57	0.617
Range	97-99	97-99	
At 3m after intubation			
Mean±SD	99.13±0.45	99.27±0.45	0.233
Range	98-100	99-100	

There was no statistically significant difference between 2 groups according to intubation attempts **(Table 9)**.

Table (9): Comparison between Dexmedetomidine Group and Magnesium Group according to intubation attempts

Groups / Intubation attempts	Dexmedetomidine Group (n=30)	Magnesium Group (n=30)	p-value
One attempts	20 (66.7%)	18 (60.0%)	0.592
Two attempts	10 (33.3%)	12 (40.0%)	

DISCUSSION

The current study was conducted on controlled hypertensive patients with anticipated difficult airway undergoing elective surgery to compare the effects of dexmedetomidine and magnesium sulphate as regards sedative effects, hemodynamics, hypoxic episodes as well as intubation time and intubation attempts during awake fiberoptic intubation.

The study's findings indicated that dexmedetomidine provided satisfactory

intubating conditions for awake fiberoptic intubation with minimal adverse effects and better patient satisfaction.

The study showed that all patients in dexmedetomidine group achieved Ramsay sedation score (RSS) ≥ 2 with significantly higher scores of RSS in dexmedetomidine group, while high percentage of patients in magnesium sulphate group failed to reach RSS ≥ 2 and required additional sedative in the form of propofol (50 mg).

In our study, satisfactory intubating conditions (facial grimace and coughing) were found in dexmedetomidine group, with better tolerance and less facial grimace and less coughing in dexmedetomidine group, than magnesium group.

Hale et al. (2012) found that in hypertensive patients, administration of dexmedetomidine before anesthesia induction blunted the hemodynamic response to tracheal intubation with significant decrease of blood pressure which is consistent with our results.

Sezen et al. (2014) reported that, in the hypertensive patients, dexmedetomidine premedication as sedative provides better hemodynamic stability compared with midazolam with significant decrease of blood pressure and heart rate which are the same results of our study. Also, *Kanchan et al. (2016)* found that infusion of dexmedetomidine in hypertensive patients attenuated the sympathetic stress response better than fentanyl and provided stable intraoperative hemodynamics, decreased heart rate and mean blood pressure which are consistent with our study.

Chan and Miwoon (2017) reported that in elderly hypertensive patients on treatment a single preanesthetic dose of dexmedetomidine (0.5μg/kg) was effectively sedative and suppressed the hemodynamic responses to endotracheal intubation with significant decrease of blood pressure and heart rate which are the same results of our study but they used smaller dose than our study dose which may be due to their study was only on elderly patients >65 years old.

Pooja et al. (2016) found that Dexmedetomidine provides optimum sedation without compromising airway or hemodynamic instability with better patient tolerance and satisfaction for awake fiberoptic intubation. It also preserves patient arousability for the post-intubation neurological assessment which is correlated with results of our study.

Rong et al. (2013) found that both dexmedetomidine and remifentanil were effective as sedatives in patients undergoing awake fiberoptic nasotracheal intubation. Compared with remifentanil, dexmedetomidine offered better endoscopy scores, lower recall of intubation, and greater patient satisfaction, with minor hemodynamic side effects which is correlated with results of our study.

Chopra et al. (2016) and *Niogyi et al. (2017)* found that dexmedetomidine infusion provided optimum level of sedation with favorable hemodynamics and no hypoxic episodes when compared to saline infusion. A decreased need of midazolam in dexmedetomidine group to achieve RSS ≥ 2 prior to intubation was observed in the Chopra study, while none of the patients receiving dexmedetomidine

in the Niogyi study required supplementary fentanyl as opposed to 60% of the patients in the placebo group.

Chu et al. (2010) and *Mondal et al. (2015)* found better intubating conditions and hemodynamics stability in dexmedetomidine group which is consistent with our study outcomes. In the Mondal study all patients achieved RSS ≥ 2 with a higher score in dexmedetomidine group; however it was associated with hypoxic episodes in both groups with a significantly higher incidence in the fentanyl group which is different with our study, No available researches compared the effects of magnesium sulphate against dexmedetomedine as a single sedative in awake fiberoptic intubation in controlled hypertensive patients. However, *Adly et al. (2016)* compared the postoperative sedative effect of dexmedetomidine versus magnesium sulphate, both drugs were started prior to induction of general anesthesia and continued as infusions till the end of surgery, both drugs provided sedation but the sedative effect of dexmedetomidine was more than that of magnesium sulphate in the first 8 hours following surgery which is consistent with our study, the difference in the sedative effect of magnesium in comparison to our study may be due to the larger dose used prior to induction 40 mg/kg, and the combined effect of general anesthesia.

Nidhi et al. (2013) reported that Magnesium 30 mg/kg is the optimum dose to control blood pressure during intubation in hypertensive patients. A further increase in the dose of magnesium may cause significant hypotension and flushing which are the same results of our study when we increased dose of magnesium.

Ghosh et al. (2016) found during comparing the analgesic effects of intravenous dexmedetomidine against magnesium sulphate given as adjuvant prior to spinal anesthesia, that dexmedetomidine provided better sedation than magnesium sulphate, which is consistent with the results of our study.

CONCLUSION

Dexmedetomidine was effective sedative agent for awake fiberoptic intubation in controlled hypertensive patients when used with “spray as you go technique” for anesthetizing the upper airway in comparison with magnesium sulphate as it allowed better patient tolerance, better patient satisfaction and acceptable sedative level without any respiratory depression or clinically significant hemodynamic compromise, while magnesium sulphate appeared not sufficient as a solo sedative agent and we recommended to use it as adjuvant to other sedatives.

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دراسة إستخدام الدكسميديتوميدين مقارنة بإستخدام سلفات الماغنسيوم فى تركيب الأنبوبة الحنجرية فى حالة الوعى بإستخدام منظار الألياف الضوئية لتأثيرهما المهدى فى المرضى البالغين ذوى الضغط المرتفع المنضبط

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خلفيـــة البحـــث: اصـــبح تركيـــب الانابيـــب الحنجريـــة باســـتخدام منظـــار الألياف الضـــوئية هـــو افضـــل الحلـــول لمعالجـــة صـــعوبة تركيـــب الأنابيـــب الحنجريـــة. ومـــن الضـــروري اعـــداد المـــرض قبـــل اســـتخدامه بإســـتعمال ادويـــة مهدئـــة مـــع تخـــدير المجـــرى التنفســـى موضـــعيا شـــريطة ألا يـــؤثر ذلـــك علـــى عمليـــة التـــنفس. والمهـــدئ الأمثـــل هـــو الـــذى تتـــوافر فيـــه الخصـــائص التـــى تجعـــل المـــريض هادئـــا ومتعاونـــا، وان يحـــافظ علـــى اســـتقرار العمليـــات الحيويـــة مثـــل الضـــغط والنـــبض ونســـبة الاكســـجين بالـــدم وأن يحـــافظ علـــى مجرى الهواء مفتوحا والتنفس مستمرا بعد إستخدامه.

الهـــدف مـــن البحـــث: المقارنـــة بـــين إثنـــين مـــن الأدويـــة المهدئـــة وهمـــا الديكســـميديتوميدين وســـلفات الماغنســـيوم قبـــل تركيـــب الانابيـــب الحنجريـــة فى حالة الوعى باستخدام منظار الألياف الضوئية.

المرضـــى وطـــرق البحـــث: وتمـــت هـــذه الدراســـة علـــى ســـتين مريضـــا مـــن ذوى مـــرض الضـــغط المرتفـــع المنضـــبط، وتـــم تقســـيمهم إلـــى مجمـــوعتين متســـاويتين: المجموعـــة الاولـــى تـــم إعطائهـــا دواء الديكســـميديتوميدين عـــن طريـــق التنقـــيط الوريـــدى بجرعـــة 1ميكروجـــرام لكـــل كيلـــو جـــرام مـــن وزن الجســـم، وتـــم تنقيطهـــا وريـــديا فـــى مـــدة 10دقـــائق ثـــم جرعـــة تكميليـــة ومقـــدارها 0.5ميكروجـــرام لكـــل كيلـــو جـــرام مـــن وزن الجســـم فـــى الســـاعة حتـــى تركيـــب

الأنبوبة الحنجرية في حين ان المجموعة الثانية تم اعطائها سلفات الماغنسيوم عن طريق التنقيط الوريدى بجرعة 30ملليجرام لكل كيلو جرام من وزن الجسم، وتم تنقيطها وريديا فى مدة 10دقائق ثم جرعة تكميلية ومقدارها 10 ملليجرام لكل كيلو جرام من وزن الجسم فى الساعة حتى تركيب الانبوبة الحنجرية. وتمت المقارنة بين المجوعتين عن طريق أيهما أكثر تهدئة وتأثيرهما على العلامات الحيوية.

نتائج البحث: حدث فرق واضح لصالح الديكسميتوميدين عند مقارنته بسلفات الماغنسيوم فى تأثيره المهدئ ومحافظته على العلامات الحيوية الضغط والنبض عند تركيب الأنبوبة الحنجرية فى حالة الوعى بإستخدام منظار الألياف الضوئية.

الاستنتاج: الديكسميديتوميدين افضل من سلفات الماغنسيوم كمهدئ لاستخدامه قبل تركيب الانابيب الحنجرية فى حالة الوعى بإستخدام منظار الألياف الضوئية فى المرضى ذوى الضغط المرتفع المنضبط لأنه يجعل المرضى أكثر هدوئا وتعاونا ويحافظ على استقرار العمليات الحيوية.

الكلمات الدالة: تركيب الأنبوبة الحنجرية بإستخدام منظار الالياف الضوئية، الديكسميتوميدين، سلفات الماغنسيوم.