Randomised Study Comparing the Use of Propofol Versus Dexmedetomidine as a Sedative Agent for Patients Presenting for Lower Gastrointestinal Endoscopy

Sameh A. Ahmed¹, Nehad Hawash², Fatma H. Rizk³, Mahmoud Elkadeem², Mohamed Elbahnasawy⁴ and Sherief Abd-Elsalam²,*

¹Department of Anesthesia, Tanta University, Tanta, Egypt; ²Department of Tropical Medicine, Faculty of Medicine, Tanta University, El-Geish Street, Tanta, Egypt; ³Department of Physiology, Tanta University, Tanta, Egypt; ⁴Department of Emergency Medicine and Traumatology, Tanta University, Tanta, Egypt

Abstract: Objectives: Dexmedetomidine, the alpha 2 agonist sedative and an analgesic agent may be beneficial in sedation for endoscopic intervention. Our aim was to compare the use of dexmedetomidine versus the traditional use of propofol as a sedative agent for colonoscopies.

Methods: This study included 100 patients presenting for elective colonoscopy under sedation with random and equal allocation of patients into two groups; group P, in which patients received propofol in a loading dose of 1.5 mg/kg and maintenance dose of 0.5 mg/kg/hr, and group D, in which patients received dexmedetomidine at a loading dose of 1 ug/kg and maintenance dose of 0.5 ug/kg/hr. In addition to the demographic data, time to recovery, time of discharge, and endoscopist rating were measured. Also, the hemodynamic parameters were recorded, and also the incidence of postoperative complications.

Results: The basic patients' characteristics, time to recovery, and time of discharge were comparable between the two groups. Moreover, the endoscopist did not significantly report more convenient procedure with one group over the other. Also, there was no significant difference in hemodynamic parameters or in the incidence of complications between the two studied groups. However the use of dexmedetomidine decreased the incidence of hypoxemia.

Conclusion: The use of dexmedetomidine seems to have a similar effect to the use of propofol as a sedative agent for lower GIT endoscopy with the positive effect of dexmedetomidine in decreasing the incidence of perioperative hypoxemia.

Keywords: Dexmedetomidine, midazolam, sedation, anesthesia, colonoscopy, propofol.

1. INTRODUCTION

Lower gastrointestinal disorders are a common clinical problem for which multiple diagnostic tests and therapeutic interventions have been developed [1]. Colonoscopy is the most convenient and effective first test in the evaluation of patients with significant lower gastrointestinal hemorrhage with the advantage of good diagnostic rule, therapeutic opportunity, and cost-effectiveness [2].

Sedation is defined as a drug induced decrease in conscious level with the advantage of relieving patient anxiety and discomfort, amnesia, and analgesia to facilitate examination and allow minor procedures [3].

Level of sedation ranges widely from minimal to moderate, deep, and general anesthesia [4]. Nearly most of the endoscopic procedures can be performed under moderate sedation which is known in practice as conscious sedation. Conscious sedation has the advantage of decreased cardiorespiratory depression [5].

Propofol, the intravenous anesthetic drug that exerts its action through GABA receptors [6, 7], is recommended for use in moderate sedation in gastrointestinal endoscopy [8] with the advantage of rapid onset, favorable pharmacodynamics, mild antiemetic properties, potentially more effective, rapid termination of effect, and expedited recovery [9]. However, its use is associated with cardiovascular depression, increased risk to induce general anesthesia, and absence of available antidote [10].

Dexmedetomidine, is a highly selective alpha adrenergic receptor agonist with favorable pharmacological properties.
It was approved by the Food and Drug Administration (FDA) of the United States for use as a sedative and analgesic agent. It was successfully used as a sedative agent in minor procedures such as MRI and CT scan. However, certain side effects and complications can occur with its use; for example, bradycardia and hypotension.

The aim of this study was to compare the use of propofol versus the use of dexmedetomidine as a sedative agent in lower gastrointestinal endoscopy.

2. MATERIALS AND METHODS

This randomized, double-blind prospective study was carried out on 100 adult patients admitted to the Tropical Medicine and Internal Medicine departments, Tanta University Hospital for elective outpatient colonoscopy.

The duration of the study was 6 months starting immediately after obtaining ethical committee approval from the ethical committee of Tanta University faculty of medicine. An informed written consent was obtained from each patient. All patients’ data were confidential with secret codes and were used for the current study only.

Any unexpected risk occurring during the course of the research was explained to the participants and proper measures were taken to overcome or minimize these risks. There was no conflict of interest, conflict with religion, law, or social obligations.

Patients included in the study were of age 25–45 years, ASA class I or II, and were scheduled for elective outpatient colonoscopy. Patients were excluded if they refused to give informed consent, if they had known hypersensitivity to the drugs used, morbidly obese patients, patients with increased risk for airway obstruction as obstructive sleep apnea and pregnant females.

Preoperative evaluation of patients included full history, thorough clinical examination, and appropriate investigations. The purpose and benefit of the study were explained and a written informed consent was obtained.

Following insertion of a 20 gauge peripheral cannula; an intravenous infusion of a 10 ml/kg normal saline was given. Patients were attached to a monitor for continuous monitoring of three leads electrocardiogram, pulse oximetry and noninvasive blood pressure. Supplemental oxygen was delivered through nasal cannula at a flow rate of 3–4 L/min. All resuscitation equipments and medications were available. No premedication was prescribed. The patients underwent lower gastrointestinal endoscopy by a trained endoscopist.

Patients were randomly allocated (using closed envelopes method) into two groups, 50 patients in each group:

2.1. Propofol Group (P): (50 Patients)

Patients in this group received sedation in the form of a bolus dose of propofol 1.5 mg/kg slowly, intravenously, followed by maintenance dose of 0.5 mg/kg/h throughout the procedure.

2.2. Dexmedetomidine Group (D): (50 patients)

Patients in this group received sedation in the form of dexmedetomidine 1 ug/kg over 10 minutes as a bolus dose followed by continuous infusion at a dose of 0.5 ug/kg/h as maintenance dose throughout the procedure.

Patients’ data in both the groups were recorded including demographic data (age, sex, BMI, ASA class, duration of endoscopy, time for complete recovery, and time to discharge).

Time for complete recovery was the time elapsed between the end of endoscopy and the complete return of consciousness, while the time to discharge was the time elapsed between regaining consciousness and hospital discharge.

Also, measurements like endoscopist rating were also carried out (easy or difficult endoscope). The endoscopist was asked at the end of the procedure to rate the endoscope according to the degree of the relaxation of the patient. Patient satisfaction score was recorded as patients were asked to rate their satisfaction on numerical scoring system (1–7) where 1–dissatisfied, and 7–highly satisfied.

Bradycardia is defined as a decrease in HR less than 50 b/min, while, hypotension is defined as a decrease in mean arterial pressure by more than 20 mmHg and hypoxia is a decrease in Spo2 less than 90%.

Bradycardia was managed by 0.3 mg i.v atropine, while, hypotension was managed by ephedrine 10 mg i.v and ringer lactate 5 ml/kg. Hypoxia was managed by adequate airway management and oxygenation.

Our primary aim was patients’ satisfaction while, the secondary aim was the safety of both drugs specially the effect on hemodynamic parameters and incidence of complication.

Statistical analysis: The sample size was calculated with the aid of an online calculator. The calculation of it depended on the number of patients admitted to Tropical Medicine and Internal Medicine departments, Tanta University Hospital for elective outpatient colonoscopy which was estimated to be about 50 cases per month. The calculated sample size was 45 cases in each group with 80% potency, 5% margin error, and 95% confidence level. So, 50 patients were enrolled in each group for compensating for possible withdrawals. The statistical differences between the studied groups were tested using unpaired t-test for (parametric variables), chi-square test and fisher’s exact test as appropriate (for nonparametric variables). Patient satisfactory score was analyzed with Mann-Whitney U test. Statistical tests were performed with SPSS (Version 23). P-values <0.05 were considered statistically significant.

3. RESULTS

3.1. Patient Characteristics of the Studied Groups

There were no statistical differences between the studied groups regarding age, gender, ASA class, BMI, duration of
3.2. Endoscopist Rating and Patient Satisfaction Score

The results showed there were no statistical differences between both the groups regarding endoscopist rating (easy in 80% of patients of group P and 82% of patients of group D) and patient satisfaction score (the median in both groups was 7) (Table 2).

3.3. Incidence of Side Effects in the Studied Groups

The statistical analysis of the incidence of side effects in the studied groups revealed that there were no statistical differences between both the groups concerning the occurrence of bradycardia, hypotension, nausea and vomiting. However, the incidence of hypoxia significantly decreased in group D compared with group P (Table 3).

3.4. Changes in Hemodynamic Parameters

There were no statistical differences between both thw groups regarding Oxygen saturation (Spo2), heart rate (HR) and mean arterial pressure (MAP) (Fig. 1).

4. DISCUSSION

The aim of our study was to assess the safety and effectiveness of dexmedetomidine when compared with the standard techniques in providing sedation for colonoscopy. Taking into consideration the potentially desirable effects of dexmedetomidine which include a significant reduction in the need for other anesthetics and analgesics, diminished

<table>
<thead>
<tr>
<th>Table 1. Patient characteristics of the studied groups.</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Group (n = 50)</td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td>Age (year) mean ±SD</td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>Male NO. (%)</td>
</tr>
<tr>
<td>Female NO. (%)</td>
</tr>
<tr>
<td>ASA class</td>
</tr>
<tr>
<td>I NO. (%)</td>
</tr>
<tr>
<td>II NO. (%)</td>
</tr>
<tr>
<td>BMI (kg/m²) mean ±SD</td>
</tr>
<tr>
<td>Duration of endoscope (min) Mean ±SD</td>
</tr>
<tr>
<td>Time for complete recovery (min) mean ±SD</td>
</tr>
<tr>
<td>Time for discharge (min) mean ±SD</td>
</tr>
</tbody>
</table>

Note: P group; propofol group, D group; dexmedetomidine group, SD; standard deviation, and ASA.

<table>
<thead>
<tr>
<th>Table 2. Endoscopist rating and patient satisfactory score.</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Endoscopist rating</td>
</tr>
<tr>
<td>- Easy NO. (%)</td>
</tr>
<tr>
<td>- Difficult NO. (%)</td>
</tr>
<tr>
<td>- Median of patient satisfactory score (minimum –maximum)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3. Incidence of side effects in the studied groups.</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
</tr>
<tr>
<td>Bradychardia</td>
</tr>
<tr>
<td>Hypotension</td>
</tr>
<tr>
<td>Hypoxia</td>
</tr>
<tr>
<td>Nausea and vomiting</td>
</tr>
</tbody>
</table>

*\( p <0.05 \) (indicate significant difference between the studied groups).
sympathetic response to stress, the potential for cardioprotective effects against myocardial ischemia, and minimal effects on respiration [16], sympatholytic side effects were assessed which may cause hypotension and bradycardia [17].

The results of this study showed that both the techniques used for sedation provided satisfactory pain relief in patients during colonoscopy.

There was no statistically significant difference regarding the duration of colonoscopy and Endoscopist’s ratings for both the groups.

We also studied the time needed for the patient to be discharged after colonoscopy as dexmedetomidine has a relatively long elimination half-life (approximately 2 h) [18]; we did not find any statistically significant difference between the two studied groups regarding recovery from colonoscopy nor in the time needed to discharge patients.

On the contrary, Muller et al. 2008 reported that patients who received dexmedetomidine had prolonged recovery period when compared to patients who received propofol [19]; while, Techanivate et al., 2012 observed a better recovery in the dexmedetomidine group than in the propofol group. These differences in results may be due to different techniques and doses as Techanivate et al., 2012 used fentanyl followed by propofol in one group and dexmedetomidine with fentanyl followed by propofol in the other group. Also, longer mean duration of colonoscopy in their study (42 minutes) than in this study may affect the results [20].

Some patients experienced bradycardia and hypotension in both the groups. This can be explained by the fact that propofol has a powerful inhibitory effect on sympathetic outflow [21], while dexmedetomidine was documented to decrease sympathetic outflow and circulating catecholamine levels [22, 23]. We did not find statistically significant differences between the two groups with regard to bradycardia and hypotension.

This was opposite to the results obtained by Techanivate et al., 2012 who concluded that dexmedetomidine causes a lower incidence of hypotension than propofol [20]; while; Jalowiecki et al., 2005 used dexmedetomidine in colonoscopy and had to stop their study due to bradycardia and hypotension caused by dexmedetomidine [24].

Dexmedetomidine appeared to be safe for the respiratory function as hypoxia was evident in P group patient and there was no statistically significant difference between the two studied groups regarding hypoxia. This is similar to the pre-
rious data about the disadvantages of propofol such as narrow therapeutic range, pain on injection and the possibility to cause respiratory and cardiopulmonary depression [25, 26]; while dexmedetomidine is not associated with respiratory depression at therapeutic doses [27], and even at high plasma concentration it has minimal adverse effects on respiratory functions [28].

CONCLUSION

In conclusion, the use of dexmedetomidine seems to have a similar effect to the use of propofol as a sedative agent for lower GIT endoscopy with the positive effect of dexmedetomidine in decreasing the incidence of perioperative hypoxemia.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The protocol of the study was approved by the Faculty of Medicine, Tanta University Ethical Committee, Tanta, Egypt, approval number (31435/03/17).

HUMAN AND ANIMAL RIGHTS

No animals were used in this study. Reported experiments on humans were in accordance with the ethical standards of the committee responsible for human experimentation (institutional national), and with the Helsinki Declaration of 1975, as revised in 2008 (http://www.wma.net/en/20activities/10ethics/10helsinki/).

CONSENT FOR PUBLICATION

A written informed consent was obtained from all participants prior to investigations.

AVAILABILITY OF DATA AND MATERIALS

The data that support the findings of this study are available from Tanta University. Restrictions apply to the data as the institute does not allow public sharing.

FUNDING

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

ACKNOWLEDGEMENTS

All authors contributed equally to this work. All the authors participated sufficiently in the work and approved the final version of the manuscript.

REFERENCES


[18] http://dx.doi.org/10.1097/00000542-200011000-00030 PMID: 11046225


[27] http://dx.doi.org/10.1117/310057X4043200602 PMID: 15648981


Current Drug Therapy, 2020, Vol. 15, No. 1


