Colonoscopy and Sedation in Romania: Early Experience using a Balanced Propofol Regimen

Ioan Sporea¹, Alina Popescu¹, Dorel Sandesc², Ovidiu Bedreag², Ramona Asai¹, Roxana Sirli¹, Corina Vernic³, Diana Nicolita¹, Alina Martie¹

1) Department of Gastroenterology and Hepatology; 2) Department of Anesthesiology and Intensive Care; 3) Department of Medical Informatics and Biostatistics, University of Medicine and Pharmacy, Timisoara, Romania

Abstract

The aim of this study was to evaluate if the sedation during colonoscopy is correctly performed in our patients, especially because it is usually performed by residents in anesthesiology. Methods: we retrospectively evaluated sedation in all the colonoscopies performed in our Endoscopy Department in 2007, by analyzing the sedation scheme that was used. Results: 974 colonoscopies were evaluated. The following sedation schemes were used in the majority of cases: midazolam + propofol + fentanyl + 507 patients (52.1%) and diazepam + propofol + fentanyl – 258 patients (26.5%). Propofol (in combination with one or more other agents) was used for sedation in 96.9% of cases. The mean doses of drugs were: propofol 125.2±67.7 mg, midazolam 2.29±0.84 mg (or diazepam 3.4±1.4 mg) and fentanyl 59±10 µg. The following complications were observed during sedation for colonoscopy: 6 patients (0.6%) developed hypoxemia, which was managed successfully with supplemental oxygen administration or flumazenil injection; 1 patient (0.1%) suffered a cardiac arrest that was successfully managed. There were no deaths or other complications. Conclusions: Propofol, combined with an opioid and a benzodiazepine, was used in approximately 97% of cases. The rate of significant oxygen desaturation was low (0.6%). No fatal complications occurred. The mean doses of propofol used were higher than those from published data, while the doses of midazolam and fentanyl were similar.

Key words


Introduction

Colonoscopy is considered to be the gold standard for evaluation of the colon. In some countries, colonoscopy is used as a screening tool to reduce the risk of colorectal cancer. Guidelines indicate that an average risk patient should begin screening colonoscopy at the age of 50 years, while individuals at increased risk of large bowel cancer may be advised to undergo screening 10 or more years sooner [1].

In order to be an effective tool for cancer screening, colonoscopy, like other screening tests, must be both safe and well tolerated by patients. It is unlikely that a test which is considered to be painful or uncomfortable would be adopted by a majority of eligible patients. Further, the quality of examination should be appropriate, as evidenced by caecal intubation rates in the range of 90-95% [2-4].

The question is how to improve the performances of diagnostic colonoscopy? The factors that lead to an increase of performances in colonoscopy are: the use of proper sedation and analgesia, the permanent internal audit of the maneuver, as well as the motivation of the endoscopist to obtain good results [5].

Some studies performed in Romania in the last years [6,7] showed that the rate of caecal intubation is still reduced in many centers, and that the use of sedation and analgesia during colonoscopy is unacceptable low.

The aim of this study was to analyze the use of sedoanalgesia during colonoscopy in our Department of Endoscopy and to compare our results with those from other centers.

Material and method

We retrospectively evaluated sedation in all the colonoscopies performed in our Department of Endoscopy between January 1st and December 31st, 2007. We analyzed the sedation scheme that was used (drugs, associations of drugs, doses, complications). The sedation was always performed by an anesthesiologist (mostly by a resident in the last two years of training, with experience in the administration of high doses of sedative agents and knowledge...
on mechanical ventilation). During this type of anesthesia, all the patients received supplemental oxygen, delivered through nasal cannula (4-6 liters/minute). The patients were monitored using peripheral pulse-oxymetry (SpO2), non invasive blood pressure and electrocardiography, with emergency trolley available at bedside, with rapid access to flumazenil administration. The respiratory (such as decrease of oxygen saturation below 96% or 90%) and cardiac (cardiac arrest) events were encountered as complications that occurred during sedation for colonoscopy.

Results

We evaluated 974 colonoscopies (only cases in which the patient’s file included complete information regarding sedation were included).

The percentage of total colonoscopies (caecal intubation) in our Department in this period was 94.9%.

From the 974 colonoscopies, 513 (52.7%) were performed in women and 461 (47.3%) in men, the mean age of the patients being 59.2±13.6 years. The age distribution of the patients who underwent colonoscopy is presented in Fig.1.

Table I. Mean doses of drugs used for sedation during colonoscopy.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Mean dose - total (mg)</th>
<th>Mean dose (mg/kg) in women</th>
<th>Mean dose (mg/kg) in men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propofol</td>
<td>125.2±67.7</td>
<td>1.57±1.05</td>
<td>1.59±1.04</td>
</tr>
<tr>
<td>Midazolam</td>
<td>2.29±0.84</td>
<td>0.02±0.01</td>
<td>0.02±0.01</td>
</tr>
<tr>
<td>Diazepam</td>
<td>3.4±1.4</td>
<td>0.01±0.02</td>
<td>0.01±0.02</td>
</tr>
<tr>
<td>Fentanyl</td>
<td>0.59±10</td>
<td>0.007±0.13</td>
<td>0.147*</td>
</tr>
<tr>
<td>Ketamine</td>
<td></td>
<td></td>
<td>0.116*</td>
</tr>
</tbody>
</table>

*p<0.05 no statistical significance

Table II. Mean doses of propofol used for sedation, according to age.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Number of patients</th>
<th>Mean dose (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20</td>
<td>2</td>
<td>2.06±1.22</td>
</tr>
<tr>
<td>20-29</td>
<td>26</td>
<td>2.30±1.14</td>
</tr>
<tr>
<td>30-39</td>
<td>52</td>
<td>1.91±0.85</td>
</tr>
<tr>
<td>40-49</td>
<td>109</td>
<td>1.76±0.96</td>
</tr>
<tr>
<td>50-59</td>
<td>249</td>
<td>1.83±1.01</td>
</tr>
<tr>
<td>60-69</td>
<td>238</td>
<td>1.62±0.88</td>
</tr>
<tr>
<td>70-79</td>
<td>166</td>
<td>1.69±1.04</td>
</tr>
<tr>
<td>≥80</td>
<td>42</td>
<td>1.38±0.86</td>
</tr>
</tbody>
</table>

p=0.0023 (ANOVA)

Table I.

- midazolam + fentanyl + tiopental: 30 (3.1%) cases;
- other schemes (different combinations of midazolam, fentanyl, propofol, ketamin, thiopental, etomidat): 88 (9%) cases.

The mean doses of drugs that were used are presented in Table I (in all patients, as well as according to gender).

According to the data presented above, propofol was used for sedo-analgesia in 96.9% of cases. The mean dose of propofol was 125.2±67.7 mg (1.57±1.05 mg/kg).

Table II.

The mean doses of propofol according to age are presented in Table II.

We compared the mean doses of propofol used most frequently (midazolam + propofol + fentanyl vs. diazepam + propofol + fentanyl). The mean dose of propofol used in association with midazolam and fentanyl was significantly lower than the one used in association with diazepam and fentanyl (1.68±0.87 mg/kg vs. 1.95±1.08 mg/kg, p<0.001).

The following complications occurred during sedation for colonoscopy: in 81 cases (8.3%) decrease of oxygen saturation below 96%, which returned to normal, without further intervention, the patients remaining on spontaneous breathing; in 6 cases (0.6%) decrease of oxygen saturation below 90%, solved either by facial mask ventilation or by flumazenil injection (only 1 patient needed flumazenil); in 1 case (0.1%) cardiac arrest, successfully managed. There were no deaths or other types of complications during sedation for colonoscopy.

The mean age in the group of patients that experienced decrease of oxygen saturation or other cardio-respiratory events was 62.0±11.7 years, not significantly higher than the age of the patients who did not have complications.
the mean age of the entire group 59.2±13.6 years (p<0.05). Also 43.9% of the patients with complications had associated pathology (such as chronic obstructive pulmonary disease, arterial hypertension, ischemic coronary disease etc.)

The cardiac arrest occurred in a patient known with chronic ischemic coronary disease. This patient did not receive high doses of drugs for sedation (midazolam 2 mg + propofol 110 mg + fentanyl 0.1 mg), the adverse event being probably due to an arrhythmia. It was successfully managed by adrenalin i.v. and external cardiac massage. In this patient, the history of ischemic coronary disease increased the risk for sedation, confirming that it is always useful to balance the risk of the procedure with the indication and the need for the investigation.

Discussion

Sedation and/or analgesia (sedo-analgesia) during colonoscopy is one of the most frequently used types of sedation worldwide, considering the number of examinations performed each year (more than 14 million in the USA and more than 1 million in France) [8, 9]. It is realized by combining midazolam with propofol and/or fentanyl (alfentanyl) or pethidine. It can be performed under the supervision of an anesthesiologist or of a gastroenterologist (preferably not the one performing the colonoscopy, so that he can intervene if necessary) [6]. In the USA, sedation with propofol is sometimes administered by a nurse working under the direction of an endoscopist [10]. This practice is not unique to the USA – it has also been practiced in Germany, Switzerland, Japan and Canada.

In our department, starting from 2004, almost all the colonoscopic evaluations were made under sedo-analgesia. Due to this strategy, the rate of caecal intubation increased constantly [5]. Sedation was always performed by an anesthesiologist. Our policy is that residents in the last two years of training in anesthesiology are the ones who should perform sedation for colonoscopy. This is why we wanted to see if the sedation protocol used in our patients was correct and to compare it (drugs and doses) to protocols used in experienced centers from abroad.

Regarding who should be responsible for the sedation of patients during the endoscopic procedures, the American Gastroenterological Association (AGA) Institute recommends that in patients with ASA physical status IV and V, sedation should be performed by a professional anaesthetist [11]. For other patients, gastroenterologists or registered nurses can be trained to administer sedation. Also, AGA issued recommendations for the pharmacologic profile and doses that should be used for endoscopic sedation. The list of drugs that can be used for sedation includes: propofol, midazolam, diazepam, fentanyl, meperidene, ketamine, promethazine, nitrous oxide, droperidol, flumazenil and naloxone.

According to AGA, combination propofol schemes should be used in order to achieve balanced sedation (by administrating small doses of several drugs with desirable pharmacologic action, it is possible to maximize the therapeutic effect of each, while minimizing the likelihood of a dose-related adverse reaction). In these combination schemes, the recommended dose of propofol that should be used for colonic evaluation is 65-100 mg (with an initial dose of 10-40 mg and a maximal dose of 400 mg) [11]. In cases in which sedation was managed by a registered nurse, the mean dose of combination propofol was 144-287 mg [12].

Concerning the risks of propofol use, the FDA recommends that this hypnotic agent, used for induction and maintenance of anesthesia, should be administered only by individuals trained in performing general anesthesia [11], but since the approval of this drug in the late 1980’s, the experience with gastroenterologist-directed administration of propofol now exceeds 200,000 patients, with no mortalities [12-14]. Most protocols target moderate rather than deep sedation [13, 15].

In a study by Tohda et al on 27,500 cases of sedation for endoscopy, the mean dose of propofol used for colonoscopy was 94 mg [16]. In a study by Paspatis et al on 120 patients undergoing colonoscopy, sedation was performed with propofol + midazolam (mean doses 80 mg and 3 mg) and midazolam + pethidine (mean doses 5 and 75 mg). In this study, patients receiving propofol were more likely to report no discomfort during the procedure (84.3% vs. 66%, p<0.05) [17]. Reiman et al used propofol + midazolam for sedation during colonoscopy, the median doses being 100 mg and 2 mg, respectively [18].

The comparative safety of propofol and benzodiazepine/opioid sedation was assessed in a meta-analysis. A total of 1,162 patients were included, 634 of them receiving propofol. Hypoxemia during colonoscopy in the propofol group occurred in 0.4% of cases (95%CI: 0.2-0.79) [19].

We compared our data with published studies. Hypoxemia occurred in 0.6% of the cases in our study (vs. 0.4% in the meta-analysis), solved in all cases without fatalities, using oxygen supplementation ± flumazenil. At the same time, regarding the doses of the drugs that were used, and comparing them with the ones from published data [11, 12, 16-18] we observed that we were using higher doses of propofol: 125.2±67.7 mg vs. 65-100 mg. The mean doses of midazolam (2.29±0.84 mg) and fentanyl (59±10 µgrams) used in our patients were similar to those from published studies. The total dose of propofol used is related to the duration of the procedure (colonoscopy). An analysis of the relation between these two factors (the total dose of propofol and the duration of colonoscopy) will be interesting: it is possible that in tertiary, university centers (such as ours) the duration of the procedure is longer, due to teaching purposes. On the other hand, in our study, the mean dose of propofol decreased significantly with age (Table II).

A relatively recent idea for sedation is to use the computer-assisted personalized sedation system (the SEDASYS System) [20], intended to provide the endoscopist/nurse team an "on-label" method to administer propofol sedation for colonoscopy. In this study on 731 cases of sedation for colonoscopy, the mean dose of propofol used was 106.2±57.1 mg, and the mean dose of fentanyl was 74.0±23.1 µg.
Sedation in gastrointestinal endoscopy is still a subject of debate but the interest regarding this problem is increasing. This is the main reason for preparing guidelines for sedation in gastrointestinal endoscopy such as those recently published by the Endoscopy Section of the German Society for Digestive and Metabolic Diseases [21].

We can conclude that in the patients sedated during colonoscopy in our Department of Endoscopy, propofol in combination was used in approximately 97% of cases. The rate of significant desaturation after combination propofol was low (0.6%), all cases resolved with oxygen supply ± flumazenil. There were no fatalities in our study. The mean doses of propofol used were higher than those from published data, but the doses of midazolam and fentanyl were similar. This evaluation of sedation skills may come in useful for the future development of new specific protocols for sedation [22], meant to reduce complications to a minimum.

Conflicts of interest

None to declare.

References