

Ketamine as the main analgesic agent during analgesia-based sedation for elective colonoscopy - A randomised, double-blind, control study

ABSTRACT

Aim: The aim of the study was to compare the analgesic effects of ketamine over fentanyl combined with propofol in analgesia-based elective colonoscopy with purpose of patient safety and satisfaction.

Methods: This is a double-blinded prospective randomized controlled trial. Ninety patients were included and randomized to either fentanyl-propofol (Group FP, n : 30), ketamine-propofol (Group KP, n : 30) or propofol-control group (Group C, n : 30). Group FP patients received fentanyl and propofol, Group KP received ketamine and propofol and Group C, propofol. In all groups, incremental doses of propofol were used to maintain a Ramsay sedation score (RSS) of 5. Respiratory depression and hemodynamic parameters were monitored for the first minute and every 5 min during endoscopy. Fifteen minutes after the procedure, the degree of pain was assessed using a visual analog scale (VAS), the quality of recovery according to the Aldrete score (ARS), complications during and after the procedure and additional doses of propofol were recorded.

Results: Mean arterial pressure (MAP) at 5 and 30 min ($p < 0.05$), heart rate (HR) at 15, 25 and 30 min ($p < 0.05$) and peripheral oxygen saturation (SpO_2) at 30 min ($p < 0.05$) were statistically significant for Group FP. Desaturation ($*p = 0.033$), and weakness ($*p = 0.004$) was also significant for Group FP at 20, 25 and 30 min ($p < 0.05$). Pain was lower assessed for the Group KP according to the VAS ($**p = 0.025$).

Conclusion: In analgesia-based colonoscopy, ketamine provides appropriate analgesia and less incidence of complications compared to fentanyl.

Key words: Analgesic, colonoscopy, fentanyl, ketamine

Introduction


There is a great interest in the diagnosis of gastroenterological conditions due to both malignant and inflammatory diseases of the colon. Sedation for colonoscopy in modern time is not questionable and to date, various methods of sedation

have been used for this procedure.^[1,2] Benzodiazepines, opioids, propofol, ketamine, dexmedetomidine and their combinations are most commonly used for analgesia-based sedation for elective colonoscopy.^[3,4] The goals of procedural

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How to cite this article: Kovačević M, Rizvanović N, Adilović AŠ, Smajić J, Sijerčić S. Ketamine as the main analgesic agent during analgesia-based sedation for elective colonoscopy – A randomised, double-blind, control study. Saudi J Anaesth 2022;16:423-9.

Access this article online	
Website: www.saudija.org	Quick Response Code 
DOI: 10.4103/sja.sja_488_22	

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Submitted: 04-Jul-2022, **Revised:** 04-Jul-2022, **Accepted:** 05-Jul-2022, **Published:** 03-Sep-2022

sedation and analgesia for colonoscopy are multiple and include sedation with reduction of pain and anxiety and appropriate degree of amnesia.^[5] Pain during and after colonoscopy significantly affects patient comfort and the best form of analgesia for colonoscopy is still unknown.^[6] Most of these drugs also cause some degree of respiratory depression and hemodynamic instability.^[7] Therefore, it is sometimes very difficult to sedate these patients at the same time with adequate or sufficient analgesia. Both ketamine and fentanyl possess analgesic properties with an appropriate degree of respiratory depression. In addition to analgesic, ketamine also has sedative properties. It causes dissociative anaesthesia and supplies excellent amnesia, but can lead to prolonged sedation.^[8] Ketamine inhibit nociceptive central sensitization and has a pre-emptive analgesic effect.^[9] Fentanyl is a strong analgesic agent with an emetic effect. But compared to other hypnotics, it has a more pronounced effect on cardiorespiratory stability than sedative effects, so it is not generally used alone for sedation, only in combination with other sedatives for moderate sedation/analgesia.^[10] The impact of analgesia-based sedation on the tolerance of patients undergoing colonoscopy has been assessed in several studies.^[11,12] However, no randomized controlled study has yet, to our knowledge, been performed to assess the effect of the currently most often used analgesic agent on patient tolerance and pain and on cardiorespiratory parameters. This study evaluated the comparative efficacy and safety of ketamine over fentanyl in combination with propofol for the colonoscopy procedure. We hypothesized that patients receiving ketamine would have less hemodynamic and respiratory instability and better achieved analgesia quality. The primary endpoints included post-procedural pain, hemodynamic (mean arterial pressure [MAP], heart rate [HR]), and respiratory stability (peripheral oxygen saturation [SpO₂]), followed by analgosedation characteristics that included depth of sedation and additional drug dosing with post-procedural side effects.

Methods

This prospective randomized control study was conducted after obtaining the approval of the Ethics Committee (N^o 00-03-35-1227-9/20) and the written consent of the patients, in the Department of Anesthesia and Intensive care unit between 2020 and 2021. Ninety ASA physical statuses I and II, patients who were older than 18 years were included in this study. Exclusion criteria were: all colonoscopies lasting longer than 30 min, patients with previous abdominal surgery, patients treated for neuropathic pain, malignant and respiratory diseases, pregnant women,

gastrointestinal obstruction, patients using antihypertensive and antiarrhythmic drugs, psychiatric patients, patients with ASA physical status III and higher, and patients who refused to participate in the study.

All patients had fasted for the previous 8 hours before the procedure and had undergone a digestive tract preparation procedure. Patients were randomly (computer-generated) divided into three groups: patients whom were administrated fentanyl and propofol (Group FP), patients whom were administrated ketamine and propofol (Group KP) and patients whom were administrated propofol (Group C-control group). The syringes were coded before the procedure by an anaesthetist who was not involved in the sedation process. Syringes were also selected in terms of volume in a similar manner, while patients, anaesthesiologists, colonoscopists and anaesthetists were blinded to the medication regimen.

After the patient admission to the endoscopy room and identification, an intravenous line was placed and intravenous fluid administration (saline) was started. All patients were placed in the lateral position and placed on non-invasive blood pressure monitoring, three-channel ECG and SpO₂. Oxygen support is provided via a facial mask at a flow rate of 5 L/min.

Sedation protocol. All three groups of patients were pre-medicated with 0.05 mg kg⁻¹ of midazolam (PanPharma), 5 min before the starting of the procedure. Afterwards, sedation induction was performed with 1 mcg kg⁻¹ of fentanyl (Panpharma; SanMed) and 0.5 mg kg⁻¹ of propofol (Fresenius Kabi; Amicus Pharma) for Group FP. Ketamine (Inresa Arzneimittel) 0.5 mg kg⁻¹ of propofol for Group KP, and 1 mg kg⁻¹ of propofol for Group C. During the procedure, the patients Ramsay sedation score (RSS) scores was maintained at 5 with an additional 0.5 mg kg⁻¹ bolus dose of propofol when required.

Data collection and measurements

Assessment of hemodynamic and respiratory stability. MAP and HR were noted upon entry of the patient into the endoscopic cabinet, immediately after the administration of propofol, and then every 5 min during the procedure. A number of episodes of hypertension, hypotension, tachycardia and bradycardia were noted. Hypertension is defined as an increase in blood pressure greater than 20%, and hypotension for a decrease in blood pressure greater than 20% from baseline. Tachycardia is defined as an increase in HR >100 beats per minute. Bradycardia as a drop in HR <50 beats per minute. Respiratory stability was assessed at the same time intervals using a peripheral pulse oximeter.

A number of desaturation episodes were recorded for each group. Desaturation was defined as a decrease in SpO₂ <95% measured with a pulse oximeter.

Assessment of sedation level. The degree of sedation was assessed by RSS, immediately after propofol administration and every 5 min during the procedure. RSS is a subjective method of sedation assessment, where patient sedation levels are divided into six groups (1: anxious, agitated or anxious or both; 2: cooperative, oriented and calm; 3: calm, responds only to command; 4: quick response to audible stimulus or light tapping on the forehead; 5: slow response to sound stimulus or light tapping on the forehead; 6: no response to stimulus). A number of additional bolus doses were recorded for each group.

Assessment of post-procedural abdominal pain. The patient's subjective feeling of post-procedural pain were determined by a 10 cm VAS. The scale is horizontal, ungraded, bounded at both ends by vertical lines that define the extreme limits of the indicators being measured. The experienced pain sensation were marked by the patient on a scale, and then the marked position were assigned a numerical value according to the VAS score as follows: VAS score: no pain 0–10 mm; mild pain 10–30 mm; moderate pain 30–70 mm; severe pain 70–100 mm. An assessment of post-procedural pain was performed 15 min after the procedure.

Recovery quality assessment. The quality of the patient's recovery were assessed by Aldrete score (ARS) 15 min after the end of the procedure. Using ARS, we examined the following five criteria: motor activity (possibility of moving 2 extremities/all extremities, no movement of extremities on command), breathing (deep breathing with cough reflex, hypoventilation and apnea), blood pressure (+20 mmHg, +20–50 mmHg, +50 mmHg relative to baseline), consciousness (awake, awake on call and unresponsive) and skin colour (pink, pale and cyanotic). With ARS, each criterion is evaluated separately from 0 to 2, with a maximum score of 10. A score with a range of 8 and 9 is considered satisfactory.

Estimation of complication frequency. The frequency of procedural complications was monitored: hallucinations, confusion, unpleasant dreams, anxiety, weakness, vomiting and nausea. Hallucinations were defined as a visual or auditory sensory event that occurs without appropriate objective sensory stimulation. Confusion were defined as an inability to think clearly, an expression of a disorder of consciousness, and unpleasant dreams as an unpleasant mental activity during sleep. Anxiety was defined as a feeling of general tension, anxiety, great stress, panic or fear, and

weakness as a feeling of loss of muscle strength, general fatigue or functional limitation. Vomiting was defined as a reflex act, during which the contents of the stomach or the initial part of the small intestine return through the mouth and are expelled into the external environment. Nausea was defined as a feeling of discomfort in the upper part of the digestive system with a feeling of threatening vomiting. Patients were interviewed to mark the experienced feeling with YES or NO.

Statistical analysis

Before each test, the normality of the data distribution were checked, if the data were normally distributed, a *t*-test was used, while in others, the Mann–Whitney test was used. In addition to descriptive statistical methods (mean and standard deviation), one-way/irreversible variant analysis was used in repeated measurements of several groups. Compared to groups, a multiple comparison test with Bonferoni correction test with an independent *t*-test were used, and in comparing qualitative data, the Chi-square and Fisher's exact test were used. The level of statistical significance was set at $P < 0.05$.

Results

There were no significant differences between the means of demographic parameters (age, * $p = 0.673$, ** $p = 0.415$; weight, * $p = 0.642$, ** $p = 0.417$; gender, * $p = 0.542$, ** $p = 0.152$), ASA score (* $p = 0.417$, ** $p = 0.417$), diagnostic (* $p = 1.000$, ** $p = 0.085$) or therapeutic (* $p = 0.554$, ** $p = 0.085$) colonoscopy, and additional propofol dose (* $p = 0.052$, ** $p = 0.258$) of the groups [Table 1]. There was statistically significant difference for 5 and 30 min MAP means detected in Group FP (5 min, * $p = 0.038$; 30 min, * $p = 0.024$). Statistically, significant difference was observed in the 15, 20, 25 and 30 min HR means of the Group FP (15 min, * $p = 0.011$; 20 min, * $p = 0.009$; 25 min, * $p = 0.032$; 30 min, * $p = 0.019$). There was also statistically significant variation in the 20, 25 and 30 min HR means in Group KP (20 min, ** $p = 0.037$; 25 min, ** $p = 0.031$; 30 min, ** $p = 0.041$). Statistically significant difference was also observed in the 30 min SpO₂ means in the Group FP (* $p = 0.000$). RSS means for both groups were statistically significantly different. For the Group FP in the first, 5, 10, 15 and 20 min (first min, * $p = 0.000$; 5 min, * $p = 0.000$; 10 min, * $p = 0.000$; 15 min, * $p = 0.001$; 20 min, * $p = 0.000$). For the Group KP at the 5 and 15 min (5 min, ** $p = 0.004$; 15 min, ** $p = 0.006$) [Table 2]. The occurrence of complications during and after procedure were not statistically different, except for desaturation (* $p = 0.033$), and weakness for Group FP (* $p = 0.004$) [Table 3]. Pain assessed according to the VAS had a statistical difference for Group KP (** $p = 0.025$) [Table 4].

Table 1: Characteristics of included patients and the procedures

Parameter	Patients group			*P	**P
	Group FP (n=30)	Group KP (n=30)	Group C (n=30)		
Age (years) mean±SD	56.17±12.24	57.47±12.1	55.77±13.34	0.673	0.415
Weight (kg) mean±SD	76.27±12.18	76.03±12.17	78.00±16.23	0.642	0.152
Gender n°(%)					
Female	22 (73.3%)	19 (63.3%)	24 (80%)	0.542	0.417
Male	8 (26.7%)	11 (36.7%)	6 (20%)		
ASA score n°(%)					
1	9 (30%)	9 (30%)	12 (40%)	0.417	0.417
2	21 (70%)	21 (70%)	18 (60%)		
Diagnostic colonoscopy no/yes n°(%)	1 (3.3%) 29 (96.7%)	5 (16.7%) 25 (83.3%)	1 (3.3%) 29 (96.7%)	1.000	0.085
Therapeutic colonoscopy no/yes n°(%)	28 (93.3%) 2 (6.7%)	25 (83.3%) 5 (16.7%)	29 (96.7%) 1 (3.3%)	0.554	0.085
Additional dose of propofol n°(%)					
Without	5 (16.7%)	3 (10.0%)	1 (3.3%)	0.052	0.258
One dose	11 (36.7%)	8 (26.7%)	5 (16.7%)		
Two doses	6 (20.0%)	11 (36.7%)	8 (26.7%)		
3-6 doses	6 (20.0%)	8 (26.7%)	15 (50.0%)		
7-10 doses	2 (6.7%)	0 (0%)	1 (3.3%)		

Group FP, group fentanyl-propofol; Group KP, group ketamine-propofol; Group C, group; ASA score, physical status classification system according to American Society of Anaesthesiologists; *P, <0.05 was considered statistically significant for Group FP compared with Group C; **P, <0.05 was considered statistically significant for Group KP compared with Group C

Discussion

In this perspective control study, we compared analgesic effect of ketamine over the fentanyl with a control group in analgesia-based elective colonoscopy. Demographic parameters, respiratory depression, hemodynamic parameters (MAP and HR) and additional doses of propofol were recorded, including the degree of pain using VAS, the quality of recovery using ARS and complications during and 15 min after the procedure. The results of this study showed higher variations of MAP in the FP group. HR variations existed in both groups, with a larger occurrence in the FP group. In the same group, there was a decline in SpO₂ at the 13th min of the procedure. RSS had statistically significant difference for both groups compared to the control group. Desaturation and weakness were found to be significant different for the FP group, while the post-procedural abdominal pain was less represented for the Group KP. When it comes to age, gender, and body weight, our study did not show a significant difference between the groups, as according to the study by Baradari *et al.*^[13] The additional dose of propofol was similar in the both group, and did not have effect on ARS after the procedure. In relation to our results, a prior prospective clinical trial also have confirmed similar values for MAP, HR and SpO₂ for group with ketamine, which is a result of his sympathetic effect.^[14] In Group FP, where we administered the mixture of fentanyl and propofol at the 5 and 30 min MAP mean was lower than in the Group C. While in the KP group there were no changes in MAP, which can be partially explained by the more pronounced effects

of fentanyl on haemodynamic.^[15] Incidence of HR changes was similar in both groups, between 15 and 30 min for the FP group and between 20 and 30 min for the KP group. No significant differences in the HR for the sedation procedure at any time point was not found due to procedure of endoscopic ultrasonography.^[16] Changes in SpO₂ was higher in Group FP, which was also confirmed according to the study of Bellolio *et al.*^[17] RSS varied more in group FP, while variations according to our results for group KP and group C were the same. Compared with a study using fentanyl-propofol and ketamine-midazolam sedation protocol in children, RSS was higher in group ketamine-midazolam,^[18] on the basis of which we could conclude that combination of ketamine-propofol is better in relation to the already mentioned ones. In means of sedation-related complications, we observed that patients in Group KP were also less likely to suffer from complications such as desaturation, which was most common complication in Group FP. Complications, according to other researches, showed similar results. Respiratory depression was not present in ketamine-propofol sedation protocol in a group of healthy volunteers with ketamine-propofol combination.^[19] Celik *et al.*^[20] reported higher rates of respiratory depression in a group of geriatric patients who underwent endoscopic procedure by propofol-fentanyl combination compared to patients who received ketamine-midazolam, with a 45% of patients who had respiratory depression during the procedure. Foo *et al.*^[21] concluded that there were no significant difference in terms of adverse effects comparing ketofol with other sedative agents. In a systematic review of peri-induction hemodynamics the ketamine-propofol

Table 2: MAP, heart rate, SpO₂ and RSS means±SD of the groups

Variables mean±SD	Patients group			*P	**P
	Group FP	Group KP	Group C		
MAP					
Initial	95.27±13.16	93.73±13.30	93.93±13.31	0.698	0.954
1 min	80.13±16.26	90.50±12.22	84.53±14.94	0.271	0.088
5 min	72.07±12.68	83.23±11.72	81.40±20.35	0.038	0.821
10 min	74.20±13.43	83.93±12.05	80.63±18.23	0.125	0.412
15 min	76.57±11.69	80.33±15.37	78.40±17.84	0.640	0.655
20 min	74.50±10.79	80.23±14.88	79.90±19.99	0.234	0.873
25 min	77.00±10.69	81.87±9.78	81.53±16.35	0.210	0.924
30 min	76.07±10.70	82.43±8.07	83.33±13.44	0.024	0.755
Heart rate					
Initial	91.83±18.26	90.50±18.45	88.27±17.74	0.419	0.635
1 min	85.03±18.62	86.57±16.84	88.83±17.59	0.420	0.612
5 min	79.60±16.81	84.27±12.39	86.40±14.73	0.101	0.546
10 min	84.27±12.39	79.90±13.72	82.83±14.90	0.081	0.292
15 min	72.53±14.71	75.63±14.94	82.73±15.48	0.011	0.076
20 min	72.93±14.96	75.70±12.63	83.07±14.04	0.009	0.037
25 min	74.73±13.05	75.27±12.14	82.03±11.49	0.032	0.031
30 min	74.50±13.05	76.30±10.26	82.07±11.05	0.019	0.041
SpO₂					
Initial	97.40±3.92	98.00±1.57	98.63±1.52	0.114	0.118
1 min	96.70±2.97	98.10±3.87	98.70±2.25	0.005	0.466
5 min	93.93±4.17	95.53±3.83	93.63±8.90	0.868	0.288
10 min	93.20±4.36	95.90±3.33	94.90±4.78	0.156	0.351
15 min	94.37±4.07	95.33±3.24	95.74±4.78	0.123	0.596
20 min	94.87±4.29	96.43±2.48	95.90±3.01	0.285	0.457
25 min	95.20±3.42	96.23±2.92	97.00±3.56	0.051	0.366
30 min	95.00±2.95	96.91±2.43	98.23±1.50	0.000	0.628
RSS					
1 min	5.73±0.691	4.73±1.17	4.77±0.817	0.000	0.770
5 min	5.47±0.776	5.17±0.874	4.57±0.874	0.000	0.004
10 min	5.40±0.968	4.80±0.761	4.53±0.681	0.000	0.187
15 min	5.23±1.04	5.10±0.810	4.60±0.563	0.001	0.006
20 min	5.50±0.682	4.93±0.785	4.60±0.724	0.000	0.142
25 min	5.23±1.04	5.23±0.728	4.93±0.740	0.053	0.124
30 min	5.50±0.731	5.30±0.702	5.23±0.728	0.116	0.729

MAP, mean arterial pressure; SpO₂, peripheral oxygen saturation; RSS, Ramsay sedation scale; Group FP, group fentanyl-propofol; Group KP, group ketamine-propofol; Group C, group propofol; *P, <0.05 was considered statistically significant for Group FP compared with Group C; **P, <0.05 was considered statistically significant for Group KP compared with Group C

group had a higher systolic blood pressure as complication during the procedure, without other emergence reactions.^[22] Although adverse effects may occur even 24 h after ketamine application, such as confusion, hallucinations, dreams or fear,^[23] our research showed no complications such as halucinations, confusion, unpleasant dreams, anxiety, weakness, nausea and vomiting in ketamine group. However, weakness was found significant for group FP. In a previous randomized, blinded study of adult patients undergoing sedation in emergency department, the median recovery time was 13 min for the ketamine group.^[24] Which is in line with our results, where we recorded ARS 15 min after the procedure. Ratio of ketamine-propofol 1: 1 showed better results of post-operative analgesia compared to propofol, however, it resulted in a longer recovery time which can be explained by a shorter half-life of propofol.^[25] In a study where a 1: 2 ketamine-propofol ratio was used, there was no significant difference between pain and recovery time.^[26]

Aydogmus *et al.*^[27] compared different doses of ketamine in combination with propofol and found no significant difference in recovery time after the procedure. Ketamine-propofol sedation procedure can be safely and effectively used in high-risk patients and this technique has advantages such as analgesia, airway protection, provision of spontaneous respiration, haemodynamic stability and rapid recovery.

Our study showed better analgesia with ketamine-propofol protocol in analgesia-based sedation for elective colonoscopy. This is partially confirmed by the results of other studies where the analgosedation with ketofol (ketamine-propofol) was preferable and recommended.^[28] According to Shah *et al.*^[29] propofol-ketamine can lead to more patients satisfaction than the other protocols. Additional use of ketamine during sedation with propofol provides significant analgesia and minimizes need for opioids. A combination propofol/ketamine also provides effective analgesia during

Table 3: Complications during and after the procedure according to the groups

Complications during the procedure n° (%)	Patients group			*P	**P
	Group FP	Group KP	Group C		
Hypertension					
Without	27 (90)	11 (36.7)	21 (70.0)	0.144	0.070
1 episode	1 (3.3)	13 (43.3)	5 (16.7)		
2 episode	2 (6.7)	4 (13.3)	2 (6.7)		
3 episode	0 (0)	1 (3.3)	2 (6.7)		
>3 episode	0 (0)	1 (3.3)	0 (0)		
Hypotension					
Without	15 (50)	18 (60.0)	18 (60.0)	0.655	0.109
1 episode	2 (6.7)	6 (20.0)	1 (3.3)		
2 episode	8 (26.7)	5 (16.7)	5 (16.7)		
3 episode	4 (13.3)	1 (3.3)	3 (10.0)		
>3 episode	1 (3.3)	0 (0)	3 (10.0)		
Tachycardia					
Without	26 (86.7)	22 (73.3)	25 (83.3)	0.986	0.822
1 episode	1 (3.3)	3 (10.0)	1 (3.3)		
2 episode	1 (3.3)	2 (6.7)	2 (6.7)		
3 episode	1 (3.3)	1 (3.3)	1 (3.3)		
>3 episode	1 (3.3)	1 (3.3)	1 (3.3)		
Bradycardia					
Without	23 (73.7)	26 (86.7)	29 (96.7)	0.153	0.367
1 episode	3 (10.0)	2 (6.7)	0 (0)		
2 episode	1 (3.3)	1 (3.3)	1 (3.3)		
3 episode	2 (6.7)	0 (0)	0 (0)		
>3 episode	1 (3.3)	1 (3.3)	0 (0)		
Desaturation					
Without	11 (36.7)	15 (50.0)	17 (56.7)	0.033	0.949
1 episode	11 (36.7)	4 (13.3)	3 (10.0)		
2 episode	7 (23.3)	5 (16.7)	4 (13.3)		
3 episode	0 (0)	3 (10.0)	2 (6.7)		
>3 episode	1 (3.3)	3 (10.0)	4 (13.3)		
Complications after the procedure No/Yes (%)					
Halucinations	30/0 (100/0)	28/2 (93.3/6.7)	30/0 (100/0)	a	0.150
Confusion	23/7 (76.7/23.3)	22/8 (73/26)	22/8 (73.3/26.7)	0.766	1.000
Unpleasant dreams	30/0 (100/0)	30/0 (100/0)	29/1 (96.7/3.3)	0.313	0.313
Anxiety	24/6 (80/20)	28/29 (3.3/6.7)	25/5 (83.3/16.7)	0.739	0.228
Weakness	10/20 (33.3/66.7)	15/15 (50/50)	21/9 (70/30)	0.004	0.114
Nausea	28/2 (93.3/6.7)	28/2 (93.3/6.7)	29/1 (96.3/3.7)	0.554	0.554
Vomiting	28/2 (93.3/6.7)	28/2 (93.3/6.7)	30/0 (100/0)	0.150	0.150

Group FP, group fentanyl-propofol; Group KP, group ketamine-propofol; Group C, group propofol; *P<0.05 was considered statistically significant for Group FP compared with Group C; **P<0.05 was considered statistically significant for Group KP compared with Group C; a, statistical constant

patient monitoring. The strength of this study is its double blindness design of a randomized clinical trial, with a control group analgesics. The most prominent limitation of this study is that it was performed in one centre with a small sample size and relatively healthy patients.

Conclusion

Our research confirmed that intensity of the pain during colonoscopy was lower in the ketamine group than in the fentanyl group. The combination of ketamine and propofol provided a more appropriate analgesic results compared to fentanyl and propofol and propofol alone for colonoscopy. Ketamine is still a good choice for painful procedures which does not require neuromuscular

relaxation and endotracheal intubation. Further studies should be based on the analysis of the same sedation-based analgesia protocol in high-risk patients and should be based on the dose of fentanyl which could play an important role in the deficiencies of the sedation protocol in the FP group.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Table 4: VAS and ARS according to the groups

Variable n° (%)	Patients group			*P	**P
	Group FP	Group KP	Group C		
VAS					
No pain	18 (60.0)	20 (66.7)	15 (50.0)	0.111	0.025
Mild	9 (30.0)	9 (30.0)	5 (16.7)		
Moderate	3 (10.0)	1 (3.3)	7 (23.3)		
Severe	0	0	3 (10.0)		
ARS					
0-5	0	0	0	0.417	0.483
6	1 (3.3)	0	0		
7	3 (10.0)	6 (20.0)	4 (13.3)		
8	16 (53.3)	14 (46.7)	10 (33.3)		
9	7 (23.3)	7 (23.3)	11 (36.7)		
10	3 (10.0)	3 (10.0%)	3 (10.0)		

Group FP, group fentanyl-propofol; Group KP, group ketamine-propofol; Group C, group propofol; VAS, visual analog scale; ARS, Aldrete recovery score; *P<0.05 was considered statistically significant for Group FP compared with Group C; **P<0.05 was considered statistically significant for Group KP compared with Group C

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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