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Factors associated with abdominal pain in patients submitted to colonoscopy☆

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ABSTRACT

Objective: The study evaluated factors associated with abdominal pain during colonoscopy.
Methods: This was a cross-sectional observational study that evaluated patients who underwent colonoscopy between February 2014 and February 2015. Physical characteristics, surgical history and previous colonoscopies, indication and current examination conditions, fentanyl and midazolam dose, and pain level were analyzed. Significance level adopted: $p < 0.05$. Chi-squared test was used for association of categorical variables, Student's *t*-test was applied for comparison of means, and Spearman's coefficient was used for correlation.
Results: A total of 566 women and 391 men with mean age of 54.81 years and mean BMI of 27,064 were evaluated. Of the total, 29 (3.0%) had mild pain, 42 (4.4%) had moderate pain, and 18 (1.9%) had severe pain. Women were less tolerant ($p = 0.011$) and had longer cecal intubation times ($p = 0.001$). Mean duration of colonoscopy and mean dose of midazolam were higher in patients with pain ($p = 0.001$), ($p < 0.001$*). Among the 39 patients with an incomplete examination, 8 reported pain ($p = 0.049$).
Conclusion: Female gender and prolonged intubation time were significantly associated with abdominal pain during colonoscopy. Patients with discomfort had a higher failure rate on the exam. Additional doses of midazolam given to patients with pain were not effective.

Fatores associados à dor abdominal em pacientes submetidos à colonoscopia

Palavras-chave:
Colonoscopia
Sedação consciente

RESUMO

Objetivo: O estudo avaliou fatores associados à dor abdominal durante a colonoscopia.
Métodos: Estudo observacional transversal, que avaliou pacientes que realizaram colonoscopia entre Fevereiro de 2014 e Fevereiro de 2015. Analisou-se características físicas,

☆ Study conducted at the Clínica Pró-Vida, Serviço de Endoscopia e Colonoscopia, Tubarão, SC, Brazil.

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Dor abdominal
Sedação

histórico cirúrgico e colonoscopias prévias, indicação e condições do exame atual, dose de fentanil e midazolam e nível de dor. Nível de significância adotado: p <0,05. Utilizou-se teste Qui-quadrado para associação de variáveis categóricas, teste t de Student para comparação de médias e coeficiente de Spearman para correlação.

Resultados: Avaliou-se 566 mulheres e 391 homens, com média de idade de 54,81 anos e IMC médio de 27,064. Do total, 29 (3,0%) tiveram dor leve, 42 (4,4%) dor moderada e 18 (1,9%) dor intensa. As mulheres foram menos tolerantes (p = 0,011) e tiveram maior tempo de intubação cecal (p = 0,001). A duração média da colonoscopia e dose média de midazolam administrada foram maiores nos pacientes com dor (p = 0,001), (p < 0,001*). Entre os 39 pacientes com exame incompleto, 8 relataram dor (p = 0,049).

Conclusão: Gênero feminino e tempo de intubação prolongado tiveram associação significativa com dor abdominal durante a colonoscopia. Pacientes com desconforto tiveram uma taxa maior de insucesso no exame. Doses adicionais de midazolam administradas nos pacientes com dor não foram efetivas.

Introduction

Colonoscopy is the most accurate examination for the diagnosis and follow-up of colorectal diseases since this procedure allows a complete evaluation of mucosae of the whole large intestine and distal terminal ileum.[1] In order to obtain an effective, good quality examination, what is needed is to count on an experienced endoscopist, an adequate preparation of the colon, and patient cooperation under effective analgesia and sedation.[2–4]

In order to perform the endoscopic procedure, the patient is submitted to a moderate sedation of the "conscious" type, in which the condition of a response to verbal and tactile stimuli persists, and the cardiovascular and respiratory systems remain with their spontaneous functions.[5,6] Among the characteristics of sedation during colonoscopy, those with an immediate effect stand out; sedation should last just the time of examination and the procedure should provide a rapid recovery of the patient, causing little or no side effect.[6] In view of these premises, benzodiazepine agents (which reduce anxiety and sedate the patient) are routinely used in association with opioids (responsible for analgesia during the examination).[7] In addition, conscious sedation with benzodiazepines and opioids is a lower-cost alternative when compared to intravenous sedation performed with propofol, a hypnotic agent widely used to perform endoscopic procedures. This drug promotes deep sedation and brings a greater risk of side effects, for example, respiratory depression.[8]

Several factors are related to the greater probability of occurrence of pain during colonoscopy; such factors may be intrinsic to the patient or may be of an external order. Some of these factors are: very young or advanced age, female gender, low body mass index (BMI), previous abdominal or pelvic surgery, poor colonic preparation, insufficient sedation, the formation of loops, and high pressure of the air inflated to promote colonic distension.[9]

The aim of this study was to identify factors related to the patient and to the examination that could be associated with the occurrence of abdominal pain during colonoscopy, as well as an evaluation of the level of pain presented by the patients and the efficacy of conscious sedation.

Methods

The present study, of the observational type with a cross-sectional design, was approved by the Research Ethics Committee of the Universidade do Sul de Santa Catarina under opinion 875.131, CAAE 36089414.5.0000.5369, according to the norms of the Conselho Nacional de Saúde for research involving human beings, resolution 466/2012.

Patients who underwent elective colonoscopy between February 2014 and February 2015 by the Endoscopy and Colonoscopy Service of a private polyclinic from a city in the South of Brazil, which attends private health plans and consultations, were evaluated. The study started in February 2015 and ended in November 2015.

All patients who were attended on an outpatient basis and who underwent colonoscopy were included in this study. Patients who needed an emergency examination or who underwent deep sedation were excluded from the study.

All patients received a no-residue diet the day before the test, followed by a 12-hour fast. On the day of colonoscopy, colonic preparation was performed with a balanced solution of polyethylene glycol, 1000 mL PO, 4 h before the test, in combination with the antiemetic agent ondansetron, 8 mg PO.

For patient sedation and analgesia, participants received midazolam 0.1 mg/kg body weight and fentanyl 1 mcg/kg body weight intravenously immediately prior to the test. In patients over 70 years, the initial dose of midazolam administered was 0.05 mg/kg IV. The medications were administered simultaneously; a second dose of midazolam was given in cases where the patient developed pain (usually half the initial dose: 0.05 mg/kg body weight). Monitoring of vital signs was done with pulse oximetry, and where necessary, supplementation of oxygen under the mask was performed. Sedation and monitoring were performed by the four endoscopists participating in the study, all of them professionals with more than 10 years

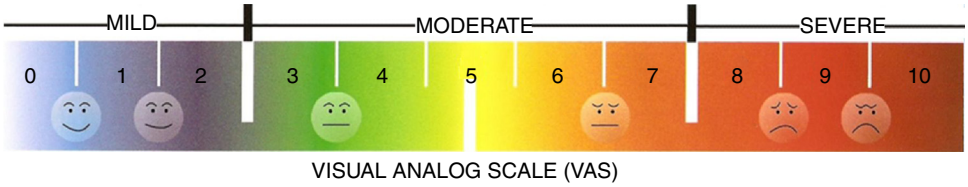

Fig. 1 – Visual Analog Scale (VAS) for pain.

of experience. Endoscopes Pentax® EPK 1000 series were used for the colonoscopic procedures.

The following data were collected by completing a Medical Records Card: age, gender, weight, height, BMI, indication of colonoscopy (diagnostic or therapeutic) and clinical indication (which was the disease to be investigated and/or treated), the occurrence of a previous pelvic surgery and/or prior colonoscopy, duration of examination (timed by the colonoscopy device itself), an appropriate (without stool, or with a minimum of solid stools and presenting only small amounts of clear liquid requiring suction) or inadequate (presence of solid or semi-solid intestinal contents not effectively eliminated) preparation of the colon,[10] a complete or an incomplete examination, the administered dose of fentanyl and midazolam, and the degree of abdominal pain informed (0: no pain, 1–2: mild pain [well tolerated], 3–7: moderate pain [bearable], or 8–10: severe pain [the worst pain possible]),[11] as measured by the Visual Analog Scale (VAS) for pain[12] (Fig. 1). VAS was applied after the procedure was performed, but only when the patient showed a complete recovery of consciousness. The patient was then discharged.

For this study, the Free and Informed Consent Term was not obtained; only one Justification for not using this document in cases of research carried out based on the use of clinical records was performed.

The data were recorded in a spreadsheet of the EpiInfo® Program version 3.5.4 and analyzed in the program SPSS® version 20.0. We adopted a significance level lower than 5% ($p < 0.05$). The variables were described using mean/standard deviation for numerical variables, and using relative frequency for categorical variables. For the association of categorical variables the Chi-squared test was used; for the comparison of means the Student's *t*-test was used; and for the correlation of variables the Spearman Correlation Coefficient was applied, with Rho (ρ) between −1 and +1.

Results

Of the total of 957 patients evaluated, 566 were women (59.1%) and 391 (40.9%) were men, with a mean age of 54.81 (20–87) years. The mean BMI for these patients was 27,064 (14.5–45.4).

Table 1 lists the characteristics of patients in terms of gender, age, BMI, number (%) of patients who had previously undergone a colonoscopy, number of those who had an appropriate colon preparation, and the number of patients who had a complete examination.

Table 2 lists the indications presented by those patients seen for the colonoscopy.

Table 1 – General aspects of patients undergoing colonoscopy under conscious sedation.

Characteristics	Number (%)
Gender	
Female	566 (59.1)
Male	391 (40.9)
Age (mean)	
<54.81 years	409 (42.7)
≥54.81 years	548 (57.3)
BMI	
<18.5	12 (1.3)
≥18.5 < 25.0	319 (33.3)
≥25.0 < 30.0	395 (41.3)
≥30.0	231 (24.1)
Previous colonoscopy	
Yes	216 (22.6)
No	741 (77.4)
Preparation of colon	
Suitable	941 (98.3)
Inapporpriate	16 (1.7)
Complete examination	
Yes	918 (95.9)
No	39 (4.1)

Table 2 – Indications for performing colonoscopy under conscious sedation.

Indication	Frequency (%)
Abdominal pain	268 (28)
Intestinal bleeding	191 (20)
Change in bowel habits	141 (14.7)
Monitoring	132 (13.8)
Family history of colorectal cancer/polyposis	46 (4.8)
Indication not mentioned	33 (3.4)
Anemia	31 (3.2)
Inflammatory bowel disease	30 (3.1)
Oncological follow-up	28 (2.9)
Post-polypectomy follow-up	24 (2.5)
Weight loss	13 (1.4)
Proctalgia/tenesmus	11 (1.1)
Endometriosis	03 (0.3)
Pre/Post-operative	02 (0.2)
Alteration of CEA level[a]	02 (0.2)
Portal hypertension	01 (0.1)
Alteration of digital rectal exam	01 (0.1)
Total	957 (100)

[a] Antígeno Carcinoembrionário/Carcinoembryonic antigen.

Table 3 – Abdominal pain level according to the gender of the patient undergoing colonoscopy under conscious sedation.

	Mild pain	Moderate pain	Intense pain	*p*-Value
Gender				
Female	21 (3.7%)	31 (5.5%)	15 (2.6%)	0.011
Male	08 (2%)	11 (2.8%)	03 (0.8%)	

Among the 957 patients, 868 (90.7%) did not present abdominal pain, while 89 (9.3%) reported some level of pain during the examination: 29 (3.0%) classified their pain as mild, 42 (4.4%) as moderate, and 18 (1.9%) as severe. The mean age of patients without abdominal complaints was 54.99 years, and the mean number of patients with discomfort was 53.06 years ($p = 0.216$). The mean BMI of patients without and with pain was 27,025 and 27,450, respectively ($p = 0.380$).

Regarding gender, men presented greater tolerance to colonoscopy *versus* women. Of the 391 male patients, 22 (5.6%) had some abdominal complaints regarding the procedure. Among the 566 women submitted to colonoscopy, pain was recorded by 67 (11.8%) patients ($p = 0.011$). Table 3 presents the abdominal pain levels, according to gender.

Among the 273 patients with some type of abdominal surgery, 29 (10.6%) reported pain and 60 (8.8%) of the 684 individuals who had never undergone abdominal surgery suffered discomfort during the examination ($p = 0.485$). Among the 394 individuals with a previous pelvic surgery, 45 (11.4%) showed intolerance to colonoscopy. Of the 563 patients without prior pelvic surgery, 44 (7.8%) showed abdominal pain ($p = 0.270$).

Regarding a previous colonoscopy, of the total of 216 patients who had previously performed an examination, 19 (8.8%) showed some intolerance during their last colonoscopy. Among patients who underwent colonoscopy for the first time, 70 (9.4%) complained of pain ($p = 0.340$).

Of the total of 935 patients diagnosed for colonoscopy, 86 (9.2%) reported some level of pain. Among the 22 patients with a therapeutic indication, 3 (13.5%) reported pain.

Of the 941 individuals with an appropriate colon preparation, 87 (9.2%) reported some complaint during the examination. On the other hand, among the 16 patients who did not have a good preparation of the gastrointestinal tract, only 2 (12.5%) reported pain ($p = 0.354$).

Of the total number of patients analyzed, 918 underwent a complete examination, 81 (8.8%) of whom were intolerant to colonoscopy. Among the 39 patients who could not complete the examination, 8 reported discomfort ($p = 0.049$).

Table 4 describes the pain levels found, according to the variables evaluated by the study.

The mean duration of colonoscopy in patients without abdominal complaints was 10.57 min and the mean number of patients with abdominal pain was 12.26 min ($p = 0.001$). We observed that the longer the insertion time of the colonoscopy device (which corresponds to the time elapsed from the introduction of the device to its arrival in the cecum), the higher the patients' pain level ($p = 0.036$). In women the intubation time was longer, with a mean time of 11.18 min, while in men the mean intubation time was 10.38 min ($p = 0.001$).

Regarding medications, 170 patients received extra doses of midazolam, in accordance with the abdominal complaints reported during the examination. The mean dose of midazolam administered to patients with discomfort was 5.67 mg, a level higher than the mean dose administered to patients without complaints, which was 5.16 mg ($p < 0.001$*). The mean dose of fentanyl given both in patients who reported no pain and in those who reported pain was 0.05 mg ($p = 0.716$).

Table 4 – Abdominal pain level of patients undergoing colonoscopy under conscious sedation according to the study variables evaluated.

	No pain	Mild pain	Moderate pain	Intense pain	*p*-Value
Abdominal surgery					0.485
Yes	244 (89.4%)	8 (2.9%)	13 (4.8%)	8 (2.9%)	
No	624 (91.2%)	21 (3.1%)	29 (4.2%)	10 (1.5%)	
Pelvic surgery					0.270
Yes	349 (88.6%)	15 (3.8%)	20 (5.1%)	10 (2.5%)	
No	519 (92.2%)	14 (2.5%)	22 (3.9%)	8 (1.4%)	
Previous colonoscopy					0.340
Yes	197 (91.2%)	3 (1.4%)	12 (5.6%)	4 (1.8%)	
No	671 (90.6%)	26 (3.5%)	30 (4%)	14 (1.9%)	
Indication					0.785
Diagnostic	849 (90.8%)	21 (3%)	48 (4.4%)	17 (1.8%)	
Therapeutic	19 (86.4%)	1 (4.5%)	1 (4.5%)	1 (4.5%)	
Preparation of colon					0.354
Suitable	854 (90.8%)	29 (3.1%)	40 (4.2%)	18 (1.9%)	
Inappropriate	14 (87.5%)	0 (0%)	2 (12.5%)	0 (0%)	
Complete examination					0.049
Yes	837 (91.2%)	27 (2.9%)	37 (4.0%)	17 (1.9%)	
No	31(79.5%)	2 (5.1%)	5 (12.8%)	1 (2.6%)	

Discussion

Colonoscopy is the most accurate diagnostic tool for colorectal diseases; however, in a considerable number of situations it can be an uncomfortable procedure for the patient, and this is one of the main causes of resistance to this procedure.

Many of the factors that contribute to abdominal discomfort during colonoscopy have already been identified and can be managed in order to increase the patient's tolerance to the examination. Appropriate guidelines on the procedure, a correct preparation of the colon, and a good sedation/analgesia for the reduction of anxiety, as well as the adoption of established techniques during the examination (such as changing the patient's position and the use of manual abdominal compression) are key measures for obtaining a less uncomfortable colonoscopy. However, some factors widely described in the literature are inherent to the patient and cannot be modified, such as anatomy, gender, age, BMI, and previous clinical and surgical history.[9]

There is currently no standardized method for evaluating abdominal pain during colonoscopy. In the present study, we chose to use VAS[12] because this is a procedure that is easy to apply and understand, especially after recovery from sedation. VAS ranges from zero to 10, where zero means no pain, 1–2 equals mild pain, 3–7 suggests moderate pain, and values between 8 and 10 correspond to severe pain. This evaluation is also accompanied by visual resources, with facial expressions that illustrate pain intensity. However, VAS is a one-dimensional method, which evaluates the intensity of pain only at a given moment, without taking into account any other aspect.[12]

The present study showed that, despite all the factors that may contribute to abdominal pain during colonoscopy, 868 (90.7%) of those 957 patients treated tolerated very well the examination, without presenting any abdominal complaints. Regarding those patients who reported discomfort, it was observed that women showed higher levels of abdominal pain, with a longer time of intubation of the colon. Regarding the technique, prolonged intubation times are also associated with higher levels of pain during colonoscopy. It was also observed that in patients who reported abdominal complaints, the total dose of midazolam administered was greater than the dose administered in patients who did not complain. The percentage of incomplete exams was also higher in patients who reported pain.

In this study, the association between female gender and abdominal pain was positively significant. Of the 67 (11.8%) women who reported pain, 21 described the episode as mild, 31 as moderate, and 15 as severe. In a number of published studies,[13–15] female gender has already been identified as an independent risk factor associated with abdominal pain during a colonoscopy procedure. In addition to higher levels of discomfort, generally in women the intubation times are longer and the percentage of incomplete exams is also higher. This is because the female colon, especially the transverse colon, is more elongated; besides, its abdominal musculature is weaker. This situation is a predisposing factor for the formation of loops in the endoscope, which hampers the examination.[16,17] Although this relationship was not detected in the present study, the female patients' surgical history showed a strong relationship with the presence of abdominal pain in previous studies.[18,19] The procedure of colonoscopy is also hampered by the formation of bands and adhesions, which are relatively common complications of abdominopelvic surgeries. In addition, the perception of pain differs between genders. One study[20] demonstrated that women have a different visceral pain memory *versus* that of men. After the patients were stimulated by a rectal distension to activate visceral pain, women demonstrated a more intense neural response to pain, which would explain the more severe abdominal pain in female subjects.

The insertion time of the colonoscope was automatically timed by the device used. The evaluated service has adopted this practice for more than 10 years, and this variable has been routinely recorded in the patient' medical record, in order to obtain a better control of the intubation time, since the prolonged insertion time of the device also contributes to abdominal discomfort.[17] The complete examination begins with the insertion of the device through the anus, passing through the rectum, sigmoid, descending colon, transverse colon, and ascending colon until it reaches the cecum.[2] In the present study, the mean time of intubation of patients who reported pain was 12.26 min, *i.e.* 1.29 min longer than the mean intubation time for patients without abdominal complaints. The pain level of the patients analyzed was directly proportional to the time of intubation of the colon: the longer the intubation time, the more severe the pain reported. In those women who participated in the present study, intubation time was longer (mean: 11.18 min), while in men the mean intubation time was 10.38 min. This result is similar to that of a study conducted in Xijing, China,[21] in which technical difficulty, prolonged intubation time, and consequently the pain level were higher in female patients.

A colonoscopy could be performed without any type of analgesia; but because this is an invasive examination and also because of the anxiety and fear of pain shown by many patients, most Endoscopy Services use some kind of conscious sedation through the association of benzodiazepines and opioids. Midazolam is a benzodiazepine agent that decreases anxiety and causes sedation of the patient; on the other hand, fentanyl is a short-acting opioid agent, responsible for analgesia during the examination. The action of these two drugs begins about 2 min after their intravenous administration and the patient's recovery is rapid,[7] with due respect to the precepts of conscious sedation. We observed that 170 patients received extra doses of midazolam in addition to the initial dose and that the mean dose administered in patients who experienced pain was significantly higher *versus* the dose administered in patients without complaints. While the group who reported abdominal pain received a mean dose of midazolam of 5.67 mg, patients without complaints received a mean dose of 5.16 mg. In most of these patients, the type of pain described was of the moderate type, which shows that, even with the recommended sedation and analgesia, the medication is often ineffective. A study[14] also demonstrated the lack of a relationship between the administration of midazolam and a decrease in abdominal symptoms or amnesia after the examination. Sedation and analgesia should be done in a more individualized way; therefore, the biophysical and

psychological profile of the patient should be previously investigated. In patients with a risk factor for discomfort during colonoscopy, for example, female gender, anxious patients, and patients with low BMI, the sedation could be more intense.

As limitations of the present study, we can highlight the absence of evaluation of the patient's social conditions and their anxious component and comorbidities, besides the medications used by the study participants – factors that may influence the perception of pain, increasing or decreasing its threshold. The method chosen for the evaluation of abdominal pain measures only its intensity, without taking into account other characteristics. Another limitation of the study is linked to the fact that colonoscopies were performed by more than one professional; therefore, differences in the procedure and in the description of data in the patients' medical record may have been generated. The time of application of VAS,[12] even after the full recovery of consciousness by the patient, may have caused a memory bias in some participants, considering that one of the possible side effects of midazolam is amnesia.[7] Because this is a cross-sectional study, it is not possible to determine the causality of the results.

Conclusion

Colonoscopy was a well-tolerated procedure when performed under conscious sedation, because despite the several factors that contribute to the appearance of abdominal pain, in the current study the number of patients with discomfort was low: only 9.3% of the total of 957 individuals evaluated reported pain. Of the total number of patients with abdominal pain during the examination, 3.0% reported mild pain, 4.4% had moderate pain, and only 1.9% reported severe pain – data confirming that, despite being uncomfortable, colonoscopy is a well-tolerated examination. A significant association between female gender and prolonged intubation time *versus* abdominal pain during colonoscopy was found, also with significance between these two variables. In relation to sedation and analgesia of the patients, it was possible to perceive that the association of fentanyl and midazolam promoted an adequate effect; however, the administration of safe extra doses of midazolam in patients who reported pain during the examination was not effective in improving pain.

Conflicts of interest

The authors declare no conflicts of interest.

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