

Observational Study

Unsedation colonoscopy can be not that painful: Evaluation of the effect of "Lamaze method of colonoscopy"

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Abstract

AIM: To evaluate the pain relieving effect of intervention with "Lamaze method of colonoscopy" in the process of colonoscopy.

METHODS: Five hundred and eighty-five patients underwent colonoscopy were randomly divided into three groups, Lamaze group, anesthetic group and control group. Two hundred and twenty-four patients of Lamaze group, the "Lamaze method of colonoscopy" were practiced in the process of colonoscopy. The Lamaze method of colonoscopy is modified from the Lamaze method of childbirth, which helped patients to relieve pain through effective breathing control. One hundred and seventy-eight patients in anesthetic group accepted sedation colonoscopy. For 183 patients in control group, colonoscopy was performed without any intervention. The satisfactory of colon cleaning, intestinal lesions, intubation time, success ratio, pain grading and complications were recorded. All data were statistically analyzed.

RESULTS: There were no significant differences at base line of the three groups ($P > 0.05$). Anesthetic group shows advantage in intubation time than the other two groups ($P < 0.05$). Lamaze group shows no advantage

in intubation time than that in control group ($P > 0.05$). The anesthetic group showed an apparent advantage in relieving pain ($P < 0.01$). Therefore, the "Lamaze method of colonoscopy" performed in colonoscopy could relieve pain effectively comparing with control group ($P < 0.05$). The patients in anesthetic group had the highest incidence of complications ($P < 0.05$).

CONCLUSION: The performance of the "Lamaze method of colonoscopy" in the process of colonoscopy could relieve patients' pain, minimize the incidence of complications, and is worthy promotion in clinical practice.

Key words: Colonoscopy; No sedation; Pain; Lamaze technique

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Core tip: Colonoscopy is used as primary investigation of colorectal neoplasm worldwide and is of great value in detection of colorectal cancer in early stage. Though, it is not widely accepted by patients due to the uncomfortable feeling, especially pain, during the process. Recent years, sedation colonoscopy has developed rapidly, it has led to a great promotion of the increase of the patients' acceptance of follow up examination. Therefore, complication of sedation colonoscopy such as bleeding, perforation, cardiopulmonary events happens once in a while. Some kinds of unsedation colonoscopy had been reported by several scholars. Music, warm water infusion is the two most often reported methods. Here we evaluated the effect of a new method of unsedation colonoscopy we called "the Lamaze method of colonoscopy" (Lamaze colonoscopy) modified from the Lamaze method of childbirth. Our study suggested that Lamaze colonoscopy is an effective way to relief pain during colonoscopy.

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INTRODUCTION

Colonoscopy plays a big part in primary investigation of colorectal diseases and screening for colorectal neoplasm^[1]. Some patients find it difficult to endure the procedure and refuse the follow up examination due to the pain during the procedure. In recent years, the administration of anesthetics during endoscopy introduced by some scholars has achieved extraordinary results^[2,3]. Meanwhile, some patients are susceptible to intestinal bleeding, bowel perforation and sedation-related cardiopulmonary adverse reaction due to the

loss of pain and throat reflex in anesthesia^[4,5].

"The Lamaze method of childbirth", developed by the French obstetrician Ferdinand Lamaze, has been used to decrease the level of maternal pain during natural birth since late 1950s, and plays a good role in the area^[6]. Pain during delivery is mainly caused by contraction of uterus. Colonoscopy requires gas infusion during the process, which can stretch the colon like a balloon if gas accumulated; the retroaction against stretching of colon may cause the pain and uncomfortable feeling^[7]. The mechanism of pain in childbirth and colonoscopy is similar. We created "The Lamaze method of colonoscopy" (Lamaze colonoscopy), which was modified from "The Lamaze method of childbirth", and practiced it in the process of colonoscopy. In our study, we verified the effect of Lamaze colonoscopy in reducing pain during colonoscopy.

MATERIALS AND METHODS

Patients

The study included consecutive patients underwent colonoscopy at endoscope center in our hospital from November 2012 to October 2014. The first 3 patients whom underwent sedation colonoscopy were enrolled in anesthetic group every Monday (Monday is our sedation colonoscopy day) except for holidays and those whom needed endoscopic treatment such as polypectomy. The first 3 patients whom underwent unsedation colonoscopy were enrolled in Lamaze group every Tuesday. Those whom needed endoscopic treatment were also ruled out. The first 3 patients whom underwent unsedation colonoscopy were enrolled in control group every Thursday. Those whom needed endoscopic treatment were excluded too. Patients with severe cardiopulmonary dysfunction, stroke, moderate to severe ascites, renal insufficiency, severe malnutrition and patients who were bed ridden were excluded from the study. All patients enrolled in the experiment had signed a consent form of colonoscopy examination. Patients in anesthetic group all signed a consent form of sedation. A total of 585 patients aged from 25-82 years old were enrolled. There were 224 patients in Lamaze group, 178 patients in anesthetic group and 185 patients in control group finally.

Examination

Bowel preparation was routinely accomplished with a 2 L electrolyte solution of polyethylene glycol (all patients were Chinese which belongs to yellow race). All patients were given supplemental oxygen intranasal (2 L/min). Heart rate, blood pressure and oxygen saturation were monitored throughout the procedure. Intravenous sedation-analgesics provided by the anesthetist in anesthetic group using a combination of fentanyl (0.5-1 $\mu\text{g/kg}$) and propofol (1.5-2 mg/kg) at the discretion of the endoscopists. Five doctors with at least 5-years-experience of performing colonoscopy performed the procedure. We began to insert

Table 1 Lamaze method of childbirth and the Lamaze method of colonoscopy

Lamaze method of childbirth ^[8,9]	<p>Thoracic breathing: Used in initial stage of uterus contraction, method: (1) completely relaxed; (2) eyes fixed on a certain point; (3) abdominal stay relaxed while breath in from nose, breath out from mouth; (4) a total of 6-9 times of inspiration and expiration per minute; and (5) practice 5 times a day, 60 s each time</p> <p>Shallow and slow accelerating breathing: Use when the uterus contracts each 2-4 min, cervix opened to 2-8 cm. Method: Step (1-3) is the same with thoracic breathing; and (4) accelerate the breathing when uterus contraction enhanced, slow it down while contraction relieves</p> <p>Shallow breathing: Use when the uterus contracts lasts for 60-90 s each 30-90 s, cervix opens to 8-10 cm Method: Step (1-2) is the same with thoracic breathing; (3) open mouth slightly to help breath (making a sound "hee-hee"); (4) breathing with nose, making noise from the larynx; (5) adjust the respiratory rate according to intensity of the contraction; (6) inspiration and expiration the same volume of air to avoid hyperventilation; and (7) 4-6 quickly continue inspiration and expiration then vigorously exhale, repeat until uterus contraction stops</p> <p>Close air-way and force movement: Used when cervix is full opened to 10 cm. Method: (1) legs apart, hands holding handrail of obstetric delivery bed; (2) vigorously aspirated and close air-way, force down; (3) head up slightly staring at navel with jaw neck down forward; and (4) hold breath for 20-30 s as far as possible, exhale and hold breath at once and force movement until uterus contraction stops</p> <p>Halitus movement: Used when cannot exert herself but cannot help to do it. Method: (1) mouth open, breathing quickly like gasping; and (2) the whole body is relaxed totally</p>
The Lamaze method of colonoscopy	<p>Thoracic breathing: Used when the procedure begins, method: (1) completely relaxed; (2) eyes fixed on a certain point; (3) abdominal stay relaxed while breath in from nose, breath out from mouth; and (4) a total of 6-9 times of inspiration and expiration per minute</p> <p>Shallow and slow accelerating breathing: Used when the scope is crossing the junction of sigmoid colon and descending colon from the sigmoid colon. Method: Step (1-3) is the same with thoracic breathing; and (4) accelerate the breathing when pain enhanced, slow it down while pain relieved</p> <p>Shallow breathing: Used when the scope is crossing the splenic flexure. Method: (1) completely relaxed; (2) eyes fixed on a certain point; (3) open mouth slightly to help breath (making a sound "hee-hee"); (4) breathing with nose, making noise from the larynx; (5) adjust the respiratory rate according to pain intensity; (6) inspire and expirate the same volume of air to avoid hyperventilation; and (7) 4-6 quick continue inspire and expirate then vigorously exhale, repeat until the pain disappear</p> <p>Close air-way and force movement: Used when the pain is moderate or severe. Method: (1) vigorously aspirated and close air-way, force down; and (2) hold breath for 20-30 s as far as possible, exhale and hold breath at once and force movement until pains relieves or disappeared</p>

colonoscope when patients fell asleep when their eyelash reflex disappeared, breathed calmly and muscle relaxed. Patients in Lamaze group were trained "the Lamaze method of colonoscopy" (detailed in Table 1), by the assigned nurse in endoscope center, 5-8 min before examination. It would be continuously practiced during the whole process of colonoscopy. The control group was given no intervention. The colonoscopy was categorized as completed when reached the cecum or the ileocolic anastomosis (in case of colonic surgery).

The endoscopists graded the quality of bowel preparation immediately after the procedure. Grade 1 as excellent with no stool visualized, Grade 2 as satisfactory with a small amount of stool visualized not blocking the view, Grade 3 as unsatisfactory with stool blocking the view and/or the passage of the colonoscope. He/she also evaluated the difficulty of insertion of the colonoscopy on a 100 mm visual analog scale, with 0 "very easy" and 100 "very difficult." All patients were asked to finish a questionnaire after the procedure in which they graded abdominal pain using a visual analogue scale (VAS) from 0 to 10 (0 as extremely acceptable/least severe, 10 as least acceptable/extremely severe). Patients marked the point on the line that they feel representing their pain grade. The VAS score is determined by measuring in millimeters from the left hand end of the line to the point that the patient marks.

Equipment and record

Age, gender, history of previous colonoscopy or previous

abdominal surgery was recorded before examination. The satisfaction of colon cleaning, intestinal lesions, intubation time, success ratio and complications were also recorded after examination.

Equipment and personnel

Bowel preparation was done in all patients before the examination using 2 L electrolyte solution of polyethylene glycol. Colonoscopy examinations were performed by an experienced endoscopist, using a video colonoscope (FUJINON). Technique assistance is performed by the same assistant when needed during examination. Patients were sedated in presence of an aesthetist. The endoscopists, assistant and nurse received the "Lamaze method of childbirth" course before trial. They were also trained to perform Lamaze colonoscopy using the method above.

Statistical analysis

SPSS 19.0 was used to process data. Quantitative data were reported as means \pm SD. One-way ANOVA was used to compare the age and intubation time of the three groups, least-significant difference is used to compare the differences within groups if difference is significant between groups and the test of homogeneity of variances shows $P < 0.05$. χ^2 test was used to compare gender, history of previous colonoscopy, previous abdominal surgery history, intestinal lesions, success ratio and complications. The satisfactory of colon cleaning and the pain grades of the three groups were

Table 2 Comparison on patients' age, gender, previous colonoscopy history and previous abdominal surgery history

	Age (yr)	Gender (male/female)	Previous colonoscopy(Y/N)	Previous abdominal surgery(Y/N)
Lamaze group	54.9 ± 9.9	118/106	88/136	43/181
Anesthetic group	55.6 ± 9.7	76/102	62/116	25/153
Control group	56.3 ± 8.6	98/85	66/117	31/152
P	0.197	0.07	0.633	0.403

Table 3 Comparison on the quality of bowel cleanliness

	Grade 1	Grade 2	Grade 3
Lamaze group	168	36	20
Anesthetic group	123	38	17
Control group	137	29	17

 $\chi^2 = 2.657$; $P = 0.617$.**Table 5** Comparison on patients' pain grading

	0-2	2-4	4-6	6-8	8-10
Lamaze group	47	96	77	3	1
Anesthetic group	142	35	1	0	0
Control group	6	7	71	88	11

 $\chi^2 = 506.579$; $P < 0.001$.**Table 4** Comparison on intestinal lesions

	Normal	Colon polyps	Colonic diverticulum	IBD	Colon cancer
Lamaze group	127	69	11	8	9
Anesthetic group	107	46	9	9	7
Control group	115	39	8	12	9

 $\chi^2 = 6.293$; $P = 0.614$. IBD: Inflammatory bowel disease.**Table 6** Further pair-wised comparison of patients' pain grading

	χ^2	P
Lamaze group <i>vs</i> control group	194.43	< 0.001
Lamaze group <i>vs</i> anesthetic group	150.92	< 0.001
Anesthetic group <i>vs</i> control group	310.68	< 0.001

Table 7 Comparison on intubation time

	Intubation time (min)
Lamaze group	9.21 ± 2.76
Anesthetic group	7.46 ± 2.93
Control group	9.45 ± 2.38

 $F = 29.696$, $P < 0.001$

compared with crosstable Pearson χ^2 test. Criterion for statistical significance was $P < 0.05$.

RESULTS

There were no significant differences between the three groups in age, gender, history of previous colonoscopy and history of abdominal surgery (Table 2).

According the endoscopists' finding, there was no difference in the quality of colon cleanliness and the intestinal lesions between the three groups (Tables 3 and 4).

The anesthetic group was much more successful in alleviating pain comparing to the other two groups, 57.3% (102/183) of patients feel completely no pain at all. The Lamaze group of colonoscopy is also more efficient in relieving pain than the control group (Tables 5 and 6).

The time required for intubation in anesthetic group is shorter than the other two groups. But the Lamaze group did not demonstrate its improvement compared with control group in this aspect (Tables 7 and 8).

Only 1 case failed to complete colonoscopy in anesthetic group, the patient was a thin women who had a previous history of cesarean section. That number in Lamaze group and control group are 7 and 12. But there is no significant difference between the three groups ($P = 0.06$) (Table 9).

The complication rates of both the Lamaze group and control group were lower and complication is milder than the anesthetic group. In anesthetic group, 5

patients incurred a decrease of pulse oxygen saturation ($< 90\%$), and 2 of the patients' heart rate drops to < 60 bpm, but all of them recovered immediately after effective intervention. There were no deaths in all three groups. The difference on complications of the three groups was significant ($P = 0.001$) (Table 10).

DISCUSSION

Colonoscopy is used as primary investigation of colorectal neoplasm worldwide and is of great value in detection of colorectal cancer in early stage^[1]. Though, it is not widely accepted by patients due to the uncomfortable feeling, especially pain, during the process. Recent years, sedation colonoscopy has developed rapidly, it has led to a great promotion of the increase of the patients' acceptance of follow up examination^[10-12]. Therefore, complication of sedation colonoscopy such as bleeding, perforation, cardiopulmonary events happens once in a while^[13]. Some kinds of unsedation colonoscopy had been reported by several scholars. Music, warm water infusion is the two most often reported methods^[14-16]. Here we evaluated the effect of a new method of unsedation colonoscopy we called "the Lamaze method

Table 8 Further pair-wised comparisons on intubation time

	Mean difference	Standard error	P	95%CI	
				Lower bound	Upper bound
Lamaze group <i>vs</i> control group	-0.243	0.269	0.368	-0.77	0.29
Lamaze group <i>vs</i> anesthetic group	1.75	0.271	< 0.01	1.22	2.28
Anesthetic group <i>vs</i> control group	-1.993	0.285	< 0.01	-2.55	-1.43

Table 9 Comparison on the quality of bowel cleanliness

	Success(Y/N)
Lamaze group	217/7
Anesthetic group	177/1
Control group	171/12

$\chi^2 = 9.918$, $P = 0.06$.

of colonoscopy" (Lamaze colonoscopy) modified from the Lamaze method of childbirth. The Lamaze method of childbirth could reduce pain by effective breathing and relaxation training. Acknowledge of pre-delivery and delivery rule could be applied to different stages and different grades of pain to intentionally control pain caused by contractions and other discomfort feeling. The pain was transferred since mothers focus on breathing control^[17]. In our study, we found Lamaze colonoscopy which modifying from "the Lamaze method of childbirth" according to the characteristics of colonoscopy. It was applied to the examination. The results indicated that the pain could be alleviated when use Lamaze colonoscopy. The mechanism of pain during colonoscopy is similar to that of childbirth. Both are caused by the spasm of smooth muscle. But the pain during colonoscopy is artificially caused by the insertion of endoscope. Also, severe pain is caused by the knotting of endoscope during operation. Lamaze colonoscopy may could maintain a relatively constant position of intestinal tract by deepening abdominal respiration, made colonoscope passed easily.

This study compared with the difference of anesthetic group, Lamaze group and control group from several aspects at the same time. Judging from the outcome, the applications of Lamaze colonoscopy did not shorten the time of intubation. The main reason of time increasing is due to the needs of helping patients get into the right step during operation. Considering from the success ratio, the anesthetic group got the highest success ratio, but it did not demonstrate a statistical difference. Too many factors working on the success ratio, research shows that age, gender, preparation of intestine, history of previous abdominal surgery, chronic colitis all contribute to it^[18,19]. There is no statistical difference among the three groups in age, gender, preparation of intestine, history of previous abdominal surgery and intestinal lesions.

The usage of sedatives in colonoscopy obviously improves the acceptance and tolerance of the examination in patients. However, some issues still cannot

Table 10 Comparison on complications

	Total	Bleeding	Perforation	Cardiopulmonary complications	Normal
Lamaze group	224	2	0	1	221
Anesthetic group	178	9	0	7	162
Control group	183	3	0	1	179

$\chi^2 = 18.043$; $P = 0.001$.

be avoided in anesthetic colonoscopy. Venous channel must be built before the exam, medical fee increased, recovery time was prolonged, complications such as cardiopulmonary events happens. The usage of sedatives can suppress respiratory directly, causing blood pressure drops. Severe allergic reaction can be life threatening, anesthetic colonoscopy causing aspiration pneumonia leads to Acute Respiratory Distress Syndrome (ARDS) finally caused death is reported in China^[20]. In this study, 2 subjects' heart rate decrease to < 60 beat per minute, 5 subjects' SPO₂ declined to less than 90% in anesthetic group, all those recovered after proper intervention. The incidence rate of complication especially severe complication is lower in Lamaze group and control group than that in anesthetic group. There is some deficiency in our study, the follow-up period is only one week, some delayed complication might be neglected. Some studies expended the follow-up period up to 30 d in accordance with complication^[5,21]. This is a single center study, multiple center study using the same standard may provide more evidences of the value of Lamaze colonoscopy.

To sum up, the application of "the Lamaze method of colonoscopy" in colonoscopy can ease the pain of patient effectively, enhance the tolerance of colonoscopy and avoid the adverse effect of anesthetics. This method is worthy of wide promotion, summary and improvement.

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COMMENTS

Background

Colonoscopy plays a big part in primary investigation of colorectal diseases and screening for colorectal neoplasm. Some patients find it difficult to endure the procedure and refuse the follow up examination due to the pain during the procedure. Sedation colonoscopy developed quickly in recent years, but the adverse reaction happens once in a while. Some unsedation colonoscopy had been used to relieve patients' pain.

Research frontiers

Some kinds of unsedation colonoscopy had been reported by several scholars. Music, warm water infusion is the two most often reported methods. They can all relief pain during unsedation colonoscopy, but not as effect as sedative colonoscopy. New method could be explored.

Innovations and breakthroughs

The use of Lamaze colonoscopy modified from Lamaze childbirth had never been reported. They explored the possibility of it, which is another way of pain-relief in patient undergoes colonoscopy.

Applications

The application of "the Lamaze method of colonoscopy" in colonoscopy can ease the pain of patient effectively, enhance the tolerance of colonoscopy.

Peer-review

The study is interesting and can be very useful in the pain-relief area of study.

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