

# **The Effect of Nasopharyngeal Ventilation on the Detection Rate of Colorectal Polyps in Two Hundred Middle-Aged and Elderly Overweight Patients**

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## **Abstract**

*Objective* To analyze the effect of nasopharyngeal ventilation on the detection rate of colorectal polyps in 200 middle-aged and elderly overweight patients during painless colonoscopy. *Methods* A total of 100 patients aged 50-75 years, body mass index (BMI)  $\geq 24$  or abdominal circumference  $\geq 85$  cm in males and  $\geq 82$  cm in females, without underlying diseases, who underwent nasopharyngeal ventilation during painless colonoscopy at physical examinations in our hospital from 2019 to 2020, were selected as the observation subjects (n = 100). The control sample area was determined by propensity matching according to the basic information characteristics presented by the observation group. 100 patients received mask oxygen at physical examinations were randomly selected in the control group (n = 100). *Results* The verification analysis after matching indicated that there were no intraoperative and postoperative adverse reactions, the number of intraoperative limb movements was less than 1, and the intestinal peristalsis intervals were more than 5s in both groups, without atropine intervention. Colonoscopy was performed by senior endoscopists with a withdrawal time of 6-8 min. When the intraoperative SpO<sub>2</sub> was lower than 90% but higher than 85%, the patients in the observation group underwent nasopharyngeal ventilation while those in the control group received mask oxygen assisted chin-lift. As a result, the SpO<sub>2</sub> was maintained higher than 90%. The detection rate of colorectal polyps was compared between the two

groups. *Conclusion* The detection rate of colorectal polyps in the observation group was higher than that in the control group, with a statistically significant difference. It may result from the reduction of ineffective respiratory movement and intraoperative intestinal peristalsis in middle-aged and elderly overweight patients.

### **Strengths and limitations of this study**

This study is a single-center propensity matching analysis after routine treatment. Because of the wide use of these two kinds of auxiliary ventilation methods in clinical, it does not involve infringing the interests of patients nor the relevant medical ethical restrictions. A multicenter expanded study can be further conducted to provide a reference for the analysis of the status of colorectal polyp detection rate and improvement measures in middle-aged and elderly obese groups in other medical centers, This will contribute to the prevention of colorectal cancer in this particular population.

**Keywords:** nasopharyngeal ventilation, gastrointestinal peristalsis, painless colonoscopy, colorectal polyps

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Colorectal cancer ranks third among all malignant tumors in the world. Colorectal polyps, especially colorectal adenomatous polyps are the most common type. At present, colorectal polyp is the main precancerous disease of colorectal cancer, accounting for about 85%-90%, thus it is considered closely associated with colorectal cancer<sup>[1]</sup>. In recent years, with the improvement of living standards and the development of endoscopic technology, the detection rate of colorectal polyps has been increasing year by year, of which the detection rate of adenomatous polyps is 18%-29%. It has been reported that the affected population is getting younger. Therefore, multiple consensus on the prevention of colorectal cancer recommends that residents aged 50-74 years all belong to the screening population for colorectal cancer<sup>[2]</sup>, and if gastrointestinal polyps are confirmed, they should be treated in time and followed up regularly<sup>[3]</sup>.

Colonoscopy is an important method for the diagnosis and treatment of colorectal diseases. Nowadays, the development and popularization of

painless endoscopic technology make colonoscopy more acceptable to patients and create better diagnosis and treatment conditions for endoscopists<sup>[4]</sup>.

Overweight patients, namely people with body mass index (BMI)  $\geq 24$  or abdominal circumference  $\geq 85$  cm in males and  $\geq 82$  cm in females<sup>[5]</sup>, have increased difficulty in colonoscopy and intraoperative anesthesia due to their abdominal circumference, intestinal physiological anatomy, and physiological and pathological changes in the respiratory and circulatory systems. Painless colonoscopy is often assisted by pressing the abdomen and adjusting position in clinical practice. Besides, anesthesiologists need to strengthen the monitoring of their vital signs during surgery, and if necessary, improve the ventilation and saturation of obese patients by indwelling nasopharyngeal ventilation tube or conducting chin-lift combined with mask oxygen, to effectively reduce the risk of anesthesia in such patients<sup>[6]</sup>. However, there is no relevant report on the relationship between the indwelling of nasopharyngeal ventilation tube and the detection rate of colorectal polyps during colonoscopy in middle-aged and elderly overweight patients. Herein, we perform a correlation analysis after propensity matching for colonoscopy patients who met the specific observation conditions in 2019 in our hospital. The outcome was reported as follows.

## **1. Materials and Methods**

### **Clinical data**

#### *Approval and consent*

The project was approved by the Ethics Committee of the Clinical Research Project of Wenzhou Integrated Traditional Chinese and Western Medicine hospital (approve number WZZXY2018-012). Patient identity remained anonymous, and the requirement for data uses informed consent was waived due to the observational nature of the study. All the subjects routinely signed the informed consent of [gastrointestinal endoscopy](#), anesthesia risk information and airway management consent.

#### *Inclusion criteria*

The patients included in the observation group ( $n = 100$ ) were selected from those who underwent colonoscopy at physical examinations in our hospital in 2019 and met the following conditions: (i) SpO<sub>2</sub> reduced lower than 90% after continuous anesthesia administration but still higher than 85%, (ii) BMI  $\geq 24$  or abdominal circumference  $\geq 85$  cm in males and  $\geq 82$  cm in females, (iii) patients without underlying diseases such as cardiopulmonary, endocrine, metabolic diseases, and malignant tumors, (iv) patients received nasopharyngeal ventilation during painless colonoscopy at examinations were selected as the observation group ( $n = 100$ ). The control sample areas were propensity-matched according to the characteristics of the observation group such as gender, age, BMI,

abdominal circumference, and underlying diseases, from which 100 patients who received chin-lift combined with mask oxygen treatment at examinations were randomly selected in the control group (n = 100).

#### *Exclusion criteria*

Patients with severe cardiopulmonary dysfunction, diabetes, thyroid dysfunction, arrhythmia, allergy to intravenous anesthetic drugs, recent cough, excessive sputum, irritable dry cough, acute pharyngitis, and pharyngeal muscle dysfunction were excluded.

#### **Operating procedures**

Electronic colonoscope (OLYMPUS, CF-HQ290) was operated by senior endoscopists with a withdrawal time of 6-8 mins in both groups. All patients were treated with midazolam combined with propofol intravenous anesthesia. Preoperative routine mask nitrogen-depleted oxygen was conducted followed by 3 L/min nasal catheter oxygen inhalation. When the intraoperative SpO<sub>2</sub> was lower than 90% but higher than 85%, nasopharyngeal ventilation was carried out in the observation group while mask oxygen assisted chin-lift was performed in the control group. As a result, the SpO<sub>2</sub> was controlled higher than 90% in both groups. The SpO<sub>2</sub> concentrations before oxygen inhalation and before anesthesia administration, the lowest blood oxygen level during the operation, intervention methods, intraoperative adverse reactions, intestinal peristalsis interval time, colonoscopy operation time, patient's awake time, postoperative discomfort, and some other conditions were recorded. The detection rate of colorectal polyps in the two groups was analyzed.

#### **Statistical processing**

Statistical analysis was performed using SPSS 19.0 statistical software. Measurement data were expressed as mean  $\pm$  standard deviation. The independent sample t-test was conducted, and the enumeration data were compared using the  $\chi^2$  test.  $P < 0.05$  was considered statistically significant.

## **2. Results**

Colonoscopy was performed in the 200 cases, during which the discovered polyps were submitted as biopsy specimens for examination. The patients in the two groups had no intraoperative or postoperative adverse reactions. The number of intraoperative limb movements was less than 1 and the intestinal peristalsis interval was more than 5 s in both groups, without atropine intervention. The Boston Bowel Preparation Scale (BBPS) was used for bowel preparation, with a total score higher than 6 and no arbitrary intestinal segment score lower than 2<sup>[7]</sup>.

Our analysis showed the following general data characteristics in both groups. The observation group: 100 cases, mean age:  $9.7 \pm 6.2$  years, 66 males and 34 females. The control group: 100 cases, mean age:  $59.6 \pm 6.7$  years, 69 males and 31 females. No significant difference was observed

in the abdominal perimeter and BMI between the two groups ( $P > 0.05$ ). Besides, there was no significant difference in the history of colorectal polyps, family history of gastrointestinal tumors, sleep hypopnea syndrome, and abdominal surgery between the two groups ( $P > 0.05$ ). These results suggest that the propensity matching observation was successful. See Table 1 for details.

Table 1 Comparison of general data between the two groups

Group	Number of cases	Age	Gender	Abdominal circumference	BMI	History of colorectal polyps (cases)	Family history of gastrointestinal cancer (cases)	Sleep hypopnea syndrome (cases)	History of abdominal surgery (cases)
Observation group	100	59.7±6.2	66 males and 34 females	82.9±2.2 cm	25.8±2.2	28	5	20	5
Control group	100	59.6±6.7	69 males and 31 females	83.0±1.7 cm	25.6±2.0	30	2	15	6
P		> 0.05	> 0.05	> 0.05	> 0.05	> 0.05	> 0.05	> 0.05	> 0.05

Through the analysis, we found that the polyp detection rate in the observation group was significantly higher than that in the control group, and the intestinal wall contraction interval recorded by intraoperative observation was longer than that in the control group. The differences were statistically significant ( $P < 0.05$ ). See Table 2 for details.

Table 2 Comparison of the detection rate of colorectal polyps between the two groups

Group	Number of cases	Intestinal wall contraction interval	Detection rate of colorectal polyps
Observation group	100	8.54±1.47	35%
Control group	100	6.79±1.12	14%

X <sup>2</sup> /T	9.315	11.921
P	< 0.05	< 0.05

### 3. Discussion

Colonoscopy is currently the most important screening and follow-up tool for colorectal polyps and colorectal tumors. Available data show that a negative high-quality colonoscopy result correlates with reduced morbidity and mortality from colorectal malignancies<sup>[1]</sup>. At present, the detection rate of colorectal polyps is higher than 30% and the detection rate of adenomatous polyps is higher than 20% in high-level endoscopic diagnosis and treatment centers<sup>[8]</sup>. In our hospital, the detection rate of colorectal polyps in endoscopic patients is 30%-40% and the detection rate of adenomatous polyps is 19%-23%. However, we found in our previous analysis that the detection rate of colonic polyps in middle-aged and elderly obese patients in our hospital is only 17%-24%, while there is no study to systematically investigate and analyze the detection rate of colorectal polyps and adenomatous polyps in this special group. With the improvement of national living standards and dietary pattern changes, the problem of overweight and obesity is becoming more and more prominent, and the proportion of this part of the population is increasing year by year. Current studies have shown that overweight, abdominal obesity, and middle-aged and elderly people are all high-risk factors of colonic polyps<sup>[9]</sup>. Therefore, high-quality colonoscopy is important to improve the screening of colorectal tumors.

The factors affecting the results of colonoscopy are currently considered to mainly include the aspects such as the cooperation of patients, patient size, history of abdominal surgery, intensity of intestinal peristalsis, anatomical structure of digestive tract, technical level of operators, operating equipment, and preoperative bowel preparation.<sup>[10]</sup> The development and popularization of painless endoscopic technology have improved the comfort during colonoscopy, improved the examination tolerance of patients with overweight, obesity, hypertension, mental stress, intestinal adhesions after abdominal surgery, greatly improved the compliance of examiners, and reduced the missed diagnosis rate during colonoscopy<sup>[11]</sup>.

The two groups of subjects included in this study showed a decrease in SpO<sub>2</sub> after the administration of anesthesia, for the following main reasons. (i) The observed subjects were overweight and abdominal obese groups, with excessive deposition of subcutaneous fat or fat around the airway, which could lead to decreased upper airway compliance compared with the general population, poor function of the airway and surrounding dilator muscles, which predisposes to changes in upper airway morphology and adverse reactions of upper airway closure and

stenosis during anesthesia<sup>[6]</sup>. (ii) Respiratory obstruction due to tongue hypertrophy and excessive retropulsion of the posterior heel exists in these patients<sup>[12]</sup>. (iii) The patients have a large body surface area, large abdominal circumference, and huge discomfort during colonoscopy. In order to reduce intraoperative adverse limb movement, it is necessary to appropriately increase the dose of administration because the risk of respiratory depression is higher than that of common patients<sup>[12-13]</sup>.

We connected the oxygen tube to oxygen supply through the nasopharyngeal ventilation tube or used chin-lift to open the airway combined with mask oxygen to improve the ventilation of patients, which effectively prevented the reduction of SpO<sub>2</sub> in overweight patients and ensured the successful completion of colonoscopy.

Through the analysis of various observation indicators, we found that the detection rate of colorectal polyps in the middle-aged and elderly overweight patients in the observation group was higher than that in the control group, which may result from the reduction of intestinal peristalsis.

Clinically, due to the presence of upper airway obstruction, frequent movement and work of respiratory muscles such as the diaphragm and rectus muscle during anesthesia make ineffective respiratory movement too frequent, thus increasing intestinal peristalsis<sup>[14]</sup>, making it difficult for the operator to withdraw the endoscope and observe the lesion. At present, the effect of inhibiting gastrointestinal peristalsis with drugs used in painless endoscopic anesthesia is not much satisfactory. If the dose of anesthetic drugs is blindly increased, it not only cannot effectively relieve gastrointestinal peristalsis but also brings adverse reactions of the respiratory and circulatory system to patients. The risk is even higher for overweight and obese patients<sup>[15]</sup>.

Nowadays, the intraoperative intestinal peristalsis is clinically assessed mainly by observing the interval time between two intestinal wall contractions by colonoscopy video, which is mild for >10 s, moderate for 5-10 s, and strong intestinal peristalsis for <5 s<sup>[16]</sup>. Atropine was used in patients with moderate and severe intestinal wall peristalsis to inhibit excessive gastrointestinal peristalsis during colonoscopy because it blocks M cholinergic receptors. However, since it blocks M receptors in systemic organs, relaxes visceral smooth muscle, and relieves vagus nerve inhibition of the heart and other pharmacological characteristics, there are side effects such as increased intraocular pressure, eye muscle accommodation paralysis, accelerated heart rate, difficult urination, and urinary retention. It has also been reported to increase the risk of delayed bleeding after colorectal polypectomy<sup>[17]</sup>.

Therefore, in middle-aged and elderly patients, it should be used with caution in patients with high-incidence diseases such as prostatic hypertrophy and glaucoma. It is recommended to be applied after

evaluating the advantages and disadvantages in patients with intestinal peristalsis interval  $\leq 5$  s<sup>[11, 18]</sup> but not recommended in patients with mild to moderate intestinal peristalsis intensity<sup>[13, 15]</sup>.

Compared with chin-lift combined with mask oxygen inhalation, indwelling nasopharyngeal ventilation tube can more effectively improve the obstruction of the upper airway, reduce the ineffective work of respiratory muscle, reduce the ineffective respiratory movement, slow down the diaphragmatic movement and rectus abdominis activity, to effectively reduce the gastrointestinal peristalsis of patients while ensuring the saturation of patients. Therefore, the colorectal lesions are easy to expose without significant side effects.

Through this study, we concluded that indwelling nasopharyngeal ventilation tube can effectively reduce intraoperative intestinal wall peristalsis in middle-aged and elderly overweight groups, thereby improving the detection rate of colorectal polyps. This study is a single-center propensity matching analysis after routine treatment. Because of the wide use of these two kinds of auxiliary ventilation methods in clinical, it does not involve infringing the interests of patients nor the relevant medical ethical restrictions. A multicenter expanded study can be further conducted to provide a reference for the analysis of the status of colorectal polyp detection rate and improvement measures in middle-aged and elderly obese groups in other medical centers, This will contribute to the prevention of colorectal cancer in this particular population.

Data Availability Statement : The data, which includes many patients' private information, has been uploaded as a supplementary file (edited only)<https://doi.org/10.5061/dryad.sn02v6x2w>Citation.

#### 4. Reference

1. Bray F, Ferlay J, Soerjomataram I, Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries [J]. CA: A Cancer J Clin, 2018, 68(6): 394-424.
2. Early Diagnosis and Treatment group, Oncology Branch, Chinese Medical Association Natl Med J China , June 9, 2020, 100 ( 22 ) 1691-1698.
3. Tanaka S, Saitoh Y, Matsuda T. Evidence-based clinical practice guidelines for management of colorectal polyps[J]. J Gastroenterol, 2015, 50(3): 252-260
4. Cohen LB Delegge MH Aisenberg J. AGA Institute review of endoscopies edation [J].Gastroenterology. 2007.133 (2):675 - 701.



5. Philip B. Maffetone<sup>1</sup>. Overfat Adults and Children in Developed Countries: The Public Health Importance of Identifying Excess Body Fat. *Front. Public Health*, 2017 Jul 24;5:190.
6. ASGE Standards of Practice Committee , Early DS , Lightdale J R . Guidelines for sedation and anesthesia in GI endoscopy. *Gastrointest Endosc* , 2018 , 87( 2) : 327-337 .
7. Kaminski MF, Thomas-Gibson S, Bugajski M. Performance measures for lower gastrointestinal endoscopy: a European Society of Gastrointestinal Endoscopy (ESGE) quality improvement initiative[J]. *Endoscopy*, 2017, 49(4):378-397
8. Rembacken B. *Endoscopy*. 2012, 12; 44 (10): 957-68.
9. H Jayasekara, R. J. Macinnis, R Room. Long-Term Alcohol Consumption and Breast, Upper Aero-Digestive Tract and Colorectal Cancer Risk: A Systematic Review and Meta-Analysis. *Alcohol and Alcoholism* 2016, 51(3).
10. Faiss S. The missed colorectal cancer problem[J]. *Digestive Diseases*, 2011, 29(Suppl. 1): 60-63.
11. Chinese Society of Digestive endoscopy, Chinese Society of Anesthesiology. *Chinese journal of practical internal medicine*. 2014,34(1):32-36.
12. Sivasankar C, Chitra MD, Schlichter M. Awake craniotomy : a new airway approach [J]. *Anesth Analg*, 2016, 122(2) : 509-511.
13. Chinese Society of Digestive Endoscopy, Chinese Society of Anesthesiology, Chinese Medical Association. Consensus opinions of Sedative anesthesiologists in The Diagnosis and Treatment of digestive endoscopy in China [J]. *Chinese Journal of Practical Internal Medicine*, 2014, 34(8): 757-763.
14. Apfelbaum JL, Connis RT, Nickinovich DG. Practice advisory for preanesthesia evaluation: an update report by the American Society of Anesthesiology, 2012, 116 (3): 522-538.
15. Randerath W, Verbraecken J, Andreas S, Arzt M, Bloch KE, Brack T, Defifinition, discrimination, diagnosis and treatment of central breathing disturbances during sleep. *Eur Respir J* 2017;49:1600959.
16. Xu Jia, MIAO Xiaoyong, Cao Jianping. Clinical observation of scopolamine inhibition of intestinal peristalsis in painless colonoscopy [J]. *Chinese Journal of Clinicians*, 2015, 9 (7): 1248-1249.
17. Buddingh KT, Herngreen T, Haringsma J. Location in the right hemi-colon is an independent risk factor for delayed post-polypectomy hemorrhage: a multi-center case-control study[J]. *Am J Gastroenterol*, 2011, 106(6): 1119-1124.
18. Beyazit Y, Koklu S, Ozturk ZA. Inclusion of a spasmolytic in bowel cleansing: a prospective randomized study. *Gastroenterol Nurs* 2011;34:352–355.