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## Should antibiotics be administered after endoscopic mucosal resection in patients with colon polyps?

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**Background/aim:** Endoscopic mucosal resection (EMR) is widely used for treating gastrointestinal polypoid lesions. However, it is currently unclear whether antibiotic administration is necessary after EMR of colon polyps to prevent infection. We aimed to assess whether antibiotic administration is essential in such conditions.

**Materials and methods:** In total, 115 patients with colon polyps were randomly assigned to 3 groups based on the treatment given after EMR: Group A, no antibiotics treatment after EMR (n = 38); Group B, administration of levofloxacin after EMR (n = 38); and Group C, administration of ceftazidime after EMR (n = 39).

**Results:** The colon polyps were completely removed by EMR in all cases without any serious complications. Although infection developed in 2 cases in Group A, it was resolved via levofloxacin injection over 3 days; infection did not develop in any cases in Group B and C. The postoperative infection rate was not significantly different among Groups A, B, and C. After 6 months, we noted that the wound surface had properly healed and there was no relapse of colon polyps in any patients.

**Conclusion:** The use of antibiotics after EMR of colon polyps to prevent infection did not affect the prognosis of patients.

**Key words:** Endoscopic mucosal resection, colon polyps, antibiotics

### 1. Introduction

Gastrointestinal polyps are protruded masses formed by focal hyperplasia of the gastrointestinal mucosa. Based on the site of occurrence, gastrointestinal polyps are classified as esophageal polyps, gastric polyps, duodenal polyps, small bowel polyps, and colon and rectum polyps. Thus, any protruding lesions in the colon can be termed as colon polyps.

Colon polyps can cause abdominal discomfort, abdominal distension, abdominal pain, constipation, and diarrhea, among other symptoms. In some cases, colon polyps may lead to bleeding, resulting in melena or bloody stool (1,2). If this condition is not promptly treated, it could lead to cancer development. The early identification and removal of these lesions is highly effective for reducing morbidity and mortality related to colorectal carcinoma (3).

The detection rate of colon polyps has significantly improved after the recent advancements in endoscopic techniques. Endoscopic treatment of this condition is currently preferred to traditional surgical treatment, as

it is associated with fewer side effects and complications (4). Colonoscopic polypectomy reduces the incidence of colorectal cancer and mortality (5).

At present, endoscopic mucosal resection (EMR) is widely used to treat polypoid lesions of the digestive tract, considering the minimally invasive nature, minimal trauma, fewer complications, and reliable clinical efficacy (6–8). However, it is currently unclear whether antibiotic administration is necessary after EMR of colon polyps to prevent the development of infection.

In the present study, we aimed to evaluate whether the postoperative use of antibiotics has any effect on the prognosis of patients undergoing EMR for colon polyps.

### 2. Materials and methods

#### 2.1. General information

This prospective study was approved by the institutional ethics committee of Xintai Municipal People's Hospital. Informed consent was obtained from all the participants before the start of the study.

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We used PASS software to calculate the sample size and consulted an epidemiological expert to confirm the suitability of the sample size. Accordingly, we enrolled a total of 115 patients who underwent colonoscopy and pathological biopsy of colon polyps at the endoscopy center of Xintai Municipal People's Hospital from January 2013 to August 2013.

The inclusion criteria were a finding of benign polyps on pathological biopsy and an age between 18 and 75 years. The exclusion criteria were as follows: colon polyp diameter >2.0 cm; presence of a malignant polyp; presence of severe organ disease including that of the heart, liver, kidneys, lungs, etc.; allergy to levofloxacin and/or cephalosporin; presence of coagulation disorders or use of aspirin and other anticoagulant drugs within 1 week prior to presentation; presence of a cardiac pacemaker; presence of pregnancy; and nursing mothers. The 115 patients were randomly assigned in chronological order into Group A (no antibiotic administration after EMR), Group B (administration of levofloxacin after EMR), and Group C (administration of ceftazidime injection after EMR). Age and sex were comparable among the 3 groups (Table 1).

We used a random number-table method for the randomization of patients into groups. The randomization process was as follows: 1) patients were first numbered according to the registration order; 2) a random number was selected from the random number table; 3) the random numbers were then sorted from the smallest to the largest; and 4) the patients corresponding to the first 38 random numbers were assigned to the first group, those corresponding to the next 39 to 76 random numbers were assigned to the second group, and the remaining were assigned to the third group.

In the present study, we only included protruded colon polyps, without any flat polyps with a polyp uplift height of <2 mm or laterally spreading polyps. Accordingly, the patients were homogeneously distributed among the groups.

## 2.2. Equipment and medication

The equipment and medication used included electronic colonoscopy (CF-Q260 AI, Olympus, Japan); a disposable EMR snare (SD-221U-25, Olympus); injection needle (NM-200L-0423, Olympus); mucosal injection of adrenaline saline solution at 1:10,000; polyethylene glycol

electrolyte powder (Hengkang Pharmaceutical, Shangrao, China); levofloxacin (levofloxacin for injection, Yangtze River Pharmaceutical, Taizhou, China); and ceftazidime (ceftazidime for injection, Zhijun Pharmaceutical, Shenzhen, China).

## 2.3. Operating methods

All the patients underwent routine blood examinations (evaluating clotting time and bleeding time) and electrocardiography before the surgery to determine the patient's general condition. The patients were requested to fast for 6 h before the operation. Moreover, they were asked to consume 2000 mL of polyethylene glycol electrolyte solution 3 h before the operation; they initially consumed 600–800 mL and then drank 250 mL every 15 min. The rectum and colon need to be completely devoid of stool prior to the procedure. Thereafter, the polyps were detected on colonoscopy. After selecting 1–4 entry points at the edge of the basilar part of the polyps, a 1:10,000 adrenaline saline solution was injected to separate the polyp from the submucosal layer, i.e. to achieve a positive lifting sign. The colon polyps were held using a colorectal polypus snare and cut using high-frequency electric coagulation and/or electric cutting. Fractional resection was used to treat larger colon polyps. The resected specimens were stored for pathological examination. After resection of the polyp via EMR, the wound was monitored for approximately 1–2 min. Based on the condition, the wound was treated with electric coagulation and/or hemostatic clipping to prevent bleeding.

Two endoscopists, who were attending physicians at the institute, performed the colonoscopies.

## 2.4. Postoperative treatment

All 3 groups underwent treatment, involving fasting, proton pump inhibitor therapy, fluid infusion, and intravenous hemostatic medications, on the same day after EMR. In addition, Group B patients were treated with levofloxacin injection for 3 days (0.4 g qd), whereas Group C patients were treated with ceftazidime injection for 3 days (1.0 g q12 h). Thereafter, a full liquid diet was ensured for 2 days, flowed by a semiliquid diet for 3 days.

## 2.5. Follow-up

All 115 patients underwent follow-up, and the follow-up duration was 6 months. Six months after the surgery, all

**Table 1.** Comparison of demographic data between the groups.

Groups	Cases	Male	Female	Age (years)
Group A	38	22	16	47.0 ± 12.5
Group B	38	20	18	46.2 ± 13.4
Group C	39	19	20	48.1 ± 14.1

patients underwent colonoscopy to determine the wound healing condition.

### 2.6. Statistical analysis

SPSS 17.0 was used for statistical analysis. The postoperative infection rate among the groups was compared using the chi-square test.  $P < 0.05$  was considered to indicate statistical significance.

### 3. Results

Among the 115 patients, 145 colon polyps were completely removed by EMR. None of the patients showed massive hemorrhage or perforation. In some cases, a small amount of bleeding was observed, which was successfully treated by clamping with metal clips or by electric coagulation.

The findings of the preoperative pathological examination indicating colon polyps were consistent with the findings observed on the postoperative pathological examination of the resected specimens. Two patients in Group A developed infection and exhibited fever, leukocytosis, and/or a high neutrophil ratio; however, these patients were successfully treated with levofloxacin injection (0.4 g qd) over 3 days. Infection was not observed in the other groups, and no case of delayed bleeding was observed as well. The postoperative infection rate did not significantly differ between Group A and Group B ( $P = 0.493$ ). Moreover, the postoperative infection rate did not significantly differ between Group A and Group C ( $P = 0.24$ ) (Table 2).

At 6 months after the surgery, all the patients showed good wound healing, without any relapse of colon polyps.

### 4. Discussion

Colon polyp is a common digestive system disease, with a high clinical detection rate (9,10). Colorectal polyps are pathologically classified as neoplastic or nonneoplastic polyps (11). Nonneoplastic polyps include inflammatory polyps, hyperplastic polyps, and others, whereas neoplastic polyps primarily include adenomatous polyps. Adenomatous polyps are associated with a high likelihood of colorectal cancer and have been considered

as precancerous lesions of colorectal cancer (12). Hence, timely identification and treatment of colonic polyps are essential for preventing colorectal cancer. Surgery was the traditional method for colon polyp resection. However, following the advancements in endoscopic techniques, the endoscopic treatment of colon polyps in an effective and safe manner is now widely recognized.

The advantages of the endoscopic treatment of colon polyps include minimal trauma, simplicity of the methodology, and rapid recovery. Hence, endoscopic treatment has become the first choice for the treatment of colon polyps. At present, the methods for the endoscopic treatment of colon polyps primarily include endoscopic argon plasma coagulation, endoscopic high-frequency electric cutting, and endoscopic mucosal resection, among others (13,14).

EMR is another effective method for the endoscopic treatment of gastrointestinal lesions. However, EMR is typically used for the removal of lesions smaller than 2 cm or for the piecemeal removal of larger lesions confined to the superficial layers (mucosa and submucosa) of the digestive tract (15). EMR requires the use of standard endoscopic accessories such as an injection needle, snare, needle knife, medical grasper, and others. The lesions and muscularis propria layer can be sufficiently separated through the injection of normal saline or other solutions into the submucosal layer. Thereafter, several methods can be used to remove the mucous membrane of the lesions (16).

EMR is commonly used to treat early gastrointestinal carcinoma without lymph node metastasis and sessile polyps. In a metaanalysis and systematic review study, Puli et al. concluded that EMR is effective for the resection of large colorectal polyps and offers an alternative to surgery (17). The complications of EMR primarily include bleeding and perforation (18). As the indications for the procedure were strictly followed and the procedure was carefully performed, none of the patients developed serious complications such as massive hemorrhage or perforation.

**Table 2.** Comparison of the postoperative infection rate among the 3 groups.

Groups	No. of cases of postoperative infection	Infection rate	P
Group A	2	0.026	0.493
Group B	0	0	
Group A	2	0.026	0.24
Group C	0	0	

Group A vs. Group B:  $P > 0.05$ ; Group A vs. Group C:  $P > 0.05$ .

Considering the large amount of bacteria in the intestine, the ASGE guidelines do not clearly state whether antibiotics should be administered after EMR in patients with colon polyps. Based on our observation and a review of the relevant literature, several physicians habitually prescribe antibiotics to prevent postoperative infection. However, the abuse of antibiotics is currently a major problem worldwide, and this has led to more severe antibiotic resistance (19). There is a concerning gap between the current worldwide spread of multiresistant bacteria and the lack of new antimicrobial drugs (20).

Hence, we ask the question: is antibiotic administration essential after EMR of colon polyps? Quinolone drugs and cephalosporin antibiotics are widely used in hospitals to prevent intestinal infection. Therefore, we conducted this study to clarify whether antibiotics should be administered after EMR in patients with colon polyps. However, in the present study, we did not observe any significant difference in the postoperative infection rate among patients who were not administered antibiotics after EMR and patients who were administered two different types of antibiotics after EMR (levofloxacin and ceftazidime). Although 2 patients in Group A developed infection, we think that the etiology of the infection may be electric coagulation syndrome after colon polyp removal in those patients. Thus, the administration of antibiotics had no effect on the prognosis of patients undergoing EMR for colon polyps. In contrast to that noted during conventional surgical operations, the operation time is short and the incision made is small in EMR. In previous work, we observed that the preoperative and postoperative use of antibiotics did not affect the prognosis of patients with EMR. Therefore, in the present study, we used antibiotics after the operation. Hence, to reduce antibiotic resistance and medical costs, we recommend that antibiotics should not be administered in such cases, unless massive hemorrhage or postoperative and other serious complications are noted. If complications such as perforation develop after EMR of colon polyps, a decision regarding antibiotic administration should be made based on the patient's condition.

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If perforation occurs during EMR, a titanium clip can be used to clip the wound. If clipping is successful, the patient can then receive conservative treatment, including fasting and nasogastric intubation, along with antibiotic treatment. Therefore, we think that antibiotics should be used to reduce the risk of infection in cases where perforation develops. Moreover, we think that massive hemorrhage caused by EMR is an indication for antibiotic use, as there is a large amount of bacteria in the intestine and the patient consequently has a high risk of infection.

In hospitals in China, patients usually undergo colonoscopy 6 months after the resection of colon polyps; hence, in the present study, all the patients underwent colonoscopy to assess the wound healing condition 6 months after the surgery.

In addition, we noted that the administration of antibiotics for the prevention of infection after EMR for colon polyps did not influence patient prognosis. Our results also confirmed that the use of antibiotics after EMR had no effect on the wound healing and rate of polyp relapse. In other words, there did not appear to be an association among wound healing, relapse, and antibiotic administration. Hence, we can conclude that the use of antibiotics after EMR of colon polyps is not essential.

Although the present study is limited by its small sample size, along with the single-center and randomized controlled design, we think that our findings can significantly guide future clinical research. If possible, we aim to conduct a multicenter, large-sample, and randomized controlled study to further confirm our findings. Nevertheless, based on the findings thus far, we do not recommend the conventional use of antibiotics after EMR of colon polyps. However, if severe complications such as perforation develop, we suggest that antibiotics be used to reduce the risk of infection.

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