

# Clinical characteristics of non-ampullary duodenal polyps in the elderly and the outcomes of endoscopic mucosal resection

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## Abstract

At present, there are no reports on non-ampullary polyps of the duodenum (NAPDs) in the elderly. The aim of this study was to analyze the clinicopathological features of NAPDs in elderly and non-elderly patients to explore the efficacy and safety of endoscopic mucosal resection (EMR) of NAPDs in the elderly.

A total of 110 patients underwent EMR of NAPDs between April 2016 and December 2019. The shape, location, size, postoperative complications, and histopathological types of NAPDs were compared between the elderly group (n=44) and the non-elderly group (n=66).

Sessile type was the most common form of NAPD in both groups. In the elderly group, the average size of NAPDs was  $12.6 \pm 3.9$  mm. In the non-elderly group, NAPDs had an average size of  $10.1 \pm 5.8$  mm. Complete EMR was performed in both groups. The postoperative complications of EMR did not significantly differ between the 2 groups. Postoperative pathological examination showed that tubular villous adenomas were more common in the elderly group than in the non-elderly group ( $P = .005$ ), while tubular adenomas were more common in the non-elderly group than in the elderly group ( $P = .007$ ). Of the 110 patients, 99 completed postoperative follow-up (median follow-up duration, 20.93 months). There were no residual or recurrent lesions.

EMR is safe and effective for the treatment of NAPDs in elderly patients.

**Abbreviations:** EMR = endoscopic mucosal resection, NAPDs = non-ampullary polyps of the duodenum.

**Keywords:** elderly, endoscopic mucosal resection, non-ampullary duodenal polyps

## 1. Introduction

The prevalence rate of duodenal polyps is approximately 1% to 5%.<sup>[1,2]</sup> Most duodenal polyps are incidentally found on gastroscopy and can be divided into ampullary and non-ampullary polyps according to their location.<sup>[3]</sup> The incidence of non-ampullary polyps of the duodenum (NAPDs) is higher than that of ampullary polyps; moreover, NAPDs have a potential for malignant transformation, so their resection is

recommended.<sup>[4]</sup> Compared with conventional surgery, endoscopic mucosal resection (EMR) is widely used for the minimally invasive treatment of digestive tract diseases because of its advantages, such as less trauma and rapid recovery. However, the duodenum has unique anatomical characteristics, such as thin walls, abundant blood supply, and submucosal Brunner glands, which makes it difficult to lift these lesions using submucosal injection during EMR. Furthermore, these unique anatomical

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This study was approved by the institutional Ethics Committee and conducted according to the declaration of Helsinki.

Informed consent was obtained from all patients. All authors gave their informed consent prior to their inclusion in the present study.

The authors have no conflicts of interest to disclose.

The datasets generated during and/or analyzed during the current study are publicly available.

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features increase the risk of perforation and bleeding after the endoscopic resection of duodenal lesions.<sup>[5]</sup>

With the aging of the population, an increasing number of elderly patients are undergoing gastroscopy and endoscopic treatment of related diseases. Some authors have reported that duodenal adenomas frequently occur in elderly patients.<sup>[3]</sup> However, no study has as yet reported on the clinicopathological features and endoscopic treatment of NAPDs in elderly patients. Therefore, the aim of the present study is to explore the clinicopathological features of NAPDs and determine the safety and efficacy of EMR in elderly patients.

## 2. Materials and methods

### 2.1. Study population

Patients with NAPDs who underwent EMR in the 900<sup>th</sup> Hospital of People's Liberation Army between April 2016 and December 2019 were retrospectively analyzed. The cases were collected using the electronic medical record system and this study was approved by the Ethics Committee of 900<sup>th</sup> Hospital of People's Liberation Army. The patients were divided into an elderly group (age  $\geq 65$  years) and a non-elderly group (age, 18–64 years). All patients were informed of the possible benefits and risks of EMR, and signed an informed consent form. EMR was performed by doctors with more than 5 years of experience in endoscopic treatment. The following clinical data were compared between the 2 groups: the proportion of underlying diseases (hypertension, coronary heart disease, stroke, and other geriatric diseases); the shape, location, and size of the polyp; postoperative complications; rate of complete resection; and results of the postoperative pathological examination and postoperative follow-up.

### 2.2. Inclusion and exclusion criteria

The inclusion criteria were as follows:

- 1) NAPDs, which was diagnosed using gastroscopy in another hospital or in our center and treated using EMR, and
- 2) normal blood coagulation function. The exclusion criteria were as follows:
- 3) ampullary polyps,
- 4) consumption of anticoagulants within 1 week before EMR or bleeding tendency,
- 5) severe cardiovascular, cerebrovascular, or pulmonary diseases, and
- 6) inability to tolerate or refusal to undergo endoscopic treatment.

### 2.3. Endoscopic equipment and instruments

An electronic gastroscope (Olympus EVIS260, Tokyo, Japan), a high-frequency electric cutting machine (ERBE ICC200, Germany), a snare device (Olympus SD-230–20, Tokyo, Japan), injection needles (Olympus NM-4L-1, Tokyo, Japan), and hemostatic clips (Nanjing Minimally Invasive Medical Technology Co. Ltd.) were used for EMR.

### 2.4. EMR procedure and histopathological evaluation

The patients were treated with EMR. A mixed solution of glycerol fructose, methylene blue, and 1:100,000 noradrenaline was injected into the submucosal layer. After good mucosal

lifting was achieved, a Snare Master and hemostatic clips were used to resect the lesion (Fig. 1). The resected specimens were fixed with 10% formalin and sent to the Department of Pathology for pathological examination.

### 2.5. Postoperative management and follow-up

After fasting for 1 to 2 days, the patients were treated with a proton-pump inhibitor, and fluid replacement, and observed for symptoms such as hematemesis, black stools, abdominal pain, and fever. Postoperative bleeding was defined as the clinical manifestation of hematemesis or black stools, a 20-g/L or greater decrease in hemoglobin level, and the requirement of blood transfusion. Bleeding at the endoscopic surgery wound site required endoscopic hemostasis.<sup>[6]</sup> Perforation was defined as the discovery of mesenteric fat or intra-abdominal space during EMR, or the presence of free gas in the abdominal cavity on postoperative abdominal plain radiography or computed tomography.<sup>[7]</sup> Follow-up endoscopy was scheduled 6 to 12 months after the operation.

### 2.6. Statistical analysis

SPSS *v*19.0 statistical software was used for analysis (IBM Corp., Armonk, NY). Continuous variables were expressed as mean  $\pm$  SD, while categorical variables were expressed as percentages. Measurement data (such as patient age and lesion size) were analyzed using the *t* test, and count data (such as underlying diseases, NAPD morphology and location, postoperative complications, and pathological results) were analyzed using the Pearson Chi-squared test. Statistical significance was set at  $P < .05$ .

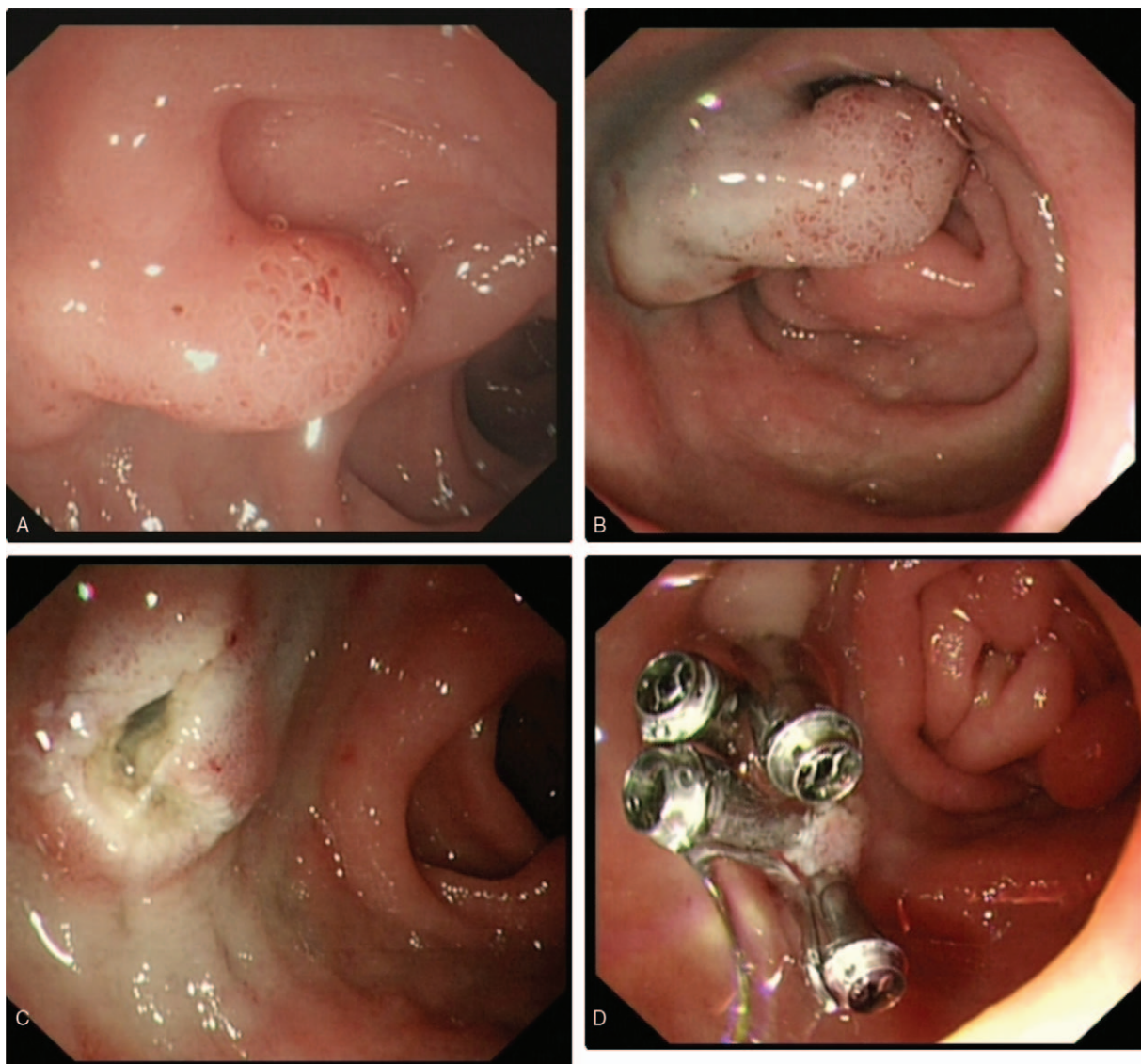
## 3. Results

### 3.1. Demographic characteristics

A total of 110 patients met the inclusion criteria. A total of 22 lesions were not included for the following reasons: ampullary polyps ( $n=8$ ), consumption of anticoagulants within 1 week ( $n=2$ ), declined to undergo endoscopic treatment ( $n=12$ ). (Fig. 2). Of the 110 included NAPDs, there were 65 men and 45 women (1.44:1), with an average age of  $57.57 \pm 14.44$  years. A total of 44 patients were assigned to the elderly group, including 30 men and 14 women, who were between 65 and 82 years of age (average age,  $71.70 \pm 4.68$  years). The non-elderly group consisted of 66 patients, including 38 men and 28 women, with an average age of  $48.15 \pm 10.48$  years. There was no significant difference in sex ratio between the 2 groups. The proportion of underlying diseases in the elderly group (24 patients, 37.0%) was significantly higher than that in the non-elderly group (25 patients, 23.4%;  $P=.036$ ) (Table 1).

### 3.2. Polyp morphology

Among the 44 NAPDs patients in the elderly group, the polyp morphology was described according to the Paris classification<sup>[8]</sup> as follows: sessile (Is), 33 patients (75.0%); semi-pedunculated, 6 patients (13.6%); pedunculated, 3 patients (6.8%); and superficial elevated, 2 patients (4.5%). The polyp morphology among the 66 patients in the non-elderly group was as follows: type Is, 42 patients (63.6%); type semi-pedunculated, 10 patients (15.2%); type pedunculated, 8 patients (12.1%); and type superficial elevated, 6 patients (9.1%). The most common polyp



**Figure 1.** A. A non-ampullary polyp of the duodenum. NAPD = non-ampullary polyp of the duodenum. B. After injection. C. The wound after resection. D. Hemostatic clips close the wound.

morphology in both groups was type Is. There was no significant difference in the overall polyp morphology between the 2 groups ( $P > .05$ ) (Table 1).

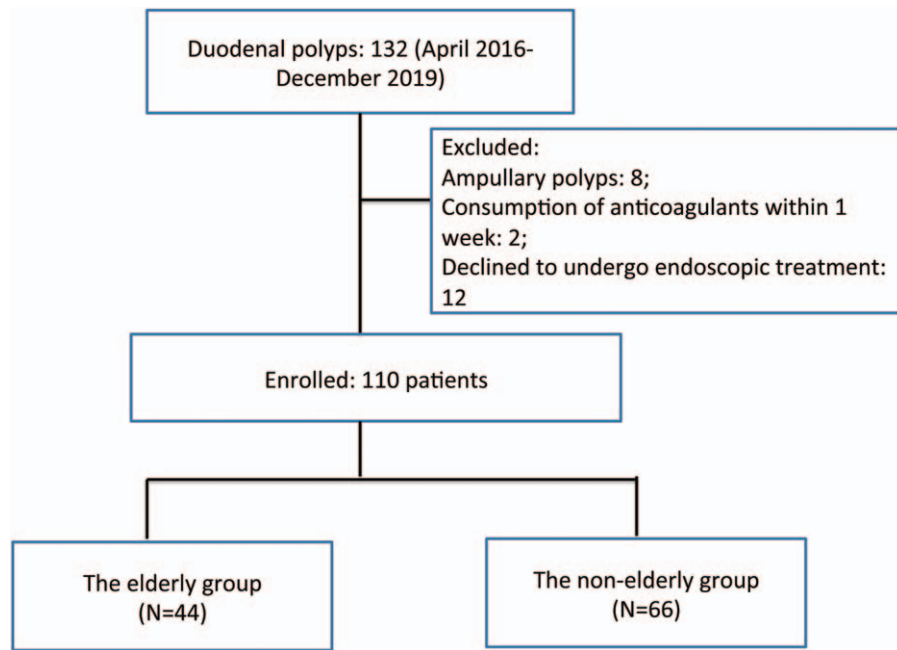
### 3.3. Polyp location

In the elderly group, NAPDs were located in the duodenal bulb in 14 patients (31.8%), at the junction of the duodenal bulb and the descending part of the duodenum in 8 patients (18.2%), and in the descending part of the duodenum in 22 patients (50%). In the non-elderly group, NAPDs were located in the duodenal bulb in 31 patients (47%), at the junction of the duodenal bulb and the descending part of the duodenum in 4 patients (6.1%), and in the descending part of the duodenum in 31 patients (47%). Although most NAPDs in the elderly group were located in the descending part of the duodenum, there was no significant difference in the overall location distribution between the 2 groups ( $P > .05$ ) (Table 1).

### 3.4. Polyp size and complications of EMR

In the elderly group, the average polyp size was  $12.6 \pm 3.9$  mm (range, 5–30 mm). One patient in this group (2.3%) developed bleeding 24 hour after EMR. The bleeding was localized at the endoscopy wound site during an emergency endoscopy and was treated using hemostatic clipping. Abdominal pain occurred in 8 elderly patients (15.2%).

In the non-elderly group, the average polyp size was  $10.1 \pm 5.8$  mm (range, 5–20 mm). Postoperative bleeding occurred in 2 patients (3%). One of these patients developed bleeding 28 hour after EMR, and this was treated using hemostatic clipping via emergency endoscopy. The other patient developed bleeding within 24 hour after EMR and improved after drug treatment. Abdominal pain occurred in 10 patients (18.2%), and was either self-limiting or improved after treatment with antispasmodic drugs. There were no cases of perforation in either group. Polyp size and postoperative complications did not significantly differ between the 2 groups ( $P > .05$ ) (Table 2).



**Figure 2.** Study flow diagram. Data are for numbers of NAPDs. NAPDs = non-ampullary polyps of the duodenum.

### 3.5. Pathological results

All lesions in both groups were completely resected. The pathological diagnoses in the elderly group were as follows: hyperplastic polyp, 23 patients (52.3%); tubular adenoma, 2 patients (4.5%); tubular villous adenoma, 14 patients (31.8%); serrated adenoma, 1 patient (2.3%); and ectopic gastric mucosa, 4 patients (9.1%). In the non-elderly group, the pathological results were as follows: proliferative polyp, 38 patients (57.5%); tubular adenoma, 16 patients (24.2%); tubular villous adenoma, 6 patients (9.1%); Peutz-Jeghers polyp, 1 patient (1.5%), and ectopic gastric mucosa, 5 patients (7.6%). There was a significant difference in the overall pathological types between the 2 groups ( $P=.006$ ). Proliferative polyps were common, and their incidence did not significantly differ between the 2 groups.

Tubular villous adenomas were more common in the elderly group than in the non-elderly group ( $P=.005$ ), and tubular adenomas were more common in the non-elderly group than in the elderly group ( $P=.007$ ) (Table 2). There was no significant difference in the incidence of Peutz-Jeghers polyps, serrated adenomas, and ectopic gastric mucosa between the 2 groups ( $P>.05$ ).

In addition to the above findings, there were 7 cases of low-grade intraepithelial neoplasia, 3 cases of high-grade intraepithelial neoplasia, and 1 case of focal carcinomatosis in the elderly group. There were 9 cases of low-grade intraepithelial neoplasia and 2 cases of high-grade intraepithelial neoplasia in the non-elderly group. There was no significant difference in the rates of these findings between the 2 groups ( $P>.05$ ).

**Table 1**  
Characteristics of the 2 groups of non-ampullary polyps of the duodenum (NAPDs).

|                                | Elderly group    | Non-elderly group | <i>P</i> value |
|--------------------------------|------------------|-------------------|----------------|
| Age (yr), mean $\pm$ SD        | 71.70 $\pm$ 4.68 | 48.15 $\pm$ 10.48 | .000           |
| Gender (M:F)                   | 30:14            | 38:28             | .318           |
| Underlying diseases            | 24 (37.0%)       | 25 (23.4%)        | .036           |
| Polyp size (mm), mean $\pm$ SD | 12.6 $\pm$ 3.9   | 10.1 $\pm$ 5.8    | .066           |
| Macroscopic polyp type         |                  |                   | .565           |
| Sessile                        | 33 (75%)         | 42 (63.6%)        |                |
| Semi-pedunculated              | 6 (13.6%)        | 10 (15.2%)        |                |
| Pedunculated                   | 3 (6.8%)         | 8 (12.1%)         |                |
| Flat, elevated                 | 2 (4.5%)         | 6 (9.1%)          |                |
| Polyp location                 |                  |                   | .079           |
| Bulb                           | 14 (31.8%)       | 31 (47%)          |                |
| Junction                       | 8 (18.2%)        | 4 (6.1%)          |                |
| Descending part                | 22 (50%)         | 31 (47%)          |                |

NAPDs = non-ampullary polyps of the duodenum.

**Table 2**  
Complications of EMR and the pathological results of non-ampullary polyps of the duodenum (NAPDs).

|                        | Elderly group | Non-elderly group | <i>P</i> value |
|------------------------|---------------|-------------------|----------------|
| Complications, n (%)   |               |                   | .896           |
| Bleeding               | 1 (2.3%)      | 2 (3%)            |                |
| Abdominal pain         | 8 (15.2%)     | 10 (18.2%)        |                |
| Histological type      |               |                   | .006           |
| Hyperplastic           | 23 (52.3%)    | 38 (57.6%)        |                |
| Tubular                | 2 (4.5%)      | 16 (24.2%)        |                |
| Tubulovillous          | 14 (31.8%)    | 6 (9.1%)          |                |
| P-J polyp              | 0 (0%)        | 1 (1.5%)          |                |
| Serrated               | 1 (2.3%)      | 0 (0%)            |                |
| Ectopic gastric mucosa | 4 (9.1%)      | 5 (7.6%)          |                |
| Concomitant findings   |               |                   | .484           |
| LGIN                   | 7 (63.6%)     | 9 (81.8%)         |                |
| HGIN                   | 3 (27.3%)     | 2 (18.2%)         |                |
| Cancer                 | 1 (9.1%)      | 0 (0%)            |                |

HGIN = high-grade intraepithelial neoplasia, LGIN = low-grade intraepithelial neoplasia, NAPDs = non-ampullary polyps of the duodenum, P-J polyp = Peutz-Jeghers polyp.

### 3.6. Follow-up

Among the 110 study patients, 99 patients were followed up for 6 to 41 months (median follow-up duration, 20.93 months). The 5 patients with high-grade intraepithelial neoplasia and 1 patient with focal cancer were followed up successfully. Follow-up gastroscopy showed that the lesions had healed completely, the EMR wounds had healed well, and there was no residual or recurrent disease.

## 4. Discussion

With the widespread use of digestive endoscopy, the detection rate of duodenal lesions has gradually increased.<sup>[9]</sup> Duodenal lesions are classified as submucosal lesions and mucosa-related lesions.<sup>[10]</sup> The former category includes lipoma, gastrointestinal stromal tumor, and neuroendocrine tumor among others, while the latter category mainly refers to duodenal polyps, which have a risk of malignant transformation. Some patients with duodenal polyps experience abdominal pain, dyspepsia, gastrointestinal bleeding, intestinal obstruction or intussusception, and other clinical manifestations, so resection is recommended.<sup>[10,11]</sup> With the wide application of endoscopic technology and the aging of the population, an increasing number of elderly patients are undergoing endoscopy, and the detection rate of NAPDs has gradually increased.<sup>[12]</sup> Compared with young and middle-aged patients, elderly patients show a decline in basic physiological functions, which is accompanied by varying degrees of cardio- and cerebrovascular diseases. However, it is unclear whether the clinicopathological features of NAPDs, and the efficacy and safety of NAPD treatments in elderly patients differ from those in non-elderly patients. Few studies have reported on this topic.

Our study found that the Is morphological type of NAPD is common in both elderly and non-elderly patients. Chong et al reported that NAPDs are mainly distributed in the descending part of the duodenum, and are also commonly found in the duodenal bulb.<sup>[13]</sup> In our study, NAPDs were mainly distributed in the descending part of the duodenum in the elderly group, and were more commonly found in the duodenal bulb and descending part of the duodenum in the non-elderly group, which is consistent with the above-mentioned results. Proliferative polyps were common in both groups, but tubular villous adenomas were significantly more common in the elderly group than in the non-elderly group. The reason may be that with increasing age, the potential risk of carcinogenesis in NAPDs may also increase, so NAPDs in elderly patients must be carefully examined and promptly dealt with. Some authors have reported that the microscopic manifestation of ectopic gastric mucosa in the duodenum can easily be confused with that of duodenal polyps; the detection rate of ectopic gastric mucosa was 1.4%<sup>[2]</sup> in the past but has increased to 8.9%<sup>[14]</sup> in recent years. In our study, the pathological detection rates of ectopic gastric mucosa after resection were 9.1% and 7.6% in the elderly and non-elderly groups, respectively. Clinicians should be highly aware of the possibility of ectopic gastric mucosa in the duodenum, as this can easily be misdiagnosed as NAPDs.

NAPDs can be treated using conventional surgery or endoscopic treatment. However, conventional surgeries such as local duodenectomy and pancreaticoduodenectomy are traumatic, high-risk procedures associated with numerous postoperative complications. Due to the special anatomical

characteristics of the duodenum, the endoscopic resection of NAPDs is more difficult than that of esophageal, gastric, and colorectal lesions; nevertheless, compared with surgery, endoscopic resection is the first choice of treatment for duodenal mucosal lesions without lymph node metastasis.<sup>[9]</sup> Some authors have reported that the rate of complete resection of duodenal lesions treated by EMR is 70% to 100%.<sup>[15-17]</sup> The incidence of bleeding after EMR is 0% to 12%, and the incidence of perforation is 6%.<sup>[17]</sup> Most elderly patients with NAPDs have concomitant hypertension, coronary heart disease, or other diseases. Our study confirmed that compared with the non-elderly group, the proportion of elderly patients with underlying diseases was higher ( $P=.036$ ). Therefore, the safe and effective removal of NAPDs in elderly patients is a matter of concern. In our study, although the polyp size was slightly larger in the elderly group than in the non-elderly group, the incidence of bleeding after EMR was similar in the two groups (2.3% and 3%, respectively,  $P>.05$ ). The reason may be that we excluded patients who had taken anticoagulants within 1 week before EMR, so there was no significant difference in the incidence of bleeding between the 2 groups. The incidence of abdominal pain was high in both groups, and postoperative intestinal spasm and postoperative stress are possible causes. Moreover, the abdominal pain was mild, and was relieved spontaneously or after antispasmodic treatment. Therefore, as long as the indications for the EMR of NAPDs are strictly followed, endoscopic treatment is safe and effective in elderly patients. Some studies have reported that the rate of residual or recurrent duodenal lesions after EMR is 0% to 37%.<sup>[18-20]</sup> In our study, no residual or recurrent lesions were found during the postoperative follow-up in either the elderly group or the non-elderly group, which may be related to the small average size of the lesions in our 2 groups.

There are some limitations of this study. First, this is a single-center, retrospective study, and the sample size is relatively small. Second, some of our patients were from remote rural areas of China, and their compliance was not high, resulting in the non-completion of part of the follow-up. Third, the average size of the lesions in our study was not large. For large duodenal polyps, it is unclear whether the clinical characteristics and the safety of endoscopic treatment differ between elderly and non-elderly patients. More research may be needed to confirm this in the future.

In summary, the endoscopic manifestations of NAPDs in elderly patients are similar to those in non-elderly patients; however, elderly patients may have a higher potential risk of malignant transformation. Although underlying diseases are more common among elderly patients, EMR is safe and effective for the treatment of NAPDs in these patients, and can yield the same short-term and long-term outcomes as those achieved in non-elderly patients.

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