

Research Article
***Adverse events after different endoscopic resection procedures
for small and intermediate-sized colorectal polyps***

Junki Toyosawa¹⁾²⁾, Yasushi Yamasaki¹⁾²⁾, Yuki Aoyama¹⁾, Kensuke Takei¹⁾, Shoko Igawa¹⁾,
Toshihiro Inokuchi¹⁾, Hideaki Kinugasa¹⁾, Masahiro Takahara¹⁾, Sakiko Hiraoka¹⁾, Hiroyuki Okada³⁾,
Motoyuki Otsuka¹⁾²⁾

1) Department of Gastroenterology, Okayama University Hospital, Okayama, Japan

2) Department of Gastroenterology and Hepatology, Okayama University Graduate School of
Medicine, Dentistry and Pharmaceutical Sciences, Okayama, Japan

3) Department of Internal Medicine, Japanese Red Cross Society Himeji Hospital, Hyogo, Japan

Short Title: Adverse events after different polypectomy for colorectal polyps

Corresponding Author:

Yasushi Yamasaki

Department of Gastroenterology, Okayama University Hospital, Okayama, Japan

Email: yamasaki-ya@okayama-u.ac.jp

Keywords: UEMR EMR CSP

Word counts: 2514 words.

Abstract

Introduction:

Cold snare polypectomy (CSP) and underwater endoscopic mucosal resection (UEMR) have been developed recently, in addition to conventional methods, but adverse events of each method have not been fully clarified. We compared outcomes of each method for the appropriate choice.

Methods:

Patients who underwent CSP, endoscopic mucosal resection (EMR)/hot snare polypectomy (HSP) or UEMR for small and intermediate-sized colorectal polyps between April 2017 and June 2020 were retrospectively examined. The rate of adverse events and recurrences due to each method were determined as main outcomes. Clinical factors related with adverse events were examined.

Results:

A total of 1,025 patients with 3,163 polyps underwent polypectomy using any of the methods. CSP, EMR/HSP and UEMR were performed for 704 (22.2%), 2,145 (67.8%) and 314 polyps (9.9%), and median size for each method was 4, 6 and 7 mm, respectively. Delayed bleeding for CSP, EMR/HSP and UEMR was 0%, 0.2% and 0.6% ($P = 0.15$), and perforation was 0%, 0.1% and 0%, respectively ($P = 0.62$). Recurrence after CSP, EMR/HSP and UEMR was 0.3%, 0.09% and 1.3%, respectively ($P < 0.01$). Recurrence for UEMR was significantly higher in the early stage of procedure introduction ($P = 0.015$). Oral anticoagulants were the risk factor for delayed bleeding ($P < 0.01$, respectively).

Conclusion:

There was no significant difference regarding adverse events among each method for small and intermediate-sized polyps, although recurrence rate after UEMR was higher than other methods.

Introduction

Colorectal cancer (CRC) is the third most commonly diagnosed cancer, and the second most common cause of cancer-related mortality worldwide [1]. Endoscopic detection and removal of colorectal polyps are the standard method for preventing CRC, and efficacy for decreasing the incidence and mortality of CRC have been well-established [2-6].

Endoscopic resection (ER) with electrocautery under air condition has previously been the most performed method for removal of colorectal polyps. However, in recent years, advanced methods, such as the cold snare polypectomy (CSP), which does not need electrocautery, and the underwater endoscopic mucosal resection (UEMR), which does not need submucosal injection, have been developed and widely used. Several studies have shown that CSP is safer than ER with electrocautery [7,8], and CSP is comparable to ER with electrocautery, regarding the recurrence rate of small polyps (< 10mm) [9,10]. The safety and efficacy of UEMR have been also reported. Comparing with the conventional EMR, UEMR has higher R0 and low recurrence rates for the intermediate-sized colorectal polyps [11,12]. While submucosal injection sometimes causes bleb formation, resulting in the difficulties of snaring the polyps, there is an advantage that neither CSP nor UEMR require submucosal injection.

Although the benefits of CSP and UEMR have been reported in prospective studies [7-12], adverse events after the different ER methods have not been fully compared. Here, we compared the adverse event rates after CSP, UEMR, and the endoscopic mucosal resection (EMR)/hot snare polypectomy (HSP) procedures for colorectal polyps in the real-world settings.

Methods

Ethics and study design

This single-center retrospective study was conducted to evaluate the adverse events after several ER methods for small and intermediate-sized colorectal polyps. The study protocol was approved by the Institutional Review Board of Okayama University Hospital (approved number ken2002-003), and the study was performed in accordance with the Declaration of Helsinki.

Participants

We identified the patients who underwent ER for colorectal polyps between April 2017 and June 2020 from our prospectively collected database. Patients with polyps resected endoscopically using a polypectomy snare were included. The exclusion criteria were: (i) polyps resected using an electrical knife, such as endoscopic submucosal dissection (ESD) or hybrid ESD; (ii) polyps resected with another device in addition to a polypectomy snare, such as endoscopic submucosal resection with ligation; (iii) polyps related to familial adenomatous polyposis; and (iv) polyps without detailed description. The baseline characteristics of each polyp and patient, and the treatment outcomes were examined.

The characteristics of the polyps were first evaluated using the white-light imaging, then the narrow band imaging (NBI) or the blue laser imaging with or without magnification to predict the histology using the Japan NBI Expert Team (JNET) classification [13]. If necessary, chromoendoscopy using indigo carmine and/or crystal violet was added to evaluate, more confidently, the histological pit pattern of the polyps [14]. The ER method was selected according to the endoscopic diagnosis. CSP was applied for the small polyps (< 10 mm) suspected as serrated lesions or low-grade adenomas, which were diagnosed as JNET Type 1 or 2A by NBI or blue laser imaging. EMR or UEMR was applied for intermediate-sized polyps (≥ 10 and < 20 mm). Small polyps suspected as high-grade adenomas or pedunculated polyps with a risk of bleeding were also treated by EMR/HSP or UEMR. Large polyps (≥ 20 mm) that were suspected to be cancerous were resected en bloc with ESD or hybrid ESD. However, in practice, the final selection of each ER method was decided according to the preference

of each endoscopist. ER was performed by 16 endoscopists, who had experience of > 100 cases before the start of this study.

Histological diagnosis

All collected specimens were fixed in 10% formalin and sectioned. Two expert gastrointestinal pathologists evaluated the ER specimens according to the Japanese Classification of Colorectal, Appendiceal, and Anal Carcinoma [15].

Follow-up after ER

For adenomatous or serrated polyps, surveillance colonoscopy (CS) at 1–3 years after ER was recommended. If the polyps were resected piecemeal and the histology was cancerous, follow-up CS was performed at 3–6 months after ER.

Outcomes and definitions

The outcomes determined in this study were the rate of adverse events and the rate of recurrences after each ER method applied. The adverse events included delayed bleeding and perforation. The clinical factors related to the delayed bleeding were analyzed for patients and polyps. Age, gender, antithrombotic therapy, history of inflammatory bowel disease (IBD) and Charlson comorbidity index (CCI) were included as clinical factors for patients. CCI is an assessment tool designed specifically to predict long-term mortality [16]. The index score was calculated by awarding weight to each comorbidity depending on the magnitude of the relative risk associated with each condition. The higher the CCI, the higher the predicted mortality [17,18]. Lesion size, morphology and location, ER method, histology determined after ER, and application of clip closure were included as polyp-related clinical factors. The delayed bleeding, perforation and recurrence rates were determined for each ER method, according to the polyp size (diminutive, small, intermediate or large). The rate of adverse events among each ER method were also evaluated according to the periods. The observatory periods were divided into 1st period (April 2017–March 2018), 2nd period (April 2018–March 2019) and 3rd period (April 2019–June 2020). In our hospital, CSP and UEMR were newly applied from April 2017.

Delayed bleeding was defined as bleeding requiring coming to the emergency endoscopy department, medical intervention, or 2 g/dL reduction of hemoglobin that required endoscopic

hemostasis within 28 days after ER. Perforation was defined as evidence of air or luminal contents outside the gastrointestinal tract by the abdominal computed tomography after ER. In this study, only intraoperative perforation was evaluated because there was no delayed perforation. Local recurrence was defined as the presence of a polyp at the site of the resection at the follow-up CS, which was histologically diagnosed as the same to the initially resected polyp by biopsy or additional ER. Otherwise, the cases were defined as no recurrence.

Statistics

Results are presented as the median (range) for continuous variables. Chi-square and Fisher's exact tests were used to compare categorical data. $P < 0.05$ was considered statistically significant for comparison between two groups. Bonferroni correction was used for multiple comparisons, and $P <$

0.05/3 was considered statistically significant for comparison between three groups. All analysis was performed using JMP 16 software (SAS Institute, Cary, NC, USA).

Results

Characteristics of patients and polyps

From April 2017 to June 2020, ER was performed in 1,025 patients with 3,163 polyps (Table 1). The median age (interquartile range; IQR) was 69 (61–74) years. Antithrombotic drugs were administered to 184 patients (18.0%). Of these, 104 patients (10.1%) were on an antiplatelet drug, 70 patients (6.9%) were on an anticoagulant drug, and 10 patients (1.0%) were on both. Eleven patients had an IBD. The median CCI of all patients (IQR) was 4 (2–5).

The median size of the polyps (IQR, range) was 6 (5–8, 2–35) mm. About half of the polyps showed type 0–Is morphology. EMR/HSP was performed for 2,145 polyps (67.8%), CSP for 704 (22.2%) and UEMR for 314 (9.9%). Clip closure was performed in 2,399 cases (75.7%), most of which was performed after EMR/HSP and UEMR. The most common histological type of polyps was adenoma. Fourteen polyps (0.4%) were carcinoma with submucosal invasion. Others included no metaplasia, inflammatory polyp, and leiomyoma. Follow-up CS was performed in 1684 cases (53.2%). Five polyps (0.3%) showed recurrence. The rates of delayed bleeding and perforation for all polyps were 0.3% and 0.1%, respectively.

Patient- and polyp-related risk factors for delayed bleeding

Patients with oral anticoagulants had a significantly higher risk of delayed bleeding. However, there was no significant difference in patients with antiplatelet drugs. Patients with IBD had a significantly higher risk of delayed bleeding (Table 2). There was no significant polyp-related risk factor for delayed bleeding. Lesion size < 6 mm and CSP tended to have lower bleeding rates (0.06% and 0.36%, respectively) compared with polyps ≥ 6 mm and ER methods other than CSP, but the differences were not significant (Table 3).

ER methods and lesion sizes as risk factors for the adverse events

The rate of delayed bleeding did not differ significantly among ER methods and among lesion sizes (Table 4). Especially, there was no bleeding after CSP regardless of lesion size. While the rate of perforation also did not differ significantly, two perforations occurred after EMR/HSP for intermediate-sized polyps. *En bloc* resection and recurrence rates differed significantly among ER methods. UEMR showed higher recurrence rate ($P < 0.01$). In UEMR, lesion size was not significantly

associated with the rate of recurrences. However, the relationship between size and recurrence is still unclear due to the small number of recurrence cases.

Characteristics of recurrences

The characteristics and the images of the recurrent polyps are shown in Table 5 and in Figure 1, respectively. The median lesion size (range) of primary polyps that showed recurrence was 7 (5–12) mm. The morphology of all primary polyps was type 0–IIa. About the histology, two of 2,463 adenoma cases (0.08%) and three of 500 serrated lesion cases (0.6%) showed recurrence. Among them, four cases underwent additional resection with UEMR and one with EMR. All cases showed no further recurrence.

Adverse events and recurrence according to the resection period

The cases of CSP and UEMR procedures applied are increasing, while the cases of EMR/HSP procedures applied are decreasing. EMR/HSP accounted for the 80% of the resections during the first period, but only about half during the third period (Table 6). Although no association with the resection timing was observed for the delayed bleeding and perforation, the rate of recurrences differed significantly for each ER method during the first stage (0% for CSP, 0.2% for EMR/HSP, and 4.0% for UEMR; $P = 0.015$), while there was no significant difference during the second and third stages.

Discussion

This study evaluated the safety of different ER methods for small and intermediate-sized colorectal polyps. There was no significant difference in the incidence of adverse events among the ER methods, although the lesion size differed among the methods. The recurrence rate of the polyps after UEMR was significantly more common only during the early stage (first period) of the observatory period while it did not differ among ER methods during the second and third periods.

Delayed bleeding rate after CSP (0.4%) for small polyps was lower than that when using the HSP method (1.5%) in a previous randomized controlled trial [19]. In our study, delayed bleeding rate after CSP (0%) also tended to be lower, but did not differ significantly from that after EMR/HSP (0.2%) and UEMR (0.6%). A possible reason for this could be the low overall delayed bleeding rate (0.2%) in our study compared with previous studies [20-22]. In general, patients taking anticoagulants have shown a higher rate of delayed bleeding even after CSP for small lesions [20]. In our study, the use of anticoagulants was high (6.9%), and was a risk factor for delayed bleeding, as previously reported [23-25]. The effect of clip closure in preventing delayed bleeding is controversial, and a recent meta-analysis concluded that prophylactic clipping was not beneficial for distal polyps ≤ 20 mm, even if antithrombotic drugs were used [26]. Consistently, clip closure was not a factor related to prevention of delayed bleeding in our study. However, the fact that clip closure was attempted in ~75% of cases after ER, and applied to achieve complete closure of the mucosal defect by experienced endoscopists might have affected the incidence of delayed bleeding. Further studies evaluating the effect of clip closure after ER for patients taking anticoagulants and the effects of the integrity of clip closure are warranted.

A new finding was that patients with IBD were at risk of delayed bleeding after ER for small and intermediate-sized polyps. In a previous study, the delayed bleeding rate after ESD for patients with IBD was also high (9.8%) [27]. Underlying fibrosis and angiogenesis associated with chronic inflammation in IBD patients may have affected the high delayed bleeding rate [28]. Because the number of patients with IBD is increasing [29] and more ER for polyps in IBD patients will be performed in future, caution about the delayed bleeding may be required. However, the results should be interpreted considering the small sample size of IBD patients. Further additional validations should be needed. Perforation is a serious adverse event and should be avoided, but it has been reported in 0.02% and 0.09% of cases after HSP and EMR [30]. In our study, perforation occurred in 0.09% of cases after EMR, but there was none after CSP or UEMR. There has been no large-scale study regarding the adverse events of UEMR, thus the exact perforation rate of UEMR is

still unclear. During snaring, we are cautious not to press the snare excessively against the mucosa, in an attempt to avoid perforation. However, because perforation during UEMR could occur [31], further data such events may be needed by examining a larger number of cases.

The recurrence rate after UEMR for small and intermediate-sized polyps was not fully evaluated previously. However, the complete resection rate of UEMR for intermediate-sized polyps was reported to be higher than that of EMR/HSP [11], and for large polyps, the recurrence rate for UEMR was lower (2%) than that for EMR (15%) [12]. However, in our study, the recurrence rate after UEMR was higher (1.3%) than that after CSP (0.3%) and EMR/HSP (0.09%). The rate of recurrences differed significantly for each ER method during only the first stage. These results suggested that the higher recurrence rate after UEMR might be due to the immature procedures just after the procedure was started to be clinically introduced.

This may have been affected by the technical learning curve for UEMR. We have introduced UEMR as new resection method since 2017. Most endoscopists were inexperienced with UEMR. UEMR was performed in our study by endoscopists who were familiar with conventional EMR/HSP, and technical proficiency was obtained as they experienced UEMR, which was contrary to a previous study [32]. In contrast, CSP did not require a technical learning curve for experienced endoscopists, considering its recurrence rate, although CSP was also newly applied in the early stage of this study. Because, in a previous study, a long learning curve was needed to acquire CSP proficiency for less-experienced endoscopists [33], the learning curve of each ER method should be explored further. Basically, CSP and UEMR are simpler procedures that do not require submucosal injection. Thus, we believe that there may be merits in choosing CSP or UEMR for small and intermediate size polyps.

Although we demonstrated the adverse events after each ER method in the clinical setting, this study had some limitations. First, it was a retrospective study performed in a single center. Several prospective studies have already shown the adverse events after each ER method [12,19,34], but prospective studies basically included the patients and lesions which met the eligibility criteria. Eligibility criteria is useful to compare the outcomes of each ER method, but the population in prospective studies might not match the population in the real world setting sometimes. Thus, we showed the outcomes of each ER method using our database as a real world clinical data. However, retrospective study has a potential of selection bias. We believe the pros and cons of each method should be evaluated by both retrospective and prospective studies. Second, follow-up CS was performed for about half the patients. Scar formation after ER was not always detected during the follow-up. The endoscopists performed follow-up CS carefully to detect scarring, and a few recurrences may have been overlooked. Third, although the indications for each ER method were

unified as much as possible, the preference of each endoscopist could not be fully excluded. Besides, the lesion size resected by each ER method varied.

Conclusions

In conclusion, there was no significant difference in the incidence of adverse events among the ER methods. Recurrence after UEMR was more common during the early stage of this study because UEMR may require a technical learning curve even for the experienced endoscopists. Further studies are needed to assess the appropriate use of each ER method according to its efficacy and safety.

Statements

Acknowledgement

We thank Cathel Kerr, BSc, PhD, from Edanz (<https://jp.edanz.com/ac>) for editing a draft of this manuscript.

Statement of Ethics

The study protocol was approved by the Institutional Review Board of Okayama University Hospital (approved number ken2002-003), and the study was performed in accordance with the Declaration of Helsinki. The study has been granted an exemption from requiring written informed consent, because This study is retrospective observational study.

The need for informed consent was waived by the Institutional Review Board of Okayama University Hospital.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Funding Sources

This study was not supported by any sponsor or funder.

Author Contributions

Y.A., K.T., S.I., T.I., H.K., M.T., S.H., H.O. contributed to the study conception and design.

Data collection, and analysis were performed by J.T., Y.Y.

The first draft of the manuscript was written by J.T. and revised critically by Y.Y., M.O.

All the authors read and approved the final version of the manuscript.

Data Availability Statement

All data generated or analysed during this study are included in this article. Further enquiries can be directed to the corresponding author.

References

- [1] Bray F, Ferlay J, Soerjomataram I et al. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin* 2018; 68: 394–424
- [2] Winawer SJ, Zauber AG, Ho MN et al. Prevention of colorectal cancer by colonoscopic polypectomy. The National Polyp Study Workgroup. *N Engl J Med* 1993; 329: 1977–81
- [3] Zauber AG, Winawer SJ, O'Brien MJ et al. Colonoscopic polypectomy and long-term prevention of colorectal-cancer deaths. *N Engl J Med* 2012; 366: 687–96
- [4] Cottet V, Jooste V, Fournel I et al. Long-term risk of colorectal cancer after adenoma removal: a population based cohort study. *Gut* 2012; 61: 1180–86
- [5] Nishihara R, Wu K, Lochhead P et al. Long-term colorectal-cancer incidence and mortality after lower endoscopy. *N Engl J Med* 2013; 369: 1095–105
- [6] Løberg M, Kalager M, Holme Ø et al. Long-term colorectal-cancer mortality after adenoma removal. *N Engl J Med* 2014; 371: 799–807
- [7] Uraoka T, Ramberan H, Matsuda T et al. Cold polypectomy techniques for diminutive polyps in the colorectum. *Dig. Endosc* 2014; 26: 98–103
- [8] Repici A, Hassan C, Vitetta E et al. Safety of cold polypectomy for <10 mm polyps at colonoscopy: a prospective multicenter study. *Endoscopy* 2011; 44: 27–31
- [9] Yoshida N, Fukumoto K, Hasegawa Det al. Recurrence rate and lesions characteristics after cold snare polypectomy of high-grade dysplasia and T1 lesions: A multicenter analysis. *J Gastroenterol Hepatol* 2021; 36: 3337–44
- [10] Maruoka D, Arai M, Akizue Net al. Residual adenoma after cold snare polypectomy for small colorectal adenomas: A prospective clinical study. *Endoscopy* 2018; 50: 693–700
- [11] Yamashina T, Uedo N, Akasaka T et al. Comparison of underwater vs conventional endoscopic mucosal resection of intermediate-size colorectal polyps. *Gastroenterology* 2019; 157: 451–61

- [12] Lenz L, Martins B, Andrade de Paulo G et al. Underwater versus conventional EMR for nonpedunculated colorectal lesions: a randomized clinical trial. *Gastrointest Endosc* 2023; 97: 549-58.
- [13] Sano Y, Tanaka S, Kudo S et al. Narrow-band imaging (NBI) magnifying endoscopic classification of colorectal tumors proposed by the Japan NBI Expert Team. *Dig Endosc* 2016; 28: 526–33
- [14] Kudo S, Tamura S, Nakajima T, Yamano H et al. Diagnosis of colorectal tumorous lesions by magnifying endoscopy. *Gastrointest Endosc* 1996; 44: 8–14
- [15] Japanese Classification of Colorectal, Appendiceal, and Anal Carcinoma 3rd English Edition: Japanese Society for Cancer of the Colon and Rectum 2019
- [16] M E Charlson, P Pompei, K L Ales, C R MacKenzie et al. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis* 1987; 40: 373-83
- [17] Katz J, Chang L, Sangha O, et al. Can comorbidity be measured by questionnaire rather than medical record review? *Med Care*. 1996; 34: 73–84.6
- [18] Poses R, McClish D, Smith W, et al. Prediction of survival of critically ill patients by admission comorbidity. *J Clin Epidemiol* 1996; 49: 74
- [19] Chang LC, Chang CY, Chen CY, et al. Cold Versus Hot Snare Polypectomy for Small Colorectal Polyps: A Pragmatic Randomized Controlled Trial. *Ann Intern Med* 2023; 176: 311-19.
- [20] Takeuchi Y, Mabe K, Shimodate Y et al. Madowazu Study Group. Continuous Anticoagulation and Cold Snare Polypectomy Versus Heparin Bridging and Hot Snare Polypectomy in Patients on Anticoagulants With Subcentimeter Polyps: A Randomized Controlled Trial. *Ann Intern Med* 2019; 171: 229-37.
- [21] Watabe H, Yamaji Y, Okamoto M et al. Risk assessment for delayed hemorrhagic complication of colonic polypectomy: polyp-related factors and patient-related factors. *Gastrointest Endosc* 2006; 64: 73–77
- [22] Park SK, Seo JY, Lee MG et al. Prospective analysis of delayed colorectal post-polypectomy bleeding. *Surg Endosc* 2018; 32: 3282-89
- [23] Shalman D, Gerson LB. Systematic review with meta-analysis: the risk of gastrointestinal haemorrhage post-polypectomy in patients receiving anti-platelet, anti-coagulant and/or thienopyridine medications. *Aliment Pharmacol Ther* 2015; 42: 949–56.

- [24] Inoue T, Nishida T, Maekawa A, et al. Clinical features of post-polypectomy bleeding associated with heparin bridge therapy. *Dig Endosc* 2014; 26: 243–49.
- [25] Ishigami H, Arai M, Matsumura T, et al. Heparin-bridging therapy is associated with a high risk of post-polypectomy bleeding regardless of polyp size. *Dig Endosc* 2017; 29: 65–72.
- [26] Turan AS, Pohl H, Matsumoto M et al. Prophylactic Clipping Collaborative Group. The Role of Clips in Preventing Delayed Bleeding After Colorectal Polyp Resection: An Individual Patient Data Meta-Analysis. *Clin Gastroenterol Hepatol* 2022; 20: 362-71.
- [27] Ngamruengphong S, Aihara H, Friedland S et al. Endoscopic submucosal dissection for colorectal dysplasia in inflammatory bowel disease: a US multicenter study. *Endosc Int Open* 2022; 10: E354-60.
- [28] Mohapatra S, Sankaramangalam K, Lopimpisuth C et al. *Endosc Int Open* 2022; 10: E593-601.
- [29] Ng SC, Shi HY, Hamidi N et al. Worldwide incidence and prevalence of inflammatory bowel disease in the 21st century: a systematic review of population-based studies. *Lancet* 2017; 390: 2769-78.
- [30] Oka S, Tanaka S, Kanao H et al. Current status in the occurrence of postoperative bleeding, perforation and residual/local recurrence during colonoscopic treatment in Japan. *Dig Endosc* 2010; 22: 376-80.
- [31] Ponugoti PL, Rex DK. Perforation during underwater EMR. *Gastrointestinal endoscopy* 2016; 84: 543-44.
- [32] Wang AY, Flynn MM, Patrie JT et al. Underwater endoscopic mucosal resection of colorectal neoplasia is easily learned, efficacious, and safe. *Surg Endosc* 2014; 28: 1348-54.
- [33] Kaltenbach T, Patel SG, Nguyen-Vu T et al. Varied Trainee Competence in Cold Snare Polypectomy: Results of the COMPLETE Randomized Controlled Trial. *Am J Gastroenterol*. 2023; Epub ahead of print
- [34] Takeuchi Y, Kawamura T, Nojima M. Continuous Anticoagulation and Cold Snare Polypectomy. *Ann Intern Med*. 2019; 171: 863-64.

Figure Legends

Fig. 1. Lesions at time of initial resection and recurrence.

Case 1 at treatment (a), and at recurrence (b).

Case 2 at treatment (c), and at recurrence (d).

Case 3 at treatment (e), and at recurrence (f).

Case 4 at treatment (g), and at recurrence (h).

Case 5 at treatment (i), and at recurrence (j).