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SPECIAL REPORT

CURRENT STATUS IN THE OCCURRENCE OF POSTOPERATIVE BLEEDING, PERFORATION AND RESIDUAL/LOCAL RECURRENCE DURING COLONOSCOPIC TREATMENT IN JAPAN

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Bleeding, perforation, and residual/local recurrence are the main complications associated with colonoscopic treatment of colorectal tumor. However, current status regarding the average incidence of these complications in Japan is not available. We conducted a questionnaire survey, prepared by the Colorectal Endoscopic Resection Standardization Implementation Working Group, Japanese Society for Cancer of the Colon and Rectum (JSCCR), to clarify the incidence of postoperative bleeding, perforation, and residual/local recurrence associated with colonoscopic treatment. The total incidence of postoperative bleeding was 1.2% and the incidence was 0.26% with hot biopsy, 1.3% with polypectomy, 1.4% with endoscopic mucosal resection (EMR), and 1.7% with endoscopic submucosal dissection (ESD). The total incidence of perforation was 0.74% (0.01% with the hot biopsy, 0.17% with polypectomy, 0.91% with EMR, and 3.3% with ESD). The total incidence of residual/local recurrence was 0.73% (0.007% with hot biopsy, 0.34% with polypectomy, 1.4% with EMR, and 2.3% with ESD). Colonoscopic examination was used as a surveillance method for detecting residual/local recurrence in all hospitals. The surveillance period differed among the hospitals; however, most of the hospitals reported a surveillance period of 3–6 months with mainly transabdominal ultrasonography and computed tomography in combination with the colonoscopic examination.

Key words: colorectal endoscopic resection, perforation, postoperative bleeding, residual/local recurrence.

INTRODUCTION

With an increase in the number of medical examinations that are carried out for detecting colon cancer, there has also been a drastic increase in the number of colonoscopic examinations. As a result, the number of patients seeking endoscopic resection (ER) for colorectal tumor has also increased. Although surgical removal of cancer was the only option available in the past, advancements in ER procedures, including endoscopic submucosal dissection (ESD),[1–7] enable successful resection of early cancer. The incidences of complications, such as residual/local recurrence, after colonoscopic treatment have also been reported in a study conducted by a hospital, but not in a multicenter study involving general hospitals. In addition, each hospital adopted a different methodology for surveillance. Therefore, current trends regarding the incidence of these complications in Japan are not available. Here, we report the results of a questionnaire survey, carried out by the Colorectal Endoscopic Resection Standardization Implementation Working Group, JSCCR (Japanese Society for Cancer of the Colon and Rectum), that examined current trends in the incidence of postoperative bleeding, perforation, residual/local recurrence, and surveillance methods used after ER, depending on the type of endoscopic procedure.

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Summary of a Multicenter Questionnaire Survey Conducted by the Colorectal Endoscopic Resection Standardization Implementation Working Group in Japanese Society for Cancer of the Colon and Rectum.

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METHODS

We gave the questionnaire to 85 586 participants across 107 hospitals (Table 1), which were part of the JSCCR, over a period of 2 years (January 2004–December 2005). We sent the questionnaire to 294 facilities which participated in the Japanese Society for Cancer of the Colon and Rectum, and the percentage of hospitals returning the questionnaire was 36.4% (107/294). The participants were questioned about the incidence of complications, such as postoperative bleeding, perforation, residual/local recurrence, and the surveillance methods used after ER, depending on the type of endoscopic procedure. The endoscopic procedures used included 14 382 lesions by hot biopsy; 34 433 lesions by polypectomy; 36 083 lesions by endoscopic mucosal resection (EMR); and 688 lesions by ESD. Postoperative bleeding was defined as

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Table 1. Facilities that answered questionnaire examining current trends in the incidence of postoperative bleeding, perforation, residual/local recurrence, and surveillance methods used after ER[†]

First Department of Internal Medicine, Sapporo Medical University
Fukuoka Dental College Medical and Dental Hospital
Division of Gastroenterology, Kurume University School of Medicine
Department of Gastroenterology, Fujita Health University
Yamagata University Hospital
Nakatsu Municipal Hospital
Department of Surgery, Kanto Rosai Hospital
Department of Surgery, Sano Ishikai Hospital
Chiba Cancer Center
Hakodata City Hospital
Keiyuukai Sapporo Hospital
Osaka Medical Center for Cancer and Cardiovascular Diseases
Ishinomaki Municipal Hospital
Shiga University of Medical Science
Haga Red Cross Hospital
NTT West Osaka Hospital
Department of Surgery, National Defense Medical Collage Hospital
Showa University
Saitama Medical Center Jichi Medical University
South Miyagi Medical Center
Ibaraki Prefectural Central Hospital
National Cancer Center Hospital
Cancer Institute Hospital of Japanese Foundation for Cancer Research
First Department of Internal Medicine, Iwate Medical University
First Department of Internal Medicine, Hirosaki University
Department of Endoscopy, Kochi Medical School
Yaizu City Hospital
Osaka Central Hospital
Niigata City General Hospital
Hyogo College of Medicine
National Hospital Organization Kyushu Medical Center
Aichi Cancer Center Hospital
Second Department of Surgery, Tokyo Women's Medical University
Kanazawa University Hospital
Division of Surgical Oncology, Nagoya University
Yokohama City University Hospital
JR Osaka Railway Hospital
Kakegawa City General Hospital
Misawa City Hospital
Fukuya Red Cross Hospital
Hyogo Cancer Center
Yao Municipal Hospital
Department of Thoracic Visceral Organ Surgery, Gunma University
Saitama Cancer Center
Hyogo College of Medicine
Fukushima Medical University Hospital
Keio University Hospital
Fukuiken Saiseikai Hospital
Iwakuni Clinical Center
Fukuoka University Chikushi Hospital
Sendai Kousei Hospital
Asahikawa-Kousei General Hospital
Department of Endoscopy, Kochi Medical University
National Cancer Center Hospital East
Sapporo Kosei General Hospital
First Department of Surgery, Yamanashi University
Asahikawa City Hospital
Department of Coloproctological Surgery, Juntendo University
Showa University Northern Yokohama Hospital
Sendai Medical Center
First Department of Surgery, School of Medicine
University of Occupational and Environmental Health
Japanese Red Cross Nagoya Daiichi Hospital
Mitsubishi Mihara Hospital
Saga University Hospital
Department of Surgery, School of Medicine, Tokai University
Department of Surgery, Tottori University
Department of Surgery, Kinki University School of Medicine
Saiseikai Niigata Daini Hospital
Kumamoto Municipal Hospital
Yokohama General Hospital
Sapporo Social Insurance General Hospital
Toyama University Hospital
Uwajima City Hospital
Nishi Sapporo National Hospital
Department of Gastroenterology and Hepatology, Kyoto University
Matsunami General Hospital
Saitama Red Cross Hospital
Sakai Municipal Hospital
Kure City Medical Association Hospital
Chikuba Hospital for Proctological and Gastrointestinal Diseases
Niigata University Hospital
Kanagawa Cancer Center
Division of Surgical Oncology, Tokyo Medical and Dental University
Tokyo Metropolitan Tama Cancer Detection Center
Mie University Hospital
Surgery for Organ Function and Biological Regulation, Nippon Medical School
Department of Medicine, Division of Gastroenterology, Jichi Medical University
Nippon Medical School Chiba Hokusou Hospital
Nara Medical University
Department of Surgery, Jichi Medical University
Akita Red Cross Hospital
Showa University Toyosu Clinic
Department of Gastroenterology, Chofu Surgical Clinic
Department of Surgery, Teikyo University School of Medicine
Department of Gastroenterology and Hepatology, Tokyo Medical University
Institute of Gastroenterology, Tokyo Women's Medical University
Gastroenterological Surgery, Toho University Medical Center Omori Hospital
Tohoku University Hospital
Nihon University Itabashi Hospital
Fukuoka University Chikushi Hospital
Kitasato University East Hospital
Department of Endoscopy, Hiroshima University Hospital
Tokushima University Hospital
Institute of Gastroenterology, Musashikosugi Hospital, Nippon Medical School

[†]Two hospitals were unnamed in the questionnaire.
ER, endoscopic resection.

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Table 2. Frequency of postoperative bleeding, perforation and local residue/recurrence depending on the type of endoscopic procedure

	Hot biopsy $n = 14\,382$	Polypectomy $n = 34\,433$	EMR $n = 36\,083$	ESD $n = 688$	Total (%) $n = 85\,586$
Postoperative bleeding (%)	38 (0.3)	444 (1.3)	520 (1.4)	12 (1.7)	1014 (1.2)
Requirement for surgical treatment (%)	0 (0)	1 (0.2)	1 (0.2)	0 (0)	2 (0.2)
Perforation (%)	2 (0.01)	6 (0.02)	33 (0.09)	23 (3.3)	64 (0.07)
Requirement for surgical treatment (%)	1 (50)	4 (66.7)	18 (54.5)	14 (60.9)	37 (57.8)
Local residue/recurrence (%)	1 (0.007)	118 (0.3)	494 (1.4)	16 (2.3)	629 (0.7)

*$P < 0.001$.
EMR, endoscopic mucosal resection; ESD, endoscopic submucosal dissection.

the condition in which the hemoglobin (Hb) content of the blood was lower than 2 g/dL or symptoms, such as hematemesis or melena, were revealed.[8] Perforation during the procedure was immediately sutured by clipping and confirmed by detection of free air on plain radiography or computed tomography (CT) image. Statistical analysis was carried out using the chi-squared test, with values of $P < 0.05$ considered statistically significant.

RESULTS

Frequency of postoperative bleeding depending on the type of endoscopic procedure

The total frequency of incidence of postoperative bleeding was 1.2% (1014/85 586). The frequencies for each endoscopic procedure used were as follows: 0.26% (38/14 382) by hot biopsy, 1.3% (444/34 433) by polypectomy, 1.4% (520/36 083) by EMR, and 1.7% (12/688) by ESD. The frequency of incidence was significantly lowest for hot biopsy as compared to the other procedures (Table 2).

Surgery of necessity for the treatment of postoperative bleeding was carried out at the rate of 0.20% (2/1014). The surgical rates depending on the type of endoscopic procedure used were 0.23% (1/444) by polypectomy and 0.19% (1/520) by EMR. Bleeding by other procedures was successfully treated by endoscopic procedures.

Frequency of perforation depending on the type of endoscopic procedure

The total frequency of incidence of perforation was 0.74% (64/85 586). The frequencies for each endoscopic procedure used were as follows: 0.01% (2/14 382) by hot biopsy, 0.017% (6/34 433) by polypectomy, 0.091% (33/36 083) by EMR, and 3.3% (23/688) by ESD. The frequency of incidence was significantly highest for ESD as compared to the other procedures (Table 2).

Surgery for the treatment of perforation was carried out at the rate of 57.8% (37/64). The surgical rates depending on the endoscopic procedure were as follows: 50.0% (1/2) by hot biopsy, 66.7% (4/6) by polypectomy, 54.5% (18/33) by EMR, and 60.9% (14/23) by ESD. There was no significant difference in the surgical rates among the endoscopic procedures.

Frequency of residual/local recurrence depending on the type of endoscopic procedure

The total frequency of incidence of residual/local recurrence was 0.73% (629/85 586). The frequencies for each endoscopic procedure used were as follows: 0.007% (1/14 382) by hot biopsy, 0.34% (118/34 433) by polypectomy, 1.4% (494/36 083) by EMR, and 2.3% (16/688) by ESD. The frequencies were significantly higher for EMR and ESD than for hot biopsy and polypectomy (Table 2).

Surveillance methods after ER

Colonoscopic examination was used as a surveillance method for detecting residual/local recurrence in all 107 hospitals. In addition, three of the hospitals separately used transabdominal ultrasound (TUS), CT, and barium enema examination in combination with colonoscopic examination. Follow-up duration from the end of ER to initial examination was 5.7 ± 3.2 (range 1–12) months and that from the initial

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examination to the second examination was 12.0 ± 6.2 (range 2–36) months, among the 91 hospitals that had responded to the questionnaire.

Surveillance for tumor metastasis was carried out by colonoscopic examination in five hospitals (4.7%), TUS in 47 hospitals (43.9%), CT scan in 98 hospitals (91.6%), serum tumor-marker test in five hospitals (4.7%), positron-emission tomography (PET) in three hospitals (2.8%), and by chest X-ray examination in two hospitals (1.9%), among all the 107 hospitals examined. Follow-up duration for the detection of metastasis from the end of ER to initial examination was 4.9 ± 1.9 (range 3–36) months and that from the initial examination to the second examination was 9.5 ± 3.5 (range 3–24) months, among the 91 hospitals that had responded to the questionnaire.

DISCUSSION

Our data revealed higher frequencies of postoperative bleeding than those reported in previous studies.[9–19] An increase in the number of patients with larger lesions, such as laterally spreading tumors (LST), and the increased use of ER for treating colon cancers as compared to the numbers at the time when the previous studies were published might be a reason for the higher frequencies obtained in the present study. In addition, the inclusion of ESD data might have influenced the results, although data from only a few cases of ESD were included in the present study.

Bleeding has the highest frequency among the incidences associated with colonoscopic treatment. In the frequency of postoperative bleeding, we could not observe any difference among polypectomy, EMR and ESD. However, the frequency of postoperative bleeding in hot biopsy was the lowest. Requirement for surgical treatment for postoperative bleeding was seen in only 0.2% of the cases in our study. This result shows that endoscopic techniques, such as clipping, are sufficient to arrest bleeding. Important factors in the endoscopic procedure for bleeding are the arrangement of the apparatus and drugs for maintaining bleeding, extensive experience with resection techniques, appropriate treatment for bleeding, postoperative management, preoperative examination of a patient's overall medical condition, and preoperative acquirement of informed consent. The patient's bleeding tendency and intake of antiplatelet and anticoagulant drugs are also important factors that should be considered before carrying out the surgery. Perforation, which is a rare incidence compared to postoperative bleeding, can sometimes become serious. Our study showed a result (3.3%) similar to other studies[1–7,14] in which the frequency of perforation by ESD was significantly higher than that with other treatment methods. ESD is difficult to carry out because the bowel has a thin wall and it exhibits flexure and peristalsis.[3,20] For treating perforation, proper management after treatment is very important.

At first, intestinal tension is relieved by aspirating air through the intestine, and then the perforating lesion is closed using clips. However, the requirement for surgical treatment following perforation was high, irrespective of the treatment methods used.[2,3]

The questionnaire study found that the frequency of residual/local recurrence after ER was 0.73%. Residual/local recurrence may occur if the lesion is incompletely resected. Therefore, surveillance after ER becomes important. Two prospective studies have examined residual/local recurrence after ER. Higaki *et al*.[21] reported that the frequency of residual/local recurrence was four (four piecemeal resections) of 24 LST lesions by follow up during a 24-month-period after ER, and Hurlstone *et al*.[22] reported that it was 10 (two en bloc resections, eight piecemeal resections, and nine were LST-granular types) of 58 lesions with LST by follow up during a 24-month-period after ER. Other retrospective studies revealed that the frequency of residual/local recurrence was 1.1–27.3%.[15,18,21–25] Most reports revealed significantly higher frequency of residual/local recurrence with piecemeal resection than with en bloc resection. An exception to this observation is a report by Tanaka *et al*.[26] In the present study, the frequency of residual/local recurrence by EMR was found to be as low as 1.4%, although we could not analyze the details of the EMR method. The present study also found that the frequency of residual/local recurrence after ESD was as high as 2.3%. This result could arise from the fact that ESD was changed from en bloc resection to piecemeal resection for various reasons.

The results of the present multicenter questionnaire survey clearly show the current status in the incidence of postoperative bleeding, perforation, and residual/local recurrence during colonoscopic treatment in Japan. Therefore, to ensure the well-being of the patient, an endoscopist who specializes in treating colorectal tumors must be cautious enough to prevent the occurrence of such incidences, in spite of the increase in the number of ER for colorectal tumor.

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