Risk of colonoscopic post-polypectomy bleeding in patients after the discontinuation of antithrombotic therapy

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ABSTRACT

Background/Aims: *Few studies have examined the incidence of post-polypectomy bleeding (PPB) after discontinuation of antithrombotic therapies. Therefore, this study aimed to evaluate the incidence of PPB and thromboembolic events in patients whose antithrombotic agents were discontinued before colonoscopy.*

Materials and Methods: *We retrospectively selected all patients who underwent colon polypectomy at a community hospital. A total of 282 patients (540 polypectomies) discontinued antithrombotic agents (group 1), and 1,648 patients (2,827 polypectomies) did not take antithrombotic agents (group 2). The cessation periods before and after polypectomies were 4 and 3 days for warfarin, 5 and 3 days for anti-platelet agents, and 7 and 5 days of combination therapy, respectively. Main outcome measurements were the incidence of PPB and thromboembolic events.*

Results: *Immediate PPB rates were 3.9% (11/282) in group 1 and 4.6% (76/1648) in group 2 (adjusted odds ratio [OR], 0.85; 95% confidence interval [CI], 0.42-1.72; p=0.65). Delayed PPB rates were 1.4% (4/282) in group 1 and 1.1% (18/1648) in group 2 (adjusted OR, 1.24; 95% CI, 0.36-4.24; p=0.732). No thromboembolic events were observed in either group.*

Conclusion: *Our cessation periods were appropriate, and further shortening of these periods is possible.*

Keywords: *Platelet aggregation inhibitors, colonic polyps, colonoscopy, post-operative hemorrhage, risk factors*

INTRODUCTION

Bleeding is the most common adverse effect of colonoscopic polypectomy (1-7). Endoscopists need to strongly consider the risk of bleeding when endoscopic procedures are performed on patients who are taking antithrombotic agents. The European Society of Gastrointestinal Endoscopy (ESGE) guidelines (8) state that polyps may be safely removed without the interruption (moderate evidence) of aspirin therapy (with the exception of large colonic mucosectomy ≥2 cm). However, Flavia et al. (9) performed a systematic review and meta-analysis and reported that aspirin/nonsteroidal anti-inflammatory drug is a risk factor for delayed post-polypectomy bleeding (PPB) (odds ratio [OR], 1.7; 95% confidence interval [CI], 1.2-2.2; degree of freedom=8, p=0.127, I-squared=36%). Moreover, Singh et al. (10) also demonstrated that the rate of colonoscopic PPB was significantly higher in patients receiving uninterrupted clopidogrel therapy (3.5% vs. 1% not on clopidogrel: p=0.02). However, interruption of antithrombotic agents has been shown to increase the risk of thromboembolic events (11, 12). Usage of antithrombotic agents has increased in recent years. Therefore, an appropriate cessation period before endoscopic procedures needs to be set. The Japan Gastroenterological Endoscopy Society (JGES) published guidelines on the management of antithrombotic agents for endoscopic procedures in 2012 (13), and these guidelines are still in use today. These guidelines evaluate the risk of thromboembolism in the same manner as that of the ASGE guidelines (14). The JGES guidelines recommend cessation periods of 3-5 days for aspirin and 5-7 days for thienopyridines before the procedures associated with

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a high risk of bleeding, such as polypectomy, for the low thromboembolic risk group. However, limited evidence is available on the incidence of PPB and thromboembolic events in patients whose antithrombotic therapies were discontinued. Therefore, our study evaluated the incidence of PPB and thromboembolic events in patients whose antithrombotic medications were stopped before colonoscopy.

MATERIALS AND METHODS

Patients

We retrospectively selected all the patients who underwent colon polypectomy between August 2007 and May 2010 at our institution. The study protocol was approved by the institutional review board at our institution. A total of 1,935 patients underwent polypectomy. However, 5 patients were excluded because the antithrombotic agents had not been discontinued as the attending physicians assessed their thromboembolic risk as very high. Therefore, 1,930 patients who underwent 3,367 polypectomies were enrolled in this study (Figure 1). A total of 165 patients underwent colonoscopy more than once during our study period. We divided the patients into 2 groups. Group 1 included patients in whom antithrombotic agents were discontinued before the colonoscopy. In group 1, 282 patients underwent 540 polypectomies. Group 2 included patients who did not take antithrombotic agents, and 1,648 patients underwent 2,827 polypectomies in group 2.

Medical Record Review

Pharmacy records/cessation period

We checked the medications (antithrombotic agents) before colonoscopy. We set the cessation periods according to the JGES guidelines (15). The cessation periods before and after polypectomies were 4 and 3 days for warfarin, 5 and 3 days for anti-platelet agents, and 7 and 5 days for combination therapy (aspirin with ticlopidine or clopidogrel), respectively. If the international normalized ratio of the prothrombin time was 1.5 or more, polypectomy was not performed.

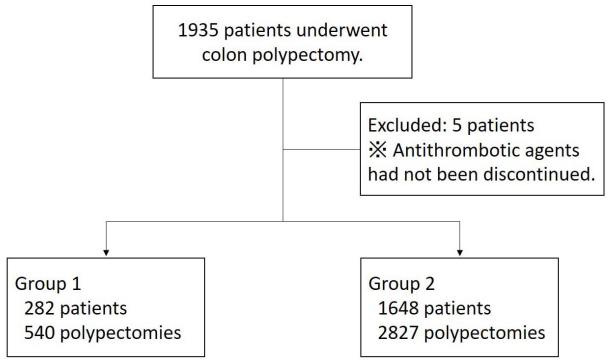

Figure 1. Flowchart of treatment results. Group 1 is defined as patients whose antithrombotic agents were discontinued before colonoscopy. Group 2 is defined as patients who did not take antithrombotic agents.

Demographics and clinical data

Patient characteristics, such as age, sex, and comorbidities (hypertension, diabetes mellitus, hyperlipidemia, coronary artery disease, cerebrovascular disease, peripheral vascular disease, chronic obstructive pulmonary disease, and chronic renal failure requiring dialysis), were obtained by reviewing their medical charts.

Colonoscopy/polypectomy details

Polyp characteristics, such as macroscopic type, size, number of polyps, methods of resection (hot biopsy, hot or cold snare, and endoscopic mucosal resection [EMR], and treatment after resection), were obtained from the endoscopic reports.

PPB

We reviewed the medical records, endoscopic reports, and endoscopic images to assess the presence of PPB. We classified PPB into immediate and delayed PPB. Immediate PPB was defined as bleeding that required hemostasis just after polypectomy. Delayed PPB was defined as hematochezia within 4 weeks of polypectomy. We classified delayed PPB into major and minor bleeding. Major bleeding was defined as bleeding that required hemostasis. Minor bleeding was defined as bleeding that did not require hemostasis. Bleeding was considered significant if the patient developed shock and/or required transfusions and interventions, including angiography or surgery.

MAIN POINTS

- *We set the cessation period before the polypectomy to 5 days for anti-platelet agents and 4 days for warfarin. No significant differences were observed in PPB rates between both the groups.*
- *Our cessation periods are appropriate, and further shortening of these periods is possible.*
- *In our study, the independent risk factors for delayed PPB were coronary artery disease and hemodialysis. This result suggests that atherosclerosis is a risk factor for delayed PPB.*

Statistical Analysis

Demographic and clinical characteristics of groups 1 and 2 were compared. Categorical variables were compared using the χ^2 and Fisher's exact tests and continuous variables by the Student's t test. The incidence of PPB was compared between the groups 1 and 2 using univariate analysis. A logistic regression analysis was performed to verify the influence of discontinuing antithrombotic agents on PPB. We adjusted for age, sex, hypertension, diabetes, hyperlipidemia, number of polyps, the maximum polyp size, and the most invasive method of resection (EMR>hot snare>hot biopsy>cold snare). A multilevel logistic regression analysis was performed to identify the independent risk factors associated with PPB. We adjusted for individual factors (hypertension, diabetes, coronary artery disease, cerebrovascular disease, hemodialysis, and group 1) and polyp-related factors (pedunculated polyp, size, procedure of resection, and prophylactic clipping). We calculated the OR and 95% CI. A p value of <0.05 was considered statistically significant. Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 20 (IBM Corp.; Armonk, NY, USA).

RESULTS

Demographics and Clinical Data

A total of 540 polypectomies were performed in group 1 (282 patients) and 2,827 in group 2 (1,648 patients) (Figure 1). Demographic and clinical data of both the groups are shown in Table 1. Mean ages were significantly higher in group 1 (71.8 years) than in group 2 (63.7 years, p<0.001). Male-to-female ratios were similar in both the groups. The incidence of comorbidities, such as hypertension, diabetes, hyperlipidemia, ischemic heart disease, peripheral vascular disease, cerebrovascular disease, and hemodialysis, was higher in group 1 than in group 2 (p<0.001).

Antithrombotic Agents

The types of antithrombotic agents used in group 1 are shown in Table 1. A total of 154 patients took aspirin at 81-100 mg, whereas 20 of these patients also received combination therapy (ticlopidine, 9; cilostazol, 4; dipyridamole, 2; ethyl icosapentate, 1; sarpogrelate hydrochloride, 1; limaprost alfadex, 1; ifenprodil tartrate, 1; and dilazep hydrochloride hydrate, 1). A total of 25 patients received ticlopidine, and 2 of these patients were also treated with combination therapy (aspirin, 100 mg). Moreover, 11 patients were taking dipyridamole as a single agent; 11 patients were being treated

Table 1. Demographic data.

Demographics	Group 1 (n=282)	Group 2 (n=1,648)	p
Age, years (mean±SD)	71.8±7.8	63.7±11.0	<0.001
Sex, male, n (%)	212 (75.2)	1,154 (70.0)	<0.074
HT, n (%)	198 (70.2)	560 (34.0)	<0.001
DM, n (%)	59 (20.9)	145 (8.8)	<0.001
HL, n (%)	87 (30.9)	181 (11.0)	<0.001
CAD, n (%)	56 (19.9)	7 (0.4)	<0.001
PVD, n (%)	4 (1.4)	2 (0.1)	<0.001
COPD, n (%)	4 (1.4)	17 (1.0)	<0.643
CVD, n (%)	65 (23.0)	22 (1.3)	<0.001
HD, n (%)	10 (3.5)	8 (0.5)	<0.001
Antithrombotic agents, n (%)			
Aspirin, 81-100 mg	154 (54.6)	NA	
Single agent	134 (47.5)	NA	
Combination use	20 (7.1)	NA	
Ticlopidine	25 (8.9)	NA	
Single agent	23 (8.2)	NA	
Combination use	2 (0.7)	NA	
Dipyridamole	12 (4.3)	NA	
Single agent	12 (4.3)	NA	
Combination use	0	NA	
Clopidogrel	11 (3.9)	NA	
Single agent	8 (2.8)	NA	
Combination use	3 (1.0)	NA	
Other anti-platelet agents	40 (14.2)	NA	
Single agent	40 (14.2)	NA	
Combination use	0	NA	
Warfarin	48 (17.0)	NA	
Single agent	35 (12.4)	NA	
Combination use	13 (4.6)	NA	

CAD: coronary artery disease; COPD: chronic obstructive pulmonary disease; CVD: cerebrovascular disease; DM: diabetes mellitus; HD: hemodialysis; HL: hyperlipidemia; HT: hypertension; NA: not applicable; PVD: peripheral vascular disease; SD: standard deviation

with clopidogrel, and 3 of these patients also received combination therapy (cilostazol in 2 and aspirin [81 mg] in 1). In addition, 40 patients were administered other anti-platelet agents as single agents (limaprost alfadex, 16; ifenprodil tartrate, 7; ethyl icosapentate, 6; cilostazol, 5; tocopherol nicotinate, 4; beraprost sodium, 1; and ibudilast, 1). Furthermore, 48 patients were taking warfarin, and 13 of these patients were also being treated with anti-platelet agents (aspirin [100 mg], 6; ticlopidine, 4; cilostazol, 2; and dipyridamole, 1). None of our patients received heparin bridge therapy (HBT) during their cessation periods because the attending physicians assessed the thromboembolic risk as low.

Table 2. Polyp characteristics and polypectomy technique.

Characteristics	Group 1 (n=282)	Group 2 (n=1,648)	p
Total number of polyps removed	540	2,827	
Number of polyps/patient (mean±SD)	1.87±1.48	1.72±1.31	0.10
Polyp size (mm), n (%)			
1-9 mm	446 (82.2)	2,245 (79.4)	0.09
10-19 mm	83 (15.8)	535 (18.9)	0.06
≥20 mm	11 (2.0)	47 (1.7)	0.53
Methods of resection, n (%)			
Hot biopsy	17 (3.1)	219 (7.7)	<0.001
Hot snare	349 (64.9)	1,804 (63.9)	0.71
Cold snare	2 (0.4)	14 (0.5)	0.96
EMR	172 (31.6)	790 (27.9)	0.06
Endoclip deployment, n (%)	119 (22.0)	493 (17.4)	0.01

SD: standard deviation; EMR: endoscopic mucosal resection

Polyp Characteristics and Polypectomy Technique

The polyp characteristics and polypectomy techniques performed in both the groups are shown in Table 2. Hot snare and EMR were popular and accounted for 90% or more of the polypectomy techniques performed. No significant differences were observed in the polyp number per patient, polyp size and location, or polypectomy technique, except for hot biopsy, between the 2 groups. A total of 17 (3.1%) patients in group 1 and 219 (7.7%) patients in group 2 underwent hot biopsy (p<0.001), and 119 (22.0%) patients in group 1 and 493 (17.4%) patients in group 2 underwent prophylactic endoclip placement after polypectomy (p=0.01).

PPB (Univariate Analysis)

PPB rates in both the groups are shown in Table 3. Immediate PPB rates were 3.9% (11/282: 95% CI, 2.0-6.9) in group 1 and 4.6% (76/1648: 95% CI, 3.7-5.7) in group 2 (OR 0.8; 95% CI 0.42-1.51; p=0.486). Delayed PPB rates were 1.4% (4/282: 95% CI, 0.4-3.6) in group 1 and 1.1% (18/1648: 95% CI, 0.6-1.7) in group 2 (OR 1.3; 95% CI 0.44-3.88; p=0.634). Major bleeding rates were 0.7% (2/282: 95% CI, 0.1-2.5) in group 1 and 0.3% (5/1648: 95% CI, 0.1-0.7) in group 2 (p=0.612). Significant bleeding rates were 0% (0/282: 95% CI, 0-1.1) in group 1 and 0.1% (2/1648: 95% CI, 0-0.4) in group 2 (p=0.679).

PPB (Logistic Regression Analysis)

Table 3 summarizes the PPB rates in both the groups by logistic regression analysis adjusted for age, sex, hyper-

Table 3. Post-polypecomy bleeding in discontinued and without groups.

	Group 1 (n=282)	Group 2 (n=1,648)						
	n (%; 95% CI)	n (%; 95% CI)	OR	95% CI	p	Adjusted OR*	95% CI	p
Immediate PPB (intraprocedural)	11 (3.9; 2.0-6.9)	76 (4.6; 3.7-5.7)	0.80	0.42-1.51	0.486	0.85	0.42-1.72	0.65
Delayed PPB (post-procedural)	4 (1.4; 0.4-3.6)	18 (1.1; 0.6-1.7)	1.30	0.44-3.88	0.634	1.24	0.36-4.24	0.732
Major bleeding	2 (0.7; 0.1-2.5)	5 (0.3; 0.1-0.7)						
Minor bleeding	2 (0.7; 0.1-2.5)	13 (0.8; 0.4-1.3)						

CI: confidence interval; OR: odds ratio; PPB: post-polypectomy bleeding

Major bleeding: bleeding that required hemostasis. Minor bleeding: bleeding that did not require hemostasis.

*In a logistic regression analysis, we adjusted for age, sex, hypertension, diabetes, hyperlipidemia, number of polyps, the maximum polyp size, and the most invasive method of resection.

Table 4. Details of delayed post-polypectomy bleeders (A: Group 1, B: Group 2).

Subj	Age	Sex	Antithrombotic agents	Comorbidities	No. polyps removed	Largest polyp (mm)	Polypectomy technique	Prophylactic procedure	Time of PPB (days)	Shock symptom	pRBC transfusions (units)	Hospital stay (days)	Interventions
A1	68	M	Aspirin 100 mg	HT, DM, HL, CAD, CVD, HD	2	6	EMR	Clipping	2	-	-	4	Aspirin held
A2	68	M	Aspirin 100 mg	HT, DM, HL, CAD, CVD, HD	1	5	EMR	Clipping	6	-	-	6	Aspirin held, clipping, hemostatic forceps
A3	73	M	Aspirin 100 mg	HT, CAD	1	6	EMR	Clipping	8	-	-	0	-
A4	76	M	Warfarin	HT, HL	2	6	EMR	-	2	-	-	16	Warfarin held, colonoscopy
B1	57	M	-	HT, HD	1	10	EMR	Clipping	2	-	-	0	Clipping
B2	51	M	-	-	2	6	EMR, HS	Clipping	2	-	-	2	Clipping
B3	52	M	-	HL	1	8	HS	Clipping	3	-	-	3	Clipping
B4	84	M	-	HT	2	13	EMR	-	1	-	-	3	-
B5	70	M	-	HT	1	4	HS	-	4	-	-	0	Clipping
B6	58	M	-	HL	1	10	EMR	-		-	-	0	-
B7	49	M	-	-	1	5	HS	-	4	-	-	0	-
B8	60	M	-	-	3	3	HB	Clipping	10	-	-	0	Clipping
B9	76	M	-	HT	1	15	HS	Clipping	8	-	-	0	Clipping
B10	47	M	-	-	2	6	HS	-	4	-	-	0	-
B11	66	M	-	-	2	10	EMR	Clipping	5	-	-	0	Clipping
B12	53	M	-	-	2	23	HS	Clipping	8	+	-	4	Clipping, ICU
B13	44	M	-	-	2	9	HS	Clipping	2	-	-	0	Clipping
B14	56	F	-	-	1	15	EMR	Clipping	1	+	units	4	Clipping
B15	66	M	-	-	1	3	HB	-	10	-	-	0	-
B16	51	M	-	HT	6	30	EMR	Clipping	1	-	-	2	Clipping
B17	52	F	-	-	1	12	EMR	-	1	-	-	0	-
B18	61	M	-	-	1	7	EMR	Clipping	5	-	-	2	Clipping

CAD: coronary artery disease; CVD: cerebrovascular disease; DM: diabetes mellitus; EMR: endoscopic mucosal resection; F: female; HB: hot biopsy; HD: hemodialysis; HL: hyperlipidemia; HS: hot snare; HT: hypertension; ICU: intensive care unit; M: male; PPB: post-polypectomy bleeding; pRBC: packed red blood cell; Subj: subject

tension, diabetes, hyperlipidemia, number of polyps, the maximum polyp size, and the most invasive method of resection. Immediate PPB rates (adjusted OR: 0.85, 95% CI: 0.42-1.72, p=0.65) and delayed PPB rates (adjusted OR: 1.24, 95% CI: 0.36-4.24, p=0.732) were similar between the 2 groups.

Management of PPB

Immediate/intraprocedural PPB

All patients with immediate PPB underwent endoclip placement. None of our patients required hospitalization, transfusions, and interventions, including angiography or surgery.

Table 5. Multilevel logistic regression analysis to identify the independent risk factors associated with post-polypectomy bleeding.

	OR	95% CI	p
Individual risk factors			
HT	0.88	0.35-2.2	0.78
DM	0.35	0.64-1.87	0.22
CAD	6.43	1.12-36.9	0.037
CVD	1.06	0.18-6.18	0.95
HD	14.2	3.0-67.7	<0.001
Group 1	0.53	0.12-2.37	0.41
Polyp-related factors			
Pedunculated polyp	3.9	1.36-11.1	0.011
Size (1-9 mm)	1		
(10-19 mm)	1.25	0.44-3.53	0.67
(>20 mm)	1.64	0.3-8.94	0.57
Procedure (hot biopsy)	1		
(polypectomy)	0.14	0.04-0.49	0.002
(EMR)	0.33	0.09-1.17	0.086
Prophylactic clipping	0.34	0.14-1.12	0.092

CAD: coronary artery disease; CI: confidence interval; CVD: cerebrovascular disease; DM: diabetes mellitus; EMR: endoscopic mucosal resection; HD: hemodialysis; HT: hypertension; OR: odds ratio

Delayed PPB

Individual data for patients with delayed PPB are shown in Table 4. A total of 4 patients in group 1 had delayed PPB. Subjects A1 and A2 were the same patient. This patient had a large number of comorbidities, such as hypertension, hyperlipidemia, coronary artery disease, cerebrovascular disease, and diabetic renal failure requiring dialysis, and was also taking aspirin (100 mg). A total of 3 patients in group 1 and 7 patients in group 2 were hospitalized. No significant difference was found in the hospitalization rates between the 2 groups using univariate analysis (p=0.45). Antithrombotic agents were discontinued in the 3 hospitalized patients from group 1 for 3-10 days without any adverse cerebrovascular or coronary ischemic effects. From group 2, 2 patients with delayed PPB developed shock, 1 of whom received a transfusion with 4 units of packed red blood cells. Bleeding sites were treated with endoclip placement. None of our patients required platelet or clotting factor transfusions, angiographic interventions, or surgery. There was no mortality or long-term morbidity.

Thromboembolic events

No thromboembolic events were observed in either group.

Risk factors for PPB

The results of a multilevel logistic regression analysis are shown in Table 5. Coronary artery disease, hemodialysis, and pedunculated polyps were identified as the independent risk factors for delayed PPB.

DISCUSSION

In this study, no significant differences were observed in PPB rates between both the groups and no thromboembolic events were detected in either group. When endoscopic procedures are performed on a patient who takes antithrombotic agents, endoscopists typically follow guidelines on the management of antithrombotic agents. However, limited evidence is currently available on the incidence of PPB in patients in whom antithrombotic therapies are discontinued. Metz et al. (16) previously reported that recent aspirin use (average cessation period: 5.4 days) increased the risk of bleeding in EMR for laterally spreading tumors of 20 mm or greater in size (OR: 6.3; 95% CI: 1.8-22.5). These findings are valuable because this study evaluated the incidence of PPB in patients whose antithrombotic medications were stopped; however, the cessation periods were not equal among patients. Therefore, we set the cessation period before the polypectomy to 5 days for anti-platelet agents and 4 days for warfarin and compared the incidence of PPB between both the groups. Although this study is retrospective, only a small number of similar studies have been conducted; therefore, the results obtained are of importance. No significant differences were observed in PPB rates between both the groups using univariate and logistic regression analyses in this study. These results indicate that our cessation periods sufficiently prevent PPB.

PPB is considered to be related not only to direct damage to the vessels of resected polyps but also to failed tissue healing and vascularization (17, 18). Previous studies reported that hypertension damages the vascular endothelium (19) and may be a risk factor for arteriole rupture in the regenerating tissue (20). Watabe et al. (21) identified that hypertension was a significant risk factor for delayed PPB and also indicated that atherosclerosis accompanying hypertension contributes to PPB. In our study, the independent risk factors for delayed PPB were coronary artery disease and hemodialysis but not hypertension. Approximately half of the patients with coronary artery disease or hemodialysis had multiple risk factors for ath-

erosclerosis, such as hypertension, diabetes mellitus, and hyperlipidemia. This result suggests that atherosclerosis is a risk factor for delayed PPB.

Previous studies have reported that the morphology of polyps (sessile or pedunculated) and polyp size greater than 1cm may be associated with PPB (22-24). Polyp-related factors for delayed PPB in this study were consistent with those reported previously.

If a patient has these risk factors for PPB, a discussion about PPB and prophylactic procedures is important for the patient. Although the efficacy of the prophylactic endoclip procedure for resected sites remains controversial (25-28), it is regarded as acceptable for high-risk patients because of its safety and simplicity.

No thromboembolic events were observed in either group during the study period. However, the cessation period needs to be as short as possible because the interruption of antithrombotic agents increases the risk of thromboembolic events. Maulaz et al. (11) found that interruption of aspirin was associated with a significantly increased risk of a recurrent cerebrovascular event (transient ischemic attack or ischemic stroke; OR, 3.4; 95% CI, 1.08-10.63; p<0.001). Moreover, Blacker et al. (29) reported that the risk of stroke for patients in whom anticoagulation was interrupted for 4 to 7 days was 1.06%. The JGES guidelines (13) recommend HBT when procedures that have a high risk of bleeding are performed on patients whose anticoagulants are stopped. A previous study demonstrated that the rate of thromboembolism after the interruption of warfarin was lower in the HBT group than in the non-HBT group (0% vs. 0.6%, respectively) (30). However, Inoue et al. (31) showed that the incidence of PPB was significantly higher in the HBT group than in the non-HBT group (20.0% vs. 1.4%, respectively, p<0.001). Horiuchi et al. (32) performed a prospective randomized study in which patients were randomized to polypectomy with either the cold snare technique (cold group) or conventional polypectomy (conventional group) without the discontinuation of warfarin; the incidence of delayed PPB was significantly lower in the cold snare group than in the conventional group (0% vs. 14%, respectively, p=0.027). Therefore, the cold snare technique without the discontinuation of anticoagulant agents may be useful for patients treated with these drugs.

This study has several limitations. It was a single-center retrospective study. In addition to the study design, the number of patients in group 1 was too small to evaluate the incidence of thromboembolic events. Furthermore, patients in this study underwent colon polypectomy between 2007 and 2010. Therefore, the management of antithrombotic agents and methods of polyp resection were different from those used in the current clinical settings. Although the ESGE guidelines (8) recommend the continuation of aspirin for polypectomy, we set the cessation period to 5 days before polypectomy. Moreover, this study did not include patients taking direct oral anticoagulants, and the number of patients who underwent cold snare polypectomy was small. We need to accumulate evidence according to the current guidelines and treatment.

In conclusion, our cessation periods are appropriate, and further shortening of these periods is possible. A prospective study with a protocol that further shortens the cessation period is warranted in the future.

Ethics Committee Approval: Ethics committee approval was received fort his study from the Institution Saku Central Hospital Advanced Care Center (Decision date: 14/12/2015).

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