https://doi.org/10.33878/2073-7556-2024-23-4-17-23

Outpatient endoscopic polypectomy

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ABSTRACT *AIM: to estimate the efficacy and safety of outpatient polypectomy of epithelial benign tumors of the colon.*
PATIENTS AND METHODS: the prospective cohort study included 809 patients with colon polyps removed by cold loop polypectomy (CSP), hot loop polypectomy (HSP) and hot loop polypectomy with injection (HSP + injection). Intra- and postoperative complications were assessed.
RESULTS: a total of 2115 colon polyps 2–20 mm (0.5 [0.4; 0,7] mm) were removed. No intraoperative complications occurred. Prophylactic clipping was performed in 6,5% of cases with a significant higher rate for larger neoplasms: 10–20 mm — 77/324 (23.8%), 6–9 mm — 43/618 (7%), 2–5 mm — 17/1173 (1.4%), $p < 0.001$ in the omnibus test and all pairwise comparisons. The frequency of delayed complications (within 3 days) was 0.49% (4/809 patients) IIIa according to the Clavien-Dindo classification and 0.19% (4/2115 removed neoplasms).
CONCLUSION: removal of benign epithelial neoplasms of the colon ⩽ 20 mm without admission in a 24-hour hospital is associated with a low rate (0.19%) of delayed bleeding (within 3 days), so it is necessary to remove polyps less than 10 mm during screening colonoscopy.

KEYWORDS: *polypectomy, outpatient surgery, epithelial neoplasms of the colon, delayed bleeding, prophylactic clipping, outpatient polypectomy, colorectal cancer screening*

CONFLICT OF INTEREST: *the authors declare no conflict of interest*

FOR CITATION: Skridlevskiy S.N., Likutov A.A., Nazarov I.V., Bogdanova E.A., Bogormistrov I.S. Outpatient endoscopic polypectomy. *Koloproktologia*. 2024;23(4):17–23. (in Russ.). https://doi.org/10.33878/2073-7556-2024-23-4-17-23

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Received — 23.08.2024 *Revised — 05.09.2024* *Accepted for publication — 01.11.2024*

INTRODUCTION

Colorectal cancer reaches 9.4% of all cancer deaths worldwide, which underscores the role of screening to prevent this disease [1–4]. Removal of polyps during colonoscopy is widely used as a preventive method and has proven to be highly effective in reducing morbidity and mortality from colorectal cancer [4,5]. Nevertheless, polypectomy is associated with certain risks, including delayed post-polypectomy bleeding, which varies from 0.2% to 2%, and the probability is higher with the removal of large polyps [4,6–8]. Issues related to the risk of delayed bleeding and the possibility of performing polypectomy in an outpatient or 24h hospital are directly related to the definition of approaches to the removal of small, medium and large epithelial tumors of the large intestine, as well as patient routing. The existing data are contradictory, and there is a limited number of studies devoted to the removal of large intestine polyps outside the 24h hospital, most of which focus on the removal of small polyps.

PATIENTS AND METHODS

A prospective observational study included 809 patients who underwent outpatient endoscopic removal of colorectal epithelial neoplasms from January 2021 to December 2023.
The criteria for selecting patients included:
1. The presence of benign colorectal epithelial neoplasms less than 20 mm in diameter, on wide bases (0-Is, 0-IIa according to the Paris classification) or on legs (0-Ip according to the Paris classification) [9].

2. Informed consent of the patient to participate in the study.

The criteria for non-inclusion are:

1. Comorbidities requiring anticoagulants and / or antiplatelet agents without the possibility of their short-term withdrawal.

2. The patient's refusal to participate in the study.

In all cases, a two-stage intestinal cleansing was used before polypectomy using polyethylene glycol. Bowel cleansing was evaluated on the Boston scale [10]. Expert-level colonoscopes were used to remove benign epithelial neoplasms of the large intestine. Polypectomy was performed using Cold-Snare Polypectomy (CSP), Hot-Snare Polypectomy (HSP) and Hot-Snare Polypectomy in combination with injection (HSP + injection) into the base of the polyp of a 4% solution of succinylated gelatin (gelofuzine) with disodium salt indigo-5.5'-disulfonic acid (indigocarmine).

After polypectomy, the wound area was evaluated, and, if necessary, preventive intraoperative endoscopic hemostasis using clips was done. A morphology of all removed neoplasms was carried out.

In the early period after removal of epithelial neoplasms of the large intestine (within the first 3 days), data on the condition of the patients were collected by telephone interview of the patients and/or their relatives. The clinical status of the patient and the presence of delayed complications (bleeding, perforation) were analyzed, assessing complications according to the Clavien-Dindo classification [11].

In case of complications in the early postoperative period (within the first 3 days), patients were admitted in a 24h hospital.

The severity of bleeding was assessed with the identification of three main groups of hemorrhagic complications:

1. Minor bleeding: does not require medical intervention and does not affect the patient's condition.

2. Clinically significant bleeding: requires medical intervention, additional examination and possibly hospitalization.

3. Severe bleeding: leads to a significant decrease in hemoglobin levels, requires surgery or blood transfusion.

This classification corresponds to the international standards for the assessment of bleeding, which is confirmed by various sources studying the risks and management of hemorrhagic complications in anticoagulant therapy and other medical interventions [12].

Data Analysis and Statistical Processing

A comparative analysis of the initial parameters and results of the removal of epithelial neoplasms, depending on their size, divided into the following groups, was carried out:

- Group 1: small (up to 5 mm).
- Group 2: medium (from 6 to 9 mm).
- Group 3: large (from 10 mm to 20 mm).

A sub-analysis was carried out within group 3:

- Group 3.1: polyps from 10 mm to 14 mm.
- Group 3.2: polyps from 15 mm to 20 mm.

The rate of preventive hemostasis and delayed complications was also analyzed.

Statistical Analysis

The statistical analysis was carried out using the StatTech v. program. 4.1.7 (developer — Stattech LLC, Russia). Quantitative indicators were evaluated for compliance with the normal distribution using the Kolmogorov-Smirnov criterion. Due to the absence of a normal distribution in all parameters, quantitative data were described using the median (Me) and the lower and upper quartiles [Q1; Q3]. Categorical data were described with absolute values and percentages.

The comparison of the two groups by a quantitative indicator, the distribution of which differed from the normal one, was performed using the Mann-Whitney U-test. The comparison of percentages in the analysis of four-field conjugacy tables was performed using Pearson's χ^2 test (if the values of the expected phenomenon are more than 10) or Fisher's exact test (if the values of the expected phenomenon are less than 10). The comparison of percentages in

the analysis of multi-field conjugacy tables was performed using Pearson's χ^2 test. The differences were considered statistically significant at $p < 0.05$.

RESULTS

According to the criteria of inclusion and non-inclusion, 809 patients were included in the study, 357 (44.1%) males and 452 (55.9%) females. Patients were aged 60 [50; 67] years (from 22 to 87 years). On an outpatient basis, from 1 to 10 neoplasms (2 [1; 3]), ranging in size from 2 to 20 mm (0.5 [0.4; 0.7] mm), of 2,115 epithelial neoplasms of the large intestine, corresponding to the endoscopic criteria for inclusion in the study, were identified and removed by polypectomy. The following methods of endoscopic removal of epithelial neoplasms have been used:

- Cold-snare polypectomy (CSP): 1,658/2,115 (78.4%).
- Hot-snare polypectomy (HSP): 39/2,115 (18.5%).
- Hot-snare polypectomy with injection (HSP + injection): 66/2,115 (3.1%).

No intraoperative complications occurred. The analyzed endoscopic features of identified and removed outpatient epithelial neoplasms of the large intestine are presented in the table (Table 1).

Morphology of removed colorectal epithelial neoplasms was performed in 1,714 (81%) cases, since not all neoplasms could be removed due to their small size (401 cases — 19%).

According to the morphology, the rate of adenomas detection was higher compared to the other morphological types of epithelial neoplasms:

- Adenomas: 1,046/1,714 (61%);
- Dentate neoplasms: 334/1,714 (19.5%);
- Hyperplastic polyps: 259/1,714 (15.1%);
- Inflammatory polyps: 41/1,714 (2.4%);
- Juvenile polyps: 2/1,714 (0.1%);
- Adenocarcinomas: 3/1,714 (0.2%);
- Fragment of the large intestine mucosa: 29/1,714 (1.7%).

Prophylactic hemostatic clipping to prevent possible delayed bleeding was performed in 137/2,115 (6.5%) cases and was significantly more often performed when removing large epithelial tumors of the large intestine compared with medium and small ones (23.8% vs. 7.0% and 1.4%, $p < 0.001$, respectively). Preventive hemostasis was also performed more often in the group of medium-sized neoplasms compared with small ones ($p < 0.001$) (Table 2).

In the group of large neoplasms of the large intestine, the rate of preventive hemostasis was significantly higher when tumors of 15–20 mm in size were removed compared with neoplasms of 10–14 mm in size (41.0% vs. 17.8%, $p < 0.001$) (Table 3).

Delayed complications (within 3 days) after removal of epithelial neoplasms of the large intestine occurred in 4/809 (0.49%) patients (IIIa according to the Clavien-Dindo classification in all 4 patients) and, accordingly, in 4/2,115 (0.19%) cases from all removed neoplasms. All cases of complications were associated with bleeding:

- minor bleeding was not reported;
- clinically significant bleeding: in 3/809 (0.37%) patients and, respectively, in 3/2,115 (0.14%) cases;

Table 1. *Endoscopic characteristics of large intestine epithelial neoplasms detected and removed outpatient*

Indicators	Removed colorectal epithelial neoplasms, *n* = 2,115
Localization:	
caecum, *n* (%)	224 (10.6)
ascending colon, *n* (%),	490 (23.2)
transverse colon, *n* (%),	551 (26.1)
descending colon, *n* (%),	120 (5.7)
sigmoid colon, *n* (%),	538 (25.4)
rectum, *n* (%)	192 (9.1)
Paris Classification:	
0-1S, *n* (%),	813 (38.4)
0-1P, *n* (%),	108 (5.1)
0-2a, *n* (%)	1,194 (56.5)
Microrelief pattern of the neoplasm surface:	
Hyperplastic polyp, *n* (%),	73 (3.5)
adenoma, *n* (%),	1,430 (67.6)
dentate adenoma, *n* (%),	606 (28.7)
inflammatory polyp, *n* (%),	3 (0.1)
adenocarcinoma, *n* (%),	1 (0.05)
juvenile polyp, *n* (%)	2 (0.1)

Table 2. *Rate of prophylactic hemostasis depending on the size of epithelial neoplasms of the large intestine (small/medium/large)*

Indicators	The size of epithelial neoplasms			*p*
	Group 1 (small — 2–5 mm), *n* = 1173	Group 2 (medium — 6–9 mm), *n* = 618	Group 3 (large — 10–20 mm), *n* = 324	
Preventive hemostasis was performed, *n* (%)	17 (1.4)	43 (7.0)	77 (23.8)	< 0.001* $p_{2\text{-}5\ mm\ —\ 6\text{–}9\ mm}$ < 0.001 $p_{2\text{-}5\ mm\ —\ 10\text{–}20\ mm}$ < 0.001 $p_{6\text{-}9\ mm\ —\ 10\text{–}20\ mm}$ < 0.001
Preventive hemostasis was not performed, *n* (%)	1156 (98.6)	575 (93.0)	247 (76.2)	

*Note: *Differences in indicators are statistically significant (p < 0.05), the method used is: Pearson's χ^2 test*

Table 3. *Rate of prophylactic hemostasis depending on the size of colorectal epithelial neoplasms (small/medium/large (10–14 mm and 15–20 mm))*

Indicators	The size of epithelial neoplasms				*p*
	Group 1 (2–5 mm), *n* = 1173	Group 2 (6–9 mm), *n* = 618	Group 3 (10-20 mm)		
			Group 3¹ (10–14 mm), *n* = 241	Group 3² (15–20 mm), *n* = 83	
Preventive hemostasis was performed, *n* (%)	17 (1.4)	43 (7.0)	43 (17.8)	34 (41.0)	< 0.001* $p_{2\text{-}5mm\ —\ 6\text{–}9\ mm}$ < 0.001 $p_{2\text{-}5\ mm\ —\ 10\text{–}14\ mm}$ < 0.001 $p_{2\text{-}5\ mm\ —\ 15\text{–}20\ mm}$ < 0.001 $p_{6\text{-}9\ mm\ —\ 10\text{–}14\ mm}$ < 0.001 $p_{6\text{-}9\ mm\ —\ 15\text{–}20\ mm}$ < 0.001 $p_{10\text{-}14\ mm\ —\ 15\text{–}20\ mm}$ < 0.001
Preventive hemostasis was not performed, *n* (%)	1156 (98.6)	575 (93.0)	198 (82.2)	49 (59.0)	

*Note: *Differences in indicators are statistically significant (p < 0.05), the method used is: Pearson's χ^2 test*

- severe bleeding: in 1/809 (0.12%) patient and, respectively, in 1/1,125 (0.05%) case.

No cases of colorectal perforation occurred.

All patients with complications were hospitalized in a 24-hour hospital, where they underwent emergency colonoscopy and successful hemostasis by clipping. In the only case of severe bleeding, blood transfusion was additionally required. No mortality occurred.

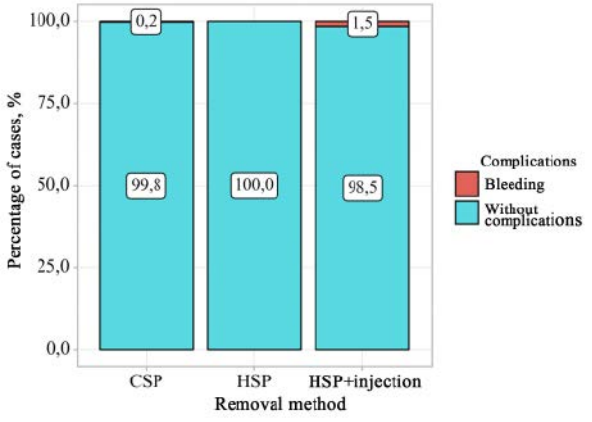
It was noted that in 2 cases delayed bleeding developed despite pre-performed preventive hemostasis, and in 2 cases preventive hemostasis was not performed.

The analysis of the rate of delayed bleeding (within 3 days), depending on the applied method of polypectomy, showed the following results:

- Hot-snare polypectomy with injection (HSP + injection): 1/66 (1.5%) case;
- Cold-snare polypectomy (CSP): 3/1,658 (0.2%) cases;
- Hot-snare polypectomy (HSP): 0/391 (0%) cases (Fig. 1).

DISCUSSION

Colonoscopy with simultaneous endoscopic removal of benign epithelial neoplasms of the large



Indicators	Removal method		
	CSP, *n* = 1658	HSP, *n* = 391	HSP + injection, *n* = 66
Bleeding, *n* (%)	3 (0.2)	0 (0.0)	1 (1.5)
Without complications, *n* (%)	1655 (99.8)	391 (100.0)	65 (98.5)

Figure 1. *Rate of delayed bleeding (3 days) depending on the method of removal of epithelial neoplasms of the colon*

intestine, including without hospitalization in a 24-hour hospital, is a promising and economically attractive direction for the development of domestic healthcare.

The expected risks of delayed complications and issues of patient routing in case of their occurrence in the early period after polypectomy required an analysis of the results of outpatient removal of epithelial neoplasms of the large intestine with dimensions < 20 mm.

A number of studies have identified several risk factors for delayed bleeding after polypectomy, which can be classified into: polyp-related (e.g., size, type), procedure-related (e.g., use of electrocoagulation) and patient-related (e.g., age, use of anticoagulants) [13,14,15]. At the same time, the authors indicate that the type of polyp (on a wide base or on a pedicle), histological type and site of the polyp are not risk factors for delayed bleeding. In the study, the rate of delayed postpolypectomy bleeding was 4/2,115 (0.19%) cases; and the analysis of factors determining the risk of delayed bleeding (age and gender of patients, site of epithelial neoplasms, endoscopic characteristics (0-Is, 0-Ip, 0-IIa) according to the Paris classification, microrelief pattern of the neoplasm surface and morphological structure) after polypectomy, is not possible due to the low rate of bleeding in the early period after polypectomy. According to most authors, polyp size is a key risk factor, since removal of polyps < 10 mm is associated with a lower rate of delayed bleeding, ranging from 0.05% to 0.43%, whereas removal of larger polyps (⩾ 10 mm) is associated with an increased risk of delayed bleeding [4,6,16]. There are indications that the risk of delayed bleeding exceeds 2–5% with polyps from 10 to 20 mm in size [6], and the risk of delayed bleeding with a polyp size of more than 20 mm exceeds 11% [16].

In this regard, unlike polyps of less than 10 mm in size, polypectomy for larger neoplasms can be a difficult task due to the relatively high risk of delayed bleeding. In this study, the risk of delayed post-polypectomy bleeding was not associated with the size of the epithelial neoplasm, but since the sample size with delayed post-polypectomy bleeding in this study was too small, it is hard to determine whether the size of the neoplasm is a risk factor for this complication. The same applies to the method of polypectomy.

It should be noted that the data on the actual effectiveness of preventive clipping are contradictory [18,19]. However, according to a meta-analysis of the literature, Winston, K. et al. found that the use of conventional endoscopic clipping as a preventive method significantly reduces the risk of post-polypectomy bleeding in polyps with a size of ⩾ 10 mm [20]. In this study, preventive clipping was used to remove polyps with sizes from 10 to 14 mm in 17.8% of cases, and from 15 to 20 mm in 43.0% (p < 0.001), and most likely this procedure contributed to the relatively rare delayed bleeding.

A number of authors believe that the risk of delayed bleeding and the risk of immediate bleeding are so low with small and medium-sized polyps that their removal can be performed on an outpatient basis without serious concerns. While in patients with large polyps, their removal must be carried out in an inpatient setting [6,16]. However, the data we have obtained on the low rate of delayed bleeding, even with the removal of large tumors, including those from 15 to 20 mm in size, indicate that their removal is also possible on an outpatient basis.

However, strict observance of two basic rules is necessary: first, careful intraoperative preventive control of the bed of the removed polyp, regardless of the size of the neoplasm, and, secondly, the possibility of urgent hospitalization in case of delayed post-polypectomy bleeding.

This study had several limitations, which were related, firstly, to the fact that the study included only neoplasms 0-Is, 0-Ip, 0-IIa according to the Paris classification and studied the rate of delayed bleeding for 3 days, and secondly, the study did not include patients with comorbidities that required taking drugs that affected blood clotting without the possibility of their short-term cancellation.

CONCLUSION

The study demonstrates that colonoscopy with simultaneous endoscopic removal of benign epithelial neoplasms of the large intestine up to 20 mm in size without admission in a 24-hour hospital is associated with a low rate (0.19%) of delayed bleeding after polypectomy. Therefore, endoscopic removal of benign epithelial neoplasms of the large intestine without admission in a 24-hour hospital is a safe and effective, provided proper control and prevention of complications, which contributes to improving the quality of medical care and optimizing healthcare costs. Taking into account the minimal risk of complications during screening colonoscopy, in case of detection of polyps less than 10 mm in diameter, it is necessary to strive for their removal.

AUTHORS CONTRIBUTION

Concept and design of the study: *Sergey N. Skridlevskiy, Aleksey A. Likutov*
Collection and processing of the material: *Elena A. Bogdanova*
Statistical processing: *Sergey N. Skridlevskiy*
Writing of the text: *Sergey N. Skridlevskiy*
Editing: *Aleksey A. Likutov, Ilya V. Nazarov, Ilya S. Bogormistrov*

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