ORIGINAL ARTICLE

Outcomes of colonoscopic polypectomy for malignant adenomas: a prospective 30-year cohort study from a single center (STROBE 1a*)

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KEY WORDS

colorectal cancer, endoscopic polypectomy, malignant adenoma, outcomes

ABSTRACT

INTRODUCTION Surgery is recommended following endoscopic polypectomy for malignant adenoma (MA) in the large bowel in patients with risk factors for tumor recurrence or distant metastasis are present.

OBJECTIVES We present long-term outcomes of a prospective study in patients with endoscopically removed MAs.

PATIENTS AND METHODS A total of 128 patients who underwent endoscopic polypectomy were followed up for a median of 70.4 months. The criteria for adequate polypectomy included endoscopically and histologically (margin ≥2 mm) complete excision, lack of angioinvasion, and good tumor differentiation (G1 or G2). Sixty-seven patients did not meet 1 or more of the criteria (high-risk group) and 61 met all of the criteria (low-risk group). Unfavorable outcomes were residual disease, lymph node metastasis, recurrent disease, distant metastasis, or death due to colorectal cancer. Histological samples from 85 patients were reassessed to determine the effect of a margin width of 1 mm or more and tumor budding on the outcomes.

RESULTS Surgery was performed in 36 patients (28.1%), of whom 32 (47.7%) were high-risk and 4 (6.5%) were low-risk. Unfavorable outcome was observed in 10 patients (7.8%; all high-risk; 10 of 67 patients, 14.9%). Favorable outcome was observed in 61 of 128 patients who had a 2-mm free margin, and in 44 of 85 patients who fulfilled the modified criterion of 1-mm free margin. Tumor budding was detected in 17 of 85 patients (20.9%). Unfavorable outcome was observed in 2 of these patients (11.7%) and in 5 patients (7.3%) without tumor budding ($P > 0.05$).

DISCUSSION Long-term outcomes of an endoscopic resection of MAs are good. Bowel resection does not prevent unfavorable outcomes, while a reduction of the tumor-free margin would not deteriorate the results (STROBE 1b).

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INTRODUCTION (STROBE 2,3) Malignant adenoma (MA) in the large bowel is an adenoma in which neoplastic cells cross the lamina muscularis mucosa and infiltrate the submucosa of the intestinal wall, but not the lamina muscularis propria.[1] Asymptomatic MAs are increasingly detected during screening colonoscopy, and various endoscopic techniques are being studied that may help increase detection rates for adenoma.[2,3] From an oncological point of view, MA is an irreversible stage in the adenoma–carcinoma sequence, which poses a risk for cancer dissemination. Endoscopic polypectomy of MA is considered adequate if all of the following criteria are met: excision was complete in the opinion of an endoscopist, the cancer-free resection margin is at least 2 mm (1 mm according to some authors), the tumor is well-differentiated (G1 or G2), and no invasion of the venous or lymphatic vessels is observed.[4-14] Also, the depth of invasion should not exceed the head of the polyp in stalked polyps or be no greater than one-third of the submucosa

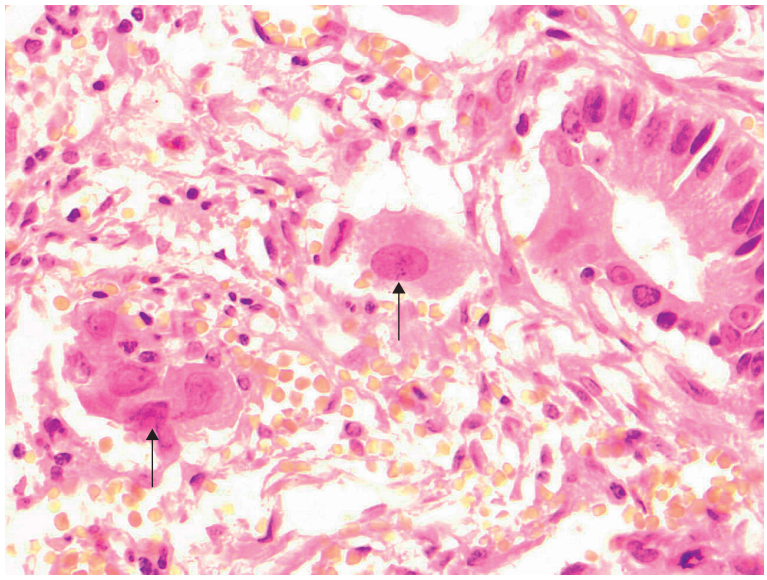

FIGURE 1 Tumor budding: an individual cancer cell and small cluster of cancer cells

thickness in nonpedunculated polyps.[15,16] Tumor budding is another possible poor prognostic factor following endoscopic polypectomy of MA.[11,17] This phenomenon is indicated by the presence of isolated crypts, microscopic clusters of cells, or undifferentiated cancer cells at the invasion front (FIGURE 1).

If at least one of the established criteria for adequate endoscopic polypectomy is not fulfilled, the risk of lymph node metastasis reported in case series is from 3.5% to even 35.7%, depending on the polyp morphology,[18-20] which is high enough to recommend an additional surgical resection of the involved bowel fragment with adjacent lymph nodes. Before the decision on the surgery is made, another independent pathologist should reassess the resected polyp. Also, complete colonoscopy should be performed to exclude the presence of possible synchronous lesions, which may affect the extent of bowel resection. The site of the polypectomy should be tattooed to facilitate its identification during surgery. However, patients who underwent surgery as an adjuvant treatment were found to have similar rates of metastasis to patients who were only followed up (5.8% and 8.9%, respectively), as well as similar death rates for colorectal cancer (6.6% and 10.1%, respectively).[6] In a large population-based sample, more than one-third of the patients with malignant polyps were treated solely with colonoscopic polypectomy, and the outcomes (1-year and 5-year risk of death) in this group were similar to those of surgical patients with comparable clinical characteristics.[14] Surgery is associated with a substantial risk of severe complications,[9] or even death.[19] The authors of a recent population-based study from England analyzed the results of all providers of major colorectal cancer surgery within the English National Health System in the years 1998–2006. In high-volume reference centers, the risk of death related to the bowel surgery was from 2% to 5%.[21] In individuals younger than 65 years of age, the risk was close to zero, but in those over 70 years of age, it increased to 12%[21] (STROBE 2). In light of the recent studies, laparoscopic surgery should be recommended as the first-choice technique in colon cancer because, compared with open surgery, it poses a lower risk of short-term complications and provides equivalent long-term oncological outcomes. Whether the same is true for rectal cancer surgery is yet uncertain.[20]

The primary aim of the present study was to prospectively evaluate long-term outcomes in patients who underwent endoscopic polypectomy for sporadic MAs in a single reference endoscopy center. The secondary aim was to assess retrospectively whether a reduction in the tumor-free resection margin from 2 mm to 1 mm or adding a tumor budding criterion influences the long-term results of treatment (STROBE 3).

PATIENTS AND METHODS (STROBE 4,5,6A,7,8,9,10,11,12)

Patients

We analyzed long-term outcomes in consecutive patients who underwent endoscopic polypectomy for MA and were prospectively managed according to the study protocol at the Department of Gastroenterology of the Medical Center for Postgraduate Education and Institute of Oncology from 1979 to 2005 (STROBE 4,5). The study protocol and inclusion/exclusion criteria, first defined in 1979, have remained unchanged over time. Endoscopic polypectomy was considered adequate if the following criteria were met: excision was complete in the opinion of the endoscopist; the histological tumor-free resection margin was at least 2 mm; the tumor was well-differentiated (G1 or G2); and there was no invasion of the venous or lymphatic vessels. Patients in whom endoscopic removal was not performed due to macroscopic features suggesting carcinoma (eg, ulceration, firm tumor, nonlifting sign), patients with inflammatory bowel disease or known familial polyposis syndromes (ie, Lynch syndrome and familial adenomatous polyposis), and patients with concomitant disseminated neoplastic diseases were excluded from the study (STROBE 6A,9,10). In 1994, the study was approved by the institutional review board in accordance with the guidelines of the Helsinki Declaration revised in 1989.

Standard endoscopic polypectomy

Polyps were removed using standard polypectomy techniques. When pedunculated polyps were removed, the cut was made in the lower one-third of the stalk of the polyp. Sessile polyps were removed in one piece whenever possible. After 1994, any polyp remnants visible after application of the diathermic loop were completely destroyed by argon plasma coagulation. When a piecemeal technique was used, the site of polypectomy was tattooed for easier further localization during surveillance colonoscopy. Diluted India ink was injected through an injection needle at an oblique angle tangential to the colon wall and targeted to the submucosal layer of the interhaustral folds on the anal side of the lesion (3 injections). In the report,

the distance of the polypectomy/tattoo site from the anal verge was included. The location and diameter of each polyp was noted and postpolypectomy complications were recorded (STROBE 8).

Histopathology All the removed tissue was subject to a histopathological examination. The specimens were fixed in formalin, embedded in paraffin, and stained with hematoxylin and eosin. The specimens were sectioned along the long axis of the polyp to examine it from the head to base. The pathologist assessed the tumor grade, presence of cancer cells in blood and lymphatic vessels, and the distance between the cut line and the (radial) tumor margin. Basically, a distance of 2 mm or more was regarded as adequate. In addition, 85 polyps that were still available for a histological assessment at the time of the final analysis were used for a retrospective assessment of tumor budding and 1-mm tumor-free margin (≥1 mm criterion met or not met) by a single experienced GI pathologist (DJ) (STROBE 8).

Further management Each patient was informed about the result of the microscopic examination and given recommendations based on the magnitude of risk (low or high) following the endoscopic treatment. The risk of dissemination was discussed in each case, and the risk of surgical complications and mortality presented. Patients at high risk of an unfavorable outcome (at least 1 criterion not met) were recommended for surgery, whereas patients at low risk (all criteria met) were recommended for follow-up. The follow-up consisted of regular outpatient visits, colonoscopy (with tattooing the polypectomy site if it was not done earlier and the site was still identifiable), abdominal ultrasonography, and an estimation of the carcinoembryonic antigen level every 3 months during the first year, every 6 months during the second year, and annually up to 5 years following the polypectomy. Further follow-up was irregular, but usually at 1-year intervals (STROBE 6A).

Unfavorable outcomes An unfavorable outcome of the endoscopic polypectomy was defined as the occurrence of 1 or more of the following: presence of cancer or adenoma in the surgical specimen from a patient who underwent surgery; lymph node metastasis in the surgical specimen from a patient who underwent surgery; local recurrence of cancer or adenoma confirmed by histopathology; presence of distant colorectal cancer metastasis; and death due to colorectal cancer dissemination (STROBE 7).

Statistical analysis (STROBE 11,12) The primary analysis covered long-term outcomes in patients with MA. The secondary analysis involved the assessment of long-term outcomes according to conventional versus modified criteria for adequate endoscopic polypectomy of MA. The frequency of unfavorable outcomes in patients with MA with and without budding was compared using the Fisher exact test.

RESULTS (STROBE 10,13A,B,C,14A,B,C,15,16,17) Of 147 patients potentially eligible for the study, 19 were excluded: lost an original full histological report (n = 3 in the 1990s), did not consent to continued follow-up (n = 9), or presented with a different disseminated neoplasm treated with radiotherapy or chemotherapy (or both) at the diagnosis of MA (n = 7). The remaining 128 patients (63 women, 65 men; age, 42–88 years; median, 64 years) fulfilled the inclusion and exclusion criteria for the study. A total of 130 MAs were endoscopically removed from those patients (STROBE 10,13A,B,14A). The median postpolypectomy follow-up was 70.4 months (STROBE 14C). The study flowchart is presented in FIGURE 2 (STROBE 13C).

General outcomes The endoscopic and histopathological features of the resected polyps are presented in TABLE 1 (STROBE 14A). The outcomes of follow-up in all 128 patients who underwent endoscopic polypectomy of MA are shown in FIGURE 2. Good long-term outcomes were observed in 118 of 128 patients (92.2%). The characteristics of patients with unfavorable outcomes after endoscopic polypectomy of MA are presented in TABLE 2. In 1 patient, the size of the polyp was not given by the endoscopist (STROBE 14B). Failures occurred only in patients with high-risk criteria who were recommended for surgery. However, 5 of these patients did not undergo surgery for various reasons (STROBE 15,16).

Low-risk patients Endoscopic polypectomy was regarded as adequate in 61 patients with 63 MAs, to whom follow-up was recommended. This recommendation was accepted by 57 patients, who were followed up for a median of 69.2 months (interquartile range [IQR], 44.2–86.7 months); 52 (85.2%) were followed up for at least 5 years. In this group, no unfavorable outcomes of endoscopic treatment were observed. In the remaining 4 patients, the surgery was performed: 2 patients had bowel perforation following polypectomy and 2 patients requested the operation. No cancer infiltration or lymph node metastases were found in the surgical specimens from these patients (STROBE 16,17).

High-risk patients At least 1 high-risk criterion was present in 67 patients with 67 MAs, to whom surgical resection of the affected bowel segment with regional lymph nodes was recommended. However, only 32 patients underwent the operation. Operations were open procedures and involved hemicolectomies, segmental resections, and 1 local excision of a lesion in the rectum. Twenty-seven of these patients were followed for a median of 71.9 months (IQR, 50.7–97.3 months), and the treatment outcome was good in 27 of 32 patients (84.3%). Unfavorable outcomes were observed in 5 of 32 patients (15.6%):

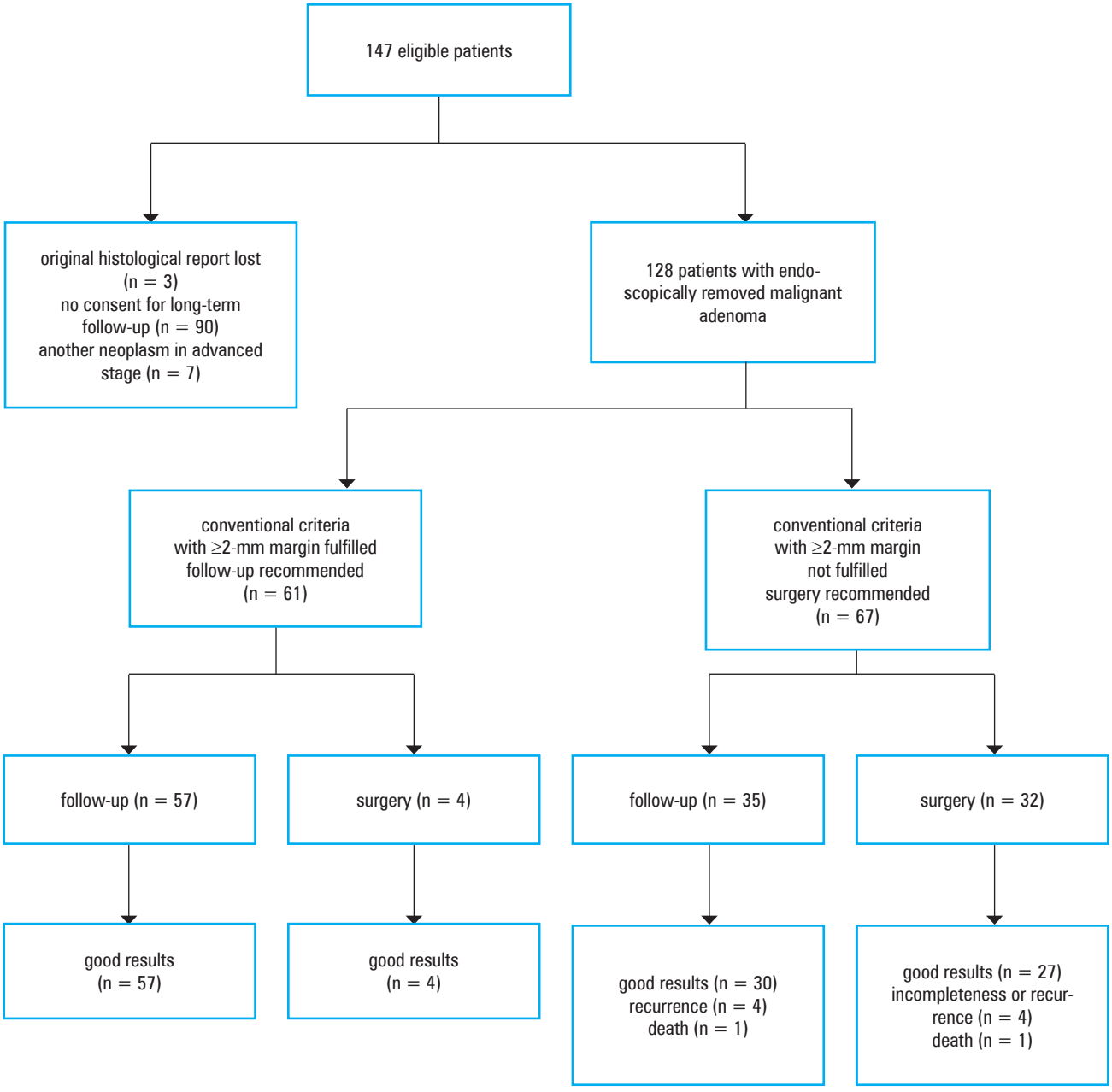

FIGURE 2 Study flow-chart and results of follow-up in 128 patients with endoscopically removed malignant adenoma(s), classified according to the conventional criteria for adequate polypectomy (≥2-mm cancer-free margin, G1–G2 differentiation rate, and no angioinvasion)

cancer infiltration in the surgical specimen (n = 1), cancer infiltration and metastasis in regional lymph nodes in the surgical specimen (n = 1), high-grade dysplasia in the surgical specimen (n = 1), cancer metastasis in regional lymph nodes in the surgical specimen (n = 1), and cancer recurrence in lymph nodes during follow-up (n = 1) (STROBE 16,17).

The remaining 35 patients from this group did not undergo surgery. The median age in this group was 69 years, 12 years older than the patients who underwent surgery; 12 patients (34%) were 75 years or older. The reasons for abstaining from surgery were: high risk due to concomitant diseases (n = 15), another synchronous malignancy (n = 5), and the lack of patient's consent (n = 15). Despite not undergoing surgery, 30 patients in this group had good long-term outcomes (30/35, 85.7%). Unfavorable outcomes that occurred in the other 5 patients were due to cancer recurrence at the site of polypectomy (n = 4) and death due to colorectal cancer (n = 1) (STROBE 16,17).

Complications of endoscopic treatment Two episodes of bleeding during polypectomy and one episode of delayed bleeding were observed (2.3% of polypectomies); all were treated endoscopically with success. Two perforations occurred, one immediate and one delayed, and the patients were treated by surgery; one of them required reoperation due to surgical complications. No deaths occurred.

Analysis of the outcomes using ≥1 mm tumor-free margin (STROBE 17) The tumor-free margin was reassessed in 85 polyps from 85 patients to examine whether reducing the margin from ≥2 mm to ≥1 mm affected the outcome (FIGURE 3). All 44 patients who fulfilled the adjusted tumor-free margin criterion and had no other high-risk factors showed good outcomes, regardless of whether

TABLE 1 Endoscopic and histopathological features of the resected polyps diagnosed as malignant adenomas; segments of the large bowel included proximal flexures (eg, descending colon included splenic flexure)

Location	Number of polyps	Percentage of the polyps
rectum	30	22.5
sigmoid colon	81	64
descending colon	9	6.5
transverse colon	6	4%
ascending colon	4	3
endoscopic appearance of polyps[a]		
sessile polyps	41	35
pedunculated polyps	56	48
semi-pedunculated polyps	20	17
polyps that had not met histopathological criteria of adequate endoscopic polypectomy[a]		
margin <2 mm	52/115	45
invasion blood of lymphatic vessels	25/111	22.5
low differentiated adenocarcinoma (G3)	3/125	2.4

a the total number of polyps is less than 130 because not every feature was assessed in each polyp

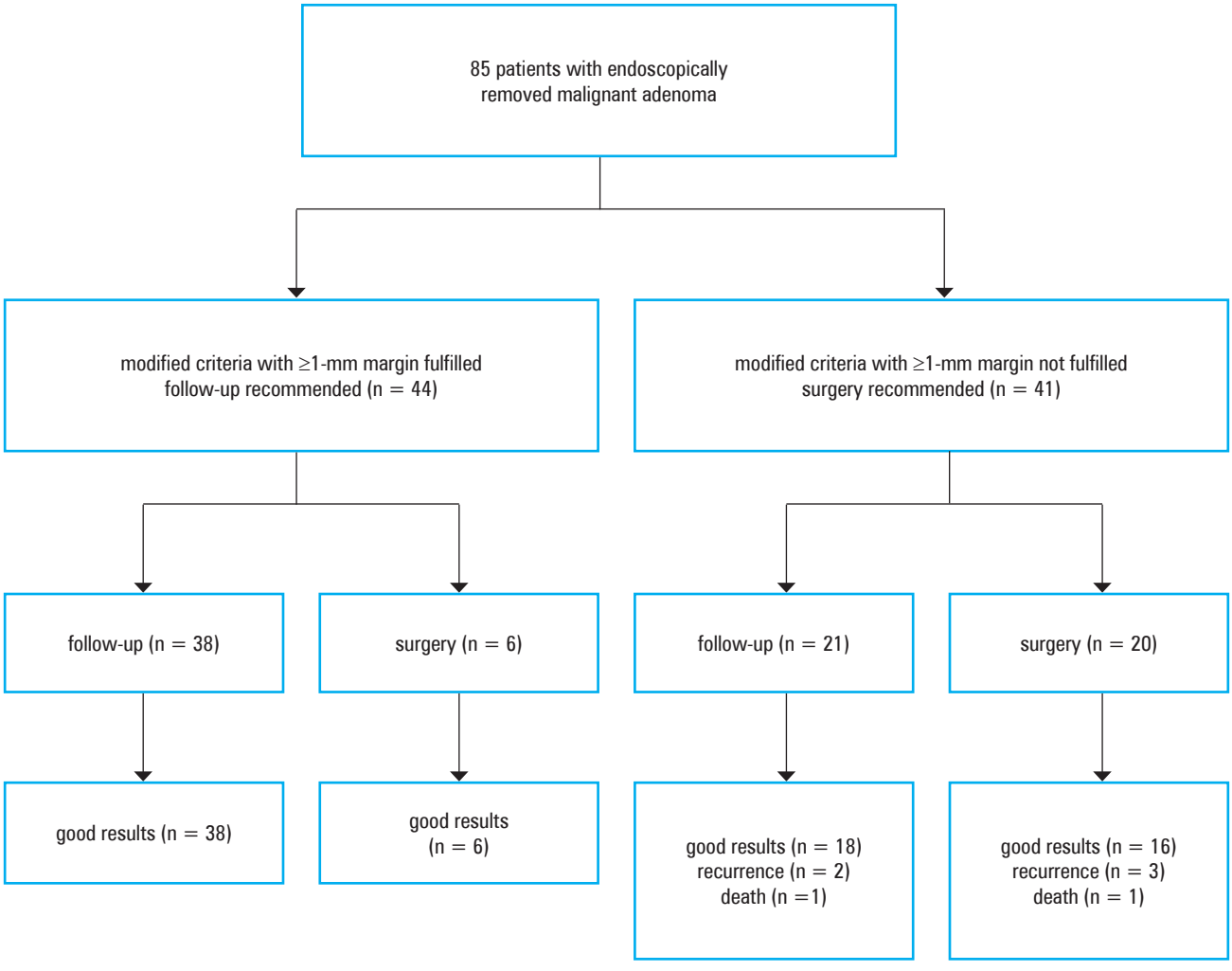

FIGURE 3 Results of follow-up in 85 patients with endoscopically removed malignant adenoma(s), reclassified according to the modified criteria for adequate polypectomy (≥1 mm tumor-free margin, G1–G2 differentiation rate, and no angioinvasion)

TABLE 2 Characteristics of patients with unfavorable outcomes of endoscopic polypectomy of malignant adenomas

N	Sex (age)	Polyp location (diameter, cm)	Macroscopic sufficiency	Criterion of margin fulfilled	Differentiation grade, G3	Angioinvasion	Surgery	Description of the treatment failure
1	F (51)	rectum (1.0)	yes	no	no	no	yes	lymph node metastases
2	F (55)	sigmoid colon (1.0)	yes	no	no	no	yes	recurrence of cancer, lymph node metastases, and death
3	F (67)	sigmoid colon (2.0)	yes	no	no	no	no	recurrence of cancer, and death
4	F (69)	sigmoid colon (7.0)	no	no	no	no	yes	residual cancer
5	M (43)	sigmoid colon (2.0)	no	no	no	no	yes	residual high grade dysplasia
6	M (45)	sigmoid colon (1.0)	yes	yes	no	yes	yes	residual cancer and lymph node metastases
7	M (54)	rectum (2.5)	yes	no	no	no	no	recurrence of cancer
8	M (71)	ascending colon (diameter not given)	yes	no	no	no	no	recurrence of high grade dysplasia
9	M (73)	transverse colon (4.0)	no	yes	no	no	no	recurrence of cancer
10	M (75)	rectum (3.0)	yes	no	no	no	no	recurrence of high grade dysplasia

TABLE 3 A hypothetical effect of reducing the tumor-free margin from ≥2 mm to ≥1 mm on management recommendations

	Margin		Difference
	≥2 mm	≥ 1 mm	
surgery recommended	47 patients	41 patients	–6 (12.7%)
follow-up recommended	38 patients	44 patients	+6 (15%)

conservative follow-up or surgery was performed. Forty-one patients did not fulfill the modified criteria and would have been recommended surgery. Twenty patients would have had the operation, 16 of whom would have good long-term outcomes. Unfavorable outcomes would have occurred in 4 patients. In the subgroup of 21 patients who would not undergo the recommended surgery, good results would have been observed in 18 and failure of the endoscopic treatment in 3 patients. Essentially, these outcomes are similar to the outcomes obtained with the use of the conventional criterion of ≥2 mm. Importantly, applying the modified tumor-free margin criterion would have resulted in transferring 6 patients from the group referred for surgery to the group recommended for follow-up alone, in which case the conservative management would have been recommended to the majority of the patients (TABLE 3). These additional 6 patients had good long-term outcomes.

The effect of tumor budding (STROBE 17) Tumor budding was present in 17 of the 85 examined MAs (20.9%). Unfavorable outcomes occurred in 2 of these patients (11.7%) and in 5 (7.3%) who were negative for tumor budding (P >0.05, Fisher exact test). The other high-risk factors were usually present in polyps with tumor budding: <2 mm tumor-free margin (12 of 17 patients, 70.6%), poor (G3) differentiation grade of cancer (1 of 17 patients, 6%), and angioinvasion (6 of 17 patients, 35.3%). In the 68 polyps without tumor budding, these percentages were lower: 35.3%, 0%, and 14.7%, respectively. The follow-up in this subgroup did not reveal significant differences in long-term outcomes between patients with and without tumor budding (TABLE 4).

DISCUSSION (STROBE 18,19,20,21) We have shown good long-term outcomes in a group of patients who underwent endoscopic polypectomy for MA and were conservatively followed up or underwent surgery depending on the detailed histopathology results and patients' health and preference. Unfavorable outcomes were observed in 7.8% of the patients with 1 or more high-risk factors. Similar results were reported in earlier studies but with fewer patients or shorter follow-up.[4,6,7,11,12,18,22-25] These studies showed that endoscopic polypectomy is an effective and safe method of treating the majority of MAs. In the present study, we have also shown, based on the long-term follow-up, that this treatment provides oncological safety in those who fulfill the established criteria for adequate polypectomy. What

TABLE 4 Tumor budding presence and unfavorable outcomes of endoscopic polypectomy of malignant adenomas in the long-term follow-up

Tumor budding	Unfavorable outcome		Fisher exact test
	n/ N	%	
present	2/17	11.7	$P < 0.623$[a]
absent	5/68	7.3	

a the difference was nonsignificant

is more, change in the tumor-free margin criterion from ≥2 mm to ≥1 mm did not deteriorate the outcome (STROBE 18).

In the present series, the proportion of patients in whom the tumor-free margin criterion of ≥2 mm was not fulfilled was high (45%), and identification of those patients in the subgroup with a particularly high risk of cancer dissemination is important. According to previous reports, residual cancer tissue at the polypectomy site was found in 10% to 30% of the patients with too narrow a tumor-free margin.[6,10,12] In our study, among 26 patients who did not fulfill the ≥2-mm tumor-free margin criterion and underwent surgery, residual cancer was found only in 2 cases (7.7%): at the polypectomy site in 1 patient and in the regional lymph nodes in the other. This finding suggests that more than 90% of the patients who did not fulfill the tumor-free margin criterion could have safely avoided the surgery. Similarly positive results have already been presented by other authors.[6,12,14,26] In a recent study by Ikematsu et al.,[26] a higher recurrence rate was observed in patients with endoscopically resected rectal cancer compared with colon cancer, but this was not the case in our study, as the proportion of rectal MAs (22.5%) and the proportion of rectal MAs among the patients who had negative outcomes (20%) were similar.

Though the importance of the tumor-free margin is not debatable, the authors differ in terms of what should be considered a safe width. Both the ≥2-mm and ≥1-mm margins are accepted.[5,8,22,26] Other definitions of adequate polypectomy in the literature include "complete polypectomy" or "no cancer infiltration in the cut line".[25] However, the coagulation current destroys tissues below the cut line. On the other hand, coagulation features in the cancer infiltration zone have been related to a significant (up to 50%) risk of local cancer recurrence and the presence of residual cancer tissue at the site of polypectomy (13%).[11] In the present study, a change in the tumor-free margin criterion from ≥2 mm to ≥1 mm did not deteriorate the outcome. In a subgroup of patients with ≥1-mm margins who had no other risk factors, no treatment failure was observed. Using this modified criterion would have allowed to avoid surgery in 13% of the patients, as they would have been recommended a conservative follow-up instead. Thus, the implementation of the ≥1-mm tumor-free margin criterion would save a sizeable group of patients from surgery while maintaining oncological safety.

Association between tumor budding and regional lymph node involvement has been observed in advanced colorectal cancer.[27-29] Studies of early cancer had similar results, though mainly in patients treated by surgery.[11,30-32] Our analysis showed that, in cancers with tumor budding, the other high-risk factors are more common compared with cancers without this sign. However, we failed to show a distinct association between tumor budding and unfavorable outcomes. In our series, adding this sign to the conventional criteria for adequate polypectomy did not affect recommendations regarding postpolypectomy management or long-term outcomes (STROBE 20,21).

The present study has the following limitations. First, this was a single-center study performed in a center of excellence specializing in the advanced techniques of polypectomy. Therefore, good results may not be reproducible in real life. Second, the study included patients over a long period of time, starting in 1979, when not all current methodologies were available (eg, argon plasma coagulation, videocolonoscopes, etc.); thus, methods for polyp assessment and removal might not have always been up-to-date. On the other hand, these limitations also represent the strengths of the study, as we kept the basic protocol, and the polypectomy techniques remained relatively unchanged; therefore, they could be fully assessed (STROBE 19,21).

Conclusions Our long-term follow-up of 128 patients confirmed the efficacy and oncological safety of adequate endoscopic polypectomy for MA. Reducing the tumor-free margin from ≥2 mm to ≥1 mm may increase the number of patients for whom the conservative approach is recommended instead of bowel surgery.

Guarantor of the article Jolanta Nałęcz-Janik

Specific author contributions Aspects of this study are part of the MD thesis of Jolanta Nałęcz-Janik. JNJ and EZ were responsible for patient follow-up, data analysis, and drafting of the manuscript. DJ performed the histopathological examinations, and JP and EB performed the majority of polypectomies. WB and JR conceived the idea for the study, participated in its design and coordination, initiated patient follow-up, and critically revised the article for important intellectual content. All authors read and approved the final version of the manuscript.

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REFERENCES

1 Schlemper RJ, Riddell RH, Kato Y, et al. The Vienna classification of gastrointestinal epithelial neoplasia. Gut. 2000; 47: 251-255.

2 Meining A, von Delius S, Eames TM, et al. Risk factors for unfavorable outcomes after endoscopic removal of submucosal invasive colorectal tumors. Clin Gastroenterol Hepatol. 2011; 9: 590-594.

3 Regula J, Rupinski M, Kraszewska E, et al. Colonoscopy in colorectal-cancer screening for detection of advanced neoplasia. N Engl J Med. 2006; 355: 1863-1872.

4 Kakol D, Fraczek M, Banaszkiewicz A, Pertkiewicz J. Narrowband imaging and whitelight endoscopy for detection of colorectal polyps: a randomized study. Pol Arch Med Wewn. 2013; 123: 519-525.

5 Volk EE, Goldblum JR, Petras RE, et al. Management and outcome of patients with invasive carcinoma arising in colorectal polyps. Gastroenterology. 1995; 109: 1801-1807.

6 Hassan C, Zullo A, Risio M, et al. Histologic risk factors and clinical outcome in colorectal malignant polyp: a pooled-data analysis. Dis Colon Rectum. 2005; 48: 1588-1596.

7 Seitz U, Bohnacker S, Seewald S, et al. Is endoscopic polypectomy an adequate therapy for malignant colorectal adenomas? Presentation of 114 patients and review of the literature. Dis Colon Rectum. 2004; 47: 1789-1796.

8 Cooper HS, Deppisch LM, Kahn EI, et al. Pathology of the malignant colorectal polyp. Hum Pathol. 1998; 29: 15-26.

9 Benizri EI, Bereder JM, Rahili A, et al. Additional colectomy after colonoscopic polypectomy for T1 colon cancer: a fine balance between oncologic benefit and operative risk. Int J Colorectal Dis. 2012; 27: 1473-1478.

10 Netzer P, Forster C, Biral R, et al. Risk factor assessment of endoscopically removed malignant colorectal polyps. Gut. 1998; 43: 669-674.

11 Ueno H, Mochizuki H, Hashiguchi Y, et al. Risk factors for an adverse outcome in early invasive colorectal carcinoma. Gastroenterology. 2004; 127: 385-394.

12 Boenicke L, Fein M, Sailer M, et al. The concurrence of histologically positive resection margins and sessile morphology is an important risk factor for lymph node metastasis after complete endoscopic removal of malignant colorectal polyps. Int J Colorectal Dis. 2010; 25: 433-438.

13 Nivatvongs S, Rojanasakul A, Reiman HM, et al. The risk of lymph node metastasis in colorectal polyps with invasive adenocarcinoma. Dis Colon Rectum. 1991; 34: 323-328.

14 Cooper GS, Xu F, Barnholtz Sloan JS, et al. Management of malignant colonic polyps: a population-based analysis of colonoscopic polypectomy versus surgery. Cancer. 2012; 118: 651-659.

15 Haggitt RC, Glotzbach RE, Soffer EE, et al. Prognostic factors in colorectal carcinomas arising in adenomas: implications for lesions removed by endoscopic polypectomy. Gastroenterology. 1985; 89: 328-336.

16 Kikuchi R, Takano M, Takagi K, et al. Management of early invasive colorectal cancer. Risk of recurrence and clinical guidelines. Dis Colon Rectum. 1995; 38: 1286-1295.

17 Homma Y, Hamano T, Otsuki Y, et al. Severe tumor budding is a risk factor for lateral lymph node metastasis in early rectal cancers. J Surg Oncol. 2010; 102: 230-234.

18 Coverlizza S, Risio M, Ferrari A, et al. Colorectal adenomas containing invasive carcinoma. Pathologic assessment of lymph node metastatic potential. Cancer. 1989; 64: 1937-1947.

19 Matsuda T, Fukuzawa M, Uraoka T, et al. Risk of lymph node metastasis in patients with pedunculated type early invasive colorectal cancer: a retrospective multicenter study. Cancer Sci. 2011; 102: 1693-1697.

20 Mou S, Soetikno R, Shimoda T, et al. Pathologic predictive factors for lymph node metastasis in submucosal invasive (T1) colorectal cancer: a systematic review and meta-analysis. Surg Endosc. 2013; 27: 2692-2703.

21 Morris EJ, Taylor EF, Thomas JD, et al. Thirty-day postoperative mortality after colorectal cancer surgery in England. Gut. 2011; 60: 806-813.

22 Mathis KL, Nelson H. Controversies in laparoscopy for colon and rectal cancer. Surg Oncol Clin N Am. 2014; 23: 35-47.

23 Oka S, Tanaka S, Kanao H, et al. Mid-term prognosis after endoscopic resection for submucosal colorectal carcinoma: 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. Dig Endosc. 2011; 23: 190-194.

24 Hackelsberger A, Fruhmorgen P, Weiler H, et al. Endoscopic polypectomy and management of colorectal adenomas with invasive carcinoma. Endoscopy. 1995; 27: 153-158.

25 Bartnik W, Butruk E, Orlowska J. A conservative approach to adenomas containing invasive carcinoma removed colonoscopically. Dis Colon Rectum. 1985; 28: 673-675.

26 Morson BC, Whiteway JE, Jones EA, et al. Histopathology and prognosis of malignant colorectal polyps treated by endoscopic polypectomy. Gut. 1984; 25: 437-444.

27 Ikematsu H, Yoda Y, Matsuda T, et al. Long-term outcomes after resection for submucosal invasive colorectal cancers. Gastroenterology. 2013; 144: 551-559.

28 Ueno H, Mochizuki H, Shinto E, et al. Histologic indices in biopsy specimens for estimating the probability of extended local spread in patients with rectal carcinoma. Cancer. 2002; 94: 2882-2891.

29 Hase K, Shatney C, Johnson D, et al. Prognostic value of tumor "budding" in patients with colorectal cancer. Dis Colon Rectum. 1993; 36: 627-635.

30 Okuyama T, Oya M, Ishikawa H. Budding as a useful prognostic marker in pT3 well- or moderately-differentiated rectal adenocarcinoma. J Surg Oncol. 2003; 83: 42-47.

31 Okuyama T, Oya M, Ishikawa H. Budding as a risk factor for lymph node metastasis in pT1 or pT2 well-differentiated colorectal adenocarcinoma. Dis Colon Rectum. 2002; 45: 628-634.

32 Park YJ, Kim WH, Paeng SS, et al. Histoclinical analysis of early colorectal cancer. World J Surg. 2000; 24: 1029-1035.

33 Hase K, Shatney CH, Mochizuki H, et al. Long-term results of curative resection of "minimally invasive" colorectal cancer. Dis Colon Rectum. 1995; 38: 19-26.

APPENDIX Note An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the websites of *PLoS Medicine* at http://www.plosmedicine.org/, *Annals of Internal Medicine* at http://www.annals.org/, and *Epidemiology* at http://www.epidem.com/). Information on the STROBE Initiative is available at http://www.strobe-statement.org.

APPENDIX STROBE Statement—checklist of items that should be included in reports of cohort studies

Title and abstract	Item No.	Recommendation	Page No.
	1	(a) Indicate the study's design with a commonly used term in the title or the abstract.	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found.	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported.	3
Objectives	3	State specific objectives, including any prespecified hypotheses.	4
Methods			
Study design	4	Present key elements of study design early in the paper.	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection.	5
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up.	5,6,7
		(b) For matched studies, give matching criteria and number of exposed and unexposed.	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable.	7
Data sources/ measurement	8a	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group.	5,6
Bias	9	Describe any efforts to address potential sources of bias.	5
Study size	10	Explain how the study size was arrived at.	5,8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why.	7
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding.	7
		(b) Describe any methods used to examine subgroups and interactions.	
		(c) Explain how missing data were addressed.	
		(d) If applicable, explain how loss to follow-up was addressed.	
		(e) Describe any sensitivity analyses.	
Results			
Participants	13a	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed.	7,8
		(b) Give reasons for non-participation at each stage.	7,8
		(c) Consider use of a flow diagram.	Fig. 2
Descriptive data	14a	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders.	7,8
		(b) Indicate number of participants with missing data for each variable of interest.	7,8
		(c) Summarise follow-up time (eg, average and total amount).	7,8
Outcome data	15a	Report numbers of outcome events or summary measures over time.	7,8,9
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included.	7,8,9
		(b) Report category boundaries when continuous variables were categorized.	
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period.	
Other analyses	17	Report other analyses done—eg, analyses of subgroups and interactions, and sensitivity analyses	9,10,11
Discussion			
Key results	18	Summarise key results with reference to study objectives.	11,12
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	12,13
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	12,13
Generalisability	21	Discuss the generalisability (external validity) of the study results.	12,13
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based.	14

a provide information separately for exposed and unexposed groups

ARTYKUŁ ORYGINALNY

Wyniki kolonoskopowej polipektomii gruczolaków z utkaniem raka: prospektywne jednoośrodkowe 30-letnie badanie kohortowe (STROBE 1a*)

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SŁOWA KLUCZOWE

endoskopowa polipektomia, gruczolak z utkaniem raka, rak jelita grubego, wyniki

STRESZCZENIE

WPROWADZENIE Pacjentom po endoskopowej polipektomii polipów jelita grubego z utkaniem raka, u których występują czynniki ryzyka nawrotu lub przerzutów odległych, zaleca się leczenie operacyjne.

CELE W pracy przedstawiono wyniki długoterminowej prospektywnej obserwacji pacjentów z endoskopowo usuniętymi gruczolakami z utkaniem raka.

PACJENCI I METODY Łącznie 128 pacjentów poddanych endoskopowej polipektomii obserwowano przez 70,4 miesiąca (mediana). Kryteria wystarczającej polipektomii obejmowały wycięcie doszczętne endoskopowo i histopatologicznie (margines ≥2 mm), brak angioinwazji i dobre zróżnicowanie raka (G1 lub G2). 67 pacjentów nie spełniło jednego lub więcej kryteriów (grupa wysokiego ryzyka), a 61 spełniło wszystkie kryteria (grupa niskiego ryzyka). Do złych wyników leczenia zaliczono: niedoszczętną polipektomię, przerzuty do węzłów chłonnych, wznowę miejscową, przerzuty odległe lub zgon z powodu raka jelita grubego. U 85 pacjentów powtórnie oceniono preparaty histologiczne w celu oceny wpływu na wyniki leczenia szerokości marginesu ≥1 mm oraz pączkowania raka.

WYNIKI Operacyjnie leczono 36 (28,1%) pacjentów, z czego 32 (47,7%) było w grupie wysokiego ryzyka, a 4 (6,5%) niskiego ryzyka. Zły wynik leczenia obserwowano u 10 pacjentów (7,8%, wszyscy wysokiego ryzyka; 10 z 67 pacjentów: 14,9%). Dobry wynik leczenia obserwowano u 61 ze 128 pacjentów z 2 mm marginesem wolnym od nacieku raka oraz 44 z 85 pacjentów ze spełnionym zmodyfikowanym kryterium 1 mm marginesu wolnego od nacieku raka. Pączkowanie raka stwierdzono u 17 z 85 pacjentów (20,9%). Zły wynik leczenia obserwowano u 2 (11,7%) z tych pacjentów i u 5 (7,3%) pacjentów bez pączkowania raka ($p < 0,05$).

WNIOSKI Długoterminowe wyniki endoskopowego leczenia gruczolaków z utkaniem raka są dobre. Resekcja jelita nie zapobiega niekorzystnym wynikom, a zmniejszenie wymaganego marginesu wolnego od nacieku raka nie miałoby niekorzystnego wpływu na wyniki (STROBE 1b).

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