Predictors of metachronous advanced colorectal adenoma after polypectomy

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Abstract

Background: Adenoma recurrence following polypectomy remains a major clinical concern, necessitating the optimization of risk assessment strategies. This study explored key risk factors for metachronous advanced adenomas, focusing on metabolic factors and initial colonoscopic findings, to offer recommendations regarding risk stratification and surveillance.

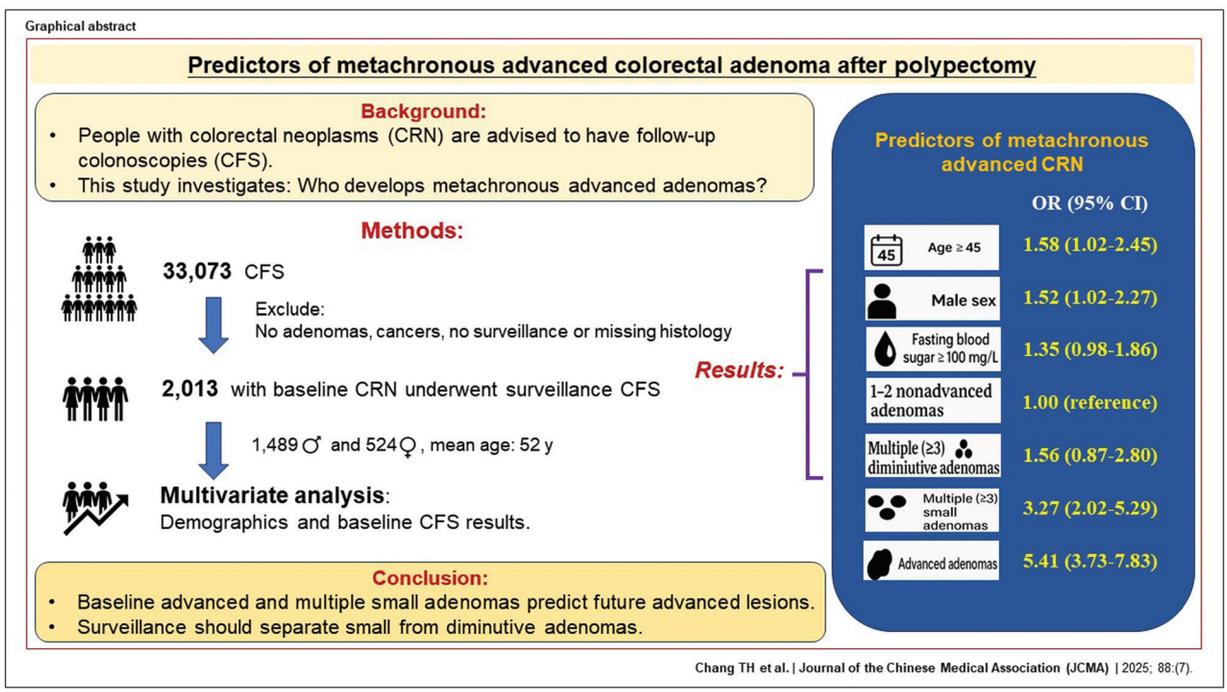
Methods: This retrospective study included individuals who had undergone two colonoscopies between January 2014 and February 2020, with adenomas detected during the initial examination. The associations of various factors—such as age, sex, metabolic disorders, and baseline colonoscopic findings—with metachronous advanced adenomas were investigated.

Results: Of 33 073 individuals who underwent baseline colonoscopy, 2013 met the eligibility criteria. Multivariate analysis indicated that age of ≥45 years, male sex, and baseline colonoscopic findings were key predictors of metachronous advanced adenomas. The adjusted odds ratio (OR; 95% CI) values for metachronous advanced adenomas in patients with multiple (≥3) diminutive adenomas, those with multiple (≥3) small adenomas, and those with advanced adenomas were 1.56 (95% CI, 0.87-2.80), 3.27 (95% CI, 2.02-5.29), and 5.41 (95% CI, 3.73-7.83), respectively, compared with the results in patients with one or two nonadvanced adenomas.

Conclusion: This study highlights the importance of baseline colonoscopy in identifying patients at elevated risk of developing metachronous advanced adenomas, particularly advanced adenomas. On the basis of our findings, we recommend integrating risk stratification by adenoma size, number, and histology into postpolypectomy surveillance guidelines. Personalized surveillance intervals informed by baseline findings and patient-specific risk factors may help clinicians optimize follow-up strategies and improve clinical outcomes.

Keywords: Advanced adenoma; Colonoscopy; Metachronous adenoma; Nonadvanced adenoma

Graphical abstract



Lay Summary: Adenomas are precancerous growths in the colon that can recur after removal. This study identified factors that increase the risk of developing more serious adenomas after initial colonoscopy and polypectomy. We examined a large group of people who had two colonoscopies over several years. We found that age, gender, and the type of adenomas detected in the first colonoscopy are key predictors of whether advanced adenomas will develop. Specifically, people with multiple or larger adenomas in the first colonoscopy had a higher risk of recurrence. Based on these findings, we suggest a more personalized approach to monitoring patients after polypectomy, adjusting follow-up exams based on individual risk factors. This approach could improve long-term outcomes, making postpolypectomy surveillance more effective and reducing the risk of future colon health issues.

1. INTRODUCTION

Colorectal cancer (CRC) remains a leading global cause of mortality despite therapeutic advancements.[1] The adenoma–carcinoma sequence is the main driver of CRC development, which highlights the importance of colonoscopy in disease screening and prevention. Colonoscopy, particularly with adenoma removal, effectively reduces the risk of CRC-related mortality. Consequently, surveillance colonoscopy is recommended after initial adenoma removal because of the risk of new tumor development. With the increasing implementation of screening colonoscopy, the rate of adenoma detection has increased, making surveillance a crucial component of endoscopic practice.[2,3] Colonoscopic findings such as adenomas measuring ≥10 mm, high-grade dysplasia, or ≥3 adenomas at baseline indicate an elevated risk of metachronous advanced neoplasms, informing current surveillance guidelines. Current guidelines recommend follow-up colonoscopy within 3 years for patients with advanced adenomas and within 7 to 10 years for those with one or two nonadvanced adenomas.[4]

Various metabolic factors have been associated with an increased risk of colorectal tumors, with the main ones being diabetes mellitus, dyslipidemia, and metabolic syndrome.[5,6] The increasing incidence of metabolic disorders in developed countries, attributable to the increasing prevalence of obesity, underscores their role as key risk factors for colorectal tumors.[7] Although evidence suggests that metabolic factors influence the recurrence of adenomas after endoscopic removal,[8] the exact mechanisms remain unclear.[9]

The present study explored additional risk factors for adenoma recurrence, focusing on metabolic factors and initial colonoscopic findings to offer a comprehensive understanding of colorectal neoplasm recurrence.

2. METHODS

2.1. Study setting and cohort

This retrospective hospital-based study included individuals aged 20 to 80 years who underwent initial screening colonoscopy and subsequent surveillance colonoscopy (more than 6 months and before 5 years after the initial examination) between January 2014 and February 2020 at our hospital. To minimize mapping errors and information loss, all authors reviewed and reached a consensus on the concept mapping. The study protocol was approved by the institutional review board of our hospital (approval number: 20200606R).

2.2. Eligibility criteria

The inclusion criterion was having an adenoma detected during the initial colonoscopy. Among 33 073 patients who underwent screening colonoscopy, 31 060 were excluded because of the following reasons: no surveillance colonoscopy (n = 28 392), no adenoma removal during the initial colonoscopy (n = 2607), and surveillance colonoscopy performed earlier than 6 months or more than 5 years after the initial colonoscopy (n = 21). Additional exclusions were made on the basis of poor bowel preparation (n = 13), incomplete colonoscopy (n = 15), inflammatory bowel disease or carcinoid tumor (n = 7), and CRC detection during the initial or surveillance colonoscopy (n = 5). Patients who received a CRC diagnosis during surveillance were excluded to focus on adenoma recurrence rather than cancer progression or postpolypectomy CRC, which typically involves distinct biological pathways or colonoscopy quality concerns beyond the scope of this study.

2.3. Data collection

2.3.1. Clinical characteristics

The following data were collected from the patients' medical records: age at initial colonoscopy, sex, abdominal obesity, hypertension, fasting blood glucose level, high-density lipoprotein cholesterol level, triglyceride level, low-density lipoprotein cholesterol level, and fatty liver status. This study used 45 years as the cutoff age for age-based subgrouping on the basis of the US Multi-Society Task Force's recommendation to lower the starting age for CRC screening to 45 years for individuals at average risk of the disease. Abdominal obesity was defined as a waist circumference of >90 cm in men and >80 cm in women, as per the Asia-Pacific region criteria. The remaining four components of metabolic syndrome were defined as per the National Cholesterol Education Program Adult Treatment Panel III criteria: hypertension (systolic blood pressure ≥130 mmHg or diastolic blood pressure ≥85 mmHg), low high-density lipoprotein cholesterol level (<40 mg/dL for men and <50 mg/dL for women), high triglyceride levels (≥150 mg/dL), and glucose intolerance (fasting blood glucose ≥100 mg/dL). High low-density lipoprotein cholesterol was defined as a low-density lipoprotein cholesterol level of ≥140 mg/dL. Fatty liver was diagnosed through abdominal ultrasonography or computed tomography.

2.3.2. Initial colonoscopic findings

Adenoma recurrence was defined as the detection and removal of adenomas during screening colonoscopy, followed by the identification of new adenomas during surveillance colonoscopy performed more than 6 months but earlier than 5 years after the initial examination. A surveillance interval of >6 months was applied to account for interpatient variations in clinical factors, particularly the requirement of early follow-up in high-risk patients. Patients who underwent colonoscopies within the 6 months after the initial examination were excluded to avoid detecting residual adenomas rather than actual metachronous lesions. For adenomas removed during the initial colonoscopy, histologic features, villous component, dysplasia grade, largest

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size, and total number were recorded. Advanced adenomas were defined as those measuring ≥10 mm or exhibiting histologic features such as ≥25% villous component or high-grade dysplasia. Baseline adenomas were stratified by size as follows: those measuring 1 to 5 mm (diminutive adenomas) and those measuring 6 to 9 mm (small adenomas). On the basis of initial colonoscopic findings, the patients were divided into the following four groups: patients with one or two nonadvanced adenomas, those with multiple (≥3) diminutive adenomas, those with multiple (≥3) small adenomas, and those with advanced adenomas.

2.3.3. Subgroup analysis

Comparative analyses by age, sex, baseline metabolic profiles, fatty liver status, and initial colonoscopic findings were performed.

2.3.4. Statistical analysis

Statistical analyses included the *t* test for continuous variables, the chi-square test for categorical variables, and logistic regression. Univariate and multivariate analyses were performed to identify potential independent associations between various clinical factors and metachronous adenomas. Multivariate regression was performed to calculate OR and 95% CI values for metachronous adenomas. In the multivariate analysis, pairwise comparisons of ORs for metachronous overall and advanced adenomas were performed, using patients with one or two nonadvanced adenomas, those with multiple diminutive adenomas, those with multiple small adenomas, and those advanced adenomas as reference groups. Statistical significance was set at $p < 0.05$. All analyses were performed using SPSS (version 18.0; SPSS Inc., Chicago, IL) for Windows.

3. RESULTS

A total of 2013 patients met the eligibility criteria (Fig. 1). Of them, 1489 (74.0%) were men and 524 (26.0%) were women. The patients' mean age was 52 (range: 28-79) years.

The baseline clinicodemographic characteristics of patients with or without metachronous adenoma are summarized in Table 1. During surveillance colonoscopy, metachronous adenoma was detected in 990 (49.2%) patients; the remaining 1023 (50.8%) patients exhibited no sign of recurrence. The baseline clinicodemographic characteristics of the patients with or without metachronous advanced adenoma are summarized in Table 2. During surveillance colonoscopy, metachronous advanced adenoma was detected in 169 (8.4%) patients. Table 3 presents the baseline risk factors for metachronous overall and

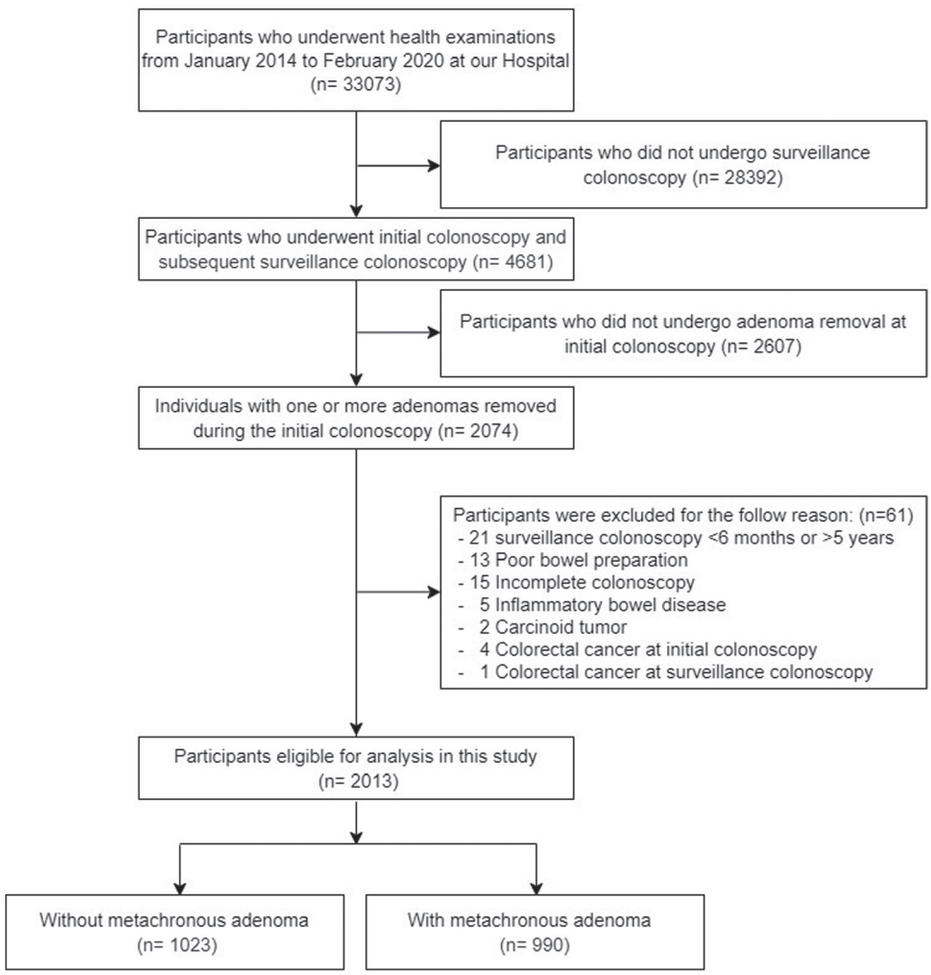

Fig. 1 Flowchart depicting patient selection.

Table 1

Baseline clinicodemographic characteristics of patients with or without metachronous adenoma

	Without metachronous adenoma (N = 1023) n (%)	Metachronous adenoma (N = 990) n (%)
Characteristics		
Age ≥45 y	773 (75.56)	816 (82.42)
Sex (men)	695 (67.94)	794 (80.20)
Abdominal obesity	356 (34.80)	422 (42.63)
Hypertension	244 (23.85)	253 (25.56)
FBG ≥100 mg/dL	331 (32.36)	378 (38.18)
Low HDL-C levels	353 (34.51)	356 (35.96)
TG ≥150 mg/dL	373 (36.46)	417 (42.12)
LDL-C ≥140 mg/dL	280 (27.37)	304 (30.71)
Fatty liver	598 (58.46)	665 (67.17)
Initial colonoscopic findings		
1-2 nonadvanced adenomas	803 (78.49)	498 (50.30)
Multiple (≥3) diminutive adenomas	57 (5.57)	58 (5.86)
Multiple (≥3) small adenomas	60 (5.87)	117 (11.82)
Advanced adenomas	103 (10.07)	317 (32.02)

FBG = fasting blood glucose; HDL-C = high-density lipoprotein cholesterol; LDL-C = low-density lipoprotein cholesterol; TG = triglyceride.

Table 2

Baseline clinicodemographic characteristics of patients with or without metachronous advanced adenoma

	Without metachronous advanced adenoma (N = 1844) n (%)	Metachronous advanced adenoma (N = 169) n (%)
Characteristics		
Age ≥45 y	1445 (78.36)	144 (85.21)
Sex (men)	1352 (73.32)	137 (81.07)
Abdominal obesity	705 (38.23)	71 (42.01)
Hypertension	456 (24.73)	41 (24.26)
FBG ≥100 mg/dL	637 (34.54)	72 (42.60)
Low HDL-C levels	643 (34.87)	66 (39.05)
TG ≥150 mg/dL	725 (39.32)	65 (38.46)
LDL-C ≥140 mg/dL	533 (28.90)	51 (30.18)
Fatty liver	1159 (62.85)	104 (61.54)
Initial colonoscopic findings		
1-2 nonadvanced adenomas	1299 (70.44)	59 (34.91)
Multiple (≥3) diminutive adenomas	147 (7.97)	12 (7.10)
Multiple (≥3) small adenomas	121 (6.56)	21 (12.43)
Advanced adenomas	277 (15.02)	77 (45.56)

FBG = fasting blood glucose; HDL-C = high-density lipoprotein cholesterol; LDL-C = low-density lipoprotein cholesterol; TG = triglyceride.

advanced adenomas. The following clinical factors were significantly associated with an increased risk of metachronous adenomas (all $p < 0.05$): age ≥45 years (OR: 1.52; 95% CI, 1.22-1.88), male sex (OR: 1.91; 95% CI, 1.56-2.34), abdominal obesity (OR: 1.39; 95% CI, 1.16-1.67), glucose intolerance (OR: 1.29; 95% CI, 1.08-1.55), high triglyceride level (OR: 1.27; 95% CI, 1.06-1.52), fatty liver status (OR: 1.45; 95% CI, 1.21-1.74), multiple diminutive adenomas (OR: 1.64; 95% CI, 1.12-2.40), multiple small adenomas (OR: 3.14; 95% CI, 2.26-4.38), and advanced adenomas (OR: 4.96; 95% CI, 3.87-6.36).

The results for metachronous advanced adenomas differed from those for metachronous adenomas. The following clinical factors were significantly associated with an increased risk of metachronous advanced adenomas (all $p < 0.05$): age ≥45 years (OR: 1.59; 95% CI, 1.03-2.47), male sex (OR: 1.56; 95% CI, 1.05-2.32), glucose intolerance (OR: 1.41; 95% CI, 1.02-1.94), multiple diminutive adenomas (OR: 1.95; 95% CI, 1.04-3.64), multiple small adenomas (OR: 3.64; 95% CI, 2.12-6.25), and advanced adenomas (OR: 6.12; 95% CI, 4.26-8.80).

To identify independent risk factors for metachronous advanced adenoma, we used a multivariate model adjusted for age, sex, glucose intolerance, multiple diminutive adenomas, multiple small adenomas, and advanced adenomas (Table 4). Variables were selected on the basis of their clinical relevance, statistical significance in univariate analysis ($p < 0.05$), and lack of collinearity with other factors (determined through correlation analysis). Notably, although a triglyceride level of ≥150 mg/dL, abdominal obesity, and fatty liver status emerged as significant risk factors for metachronous adenoma in the univariate analysis, they did not reach statistical significance for metachronous advanced adenoma and were thus excluded from the multivariate model.

In the multivariate analysis, age ≥45 years, male sex, multiple small adenomas, and advanced adenomas were significantly associated with the risks of metachronous overall and advanced adenomas. Glucose intolerance was a risk factor for metachronous adenoma (adjusted OR: 1.07; 95% CI, 1.03-1.11) but not metachronous advanced adenoma (adjusted OR: 1.03; 95% CI, 0.99-1.08). No significant difference was found between the

Table 3

Risk of metachronous overall or advanced adenoma detection during surveillance colonoscopy

	Metachronous adenoma		Metachronous advanced adenoma	
	OR (95% CI)	*p*	OR (95% CI)	*p*
Characteristics				
[a]Age ≥45 y	1.52 (1.22-1.88)	<0.001	1.59 (1.03-2.47)	0.038
[a]Sex (men)	1.91 (1.56-2.34)	<0.001	1.56 (1.05-2.32)	0.029
Abdominal obesity	1.39 (1.16-1.67)	<0.001	1.17 (0.85-1.61)	0.334
Hypertension	1.38 (0.89-1.34)	0.375	0.98 (0.68-1.41)	0.893
[a]FBG ≥100 mg/dL	1.29 (1.08-1.55)	0.006	1.41 (1.02-1.94)	0.037
Low HDL-C levels	1.07 (0.89-1.28)	0.495	1.20 (0.87-1.65)	0.276
TG ≥150 mg/dL	1.27 (1.06-1.52)	0.009	0.96 (0.70-1.33)	0.828
LDL-C ≥140 mg/dL	1.18 (0.97-1.43)	0.099	1.06 (0.75-1.50)	0.727
Fatty liver	1.45 (1.21-1.74)	<0.001	0.95 (0.68-1.31)	0.735
Initial colonoscopic findings				
1-2 nonadvanced adenomas	1.00 (reference)		1.00 (reference)	
[a]Multiple (≥3) diminutive adenomas	1.64 (1.12-2.40)	0.011	1.95 (1.04-3.64)	0.036
[a]Multiple (≥3) small adenomas	3.14 (2.26-4.38)	<0.001	3.64 (2.12-6.25)	<0.001
[a]Advanced adenomas	4.96 (3.87-6.36)	<0.001	6.12 (4.26-8.80)	<0.001

FBG = fasting blood glucose; HDL-C = high-density lipoprotein cholesterol; LDL-C = low-density lipoprotein cholesterol; OR = odds ratio; TG = triglyceride.
[a]Variables included in the multivariate analysis.

Table 4

Key risk factors for metachronous overall and advanced adenomas

	Metachronous adenoma		Metachronous advanced adenoma	
	OR (95% CI)	*p*	OR (95% CI)	*p*
Characteristics				
Age (≥45 y)	1.49 (1.20-1.84)	<0.001	1.58 (1.02-2.45)	0.041
Sex (men)	1.77 (1.45-2.17)	<0.001	1.52 (1.02-2.27)	0.039
FBG ≥100 mg/dL	1.23 (1.02-1.48)	0.026	1.35 (0.98-1.86)	0.070
Initial colonoscopic findings				
1-2 nonadvanced adenomas	1.00 (reference)		1.00 (reference)	
Multiple (≥3) diminutive adenomas	1.36 (0.93-1.98)	0.108	1.56 (0.87-2.80)	0.138
Multiple (≥3) small adenomas	3.11 (2.21-4.36)	<0.001	3.27 (2.02-5.29)	<0.001
Advanced adenomas	4.71 (3.67-6.05)	<0.001	5.41 (3.73-7.83)	<0.001

FBG = fasting blood glucose; OR = odds ratio.

patients with multiple diminutive adenomas and those with one or two nonadvanced adenomas in terms of the risk of metachronous overall adenoma (adjusted OR: 1.36; 95% CI, 0.93-1.98) or metachronous advanced adenoma (adjusted OR: 1.56; 95% CI, 0.87-2.80).

Table 5 presents the results of the multivariate analysis investigating the risks of metachronous overall and advanced adenomas; patients with one or two nonadvanced adenomas, those with multiple diminutive adenomas, and those with advanced adenomas constituted the reference groups for this analysis. The adjusted OR (95% CI) values for metachronous advanced adenomas in patients with multiple (≥3) diminutive adenomas, those with multiple small adenomas, and those with advanced adenomas were 1.56 (95% CI, 0.87-2.80), 3.27 (95% CI, 2.02-5.29), and 5.41 (95% CI, 3.73-7.83), respectively, compared with the results in patients with one or two nonadvanced adenomas. These findings highlighted multiple small adenomas and advanced adenomas, but not multiple diminutive adenomas, as significant risk factors for metachronous advanced adenoma. The adjusted OR (95% CI) values for metachronous advanced adenomas in patients with one or two nonadvanced adenomas, those with multiple small adenomas, and those with advanced adenomas were 0.64 (95% CI, 0.36-1.15), 2.10 (95% CI, 1.08-4.08), and 3.47 (95% CI, 1.93-6.25), respectively, compared with the results in patients with multiple diminutive adenomas. Furthermore, the adjusted OR (95% CI) values for metachronous advanced adenomas in patients with one or two nonadvanced adenomas, those with multiple diminutive adenomas, and those with multiple small adenomas were 0.19 (95% CI, 0.13-0.27), 0.29 (95% CI, 0.16-0.52), and 0.60 (95% CI, 0.37-0.98), respectively, compared with the results in patients with advanced adenomas. Similar trends were discovered for metachronous adenomas.

4. DISCUSSION

Risk factors for recurrent advanced colorectal adenomas have been well studied, with key factors including the size, number, and histologic features of polyps and the complexity of polypectomy at baseline colonoscopy.[10–12] Baile-Maxía et al[13] highlighted baseline adenomas measuring ≥10 mm or exhibiting a villous component as significant predictors of metachronous advanced adenomas. Emmanuel et al[14] reported that incomplete resection of polyps—particularly larger sessile polyps (>2 cm), which have a residual adenoma rate of 23.8%—contributes to the risk of metachronous advanced adenomas. Large-scale studies have demonstrated that the

Table 5

Risk of metachronous overall or advanced adenoma detection during screening colonoscopy

	Metachronous adenomas					
Initial colonoscopic findings	**OR (95% CI)**	***p***	**OR (95% CI)**	***p***	**OR (95% CI)**	***p***
1-2 nonadvanced adenomas	1.00 (reference)		0.74 (0.51-1.07)	0.108	0.21 (0.17-0.27)	<0.001
Multiple (≥3) diminutive adenomas	1.36 (0.93-1.98)	0.108	1.00 (reference)		0.29 (0.19-0.44)	<0.001
Multiple (≥3) small adenomas	3.11 (2.21-4.36)	<0.001	2.29 (1.41-3.70)	0.008	0.66 (0.45-0.98)	0.038
Advanced adenomas	4.71 (3.67-6.05)	<0.001	3.46 (2.27-5.29)	<0.001	1.00 (reference)	
	Metachronous advanced adenomas					
Initial colonoscopic findings	**OR (95% CI)**	***p***	**OR (95% CI)**	***p***	**OR (95% CI)**	***p***
1-2 nonadvanced adenomas	1.00 (reference)		0.64 (0.36-1.15)	0.138	0.19 (0.13-0.27)	<0.001
Multiple (≥3) diminutive adenomas	1.56 (0.87-2.80)	0.138	1.00 (reference)		0.29 (0.16-0.52)	<0.001
Multiple (≥3) small adenomas	3.27 (2.02-5.29)	<0.001	2.10 (1.08-4.08)	0.029	0.60 (0.37-0.98)	0.042
Advanced adenomas	5.41(3.73-7.83)	<0.001	3.47 (1.93-6.25)	<0.001	1.00 (reference)	

OR = odds ratio.

risk of recurrent advanced adenomas is influenced by the number of polyps detected during the initial colonoscopy.[15–17] In light of these findings, the US Multi-Society Task Force recommends risk-adjusted surveillance strategies. A 3-year surveillance interval is recommended for patients with advanced adenomas, whereas a 7 to 10-year interval is recommended for those with one or two nonadvanced adenomas.[4] These guidelines emphasize the importance of risk-stratified surveillance for optimizing clinical outcomes.

Although adenoma multiplicity is a known risk factor for recurrent advanced adenomas, whether patients with multiple diminutive adenomas have an increased risk of metachronous advanced adenomas remains unclear. A study comparing patients with diminutive adenomas (1-5 mm) vs those with small (6-9 mm) adenomas at baseline revealed that diminutive adenomas, regardless of their number, were associated with a low risk of metachronous advanced neoplasms.[18] Sekiguchi et al[19] reported that the 5-year cumulative incidence of advanced adenomas was similar between patients with untreated diminutive adenomas and those with no adenomas, with no advanced adenomas developing from unresected diminutive lesions. However, Cheng et al indicated that the presence of three or four diminutive or small nonadvanced adenomas was significantly associated with an increased risk of metachronous advanced adenomas.[8] These conflicting findings highlight the need for further studies to clarify the actual effect of diminutive adenomas on the long-term risk of colorectal neoplasia.

In addition to polyp multiplicity, patient demographics and metabolic factors contribute to the risk of metachronous adenomas. Lee et al[20] noted an association between age and the recurrence of high-risk adenomas, whereas Park et al[21] found a correlation between older age and the recurrence of both overall and advanced adenomas. Current international guidelines recommend lowering the starting age for CRC screening to 45 years for individuals at average risk.[22–24] Kang et al[25] indicated baseline adenoma characteristics, patient demographics, and metabolic risk factors as significant predictors of metachronous advanced adenomas. These findings emphasize the elevated risk of metachronous advanced neoplasms associated with the presence of advanced adenomas or multiple small adenomas at baseline, underscoring the need for a comprehensive risk assessment that integrates both adenoma features and patient-specific factors.

This study highlights the need for tailoring surveillance strategies to demographic, metabolic, and endoscopic factors. Our findings indicated age, glucose intolerance, and adenoma size and number as key predictors of metachronous advanced adenomas. Few studies have evaluated the risk of metachronous advanced colorectal adenomas by using an age of 45 years as the cutoff. We found that an age of ≥45 years was a significant predictor of metachronous advanced adenomas, aligning with the findings of other studies linking age to recurrent high-risk adenomas.[20,21] The present study revealed that patients aged younger than 45 years had a significantly lower risk of metachronous advanced adenomas. Thus, surveillance strategies should be more flexible for younger patients with low-risk adenomas. We further noted that the presence of multiple small adenomas, but not multiple diminutive adenomas, was associated with an increased risk of metachronous advanced adenomas. Therefore, surveillance intervals for multiple diminutive adenomas should be adjusted to align with the requirement of low-risk groups.

On the basis of our findings, we offer the following recommendations. Patients with advanced adenomas at baseline are at the highest risk of metachronous advanced adenomas (adjusted OR: 5.41; 95% CI, 3.73-7.83). For these patients, clinicians should adhere to the current guideline recommendation of performing surveillance colonoscopy at 3-year intervals. For patients with multiple small adenomas, the significantly elevated risk of metachronous advanced adenomas (adjusted OR: 3.27; 95% CI, 2.02-5.29) supports a surveillance interval of 3 to 5 years. The risk of metachronous advanced adenomas was similar for patients with multiple diminutive adenomas and those with one or two nonadvanced adenomas. Therefore, for these patients, the surveillance interval may be extended to 5 to 7 years. Furthermore, demographic factors such as older age (≥45 years) and male sex were independently associated with an increased risk of metachronous advanced adenomas, emphasizing the need for tailored surveillance intervals that consider both adenoma characteristics and patient-specific factors. In the future, prospective studies should be conducted to validate our recommendations and explore additional patient-specific factors to further refine surveillance intervals and improve clinical outcomes for individuals undergoing postpolypectomy surveillance.

Our study has several limitations. First, the possibility of misclassification could not be eliminated because open biopsy–derived information was used as a reference for estimating polyp size. Second, the retrospective design of this study precluded the investigation of key factors influencing colonoscopy quality—for example, withdrawal time and the endoscopist's adenoma detection rate. Furthermore, although family history, medical history, smoking, and alcohol use are known risk factors for colorectal adenomas, these factors were not included in the analysis because of data limitations. Future research should incorporate these factors to ensure a comprehensive risk assessment. Finally,

data were collected from the health screening center of a single tertiary hospital; the study also had a relatively small sample size. These factors may limit the generalizability of our findings.

In conclusion, our findings highlight the importance of initial colonoscopy in assessing the risk of metachronous colorectal adenomas, particularly advanced adenomas. No significant difference in the risk of metachronous advanced adenomas was discovered between patients with multiple diminutive adenomas and those with one or two nonadvanced adenomas. Therefore, we recommend that clinicians include risk stratification in post-polypectomy surveillance guidelines for patients with multiple small or diminutive adenomas. Further research is required to optimize the surveillance interval for patients with a history of colorectal adenomas and to validate our recommendations.

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