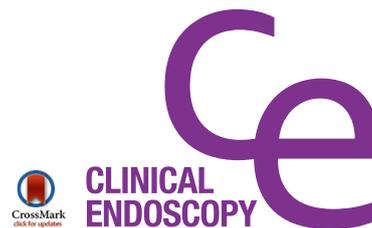


REVIEW

Clin Endosc 2016;49:359-363
http://dx.doi.org/10.5946/ce.2016.080
Print ISSN 2234-2400 • On-line ISSN 2234-2443



Open Access

Optimal Colonoscopy Surveillance Interval after Polypectomy

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The detection and removal of adenomatous polyps and postpolypectomy surveillance are considered important for the control of colorectal cancer (CRC). Surveillance using colonoscopy is an effective tool for preventing CRC after colorectal polypectomy, especially if compliance is good. In current practice, the intervals between colonoscopies after polypectomy are variable. Different recommendations for recognizing at risk groups and defining surveillance intervals after an initial finding of colorectal adenomas have been published. However, high-grade dysplasia and the number and size of adenomas are known major cancer predictors. Based on this, a subgroup of patients that may benefit from intensive surveillance colonoscopy can be identified. **Clin Endosc 2016;49:359-363**

Key Words: Colorectal neoplasms; Colonoscopy; Colon polypectomy; Surveillance

INTRODUCTION

The global prevalence of colorectal cancer is increasing, and the incidence in South Korea is rapidly increasing owing to a Westernized diet. Colon carcinogenesis occurs through either the adenoma-carcinoma sequence or a *de novo* pathway. It is known that over two-thirds of colorectal cancer cases develop from adenomas; therefore, detection and removal of adenomas by colonoscopy is the best way to prevent colorectal cancer. According to an American study in 2008, polyps over 9 mm in size have been detected in 6% to 7% of health screening examinations; the reported adenoma detection rate in Korea varies, but is approximately 9% during screening examinations.^{1,2} Diagnosis and removal of colorectal polyps is increasing because of the widespread availability of colonoscopy.^{1,2} Consequently, the need for postpolypectomy surveillance is increasing. Follow-up colonoscopy is required to reduce the risk of colorectal carcinogenesis after polypec-

tomy for adenoma. Metachronous lesions were detected in 20% to 30% of patients during follow-up colonoscopy 3 to 5 years after polypectomy to remove one or more adenomas.³⁻⁷ Advanced adenomas (>10 mm in diameter, over 25% villous component, or high-grade dysplasia) were found in 20% of these patients,³⁻⁸ and a small number had invasive colorectal cancer.^{5,9-14} In addition, interval cancer was reported during an adequate follow-up period after screening colonoscopy,¹⁵⁻¹⁷ and 19% to 27% of such interval cancers are known to be caused by incomplete removal of polyps.^{9,18,19} Enhanced colonoscopy surveillance may be needed for screening of patients at high risk of colorectal carcinogenesis, for prediction of progressive colorectal tumor development, management of incompletely removed polyps, and appropriate follow-up.

SUBJECTS

Follow-up colonoscopy is required because the risk of colorectal cancer after polypectomy is higher than that in patients without polyps.²⁰ An appropriate interval for follow-up colonoscopy was recommended in Korea in 2012, based on features of polyps detected by colonoscopy and the risk of progression to an advanced neoplasm during this interval. It is known that number, size, and histological characteristics of adenomas should be considered in postpolypectomy surveillance. The first risk factor is the number of adenomas. The

Received: June 16, 2016 Accepted: July 12, 2016

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probability of detecting an advanced adenoma or tumor is increased when the number of adenoma is 3 or more. According to previous studies that evaluated the correlation between risk of advanced neoplasm and the number of adenomas found during follow-up,²¹⁻²⁹ the risk increases with the number of adenomas: combined odds ratio (OR) 1.93 (95% confidence interval [CI], 1.51 to 2.45) and combined hazard ratio (HR) 2.20 (95% CI, 1.49 to 2.90). The risk of neoplasm development is especially increased in patients with three or more adenomas: combined OR 2.84 (95% CI, 1.26 to 6.39) and combined HR 2.20 (95% CI, 1.40-3.46). Thus, established international guidelines recommend follow-up in 3 years in patients with three or more adenomas. Several other guidelines recommend early follow-up for cases with multiple adenomas. The British Society of Gastroenterology-Association of Coloproctology of Great Britain and Ireland guidelines define cases with five or more adenomas, or three or more adenomas including an adenoma over 1 cm in size, as high-risk, and recommend follow-up after 1 year.³⁰ The US Multi-Society Task Force on Colorectal Cancer-American Cancer Society guidelines recommend follow-up in 3 years, and consideration of familial polyposis in cases with 10 or more adenomas.³¹ Moreover, several guidelines recommend follow-up after 1 year for cases with five or more adenomas or with three or more polyps including adenomas over 1 cm in size. In cases with detection and removal of 10 or more polyps, familial polyposis should be considered and examination of family members should be recommended. Polyps are categorized based on size. Diminutive polyps are <5 mm in size, small polyps are between 6 and 9 mm, and large polyps are larger than 10 mm. According to studies evaluating the risk of development of an advanced neoplasm based on the size of a preexisting adenoma,^{21-25,27-29} the risk is not significantly increased for adenomas between 5 and 10 mm in comparison with the risk for those under 5 mm. However, the risk of development of an advanced neoplasm is increased for adenomas over 10 mm in size, with a rate two times higher than in cases with adenomas under 10 mm. Larger adenomas include more villous components and are more likely to show advanced pathology; therefore, a maximum 32% of polyp over 20 mm are reported to include malignant portions.^{32,33} It is important to assess pathologic completeness when larger sessile polyps are removed, but sessile polyps over 20 mm are difficult to remove with conventional snare polypectomy, and most are removed by piecemeal resection.^{34,35} Follow-up after 1 year is not mandatory for polyps between 1 and 2 cm in size, but should be performed in 1 year in the case of incomplete removal. Determination of completeness is important for sessile polyps over 2 cm in size, and follow-up study after 6 to 12 months is required if completeness is not confirmed. The definition of a polyp as a tubu-

lar or villous adenoma has been controversial. However, cases with over 20% to 25% villous components in a preexisting adenoma are defined as tubulovillous or villous adenomas; several studies have reported that the risk of development of an advanced neoplasm is significantly increased in patients with tubulovillous or villous adenomas, compared with patients with tubular adenoma alone: combined OR 1.51 (95% CI, 1.16 to 1.97) and combined HR 1.83 (95% CI, 1.15 to 2.89).^{21,22,24,27} A Korean study reported that the risk of development of an advanced adenoma is not increased for the villous adenoma component in a preexisting adenoma (HR, 1.48; 95% CI, 0.74 to 2.95).²⁹ However, Yang et al.³⁶ reported that the risk of development of an advanced adenoma is significantly increased with tubulovillous or villous pathology (OR, 8.1; 95% CI, 4.2 to 15.6), in a 16-year follow-up study after adenoma removal by sigmoidoscopy, and suggested that tubulovillous or villous pathology is the most important predictive factor for risk of advanced neoplasm after polypectomy, along with high-grade dysplasia. An increasing trend for the risk of advanced neoplasm was observed in cases with high-grade dysplasia detected by colonoscopy, compared to cases with low-grade dysplasia: combined OR 1.33 (95% CI, 0.85 to 2.09) and combined HR 1.69 (95% CI, 1.14 to 2.50).^{21,22,27} Stage adjustment at follow-up is required for such cases, but Martínez et al.³ reported that the risk is not high. A meta-analysis by Saini et al.³⁷ recommends follow-up after 3 years, because high-grade dysplasia and the number of adenomas are the most meaningful factors in the prediction of increased risk for advanced adenoma: combined relative risk 1.84 (95% CI, 0.53 to 8.93). It was recently reported that serrated polyps progress to colorectal cancer through a pathway different from the adenoma-carcinoma sequence.³⁸ Sessile serrated adenomas include hyperplastic polyps, traditional serrated adenomas, and mixed adenomatous and hyperplastic polyps, which have serrated pathological architecture.³⁹ Serrated polyps mostly occur in the right colon, and most are associated with BRAF and/or MSI-high mutations, and are predicted to rapidly progress to colorectal cancer. The combined OR in serrated polyp cases at risk for development of advanced neoplasm was 1.98 (95% CI, 1.24 to 3.15); moreover, the presence of a serrated polyp over 10 mm in size reportedly increases the risk of development of an advanced neoplasm.⁴⁰ The correlation between location and risk of neoplasm has recently been studied. The risk of a progressive neoplasm has a combined OR of 1.73 (95% CI, 1.48 to 2.01) when the adenoma is found in the right colon, defined as the colon from cecum to transverse colon or splenic flexure, compared to adenoma located in the left colon.^{24,28,38} Further investigation is required to determine whether an adenoma in the right colon is a risk factor for advanced neoplasm because colonoscopy may miss a tumor owing to the

Table 1. Summary of Guidelines for Postpolypectomy Surveillance

	Guideline society	Initial interval	Subsequent interval if FU colonoscopy shows only low-risk adenomas	Subsequent interval if FU colonoscopy shows no adenomas
Low risk				
1–2 Small adenomas ^{a)}	Task force	5–10 yr	5–10 yr	Not specified
	ACG ^{b)}	5 yr	Not specified	5 yr
	ASGE	≥5 yr	≥5 yr	≥5 yr
	BSG	5 yr or no surveillance	5 yr or no surveillance	No surveillance
Intermediate risk				
Advanced neoplasm ^{c)} or 3–10 small adenomas	Task force	3 yr	5 yr	5 yr
	ACG ^{b)}	3 yr	Not specified	5 yr
	ASGE	3 yr	Not specified	≥5 yr
	BSG	3 yr	3 yr	3 yr
High risk				
Small adenomas > 10	Task force	< 3 yr	Not specified	Not specified
	ACG ^{b)}	Not specified	Not specified	Not specified
	ASGE	< 3 yr	Not specified	5 yr
	BSG	1 yr	3 yr	3 yr
Large sessile adenoma	Task force	2–6 mo	Customized	Customized
	ACG ^{b)}	3–6 mo	Not specified	Not specified
	ASGE	2–6 mo	Customized	Customized
	BSG	3 mo	Customized	1 yr ^{d)}

By US Multi-Society Task Force on Colorectal Cancer (Task Force), ACG, ASGE, and BSG.

FU, follow-up; ACG, American College of Gastroenterology; ASGE, American Society of Gastrointestinal Endoscopy; BSG, British Society of Gastroenterology.

^{a)}Small adenomas are defined as tubular adenomas <1 cm in size; ^{b)}ACG guidelines note that selected low-risk patients might not need surveillance at all, but do not further elaborate; ^{c)}Advanced neoplasm is defined as villous or tubulovillous adenoma, adenoma with high-grade dysplasia, or a tubular adenoma ≥1 cm in size; ^{d)}BSG guidelines recommend repeating colonoscopy in 1 year after confirmation of complete removal, then every 3 years.

Table 2. Index Colonoscopy Findings Related to an Increased Risk of Subsequent Neoplasia

Index colonoscopy findings related to an increased risk of subsequent neoplasia, any of the followings
Three or more adenomas
Any adenoma(s) larger than 10 mm
Any tubulovillous or villous adenoma(s)
Any adenoma(s) with high-grade dysplasia
Any serrated polyp(s) larger than 10 mm

anatomical characteristics of the right colon, which has sharp curves and distinct haustra; moreover, cancer in the right colon can be caused by the serrated pathway and can be affected by individual patient features and environmental factors. The Korean 2012 guidelines recommend surveillance 5 years after polypectomy for groups that are not at a high risk for advanced neoplasm development; less frequent follow-up is recommended for cases with previous colonoscopy findings related to an increased risk, even if the findings of current colonoscopy suggest no increased risk. Follow-up colonoscopy 3 years after polypectomy is recommended for cases with a high risk of carcinogenesis. However, the follow-up interval

should be reduced when well-known conditions are not satisfied, or based on previous colonoscopy findings, completeness of removal, health status, family history, and past medical history (Table 1).

CONCLUSIONS

The prevalence of colorectal cancer is increasing, and adequate postoperative surveillance is required for patients who undergo polypectomy during colonoscopy, because of higher risk for development of an advanced neoplasm. An increased

risk of subsequent neoplasia occurs because of polypectomy of three or more adenomas, any adenomas larger than 10 mm, any tubulovillous or villous adenoma, any adenoma with high-grade dysplasia, or any serrated polyp larger than 10 mm (Table 2). Patients with any of these findings are defined as a high-risk group, and colonoscopy 3 years after complete removal is recommended. In addition, the surveillance period can be reduced based on previous colonoscopy findings, completeness of removal, health status, family history, and past medical history; follow-up colonoscopy at 5 years after polypectomy is recommended for low- or intermediate-risk patients. Recommendations from other countries cannot be applied because the Korean reimbursement system is based on cost-effectiveness. Therefore, management of polyps requires further cost-effectiveness analysis relevant to health care in Korea.

Conflicts of Interest

The author has no financial conflicts of interest.

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