

• BRIEF REPORTS •

## How can colorectal neoplasms be treated during colonoscopy?

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### Abstract

**AIM:** For many physicians who ordinarily treat patients with colonic diseases, colonoscopy is considered a prime study interest. Developments in colonoscopic equipment and methods have led to a large number of endoscopic diagnoses and treatment for colorectal neoplasms. The purpose of this investigation is to evaluate the efficacy and outcomes of endoscopic treatment for colorectal neoplastic lesions.

**METHODS:** From September 1999 to May 2003, 11 447 consecutive colonoscopic examinations in 9 864 patients were gathered; totaling 5 502 endoscopic treatments for colorectal neoplasms. Macroscopic characteristics of the neoplasms were classified into protruded ( $n = 3\,953$ ), sessile ( $n = 1\,402$ ), lateral spreading tumor ( $n = 139$ ) and depressed lesions ( $n = 8$ ). Snare polypectomy was conducted in 3 984 lesions, hot forcep removal in 1 368 lesions, and endoscopic mucosal resection in 150 lesions.

**RESULTS:** Histological diagnoses were 4 596 neoplastic lesions (4 376 adenomas and 220 adenocarcinomas) and 906 non-neoplastic lesions (891 hyperplastic and 15 inflammatory polyps). For the adenocarcinoma group, 31 instances involved submucosal invasion or resection margin, who received further operations, while 13 surgical specimens discovered no residual tumors. Three perforations and 96 bleedings were found following endoscopic treatment. No procedure-related mortality was found and no recurrent malignancy was found after 14-56 mo follow-up.

**CONCLUSION:** To lower the incidence and mortality of colorectal cancer, endoscopic treatment for colorectal neoplasms is a simple and safe procedure.

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**Key words:** Colonoscopy; Snare; Hot forcep; Endoscopic mucosal resection

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### INTRODUCTION

For many physicians who normally treat patients with colonic diseases, colonoscopy is considered a prime study interest. The advantage of colonoscopy is its capacity to visualize lesions in situ and also to biopsy or resect both benign and malignant mucosal lesions. Developments in colonoscopic equipment and methods have led to larger numbers of endoscopic resections for colorectal neoplasms including any macroscopic morphology. Macroscopically, colorectal neoplasms can be categorized into protruded, sessile, depressed lesions and lateral spreading tumors. Protruded lesions were protruding lesions with or without a stalk; sessile lesions are superficial, slightly raised lesions with a diameter of no more than 5 mm, and while lateral spreading tumors are bigger, flat lesions with a diameter above 5 mm, and depressed colonic lesions are superficial flat lesions with depressed centers. Several variables, including size, shape, and depth of invasion, have been investigated in attempts to optimize therapy<sup>[1-4]</sup>. While the protruded lesions can be easily excised by snare polypectomy; other lesion types should be resected by hot forcep polypectomy or endoscopic mucosal resection.

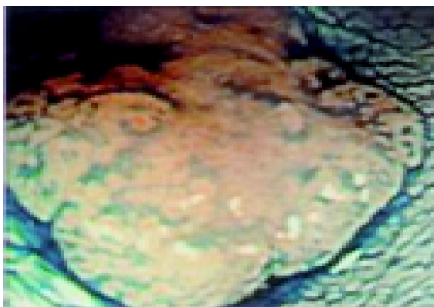
Colorectal neoplasms can be histologically categorized into neoplastic (include adenoma and adenocarcinoma) and non-neoplastic lesions. Ethically, all the neoplastic lesions should be completely resected to prevent colorectal malignancy. This study presents experience with endoscopic treatments for different types of colorectal neoplasms.

### MATERIALS AND METHODS

From September 1999 to May 2003, 11 447 consecutive colonoscopic examinations in 9 864 patients at the digestive therapeutic endoscopic center of Chang Gung Memorial Hospital (Taipei, Taiwan) were gathered. There were 6 138 male and 3 726 female patients, with a mean age of 53 years (ranging from 16 to 97 years). After the patients were readied with ingestion of an electrolyte lavage solution (2 000 mL of polyethylene glycol, PEG), colonoscopic examination was performed with a CF200Z or CF240ZI electronic videoendoscope (Olympus, Tokyo). The colonoscope was inserted up to the cecum in all the included patients. Lesions were gauged by putting an opened standard biopsy forceps beside the lesions, and then the lesions were resected endoscopically if morphologically neoplastic lesions were



**Figure 1** Protruded polyp with a stalk.



**Figure 2** Sessile lesion.



**Figure 3** Lateral spreading tumor.



**Figure 4** Depressed lesion.

suspected.

Macroscopic characteristics of the lesions were classified into protruded, sessile, depressed lesions and lateral spreading tumors. The resection methods included snare polypectomy, hot forcep polypectomy and endoscopic mucosal resection (EMR). An electrocautery device performed the polypectomy,

while EMR was conducted using techniques introduced by Kudo *et al*<sup>[5]</sup>. First the lesion was elevated by injecting 5-20 mL normal saline into the submucosal layer using a standard 25-G injection needle (Olympus) inserted beside the lesion base. For lesions draped over a fold, the distant aspect was injected first to sustain or increase lesion visualization. The volume of normal saline injected varied but was sufficient to attain the desired goal of a large submucosal swelling beneath the lesion and nearby parts of the mucosa. Next the lesion was completely and securely ensnared with a spiked snare and finally, the lesion was resected with a 40-W pure cutting current with an electrosurgical unit (UES-20, Olympus). The wound was then clamped with hemoclips.

Endoscopic resection specimens were embedded in paraffin and then stained with hematoxylin and eosin. Microscopic examinations of specimens were performed by a pathologist specializing in gastrointestinal pathology. If the pathologic finding indicated malignancy, a follow up colonoscopy would be performed 1 mo later, or for the adenomatous group, otherwise followed up 6 mo later.

## RESULTS

Cumulatively 5 502 endoscopic treatments were conducted for colorectal neoplasms in this period. Macroscopic features of the neoplasms were classified into protruded ( $n = 3\,953$ ) (Figure 1), sessile ( $n = 1\,402$ ) (Figure 2), lateral spreading tumor ( $n = 139$ ) (Figure 3) and depressed lesions ( $n = 8$ ) (Figure 4). Snare polypectomy was performed in 3 984 lesions, hot forcep removal in 1 368 lesions, and endoscopic mucosal resection in 150 lesions. The position of colorectal neoplasms was mostly in the left side colon and rectum (Table 1). The mean sizes of lesions were 19.3 mm for pedunculated (4-60 mm), 4.6 mm for sessile (3-5 mm), 7.1 mm for depressed lesions (4-10 mm) and 20.3 mm for lateral spreading tumors (6-60 mm).

For protruded lesions, all were excised by snare polypectomy, which pathologically showed 3 473 (87.86%) neoplastic and 480 non-neoplastic lesions. For neoplastic lesions, there were 2 465 adenomas without dysplasia, 842 with moderate to severe dysplasia, 148 mucosal cancer and 18 adenocarcinomas with submucosal involvement (Table 2). Twenty-two patients with malignant lesions in this group underwent further operation due to resection margin or submucosal involvement, and eight of them showed no residual tumors from surgical specimens. Lymph nodes metastases were observed in two cases with submucosal cancers in this group.

Hot forcep polypectomy was used in 1 368 sessile lesions, while 31 lesions were excised by snare polypectomy, and three were resected by EMR. Pathologic findings were 983 (70.11%) neoplastic and 419 non-neoplastic lesions. Neoplastic lesions included 743 adenomas, 232 adenomas with moderate to severe dysplasia, six mucosal cancer and two adenocarcinomas with submucosal involvement. Two submucosal cancerous lesions received further operation and one case without residual tumor was noted by surgical specimen.

The lateral spreading tumors were all resected by EMR methods pathologically revealing 133 (95.68%) neoplastic and six non-neoplastic lesions while 38 adenomas, 53

**Table 1** Characteristics of 5 502 resected colorectal lesions

Morphology	Size (mm)	Location					Total
		R	S	D	T	A & C	
Protruded	≤5	161	135	209	63	161	729
	6-10	1 105	717	478	72	254	2 626
	11-20	118	121	173	46	75	533
	21-30	13	22	14	0	1	50
	>30	7	8	0	0	0	15
Sessile	≤5	353	495	271	143	140	1 402
LST	6-10	25	11	5	5	11	57
	11-20	12	8	3	2	12	37
	21-30	15	21	1	0	2	39
	>30	4	2	0	0	0	6
Depressed	≤5	0	1	0	0	2	3
	6-10	2	0	1	0	2	5
Total		1 815	1 541	1 155	331	660	5 502

R, rectum; S, sigmoid colon; D, descending colon; T, transverse colon; A, ascending colon; C, cecum; LST, lateral spreading tumor.

**Table 2** Histological finding of 5 502 resected lesions

Morphology	Size (mm)	Adenoma		Adenocarcinoma		Non-neoplastic	Total
		(-) Dysplasia	(+)	M (%)	SM (%)		
Protruded	≤5	293	19	1 (0.14)	0	416	729
	6-10	2 053	505	7 (0.27)	0	61	2 626
	11-20	118	312	99 (18.6)	1 (0.19)	3	533
	21-30	1	5	39 (78)	5 (10)	0	50
	>30	0	1	2 (13.3)	12 (80)	0	15
Sessile	≤5	743	232	6 (0.43)	2 (0.14)	419	1 402
LST	6-10	18	27	8 (14)	0	4	57
	11-20	15	10	10 (27)	0	2	37
	21-30	5	15	18 (46.2)	1 (2.6)	0	39
	>30	0	1	3 (50)	2 (33.3)	0	6
Depressed	≤5	1	0	1 (33.3)	0	1	3
	6-10	0	2	2 (40)	1 (20)	0	5
Total		3 248	1 128	196 (3.56)	24 (0.44)	906 (891 HP, 15 IP)	5 502

LST, lateral spreading tumor; M, mucosal cancer; SM, cancer with submucosal involvement; dysplasia (+), with moderate to severe dysplasia; HP, hyperplastic polyp; IP, inflammatory polyp.

adenomas with moderate to severe dysplasia, 39 mucosal cancers and 3 submucosal cancers were discovered. Six patients received further operations, but in three of them residual tumors could not be found in the surgical specimens. Lymph node metastases were noted in two cases with submucosal cancers in this group.

The eight depressed lesions were resected successfully by EMR. Seven (87.5%) were neoplastic lesions and one was non-neoplastic lesion. Two adenomas and one adenoma with moderate to severe dysplasia were found in the neoplastic lesion; the other three were mucosal cancers and one was adenocarcinoma with submucosal invasion; the last patient underwent further operation but no residual tumor was discovered.

Across all the endoscopic treatments, only two colonic perforations occurred after snare polypectomy and one in hot forcep polypectomy, and all three patients received surgical procedures without mortality. Post treatment bleeding was identified in 89 patients following snare polypectomy and seven after hot forcep polypectomy; while endoscopic hemostasis was accomplished by heat probe coagulations or hemoclips. For the malignant lesions, no recurrent tumors occurred 14-56 mo following endoscopic resections.

## DISCUSSION

Polyps are significant owing to their well-recognized relationship to colorectal cancer<sup>[6]</sup>. Researchers generally recognize that colorectal cancer extends from benign adenomas -the "adenoma-adenocarcinoma sequence"<sup>[7]</sup>, and thus that excising adenomatous polyps lower the risk of colorectal cancer<sup>[8]</sup>. Histologically, polyps are categorized into neoplastic and non-neoplastic polyps. Non-neoplastic polyps encompass hyperplastic polyps, hamartomas, lymphoid aggregates, and inflammatory polyps, which are not potentially malignant.

Colonoscopic treatments, including hot forcep polypectomy, snare polypectomy, and endoscopic mucosal resection<sup>[9,10]</sup>, carry risks of bleeding and perforation. Beside these risks, colonoscopic treatments are also financially expensive. However, this expensive and risky method has been normally employed, because colorectal polyps are frequently discovered during screening colonoscopy<sup>[11]</sup>. Ideally, the criteria for colonoscopic treatments should be restricted to an adenomatous polyp with the potential to transform into invasive colorectal carcinoma. To avoid needless polypectomy following screening colonoscopy, distinguishing neoplastic from non-neoplastic polyps may help lower this risk and thus the attendant costs. Conventional colonoscopic examination thus far has provided

no morphological criterion<sup>[12-15]</sup>. Although a small polyp of less than 5 mm is histologically hyperplastic in 80-90% of cases<sup>[16,17]</sup>, recent data has implied that up to 40-60% of diminutive colorectal polyps can be neoplastic<sup>[18,19]</sup>. Furthermore, small, flat adenomas have been shown to carry elevated risk of dysplasia<sup>[20,21]</sup>. In this study, the predictive value of macroscopic diagnosis for neoplastic polyps was 83.26%. However, a previous study of magnifying colonoscopy with the 0.1% indigo carmine dye spreading method puts the diagnostic accuracy at higher than 90%<sup>[22]</sup>. If magnifying colonoscopy and chromoendoscopy were applied to all the colonic polyps, this would raise diagnostic accuracy and avoid some needless colonic treatments. A major problem with these procedures is the risk of bleeding and perforation following treatment. In fact, complication rates following treatment have ranged from 0.4% to 1.7%<sup>[23-25]</sup>. In this study, the perforation rate was 0.05% and bleeding rate was 1.7% without any mortality. The perforation rate is connected to coagulation current energy and would be diminished by the use of cutting current. However, pure cutting current increases the bleeding rate, although it is easily controlled by the hemoclips method. It is considered as a simple and safe procedure.

The locations of colon lesions were mostly in rectum (32.99%) and sigmoid colon (28.00%), a result comparable with previous reports. As widely recognized, most colorectal carcinomas develop via malignant transformation in benign adenomatous polyps<sup>[26]</sup>. Large studies of colonoscopic polypectomies indicate at least two factors connected with malignant degeneration of polyp size and tissue type. Carcinoma is histologically detected in 0.1% of polyps measuring less than 5 mm in diameter. This increases to 1.0% in cases with a 10 mm diameter polyp and may attain 40% in cases with polyps exceeding 20 mm<sup>[27]</sup>. Colonoscopic treatment, which includes snare polypectomy, hot forcep polypectomy and endoscopic mucosal resection, is acknowledged as an established method of removing adenomatous polyps and for diminishing the incidence of and mortality from colorectal cancer. This study indicated that while colorectal lesions less than 5 mm had a 0.45% incidence of malignancy; lesions between 6 and 10 mm had a malignancy rate of 0.67%; for lesions between 11 and 20 mm was 19.3%; for lesions between 21 and 30 mm was 70.8%; and those larger than 30 mm had a 90.5% incidence of carcinoma. The overall incidence of malignancy (4.00%) was higher than in previous reports, which may be related to the fact that, because the Chang-Gung Memorial Hospital is a referral center, some bigger colonic lesions found by local hospitals or clinics will be transferred there. Colorectal lesions larger than 10 mm should be completely resected and subjected to carefully pathologic review for the rising malignancy incidence. The pedunculated lesions could be resected by snare polypectomy, while LST larger than 10 mm should be resected by EMR method. Although previous studies show a low level of malignant transformation in small adenomas, this investigation indicated that it also had a 0.45% incidence of carcinoma. Therefore if neoplastic lesions were suspected macroscopically, even at less than 5 mm, they should be excised completely by hot forcep polypectomy or EMR method. According to the morphology of lesions, there was a 4.2% incidence of malignancy in pedunculated lesions, 0.57% in sessile lesions,

30.21% in LST, and 50% in depressed lesions. This result resembles the previous report by Dr. Kudo that depressed colorectal lesions display a significantly higher rate of malignancy.

There were 31 (14.09%) malignant cases which received further operation following endoscopic treatment, 24 of which were submucosal invasion, and seven were unclear resection line. Of these cases, 13 identified no residual tumors from the surgical specimens. Four cases (16.67%) with cancer of submucosal invasion, revealed lymph node metastases in surgical specimens. This implies that, if the submucosal tissues were involved with carcinoma, a further operation is needed. In all malignant cases treated endoscopically or surgically, no recurrent tumors were discovered after 14-56 mo. Cristie published a study establishing five criteria for determining colonoscopic cure by polypectomy: (1) the stalk was uninvolved with carcinoma; (2) no lymphatic or vascular invasion was apparent; (3) the adenomas included a well-differentiated or moderately-differentiated malignancy; (4) early follow-up colonoscopic examination (3 mo) showed no recurrence of cancer at the polypectomy site; and (5) the carcinoma was restricted to the head of the adenoma. The authors contend that all mucosal cancers could be cured endoscopically.

In conclusion, to lower the incidence and mortality of colorectal cancer, colonoscopic treatment is a simple and secure technique of removing colorectal neoplastic lesions. Complete resection of neoplastic lesions is essential, particularly for LST and depressed lesions. Snare polypectomy for protruded lesions, hot forcep polypectomy or EMR for sessile lesions, and EMR for LST and depressed lesions could resect the lesions completely. Detailed histological examinations are essential for deciding surgery indication. If unclear resected margins or submucosal invasions are discovered, further operation is indicated. Early follow-up (1-3 mo) colonoscopy after mucosal cancer resection is essential for deciding colonoscopic cure.

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