Treating Colorectal Polypoid Neoplasms during a Colonoscopy

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Background: To evaluate the efficacy and outcomes of endoscopic treatment for colorectal polypoid neoplastic lesions.

Methods: From September 1999 to May 2003, 11,447 consecutive colonoscopic examinations were performed in 9864 patients, totaling 5355 endoscopic polypectomies for colorectal polypoid neoplasms. According to the macroscopic characteristics, the neoplasms were classified into protruded (n = 3953) and sessile (n = 1402) ones. A snare polypectomy was conducted on 3987 lesions and hot biopsy forceps removal on 1368 lesions.

Results: Histological diagnoses included 4456 neoplastic lesions (4282 adenomas and 174 adenocarcinomas) and 899 non-neoplastic lesions (889 hyperplastic and 10 inflamed polyps). For the adenocarcinoma group, 24 instances involved submucosal invasion or an unclear resection margin, and these patients received a further operation, while 11 surgical specimens disclosed no residual tumors. Three (0.05%) perforations and 96 (1.8%) instances of bleeding were found following endoscopic polypectomy. No procedure-related mortality was found, and no recurrent malignancy was found after 14~56 months of follow-up.

Conclusions: To lower the incidence of and mortality from colorectal cancer, endoscopic polypectomy for colorectal polypoid neoplasms is an effective and safe procedure.

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Key words: colonoscopy, snare, hot biopsy forceps.

For many physicians who treat patients with colonic diseases, a colonoscopy is considered of prime study interest. The advantages of a colonoscopy are its capacity to visualize lesions in situ and also to biopsy and 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 those with a macroscopic morphology. Macroscopically, colorectal neoplasms can be categorized into polypoid and nonpolypoid lesions. Polypoid lesions can also be divided into protruded and sessile lesions. Protruded lesions are protruding lesions with or without a stalk; sessile lesions are superficial, slightly raised lesions. The classification of polypoid lesions used herein are based on Kudo's classification in the textbook, Early colorectal cancer-detection of depressed types of colorectal carcinoma.[1] For lesions, the height is measured as "A" and the width is measured as "B". Lesions for which A > B are defined as protruded polyps and can be further divided into those with a stalk (pedunculated

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polyp) or without a stalk (subpedunculated polyp). Lesions for which $A \leq B \leq 2A$ are defined as sessile polyps. Lesions for which $B > 2A$ are defined as non-polypoid lesions and can be further divided into flat polyps (with a diameter of < 10 mm) or laterally spreading tumors (with a diameter exceeding 10 mm). Several variables, including the size, shape, and depth of invasion, have been investigated in attempts to optimize therapy.[2-5] While protruded lesions can easily be excised by snare polypectomy, other lesion types should be resected by hot biopsy forceps polypectomy.

Colorectal neoplasms can be histologically categorized into neoplastic (include adenomas and adenocarcinomas) and non-neoplastic lesions. Ethically, all neoplastic lesions should be completely resected to prevent colorectal malignancy. This study presents our experience with endoscopic polypectomies of different types of colorectal polypoid neoplasms.

METHODS

From September 1999 to May 2003, 11,447 consecutive colonoscopic examinations were performed in 9864 patients at the digestive therapeutic endoscopic center of Chang Gung Memorial Hospital (Taipei, Taiwan). There were 6138 male and 3726 female patients, with a mean age of 53 (range, 16~97) years. After the patients were prepared with ingestion of an electrolyte lavage solution (2000 ml of polyethylene glycol, PEG), a colonoscopic examination was performed with a CF200Z or CF240ZI electronic videoendoscope (Olympus, Tokyo, Japan). The colonoscope was inserted up to the cecum in all included patients. There were 331 incomplete colonoscopies, due to inadequate preparation (114), obstructive lesions (98), or an acute angle (119). The complete examination rate was around 97%. Lesions were gauged by putting opened standard biopsy forceps beside the lesions, and then the lesions were resected endoscopically if morphologically neoplastic lesions were suspected.

Macroscopic characteristics of the polypoid colorectal lesions were classified into protruded and sessile. The resection methods included snare polypectomy and hot biopsy forceps polypectomy. An electrocautery device was used to perform the polypectomy. The snare polypectomy consisted of ensnaring the lesions with a oval snare, and then the lesion was resected with a 15~20 W cutting current with an electrosurgical unit (UES-20, Olympus). The hot biopsy forceps polypectomy used forceps to grasp the lesion, which was then resected by 15~20 W of coagulating current with the same electrosurgical unit. Sessile lesions larger than 5 mm cannot be removed en bloc by hot biopsy forceps polypectomy, so an endoscopic mucosal resection method was performed, and those lesions were excluded from this study. Some sessile lesions, before endoscopic removal, were coated with 0.2% indigo carmine dye spray with magnifying endoscopic observation to differentiate if they were of neoplastic or non-neoplastic lesions. Some larger lesions exceeding 1 cm or with a protruding vessel found in the resected stalk had the potential for a higher post-polypectomy bleeding rate. So, a detachable snare or a hemoclip was applied to the wound to prevent wound bleeding.

Endoscopically resected 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 with complete resection, a follow-up colonoscopy was performed 1 month later, or a further operation was arranged for submucosal invasive lesions and lesions with an unclear resection margin for the adenomatous group; otherwise patients were followed-up 1 year later.

RESULTS

Cumulatively 5355 endoscopic polypectomies were conducted for colorectal polypoid neoplasms in this period. By use of macroscopic features, we classified these neoplasms into protruded (n = 3953) (Fig. 1) and sessile (n = 1402) ones (Fig. 2). Snare polypectomy was performed on 3987 lesions, and hot biopsy forceps removal was used on 1368 lesions. The position of the colorectal neoplasms was mostly in the left side of the colon and rectum (Table 1). The mean sizes of lesions were 19.3 mm for protruded (4~60 mm) and 4.6 mm for sessile (3~5 mm) ones.

All protruded lesions were excised by snare polypectomy, which pathologically showed 3473 (87.86%) neoplastic and 480 non-neoplastic lesions. For neoplastic lesions, there were 3307 adenomas

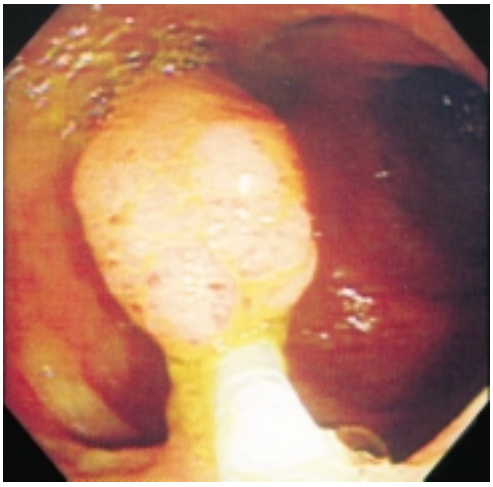

Fig. 1 Protruded polyp with a stalk.

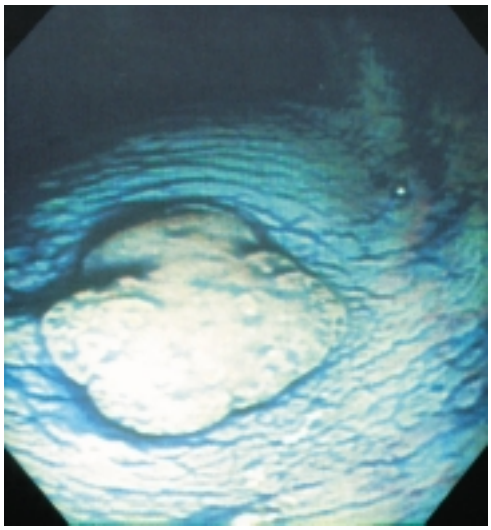

Fig. 2 Sessile lesion.

Table 1. Characteristics of 5355 Resected Colorectal Polypoid Lesions

Morphology	Size (mm)	Location					Total
		R	S	D	T	A and C	
Protruded	≤ 5	161	135	209	63	161	729
	6~10	1105	717	478	72	254	2626
	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	1402
Total		1757	1498	1145	324	631	5355

Abbreviations: R: rectum; S: sigmoid colon; D: descending colon; T: transverse colon; A: ascending colon; C: cecum.

(842 of which had moderate to severe dysplasia), 148 mucosal cancers, and 18 adenocarcinomas with submucosal involvement (Table 2). Twenty patients with malignant lesions in this group underwent a further operation due to an unclear resection margin or submucosal involvement, and 8 of them showed no residual tumors from surgical specimens. Lymph node metastases were observed in 2 cases with submucosal cancers in this group. In protruded lesions, with or without a stalk, the treatment modality by snare polypectomy was the same in both groups. The outcomes were the same as those for benign lesions, i.e., malignant lesions and non-pedunculated lesions had higher incidences of submucosal invasion than pedunculated lesions.

Hot biopsy forceps polypectomy was used on 1368 sessile lesions, while 34 lesions were excised by snare polypectomy. Pathologic findings revealed 983 (70.11%) neoplastic and 419 non-neoplastic lesions. Neoplastic lesions included 743 adenomas (232 of which had moderate to severe dysplasia), 6 mucosal cancers, and 2 adenocarcinomas with submucosal involvement. The 2 submucosal cancerous lesions and the other 2 cancerous lesions with unclear resection margins received a further operation, and 3 cases without a residual tumor were noted according to the surgical specimens.

Table 2. Histological Findings of 5355 Resected Lesions

Morphology	Size (mm)	Adenoma Dysplasia		Adenocarcinoma		Non-neoplastic	Total
		(-)	(+)	M (%)	SM (%)		
Protruded	≤ 5	293	19	1 (0.13%)	0	416	729
	6~10	2053	505	7 (0.27%)	0	61	2626
	11~20	118	312	99 (18.57%)	1 (0.18%)	3	533
	21~30	1	5	39 (78%)	5 (10%)	0	50
	> 30	0	1	2 (13.33%)	12 (80%)	0	15
Sessile	≤ 5	743	232	6 (0.43%)	2 (0.14%)	419	1402
Total		3208	1074 (2.88%)	154 (0.37%)	20 (889 HP, 10 IP)	899	5355

Abbreviations: M: mucosal cancer; SM: cancer with submucosal involvement; Dysplasia (+): with moderate to severe dysplasia; HP: hyperplastic polyp; IP: inflammatory polyp.

In total, 24 cases involving submucosal invasion or unclear resection margins received a further operation, among which 20 cases were well-differentiated adenocarcinomas, 2 cases were moderately differentiated adenocarcinomas, and 2 cases were moderately differentiated adenocarcinomas with lymph node metastasis.

Among all endoscopic treatments, only 2 colonic perforations occurred after snare polypectomy and 1 with the hot biopsy forceps polypectomy; all 3 patients received surgical procedures without mortality. Post-treatment bleeding was identified in 89 patients following snare polypectomy and 7 after hot biopsy forceps polypectomy; while endoscopic hemostasis was achieved by heat probe coagulation or hemoclips. For malignant lesions, no recurrent tumors occurred within 14~56 months following the endoscopic resection.

DISCUSSION

Polyps are significant because of their well-recognized relationship to colorectal cancer.[5] Researchers generally recognize that colorectal cancer extends from benign adenomas, i.e., the "adenoma-adenocarcinoma sequence",[6] and thus that excising adenomatous polyps lowers the risk of colorectal cancer.[7] Histologically, polyps are categorized into neoplastic and non-neoplastic polyps. Non-neoplastic polyps encompass hyperplastic polyps, hamartomas, lymphoid aggregates, and inflammatory polyps, none of which is potentially malignant.

Colonoscopic polypectomy, including hot biopsy forceps polypectomy and snare polypectomy,[8,9] carries risks of bleeding and perforation. Beside these risks, a colonoscopic polypectomy is also expensive. However, this expensive and risky method has commonly been employed, because colorectal polyps are frequently discovered during screening colonoscopy.[10] Ideally, the criteria for a colonoscopic polypectomy should be restricted to an adenomatous polyp with the potential to transform into an invasive colorectal carcinoma. To avoid needless polypectomies following screening colonoscopy, distinguishing neoplastic from non-neoplastic polyps may help lower this risk and thus the attendant costs. No morphological criteria have thus far been provided for conventional colonoscopic examinations.[11-14] Although a small polyp of less than 5 mm is histologically hyperplastic in 80%~90% of cases,[15,16] recent data have implied that up to 40%~60% of diminutive colorectal polyps can be neoplastic.[17,18] Furthermore, small, sessile adenomas have been shown to carry an elevated risk of dysplasia.[19,20] In this study, the predictive value of a macroscopic diagnosis for neoplastic polyps was 83.21%. However, a previous study using magnifying colonoscopy with the 0.1% indigo carmine dye spreading method had a diagnostic accuracy exceeding 90%.[21] Applying magnifying colonoscopy and chromoendoscopy to all colonic polyps would raise the 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%.[22,23] In this study, the perforation rate was 0.05% and bleeding rate was 1.8% with no mortality. The perforation rate is connected to the coagulation current energy and can be diminished by using the cutting current. However, using the pure cutting current increases the bleeding rate, although it is easily controlled by the hemoclip method. It is also considered a simple and safe procedure.

The colon lesions were mainly located in the rectum (32.81%) and sigmoid colon (27.97%), a result comparable with previous reports. As widely recognized, most colorectal carcinomas develop via malignant transformation in benign adenomatous polyps.[24] Large studies of colonoscopic polypectomies indicate that at least 2 factors are connected with malignant degeneration of polyps: size and tissue type. Carcinomas are histologically detected in 0.1% of polyps measuring < 5 mm in diameter. This increases to 1.0% in cases with a 10-mm diameter polyp and may reach 40% in cases with polyps exceeding 20 mm.[25] Colonoscopic polypectomy, which includes snare polypectomy and hot biopsy forceps polypectomy, 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 of < 5 mm had a 0.42% incidence of malignancy; lesions between 6 and 10 mm had a malignancy rate of 0.27%; for lesions between 11 and 20 mm, it was 18.76%; for lesions between 21 and 30 mm, it was 88%; and for those larger than 30 mm, there was a 93.33% incidence of carcinoma.

The overall incidence of malignancy (3.25%) was higher than those of previous reports, which may have been related to the fact that because Chang-Gung Memorial Hospital is a referral center, some patients with larger colonic lesions found by local hospitals or clinics are transferred there. Colorectal lesions larger than 10 mm should be completely resected and subjected to carefully pathologic review due to the increased malignancy incidence. Protruded lesions can be resected by snare polypectomy, while sessile lesions are difficult to snare. Sessile lesions of < 5 mm can be grasped by hot biopsy forceps and resected by hot biopsy forceps polypectomy; while sessile lesions larger than 5 mm should be resected by other methods such as endoscopic mucosal resection. Although previous studies showed a low level of malignant transformation in small adenomas, this investigation indicated that they also had a 0.42% incidence of carcinoma. Therefore if neoplastic lesions are suspected macroscopically, even those smaller than 5 mm, they should be completely excised by either a snare, hot biopsy forceps, or endoscopic mucosal resection method. According to the morphology of the lesions, there was a 4.2% incidence of malignancy in protruded lesions and 0.57% incidence in sessile lesions.

There were 24 (13.79%) malignant cases which received a further operation following the endoscopic polypectomy, 20 of which were submucosal invasion, and 4 had an unclear resection line. Of these cases, no residual tumors were identified from 11 of the surgical specimens. Two cases (10%) with cancer of submucosal invasion revealed lymph node metastases in the surgical specimens. The 2 cases were moderately differentiated adenocarcinomas, and both were larger than 3 cm. Macroscopically, they showed no stalk, and the post-polypectomy resection margin involved lymphatic tissue. These findings might help predict lymph node metastasis. According to previous studies, submucosal invasion will have up to a 10%~20% lymph node metastasis rate, implying that if submucosal tissues are involved with a carcinoma, a further operation is needed. In all malignant cases treated endoscopically or surgically, no recurrent tumors were discovered after 14~56 months of follow-up. Christie[26] published a study establishing 5 criteria for determining a colonoscopic cure by a polypectomy: (1) the stalk is not involved with the carcinoma; (2) no lymphatic or vascular invasion is apparent; (3) the adenomas include a well-differentiated or moderately differentiated malignancy; (4) early follow-up colonoscopic examination (at 3 months) shows no recurrence of the cancer at the polypectomy site; and (5) the carcinoma is restricted to the head of the adenoma. The authors contended that all mucosal cancers could be cured endoscopically.

In conclusion, to lower the incidence of and mortality from colorectal cancer, colonoscopic polypectomy is a simple and secure technique of removing colorectal polypoid neoplastic lesions. Complete resection of neoplastic lesions is essential, particularly for lesions exceeding 10 mm. Snare polypectomy for protruded lesions and hot biopsy forceps polypectomy for sessile lesions of < 5 mm can be used to completely resect the lesions. Detailed histological examinations are essential for determining the indications for surgery. If an unclear resected margin or submucosal invasion is discovered, a further operation is indicated. An early follow-up (1~3 months) colonoscopy after the mucosal cancer resection is essential for determining the colonoscopic cure.

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大腸鏡檢對大腸直腸息肉樣贅瘤的治療探討

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背 景： 對於大腸直腸息肉樣贅瘤，以內視鏡切除術治療的成效與預後，於本報告中提出。

方 法： 自民國 88 年 9 月至 92 年 5 月，共 11447 人次於林口長庚醫院內視鏡治療中心接受大腸鏡檢，對於息肉樣贅瘤，共施行 5355 例內視鏡息肉切除術。其中 3953 例爲突出型息肉，1402 例爲廣基型息肉。3987 例以圈刀 (snare) 切除，而 1368 例以熱切片鉗 (hot biopsy forceps) 切除。

結 果： 病理組織檢驗顯示 4456 例贅瘤性病灶（4282 例腺瘤及 174 例腺癌），899 例非贅瘤性病灶（889 例增生性息肉，10 例發炎性息肉）。在腺癌這組病人中，24 例因侵犯到黏膜下層或內視鏡切除術的切除邊緣不淨，轉而接受外科手術治療，其中 11 例並未發現有殘留癌細胞。於所有內視鏡切除術，共發生 3 例 (0.05%) 腸道破裂及 96 例 (1.8%) 出血的併發症。但並未發生內視鏡切除術相關的病患死亡。在腺癌這組病人中，於爲期 14 到 56 個月的追蹤內，並未有復發的情形。

結 論： 爲降低大直腸癌的發生率和所帶來的致死率，以內視鏡切除術來切除大直腸息肉樣贅瘤，爲一有效且安全的方法。

(長庚醫誌 2005;28:801-7)

關鍵字： 大腸鏡，圈刀，熱切片鉗。

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