

Endoscopic Mucosal Resection for Colorectal Neoplastic Lesions

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PURPOSE: Endoscopic mucosal resection, which is a new option for endoscopic polypectomy of colorectal polyps without stalks, was evaluated on its usefulness in polypectomy. **METHODS:** Three hundred thirty-seven lesions, which were removed by endoscopic mucosal resection between January 1990 and January 1993, were studied. The endoscopic configuration of neoplastic lesions were classified into four types: flat, sessile, large sessile with distinct lobulations, and semipedunculated. **RESULTS:** The 337 lesions included 243 adenomas, 30 mucosal cancers, 13 submucosal cancers, 3 carcinoids, 43 hyperplastic polyps, and 5 inflammatory polyps. Of the 286 neoplastic lesions, excluding 3 carcinoids, 137 were flat, 81 were sessile, 18 were large sessile, and 50 were semipedunculated. The 137 flat lesions consisted of 125 adenomas, 10 mucosal cancers, and 2 submucosal cancers. The rate of complete removal was related to their size and configuration and was 87 percent in flat neoplastic lesions. Lesion diameters of greater than 20 mm and the large sessile-type configurations were factors that were associated with incomplete removal. Two (0.7 percent) cases were complicated by perforations, and one (0.4 percent) case was complicated by bleeding. **CONCLUSION:** Endoscopic mucosal resection is an useful option for complete removal of colorectal nonpolypoid adenomas and cancers. [Key words: Endoscopic mucosal resection; Endoscopic polypectomy; Flat adenoma; Flat cancer]

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Development of high-quality video colonoscopes and improved bowel preparation using whole-gut irrigation¹ have made it possible to identify small and/or nonpolypoid neoplastic lesions that may have been overlooked in the past. Since Muto *et al.*² first reported flat adenoma and its clinical importance, the number of reports of such lesions³⁻⁸ has steadily increased. Colonoscopic polypectomy has been accepted as an established procedure for removing adenomatous polyps and early invasive cancers for the purpose of reducing the incidence of colorectal cancer. Undoubtedly, the procedure is useful in the resection of polypoid growths. However, complete removal of recently recognized nonpolypoid neoplastic lesions by conventional snare polypectomy is dif-

icult because of their flat nature. In this study, we introduce endoscopic mucosal resection (EMR) for the removal of flat or nonpolypoid lesions and evaluate its usefulness in colonoscopic polypectomy.

MATERIALS AND METHODS

Between January 1990 and January 1993, 5,123 colonoscopies were performed at the National Cancer Center Hospital, including 337 EMRs, 523 polypectomies, and 672 hot biopsies. The 337 lesions resected by EMR in 282 patients were studied with regard to the colonoscopic configuration, size, histologic grade, and completeness of resection. Concerning colonoscopic configuration, the neoplastic lesions were classified into four types: flat, sessile, large sessile with distinct lobulations, and semipedunculated. The flat type was either not elevated or only slightly elevated above the normal mucosa, and its upper surface was flattened or depressed, rather than hemispheric (Fig. 1).

Endoscopic Mucosal Resection

The procedure of EMR is shown in Figure 2. After confirming the presence of the lesion using a dye spray with indigo carmine, 2 ml of saline with epinephrine (0.025 mg/ml) was injected into the submucosa adjacent to the lesion to produce a plaque. The plaque on which the lesion is located is then wired by a diathermic snare with fine needles and then diathermied by a combination of cutting and coagulation current. The specimen is retrieved with grasping forceps.

EMR was indicated primarily for flat or nonpolypoid lesions and sessile polyps. Semipedunculated polyps were also resected by EMR when they were suspected to contain mucosal or submucosal cancer.

Histopathologic Examination

Resected specimens pinned on a plate were fixed with 10 percent formalin and stained with hematoxylin and eosin for histopathologic examination. Le-

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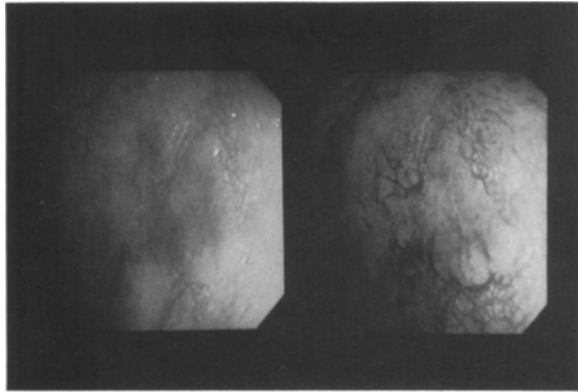


Figure 1. Left: on colonoscopy, a flat adenoma of the rectum appears as a faint reddish spot with irregular light reflex. Right: the same lesion being sprayed with indigo carmine had a distinct margin and was slightly elevated above the adjacent normal mucosa.

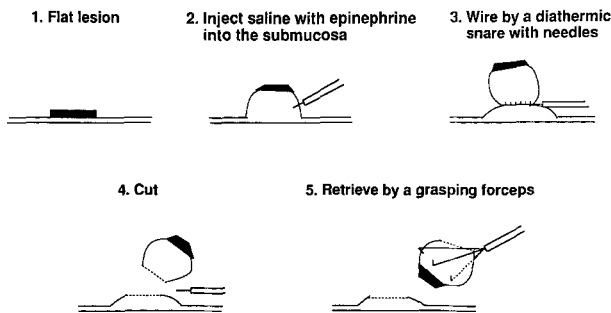


Figure 2. Procedure of endoscopic mucosal resection.

sions were considered to be completely resected when at least one nondysplastic crypt was present between dysplastic crypts and the resected margin at either lateral side and when dysplastic crypts were not exposed at the bottom (Fig. 3).

RESULTS

The 282 patients who underwent EMR consisted of 214 males and 68 females with a median age of 61.9 years. Of the 337 lesions resected by EMR, 7 were located in the cecum, 23 in the ascending colon, 78 in the transverse colon, 32 in the descending colon, 148 in the sigmoid colon, and 49 in the rectum. His-



Figure 3. Histopathology of a flat adenoma resected by endoscopic mucosal resection revealed complete resection and tubular adenoma with mild dysplasia.

topathologically, 289 lesions were neoplastic, including 243 adenomas, 30 mucosal cancers (carcinoma *in situ*), 13 submucosal cancers, and 3 carcinoids, 43 were hyperplastic, and 5 were inflammatory (Table 1). Of the neoplastic lesions, excluding the 3 carcinoids, 137 were flat, 81 were sessile, 18 were large sessile, and 50 were semipedunculated (Table 2). The malignancy rate (mucosal and submucosal cancer) was greatest in semipedunculated polyps (34 percent), followed by large sessile, sessile, and flat. One possible explanation for this finding is that 40 percent (20/50) of the semipedunculated polyps were greater than 10 mm in diameter, as compared with only 3.6 percent (8/137) of the flat type (Table 3). This finding may also be caused by selection bias, because semipedunculated polyps were resected by EMR when they were colonoscopically suspected to contain cancer cells.

Rate of complete removal was related to both size and colonoscopic configuration (Table 3). Lesion diameters of greater than 20 mm and the large sessile-type configurations were factors associated with incomplete removal. Eighty-seven percent of the flat type and 88 percent of the sessile type were completely removed.

Two (0.7 percent) cases were complicated by perforations and one (0.4 percent) case was complicated by bleeding. Perforations required emergency surgery for a colostomy, and bleeding was controlled by an endoscopic ethanol injection. There were no cardiovascular emergencies caused by epinephrine.

DISCUSSION

To prevent perforation by endoscopic polypectomy, Deyhle *et al.*⁹ tried to resect seven sessile colonic polyps by using a saline injection into the submucosa. In Japan, where gastric cancer is the most common cause of cancer death, the number of cases

Table 1.
Histopathologic Features of Colorectal Lesions Removed by Endoscopic Mucosal Resection

Histopathology	Number of Lesions
Adenoma	243
Cancer	
Mucosal	30
Submucosal	13
Carcinoid	3
Hyperplastic	43
Inflammatory	5
Total	337

Table 2.
Colonoscopic Configuration and Histologic Grade of Neoplastic Lesions Removed by Endoscopic Mucosal Resection

Colonoscopic Configuration	Histologic Grade			Total
	Adenoma	Mucosal Cancer	Submucosal Cancer	
Flat	125	10	2	137
Sessile	70	9	2	81
Large Sessile	15	2	1	18
Semipedunculated	33	9	8	50
Total	243	30	13	286

Table 3.
Rate of Complete Removal of Neoplastic Lesions

Colonoscopic Configuration	Size (mm)				Total
	~5	6-10	11-20	~21	
Flat	68/73 (93)*	46/56 (82)	5/8 (63)		119/137 (87)
Sessile	28/30 (93)	38/43 (88)	5/6 (83)	0/2 (0)	71/81 (88)
Large Sessile		5/6 (83)	3/8 (38)	1/4 (25)	9/18 (50)
Semipedunculated	3/4 (75)	26/26 (100)	16/18 (89)	2/2 (100)	47/50 (94)
Total	99/107 (93)	115/131 (88)	29/40 (73)	3/8 (38)	246/286 (86)

* Number in parentheses is the percent completely removed.

of early gastric cancer has been increasing as screening systems and diagnostic technologies have improved.^{10,11} In 1984, Tada *et al.*¹² introduced EMR as a treatment for early gastric cancers. EMR is now in widespread use throughout Japan for the treatment of early gastric cancers, especially in patients with surgical risks such as cardiovascular diseases and renal failure.

Since 1985, when Muto *et al.*² reported flat adenoma and its features, the number of reported cases of nonpolypoid adenomas has steadily increased.³⁻⁸ This increased incidence may be partially the result of widespread use of high-quality video colonoscopes, improved bowel preparation by whole-gut irrigation,¹ and colonoscopist's increased awareness of the existence of flat adenoma. In this study, while trying to detect flat adenomas, nonpolypoid, superficially invasive cancers were recognized (Fig. 4). These neoplasms may have been described as *de novo* cancer on the basis of their histologic characteristics: *i.e.*, small size, nonpolypoid, and no adenomatous component. However, it is difficult to determine whether they are *de novo* cancers or whether they have arisen from pre-existing flat adenomas.

Based on the recognition that adenomas are precursors to most colorectal cancers, colonoscopic polypectomy has been performed for the purpose of decreasing the incidence of, and death from, colorec-

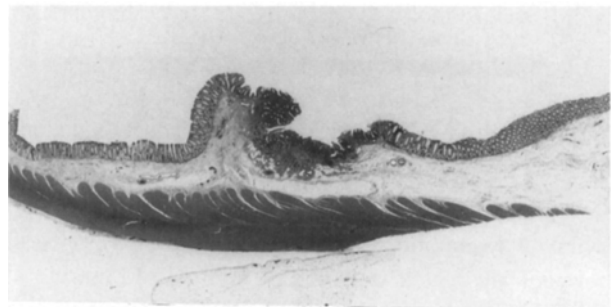


Figure 4. A surgically resected specimen showed non-polypoid cancer of the descending colon invading the submucosal layer.

tal cancers. Colorectal adenomas were previously considered to be strictly polypoid, *i.e.*, pedunculated, broad-based, or sessile. The recent recognition of flat adenoma may add a new pathway to the adenoma-carcinoma sequence in the development of colorectal cancers.¹³ Colonoscopic polypectomy for flat adenoma should be included in a colorectal cancer prevention program, because flat adenomas may have a high malignant potential.^{2,14-16}

EMR is useful for complete removal of nonpolypoid lesions. In the present study, flat lesions were completely removed by EMR at a rate of 87 percent. The figure may be lower than that which has been achieved if the flat lesions had been cut with conventional snare polypectomy. However, a lesion diameter

of greater than 20 mm and large sessile-type configurations were factors that were associated with incomplete removal. Although Karita *et al.*¹⁷ reported a high rate of complete resection with EMR, 59 of 71 lesions in their series were pedunculated or semipedunculated.

Walsh *et al.*¹⁸ reported that 17 percent of local recurrent tumors after piecemeal polypectomy were cancerous, even though polypectomized specimens had been diagnosed as benign adenomas. Their report may suggest the importance of complete removal of lesions, even in cases of benign adenomas.

Considering that EMR requires more electric energy and burns a larger area, complications may be more frequent in EMR than in conventional snare polypectomy. In the present study, two cases were complicated with perforation, and one case was complicated with bleeding. More experiences with this procedure may decrease the complication rate.

CONCLUSION

EMR is a useful procedure for removing colorectal flat adenomas and early cancers and may decrease the morbidity associated with advanced colorectal cancers.

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