

## Endoscopic Mucosal Resection Using a Pure Cut and Hemoclip Method for Colonic Nonpolypoid Neoplasms

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**Background:** Colonic mucosal neoplastic lesions can be classified morphologically into polypoid and nonpolypoid types. The nonpolypoid type has a greater malignancy potential than does the polypoid type. Removing these lesions and obtaining an integral specimen for histopathologic assessment during colonoscopy are very important. This study evaluates the safety and integrity of specimens obtained by endoscopic mucosal resection (EMR) using the pure cut current and hemoclip method.

**Methods:** Fourteen nonpolypoid colonic neoplasms, which were removed by EMR using the pure cut and hemoclip method between April 2001 and April 2002, were studied. There were 9 male and 4 female patients and the mean age was  $57.8 \pm 15.5$  (range, 32-80) years. EMR was conducted in cases where the lesions were diagnosed as neoplastic tumors by magnification colonoscopy and the indigo carmine dye spray method.

**Results:** The study revealed 11 flat type neoplasms and 3 laterally spreading tumors. The mean size of the lesions was  $10.7 \pm 5.6$  (range, 6-25) mm. All lesions were completely removed. Histopathologically, there were 1 adenocarcinoma and 13 adenomas (3 with mild dysplasia, 7 with moderate dysplasia, and 3 with severe dysplasia). The mean number of hemoclips used was  $2.14 \pm 0.66$  (range, 1-3) pieces. No bleeding or perforation was noted following EMR.

**Conclusion:** EMR using the pure cut and hemoclip method is a useful means of obtaining an integral specimen for accurate pathologic assessment. This method provides a safe and minimally invasive technique for managing colonic nonpolypoid lesions.

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**Key words:** endoscopic mucosal resection, cutting current, hemoclip, colonic polyp.

Colonic mucosal neoplastic lesions can be classified morphologically into polypoid and nonpolypoid types. The nonpolypoid lesions, including flat type polyps and laterally spreading tumors, have a higher malignancy potential than do polypoid lesions.<sup>(1)</sup> Flat type polyps are superficial, elevated

lesions with a diameter of no more than 10 mm. Meanwhile, laterally spreading tumors are large, flat lesions with a diameter in excess of 10 mm. Consequently, it is important to remove nonpolypoid lesions when they are detected during colonoscopy. Complete removal of nonpolypoid type lesions has

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been made possible by the development of the endoscopic mucosal resection (EMR) method by Deyhle et al.<sup>(2)</sup> Injection of fluid into the submucosa to elevate the nonpolypoid lesion facilitates its complete entrapment by a snare. The cushioning effect of the submucosal fluid can prevent thermal injury from penetrating the thin wall of the colon. Some endoscopists prefer to use blended or coagulation current to enhance the hemostatic effect and reduce complications such as bleeding.<sup>(3-6)</sup> On the other hand, others like to use a pure cut current to provide a clear resected margin to facilitate pathologic evaluation and reduce the risk of transmural burns and perforation, because this type of current can resect the lesion faster while causing less thermal injury to tissue.<sup>(7)</sup> Furthermore, hemoclips have been successfully applied to prevent bleeding and perforation in post-snare polypectomies.<sup>(8)</sup> This study aimed to assess the safety and tissue integrity by the pure cut and hemoclip method of EMR.

## METHODS

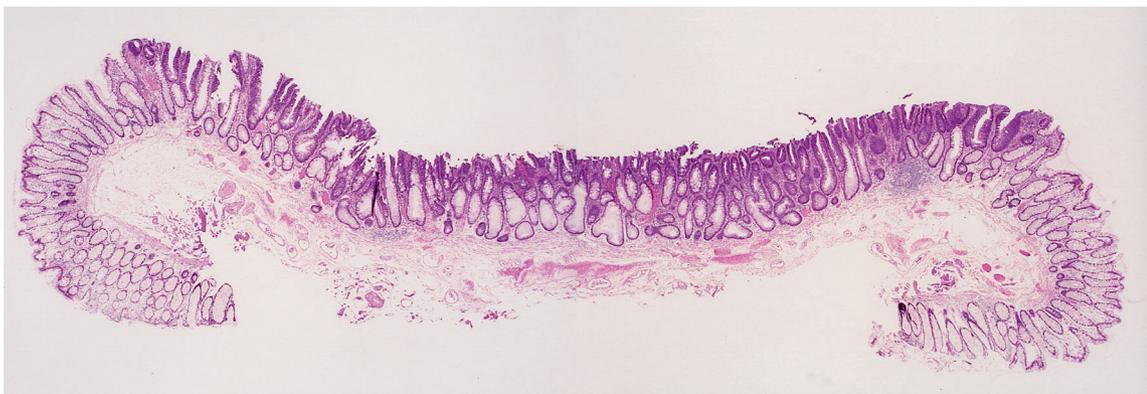
From April 2001 to April 2002, a retrospective review of EMR by pure cut with the hemoclip method for nonpolypoid colonic mucosal neoplasms was conducted at the Digestive Therapeutic Center of Chang Gung Memorial Hospital (Linkou, Taiwan). In total, 14 lesions in 13 consecutive patients (9 males, 4 females) were encountered during scheduled colonoscopy examinations. The mean age of the patients was  $57.8 \pm 15.5$  (range, 32-80) years. EMR was performed when nonpolypoid neo-

plastic lesions were diagnosed as neoplastic tumors by observing the pit pattern with magnification colonoscopy (CF-Q 240 ZI, Olympus, Tokyo, Japan) and using the 1% indigo carmine dye spraying method if the pit pattern belonged to types III to V according to Kudo's classification.<sup>(9)</sup>

First the lesion was elevated by injecting 5-10 ml normal saline into the submucosal layer. The endpoint of submucosal normal saline injection was bleb formation beneath the lesion and adjacent parts of the mucosa, and this endpoint determined the volume of saline injection. The lesion was then completely and firmly ensnared with a spiked snare. Finally, the lesion was resected en bloc using a 40-W pure cut current with an electrosurgical unit (UES-20, Olympus). The resected specimens were retrieved using a pentapod. Finally the wounds were clamped with hemoclips. All of the resected specimens were reviewed by a pathologist specialized in gastrointestinal pathology.

## RESULTS

There were 11 flat type polyps and 3 laterally spreading tumors based on gross morphology in this study. Of the 14 lesions removed by EMR, 3 were located in the ascending colon, 4 in the transverse colon, 2 in the descending colon, and 5 in the sigmoid colon. Notably, the mean size of the lesions was  $10.7 \pm 5.6$  (range, 6-25) mm. All lesions were entirely removed en bloc from the submucosal layer, with only mild thermal injury to the adjacent normal mucosa. Moreover, the cut surface of the wounds



**Fig. 1** Histopathology of a flat adenoma resected by endoscopic mucosal resection showing complete excision. The margins of the specimen were free of tumor. (H&E 20 $\times$ )

**Table 1.** The Patient Characteristics and the Results of EMR for Colonic Nonpolypoid Neoplasms

Case no.	Age	Gender	Morphology	Polyp size (mm)	Location of polyp	No. of hemoclips	Histology	Complications
1	77	M	Flat polyp	6	S	2	Adenoma with moderate dysplasia	nil
2	44	M	Flat polyp	8	A	2	Adenoma with moderate dysplasia	nil
3	80	F	Flat polyp	8	A	2	Adenoma with moderate dysplasia	nil
4	39	M	Flat polyp	8	S	2	Adenoma with mild dysplasia	nil
5	41	M	LST	12	T	3	Adenoma with mild dysplasia	nil
6	58	F	LST	25	A	3	Adenocarcinoma with massive submucosal invasion	nil
7	69	M	Flat polyp	10	S	2	Adenoma with severe dysplasia	nil
8	61	M	Flat polyps	8	T	2	Adenoma with mild dysplasia	nil
				6	S	2	Adenoma with moderate dysplasia	
9	61	M	Flat polyp	10	S	3	Adenoma with moderate dysplasia	nil
10	59	F	LST	20	T	3	Adenoma with moderate dysplasia	nil
11	32	M	Flat polyp	10	D	1	Adenoma with severe dysplasia	nil
12	69	F	Flat polyp	10	T	2	Adenoma with severe dysplasia	nil
13	64	M	Flat polyp	8	D	1	Adenoma with moderate dysplasia	nil
Mean	57.8			10.7		2.14		
SD	15.5			5.6		0.66		

**Abbreviations:** EMR: endoscopic mucosal resection; No: number; M: male; F: female; LST: laterally spreading tumor; S: sigmoid colon; A: ascending colon; T: transverse colon; D: descending colon; SD: standard deviation.

reached the muscular layer. The mean number of hemoclips used per wound was  $2.1 \pm 0.66$  (range, 1-3) pieces. The procedure took 5 to 15 min.

Pathological examination showed 1 well-differentiated adenocarcinoma with massive submucosal invasion (type IIc) and 13 adenomas (3 mildly dysplastic, 7 moderately dysplastic, and 3 severely dysplastic). The resection margins of these lesions were integral, and the depth of submucosal invasion could be accurately assessed by pathological examination (Fig. 1). No bleeding or perforation was observed following EMR. The patient with the massive submucosal invasive adenocarcinoma underwent a right hemicolectomy. No residual tumors were found among the surgical specimens. Table 1 listed the patient characteristics and the results of EMR.

## DISCUSSION

Colonic mucosal nonpolypoid neoplastic lesions can be morphologically classified into 2 types: flat (elevated and/or depressed) and large laterally spreading ones. These lesions are easily missed if the colonic mucosa is not carefully inspected during an endoscopic examination. The endoscopic clues associated with these lesions include color change, interruption of the capillary network, deformation of

the colonic wall, spots of spontaneous bleeding, lesion shape changes with air inflation and deflation, and interruption of the innominate grooves.<sup>(1)</sup> Application of magnification endoscopy with indigo carmine dye spraying and pit pattern analysis can demarcate these lesions and differentiate them from non-neoplastic lesions.<sup>(10)</sup> All neoplastic lesions should be removed due to their malignant potential.

EMR is accepted as a useful procedure for the diagnosis and treatment of nonpolypoid colonic neoplastic lesions which cannot be removed via a conventional snare polypectomy.<sup>(11)</sup> Early colon cancer is indicated for EMR treatment if the pathology of the resected specimen is well or moderately well differentiated, with no lymphatic or vascular involvement, with a resection margin free from cancer, and with no massive submucosal involvement.<sup>(1,12-15)</sup> Therefore, EMR is superior to other endoscopic ablation therapies because the resected specimen can be evaluated by histologic examination. In the presence of poor prognostic factors (e.g., poorly differentiated carcinoma, lymphatic or vascular invasion, cancer at the polypectomy margin, or massive submucosal invasion), surgical resection should be considered due to the high risk of metastases.<sup>(12-15)</sup>

To obtain an integral specimen with minimal thermal tissue injury for accurate histopathologic

assessment, a pure cut current was applied in this study. However, the hemostatic effect is considered to be insufficient when pure cutting is used.<sup>(16)</sup> Therefore a blended or coagulation current is applied for resection in EMR by some endoscopists. Although the bleeding rate did not differ statistically between the 2 groups of polypectomy patients using blended current or coagulation current, the blended current was associated with immediate bleeding, while the coagulation current was associated with delayed bleeding.<sup>(17)</sup> However, Parra-Blanco et al. found no increase in the incidence of post-polypectomy bleeding when performed with a pure cut compared with a blended or coagulation current.<sup>(18)</sup> Consequently, the pure cut current appears safe for EMR, and has the advantage of reducing thermal injury to tissue, thus decreasing the risk of transmural burns and perforation. This study found no perforation or transmural burns.

Bleeding is the most frequent complication of EMR. The bleeding rate of EMR ranges from 0.4% to 24% in different studies.<sup>(3,5,6,18-21)</sup> Factors associated with increased risk of bleeding include patient age, polyp size, location, number, and morphology, and the use of anticoagulants.<sup>(6,13)</sup> A significant relationship exists between lesion size and likelihood of bleeding. Ahmad et al. reported no bleeding in cases of lesions smaller than 1 cm in size, compared to 4% in cases of lesions of 1 to 1.9 cm, 24% in cases of lesion of 2 to 3 cm, and 32% in cases of lesions exceeding 3 cm.<sup>(6)</sup> Hemoclips have been effectively applied to prevent bleeding in snare polypectomies.<sup>(8)</sup> Moreover, some endoscopists also immediately apply hemoclips after a polypectomy when evidence exists of a high bleeding risk, such as in aged patients, patients with comorbid disease, and those with thick stalk polyps or large mucosal ulceration resulting from the polypectomy.<sup>(18)</sup> The clipping procedure is easy to perform.<sup>(8)</sup> Therefore, this study routinely employed hemoclips on post-EMR wounds to prevent bleeding. The hemoclip method was effective, since no bleeding developed in this study. The average number of hemoclips applied for each lesion was  $2.14 \pm 0.66$  pieces. Notably, the number of hemoclips used increased with lesion size. Additionally, the hemoclips also serve as useful markers for accurately localizing the lesion using abdominal X-ray when uncertainty exists regarding the anatomic site.<sup>(22)</sup>

In this study, all nonpolypoid colonic neoplasms were completely resected by the EMR method without complications, regardless of the lesion location. The margin of the specimen could be accurately assessed by histopathological examination based on specimen integrity. The procedure is simple and rapidly performed.

In conclusion, EMR using the pure cut and hemoclip method is useful for obtaining integral specimens from colonic nonpolypoid lesions, which is especially important for assessment of submucosal invasion in early colon cancer. The risks of post-EMR hemorrhage, transmural burns, and perforation may be reduced by applying this method. In summary, this method provides a safe and minimally invasive measure for managing colonic nonpolypoid neoplasms.

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## 應用純電切與止血夾內視鏡黏膜切除術於大腸非息肉型腫瘤

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**背景：**大腸黏膜腫瘤病灶型態上可分成息肉型與非息肉型。非息肉型比息肉型腫瘤有更高惡性機會。因此於大腸鏡檢時將此類病灶切除並取得完整檢體以供病理組織學檢查是重要的。本研究目的，在於評估應用純電切與止血夾內視鏡黏膜切除術於非息肉型腫瘤的安全性與保持檢體的完整性。

**方法：**2001年4月至2002年4月，共有14例大腸非息肉型腫瘤應用純電切與止血夾方法切除。其中有9位男性與4位女性，平均年齡 $57.8 \pm 15.5$ 歲。當非息肉型病灶以放大鏡式大腸鏡與靛洋紅染色法診斷為腫瘤時，則施以內視鏡黏膜切除術治療。

**結果：**本研究中有11例扁平型腫瘤與3例橫向蔓延型腫瘤。病灶大小平均 $10.7 \pm 5.6$ 公釐。病灶皆完全切除。病理組織學上有1例腺癌與13例腺瘤(3例合併有輕度化生不良，7例合併有中度化生不良，3例合併有重度化生不良)。平均每一病灶使用 $2.14 \pm 0.66$ 支止血夾(1至3支)。14例皆無術後出血或穿孔的併發產生。

**結論：**應用純電切與止血夾內視鏡黏膜切除術是一可得到完整檢體以供病理正確評估的好方法。對於大腸非息肉型腫瘤，此方法提供一安全且低侵襲性的治療方式。

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**關鍵字：**內視鏡黏膜切除術，純電切，止血夾，大腸息肉。

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