

ORIGINAL ARTICLE

조기위암의 복강경하 원위부 위절제술 시 절제면 표시를 위한 내시경 클리핑의 최적 시기

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Optimal Timing of Endoscopic Clipping for Determining the Resection Line for Laparoscopy-assisted Distal Gastrectomy

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Background/Aims: Pre-operative endoscopic clipping for determining the resection line in patients with early gastric cancer has been used safely, and its efficacy has been demonstrated. However, the optimal timing of endoscopic clipping for determining the resection line in early gastric cancer patients undergoing laparoscopy-assisted distal gastrectomy has not been investigated.

Methods: A retrospective analysis of 92 patients with early gastric cancer who underwent gastric resection after endoscopic clipping at Inje University Sanggye Paik Hospital (Seoul, Korea) was performed. We analyzed the clinical and endoscopic features of patients, number of clips, time from clipping to surgery, and number of patients showing detachment of clips from the gastric wall before surgery. Patients were categorized according to the following two groups: group A included patients whose clips were applied within one day before surgery and group B included patients whose clips were applied more than one day before surgery.

Results: Of the 92 patients, 56 were included in group A and 36 were included in group B. In 11 patients (12.0%, five in group A and six in group B, $p=0.329$), the clips were detached from the gastric wall before surgery. The mean time from clipping to surgery did not differ significantly between the detached and non-detached groups (11 patients, mean 4.6 ± 4.6 days vs. 81 patients, mean 3.0 ± 4.0 days, $p=0.227$).

Conclusions: The timing of endoscopic clipping for localization of tumors in early gastric cancer patients undergoing gastrectomy is not important for determining the resection line. (Korean J Gastroenterol 2014;64:76-80)

Key Words: Stomach cancer; Laparoscopic surgery; Endoscopic clip; Gastrectomy

INTRODUCTION

The expanded use of diagnostic endoscopy has led to an increase in the detection rate of early gastric cancer (EGC).¹ The therapeutic option for EGC is gastric resection with an adequate resection margin and perigastric lymph node

dissection.¹⁻³ However, EGC cannot be detected by inspection of the serosal surface in the operative field, and in general, it cannot be palpated manually because of its shallow invasion depth.^{1,2,4,5}

Endoscopic mucosal clipping was developed for hemostasis of gastrointestinal bleeding, but it is now widely used

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for other purposes; for example, as a marker for radiotherapy and for closing gastrointestinal perforations.^{2,6,7} Some studies have demonstrated the value of endoscopic clipping of the proximal region outside the lesion for selection of the appropriate surgical procedure and determining the resection line for tumors located in the middle corpus or more distal portions of the stomach.^{2,8,9} This technique is safe, cost-effective, and easily performed. In addition, the clips are not easily detached and remain firmly in place for several days.^{1,2} However, the optimal timing of pre-operative endoscopic clipping for determining the resection line has not been investigated. In the current study, we evaluated the optimal timing of endoscopic clipping for determining the resection line in patients with EGC undergoing laparoscopy-assisted distal gastrectomy (LADG).

MATERIALS AND METHODS

We performed a retrospective analysis of partial gastrectomies performed after endoscopic clipping for localization of EGC. A total of 92 patients with EGC who had undergone gastric resection after endoscopic clipping between January 2010 and December 2012 at Inje University Sanggye Paik Hospital (Seoul, Korea) were enrolled in the study. Pre-operative endoscopic clipping was performed to determine the proximal resection line by identifying the exact site of the tumor in patients undergoing LADG. All data were reviewed retrospectively. The clinical and endoscopic features of all patients, number of clips, time from clipping to surgery, and number of patients whose clips were detached from the gastric wall before surgery were analyzed. Detachment of clips

was detected macroscopically from intra-operative and pathologic pictures of specimens. Patients were categorized according to the following two groups: group A included patients whose clips were applied within one day before surgery and group B included those whose clips were applied more than one day before surgery.

1. Endoscopic clipping

Before the operation (mean, 3.1 days; range, 0-18 days), several endoscopic clips (HX-600-090L; Olympus, Tokyo, Japan) were placed at proximal sites outside the lesion to determine the resection line through a flexible endoscope using a rotator clip-fixing device (HX-5QR-L; Olympus). The procedure was performed separately by three endoscopists with extensive experience (> 700 gastroscopies per year for a period of more than 10 years). The clips were 8 mm in length and 2 mm in diameter. After application of the clips, patients were evaluated by plain radiography of the chest and abdomen before surgery to obtain general information on the location of the lesion and attachment of the clips to the gastric wall (Fig. 1).

2. Statistical analysis

The chi-square and Fischer's exact tests were used for comparison of categorical data. All continuous data values were expressed as mean±SD. Differences in the mean values were examined by Student's t-test. The significance level was set at a p-value of less than 0.05. All statistical calculations were performed using SAS ver. 8.1 (SAS Institute, Cary, NC, USA).

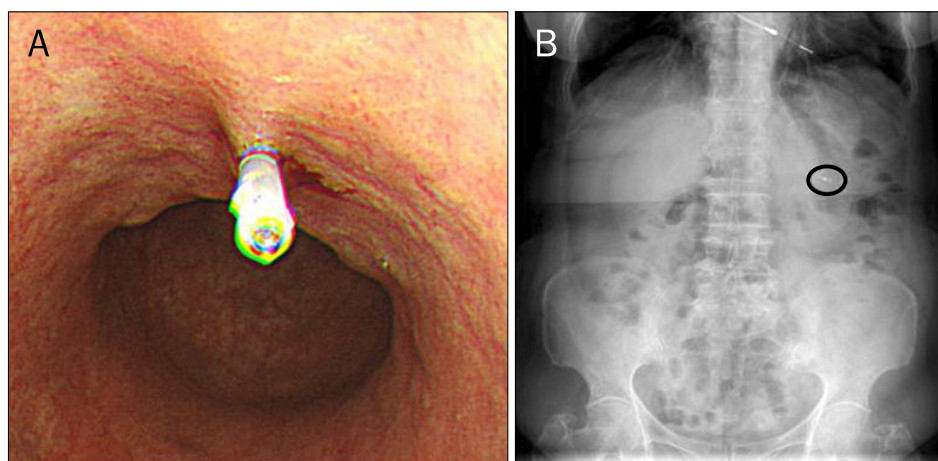


Fig. 1. Pre-operative endoscopic clipping for early gastric cancer (HX-600-090L[®]; Olympus). Pre-operative application of a clip at the proximal side of the lesion (A) and plain abdominal x-rays obtained after clipping in the upright position (circle; B).

RESULTS

The clinical and endoscopic characteristics of all patients are summarized in Table 1. All of the applied endoscopic clips were easily detected by intra-operative or pathologic pictures of specimens (Fig. 2). Proximal surgical margin identified by pathologic finding was free from carcinoma in all patients. Of the 92 patients, 56 were included in group A and 36 in group B. A total of 287 clips were used, with 2-4 clips per patient (mean, 3.1 clips/patient; range, 1-5 clips/patient). Detachment of clips from the gastric wall before surgery was observed in 11 patients (12.0%, five in group A, six in group B). Age, tumor location, number of clips applied, and number of patients showing detachment of clips from the gastric wall before surgery did not differ significantly between the two groups ($p > 0.05$).

The clinical and endoscopic features of the 11 patients showing detachment of clips applied before surgery for determining the resection line are shown in Table 2. One clip was lost in nine patients and two clips were lost in two

patients. The mean time from clipping to surgery did not differ significantly between the detached and non-detached groups (mean, 4.6 ± 4.6 days [$n=11$] vs. mean, 3.0 ± 4.0 days [$n=81$]; $p=0.227$).



Fig. 2. Resected specimen of early gastric cancer marked with a preoperative endoscopic clip (arrow).

Table 1. Clinical and Endoscopic Features of the 92 Patients Who Underwent Endoscopic Clipping for Early Gastric Cancer

	Group A (≤ 1 day, $n=56$)	Group B (> 1 day, $n=36$)	p-value ^a
Age (yr)	61.8 ± 10.4	61.3 ± 10.7	0.819
Sex (male : female)	43 (76.8) : 13 (23.2)	19 (52.8) : 17 (47.2)	0.017
Location			0.256
Antrum	31 (55.4)	13 (36.1)	
Angle	11 (19.6)	8 (22.2)	
Lower body	11 (19.6)	13 (36.1)	
Middle body	3 (5.4)	2 (5.6)	
Number of clips	3.1 ± 0.8	3.1 ± 1.0	0.941
Loss of clips (patient, n)	5 (8.9)	6 (16.7)	0.329

Values are presented as mean \pm SD or n (%).

^a $p < 0.05$.

Table 2. Clinical and Endoscopic Features of 11 Patients Who Showed Detachment of Clips Applied for Determining the Resection Line before Surgery

	Detached ($n=11$, 12.0%)	Non-detached ($n=81$, 88.0%)	p-value ^a
Age (yr)	65.4 ± 9.0	61.1 ± 10.6	0.202
Sex (male : female)	8 (72.7) : 3 (27.3)	54 (66.7) : 27 (33.3)	0.687
Location			0.187
Antrum	8 (72.7)	36 (44.4)	
Angle	0 (0)	19 (23.5)	
Lower body	2 (18.2)	22 (27.2)	
Middle body	1 (9.1)	4 (4.9)	
Number of clips	3.1 ± 0.8	3.0 ± 1.1	0.632
Time-to-surgery (day)	4.6 ± 4.6	3.0 ± 4.0	0.227

Values are presented as mean \pm SD or n (%).

^a $p < 0.05$.

DISCUSSION

Many studies have reported an association of EGC with a favorable prognosis; therefore, improving the quality of life of patients with EGC remains the primary therapeutic objective.^{1,4,10} LADG has many advantages over open distal gastrectomy, including less pain, smaller wounds, fewer respiratory complications, a shorter hospital stay, better quality of life postoperatively, and an earlier return to normal activity.^{10,11} The success of LADG depends on precise determination of the tumor site.^{1,5,12} Because accurate localization of the tumor is sometimes difficult, use of specific techniques is necessary in order to define an adequate gastric resection range, especially in patients undergoing laparoscopy-assisted gastrectomy.^{1,2} Several studies have shown that endoscopic clipping is a safe and reliable procedure for determining the resection line in tumors located in the stomach, and this technique has been widely used for this purpose.^{1,2} However, the optimal timing of pre-operative endoscopic clipping for determining the resection line has not been investigated, and, in our institution, clipping has been routinely performed one day before surgery without definitive reference.

In the current study, the number of patients showing detachment of clips from the gastric wall before surgery did not differ significantly between groups A and B (five patients vs. six patients, $p=0.329$). In addition, the mean time from clipping to surgery did not differ significantly between the detached and non-detached groups. Similarly, no significant differences in tumor location ($p=0.187$) and number of clips ($p=0.632$) were observed between the detached and non-detached groups. These results suggest that the timing of the clipping procedure was not important for localizing tumors in EGC patients.

None of the patients included in the study lost more than three clips, with nine patients losing one clip and two patients losing two clips. Based on this result, more than three clips should be applied for localization of lesions, although large-scale prospective randomized controlled studies are needed in order to prove this result. The exact period of exposure to clips tolerated by patients cannot be determined from our results. However, clips remained in place for > 7 days in 16 cases, and the longest duration was 18 days in two cases. Further studies will be needed before an optimal or tolerable duration can be suggested.

The main limitations of our study are inherent to its retrospective study design. All data were collected retrospectively, and data were not adjusted for age and sex. In addition, the distances between the specimen, tumor margin, and depth of clipping were not determined after the gastrectomy. Therefore, adequate placement of endoscopic clips could not be assessed. In addition, because specimens could not be obtained at the beginning of our study, clip detachment was assessed by plain radiography instead of analysis of specimens after gastrectomy. Therefore, the possible overlapping of clips might have been missed in radiographic images, and this could have affected our results. Despite these limitations, the current study is important, as it is the first study to evaluate the optimal timing of endoscopic clipping for determining the resection line for LADG in patients with EGC.

In conclusion, the results of the current study showed that the timing of clipping for localization of tumors in EGC patients undergoing gastrectomy is not important. Conduct of further large-scale prospective randomized controlled studies will be needed in order to confirm these findings.

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