Digestive and Liver Disease 46 (2014) 187–190

Contents lists available at ScienceDirect

Digestive and Liver Disease

journal homepage: www.elsevier.com/locate/dld

Short Report

Prediction of submucosal gastric cancer by narrow-band imaging magnifying endoscopy

Kazuyoshi Yagi [a,*], Akiko Saka [a], Yujiro Nozawa [a], Atsuo Nakamura [a], Hajime Umezu [b]

[a] Department of Gastroenterology, Niigata Prefectural Yoshida Hospital, Niigata, Japan
[b] Division of Pathology, Niigata University Medical and Dental Hospital, Niigata, Japan

ARTICLE INFO

Article history:
Received 7 May 2013
Accepted 4 September 2013
Available online 21 October 2013

Keywords:
Gastric cancer
Magnifying endoscopy
Narrow band imaging
Submucosal invasion

ABSTRACT

Background: The features of gastric submucosal cancer revealed by magnifying endoscopy have not been reported. Aim of our study was to investigate whether magnifying endoscopy could contribute to the diagnosis of submucosal invasion.
Patients and methods: In this prospective, cross-sectional study, 197 lesions of gastric differentiated adenocarcinoma, diagnosed as mucosal cancer by conventional endoscopy, were observed by magnifying endoscopy with narrow-band imaging, paying attention to the presence of a blurry mucosal pattern and an irregular mesh pattern. After endoscopic submucosal dissection, all lesions were examined histologically and the areas of two features were estimated.
Results: Among the lesions examined, 177 were diagnosed histologically as mucosal cancer and 20 as submucosal cancer. Multivariate logistic regression analysis confirmed that a blurry mucosal pattern (odds ratio 12.15, 95% confidence interval 3.45–42.76, $p = 0.000$) and an irregular mesh pattern (22.55, 4.22–120.45, $p = 0.000$) were independent predictors of submucosal invasion.
Conclusions: Narrow band imaging magnifying endoscopic features are useful for predicting submucosal invasion in gastric cancer.

1. Introduction

With the widespread adoption of endoscopic submucosal dissection (ESD), many patients with early gastric cancer (GC) can now be cured using this approach in Japan [1,2]. The use of ESD is indicated for mucosal differentiated adenocarcinoma without ulceration, mucosal differentiated adenocarcinoma <3 cm in diameter with ulceration, and differentiated adenocarcinoma with submucosal invasion depth of <500 μm without ulceration [3,4]. Any GC other than the above is thought to have a risk of lymph node metastasis and must be treated by surgery. The endoscopic diagnosis of GC, including its extent, has developed since the introduction of narrow-band imaging magnifying endoscopy (NBI-ME) [5–9]. However, the depth of GC is still diagnosed by conventional endoscopy, which has only limited accuracy. We investigated whether the features revealed by NBI-ME would be sufficiently accurate for predicting whether GC would have submucosal invasion.

2. Methods

This was a prospective, cross-sectional study performed at Niigata Prefectural Yoshida Hospital. The candidate lesions were 207 differentiated early GCs in 199 patients for which ESD treatment was planned between 2010 and 2013. All of the lesions had been diagnosed as differentiated adenocarcinoma on the basis of biopsy and as mucosal GC by conventional endoscopy. The lesions were diagnosed as mucosal cancers if the following criteria for submucosal cancer employed at our hospital were not met: extremely uneven on depression, nodularity at the verge, obvious hardening of the wall and unusual elevated non-cancerous mucosa on the verge.

The study protocol was approved by the ethics committee of our institution. Written informed consent for participation was obtained from all patients.

The instruments used were a magnifying videoendoscope (GIF-H260Z; Olympus Medical Systems, Tokyo, Japan) and an electronic endoscopic system (EVIS LUCERA Spectrum; Olympus Medical Systems). Two patterns demonstrated by NBI-ME were chosen as indicative of suspected submucosal invasion: a blurry mucosal pattern (BMP) (Fig. 1, Panel A), excluding a mesh pattern (Fig. 1, Panel B) [9], and an irregular mesh pattern (IMP, Fig. 1, Panel C) [9]. In BMP cases (Fig. 1, Panel A), no mucosal patterns, for example a tubular or a villus-forming pattern [9], were evident. However, one exception was a vascular pattern with mesh-like features (Fig. 1, Panel

* Corresponding author at: Department of Gastroenterology, Niigata Prefectural Yoshida Hospital, 32-14, Daibo-cho, Yoshida, Tsubame, Niigata 959-0242, Japan. Tel.: +81 256925111.
E-mail address: yagikazu@pop12.odn.ne.jp (K. Yagi).

1590-8658/$36.00
http://dx.doi.org/10.1016/j.dld.2013.09.003

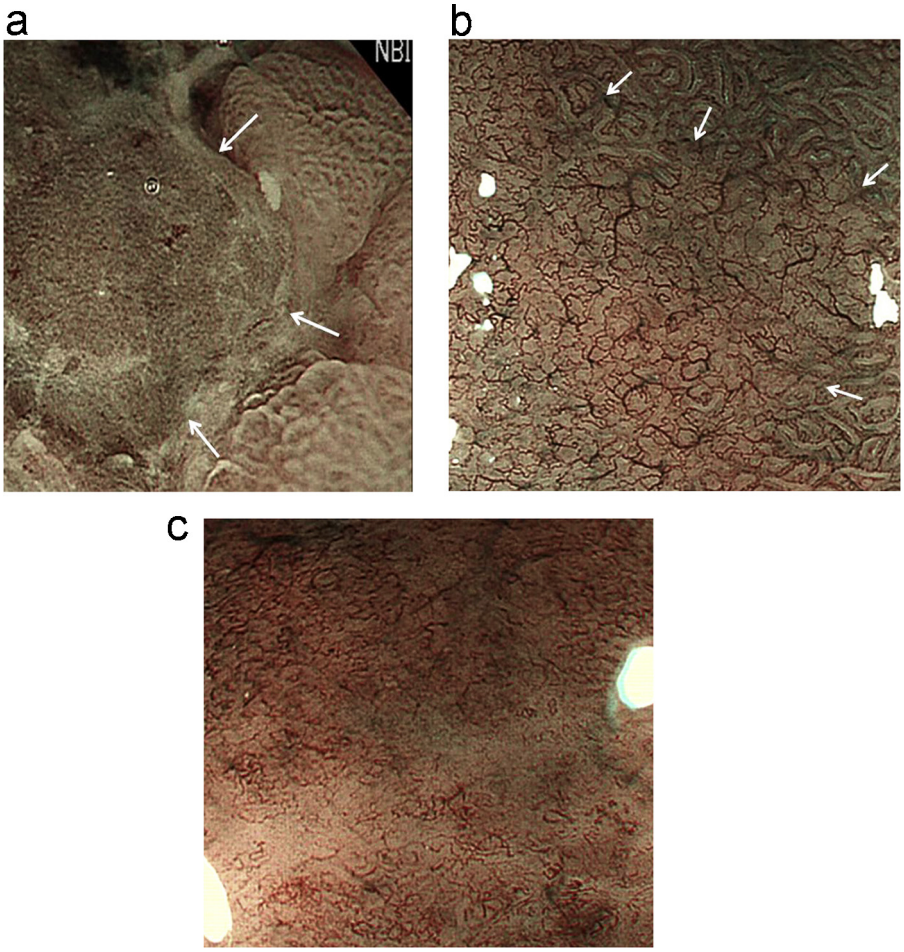

Fig. 1. Panel A: Blurry mucosal pattern (BMP) (white arrows). Panel B: Mesh pattern (white arrows). Panel C: Irregular mesh pattern (IMP).

B), almost all such cases being mucosal well differentiated adenocarcinoma [9]. This mesh pattern was excluded from among BMP cases. In IMP cases (Fig. 1, Panel C), the blood vessels basically form a mesh, but this appears broken, is lacking in some areas, some vessels are discontinuous, or unusually irregular vessels are apparent [9].

All of the endoscopic procedures were performed by a single endoscopist (KY). Using electrocoagulation, several marks were made in the area surrounding the lesions to allow their location to be identified in the specimens after ESD.

After completion of the endoscopic examination, two endoscopists (KY and AN) decided whether any of the above two patterns were present. If one lesion had both of these patterns, all of them were recorded. The degree of agreement was calculated as k value.

Each resected specimen was pinned on a flat rubber board and fixed in 20% formalin solution. The fixed specimen was then cut into serial slices at 2-mm intervals. Beforehand, photographs of each specimen were taken to record the positioning relationship of the marking points and the lines of section. With reference to the histopathological findings, the extent of the carcinoma was reconstructed on a macroscopic photograph of the specimen. Furthermore, if submucosal invasion was present, its area was constructed on the picture. All of the pathological procedures were performed by an expert pathologist (HU).

Interobserver agreement was analysed statistically using the chi-squared test and estimated in terms of the k value. The sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) were calculated. To identify important predictive factors for submucosal invasion, multiple logistic regression analysis was used. Analysis was performed using IMB SPSS smartreader 19. Differences at $p < 0.05$ were considered significant.

3. Results

Attempts were made to view all of the 207 lesions by NBI-ME, but in 10 the images obtained were of insufficient quality, and these lesions were therefore excluded (Fig. 2). Among the remaining 197 lesions, macroscopic features were divided to three types: distinct elevation ($n = 20$), slightly elevated or flat ($n = 115$) and depressed ($n = 62$). Two, 8 and 10 lesions showing these macroscopic features were submucosal cancer, respectively (Table 1). Regarding NBI-ME features, 22 lesions showed BMP and 10 lesions showed IMP (Fig. 2); 177 and 20 were diagnosed as mucosal and submucosal cancer, respectively (Table 1). Only one lesion showed both BMP and IMP, which was submucosal cancer. Multivariate logistic regression confirmed that lesion size (odds ratio [OR] 0.94, 95% confidence interval [CI] 0.91–0.98, $p = 0.005$), BMP (OR 12.15, 95% CI 3.45–42.76, $p = 0.000$) and IMP (OR 22.55, CI 4.22–120.45, $p = 0.000$) were independent predictors of submucosal cancer (Table 1). The sensitivity and specificity of BMP and IMP for submucosal cancer were 0.45 and 0.93, and 0.25 and 0.97, respectively. PPV and NPV for BMP and IMP were 0.41 and 0.93, and 0.5 and 0.92, respectively. Since BMP and IMP showed κ values of 0.73 and 0.69 respectively, the interobserver agreement was graded as substantially significant.