The Korean Journal of Internal Medicine
Vol. 17, No. 4, December, 2002

Endoscopically Observed Lower Esophageal Capillary Patterns

Do Won Choi, M.D., Seong Nam Oh, M.D., Soo Jung Baek, M.D., Soo Hyun Ahn, M.D., Yun Jung Chang, M.D., Won Seok Jeong, M.D., Hyo Jung Kim, M.D., Jong Eun Yeon, M.D., Jong Jae Park, M.D., Jae Seon Kim, M.D., Kwan Soo Byun, M.D., Young Tae Bak, M.D. and Chang Hong Lee, M.D.

Department of Internal Medicine, Korea University College of Medicine, Seoul, Korea

Background: *It has been reported that there are four zones of distinct venous patterns around the gastroesophageal junction (GEJ); i.e. truncal, perforating, palisade (PZ) and gastric zones. Using the distal end of PZ as a marker for GEJ, this study was done to assess the length and patterns of PZ in Koreans, and to assess the prevalence of endoscopic Barrett's esophagus (E-BE) and hiatal hernia (E-HH).*

Methods: *847 consecutive patients undergoing diagnostic endoscopy were included. During endoscopy, PZ, squamocolumnar junction (SCJ) and pinchcock action (PCA) were identified. Patterns were classified according to the relationships of the distal end of PZ with SCJ and PCA; A: all three at the same level, B: SCJ proximal to the other two which are at the same level, C: PCA distal to the other two which are at the same level, D: SCJ proximal to the distal end of PZ which is proximal to PCA. Cases with patterns B and D were thought to have E-BE, and those with patterns C and D to have E-HH.*

Results: *Patterns A, B, C and D were 79.2%, 12.1%, 3.8% and 4.9%, respectively. Length of PZ was 3.0±0.1 cm. E-BE and E-HH were found in 17.0% and 8.7%, respectively. Both E-BE and E-HH were more frequently found in males and in cases with reflux esophagitis.*

Conclusion: *E-BE and E-HH are not so infrequent in Koreans as previously thought, if we use the distal end of PZ as an endoscopic marker of GEJ.*

Key Words : *Gastroesophageal junction; Capillary pattern; Palisade zone; Barrett's esophagus; Hiatal hernia*

INTRODUCTION

Identifying gastroesophageal junction (GEJ) is essential in diagnosing Barrett's esophagus (BE) and hiatal hernia (HH). It is usually easy to identify GEJ endoscopically. However, endoscopists admit that it is very difficult in some, but important, cases. Even pathologists sometimes cannot point the exact GEJ on a resected specimen.

Address reprint requests to : Young Tae Bak, M.D., *Division of Gastroenterology, Korea University Guro Hospital, 97 Gurodong-gil, Guro-gu, Seoul 152-703, Korea, E-mail : drbakyt@korea.ac.kr*

Proximal margin of the gastric mucosal folds is generally accepted as an endoscopic marker of GEJ[1, 2]. But sometimes the shape of gastric type mucosal folds in the hiatal sac changes with the degree of air inflation and it cannot be clearly identified.

It has been reported previously that there are four zones with distinct venous patterns around GEJ; i.e. truncal zone, perforating zone, palisade zone (PZ) and gastric zone[3, 4]. Distal margin of PZ is known to be located at GEJ[2, 3, 4].Using the distal end of PZ as a marker for GEJ the aims of this study were to assess the length and patterns of PZ in Koreans and to assess the prevalence and grade of endoscopic BE (E-BE) and endoscopic HH (E-HH).

MATERIALS AND METHODS

Materials

All 847 consecutive patients (382 males and 465 females, M:F=1:1.2; age, mean±SD 48.7±13.8 years) undergoing routine diagnostic upper gastrointestinal endoscopy were included.

METHODS

All endoscopies were done by one examiner (YTB). Lower esophagus and gastroesophageal junction were carefully examined with minimum air inflation. PZ was defined endoscopically as a zone of clearly visible longitudinally parallel linear capillaries on the distal esophagus.

During endoscopy, while in quiet breathing without retching or peristalsis, proximal and distal ends of PZ, squamocolumnar junction (SCJ) and the site of the pinchcock action (PCA) were identified, and the distance of each location from incisors was measured. To avoid any error from time-to-time variation, the distances were measured twice during insertion and withdrawal of the endoscope and, if the two values were different, the average value was used.

From these values, longitudinal lengths of PZ, PZ below SCJ (i.e. E-BE), if any, and the area between PCA and the distal end of PZ (i.e. E-HH) were calculated in each case. Only lengths of 5 mm or longer were considered significant.

Patterns of PZ were classified according to the relationships of the distal end of PZ with SCJ and PCA[5] (Figure 1); A: all three were at the same level, B: SCJ was proximal to the other two which are at the same level, C: PCA was distal to the other two which were at the same level, D: SCJ was proximal to the distal end of PZ which was proximal to PCA. Cases with B and D belonged to E-BE, and cases with C and D belonged to E-HH.

Reflux esophagitis was considered to be present if the endoscopic grade was Los Angeles grade A or higher.[6] In reporting data, a format of mean ± standard deviation was used. Results in different groups were compared with chi-square test or Mann-Whitney U test. Correlation between lengths and age were tested with linear regression of Pearson correlation test. p-values less than 0.05 were considered significant.

RESULTS

In 11 cases (1.3%) among the total population, PZ could not be clearly identified, and all of them were cases with some degree of reflux esophagitis. Data from the remaining 836 cases, who showed endoscopic PZ, were analyzed.

Patterns A, B, C and D of PZ were found in 662 cases (79.2%), 101 cases (12.1%), 32 cases (3.8%) and 41 cases (4.9%), respectively. Average length of PZ was 3.0±0.1 cm.

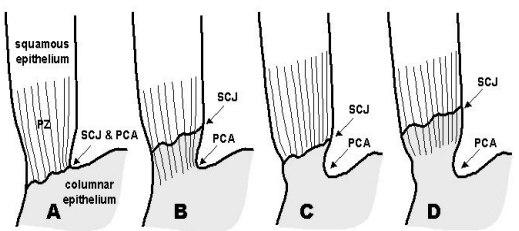

Figure 1. Endoscopically observed lower esophageal capillary patterns. Patterns were classified according to the relationships of the distal end of palisade zone (PZ) with the squamocolumnar junction (SCJ) and the site of pinchcock action (PCA); A: all three were at the same level, B: SCJ was proximal to the other two which are at the same level, C: PCA was distal to the other two which were at the same level, D: SCJ was proximal to the distal end of PZ which was proximal to PCA.

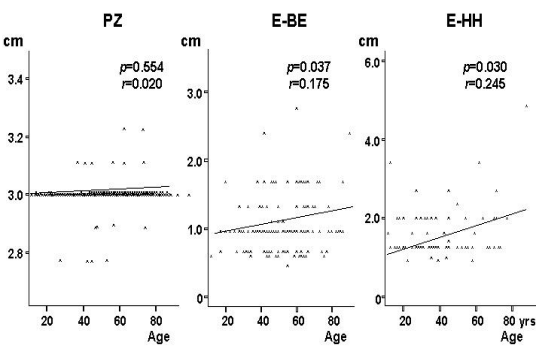

Figure 2. Lengths of palisade zone (PZ), endoscopic Barrett's esophagus (E-BE), and endoscopic hiatal hernia (E-HH) according to age in years. The length of PZ did not increase with age. However, the lengths of E-BE and E-HH showed increasing tendency with age, but their correlation coefficients were low.

Table 1. Prevalence of Endoscopic Barrett's Esophagus (E-BE) and Endoscopic Hiatal Hernia (E-HH) in Different Genders

	Male (n=374)	Female (n=462)	*p*-value
E-BE			
+	100 (27%)	42 (9%)	0.001
−	274 (73%)	420 (91%)	
E-HH			
+	49 (13%)	24 (5%)	0.001
−	325 (87%)	438 (95%)	

Table 2. Prevalence of Endoscopic Barrett's Esophagus (E-BE) and Endoscopic Hiatal Hernia (E-HH) in Cases with or without Reflux Esophagitis (RE)

	RE (+) (n=36)	RE (−) (n=800)	*p*-value
E-BE			
+	17 (47%)	125 (16%)	0.0001
−	19 (53%)	675 (84%)	
E-HH			
+	15 (42%)	58 (7%)	0.0001
−	21 (58%)	742 (93%)	

Table 3. Length (cm) of Endoscopic Barrett's Esophagus (E-BE) and Endoscopic Hiatal Hernia (E-HH) in Cases with or without Reflux Esophagitis (RE)

	RE (+) (n=36)	RE (−) (n=800)	*p*-value
E-BE (n=142)	1.37±0.78	1.15±0.54	0.363
E-HH (n=73)	2.01±1.34	1.31±0.52	0.028

E-BE was found in 142 cases (17.0%) and its length was 1.2±0.6 cm. The number of cases with E-BE of 3.0 cm or longer were 4 (0.5%). E-HH was found in 73 cases (8.7%) and its length was 1.4±0.6 cm. The number of cases with E-HH of 2.0 cm or longer were 23 (2.8%).

The length of PZ did not increase with age (Figure 2) (p=0.554). The age (51.3±13.0 yrs) of those with E-BE was higher than that (48.0±13.8 yrs) of those without E-BE (p=0.0128). However, the age (49.7±14.0 yrs) of those with E-HH was similar to that (48.4±13.7 yrs) of those without E-HH (p=0.8716). Both of the lengths of E-BE and E-HH showed increasing tendency with age (Figure 2) (p=0.037 and 0.030, respectively), but their correlation coefficients were low (r=0.175 and 0.245, respectively).

Both E-BE and E-HH were more frequently found in males than in females (Table 1) and in cases with reflux esophagitis than in those without (Table 2).

The length of E-BE was not different between those with and without reflux esophagitis (Table 3) (p=0.363). The length of E-HH was longer in cases with than in those without reflux esophagitis (Table 3) (p=0.028).

DISCUSSION

Determining the exact location of GEJ is essential in diagnosing BE and HH. It is usually not difficult to identify GEJ endoscopically. However, it is very difficult in some, but important, cases.

Proximal margin of the gastric mucosal folds is generally accepted as an endoscopic marker of GEJ[1, 2]. But, sometimes, gastric type mucosal folds in the hiatal sac change in shape with air inflation and it cannot be clearly identified.

It has been reported previously that there are four distinct venous patterns around GEJ; i.e. truncal zone, perforating zone, palisade zone (PZ) and gastric zone[3, 4]. Distal margin of PZ is known to be located at GEJ.[2, 3, 4] Using the distal end of PZ as a marker for GEJ, we tried to assess the length and patterns of PZ in Koreans and to assess the prevalence and grade of endoscopic BE and HH.

Endoscopic measurement of distance of any location from incisors might have some limitation in precision. Measuring distance of a site in the esophagus from incisors might be relatively more reliable than in the stomach or duodenum because of the less influence of the elasticity of the organs and the degree of flexion of the endoscope. However, considering the possible error in measuring the lengths, we measured twice during insertion and withdrawal of the endoscope and we regarded any length shorter than 5 mm as insignificant to avoid an over-diagnosis.

PZ could be identified in nearly all cases, except a few cases with some degree of reflux esophagitis. Capillaries in PZ are known to be located at lamina propria of the esophageal mucosa[3, 4], and mucosal inflammation leading to epithelial break or edema may prevent them from being seen through the ordinarily transparent epithelial layer.

Average length of PZ observed in our cases was 3.0± 0.1 cm. Patterns A, B, C and D were found in 79.2%, 12.1%, 3.8% and 4.9%, respectively. Patterns C and D were found less frequently than in a Japanese report[5], where patterns A, B, C and D were reported to have been found in 57.9%, 9.1%, 13.2% and 19.8%, respectively.

E-BE was found in 17.0% and its average length was 1.2±0.6 cm. Cases with E-BE of 3.0 cm or longer were only 0.5%. The prevalence of E-BE was quite higher than expected, although most of them belonged to short segment BE. It has been traditionally thought that BE is quite rare in Korea. According to the experiences of us[7] and others[8, 9], goblet cells were found in about 30~40% of cases with endoscopically-found short segment columnar-lined esophagus if randomly biopsied, and in 60~70% if using methylene blue-directed biopsies. Although we did not do a biopsy to demonstrate the goblet cells in this study, it can be estimated that about 5~12% of cases undergoing routine diagnostic endoscopy might have BE containing goblet cells.

E-HH was found in 8.7% and its length was 1.4±0.6 cm. The clinical significance of E-HH shorter than 2.0 cm is not known yet. If E-HH of 2.0 cm or longer, as classically defined, were considered, its prevalence was 2.8%.

The length of PZ did not increase with age, but the lengths of E-BE and E-HH showed increasing tendency with age, although their correlation coefficients were not high. The average age of those with E-BE was higher than that of those without E-BE, but the age of those with E-HH was not higher than that of those without E-HH. These suggest that the length of PZ does not change according to his/her age, but the presence of E-BE and the length of both E-BE and E-HH have a tendency to increase with age.

Both E-BE and E-HH were more frequently found in males than in females and in cases with reflux esophagitis than in those without. The length of E-BE was not different between those with and without reflux esophagitis. However, the length of E-HH was longer in cases with than in those without reflux esophagitis. These suggest that some pathogenetic correlations might exist between reflux esophagitis and E-BE or E-HH.

In conclusion, E-BE and E-HH are not so infrequent in Koreans as previously thought, if we use the distal end of PZ as an endoscopic marker of GEJ.

REFERENCES

1) McClave SA, Boyce HW, Jr, Gottfried MR. *Early diagnosis of columnar-lined esophagus: a new endoscopic diagnostic criterion. Gastrointest Endosc 33:413-416, 1987*
2) Boyce HW. *Endoscopic definitions of esophagogastric junction regional anatomy. Gastrointest Endosc 51:586-592, 2000*
3) Spence RAJ. *The venous anatomy of the lower esophagus in normal subjects and in patients with varices: an image analysis study. Br J Surg 71:739-744, 1984*
4) Vianna A, Hayes PC, Moscoso G, Driver M, Portmann B, Westaby D, Williams R. *Normal venous circulation of the gastroesophageal junction: a route to understanding varices. Gastroenterology 93:876-889, 1987*
5) Hoshihara Y. *Complications of gastroesophageal reflux disease. Endoscopic diagnosis of Barrett's esophagus: can Barrett's esophagus be diagnosed by endoscopic observation alone? (Japanese) Nippon Naika Gakkai Zasshi 89:85-90, 2000*
6) Lundell LR, Dent J, Bennett JR, Blum AL, Armstrong D, Galmiche JP, Johnson F, Hongo M, Richter JE, Spechler SJ, Tytgat GN, Wallin L. *Endoscopic assessment of oesophagitis: clinical and functional correlates and further validation of the Los Angeles classification. Gut 45: 172-180, 1999*
7) Bak YT, Jung GM, Yeon JE, Kim JS, Byun KS, Kim JH, Kim JG, Lee CH, Kim HK, Won NH. *Validity of the specialized columnar epithelium as a diagnostic criterion of the short segment Barrett's esophagus. Kor J Intern Med 13:99-103, 1998*
8) Canto MIF, Setrakian S, Willis J, Chak A, Petras R, Powe NR, Sivak MV, Jr. *Methylene blue-directed biopsies improve detection of intestinal metaplasia and dysplasia in Barrett's esophagus. Gastrointest Endosc 51:560-568, 2000*
9) Sharma P, Topalovski M, Mayo MS, Weston AP. *Methylene blue chromoendoscopy for detection of short-segment Barrett's esophagus. Gastrointest Endosc 54:289-293, 2001*