Diseases of the Esophagus (2009) **22**, 348–353
DOI: 10.1111/j.1442-2050.2008.00924.x

DISEASES OF THE ESOPHAGUS

Original article

The characteristics of Barrett's esophagus: an analysis of 4120 cases in China

Xia Chen, Liang-ru Zhu, Kiao-hua Hou

Department of Gastroenterology, Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China

SUMMARY. **Our objective was to investigate the endoscopic and clinico-pathological characteristics in patients with Barrett's esophagus (BE) in China. Using the terms 'Barrett's esophagus' and 'Barrett's esophagus, China' as key words, literatures published in Chinese and English journals were searched in Chinese data banks, as well as PubMed and ISI Web of Science from 1989 to 2007. An analysis was carried out with the standard inclusion and exclusion criteria. A total of 4120 cases were included in this study. BE was found in 2.44% of patients undergoing endoscopy for various symptoms of upper gastrointestinal tract diseases; the male : female ratio was 2.09 : 1, the average age of detection of BE was 53.15 years old, and 51% of patients with BE had typical symptoms for gastroesophageal reflux disease (GERD). The island-type BE was predominant (56.80%), and the occurrence of BE with special intestinal metaplasia (SIM) was 36.58%, but SIM was more common in tongue-type BE than island-type and circumferential-type BE (both $P < 0.001$), as well as in long segment BE (LSBE) than in short segment BE (SSBE) ($P < 0.001$). A total of 46.39% of patients had *Helicobacter pylori* infection. The mean length of follow up was 2 years in 492 patiens. The incidence of adenocarcinoma was 0.61% patient-years of total follow up. In China, the endoscopic prevalence of BE is lower, but the average age of diagnosis is younger; a high proportion of *H. pylori* infection is found in patients with BE, and about half of the patients have no typical symptoms of GERD; the tongue-type BE and the LSBE are apt to SIM.**

KEY WORDS: **Barrett Esophagus (BE), clinico-pathological characteristics, endoscopic characteristics, follow up.**

INTRODUCTION

Barrett's esophagus (BE) is an acquired condition characterized by the replacement of metaplastic columnar epithelium for the normal squamous epithelium of the lower esophagus. In humans, it is clearly known that severe gastroesophageal reflux is the main cause for BE; however, it would be of no importance were it not for its well-recognized association with esophageal adenocarcinoma.[1] The rapid rise in the incidence of adenocarcinoma of the esophagus (ACE)[2–5] has evoked greatly increased interest in BE, and it is being seen as a growing public health problem in Western countries.

In recent years, the prevalence of this disease is increasing in China,[6] partly because of increasing usage of endoscopy, and also because of a true rise in the prevalence of the disease, mainly due to a concomitant rise in gastro-intestinal reflux disease (GERD).[7] Unfortunately, in contrast with numerous studies about BE in industrialized countries, few clinical researches have been carried out.

For the purpose of acquiring more data about patients with BE in China, we will review 4120 cases from 38 published papers, and will investigate the endoscopic and clinico-pathological characteristics in these patients.

MATERIALS AND METHODS

Literature search

Studies about BE, including clinical reports, that were published between January 1, 1989 and May 30, 2007 were retrieved. Using 'Barrett's esophagus' as keywords, papers in Chinese were searched for in the databases that follow: CJFD, WeiPu, CBMdisc, WanFang (they include all published medical articles

Address correspondence to: Professor X.-H. Hou, MD, PhD, Department of Gastroenterology, Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan China. Email: houxh@public.wh.hb.cn

in China). Papers in English were searched in PubMed and ISI Web of Science using the terms 'Barrett's esophagus' and 'China.' Also, online early publications were included in this search. The reference lists of published articles were then used to locate other relevant studies. We also contacted or attempted to contact the corresponding authors of each relevant article we found and asked whether the person knew of other relevant articles not yet published. When an article provided insufficient information to determine an effect size or to enter data for a moderator analysis, we wrote to the corresponding author, asking for the needed information.

Inclusion criteria

(i) Studies about BE in China, including Hong Kong, were considered; (ii) according to the Montreal definition,[8] BE is diagnosed when a columnar-lined esophagus appeared endoscopically with an histological confirmation; (iii) chose a recent study if there are sereval studies on the same patients; and (iv) the data we considered shoud be quite sufficient, including at least three aspects among prevalence, gender, age, endoscopic characteristics, histological type, symptoms, complications, and follow-up results.

Exclusion criteria

(i) Studies were repetitive or the patients researched were the same; (ii) abstracts; and (iii) the data were insufficient or the data did not include three aspects among prevalence, gender, age, endoscopic characteristics, histological type, symptoms, complications, and follow-up results.

Study selection

After identifying relevant titles, the corresponding abstracts were judged independently by two reviewers (X. Chen and L.-R. Zhu). If disagreement occurred, the final decision regarding inclusion was based on the full article. Any discrepancies on article selection were resolved by discussion or a third reviewer (X.-H. Hou). The selection mainly focused on the aspects of prevalence, gender, age, endoscopic characteristics, histological type, symptom, complications, and follow-up data.

Data extraction

Two reviewers (X. Chen and L.-R. Zhu) extracted the data independently. The data collected from each study mainly focused on prevalence, gender, age, endoscopic characteristics, histological type, symptom, complications, and follow-up results.

We applied the guidelines for meta-analysis of observational studies in epidemiology.[9]

Statistical analysis

The data were analyzed using SPSS Version 12.0 (SPSS Inc., Chicago, IL, USA). Proportions were evaluated by standard formula and the proportions of various groups were compared by $\chi 2$ test and Fisher's exact test.

RESULTS

Study descriptions

A total of 308 papers (297 in Chinese, 11 in English), among them 38 papers in line with the inclusion criteria were searched from various data banks. The included papers represented 4120 patients over a period of 10 years (from 1997 to 2007), and the characteristics of these articles are shown in Table 1. The data from the included papers distributed over 34 regions.

Endoscopic prevalence

The patients undergoing endoscopy for various symptoms of upper gastrointestinal tract diseases at the same time were recorded in 13 papers. The prevalence of BE was 2.44% (2665/111 984, 95% confidence intervak [CI] = 2.35~2.53). The time of diagnosis in 521 cases was described in 12 articles, which was from 15 days to 6 years, and the mean time was 34 $\pm$ 11 months.

Gender and age

There were 35 papers written about the gender and age of patients among the studies we included. A total of 2678 males and 1284 females were found, with a ratio of 2.09 : 1. The age of detection of BE was from 17~87 years and the average was 53.15 years.

Endoscopic characteristics

In line with the Herlihy[10] standard, the BE endoscopic characteristics were classified into three types: tongue type, island type, and circumferential type, in 26 studies.The percentage of circumferential-type BE was 22.58% (874/3870, 95% CI = 21.27~23.89), that of island-type BE was 56.80% (2198/3870, 95% CI = 55.24~58.36), and that of tongue-type BE was 21.08% (816/3871, 95% CI = 19.80~22.36).

A total of 2893 cases (nine studies) were divided to long segment BE (LSBE) and short segment BE (SSBE). The distinction between SSBE and LSBE Barrett's esophagus is based on the length of metaplasia columnar epithelium, with the former being less than 3 cm by definition and the latter being 3 cm or more in length. In this study, the percentage of LSBE (21.81%, 631/2893, 95% CI = 20.31~23.31)

Table 1 Characteristics of included papers

Author	Year of publication	Area of origin	Patients (*n*)	Male (*n*)	Female (*n*)	Mean age (years)
MENG Xiao-Guan	2007	Liaoning Province	21	13	8	54.8
DUAN Shu-Fen	2007	Henan Province	54	38	16	51.6
WU Yi-Long	2006	Fujian Province	13	10	3	48
LI Feng-Ling	2006	Tianjin City	37	25	12	58.3
LI Rong-Guan	2006	Shandong Province	54	35	19	49
YANG Hua-Yuan	2006	Beijing City	86	58	28	46
YU Ye	2006	Xinjiang Autonomous region	26	19	7	67.3
DOU Xiao-Lin	2006	Guizhou Province	89	57	32	46.3
SUO Biao	2006	Fujian Province	37	24	13	50
GAO Wei-Mei	2006	Beijing City	248	165	83	45
ZHOU Jing	2006	Hubei Province	128	NR	NR	NR
WANG Ping	2006	Hubei Province	33	22	11	48
LIU Ping	2006	Shaanxi Province	46	34	12	NR
WANG Wen	2006	Fujian Province	1917	1319	665	45.1
SHU Zheng	2006	Hubei Province	13	12	1	NR
WANG Su-Li	2006	Shaanxi Province	73	29	44	45.6
ZHONG Dun-Jing	2005	Hainan Province	38	26	12	48.2
LIANG Yan	2005	Xinjiang Autonomous region	20	14	6	NR
ZHENG Li-Duan	2005	Hubei Province	231	152	79	NR
CUI Shuzhen	2004	Qinghai Province	25	22	3	NR
CHEN Wen-Xu	2004	Fujian Province	316	234	82	52
LV Yong	2003	Fujian Province	51	38	13	55.51
ZHAO Wei-Dong	2003	Shandong Province	55	38	17	46.8
DONG Lai-Hua	2003	Jiangsu Province	32	23	9	48.8
WANG Ying	2003	Shanxi Province	60	41	19	67.3
WM Wong	2002	Hong Kong	10	6	4	65
LIU An-Li	2002	Henan Province	36	NR	NR	NR
QIN Guang-Da	2002	Shanxi Province	42	32	10	67.3
ZHANG Gui-Mei	2001	Anhui Province	14	11	3	NR
WANG Yi-Ming	2001	Hubei Province	21	16	5	67.3
ZHANG Jun	2001	Shaanxi Province	61	43	18	45.5
YI Cui-Qiong	2001	Hubei Province	51	NR	NR	NR
YANG Hua-Yuan	2000	Beijing City	29	22	7	50
ZHAO Wei-Dong	2000	Shandong Province	35	28	17	46.8
WU Huai-Zhong	1998	Jiangsu Province	15	10	5	50
DUAN Shu-Fen	1997	Henan Province	16	9	7	48.5
ZHAO Li-Qun	1997	Henan Province	77	59	18	51
HUO Xiao-Ling	1997	Xinjiang Autonomous region	10	6	4	NR

Note: only listed the first author. NR, not reported.

differed significantly from that of SSBE (78.19%, 2262/2893, 95% CI = 76.69~79.69).

Manifestations

A total of 3407 cases (29 studies) were discribed in detail about clinical manifestations (Table 2). Fifty-one percent (1738/3407) patients appeared to have typical symptoms of GERD, including acid and food regurgitation (840 cases), and heartburn (898 cases). However, a large amount of people appeared to have atypical symptoms of GERD, such as upper abdominal complaints, upper abdominal pain complaints, pain behind the breastbone, etc.

Histologic characteristics

Three types of columnar epithelia could be detected in the columnar-lined esophagus:[11] gastric-fundic-type epithelium with parietal and chief cells, cardiac-type epithelium with cardiac mucous glands, and distinctive specialized intestinal metaplasia (SIM)-type epithelium with a villiform surface, mucous glands, and intestinal-type goblet cells.

A total of 782 cases in 17 papers were reported with results of histologic types as previously mentioned. The percentage of patients with gastric-fundic-type epithelium was 34.65% (271/782, 95% CI

Table 2 Clinical manifestations in the patients with BE

Symptom	*n* (%)	95% CI
GERD symptom	1738 (51.00)	(49.31~52.69)
Heartburn	898 (26.36)	(24.89~27.83)
Regurgitation	840 (24.63)	(23.18~26.08)
Epigastric discomfort or/and pain	1339 (39.30)	(37.75~40.95)
Discomfort or/and pain behide the breastbone	579 (16.99)	(15.73~18.25)
Dysphagia	238 (6.98)	(6.14~7.82)
Swallows disadvantageously	121 (3.55)	(2.93~4.17)
Belching	95 (2.79)	(2.24~3.34)
Haematesis or/and melena	58 (1.70)	(1.46~1.94)
Weight loss	41 (1.20)	(0.83~1.57)
Nausea or vomiting	21 (0.60)	(0.46~0.74)
Anemia	14 (0.41)	(0.20~0.62)
Absence of obvious symptom	74 (2.17)	(1.68~2.66)

Table 3 The clinico-pathological characteristics of SIM- type BE

Characteristics	*n* (%)	95% CI	x^2	*P*-value
Male	43 (68.25)	–	–	–
Female	20 (31.75)	–	–	–
LSBE	27 (27/59) (45.76)	33.05~58.47	12.494*	$P < 0.001$
SSBE	34 (34/158) (21.51)	15.10~27.92		
Circumferential-type	9 (9/111) (8.10)	3.02~13.18	70.976**	$P < 0.001$
Island-type	38 (38/172) (22.09)	15.89~28.29		
Tongue-type	28 (28/37) (75.68)	61.86~90.50	67.568***	$P < 0.001$
			40.462****	$P < 0.001$

*Compared with SSBE, $P < 0.05$. **Comparsion of tongue-type, island-type, and circumferential-type BE, $P < 0.05$. ***Compared with circumferential-type BE, $P < 0.05$. ****Compared with island-type BE, $P < 0.05$.

= 31.31~37.99), cardiac-type epithelium was 39.26% (307/782, 95% CI = 35.84~42.68), and SIM was 33.38% (261/782, 95% CI = 30.07~36.69).

Other articles did not list the histologic types, but had the number of SIM. There were 1134 cases of SIM in 24 anticles in this study in total; the percentage was 36.58% (1134/3100, 95% CI = 33.20~39.96). The clinico-pathological characteristics of SIM-type BE were investigated in few studies. (Table 3).

From 63 cases in two papers, we found the fact that there were more males with SIM than females, with a ratio of 2.15 : 1. Furthermore, SIM was most common in tongue-type BE, in contrast with the island-type and the circumferential-type (75 cases in two articles), and it was more observed in LSBE than in SSBE (62 cases in two articles).

Dysplasia

Twenty-two studies were reviewed for the presence of the grade of dysplasia in 3508 cases. The incidence of dysplasia in BE patients was 13.28% (466/3508, 95% CI = 12.16~14.40%), and the proportion of low-grade dysplasia (LGD) was 9.55% (336/3517, 95% CI = 9.07~10.03%).

Complications and concomitant diseases

A total of 17.98% (146/812, 95% CI = 15.34~20.62) hiatus hernia was found in 812 patients (16 papers). Being a complication of BE, esophagostenosis was found in 39.09% of patients (172/440, 95% CI = 34.53~43.65) in 10 papers.

Prevalence of *Helicobacter pylori* infection

A total of 1774 patients (six papers) were detected to have *Helicobacter pylori*, and 46.39% of cases (823/1774, 95% CI = 44.06~48.69) had *H. pylori* infection.

Endoscopic follow up

Seventeen included papers reported that 11.91% (492/4132) of patients was in follow up ranging from 13.7 months to 4 years. The mean duration was 2 years, and the incidence of developing to ACE was 0.61% (6/984, 95% CI = 0.12~1.10) patient-years of total follow up.

DISCUSSION

As more appropriately known, BE owes its importance to being a precursor lesion of ACE.[12] The risk of cancerization in patients with BE is dramatically higher than that in the general population by about 30~125-fold.[13–15] Undoubtedly, it will be beneficial to lower the incidence of ACE if we take some preventive measures,[16,17] which is based on our full knowledge of BE. Although there are increasing studies about BE in China and more focus on it from Chinese researchers, many questions, such as endoscopic surveillance, detection of dysplasia, management of SIM, and treatment of BE, are still unresolved because of lack of epidemiologic data. Therefore, a deeper understanding of the characteristics of patients with BE in China is required in order for some steps to deal with these problems be taken.

The aim of this study was to investigate the endoscopic and clinico-pathological characteristics of patients with BE in China. Our review included papers published from 1997 to 2007, with a considerably large munber of patiens (4120), resulting in additional statistical power.

We found that 2.44% of patients were diagnosed with BE among those undergoing endoscopy for various symptoms from the upper gastrointestinal tract diseases over a specified time period. The incidence rate is less than 3~8%, as reported by Westerner.[18,19] The probable causes of the difference are as follows: racial differences, variation in diet, areal differentiation, and the lower prevalence of GERD.[20] We may not exclude other reasons, such as insufficient understanding of BE, from Chinese gastroenterologists.

BE was more common in males than females, with a ratio is 2.09 : 1, similar to the European ratio of 2 : 1.[21] The median age of endoscopically diagnosed

BE was 53.15 years in the Chinese, younger than about 60 years in Europeans,[19,21] which should be paid more attention.

Like the reports from other areas,[22,23] island-type BE and SSBE were predominant in this study. In recent years, a controversy has emerged about the clinical significance of SSBE. Although the statement that LSBE with intestinal-type metaplasia is the most important identified risk factor for esophageal adenocarcinoma[8,24] is accepted universally, patients with SSBE can develop dysplasia and cancer,[25,26] and the incidence of the development of cancer in these patients is not fully defined.[27] In a series that may not have been adequately powered to detect a difference, patients with SSBE had the same incidence of cancer as patients with LSBE.[28] It is still argued for neglecting SSBE in surveillance, considering that SSBE is a high proportion of BE.

Although 51% of patients in this study were found presenting typical symptoms of GERD, including regurgitation and heartburn, there were about half of patients who had atypical GERD symptoms, mainly including discomfort and/or pain in the epigastric area or behind the breastbone, and dysphagia. Similarly, in the study by Avidan,[29] the presence of reflux symptoms was compared between a case population of 306 patients with esophagitis, 235 patients with BE, and a control population of 198 subjects without GERD. The data had no significant difference within these three groups. On the contrary to Gerson,[2,30] our conclusion is that there are no reliable symptoms for the diagnosis of BE, and it is crucial to avoid missed diagnosis for patients with BE without typical GERD symptoms.

The close relationship between SIM-type BE and ACE has been well investigated. In 3100 pateints (24 papers, described in the results), the incidence of SIM was 36.58%, in approximation to the value of 33.1% reported by Caum.[31] Further investigation demonstrated that SIM was more common in males than females (2.15 : 1), and most are tongue-type BE. Moreover, it was more observed in LSBE than in SSBE. The results were consistent with others.[32,33] However, considering the limited number of cases in our study, a larger scale investigetion is needed to get more data of patients with SIM in China.

Our data also showed that 46.39% of patients with BE in China had *H. pylori* infection, more than that in other countries.[34,35] The potential reason is the high rate of *H. pylori* infection in Chinese.[36] It is not uncertain what role *H. pylori* infection plays in the development of BE, and a heat controversy on the protection against the development of BE has been evoked at present.[33,37] Whatever, in the light of a high proportion of *H. pylori* infection in patiets with BE in China, further research is worth carrying out.

A universal agreement has been accepted by reseachers, which is that an increased risk of progression from LGD to high-grade dysplasia or carcinoma, and the goal of endoscopic follow up for patients with BE is to detect curable neoplasia.[38,39] A follow up was complete in 166 patients with a mean of 5.5 years.[40] LGD increased from 9.6% initially to 18.1% later. A total of 9.55% patients in our study had LGD, which was similar to the incidence reported from Western countries,[40–42] but only 11.91% of patients was in the follow up, far from the purpose of surveillance. The mean length of follow up was 2 years in 492 patiens. The incidence of adenocarcinoma was 0.61% patient-years of total follow up, higher than 0.54% reported by Conio.[40] The data from our study suggest that more endoscopic surveillances on patients with BE, especially with dysplasia, are necessary for the sake of decreasing the incidence of ACE in China.

In conclusion, compared with Western data, the endoscopic incidence of BE is lower in the Chinese, but the average age of diagnosis is younger. A high proportion of *H. pylori* infection is found in these patients. There is an approximate value of the incidence of BE developing ACE among the Chinese and Westerners. Similar to reports from Western countries, BE is more frequent in males than in females, and about half the patients have no typical symptoms of GERD, and the tongue-type and the LSBE are apt to special intestinal metaplasia.

References

1 Moghissi K, Sharpe D A, Pender D. Adenocarcinoma and Barrett's oesophagus. A clinico-pathological study. Eur J Cardiothorac Surg 1993; 7: 126–31.
2 Van Laethem J L, Peny M O, Salmon I *et al.* Intramucosal adenocarcinoma arising under squamous re-epithelialisation of Barrett's oesophagus. Gut 2000; 46: 574–7.
3 Shaheen N, Ransohoff D F. Gastroesophageal reflux, barrett esophagus, and esophageal cancer: scientific review. JAMA 2002; 287: 1972–81.
4 Zagorowicz E, Jankowski J. Molecular changes in the progression of Barrett's oesophagus. Postgrad Med J 2007; 83: 529–35.
5 Bytzer P, Christensen P B, Damkier P *et al.* Adenocarcinoma of the esophagus and Barrett's esophagus: a population-based study. Am J Gastroenterol 1999; 94: 86–91.
6 Hou X H, Zheng L D, Wang D R. The aetiology and epidemiology of Barrett's esophagus in China. Chin J Dig 2006; 26: 114–15.
7 Li Y M, Du J, Zhang H *et al.* Epidemiological investigation in outpatients with symptomatic gastroesophageal reflux from the Department of Medicine in Zhejiang Province, east China. J Gastroenterol Hepatol 2008; 23: 283–9.
8 Vakil N, van Zanten S V, Kahrilas P *et al.* The Montreal definition and classification of gastroesophageal reflux disease: a global evidence-based consensus. Am J Gastroenterol 2006; 101: 1900–20, quiz 43.
9 Stroup D F, Berlin J A, Morton S C *et al.* Meta-analysis of observational studies in epidemiology: a proposal for reporting. Meta-analysis Of Observational Studies in Epidemiology (MOOSE) group. JAMA 2000; 283: 2008–12.
10 Herlihy K J, Orlando R C, Bryson J C *et al.* Barrett's esophagus: clinical, endoscopic, histologic, manometric, and electrical potential difference characteristics. Gastroenterology 1984; 86: 436–43.
11 Sharma P, McQuaid K, Dent J *et al.* A critical review of the diagnosis and management of Barrett's esophagus: the AGA Chicago Workshop. Gastroenterology 2004; 127: 310–30.

12 Belladonna J A, Hajdu S I, Bains M S *et al.* Adenocarcinoma in situ of Barrett's esophagus diagnosed by endoscopic cytology. N Engl J Med 1974; 291: 895–6.
13 Lagarde S M, ten Kate F J, Reitsma J B *et al.* Prognostic factors in adenocarcinoma of the esophagus or gastroesophageal junction. J Clin Oncol 2006; 24: 4347–55.
14 Cossentino M J, Wong R K. Barrett's esophagus and risk of esophageal adenocarcinoma. Semin Gastrointest Dis 2003; 14: 128–35.
15 Wong A, Fitzgerald R C. Epidemiologic risk factors for Barrett's esophagus and associated adenocarcinoma. Clin Gastroenterol Hepatol 2005; 3: 1–10.
16 Tytgat G N, Bartelink H, Bernards R *et al.* Cancer of the esophagus and gastric cardia: recent advances. Dis Esophagus 2004; 17: 10–26.
17 Souza R F, Spechler S J. Concepts in the prevention of adenocarcinoma of the distal esophagus and proximal stomach. CA Cancer J Clin 2005; 55: 334–51.
18 Casson A G, Williams L, Guernsey D L. Epidemiology and molecular biology of Barrett esophagus. Semin Thorac Cardiovasc Surg 2005; 17: 284–91.
19 Ford A C, Forman D, Reynolds P D *et al.* Ethnicity, gender, and socioeconomic status as risk factors for esophagitis and Barrett's esophagus. Am J Epidemiol 2005; 162: 454–60.
20 Chen M, Xiong L, Chen H *et al.* Prevalence, risk factors and impact of gastroesophageal reflux disease symptoms: a population-based study in South China. Scand J Gastroenterol 2005; 40: 759–67.
21 Caygill C P, Watson A, Reed P I *et al.* Characteristics and regional variations of patients with Barrett's oesophagus in the UK. Eur J Gastroenterol Hepatol 2003; 15: 1217–22.
22 Csendes A, Smok G, Quiroz J *et al.* Clinical, endoscopic, and functional studies in 408 patients with Barrett's esophagus, compared to 174 cases of intestinal metaplasia of the cardia. Am J Gastroenterol 2002; 97: 554–60.
23 Qureshi W A, Wu J, Demarco D *et al.* Capsule endoscopy for screening for short-segment Barrett's esophagus. Am J Gastroenterol 2008; 103: 533–7.
24 Hirota W K, Loughney T M, Lazas D J *et al.* Specialized intestinal metaplasia, dysplasia, and cancer of the esophagus and esophagogastric junction: prevalence and clinical data. Gastroenterology 1999; 116: 277–85.
25 Yagi K, Nakamura A, Sekine A *et al.* Endoscopic findings of adenocarcinoma arising from short-segment Barrett's esophagus. J Gastroenterol Hepatol 2004; 19: 940–3.
26 May A, Gossner L, Pech O *et al.* Intraepithelial high-grade neoplasia and early adenocarcinoma in short-segment Barrett's esophagus (SSBE): curative treatment using local endoscopic treatment techniques. Endoscopy 2002; 34: 604–10.
27 Spechler S J. Guidelines for managing short-segment Barrett's esophagus. Am J Manag Care 2000; 6: S891–4.
28 Sampliner R E. Updated guidelines for the diagnosis, surveillance, and therapy of Barrett's esophagus. Am J Gastroenterol 2002; 97: 1888–95.
29 Avidan B, Sonnenberg A, Schnell T G *et al.* There are no reliable symptoms for erosive oesophagitis and Barrett's oesophagus: endoscopic diagnosis is still essential. Aliment Pharmacol Ther 2002; 16: 735–42.
30 Gerson L B, Edson R, Lavori P W *et al.* Use of a simple symptom questionnaire to predict Barrett's esophagus in patients with symptoms of gastroesophageal reflux. Am J Gastroenterol 2001; 96: 2005–12.
31 Caum L C, Bizinelli S L, Pisani J C *et al.* Specialized intestinal metaplasia of the distal esophagus in gastroesophageal reflux disease: prevalence and clinico-demographic features. Arq Gastroenterol 2003; 40: 220–6.
32 Csendes A, Smok G, Burdiles P *et al.* Prevalence of intestinal metaplasia according to the length of the specialized columnar epithelium lining the distal esophagus in patients with gastroesophageal reflux. Dis Esophagus 2003; 16: 24–8.
33 Weston A P, Krmpotich P T, Cherian R *et al.* Prospective evaluation of intestinal metaplasia and dysplasia within the cardia of patients with Barrett's esophagus. Dig Dis Sci 1997; 42: 597–602.
34 Weston A P, Badr A S, Topalovski M *et al.* Prospective evaluation of the prevalence of gastric Helicobacter pylori infection in patients with GERD, Barrett's esophagus, Barrett's dysplasia, and Barrett's adenocarcinoma. Am J Gastroenterol 2000; 95: 387–94.
35 Abe Y, Ohara S, Koike T *et al.* The prevalence of Helicobacter pylori infection and the status of gastric acid secretion in patients with Barrett's esophagus in Japan. Am J Gastroenterol 2004; 99: 1213–21.
36 Brown L M, Thomas T L, Ma J L *et al.* Helicobacter pylori infection in rural China: demographic, lifestyle and environmental factors. Int J Epidemiol 2002; 31: 638–45.
37 Ferrandez A, Benito R, Arenas J *et al.* CagA-positive Helicobacter pylori infection is not associated with decreased risk of Barrett's esophagus in a population with high H. pylori infection rate. BMC Gastroenterol 2006; 6: 7.
38 Riddell R H. Early detection of neoplasia of the esophagus and gastroesophageal junction. Am J Gastroenterol 1996; 91: 853–63.
39 Farrow D C, Vaughan T L. Determinants of survival following the diagnosis of esophageal adenocarcinoma (United States). Cancer Causes Control 1996; 7: 322–7.
40 Conio M, Blanchi S, Lapertosa G *et al.* Long-term endoscopic surveillance of patients with Barrett's esophagus. Incidence of dysplasia and adenocarcinoma: a prospective study. Am J Gastroenterol 2003; 98: 1931–9.
41 Skacel M, Petras R E, Gramlich T L *et al.* The diagnosis of low-grade dysplasia in Barrett's esophagus and its implications for disease progression. Am J Gastroenterol 2000; 95: 3383–7.
42 Sharma P. Low-grade dysplasia in Barrett's esophagus. Gastroenterology 2004; 127: 1233–8.