Peer reviewed article

Increased detection rates for Barrett's oesophagus without rise in incidence of oesophageal adenocarcinoma

A ten-year survey in Eastern Switzerland

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Summary

Questions under study/principles: The incidence of oesophageal adenocarcinoma has quadrupled in the last 20 years. Barrett's oesophagus carries a 30- to 125-fold increased risk of developing adenocarcinoma. The purpose of this study was to evaluate the incidence and surveillance of Barrett's oesophagus, dysplasia and adenocarcinoma in Eastern Switzerland.

Methods: Histological reports of 3659 patients (5190 oesophageal biopsies) from the St. Gallen Institute of Pathology were searched for evidence of Barrett's oesophagus (period 1989–1999). After retrospective classification according to findings on endoscopy and histology, the data were analysed with regard to surveillance intervals and incidence rates of Barrett's oesophagus, dysplasia and adenocarcinoma.

Results: 742 patients with Barrett's oesophagus and 100 with oesophageal adenocarcinoma were identified and followed up for a mean 1.6 (1–11) years. The average incidence of Barrett's oesophagus rose from 8.5/10^5/yr (CI-95%: 7.4–9.7) in the first to 15.5/10^5/yr (CI-95% 14.0–17.0) in the second 5–year period. The incidence of adenocarcinoma in our study population was 0.5% (1/97 patient years). In 207 patients (25%) with follow-up of >1 year, 9% progressed to low grade and 1% to high grade dysplasia, and 5% to adenocarcinoma. Adequacy of surveillance in BE patients rose from 54% to 87% over the study period.

Conclusions: There is an increasing incidence of Barrett's oesophagus, which is not accompanied by an increase in oesophageal adenocarcinoma, in Eastern Switzerland. Surveillance of Barrett's oesophagus is often inadequate in spite of relevant findings such as dysplasia.

Key words: Barrett's oesophagus; oesophageal dysplasia; oesophageal adenocarcinoma; incidence rate; surveillance

Introduction

Adenocarcinomas of the distal oesophagus and oesophago-gastric junction have shown the fastest rising incidence of all tumours in the United States over the last two decades [1]. Specialised metaplastic columnar lined epithelium of the oesophagus (Barrett's oesophagus) is the most striking

Abbreviations

BE:	Barrett's oesophagus
SIM:	Specialised intestinal metaplasia
EGJ:	Oesophago-gastric junction
GERD:	Patients with gastro-oesophageal reflux disease without evidence of Barrett's oesophagus at first endoscopy but developing BE within the study period
BE with SIM:	Barrett's oesophagus diagnosed at endoscopy with specialized intestinal metaplasia on histology
HistoSIM:	Specialised intestinal metaplasia on histology without further specifications at endoscopy
EndoBE:	Barrett's oesophagus at endoscopy without confirmation at histology
ID:	indefinite for dysplasia
LGD:	low grade dysplasia
HGD:	high grade dysplasia
Yr:	year(s)

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complication of long-standing gastro-oesophageal reflux disease [2], with a 30–125-fold increased risk of adenocarcinoma compared with the general population [3–5]. The pathogenesis of adenocarcinoma in Barrett's oesophagus (BE) is marked by a multistep sequence of events, leading from metaplastic epithelium to low and high grade dysplasia and adenocarcinoma [6]. 10–12% of patients with symptomatic reflux disease undergoing upper endoscopy exhibit BE and up to 10% of these patients have concurrent adenocarcinoma [4]. Moreover, autopsy studies indicate that the prevalence of BE may be as much as 20 times higher than the figure derived from clinical studies [7], suggesting that the majority of cases in the population remain unrecognised.

Patients with short segment BE (≤3 cm) have lower incidence rates of dysplasia and adenocarcinoma than patients with long segment BE (≥3 cm) [8]. About 20% of biopsies in patients show SIM at the oesophago-gastric junction, with an uncertain risk of developing adenocarcinoma [5, 9]. Despite controversy regarding the definition of BE and the classification of metaplasia, the presence of SIM on biopsy is considered the most reliable criterion for diagnosis of BE [10].

Endoscopic surveillance in BE is controversial [11, 12]. Although prospective surveillance studies indicate that adenocarcinoma of the oesophagus can be detected at an early stage [13], improved outcomes such as decreased morbidity and mortality have so far been demonstrated only in observational studies [14].

Our aim was to determine the incidence rates of BE, dysplasia and oesophageal adenocarcinoma in Eastern Switzerland. We also wished to assess whether there has been a rise in the number of patients newly diagnosed with BE and adenocarcinoma over the period 1989–1999, and whether any change was related to increased use of endoscopy. We also assessed the adequacy of surveillance endoscopy in our region in the light of international guidelines [15–17].

Methods

Kantonsspital St. Gallen is the main healthcare centre for Eastern Switzerland and its Institute of Pathology analyses over 90% of all oesophageal biopsies. Over 80% of the biopsies were performed there using a 4-quadrant biopsy protocol of 2 cm each. The remaining biopsies were received from other well trained gastroenterologists, often also associated with the hospital. The population of St. Gallen-Appenzell was stable over the study period with 476,770 inhabitants in 1989 and 511,620 in 1998, an increase of 0.7%. Migration movements were minimal; the migration rate (–0.16% of the mean population in the area) in 1998 was compensated by higher birth rates and immigration (0.15%).

Classification criteria

All patients from Eastern Switzerland who had oesophageal biopsies in the period 1989–1999 were registered at the St. Gallen Institute of Pathology. We performed a search for all possible cases of Barrett's oesophagus using an Access database (Microsoft 95). Patients were divided into two main groups (A, B) and 6 subgroups (1–6):

Main groups: (A) Patients followed for ≤1 year and (B) Patients surveyed for ≥1 year.

Subgroups of Barrett's oesophagus: (1) GERD: patients with anamnestic or clinical gastro-oesophageal reflux undergoing endoscopy for staging or grading of gastro-oesophageal reflux disease without evidence of Barrett's oesophagus (BE) at first endoscopy but developing BE during the study period; (2) BE with SIM: BE diagnosed at endoscopy with specialised intestinal metaplasia (SIM) on histology; (3) HistoSIM: specialised intestinal metaplasia (SIM) without further specifications at endoscopy; (4) EndoBE: BE at endoscopy without confirmation at histology; (5) Dysplasia: indefinite for dysplasia (ID), low-grade dysplasia (LGD) or high-grade dysplasia (HGD); (6) Adenocarcinoma of the oesophagus.

Exclusion criteria: all patients without the diagnosis of BE (BE with SIM, EndoBE, HistoSIM) during the study period and histological reports of cardiac or fundic mucosa (including adenocarcinoma) were excluded, as were all squamous cell carcinomas, sarcomas and lymphomas of the oesophagus.

Validation

90 of 264 histological slides with imprecise descriptions (e.g. mucosa of pyloric type or columnar cells) were chosen in blinded fashion and reviewed by one GI pathologist (J.N.). Only 2 additional cases of SIM were detected, indicating high sensitivity (>95%) of the search procedure. Our database was compared with the Cancer Registry of St. Gallen-Appenzell. We assumed that 93% of all cases of oesophageal adenocarcinoma occurring in the area were registered by the St. Gallen Institute of Pathology.

Histological staining and review of diagnosis

Three slides with 1–3 μm cuts from three different levels of the paraffin embedded biopsy sample were stained with either haematoxylin-eosin, periodic acid-Schiff (before 1994), Alcian-PAS at pH 2.5 (1994 and after) or van Gieson. All biopsies with prior diagnosis of dysplasia were reviewed by the same expert GI pathologist (J.N.), grading defined as ID, LGD and HGD as published by Haggitt [4].

Definitions

The following definitions were used:

Surveillance interval. Time between two subsequent endoscopies with oesophageal biopsies.

Adequacy. Surveillance of BE was judged adequate when ≤3-year intervals were observed between oesophageal biopsies [37]. Regarding the 3-year surveillance intervals, 25% of BE and 23% of SIM patients were diagnosed in the last two years of our study period and were therefore excluded from this part of the analysis.

Endpoints of surveillance. Oesophageal adenocarcinoma was considered the main endpoint in our analysis.

Incidence rate. Newly identified cases of BE/10^5 inhabitants/year (age adjusted and standardised for Euro-

pean Standard Population) found at the St. Gallen Institute of Pathology.

Relative risk. Incidence of adenocarcinoma in BE (BE with or without dysplasia) was compared to an age-matched control group without BE on oesophageal biopsies.

Calculation and statistical analysis

Linear regression analysis was carried out on incidence data for BE and adenocarcinoma from 1990–1999. 1989 data were considered as baseline. Incidence rates (n/10^5/yr) were computed for two 5-year intervals (1990–1994 and 1995–1999). The relative risk was computed by χ^2 analysis (Pearson, Mantel and Haenszel) with $p = 0.05$. To assess the adequacy of surveillance we analysed patients from subgroup A up to 1997 in respect of the maximum 3-year interval for adequate follow-up evaluations. Since a revision of internationally accepted guidelines was published in 1994 [36], surveillance intervals in group B were analysed comparing two 5-year periods (1990–1994 and 1995–1999) and the difference in the number of surveillance endoscopies and biopsies was calculated.

Results

Study population (figure 1)

A total of 3659 patients were entered in our primary database from the period 1989–1999. 842 (23%) patients with either BE and/or adenocarcinoma of the oesophagus on histology were classified and followed over a mean period of 1.6 yr (range 1–11 yr).

Gender and age

65% of patients with BE without adenocarcinoma were male, 35% female, and the mean age was 64.4 yr (range 17–90 yr). The male to female ratio was 2:1 and was stable throughout the study period. The mean age dropped from 73 yr to 65 yr in females between the two study periods but remained constant in males (64 yr vs. 63 yr). 100 patients had adenocarcinoma (78% male, 22% female) with a mean age of 67.6 yr (range 36–92 yr).

Reclassification of dysplasia

All original histological reports with dysplasia (187 biopsy specimens from 116 patients) were reviewed and reclassified (Table 1) by one expert GI pathologist (J.N.). Six cases (2 ID, 4 LGD) were reclassified as HGD. 25 patients had a false positive diagnosis of LGD and 5 patients (4 LGD, 1 HGD) exhibited gastric or dysplastic mucosa from the gastric cardia without SIM. In all, 36 patients (31%) were reclassified. Overall agreement between previous diagnosis and the reassessment was 69% (Table 1).

Division into group A and B

Division into group A and B is shown in figure 1.

Group A
(n = 635 patients followed for <1 year)

212 patients had "BE with SIM" (33%), 141 "HistoSIM" (22%), 156 "EndoBE" (25 %), and 36 dysplasia on histology (9 ID, 22 LGD and 5 HGD). These 36 patients with dysplasia and <1-year follow up represent 48% of all patients with dysplasias. 34 cases of adenocarcinoma associated with BE were detected at first endoscopies (fig. 1). In addition, 56 further patients with adenocarcinoma without associated BE were identified.

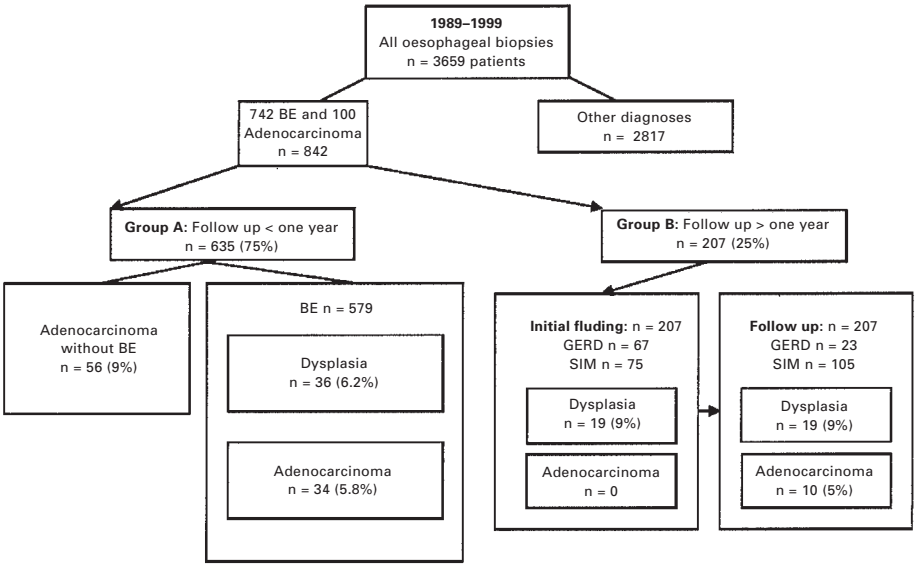


Figure 1

Study population, divided according to length of follow-up, group A <1 year and B >1 year. The presence of dysplasia and adenocarcinoma in initial and subsequent biopsy specimens is detailed.

Abbreviations: BE: Barrett's oesophagus either at endoscopy or on histology or both (BE with SIM, HistoSIM and EndoBE); **GERD:** gastro-oesophageal reflux disease without evidence of Barrett's oesophagus neither at endoscopy nor on histology; **SIM:** specialized intestinal metaplasia consistent with Barrett's oesophagus (subgroup BE with SIM and HistoSIM).

Table 1

Reclassification of dysplasia.

Initial diagnosis	n	Reclassification n (% of first diagnosis)	Agreement on review n (% of first diagnosis)
ID	22	20 (91%)	20 (91%)
LGD	87	54 (62%)	54 (62%)
HGD	7	12 (171%) [1])	6 (86%)
Total	116	86 (74%) + 30 patients without dysplasia[2]	80 (69%) + 36 patients without agreement on review[1, 2]

Abbreviations: ID: indefinite for dysplasia; LGD: low-grade dysplasia; HGD: high-grade dysplasia;
[1] 6 previous LGD; [2] 25 specialised intestinal metaplasia (SIM) without evidence of dysplasia and 5 even without evidence of Barrett's oesophagus (BE)

Table 2

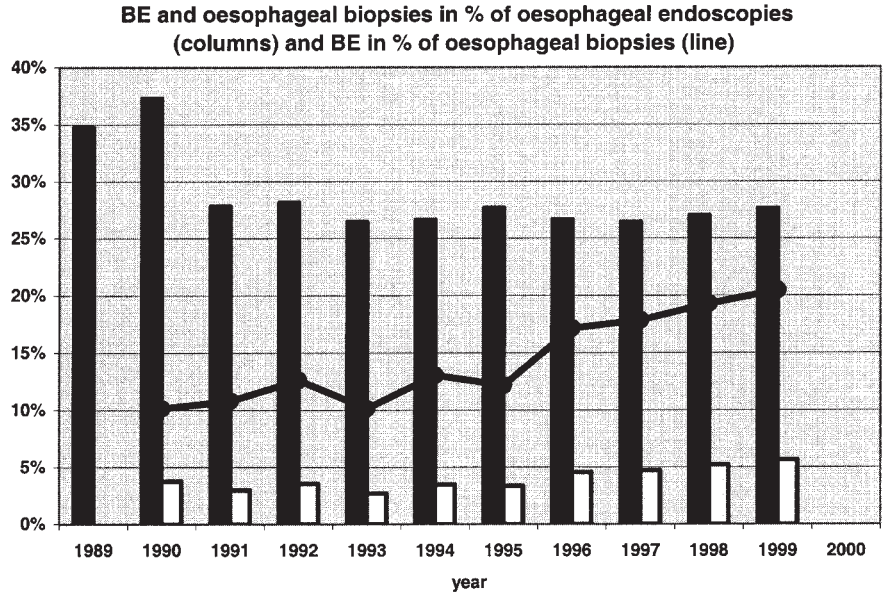
Progression of histological findings during follow-up (group B): reviewed and reclassified data

Initial finding:	GERD	BE with SIM	HistoSIM	EndoBE	ID	LGD	HGD	Total
	67 (32.4%)	55 (26.6%)	20 (9.7%)	46 (22%)	4 (2%)	13 (6.3%)	2 (1%)	207 (100%)
Subsequent finding:								
GERD	0	3	8	10	0	2	0	23 (11%)
BE with SIM	25	37	5	18	1	4	0	90 (43%)
HistoSIM	9	0	3	1	0	2	0	15 (8%)
EndoBE	24	7	2	12	0	0	0	45 (22%)
ID	1	1	0	0	0	0	0	2 (1%)
LGD	5	5	2	2	1	4	0	19 (9%)
HGD	0	2	0	1	0	0	0	3 (1%)
Adeno-Ca	3	0	0	2	2	1	2	10 (5%)

Abbreviations: GERD: patients with gastro-oesophageal reflux disease without evidence of Barrett's oesophagus (BE);
BE with SIM: endoscopic Barrett's oesophagus with evidence of specialised intestinal metaplasia on histology;
EndoBE: diagnosis of Barrett's oesophagus at endoscopy without confirmation on histology;
HistoSIM: specialised intestinal metaplasia on histology without endoscopic suspicion of BE;
ID: indefinite for dysplasia; LGD: low-grade dysplasia; HGD: high-grade dysplasia;
Adeno-Ca: Adenocarcinoma of the lower oesophagus. All dysplasias shown in this table are verified and reclassified by one expert GI pathologist. Each datum presents the endpoint of progression or regression during the surveillance period.

Figure 2

The dark columns represent oesophageal biopsies as a percentage of oesophageal endoscopies per year. White columns show BE in percent of endoscopies with a slight increase from 4–6%, whereas the dark line represents BE in percent of oesophageal biopsies with a marked increase from 10–20% of biopsies over the study period.

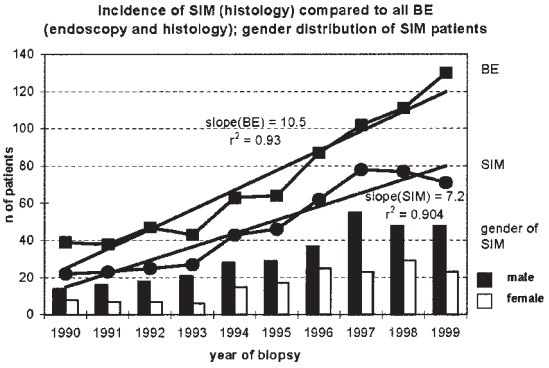


Group B
(n = 207 patients followed for >1 year)

67 patients had GERD, 75 with BE on histology (BE with SIM or HistoSIM), 46 with EndoBE and 19 with dysplasia on initial diagnosis. Detailed results of surveillance, including reviewed and reclassified dysplasias (Table 1) are given in Table 2: 34 patients out of 67 with GERD (51%) presented BE with SIM or HistoSIM, 6 (9%) dysplasia and 3 (4.5%) adenocarcinoma on follow-up. Out of 46 patients with EndoBE 3 (6.5%) developed dysplasia and 2 (4%) adenocarcinoma. Half of patients with ID (2), 1/13 of patients with LGD and all (2) patients with HGD developed adenocarcinoma. Overall, 24 patients surveyed (11%) had dysplastic mucosa changes on follow-up and 10 (5%) devel-

Figure 3

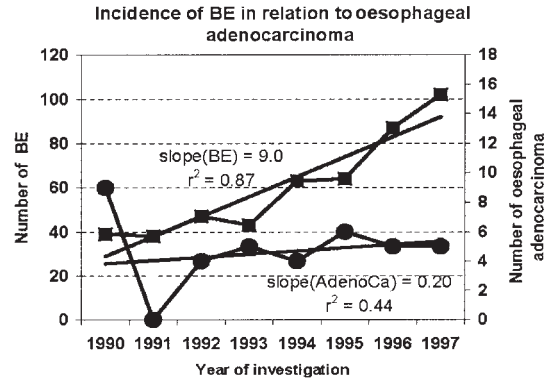
The 3.5-fold rise in the incidence of SIM confirmed at histology (BE with SIM, HistoSIM; dots) accompanied the 3.3-fold increase in the comprehensive BE group diagnosed at endoscopy and/or histology (EndoBE, BE with SIM, HistoSIM; squares). Linear regressions (slope [BE] = 10.5; slope [SIM] = 7.2) and the gender distribution (bars) of patients with SIM are shown.



Abbreviations: BE: Barrett's oesophagus at endoscopy or on histology or both (BE with SIM, HistoSIM and EndoBE); **SIM:** BE on histology (BE with SIM and HistoSIM); **slope** of linear regression line; **r²** correlation coefficient.

Figure 4

The detection rate of oesophageal adenocarcinoma of the oesophagus (dots) was nearly constant (slope of regression line [Adeno-Ca] = 0.2), while there was a 2.6-fold increase in BE (squares) from 1990 to 1997 (slope of regression [BE] = 9.0).



Abbreviations: BE: Barrett's oesophagus at endoscopy or on histology or both (BE with SIM, HistoSIM and EndoBE) (squares); **AdenoCa:** oesophageal adenocarcinoma (dots); **slope** of linear regression line; **r²** correlation coefficient.

oped adenocarcinoma. Conversely, in 23 patients (11%) BE or dysplasia were not confirmed on subsequent biopsies.

BE, oesophageal endoscopies and oesophageal biopsies

The total number of endoscopies in the Gastroenterology Division of the Kantonsspital St. Gallen increased from 1011 in the year 1989 to 2304 in the year 1999 (2499 in the year 2000), and thus a 2.3-fold increase in endoscopies was observed. In comparison, the Institute of Pathology registered 351 oesophageal biopsies in the year 1989, with an increase to 636 biopsies in the year 1999, i.e. a 1.8-fold increase in acquisition of oesophageal biopsies during the observation period. Approximately 28% of endoscopies a year had been followed by biopsy sampling (fig. 2). The total number of newly detected BE patients a year (incidence rates of EndoBE, BE with SIM, HistoSIM) increased 3.3-fold (39–130 patients/yr).

In consequence, newly detected BE per number of oesophageal biopsies increased from 10–20%, whereas the increase in new BE per number of endoscopies rose from 4–6% (fig. 2). Figure 3 shows a nearly parallel increase in patients with histological diagnosis of SIM (BE with SIM and HistoSIM: 3.5-fold from 1990 to 1999). The average incidence of all BE was 8.5/10^5/yr (CI-95%: 7.4–9.7) during the 5-year period 1989–1993 and 15.5/10^5/yr (CI-95%: 14.0–17.0) from 1994–1998 (standardised for European Standard Population).

Adenocarcinoma

In the period 1989–1999 we observed 100 adenocarcinomas of the oesophagus and oesophagogastric junction. Based on data from the Cancer Registry (which do not include carcinomas from the cardia), the incidence rates were 1.24/10^5/yr (1988–1992) and 1.78/10^5/yr (1993–1997) as standardised for European Standard Population. In contrast to BE, detection of new adenocarcinomas remained constant, as shown in figure 4. Ten new adenocarcinomas in group B (follow-up >1 yr, n = 207) developed during a cumulative surveillance period of 966 patient years (mean follow-up 4.6 yr, range 1–11 yr); this represents an incidence of one adenocarcinoma every 97 patient years or 0.48%/yr. Adenocarcinoma of the lower oesophagus occurred 3.0 times more often in patients with EndoBE, BE with SIM or HistoSIM (n = 786) than in patients with no evidence of BE (n = 2873) (odds ratio: 2.97, CI-95%: 2.02–4.37) and 4.4 times more often if there were dysplastic changes (odds ratio: 4.39, CI-95%: 2.19–8.81).

Adenocarcinoma developed in 3 patients with GERD after 2–5 years (mean 4 yr) without any surveillance in the interim. Five patients with adenocarcinoma on follow-up (50%) had a previous diagnosis of SIM. The time interval from dysplasia to adenocarcinoma was 1–6 years (mean 2.2 yr). Six patients with adenocarcinoma were followed for 4 or more years. Four of these patients already had advanced disease at the time of diagnosis (pT2–3, N2, or M1) and all except one died within 2 years, the last after 4 years. The other two patients had early disease at diagnosis (pT1–2, N0, M0) and were still alive at 1 and 4 years' follow-up respectively (August 2000).

Adequacy of surveillance

165 of 207 patients with BE (80% of group B, 20% of all BE) had appropriate surveillance intervals (≤3 years). Surveillance was not adequate in 396 patients (354 group A and 42 group B) with BE (54% of all BE) and in 266 with SIM (53% of all SIM). Adequacy of surveillance in BE patients from group B increased 33% during the study, from 54% in those patients diagnosed in 1989 to 87% diagnosed in 1997.

Discussion

Our study shows a maximum 3.3-fold increase in detection of Barrett's oesophagus (10% increase per number of oesophageal biopsies) and a twofold increase in average incidence rates for BE (8.5 to 15.5/100,000 inhabitants) from 1989 to 1998 in Eastern Switzerland, a region with a stable population of 500,000.

The increase in oesophageal biopsies paralleled the (twofold) increase in use of upper endoscopies performed at the St. Gallen Division of Gastroenterology, where the average share of biopsies in percent of endoscopies was 28% throughout the study period (Fig. 2). This fact strongly suggests that there were few changes in biopsy procedures. Detection rates for specialised intestinal metaplasia (SIM) were accompanied by an increase in the use of endoscopy and biopsy sampling up to 1994, but rose disproportionately thereafter, indicating a true rise in incidence. In our opinion this marked increase in detection of new SIM cases can be explained neither by qualitative changes in biopsy techniques or strategies alone, nor simply by amplified use of oesophageal endoscopy and biopsy procedures, but may be a combination of a true rise in incidence and better awareness of this entity.

These results are consistent with data from Scotland showing a rise in incidence of Barrett's oesophagus (BE) from $1/10^5$/yr in the early eighties to $18/10^5$/yr in the years 1992/93 [18]. These Scottish findings probably underestimated the real incidence of BE ($48/10^5$/yr), as BE was often (62.5%) not confirmed by histological diagnosis of SIM. Likewise, 54 % of our patients with BE under surveillance (follow-up >1 yr) had no evidence of SIM on first endoscopies, but SIM was found in 25% and dysplasia in 5% on further endoscopies, indicating biopsy sampling errors in the initial procedure. Another long-term study from a single centre in the UK [19] demonstrated an increase in BE from 2–16/10^3 endoscopies during 5-year intervals from 1976–1996. These results are consistent with reported incidences of BE in North America (9.5/10^3 endoscopies, stable for 20 years) [7, 20] and southern Europe (7.4/10^3 endoscopies) [21], showing an increase in the later nineties (19–29/10^3 endoscopies) [10, 22]. Segment length influences epidemiological results considerably (by a factor of 3.5), as shown by Hirota et al. in 1999 [23], and is an important risk factor for development of dysplasia and adenocarcinoma [24]. Furthermore, genetic factors, exposure to ionising radiation and different patterns of alcohol and tobacco consumption may affect the prevalence of long- and short-segment BE in different countries [25]. We found BE predominantly in men, with a male to female ratio of 2:1; this corresponds to the gender distribution and mean age reported by the UK National Barrett's Oesophagus Registry [19].

Surveillance programmes in patients with BE often show low adherence to protocol. Likewise, 354 of our patients (41%) had no follow-up between 1989 and 1999. 165 (80%) of 207 patients under long-term follow-up had adequate intervals between endoscopic examinations of ≤3 years, as proposed by international guidelines [16, 17], while 20% had longer intervals. Adequacy of surveillance (≤3-year intervals) rose in the period 1989–1999, indicating increased awareness of this disease entity among gastroenterologists. Surprisingly inadequate surveillance was equally common for patients with dysplasia (n = 55), with appropriate follow-up in only 35% of these patients. Similarly, a prospective study by Ferraris et al. reported that 46% of patients with BE could not be followed up and 50% of the remainder would not participate in surveillance endoscopy [26].

The time interval for progression from dysplasia to adenocarcinoma was 1–6 years (mean 2.2 years) in our study, and was comparable to other reports with observation periods of 1.5–4 years (2.5 years from LGD to HGD and 1.5 years from HGD to carcinoma) [27, 28]. However, other authors have observed patients with HGD over periods of 4 years without progression to adenocarcinoma [29, 30].

Three individual examples of surveillance in patients with BE with different courses are shown in figure 5. These findings demonstrate the considerable variation in endoscopy and histology during surveillance. Much of this variation is likely to be due to sampling errors or may be influenced by various treatment strategies. The retrospective study design used in this study did not allow us to assess the impact of treatment on the 'natural history' of low-grade dysplasia and BE.

Dysplasia was diagnosed in 7.4% of our patient population with BE, the incidence of dyspla-

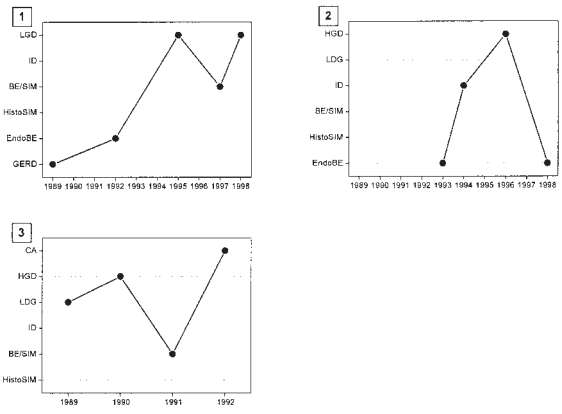


Figure 5

Follow-up in 3 patients with Barrett's oesophagus by oesophageal biopsies.
1. Initial diagnosis of GERD progressed over 6–8 years to LGD.
2. Resolution of HGD to BE on endoscopy without proof of SIM, indicating sampling error or possible regression on treatment.
3. Variable course over 4 years with dysplasia, subsequent loss of dysplasia (sampling error?) and evolution to adenocarcinoma.

Abbreviations: **GERD:** gastro-oesophageal reflux disease without evidence of Barrett's oesophagus (BE); **EndoBE**: BE at endoscopy without confirmation on histology; **histoSIM**: specialised intestinal metaplasia consistent with BE without suspicion at endoscopy; **BE/SIM:** BE at endoscopy and on histology; **ID**: indefinite for dysplasia; **LGD:** low grade dysplasia; **HGD:** high grade dysplasia; **CA:** oesophageal adenocarcinoma

sia being 2%/yr. The prevalence of dysplasia reported from other countries varies from 6–8% to 15–24% [23, 31]. However, Weston et al. reported a higher incidence of dysplasia from a long-term prospective follow-up study, with 7.5% for short-segment BE and 31% for long-segment BE over a mean follow-up time of 1.5 to 1.8 years [31].

Agreement on the diagnosis of dysplasia was 69% in our study (Table 1) and is comparable to previous data on inter-observer variation by Reid et al., with agreement rates of 58–87% between pathologists comparing different grades of dysplasia. The highest agreement rate of 85–87% was reached only for high-grade dysplasia [32].

The prevalence of oesophageal adenocarcinoma in BE patients was 4.3% in our study, which corresponds to the prevalence rates reported by Drewitz et al. (4%) [6] but is markedly lower than that reported by other authors (8–16%) [30].

The incidence of oesophageal carcinoma of 1:97 patient years is consistent with large retrospective [3, 33, 34] and prospective [6, 21, 24, 27, 35,] trials with reported incidences of 1:48 to 1:441 and 1:52 to 1:208 patient years' follow-up respectively. In our study population we found an annual incidence of adenocarcinoma of 0.48%, which is consistent with other studies [36, 37] and the results of a recent meta-analysis (0.5%/yr) [38].

The incidence rates from our Cancer Registry were 1.24/10^5/yr (1988–1992) and 1.78/10^5/yr (1993–1997), as standardised for the European population. Despite the increased detection rates for BE these data show a moderate incidence of oesophageal adenocarcinoma in Eastern Switzerland, in contrast to findings in Northern Europe [39].

We conclude that there is a true increase in the frequency of BE in Eastern Switzerland, while the incidence of adenocarcinoma remains moderate and stable; the observed increase in absolute numbers may, however, herald a significant rise in the future. Our retrospective data show often inadequate surveillance of patients with BE in spite of relevant findings such as dysplasia. Rigorous biopsy protocols should be applied in patients with endoscopic suspicion of BE, since short segment BE and SIM are often missed. Considering the overall low annual incidence of adenocarcinoma (0.5%) as shown in this and previous studies, surveillance is necessary in patients with SIM without dysplasia at time intervals of 3–5 years, as proposed by recent guidelines [17, 40].

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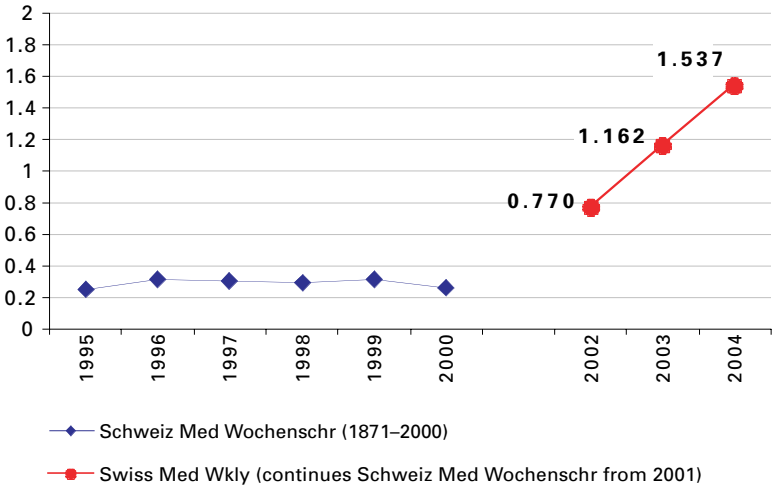

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