Changing incidence of esophageal cancer among white women: analysis of SEER data (1992–2010)

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Aim of the study: To analyse trends in the incidence rates of adenocarcinoma and squamous cell carcinoma of the oesophagus (ACE and SCC, respectively) in white women between 1992 and 2010.

Material and methods: We used data from the Surveillance, Epidemiology, and End Results (SEER program to identify cases of esophageal cancer). Age adjusted incidence rates (IR) were calculated for ACE and SCC for two different time periods (1992–1996 and 2006–2010) and stratified by age, stage, and histologic type. We used joinpoint analysis to detect changes in rates between 1992 and 2010.

Results: Between the time periods 1992–1996 and 2006–2010, the age-adjusted incidence rates for SCC in white women decreased from 1.2/100,000 to 0.8/100,000 person-years, and for ACE it increased from 0.5/100,000 to 0.7/100,000 person-years. Similar to white men, the increase in the incidence of ACE was consistent for all stages and all age groups in white women. However, it was most pronounced in women aged 45–59 years, where the incidence of ACE (0.9/100,000 person-years) in 2006–2010 exceeded the incidence of SCC (0.6/100,000 person-years). On joinpoint regression analysis, an inflection point was seen in 1999 for ACE, indicating a slower rate of increase for ACE after 1999 (annual percentage change of 8.00 before 1999 vs. 0.88 starting in 1999).

Conclusions: The incidence of ACE is increasing in white women, irrespective of age or stage. Indeed, ACE is now more common than SCC in white women between 45 and 59 years of age.

Key words: esophageal cancer, incidence, white women, SEER.

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Introduction

Oesophageal carcinoma (EC) is the eighth most common cancer and the sixth most lethal cancer worldwide [1]. In the U.S. an estimated 17,990 new cases of EC and 15,210 deaths due to EC are estimated to have occurred in 2013 [2], underscoring the lethality of this disease. The two main histological subtypes of EC are squamous cell carcinoma and adenocarcinoma of the oesophagus (ACE and SCC, respectively). While SCC has historically been the dominant subtype for both men and women across all age groups and races, the SCC incidence rate (IR) has been steadily decreasing, and ACE IR has been increasing over the last four decades in western countries [3–6]. It was recently reported that in white males ACE IRs had surpassed that for SCC around 1990 [4], but SCC continued to remain the predominant EC subtype in white women. In this study, we have evaluated the IRs of EC (both SCC in white males and ACE) in white women in the U.S. using the Surveillance, Epidemiology, and End Results (SEER) database.

Material and methods

We used data from 13 registries of the SEER program to extract malignant EC cases diagnosed during 1992–2010 in white females. ICD-O-3 (International Classification of Diseases for Oncology, 3rd ed.) morphology codes 8140-8144, 8210, 8211, 8255-8323, 8480-8490, 8570-8574, and 8576 were used to identify ACE, and 8052-8076 and 8083 were used to identify SCC, respectively, by use of SEER*Stat software version 8.0.4. Age-adjusted IRs were calculated and stratified by age (< 45, 45–59, 60–74, and > 75 years), stage (localised, regional, distant, and unknown, as defined by SEER historical stage A) and histological subtype (SCC and ACE) for two different time periods (1992–1996 and 2006–2010). All IRs are expressed per 100,000 person-years. Regression lines were fit to annual IRs separately for SCC and ACE using the SEER JoinPoint Regression Program, Version 3.5.3.

Results

Figure 1 demonstrates a consistent decline in SCC and an increase in ACE from 1992 to 2010. Between the time periods 1992–1996 and 2006–2010 there was a decrease in the IRs of SCC from 1.2/100,000 person-years to 0.8/100,000 person-years. The decrease over the 1992–2010 period corresponds to an annual percentage change (APC) of –2.50, which is a statistically significant decline ($p < 0.05$). During the same time period, there was an increase in IRs of ACE from 0.5/100,000 person-years to 0.7/100,000 person-years. For adenocarcinoma, an inflection point in the APC was seen in 1999. From 1992 to 1999 there was a rapid and significant increase in the incidence of ACE, and the annual percentage change was 8.00 ($p < 0.05$);

whereas from 1999 to 2010 the APC was a non-significant increase of 0.88 ($p = 0.33$). To find the APC in ACE IRs for the entire period from 1992 to 2010, the Joinpoint application was configured to fit the data with no inflection points. This yielded an APC of 2.92 ($p < 0.05$).

The decrease in the incidence of SCC and increase in the incidence of ACE was consistent across stage and age at diagnosis (Table 1). During the 2006–2010 time period, the age-adjusted IR of ACE had become almost equal to that of SCC among white women (Table 1). The increased IRs of ACE were most pronounced in women aged 45–59 years, where the IRs of ACE in 2006–2010 were more than that of SCC (0.9/100,000 person-years for ACE vs. 0.6/100,000 person-years for SCC).

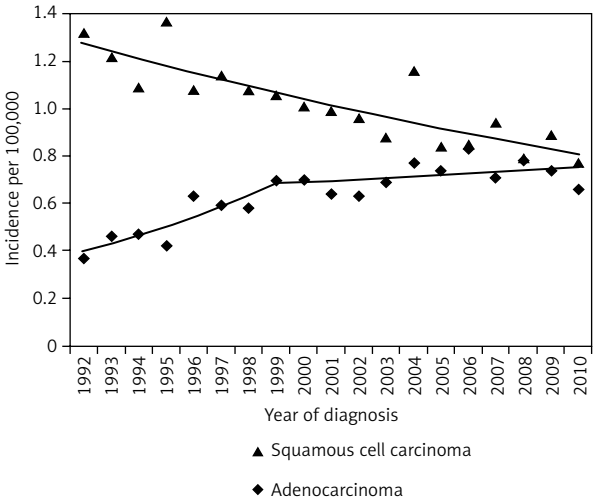

Fig. 1. Age-adjusted incidence rates (points) and regression lines for squamous cell carcinoma and adenocarcinoma for diagnoses made from 1992 to 2010 in white women

Discussion

Between 1992 and 2010, the incidence of ACE rose steadily in white women of all age groups, making it as common as SCC in white women overall and the most common histology of EC in white women aged 45–59 years.

Various risk factors have been described for the development of ACE in both sexes, including obesity, symptomatic gastro-esophageal reflux disease (GERD), Barrett's esophagus (BE), and decreased consumption of fruits and vegetables [7]. Increasing prevalence of obesity, GERD, and BE have paralleled the increasing rates of ACE in men [8–11]. We noted a similar relationship between the prevalence of obesity and IRs of ACE among white women. While the prevalence of obesity among white women in the US remained relatively constant from 1960 to 1980, it showed a rapid rise over the next two decades, i.e. 22.9% (1988–1994) and 30.1% (1999–2000) [12], before slowing down at the turn of the century (33.4% in 2009–2010) [13]. Our results similarly indicated that the rapid increase in

Table 1. Incidence of squamous cell carcinoma and adenocarcinoma of the esophagus in white women in 13 SEER registries

	1992–1996		2006–2010	
	Rate (95% CI)	**Count**	**Rate (95% CI)**	**Count**
Squamous cell carcinoma	1.2 (1.1–1.3)	924	0.8 (0.8–0.9)	731
Adenocarcinoma	0.5 (0.4–0.5)	363	0.7 (0.7–0.8)	653
Squamous cell carcinoma				
Age				
< 45 years	< 0.1	16	< 0.1	5
45–59 years	0.9 (0.7–1.1)	98	0.6 (0.5–0.8)	102
60–74 years	5.5 (5–6)	441	3.3 (2.9–3.7)	277
75+ years	7.5 (6.7–8.3)	369	6.3 (5.7–7)	347
Stage				
Localized	0.4 (0.3–0.4)	290	0.2 (0.2–0.3)	189
Regional	0.4 (0.3–0.4)	264	0.3 (0.2–0.3)	238
Distant	0.2 (0.2–0.2)	133	0.2 (0.2–0.2)	181
Unstaged	0.3 (0.3–0.3)	237	0.1 (0.1–0.2)	123
Adenocarcinoma				
Age				
< 45 years	< 0.1	8	< 0.1	9
45–59 years	0.4 (0.3–0.5)	42	0.9 (0.7–1)	143
60–74 years	1.6 (1.3–1.9)	127	2.7 (2.4–3.1)	228
75+ years	3.7 (3.2–4.3)	186	4.8 (4.2–5.4)	273
Stage				
Localized	0.1 (0.1–0.1)	92	0.2 (0.2–0.2)	161
Regional	0.1 (0.1–0.1)	86	0.2 (0.2–0.3)	189
Distant	0.1 (0.1–0.1)	85	0.3 (0.2–0.3)	235
Unstaged	0.1 (0.1–0.2)	100	0.1 (0.1–0.1)	68

ACE IR rates levelled off around 1999 (Fig. 1). This trend possibly reflects increased detection of ACE in obese women, because obesity and obesity-associated lifestyle are known to exacerbate symptomatic GERD. The contribution of other known risk factors for ACE in men is less well understood in women. For example, women with BE are two times less likely to develop ACE than are their male counterparts [13].

It has been reported that the increasing incidence of ACE in white males has slowed down since 1996 [14]. In this study we found a similar slowing of the increasing incidence for white females. Relatively small numbers in each category limits further analysis of stage-specific analysis of IR trends in white women.

Use of newer technology (such as endoscopic ultrasound) has improved the staging of EC in recent years; however, stage migration due to improved staging is unlikely to explain these results because the IRs for all stages of ACE have increased while those of 'unstaged' have remained constant (Table 1). Similarly, any change of classification of gastric cardia cancers to esophageal cancers cannot explain the increase in the IRs of EC because the IRs of gastric cardia cancer also increased during the study period (data not shown).

A significant finding of our analysis is the remarkable increase in ACE IR in relatively young white women (age 45–59 years), such that ACE is now more common than SCC in this age group. One possible explanation could be differences in healthcare-seeking behaviour in this age group and thereby a higher likelihood of being diagnosed with an underlying cancer. However, one would expect this to lead to a higher proportion of early stage ACE at diagnosis in 45-59 year old white women. The small numbers in each age group did not allow for stage pecific analysis in the current study. Alternative explanations such as age-specific risk factor distribution, must also be examined. This is important because localised EC (both ACE and SCC) is potentially curable, especially in younger patients (age 45–65 years). Along with advanced imaging, improved surgical techniques and the use of neoadjuvant therapy survival rates for oesophageal carcinoma have significantly improved over the last three decades [6, 15].

In summary, our study shows that the IRs of ACE have increased in white women for all age and stage groups, making ACE as common as SCC. ACE IRs have increased dramatically in women between 45–59 years of age, making it the most common histological subtype of EC in this age group. This study is limited by the relatively small number of incident ACE cases in white women, which does not allow us to draw any conclusions about time trends based on the stage of disease. In addition, trends in ACE IRs could not be analysed for women of other racial groups due to small numbers. Although the IRs and numbers diagnosed each year remain small compared with other more common cancers, it will be interesting to monitor and seek explanations for the changing ES patterns among white women, particularly those in the age group 45–59 years.

The authors declare no conflict of interest.

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