Comparison of Esophageal Cancer Incidence between the Eastern Anatolia and Eastern Black Sea Regions

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OBJECTIVE

Incidence of esophageal cancer varies among countries, with differences found particularly between developed and less-developed regions. The aim of the present study was to investigate differences in incidence between the Eastern Anatolia Region (EAR) and the Eastern Black Sea Region (EBSR).

METHODS

Data were obtained from the databases of the EAR (1996-2010) and the EBSR (1999-2013). A total of 47 patients from the EBSR and 135 patients from the EAR were included.

RESULTS

Higher incidence of esophageal cancer was found in the EAR, compared to the EBSR. In the EAR, overall survival was 20 months, median survival was 13 months, and 1-, 3-, and 5-year survival rates were 51.3%, 20.1%, and 13.4%, respectively. Following termination of treatment, overall survival was 18 months in the EBSR, median survival was 12 months, and 1-, 3-, and 5-year survival rates were 52.5%, 10.9%, and 6.6%, respectively.

CONCLUSION

A significant difference was found between regions regarding incidence of esophageal cancer. This cancer may be prevented through public education and awareness. Programs that promote prevention must be implemented worldwide, particularly in the EAR.

Keywords: Esophageal cancer; epidemiology; Eastern Anatolia Region, Eastern Black Sea Region.

Introduction

Esophageal cancer is diagnosed at a rate of 5% among all cancers, and is the sixth most common cause of cancer mortality. Average annual incidence is 5:100,000.[1] Incidence of cancer varies around Turkey, with distinct differences particularly found between developed and less-developed regions. While the national mean rate is 1.7%, it is increased to 16% in the Eastern Anatolia Region (EAR). Demographic, ecological, environmental, cultural, and genetic variables all contribute to the het-

erogeneity of cancer incidence. Genetic factors and excessive consumption of hot drinks and food, and nitrite- and nitrosamine-containing foods, have been thought to contribute.[2] However, little information is available regarding cancer in less-developed countries. Patterns of cancer incidence can provide important insights into the impact of lifestyle on cancer development.

The aim of the present comparison of cancer incidence between the EAR and the Eastern Black Sea Region (EBSR) was to provide useful information in

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an effort to determine requirements for cancer prevention and control.

Materials and Methods

The present data were obtained from the EAR 1996-2010 and the EBSR 1999-2013 databases. A total of 47 patients in the EBSR and 135 patients in the EAR were enrolled. Sex (male / female), age (≤60 / >60), Karnofsky performance status (KPS), localization (upper / middle / lower), histology (squamous cell carcinoma (SCC) / adenocarcinoma (ADC) / other), stage of disease (TNM), and treatment modality were noted. Data analysis was performed using SPSS software (version 13.0; SPSS Inc., Chicago, IL, USA). The Kaplan-Meier test was used for survival analysis, and the log-rank test was used to determine potential prognostic significance of variables in order to assess effects on survival.

Results

Patient characteristics are shown in Table 1. Prevalence of esophageal cancer is higher among females in the EBSR and among males in the EAR.

Risk of EAR was increased in patients under 60 years of age. A similarity was found regarding smoking and performance status among the regions. While the EBSR was not associated with familial predisposition, the EAR was associated with an incidence ratio of 7:100. The most common histology was SCC, and the primary site of tumor was the lower esophagus in both regions. Ratio of EBSR patients with stage 4 was 1:10,

Table 1 Patient characteristics

	EAR (n)	EBSR (n)	EAR (%)	EBSR (%)
Sex				
Male	65	35	48	74
Female	70	12	52	26
Age				
≤60	69	21	51	45
≥61	66	26	49	55
Smoking				
No	77	25	43	53
Yes	58	22	57	47
Family History				
No	125	47	93	100
Yes	10	0	7	0
KPS				
60	5	5	4	10
70	34	15	25	32
80	49	13	36	28
≥90	47	14	35	30
Localization				
Upper	25	5	19	10
Middle	34	3	25	7
Lower	76	39	56	83
Histology				
SCC	129	42	96	89
ADK	5	4	3	9
Other	1	1	1	2
Stage				
II	19	17	14	36
III	90	25	67	54
IV	26	5	19	10
Life Situation				
Alive	30	3	22	7
Dead	90	44	67	93
Unknown	15	–	11	–

Table 2 Treatment characteristics

	EAR (n)	EBSR (n)	EAR (%)	EBSR (%)
Treatment				
No	2	1	2	2
RT	29	16	21	34
CRT	63	17	47	36
S+RT	9	3	7	7
S+CRT	10	9	7	19
Palliative	22	1	16	2
CT Cure				
No	53	19	39	40
1 cure	21	21	16	45
2 cure	53	4	39	9
3≤	8	3	6	6
CT Protocol				
No	53	19	39	40
Cisplatin+5-FU	71	21	52	45
Cisplatin (weekly)	9	4	7	9
Other	2	3	2	6
RT Dose				
No	2	2	2	4
30 Gray	21	11	16	23
45 Gray	29	5	21	11
50.4 Gray	45	12	33	26
54 Gray	11	3	8	6
60 Gray	12	7	9	15
Other	15	7	11	15
Surgery				
No	92	35	68	74
Yes	34	12	25	26
Pre-operative	9	0	7	0

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Table 3 Survival analysis

	n		Median survival period (month)		Average survival period (month)		p		Survival rate 1 year (%)		Survival rate 3 years (%)		Survival rate 5 years (%)	
	EAR	EBSR	EAR	EBSR	EAR	EBSR	EAR	EBSR	EAR	EBSR	EAR	EBSR	EAR	EBSR
General	135	47	13±1	12 ±2	20	18			51.3	52.5	20.1	10.9	13.4	6.6
Sex														
Female	70	12	13±2	14 ±3	22	25			51.5	58.3	27.8	16.7	18.5	8.3
Male	65	35	13±1	10 ±2	16	15	0.421	0.219	51.1	47.5	15.6	8.9	10.4	3.0
Age														
≤60	69	21	15±2	10 ±2	23	18			60.2	42.9	30.3	14.3	15.1	4.8
≥61	66	26	11±1	12 ±2	15	16	0.021	0.651	40.7	48.7	14.6	8.1	9.7	4.1
KPS														
60	5	5	8±1	2±0.5	9	2			20.0	0	0	0	0	0
70	34	15	8±1	7 ± 3	8	5			16.9	0	0	0	0	0
80	49	13	14±1	14 ±1	19	12			62.5	53.8	11.1	0	0	0
90 and ↑	47	14	21±3	29 ±4	29	40	0.001	0.001	70.0	92.9	42.4	35.7	38.5	14.3
Smoke														
No	77	25	14±2	14 ±4	22	21			56.3	50.5	24.8	12.6	16.5	0
Yes	58	22	11±1	8 ±2	15	14	0.122	0.243	44.0	40.9	18.0	9.1	13.5	0
Loc.														
Upper	25	5	19±2	12 ±2	25	13			70.2	60.0	29.2	0	0	0
Middle	34	3	10±1	6 ± 2	18	5			47.1	0	32.1	0	27.5	0
Lower	76	39	11±1	12 ±3	17	19	0.370	0.107	46.2	47.7	17.0	13.2	14.1	5.3
Histo.														
SCC	129	42	13±1	12±3	20	18			51.4	45.2	22.9	11.9	15.3	4.8
ADC	5	4	19±1	10±3	17	12			60.0	25.0	0	0	0	0
Other	1	1	8	12±2	8	18	0.605	0.661	0	0	0	0	0	0
Stage														
II	19	17	19±3	27 ±2	21	34			64.3	88.2	21.4	29.4	14.3	11.8
III	90	25	14±1	7±1	23	9			56.9	32.0	30.1	0	20.1	0
IV	26	5	9±1	4 ± 1	8	5	0.002	0.001	25.0	0	4.2	0	0	0
Treat.														
No	2	1	2±0	-	3	-			0	-	0	-	0	-
RT	29	16	10±1	15	16				35.3	43.8	12.6	12.5	0	0
CRT	63	17	19±2	14±3	24	20			67.2	52.9	33.2	11.8	29.9	11.8
S+ RT	9	3	34±0	7±1	26	25			75.0	33.3	0	0	0	0
S+ CRT	10	9	14±1	10±4	23	14			60.0	33.3	50.0	11.1	37.5	0
Pal. RT	22	0	8±1	-	8	-			18.2	-	0	-	0	-
CT	0	1	-	-	-	-	0.001	0.917	-	-	-	-	-	-
CT														
No	53	19	9±6	12±4	11	18			27.6	47.4	4.4	15.8	0	5.3
Cis-FU	71	22	19±1	14±4	26	20			67.6	53.1	36.1	9.7	32.8	9.7
W. Cis	9	4	9±3	7±5	11	8			44.4	25.0	11.1	0	0	0
FUFA	2	2	3±0	7	6	8	0.001	0.405	0	0	0	0	0	0
RT														
No	2	2	2±0	16 ±0	2	16			0	0	0	0	0	0
0-3000	21	11	8±1	3 ± 1	8	8			15.0	9.1	0	0	0	0
4500	29	5	16±4	7 ± 1	23	10			63.2	20.0	27.6	0	13.8	0
5040	45	12	21±2	18 ±8	29	30			75.6	83.3	40.4	16.7	36.3	16.7
5400	11	3	9±7	12 ±4	11	16			50.0	33.3	40.0	0	30.0	0
6000	12	7	13±5	7 ±1	17	16			60.0	28.6	30.0	14.3	15.0	0
6000 ↑	15	7	1±0	14 ±7	4	21	0.001	0.062	8.3	57.1	0	14.3	0	0

KPS, karnofsky performance score; SCC, squamouse cell ca; ADC, adenokarsinom; RT, radiotherapy; CRT, Chemoradiotherapy; S+RT, surgery+radiotherapy; S+CRT, surgery+chemoradiotherapy; CT, chemotherapy; Pla. RT, palliative radiotherapy; Cis-FU, cisplatine-fluouracil; W. Cis; weekly cisplatine; FUFA, fluouracil calcium leukovorine.

while that of EAR patients was 1:10.

Treatment characteristics are shown in Table 2; the characteristics of both regions were substantially similar.

Survival analysis is shown in Table 3, and prognostic factors were also determined. In patients with esophageal cancer in the EAR, age, KPS, stage, treatment modality, chemotherapy protocol, number of cures, and general survival rates were found to be the prognostic factors related to the survival period in univariate analysis (p<0.05). In patients with esophageal cancer in the EBSR, KPS, stage, and general survival rate were found to be the prognostic factors related to the survival period in univariate analysis (p<0.05).

Discussion

Esophageal cancer carries high rates of mortality and morbidity, and is the sixth most common cause of cancer mortality worldwide.[3] While not very common in Turkey, incidence is higher in the EAR, where it is a significant cause of cancer mortality.[4] This can be explained by geographic predisposition and environmental exposure.[2]

Esophageal cancer is more common in men worldwide. In the present patient population, the female:male ratio was 1.1:1 in the EAR and 2.9:1 in the EBSR. Early age at diagnosis among women in the EAR can be attributed to environmental exposure (use of tandoor and manure, hot food consumption) and to geographical predisposition.[2]

Average age at occurrence is 67, with a peak in the 7th decade.[5] Average age in the EAR was 59 (59 in men, 58 in women). Average age in the EBSR was 61 (62 in men, 61 in women). SCC and ADC histological types are 95% for the esophagus.[6] SCC and ADC histological types of both regions were determined as 99% in the present study.

Tumor localization is an important factor in prognosis. While upper-third esophageal cancer rarely occurs, survival is better than that of patients with esophageal cancer in the lower two-thirds.[7] In the present study, median survival was improved in patients with upper-third esophageal cancer, compatible with the literature.

Following termination of treatment, overall survival was 20 months in the EAR, median survival was 13 months, and survival rates at 1, 3, and 5 years were 51.3%, 20.1%, and 13.4%, respectively. Following termination of treatment, overall survival was 18 months in the EBSR, median survival was 12 months, and survival rates at 1, 3, and 5 years were 52.5%, 10.9%, and 6.6%, respectively.

It was determined in the present retrospective analysis that the best survival in patients with inoperable esophageal cancer was obtained following 50.4 Gy radiotherapy with concurrent chemotherapy. In light of this information, we have adopted this clinical protocol as routine application.

Conclusion

Significant differences in esophageal cancer incidence were found between the regions. Esophageal cancer may be prevented through public education and awareness. Programs to promote esophageal cancer prevention should be globally implemented, particularly in the EAR.

Disclosure Statement

The authors declare no conflicts of interest.

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