Tracheal Cancer Mortality Trends in the United States

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Citation

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Abstract

Objectives: Malignant primary tracheal tumors are rare and specific epidemiological information is not well characterized. Previously conducted studies are largely case series related and focus primarily on management of the malignancy. We report national mortality patterns and trends for the United States, 1979 to 2010.

Methods: For the United States from 1979-2010, we obtained the mortality data for persons with underlying cause of death or multiple cause of death listed as cancer of trachea, bronchus and lung available on CDC WONDER database by year. For each year or for groups of years, we computed rates per 1,000,000 persons by age, gender, and race. Age adjustment of mortality used the direct method with the 2000 U.S. population as standard. We used JoinPoint Regression program v4.0.4 to analyze trends in age adjusted mortality rates.

Results: In 1999-2010 the total number of deaths with tracheal cancer listed as underlying cause was 942, out of which 366 were female and 576 were male (39 percent for females and 61 percent for males). The ratio of age adjusted rates in males to females was 3.0 and the ratio of rates in blacks to whites was 1.3. Rates increased to age 64 but showed little further increase at older ages. Age-adjusted rates increased by 1.9% per year from 1979 to 1984, and then decreased by 4.9% per year from 1985 to 2010.

Conclusion: US mortality data reveal about 80 deaths from primary tracheal cancer annually. Age-adjusted death rates have declined since 1985.

INTRODUCTION

Malignant primary tracheal tumors are rare and specific epidemiological information is limited. Tracheal neoplasms have a low incidence and various reports suggest they account for less than 0.4% of all newly diagnosed tumors (1–3). Tracheal cancers are often misdiagnosed or diagnosed at a late stage negatively affecting the prognosis of patients. Previously conducted studies were largely case series and focused primarily on management of the malignancy (3). Relatively few reports pertaining to the epidemiology have appeared, most from Europe (4–6). One previous United States report obtained from the Surveillance, Epidemiology and End Results (SEER) consisting of 578 cases on primary tumors of the trachea spanning over a 31 year period, is the largest study done to date (1). However we found no other reports of US mortality trends. Therefore we report US mortality patterns and trends for 1979 to 2010.

MATERIALS AND METHODS

For the United States from 1979-2010, we obtained mortality data for persons with underlying cause of death or multiple cause of death listed as cancer of trachea, bronchus and lung from the Centers for Disease Control and Prevention (CDC) WONDER database by year (7). Data included the underlying cause of death in all years and up to 20 additional contributing causes and demographic data on decedents in 1999-2010. The underlying cause of death is the disease (or injury) that initiated the sequence of events leading directly to death. For 1979 through 1998, we used the International Classification of Diseases, 9th Revision (ICD9) code 162.0 for malignant neoplasm of trachea, and 162 for trachea, bronchus, and lung mortality data. Also, for 1999-2010, we used ICD, 10th Revision code C33 for malignant neoplasm of trachea and C33-C34 for malignant neoplasm of trachea, bronchus and lung (hereafter "all lung cancer").

Using population counts from the US Bureau of Census, we computed crude rates, age adjusted mortality rates, and 95% confidence intervals for mortality rates. For each year or for groups of years, we computed rates per 1,000,000 persons by

age, gender, and race. Age adjustment of mortality used the direct method with the 2000 U.S. population as standard.

We used JoinPoint Regression program v4.0.4 (8,9) to analyze trends in age adjusted mortality rates between 1979 and 2010. JoinPoint is statistical software for the analysis of trends using Joinpoint models, that is, models where several different lines are connected together at the "joinpoints". This enables the user to test that an apparent change in trend is statistically significant. The tests of significance use a Monte Carlo Permutation method.

RESULTS

In 1999-2010 the total number of deaths caused by cancer of trachea was 942 of which 366 were female and 576 were male (39 percent for females and 61 percent for males). The percent of deaths at age greater than or equal to 45 years was 96 percent. The total number of deaths caused by all cancers of trachea, bronchus and lung during the same period was 817,455 for females and 1,072,018 for males (43 percent for females and 57 percent for males).

The ratio of underlying cause to multiple causes was calculated by gender group. For lung cancer, this ratio was 94.5% for females and 94% for males, but for trachea cancer, this ratio was 72.2% for females and 72.7% for males.

Table 1 shows age adjusted rate by gender and race for 1999-2010. For cancer of trachea the ratio of males to females was 2.0. For all lung cancers the ratio was 1.7. For cancer of trachea the ratio of blacks to whites was 1.3. For all lung cancers the ratio was 1.1. Age adjusted rate for tracheal cancer increased to age 64 but showed little further increase at older ages. For lung cancer on the other hand the rates showed steady increase until age 84. The ratio of lung cancer to trachea cancer was greater at older ages.

Table 2 shows the results of the JoinPoint analysis. The trend of age adjusted mortality rates of trachea cancer significantly changed from 1979-2010. The rates first increased by 1.9% per year from 1979 to 1984, and then decreased by 4.9% per year from 1985 to 2010 (Fig. 1). For comparison, trends for all lung cancer were calculated for 1979 to 2010 (Fig. 2). From 1979 to 1990 the rate significantly increased by 1.8% per year. The rates were relatively stable for 1990 through 1995 (i.e. the slight decrease in the rates for this time period was not statistically significant). Then, the trend significantly decreased by rate 1% per year for 1995-2004. Finally, the rate decreased by rate 2% for 2004-2010.

DISCUSSION

Lung cancer was a leading cause of death in the US (10,11). Tracheal tumors are less common and represent a small fraction of all lung cancer deaths. We demonstrate generally similar patterns and trends for tracheal cancer as for lung cancer mortality. However, in 1984-1990, rates for tracheal cancer declined while those for lung cancer continued to increase. Declines in cancer of the trachea, and trachea, lung and bronchus likely relate to declines in tobacco use and increased tobacco control efforts (11). Between 77 – 86% of tracheal cancer patients are smokers (6). The earlier onset of the decline in tracheal cancer death rates may relate to other factors discussed below. As for lung cancer mortality, future declines for tracheal cancer are likely to follow declines in tobacco use.

Other possible factors that may relate to the observed trends include early detection, improvement in treatment outcome, and improvement in recording and coding the diagnosis on death certificates. Advances in the use of CT imaging of the chest and endoscopy may have contributed to increases in early detection, complete surgical resection with attendant improvement in 5-year survival (2, 3, 12). Advances in use of external beam radiation therapy may have improved palliative treatment. The introduction of the ninth revision of the ICD in 1999 encouraged improved and more detailed diagnostic reporting and coding for death certificates.

A majority of tracheal tumors are malignant and largely consist of squamous cell carcinoma (SCC) and adenoids cystic carcinoma (ACC). SCC is the most common form of tracheal cancer and accounts 50% to 66% of all tracheal tumor cases (1–3). The second most common ACC represents 10 to 15%. The remaining groups of tracheal tumors consist of other types of tracheal cancers. (Squamous papillomas, Neurogenic tumors, hemartomas, and hemangioma granular cell tumor are all benign in nature.)

Previously conducted studies are largely case series related and focuses primarily on management of the malignancy (3,5). Relatively few reports pertaining to the epidemiology have appeared, most from Europe (4–6). A previous United States report using data from the Surveillance, Epidemiology and End Results (SEER) system included 578 cases of primary tumors of the trachea, SCC 44.8% and ACC 16.3%, spanning over a 31 year period, the largest study done to date (1). Results from that study indicated approximately

56% of the decedents were male and further indicated the mean age of 63 at death. The incidence rate was 2.6 cases per 1,000,000 patients per year with a general overall five-year survival rate of 27.1%.

SEER-9 areas incidence data from 1975 to 2005 covering 10% of US population showed increases in age-adjusted lung cancer rates in both sexes prior to 1990 (11). Thereafter rates in men declined and rates in women leveled off. However, incidence rates for tracheal cancer were not reported.

Reports from Western Europe may also be relevant to the present data, given the nearly identical death rates for all lung cancer compared to the US (2010 Western Europe 51, US 53 deaths/100,000, source http://viz.healthmetricsandevaluation.org/gbd-compare/, last accessed 23 April 2014). In Netherlands, estimated annual incidence of primary tracheal malignancies was 1.4 new cases per 1,000,000 people (6). An analysis of the SEER 1973 -2004 database recorded 578 cases of primary tracheal carcinomas as first and only malignancy recorded (1). Of These 55.7% were men and 44.3% were women, similar to deaths in 1999 – 2010 in the US. SEER patients were 84.1% white and 9.5 % African American. In SEER 91% of cases were > = 40 years of age. Regarding histology, 44.8% of SEER cases were SCC, 16.3% ACC and 9.7% neuroendocrine tumors. ICD-10 does not permit enumeration of histologic tumor type for deaths. Regarding treatment, 34% of SEER cases did not undergo surgery and 29% did not undergo radiation while 66% had surgery and 63% had external beam radiation therapy. For cases from 2000 – 2004, 22% had localized, 37% regional, 19% distant and 20% unknown disease. Improvements in survival occurred between 1970 and 2004 likely due to improved early detection. For the entire SEER cohort five year survival was 27% 1973 - 2004, and 37% in 2000 - 2004, whereas in the Netherlands five year survival was 15% from 1989 – 2002 and 13% in Denmark from 1978 - 1995 (5,6).

Misdiagnosis followed by prolonged mismanagement negatively impacts the prognosis and subsequent mortality of patients (2,3). Insidious onset and prolonged growth usually causes patients to have clinical symptoms consistent with asthma, COPD and pneumonia. Symptoms may include cough, strider, wheeze, hoarseness, weight loss as well as hemoptysis. Tracheal tumor induced obstruction, followed by inappropriate management with steroids has the potential to exacerbate the severity of lower respiratory tract infections.

Limitations and Strengths. Statistical reports without validation of diagnosis using case histories may overestimate the occurrence of rare diseases such as primary tracheal cancer. For example, of 133 tracheal malignancies in Finland cancer registry in 1967 to 1985 only 95 cases have diagnosis confirmed after review of case records (4). Tracheal cancers showed a lower ratio of underlying causes to contributing causes of death compared to lung cancer suggesting diagnostic difficulties. ICD-10 does not permit enumeration of histologic tumor type for deaths. However, vital statistics cover 100% of the US population. Given the small number of deaths from tracheal cancer, only death rates for large population racial subgroups, namely white and black, were reliable. Incidence data for this cause were not available to the authors via CDC WONDER for this report. Yet, mortality trends provide an inexpensive surveillance tool even for rare cancers i.e. tracheal cancer.

CONCLUSIONS

US mortality data reveal about 80 deaths from primary tracheal cancer annually, the majority in males over the 45 years. Age adjusted death rates have declined since 1985. With continued progress in early detection and tobacco control this trend should continue. Although the decrease in overall tracheal cancer and all lung cancer death rates is encouraging continued tobacco control programs are needed.

Table 1

Age adjusted death rates for cancer of the trachea and all cancers of lung by gender, and race: United States 1999-2010

	Trachea		Lung	
	Rate	CI	Rate	CI
Gender				
Male	0.36	(0.33,0.39)	687.78	(686.46,689.1)
Female	0.18	(0.16,0.2)	401.51	(400.64,402.38)
M/F Ratio	2.0	-	1.7	-
Race				
White	0.26	(0.24,0.27)	527.14	(526.34,527.95)
Black	0.33	(0.27,0.39)	577.33	(574.72,579.94)
B/W Ratio	1.3	-	1.1	-
Age-groups				
25-34	*	*	3.92	(3.75, 4.1)
35-44	0.05	(0.03, 0.08)	50.84	(50.23, 51.45)
45-54	0.25	(0.2, 0.29)	294.29	(292.79, 295.79)
55-64	1.52	(0.44, 0.59)	1026.33	(1023.01,1029.64)
65-74	1.16	(1.03, 1.3)	2559.91	(2553.4, 2566.42)
75-84	1.57	(1.37, 1.77)	3692.42	(3682.83, 3702.01
85+	1.55	(1.24, 1.91)	3201.88	(3187.16, 3216.6)

* Rate per 100,000 populations. Age-standardized to the 2000 U.S. standard population
* Unreliable
CI: confidence interval

Table 2

Average annual percentage of change (APC) and 95% confidence interval (CI) for age adjusted rate: in United States 1979-2010

Cancer of the Trachea		
Year	APC	CI
1979-1984	1.9	-3.4, 7.5
1984-2010	-4.9*	-5.4, -4.5
All Cancers of Lung		
Year	APC	CI
1979-1990	1.8*	1.7, 2.0
1990-1995	-0.31*	-0.9, -0.2
1995-2004	-1.0*	-1.2, -0.8
2004-2010	-2.0*	-2.3, -1.7

* The Annual Percent Change (APC) is significantly different from zero at alpha=0.05

Figure 1

Trend in age-adjusted mortality rate of malignant neoplasms of the trachea: United States 1979-2010.

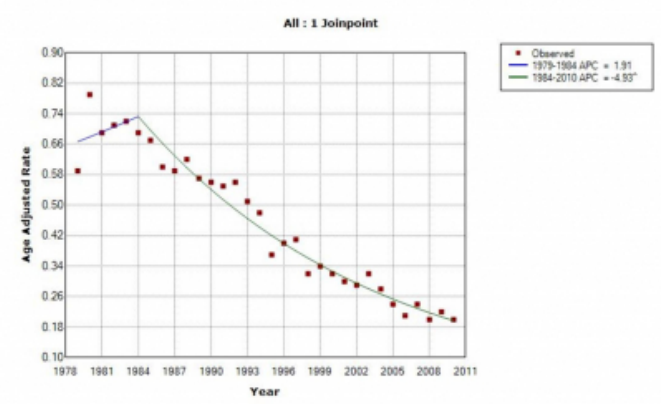
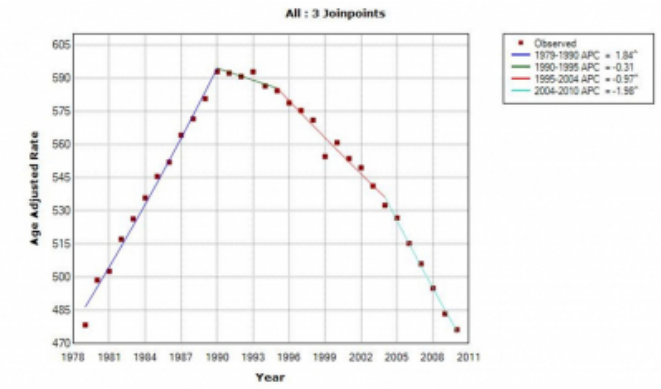


Figure 2

Trend in age-adjusted mortality rate of malignant neoplasms of the trachea, bronchus and lung: United States 1979-2010.



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