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ORIGINAL ARTICLE

Increasing Incidence of Melanoma in the Elderly: An Epidemiological Study in Olmsted County, Minnesota

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Abstract

Objective: To estimate the age- and sex-adjusted incidence of melanoma in adults 61 years or older in Olmsted County, Minnesota, from 1970 through 2009.

Patients and Methods: Using Rochester Epidemiology Project resources, 397 patients were identified who were 61 years or older and who received a first lifetime diagnosis of melanoma from January 1, 1970, through December 31, 2009, in Olmsted County. The incidence of melanoma and the overall and disease-specific survival rates were compared by age, sex, year of diagnosis, and stage of disease.

Results: From 1970 through 2009, age- and sex-adjusted incidence increased significantly ($P<.001$) from 17.0 (95% CI, 8.6-25.4) to 124.6 (95% CI, 108.9-140.3) per 100,000 person-years, with a 4-fold increase in women and a more than 11-fold increase in men. In men, incidence rates increased with age ($P<.001$) and over time ($P<.001$). In women, incidence rates increased over time ($P<.001$) but were constant across all age groups studied ($P=.90$). The dramatic increase in the incidence of melanoma was observed mainly for stages 0 and I tumors in both men and women (>55-fold increase). Disease-specific survival increased across the decades ($P<.001$); when year of diagnosis was compared to mortality, hazard ratios were 0.94 (95% CI, 0.90-0.99; $P=.010$) and 0.93 (95% CI, 0.89-0.98; $P=.006$) for men and women, respectively.

Conclusion: The incidence of melanoma in older men and women increased significantly over the past 4 decades in Olmsted County, with men experiencing higher rates of increase than did women.

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Skin cancer is the most common cancer in the United States, with malignant melanoma being one of the most fatal forms.[1] Malignant melanoma is a major cause of morbidity and mortality, and it is currently the fifth most common cancer in men and the sixth most common cancer in women.[2] In the United States, the annual age-adjusted incidence of melanoma is 18.3 per 100,000 person-years and the annual age-adjusted mortality from melanoma is 2.7 per 100,000 person-years.[3,4] In addition, the incidence of melanoma is increasing faster than the incidence of any other neoplasm, with the exception of lung cancer in women.[5] Recent studies[6,7] have found a striking increase in the incidence of melanoma over the past 40 years in cohorts of women who were young (an 8-fold increase) or middle-aged (a 24-fold increase).

Older age is an independent poor prognostic factor predicting worse survival from melanoma.[8,9] Studies[10,11] have also shown that elderly patients tend to have increased Breslow thickness, increased incidence of ulceration, and increased regression, all of which are associated with a poor prognosis. Melanoma incidence is projected to continue increasing in older adults.[12] The National Cancer Institute, using the Surveillance, Epidemiology, and End Results (SEER) Program database, reported that the number of new cases of melanoma increased from 7.9 cases per 100,000 persons in 1975 to 22.9 cases per 100,000 persons in 2012. In young and middle-aged adults, women account for most melanoma cases; however, men are disproportionately affected in older populations. According to data from the SEER Program database,[12] the incidence of melanoma in men aged 65 or older increased nearly 5-fold from 1969 to 1999 (18.8-91.9 per 100,000 persons-years). Older men also have the highest risk of dying of melanoma.

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Reporting of melanoma to large national registries is often fraught with problems of underreporting and delayed reporting.[13,14] Few true population-based epidemiology studies have analyzed the incidence and characteristics of melanoma in older men and women. The results of the present study were obtained from a well-defined patient population with estimates of the incidence and disease-specific survival of melanoma in older adults over the past 4 decades. The present study is the culmination of a series of 3 studies aimed at studying melanoma and spanning 4 decades, from 1970 through 2009, in Olmsted County, Minnesota, in young, middle-aged, and older groups.

PATIENTS AND METHODS

Patient Selection

After approval by the institutional review boards of Olmsted Medical Center and Mayo Clinic, the resources of the Rochester Epidemiology Project (REP)[15] were used to identify 397 patients aged 61 years or older who were residents of Olmsted County receiving their first lifetime diagnosis of cutaneous melanoma from January 1, 1970, through December 31, 2009. The REP was started in 1966 by Dr Leonard T. Kurland as indices of diagnosis in Olmsted County that were linked to all sources of medical data in the county. The REP allows researchers to estimate the true incidence of almost any disease that is somewhat common in the population.[16]

In the present study, *International Classification of Diseases, Ninth Revision* codes were adapted and used to identify patients with cutaneous malignant melanoma. If patients had received a diagnosis of noncutaneous melanoma, they were excluded. The diagnosis of cutaneous melanoma and residency status in Olmsted County were confirmed. For all confirmed cases of melanoma, a date of diagnosis was established according to the date of biopsy. The age and residency of each patient were also established for that date. To be included in the study, patients had to (1) have a confirmed diagnosis of cutaneous melanoma; (2) be 61 years or older; (3) be an Olmsted County resident; and (4) have received the diagnosis between January 1, 1970, and December 31, 2009. After the inclusion criteria were confirmed, several characteristics were identified from the medical record: patient demographic characteristics, melanoma location, pathologic stage, tumor subtype, Breslow thickness, clinical course, and mortality.

Statistical Analyses

With the 397 incident cases as the numerator and the age- and sex-specific county population as the denominator, incidence rates per 100,000 person-years were calculated. The denominators were obtained from a complete enumeration of the Olmsted County population provided by the REP.[17] To facilitate comparisons with other studies performed in different geographic areas, incidence rates spanning all ages and both sexes were directly age- and sex-adjusted to the structure of the 2000 US white population and incidence rates spanning all ages for men and women separately were directly age-adjusted. The relationships of age group (61-64, 65-69, 70-74, 75-79, 80-84, 85-89, and $\geq$90 years), sex, and decade of diagnosis (1970-1979, 1980-1989, 1990-1999, and 2000-2009) with incidence rates were assessed by fitting Poisson regression models with use of the SAS GENMOD procedure (SAS Institute Inc.).[6]

Continuous data are presented as medians, interquartile ranges (IQRs), and ranges; categorical data are presented as frequency counts and percentages. Overall survival and disease-specific survival were estimated using the Kaplan-Meier method. The duration of follow-up was calculated from the date of diagnosis to the date of death or last follow-up. Disease-specific survival was compared between men and women by using a log-rank test. Associations of death due to melanoma and death from any cause were evaluated using the Cox proportional hazards regression models and summarized with hazard ratios and 95% CIs. Statistical analyses were performed with the SAS version 9.3 software package. All tests were 2-sided, and *P* values less than .05 were considered statistically significant.

RESULTS

Demographic characteristics of the 397 adults in the study are summarized in Table 1. The overall age- and sex-adjusted incidence of malignant melanoma in adults 61 years or older was 72.4 (95% CI, 65.3-79.6) per 100,000