Anatomic Distribution of Malignant Melanoma on the Non-Hispanic Black Patient, 1998-2007

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Objectives: To provide a population-based description of the anatomic distribution of melanoma among non-Hispanic black patients and to explore how characteristics of this distribution relate to the etiologies previously reported for both white and black patients.

Design: Cross-sectional, retrospective.


Patients: A total of 1439 non-Hispanic black patients with a diagnosis of malignant melanoma.

Main Outcome Measures: Proportion of melanoma found per anatomic site (head, face, or neck; trunk; upper limb and shoulder; and the lower limb and hip) by patient sex, age, and region of diagnosis.

Results: The most frequent site of melanoma was the lower limb and hip (848 [58.9%]) and trunk (238 [16.5%]). The youngest median age was presented for diagnoses of the trunk (male: 56 years and females: 48 years). Presentation on the lower limb and hip accounted for most diagnoses in both the northern and southern geographic regions (north: 58.2% and south: 59.7%).

Conclusions: By increasing knowledge about the burden of this disease within the black population, our findings can be used to improve the early detection of melanoma by both the patient and the provider.

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MALIGNANT MELANOMA is the most fatal form of skin cancer, accounting for approximately 75% of all skin cancer deaths. Some studies have cited the exposure to UV radiation through sunlight as a major etiologic factor associated with the incidence of melanoma. For blacks in particular, perceptible erythema is estimated to be present at a UV radiation dose 6 to 33 times greater than in whites. Later stage at diagnosis and an increased risk of melanoma-related mortality have been linked to the timeliness of detection of cancerous lesions by the patient and the ability to seek care early when the disease is localized. Within the black population, detection efforts have been difficult because melanoma (1) has appeared in atypical, non–sun-exposed locations (eg, the feet), (2) is often of unclear etiology, and (3) may be subject to delayed identification because of the patient’s and/or the physician’s misperception of risk.

There remains a dearth of published information concerning the presentation of melanoma among blacks. Recent investigations into the anatomic site of melanoma have focused on the distribution as it relates to white patients, with authors often citing a limited number of cases as the principal reason for the exclusion of black patients from their analyses. For most published works focusing on black patients, the research dates back to the early to mid 1900s. Nonetheless, these...
studies coupled with more recent findings12-19 have found melanoma to present most frequently on non–sun-exposed areas, specifically the foot. In this study, we aimed to provide a population-based description of the anatomic distribution of melanoma among non-Hispanic black patients and to explore how characteristics of this distribution relate to the etiologies previously reported for both white and black patients. To our knowledge, this study is the most extensive population-based assessment of the anatomic distribution of melanoma in non-Hispanic blacks, using data covering 79.5% of the overall US population.

We analyzed data from 46 population-based cancer registries participating in the Centers for Disease Control and Prevention’s National Program of Cancer Registries and National Cancer Institute’s Surveillance, Epidemiology, and End Results Program. The data used were submitted in the National Program of Cancer Registries Cancer Surveillance System Call for Data and reported to the Centers for Disease Control and Prevention as of November 30, 2009, covering 79.5% of the overall US population. These registries met established criteria for high-quality data. Information on states that met established data quality criteria for the United States Cancer Statistics is available at the National Program of Cancer Registries’ website: http://www.cdc.gov/cancer/npcr/uscs/2007/technical_notes/criteria.html. Institutional review board–approval for this study was waived by the Centers for Disease Control and Prevention.

Study data were limited to microscopically confirmed cases with a primary diagnosis of invasive malignant melanoma (using the National Cancer Institute’s Surveillance, Epidemiology, and End Results Registries site recode with mesothelioma and Kaposi sarcoma field) and a reported primary site from January 1, 1998, through December 31, 2007. Information for these diagnoses was limited to data obtained at time of first primary diagnosis. Only patients who were identified in the data as having an ethnicity of non-Hispanic and a race of black were included for analysis. Hereafter, the ethnic/racial identification of these patients will be referred to as black.

Information for sex, age, state of diagnosis, and primary site was collected for all patients. Age at diagnosis was recoded into a categorical variable consisting of 44 years or younger, 45 to 64 years, and 65 years or older; considering the role of latitude on the incidence of melanoma, the state of diagnosis was regionally distributed as north and south on the basis of the US Census Bureau classification. According to the International Classification of Diseases, Ninth Revision, Clinical Modification codes, primary sites reported as skin of lip not otherwise specified (C44.1), skin of eyelid (C44.2), skin of external ear (C44.3), skin of scalp (C44.4), and skin of unspecified face (C44.3) were classified as face. Because they did not meet the objectives of this study, patients with an unspecified primary site (C44.9) (n=294) of melanoma presentation were excluded from the analysis. In total, there were 4 anatomic groups analyzed: (1) face, (2) trunk, (3) upper limb and shoulder, and (4) lower limb and hip. With the exception of the face in the anatomic groupings, all anatomic categories analyzed were based on the classification reported to the cancer registries.

Diagnoses were stratified by anatomic site for both males and females for diagnosis years 1998 through 2007. Age and region of diagnosis were examined for each stratum through descriptive analyses that provided frequencies and proportions. Cochran-Mantel-Haenszel statistics were used to identify statistical differences (P < .05) in characteristics of age and region. All analyses were performed using SAS statistical software, version 9.2 (SAS Institute, Inc).

From January 1, 1998, through December 31, 2007, a total of 1439 blacks received a diagnosis of microscopically confirmed malignant melanoma and had a reported primary site of diagnosis. Melanoma of the lower limb and hip (848 [58.9%]) and of the trunk (238 [16.5%]) were the most frequent sites for these diagnoses. Distributions for all anatomic sites are presented in the Figure. There was a similar site distribution among patients diagnosed in the northern and southern geographic regions of the United States. Presentation on the lower limb and hip accounted for most diagnoses in each of these regions (north: 58.2% and south: 59.7%).

Five hundred ninety-two patients (41.2%) in our study were male and 847 (58.9%) were female. For both groups, melanoma of the lower limb and hip (males: 312 [52.7%] and females: 536 [63.3%]) and trunk (males: 120 [20.3%] and females: 118 [13.9%]) were the most frequent sites of diagnosis. Approximately 51% of males (P = .58) and 50.3% of females (P = .62) were diagnosed in the southern region. The overall median age at diagnosis in this study was 61 years. The median (range) age at diagnosis for males was 61 (0-94) years and for females was 61 (0-99) years. By site of diagnosis, the median (range) age for male patients was 66 (2-90) years for the head, face, or neck; 56 (0-94) years for the trunk; 59 (5-92) years for the upper limb and shoulder; and 64 (0-94) years for the lower limb and hip. For female patients, the median (range) age was 54 (0-99) years for the head, face, or neck; 48 (7-93) years for the trunk; 57 (6-96) years for the upper limb and shoulder; and 65 (7-99) years for the lower limb and hip. Younger patients (≤44 years) made up a greater proportion of diagnoses of the head, face, or neck (P < .05) and trunk (P < .05) for females compared with males (head, face, or neck: 38.7% vs 20.3% and trunk: 46.6% vs 31.7%). Counts and proportions for age strata 44 years or younger, 45 to 64 years, and 65 years or older for male and female patients are presented in the Table.
COMMENT

The findings from our study provide a population-based description of the anatomic distribution of melanoma within the black population using a data set covering 79.5% of the overall US population. We report interesting findings associated with patient sex, age, and region of diagnosis that were aligned with neither the distributions nor the etiologies previously reported with the incidence of melanoma among either black or white patients. Notably, our findings are unique because we were able to stratify our analysis of the black patient with melanoma by sex.

We found melanoma most frequently presented on the lower limb and hip for both male and female black patients. Previous reports found the diagnosis of the site to be common among females and attributed the increased incidence to an elevated exposure to UV rays due to the wearing of skirts and dresses and increased host susceptibility.\(^9\)\(^{-}\)\(^{11}\)\(^{20}\)\(^{-}\)\(^{27}\) Notwithstanding these reports, we believe UV exposure provides only a partial explanation for the increased incidence observed among female patients in our study. From unpublished analyses, we found in female patients that 27% of the diagnoses of the lower limb and hip were of the subtype acral lentiginous melanoma. A common subsite among melanoma diagnoses in blacks,\(^28\)\(^{-}\)\(^{39}\) acral lentigious melanoma has not previously been found to be associated with increased exposure to UV rays. Future subtype-specific studies are needed to identify additional risk factors for melanoma of the lower limb and hip as it relates to the black female population.

Earlier studies of white male patients found diagnoses to occur primarily on the head, face, or neck and trunk,\(^9\)\(^,\)\(^{10}\)\(^{-}\)\(^{21}\)\(^{-}\)\(^{25}\)\(^{-}\)\(^{30}\)\(^{-}\)\(^{33}\) yet these sites (combined) accounted for only 33.6% of the overall diagnoses in males in our study. The low proportion of diagnoses we found for the head, face, or neck and trunk in males, as well as in females (24.9%), is potentially an outcome of the greater inherent protection blacks have against UV radiation exposure. Future studies are needed to assess and compare the role of environmental factors (eg, occupation) associated with potential exposure that may provide further explanation for the differences between white and black males diagnosed with melanoma. To our knowledge, this study is the first to report that melanoma of the trunk may disproportionately affect patients at a younger age. Among white patients, diagnoses to this site have been associated with a patient's inherent susceptibility, such as family history of melanoma, hair color, and nevi count.\(^31\)\(^,\)\(^{34}\)\(^{-}\)\(^{35}\) Detailed data, potentially captured through medical record reviews or clinical cohorts, are needed to gain information to assess the role of each of these factors on the age-specific incidence within the black population.

Females presented with diagnoses of the head, face, or neck at an age 7 years younger than the overall median age at diagnosis for females in this study. This finding is somewhat concerning, considering that the younger age of the patient may reflect a greater susceptibility of black females for melanoma to a site that is more often presented in older white patients.\(^9\)\(^,\)\(^{11}\)\(^{-}\)\(^{32}\)\(^,\)\(^{36}\) Acknowledging the perceived predominance of dark hair color among black females, our findings are contrary to earlier suggestions that dark hair color serves as a protective factor against developing melanoma of the head and neck.\(^9\)\(^,\)\(^{30}\)\(^,\)\(^{31}\)\(^,\)\(^{-}\)\(^{37}\)\(^{-}\)\(^{39}\) In addition, younger white female patients are more likely to present with melanoma on the lower limb and hip.\(^40\)\(^,\)\(^{41}\) Females in our study were diagnosed with the oldest median age for this site. Without knowing the severity of the disease at diagnosis, we cannot determine whether the age at diagnosis presented here is merely an artifact of the health-seeking behaviors related to the patient's age or whether our findings are more indicative of disease progression among the black female population.

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**Table.** Characteristics of Non-Hispanic Black Persons Diagnosed With Malignant Melanoma by Anatomic Site, 1998-2007

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Anatomic Site</th>
<th>Head, Face, or Neck</th>
<th>Trunk</th>
<th>Upper Limb and Shoulder</th>
<th>Lower Limb and Hip</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. (%)</td>
<td>P Value</td>
<td>No. (%)</td>
<td>P Value</td>
<td>No. (%)</td>
<td>P Value</td>
</tr>
<tr>
<td>Males</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Age, y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;44</td>
<td>16 (20.3)</td>
<td>.14</td>
<td>38 (31.7)</td>
<td>&lt;.05</td>
<td>23 (28.4)</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>45-64</td>
<td>22 (27.8)</td>
<td>.48</td>
<td>40 (33.3)</td>
<td>&lt;.05</td>
<td>31 (38.3)</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>&gt;65</td>
<td>41 (51.9)</td>
<td>.62</td>
<td>42 (35.0)</td>
<td></td>
<td>27 (33.3)</td>
<td></td>
</tr>
<tr>
<td>Region of diagnosis</td>
<td></td>
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<tr>
<td>North</td>
<td>38 (48.1)</td>
<td>.56</td>
<td>68 (56.7)</td>
<td>.18</td>
<td>40 (49.4)</td>
<td>.73</td>
</tr>
<tr>
<td>South</td>
<td>41 (51.9)</td>
<td>.56</td>
<td>52 (43.3)</td>
<td></td>
<td>41 (50.6)</td>
<td>.73</td>
</tr>
<tr>
<td>Total</td>
<td>79 (100)</td>
<td></td>
<td>120 (100)</td>
<td></td>
<td>81 (100)</td>
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<tr>
<td>Females</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Age, y</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;44</td>
<td>36 (38.7)</td>
<td>.14</td>
<td>55 (46.6)</td>
<td>&lt;.05</td>
<td>26 (26.0)</td>
<td>.14</td>
</tr>
<tr>
<td>45-64</td>
<td>22 (23.7)</td>
<td>.05</td>
<td>33 (28.0)</td>
<td>&lt;.05</td>
<td>39 (39.0)</td>
<td></td>
</tr>
<tr>
<td>&gt;65</td>
<td>35 (37.6)</td>
<td>.05</td>
<td>30 (25.4)</td>
<td>&lt;.05</td>
<td>35 (35.0)</td>
<td>.05</td>
</tr>
<tr>
<td>Region of diagnosis</td>
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<td></td>
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<tr>
<td>North</td>
<td>52 (55.9)</td>
<td>.21</td>
<td>58 (49.2)</td>
<td>.20</td>
<td>47 (47.0)</td>
<td>.57</td>
</tr>
<tr>
<td>South</td>
<td>41 (44.1)</td>
<td>.21</td>
<td>60 (50.8)</td>
<td></td>
<td>53 (53.0)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>93 (100)</td>
<td></td>
<td>118 (100)</td>
<td></td>
<td>100 (100)</td>
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To create a proxy for UV exposure, we categorized the United States into 2 geographic regions on the basis of US Census Bureau designations of north and south. The southern region of the United States has experienced an increased overall incidence of melanoma presumed to be related to the higher levels of UV exposure associated with the lower degrees of geographic latitude of the region.42-45 We anticipated that this region would give us a higher incidence of diagnoses on the head, neck, shoulders, and trunk because of its geographic latitude.9,31,32,37 However, we found these sites yielded only 40% of the diagnoses of the southern region. Potentially, the use of spatial-temporal measurements could provide more exact correlations between UV exposure for each state observation and could be of value in future assessments of the role of UV exposure on melanoma presentation among blacks.

We were challenged by the systematic grouping of the anatomic site within our data. Cancer registries consolidate the foot with the lower limb and hip, which limited our ability to compare our findings with earlier reports12-19 that found an increased occurrence of melanoma on the foot of black patients. Nonetheless, by using the histological features of acral lentiginous melanoma, we report approximately 26% of the overall diagnoses of the lower limb and hip did present on the foot, although this proportion likely remains an underestimate because acral lentiginous melanoma is not coded for the plantar region. With an etiology of melanoma on the foot remaining uncertain, researchers have speculated trauma as a leading factor for melanoma of this site in blacks.12,46 A 1948 hospital medical record review found 50% of all black patients were diagnosed with melanoma of the foot, with 46% of these patients having antecedent trauma to the primary site at diagnosis.17

Our study has several limitations. First, counts of melanoma in cancer registry data are likely to be substantially underestimated. A significant proportion of melanoma diagnoses occur in private physicians’ offices and/or outpatient settings, and these sites have been found to underreport cases to their state and local cancer registries.47-49 Second, there is a lack of specificity in the designation of anatomic sites in the data analyzed in this study. In the future, cancer registries may be able to provide a more refined descriptive categorization of anatomic sites, which in turn will increase the precision of any analysis using the registry data’s primary site variable. Third, the data analyzed in this study lacked sufficient reporting of the cancer stage information, as well as survival data—both could have been used to assess the severity of the melanoma presented at diagnosis. Fourth, as a proxy for UV exposure geographic region based on US Census Bureau classification of northern and southern regions of the US was used—this provides only a proxy. For instance, states located in the Midwest/Central United States were included in both the northern and southern regions, potentially confounding any region-specific findings presented here. Finally, our limited sample size did not allow us to examine interaction in multivariate analyses. Despite these limitations, our study is strengthened by the fact that patient information was ascertained from a population-based data set that captured 79.5% of the overall US population during our study period and met high-quality standards required of United States Cancer Statistics data.

To our knowledge, this is the first population-based study to examine the anatomic distribution of malignant melanoma in the non-Hispanic black population. The ambiguity of the anatomic site designations in the current cancer registry data collection prevented us from drawing a direct comparison between our findings and those of the earlier works that had reported a higher incidence of melanoma on the foot of black patients. Nonetheless, our results provide a national baseline for future studies examining the anatomic distribution of melanoma and update the epidemiology of melanoma as it relates to blacks. By increasing knowledge about the burden of this disease within the black population, our findings can be used to improve the early detection of melanoma by both the patient and the provider.

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Author Contributions: Mr Myles, Drs Buchanan, White, and Wu, and Ms King had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Myles, Buchanan, Singh, White, and Wu. Acquisition of data: Myles and Wu. Analysis and interpretation of data: Myles, Buchanan, King, White, Wu, and Ajani. Drafting of the manuscript: Myles, Buchanan, Singh, White, and Wu. Critical revision of the manuscript for important intellectual content: Myles, King, Singh, White, Wu, and Ajani. Statistical analysis: Myles, King, Singh, White, and Wu. Obtained funding: Wu. Administrative, technical, and material support: Myles, Buchanan, Singh, and Wu. Study supervision: Myles, Wu, and Ajani.
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REFERENCES

Barriers in Melanoma Detection in Ethnic Minorities

**KNOWLEDGE**

Population-based studies are needed. As dermatologists, we must be the leaders in research in melanoma. With overall incidence lower in these patient cohorts, we must begin by having a complete data set. Physicians are required by law to report melanoma to central cancer registries; however, there is a persistent knowledge and practice gap in implementation.

**PATIENT PERCEPTION**

We must improve the ability to identify a suspect lesion by patient and provider. Our patient advocacy efforts should reach all target populations. In single-ethnicity focus groups conducted in Chicago, persons who self-

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