To ensure that the BMR was based only on lesions removed owing to a clinical suspicion of malignancy, we collected the clinical differential diagnoses for all pigmented lesions biopsied. We defined clinically suspect lesions as those for which the study dermatologist’s differential diagnosis indicated melanoma and/or dysplastic nevus on the pathology requisition form. In this way, lesions removed for cosmetic purposes were excluded from the BMR.

Statistical Analysis. The BMR for each year was determined by dividing the total number of clinically suspect, histologically proven benign pigmented lesions (including dysplastic nevi, common nevi, seborrheic keratoses, solar lentigines, lichen planus–like keratosis, and pigmented actinic keratoses) by the total number of histologically proven melamomas.

Results. The histologic diagnoses rendered for all clinically suspect pigmented lesions biopsied during periods 1 and 2 and their BMRs are listed in the Table. For the general dermatologist, the ratio initially increased in the first year of dermoscopy use from 18.4:1 to 22.5:1. After additional dermoscopy use, however, this ratio decreased markedly to 7.9:1. The BMR of the general dermatologist in the last year of dermoscopy use approached that of the PLS (7.9:1 vs 6.0:1). The BMR for the PLS ranged from 3.2:1 to 9.0:1 during the study period.

Comment. In this pilot study, we demonstrated a positive impact of dermoscopy on the management of clinically suspect pigmented lesions by a general dermatologist. Following the introduction of dermoscopy into his practice and an approximately 18-month learning curve, the general dermatologist achieved a BMR that approached that of the PLS.

This study suggests that general dermatologists may improve their management of pigmented lesions by incorporating dermoscopy into their practices. In addition, our data support the notion that the learning curve for dermoscopy is a long one, and they underscore the value of providing dermoscopy training to dermatology residents so that they will be proficient users on graduation. Finally, we hope that results from this study can begin to alleviate concerns of general dermatologists and third-party payers regarding the use of dermoscopy by non-PLSs.

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Distribution of Skin Type and Skin Cancer in Organ Transplant Recipients

The higher risk of skin cancer, especially squamous cell carcinoma (SCC), in the organ transplant recipient (OTR) population compared with the general population is well documented. Cumulative incidences have been noted as high as 70% to 82.1% in kidney transplant recipients (KTRs) after 20 years of immunosuppression. In the OTR population, high sun exposure, especially in the first 30 years of life, increased age at the time of the transplant, and length of exposure to immunosuppressive therapy are associated with the development of skin cancer. Borde et al found that exposure to immunosuppression for over 10 years conferred a risk of skin cancer almost 10 times higher than exposure to immunosuppression for less than 5 years.

For SCC, an adjusted odds ratio of 4.3 was found for KTRs with Fitzpatrick skin type 1 or 2 to develop SCC. Among KTRs who developed skin cancer, skin type 2 was the most common skin type and was a statistical risk factor with a hazard ratio of 3.4 for KTRs developing any type of skin tumor; however, inclusion of KTRs with all skin types was very limited. Our hypothesis is that OTRs with skin types 3 through 6 have less risk of developing skin cancer than those with skin types 1 and 2. Given similar environmental exposure to UV light, we hypothesized that the duration of immunosuppression prior to developing skin cancer would be greater for OTRs with skin types 3 through 6 than for those with skin types 1 and 2. Our study of OTRs with all skin types investigated skin cancer development and age of OTR at time of transplant, skin type, and duration of immunosuppression.
Table. Characteristics of Organ Transplant Recipients

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Without Skin Cancer</th>
<th>With Skin Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total No. of patients (N=743)</td>
<td>643</td>
<td>100</td>
</tr>
<tr>
<td>Transplant type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kidney (n=680)</td>
<td>583</td>
<td>97</td>
</tr>
<tr>
<td>Liver (n=63)</td>
<td>60</td>
<td>3</td>
</tr>
<tr>
<td>Age at time of transplant, mean (SD), y</td>
<td>42 (4.1)</td>
<td>59 (8.1)</td>
</tr>
<tr>
<td>Fitzpatrick skin type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 or 2 (n=409)</td>
<td>328</td>
<td>81</td>
</tr>
<tr>
<td>3-6 (n=334)</td>
<td>315</td>
<td>19</td>
</tr>
<tr>
<td>Duration of immunosuppression, mean (SD), y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skin type 1 or 2</td>
<td>4.5 (5.3)</td>
<td>7.5 (3.2)</td>
</tr>
<tr>
<td>Skin type 3-6</td>
<td>5.2 (4.8)</td>
<td>8.9 (5.2)</td>
</tr>
</tbody>
</table>

*Unless otherwise indicated, data are reported as number of patients.

b P<.001 for the χ² test.

Methods. From 2007 to 2009, we conducted 10-minute telephone interviews of OTRs whose transplants were performed at Northwestern Memorial Hospital in Chicago, Illinois, between November 12, 1977, and January 8, 2009. Skin type, date(s) and type of transplant(s), duration of immunosuppression, and skin cancer history were based on participants’ self-reports. Participants were asked to select the response that most closely described their skin tone among the following 6 choices: very fair, fair, olive, light brown, dark brown, and very dark. The skin color scale has good reliability (κ=0.71) and validity compared with the standard Fitzpatrick phototype scale.12,13 We reviewed the medical record to confirm the date of the transplant(s), and the pathology report, when available, to confirm the type of skin cancer. The research was approved by the institutional review board of Northwestern University.

Cumulative incidences of skin cancer were computed for 2 categories: (1) OTRs with skin type 1 or 2; and (2) OTRs with skin types 3 through 6. The number of person-years of immunosuppression was computed between the date of the transplant (used as the starting date) and either the date of skin cancer diagnosis (considered as the end point) or the end of the study (October 2009). A χ² test was used to detect differences among groups. In all analyses, a 2-sided α level of .05 was considered statistically significant.

Results. Among the 775 living OTRs with valid telephone numbers, 743 participated, for a 95% response rate, and 32 declined to participate because they were too busy. The participants consisted of 63 liver transplant recipients and 680 KTRs. Development of skin cancer was associated with skin types 1 and 2 and age greater than that of those who did not develop skin cancer (P<.001) (Table). A longer period of immunosuppression was associated with development of skin cancer in all OTRs (P<.001). Five percent of those with skin types 3 through 5 developed skin cancer compared with 19% of those with skin type 1 or 2.

Comment. In this study, skin cancer in OTRs was associated with skin types 1 and 2, older age at the time of the transplant, and longer duration of immunosuppression. Interestingly, 5% of those with skin types 3 through 5 developed skin cancer compared with 19% of those with skin types 1 and 2; therefore, darker skin conferred some protection against developing skin cancer. Other studies of OTRs have not defined the incidence of skin cancer among those with skin types 3 through 5.10 In our study, the mean duration of immunosuppression prior to developing skin cancer was greater in those with darker skin; however, it was within the average time of development of skin cancer previously estimated to range from 4 to 9 years after an organ transplant.14

Limitations of our study included the relatively small number of OTRs with skin types 3 through 5, self-report of skin type, our inability to confirm the cumulative dose of immunosuppression, and in some cases our inability to review the pathology report to confirm the type of skin cancer. Our database did not include assessment of sun damage or precancerous lesions at the time of the transplant or history of sun exposure prior to the transplant.

The limited protective effect of skin pigmentation against carcinogenic UV light was demonstrated in our study of OTRs with all skin types. Organ transplant recipients with skin types 3 through 5 underwent a longer period of immunosuppression than those with skin types 1 or 2 before developing skin cancer. All OTRs must receive sun protection messages, take primary prevention measures to minimize their sun exposure, and undergo regular skin examinations with their dermatologists.

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Author Contributions: Study concept and design: Yoo and Robinson. Acquisition of data: Buoy, Alam, and Robinson. Analysis and interpretation of data: Buoy, Ortiz, West, Gordon, and Robinson. Drafting of the manuscript: Buoy and Robinson. Critical revision of the manuscript for important intellectual content: Buoy, Yoo, Ortiz, West, and Gordon. Administrative, technical, and material support: Buoy, Yoo, Ortiz, West, and Robinson. Study supervision: West and Robinson.

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VIGNETTES

Combined Multifocal Indeterminate Cell Histiocytosis and Basal Cell Carcinoma

Report of a Case. An 85-year-old white man with a history of nonmelanoma skin cancer involving basal cell carcinomas (BCCs) and a remote history of smoking 50 years ago presented with a 1.4-cm nodule of the right neck and its cells stain with S-100 and CD1a. Indeterminate cell histiocytosis is differentiated from LCH by lacking both Birbeck granules and langerin and by reacting with immunostain CD68 (a macrophage marker). While EM is used to identify Birbeck granules, it is rarely performed. An immunostain for langerin has recently become available that is specific for LCH.1 Langerin (CD207) is a member of the lectin family of transmembrane glycoproteins that mediate antigen uptake and delivery to Birbeck granules.

During the next 2 years, the patient developed yellow papules of the head, neck, and back. Six biopsy specimens demonstrated similar histiocytic infiltrates without BCCs. The patient was examined by an oncologist biannually to rule out systemic histiocytosis or other malignant neoplasms, and serial computed tomography, magnetic resonance imaging, and bone scans revealed no abnormalities.

Comment. Indeterminate cell histiocytosis (ICH) is a rare histiocytic neoplasm. It is morphologically similar to LCH, and its cells stain with S-100 and CD1a. Indeterminate cell histiocytosis is differentiated from LCH by lacking both Birbeck granules and langerin and by reacting with immunostain CD68 (a macrophage marker). While EM is used to identify Birbeck granules, it is rarely performed. An immunostain for langerin has recently become available that is specific for LCH. Langerin (CD207) is a member of the lectin family of transmembrane glycoproteins that mediate antigen uptake and delivery to Birbeck granules.