Objective: To establish the anatomical site distribution of cutaneous squamous cell carcinoma (SCC) in organ transplant recipients (OTRs) with regard to age and sex.

Design: Retrospective population-based cohort study of OTRs.


Patients: From the cohort of 5931 OTRs, we could include 179 patients with 475 cutaneous SCCs. Information on the sites was received from the cancer registry and from the histopathological reports.

Results: The site of each SCC was registered in a computer program displaying the results on a 3-dimensional human figure. The head and neck were the predominant sites in male patients, and the trunk was the predominant site in female patients. The most common site in younger patients (born in 1940 or after) was the chest; and in older patients, the face. The ear was a common site in male patients, but, in contrast, no tumors were located there in female patients. Overall, the OTRs were younger compared with the overall Swedish population with cutaneous SCC.

Conclusions: There are differences in the anatomical site distribution of cutaneous SCCs in OTRs with regard to sex and age, and with regard to the general distribution in Swedish patients. The level of sun exposure is considered the most important factor in explaining those differences, and highlights the importance of sun avoidance in this group of patients.
The doll can be turned in any position, and along with an additional zoom function any part of the skin is easily visualized in detail. The tumor in question was positioned on the doll with a pointer and then clicked in place. One of us (N.M.) recorded all tumors using this computer program. Skin surface areas and subareas can be selected on the doll, and enable calculation of any desired tumor density. The chosen areas appear together, with a legend describing the total number of tumors in the area.

The 475 tumors consisted of 387 SCCs and 88 SCCs in situ. Of the patients, 49.2% had 1 SCC, 47.4% had 2 to 10 SCCs, and 3.4% had 11 to 26 SCCs. The anatomical site distribution of the SCCs is shown for both sexes in the Table. As expected, the predominant sites were located on sun-exposed areas. The head and neck were the predominant sites in male patients, while SCCs on the trunk, especially on the chest and extremities, were more frequently observed in female patients. No SCCs were located on the ears of the female patients, in contrast to the male patients, who had many SCCs at that site (Figure 1).

The site distribution of SCC by age (Figure 2) shows that older (born before 1940) patients’ SCCs are located predominantly on the head, while younger patients have their SCCs predominantly on the trunk and extremities.

We also compared the age distribution of the SCCs (n=475) in OTRs (Figure 3A) with the general age distribution of the SCCs (n=2562) in the Swedish Cancer Registry, 1997 (Figure 3B). The SCCs in OTRs are much more common in younger persons than in the general population in the Swedish Cancer Registry, reflecting the increased risk of cancer after transplantation.

The main finding of our study was that the anatomical site distribution of SCCs in OTRs differed depending on sex and age, and that SCCs in younger persons are more common than in the general population of Swedish SCC patients. The most common sites were the head and neck for males, and the trunk for females. These findings, together with the fact that several SCCs were located on the ears of males in contrast to females (who had no SCCs there), point out the importance of UVR. Because of differences between males and females with regard to hairdo fashions, the obvious explanation might be that females had protection from their hair. That younger patients had their SCCs predominantly on the trunk and extremities is a bit more difficult to explain in terms of UVR exposure. One probable explanation is that the protection of hair is important also in this regard to hairdo fashions, the obvious explanation might be that females had protection from their hair. That younger patients had their SCCs predominantly on the trunk and extremities is a bit more difficult to explain in terms of UVR exposure. One probable explanation is that the protection of hair is important also in this group, and prevents the high incidence on the head and neck. As young males grow older, many of them lose their hair protection and become bald. Apart from the hair protection factor, the angle of incident UVR entering the skin at different body sites seems to be important. Obviously, this factor can explain the concentra-

Table. Anatomical Site Distribution of 475 Squamous Cell Carcinomas in Organ Transplant Recipients Related to Sex

<table>
<thead>
<tr>
<th>Site</th>
<th>Males (n = 329)</th>
<th>Females (n = 146)</th>
<th>Total (N = 475)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head and neck</td>
<td>195 (59.3)</td>
<td>30 (20.5)</td>
<td>225 (47.4)</td>
</tr>
<tr>
<td>Trunk</td>
<td>54 (16.4)</td>
<td>48 (32.9)</td>
<td>102 (21.5)</td>
</tr>
<tr>
<td>Upper extremity</td>
<td>63 (19.1)</td>
<td>39 (26.7)</td>
<td>102 (21.5)</td>
</tr>
<tr>
<td>Lower extremity</td>
<td>17 (5.2)</td>
<td>29 (19.9)</td>
<td>46 (9.7)</td>
</tr>
</tbody>
</table>

*Data are given as number (percentage) of each group. Percentages may not total 100 because of rounding.

METHODS

PATIENTS

From the Swedish organ transplant cohort composed of 5931 patients who underwent transplantation of their kidney (n=5139), liver (n=397), or other organ (heart, lung, and pancreas) (n=395) from January 1, 1970, through December 31, 1997, described in detail elsewhere,3,8 we selected all patients, living or dead, with cutaneous SCC who were registered in the national Swedish Cancer Registry.

We could identify 273 patients with a total of 656 SCCs. After approval from the Karolinska Institute Research Ethical Committee and with a written consent from all living patients, we sent a request to all 33 different histopathological laboratories that had reported the SCCs and asked for the original histopathological reports. With this method, 179 patients (69.9%) could be identified who had SCCs and 34 had no SCCs. The histopathological reports for each patient and tumor were reviewed and categorized on the basis of sex and age, and that SCCs in younger persons are more common than in the general population of Swedish SCC patients. The anatomical site distribution of SCCs in OTRs differed depending on sex and age, and that SCCs in younger persons are more common than in the general population of Swedish SCC patients. The most common sites were the head and neck for males, and the trunk for females. These findings, together with the fact that several SCCs were located on the ears of males in contrast to females (who had no SCCs there), point out the importance of UVR. Because of differences between males and females with regard to hairdo fashions, the obvious explanation might be that females had protection from their hair. That younger patients had their SCCs predominantly on the trunk and extremities is a bit more difficult to explain in terms of UVR exposure. One probable explanation is that the protection of hair is important also in this group, and prevents the high incidence on the head and neck. As young males grow older, many of them lose their hair protection and become bald. Apart from the hair protection factor, the angle of incident UVR entering the skin at different body sites seems to be important. Obviously, this factor can explain the concentra-

RESULTS

The Swedish Cancer Registry, started in 1958, receives reports on all incident malignant tumors diagnosed in Sweden. Reporting by diagnosing physicians and pathologists is mandatory by law, resulting in registration of more than 98% of all tumors, with histopathological verification of 97% of the tumors.2 For skin tumors, these figures are close to 100%. Basal cell carcinomas were also included.

TUMOR SITE REGISTRATION

The histopathological reports for each patient and tumor were reexamined. These reports include the original description of the tumor site made by the clinicians. The site of the tumor was registered by a newly created computer program (Essdol).13 This program contains 4 different windows for the following: (1) tumor site registration, (2) selection of areas, (3) analyses, and (4) statistical queries. Each of these windows displays a movable 3-dimensional human figure (doll).
tion of SCCs on the chest of females, and the fact that the arms are a more common site than the legs in OTRs. However, there are probably several other important risk factors that might differ in different age groups, including sun habits, the immunosuppressive regimen, and infection with human papillomavirus. Genetic factors and skin type are also important.

When the tumors were plotted, we mainly used data from the histopathological reports. In doing so, we were able to achieve a more precise anatomical location than the information already existing in the Swedish Cancer Registry (ie, body sites according to International Classification of Diseases, Seventh Revision [ICD-7] code). Despite the many studies reporting skin cancer in OTRs, only a few have reported the anatomical site distribution of the tumors. In a study of 138 SCCs in 39 patients from the Netherlands, SCCs in renal transplant recipients were far more often confined to sun-exposed areas than basal cell carcinomas.4 In a study of 580 kidney and 150 heart transplant recipients from France, most premalignant and malignant epithelial lesions were located on sun-exposed areas.14 These findings correspond with our research. In another study of 33 SCCs in 94 patients from Italy,7 the researchers concluded that the anatomical site distribution of the SCCs diagnosed in their OTRs roughly resembled the distribution in the general population. However, in that study, the figures used for the anatomical site distribution in the general population were not based on the population of Italy. The resemblance with the general population was also found in this study when including only first cancers, and adjusting for age differences between the OTRs and the general population. This implies that the transplantation and immunosuppression do not change the site distribution of first cancers. However, the site distribution for all cancers (Table) differs from the distribution of the general population. This difference comes from a different site distribution

Figure 1. Distribution of squamous cell carcinomas in the head and neck region of organ transplant recipients.
of nonfirst cancers. A few patients with many cancers affect the site distribution of cancers because some of their cancers are clustered on the same anatomical site. The influence of these extremes is most noticeable for female patients, because the number of patients was fewer compared with males (47 vs 132). As an example of the clustering, the patient with the most cancers had 26, 21 of which were located on the trunk.

Our findings again stress the importance of extensive education of OTRs about the risk of developing skin cancer and its association to sun exposure. They should be advised to wear protective clothing and use an effective UV-B/UV-A sunscreen with a sun protective factor of 15 or higher daily, and tanning bed use should be prohibited. Patients with Fitzpatrick skin type I or II must be even more strictly advised, and males should protect their ears from sun exposure. Despite the advice given to OTRs, their knowledge about the skin cancer risk and preventive measures is not good. In a British study, only 54% of the OTRs remembered receiving such advice, and in a recent study, only 42% of OTRs with SCC and 39% of control OTRs (without SCC) stated that they had received information about sun protection.

In conclusion, there are differences in the anatomical site distribution of SCCs in OTRs with regard to sex, age, and the general distribution in Swedish patients. This must be considered to optimize the monitoring of this group of patients.

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Correspondence: Bernt Lindelof, MD, PhD, Department of Dermatology, Karolinska Hospital, S-171 76 Stockholm, Sweden (bernt.lindelof@karolinska.se).

REFERENCES


