### Background:
Epidemiological studies concerning melanoma are most often performed by general practitioners and dermatologists in patients previously aware of the risk of nevi.

### Objective:
To determine the efficiency of early detection of melanoma by occupational medicine specialists trained in the use of ABCDE criteria during annual systematic examination of workers.

### Methods:
A total of 370 subjects with suspect lesions that demonstrated at least 2 of 5 ABCDE criteria were selected from 65,000 employees examined; these subjects were requested to see their physician about possible excision. Of the 370 subjects, 273 (73.8%) were seen at a second-year follow-up visit to determine their outcome.

### Results:
Among the 273 subjects who were seen again, 172 (63.0%) had consulted a physician. For the 101 subjects who had not seen a physician, the main reason was the negligence (86.1%). A total of 353 atypical nevi were observed. The mean number of ABCDE criteria noted per lesion was 2.6. Lesion diameter greater than 6 mm was the most frequent (80.5%) and enlargement the least frequent criteria seen; heterochromous coloration and diameter greater than 6 mm was the most common association (54.5%). Five histologically confirmed melanomas were found among nevi excised in 78 subjects.

### Conclusion:
This screening approach seems efficient for the early detection of melanoma, demonstrating an incidence of 7.7 per 100,000 vs 9 per 100,000 in the general French population.

### Early Detection
EARLY DETECTION of melanoma is usually the result of screening campaigns conducted by dermatologists or general practitioners. However, selection bias can be a limiting factor in this approach since participating subjects are often well aware of the risk of the disease. Screening can also take place in the context of occupational medicine, which in France operates as an established medical program that requires no additional structures or special funding for this purpose and avoids selection bias through systematic application. In fact, occupational medicine specialists (OMS) conduct an annual complete clinical examination of the French working population, which in 1995 represented 25.6 million persons (43.6% of the total population). As these examinations are mandatory for employees aged 18 to 65 years, bias through volunteer selection is avoided. Finally, OMS are totally independent in their relations with the persons examined since they are not in the liberal sector (ie, physician working in a private office).

As no studies appear to have evaluated melanoma detection in occupational medicine, we developed a screening program conducted by OMS trained initially in ABCDE criteria. Screened subjects with a suspect lesion were requested to see their family physician. One year later, they were seen or contacted again to determine the outcome.

### Results
CHARACTERISTICS OF SUBJECT RESPONSES
A total of 172 subjects (63.0%) were seen by a single physician, and 20 by 2 physicians. A total of 192 visits were made, ie, 1.12 per subject. Among the 172 subjects seen by a single physician, 114 (66.3%) were examined by a dermatologist, 36 (20.9%) by a general practitioner, 16

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SUBJECTS AND METHODS

SUBJECTS

The subjects studied were from firms in and around Nantes, which is located in an area along the French Atlantic coast with 3 million inhabitants. In the first year of the study (1995), 65,000 workers were examined by OMS; 370 (0.6%) of whom had a nevus presenting 2 of the 5 ABCDE criteria or criterion E alone. Because of the mobility of workers and the transfers of some OMS, 273 (73.8%) of the 370 subjects selected the first year were seen again the second year.

The male-female sex ratio was 1:2 and median age was 33 years. Two men had a personal history of melanoma, and 13 individuals had a family history of melanoma. The median phototype of the population studied was type III (fair or brown hairs with clear to matte color, sometimes burning, usually tanning) according to the standardized classification system.

A summary of the main steps and results of the study are shown in the Figure.

STUDY DESIGN

A cross-sectional study was conducted in a population of salaried workers, requiring 2 visits to an OMS at a 1-year interval. To ensure that the group of investigators was homogeneous, 29 OMS received training in the use of ABCDE criteria. These criteria were adopted from the checklist of the American Cancer Society (A, asymmetry; B, irregular border; C, heterochromous coloration; D, diameter > 6 mm; E, enlargement). The training was organized by a senior dermatologist (B.D.) who used slides to define the ABCDE criteria during a 2-hour session. Training was performed by the projection and discussion of more than 50 cutaneous pigmented lesions during 2 hours' training. The OMS were requested to conduct a complete examination of the skin surface but not to change anything else in their routine procedure. A lesion was defined as “suspect” if it demonstrated 2 of the 5 ABCDE criteria or criterion E alone. When an OMS detected 1 or more suspect lesions, the subject was asked to see his or her family physician or a specialist concerning possible excision. The OMS also recorded the subject’s characteristics (sex, age, phototype, possible history of melanoma) and those of the suspect nevus (site, whether multiple, congenital, etc). The ABCDE criteria involved were also noted. At the request of the subject, the OMS could arrange an appointment with a physician (general practitioner or dermatologist). Meetings were held twice a year by the steering committee to determine how the study was proceeding.

During the next annual visit (in 1996), the OMS determined whether the subject had followed his or her advice concerning possible excision of the suspect nevus. All conclusions made by the physicians who had seen subjects for the lesions were noted and rated as “benign,” “requiring follow-up,” and “requiring excision.” Subjects not seen again the second year were sent a questionnaire to determine the follow-up status of their lesion. If necessary, telephone calls were made. If the lesion had been excised, the histological report was obtained, whenever possible, from the physician concerned. If melanoma had been diagnosed, the slides were interpreted a second time by another pathologist. Finally, a letter was sent to all physicians examining a subject to compare the decisions actually made with those understood by the subject himself or herself.

Subjects gave their oral consent to participate in the study, and their anonymity was preserved. Written consent was obtained in the event of any medical correspondence concerning a subject.

STATISTICAL ANALYSIS

Variables were studied by the χ² test, t test, and analysis of variance (α risk set at 5%). Analysis was also performed, when appropriate, on variables stratified as to age and sex, which did not affect the results. Three factors from more than 1 category (age, phototype, and number of criteria) were analyzed by the Mantel-Haenszel extended χ² test. Finally, multivariate analysis by logistic regression was performed on some variables using Logistic software. Five models were constructed to analyze the congenital nature of the lesion, awareness that the lesion existed, influence of the medical appointment, factors affecting excision, and criteria related to an at-risk histological condition.

(9.3%) by a hospital physician, and 6 (3.5%) by a surgeon. The decision to see a physician was not influenced by age or a history of melanoma.

The reasons why 101 subjects (37.0%) did not see a physician are various but the first 3 reasons (86.1%) can be attributed to negligence. Indeed, 30.7% considered "it was not important." 30.7% said they forgot, 30.7% had no time for seeing a physician, 8.9% were afraid, 1% considered it was not necessary, and 4% gave another reason.

FOLLOWING ADVICE

Sixty-six subjects (24.3%) had already seen a physician for their lesion before the beginning of the study, and 20 had ignored the recommendation to have it excised. There were 78 excisions of lesions performed.

Two women among the 78 subjects who underwent excision requested removal of a growth, contrary to the advice of the dermatologist. One had a "benign" intradermal nevus, and the other a seborrheic keratosis "requiring follow-up." It was determined that in all other cases excision was performed after being recommended by a physician.

Among the 94 subjects whose lesion had not been removed, 7 (7.4%) had been advised that excision was necessary. They cited a lack of time (4 subjects) or considered the procedure of no importance (2 subjects) or unneccessary (1 subject). Two subjects had understood that the lesion required follow-up when the physician described it as benign, and 3 others had understood just the opposite. In total, 12 of 94 subjects had not followed or had poorly interpreted the physician's recommendation. The opinion of physicians was obtained for
75 of 94 subjects. For 14 subjects, the suspect lesion was considered as benign by the physician and for 43 subjects, as benign requiring a regular follow-up.

EXCISION

Seventy-five excisions of suspect skin lesions were performed by a dermatologist and 3 excisions were performed by a general practitioner; histological diagnosis was obtained for 68 lesions (Table). Multivariate analysis indicated that female sex (odds ratio, 1.93; 95% confidence interval, 1.09-3.43; P = .02), phototype III (odds ratio, 1.59; 95% confidence interval, 1.11-2.33; P = .01), and an appointment arranged directly by the OMS (odds ratio, 4.92; 95% confidence interval, 1.86-13.05; P < .001) were the 3 criteria most frequently associated with performance of excision. Women with a clear phototype whose appointment was made by the OMS were most likely to have their lesion excised.

CHARACTERISTICS OF SELECTED ATYPICAL NEVI

A total of 353 atypical nevi were observed on the basis of ABCDE criteria in 273 subjects (1.3 per subject). The mean number of atypical nevi observed was higher in men (1.35 vs 1.23 in women; P = .005). Their anatomical distribution was also sex related, with more nevi occurring on the back in men and on the legs in women (P < .001). The presence of the lesion was known in 89.2% of cases, independent of a subject’s characteristics. Lesions were more frequently observed on the front as benign requiring a regular follow-up.

The frequency with which ABCDE criteria were noted by the OMS is indicated in the tabulation below.

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seborrheic keratosis</td>
<td></td>
</tr>
<tr>
<td>Pigmented nevus</td>
<td>49 (72)</td>
</tr>
<tr>
<td>Blue nevus</td>
<td>3 (4)</td>
</tr>
<tr>
<td>Lentigines</td>
<td>1 (1.5)</td>
</tr>
<tr>
<td>Fibrous histiocytoma</td>
<td>1 (1.5)</td>
</tr>
<tr>
<td>In situ carcinoma</td>
<td>1 (1.5)</td>
</tr>
<tr>
<td>Basal cell carcinoma</td>
<td>1 (1.5)</td>
</tr>
<tr>
<td>Nevi with cell atypies</td>
<td>2 (3)</td>
</tr>
<tr>
<td>Melanoma</td>
<td>5 (7)</td>
</tr>
</tbody>
</table>

Heterochromous coloration and a diameter greater than 6 mm was the most common association of criteria (54.6% of total nevi). The enlargement criterion appeared to be negatively related to irregular border and heterochromous coloration. Enlargement was characteristic of nevi in women and diameter greater than 6 mm was of nevi in men. Among the 78 subjects who underwent excision, 5 had melanoma and 2 had nevus with junctional atypia. Because of the small numbers of subjects, only the enlargement criterion was close to significance for at-risk histological diagnosis (P = .12).

A melanoma was removed in 1 woman and 4 men whose ages ranged from 18 to 51 years. The woman had been unaware of the lesion, whereas the men had realized (for 3 months to 12 years) that it existed. The melanomas had a Breslow index between 0.46 and 1.38 mm and a Clark level between 1 and III.

COMMENT

At present, about 5000 new cases of melanoma are detected every year in France (58 million inhabitants) and the melanoma screening described in this study detected 5 melanomas among 65,000 subjects. Therefore, these results confirm the utility of ABCDE criteria in melanoma detection. The criteria most often cited (54.6% of cases) by the OMS for lesion selection were C (heterochromous coloration) and D (diameter >6 mm). The enlargement criterion, considered as essential for diagnosis of a lesion at risk, was nearly statistically significant in its correlation with at-risk histological diagnosis. In fact, there was a lack of power owing to the small number of lesions. However, the number of lesions demonstrating 2 or more ABCDE criteria in our study is low (0.6%) compared with the incidence generally reported in white subjects (2.17%). This may be explained by the fact that OMS underestimate the presence of some ABCDE criteria that are often clinically difficult to appreciate, notably A and B criteria.
The attitudes of subjects concerning the recommendation of the OMS tended to be cooperative or “negligent.” Subjects with a cooperative attitude (most often women) were aware of their lesion and followed the advice of the OMS, whereas the latter group (most often men) correspond to 37% of subjects with suspected lesions seen again the next year and who knew of their lesion but were relatively unmotivated to comply with the recommendation of the OMS. Only 12 of 94 subjects did not understand or failed to comply with the recommendation of the OMS, whereas 20 (31%) of 65 had not followed previous advice to have excision performed. Thus, the role of the OMS seems to have been effective.

This study also shows that the decisions taken by the OMS in melanoma detection were largely followed by the family physician and the dermatologist.

However, this study has several limitations. First, only 73.8% subjects were seen again the second year. This fact is mainly explained by the mobility of screenees for their jobs. The development of a system that allows the transfer of medical information between OMS of different companies could significantly improve the follow-up of subjects. This loss of subjects to follow-up could have led to an underestimation of the results. The second limitation is that 37% of the subjects seen at the second-year follow-up did not see a physician as recommended by the OMS. Thus, even though ABCDE criteria are effective for OMS in finding suspected pigmented lesions, steps must be taken to ensure that persons with suspect lesions have a follow-up mechanism. Third, no further evaluation of the 101 individuals who failed to comply with the recommendation of OMS might be performed, which may be another factor of underestimation of results. Finally, a fourth factor of underestimation may be false-negative results, which may be related to the short duration of training (only 2 hours) without a testing component. However, even with this limitation, 5 melanomas were discovered.

The ratio between the number of melanomas detected and the number of lesions noted can be compared with that of other studies. Our ratio of 1:70 (5 of 353 subjects) is more efficient than that of annual US detection campaigns (1:250) and close to that of British “pigmented lesion clinics” (1:33 to 1:22). Moreover, the cost-effectiveness ratio in our study appears to be lower than that of temporary campaigns requiring specific use of staff and material since our funding was less than $17,000. It is noteworthy that the subjects examined by the OMS represented an age group that is rarely sick and therefore sees a physician infrequently. This is an important consideration with respect to screening and tends to give a particular value to our results.

Finally, it should be noted that 27% of the subjects failed to follow the advice of the OMS concerning a lesion at risk. This suggests that information about the risk of melanoma in the general public is still inadequate.

In conclusion, it would appear that an annual examination performed by an OMS trained in the use of ABCDE clinical criteria is efficient for early detection of melanoma. A complete physical examination is recommended, particularly in men whose dorsal lesions are frequently overlooked. The predictive value of criterion E (enlargement) seems to be important enough to warrant a greater effort at increasing public awareness of this possible risk factor.

As noted in other studies, this approach to melanoma screening could be extended to include other OMS without creating any appreciable increase in their workload.

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REFERENCES


