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Impact of Melanoma Diagnosis on Sun Protection

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KEYWORDS

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Knowledge;
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Abstract

Introduction: Knowledge of the dangers of sun exposure does not always lead to changes in behavior. Failure to make behavioral adjustments is of particular concern in high-risk patients.

Objectives: a) To assess the impact of melanoma diagnosis on knowledge, attitudes, and behaviors relating to sun protection, and b) to identify factors that could influence sun protection behaviors.

Methods: A coded, anonymous questionnaire was given to 195 patients with a recent diagnosis of melanoma. Data were collected on clinical and demographic variables and on knowledge, attitudes, and behaviors relating to sun protection before and after diagnosis. The questionnaire also addressed patients' sense of distress and guilt following diagnosis.

Results: Sun protection behaviors improved following diagnosis in 66% of patients. Although 98% of patients reported having received advice on sun protection following diagnosis, 15% continued to take inadequate sun protection measures. The probability of behavioral improvement following diagnosis was 4 times greater in women than in men. The subgroup of patients whose behavior improved had worse behaviors prior to diagnosis than did those who showed no improvement. Patients who expressed distress and feelings of guilt following diagnosis were more likely to improve their sun protection behavior. Age, tumor site, intensiveness of treatment, and belief that a suntan is healthy had no significant influence on behavioral change.

Conclusions: Melanoma diagnosis is associated with increased knowledge of sun protection measures and improvement in behaviors. Nevertheless, patients continue to use inadequate sun protection measures. Identification of barriers to optimal sun protection behavior may be instrumental in designing targeted educational campaigns.

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PALABRAS CLAVE

Fotoprotección;
 Conocimiento;
 Comportamiento;
 Melanoma

Impacto del diagnóstico de melanoma sobre la fotoprotección**Resumen**

Introducción: El conocimiento sobre los peligros de la exposición solar no siempre se traduce en cambios en el comportamiento. Esto es particularmente alarmante en pacientes de alto riesgo.

Objetivos: a) Evaluar el impacto del diagnóstico de melanoma en los conocimientos, actitudes y hábitos sobre fotoprotección, y b) analizar qué factores pueden influir en el cambio de hábitos de fotoprotección.

Métodos: Usando un cuestionario anónimo y codificado que recogía datos clinicodemográficos, 195 pacientes con reciente diagnóstico de melanoma fueron interrogados sobre los conocimientos, hábitos y actitudes sobre fotoprotección antes y después del diagnóstico y sobre los sentimientos de angustia y culpabilidad tras el mismo.

Resultados: El 66% de los pacientes optimizó su conducta tras el diagnóstico. Un 15% mantuvo conductas deficientes, a pesar de que el 98% de los sujetos refería haber recibido consejos de fotoprotección tras el diagnóstico. Las mujeres optimizaron su conducta 4 veces más que los hombres. El subgrupo de pacientes que mejoró presentaba conductas más deficientes que el subgrupo que no mejoró. Aquellos que experimentaron sentimientos de angustia y culpa tras el diagnóstico presentaron mayor probabilidad de optimizar su conducta. La edad, la localización tumoral, la agresividad terapéutica y la creencia de que el bronceado es saludable no tuvieron influencia significativa en la modificación de la conducta.

Conclusión: El diagnóstico de melanoma lleva consigo un aumento en los conocimientos y un cambio favorable en los hábitos de fotoprotección. A pesar de ello, las medidas de fotoprotección no son lo suficientemente adecuadas. La evaluación de las barreras hacia la fotoprotección óptima puede ser la clave para diseñar programas educativos específicos.

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Introduction

Malignant melanoma is a major cause of morbidity and mortality worldwide. Although its pathogenesis is complex and influenced by multiple genetic and epigenetic factors, sun exposure is generally recognized as the main modifiable risk factor for development of the disease. It is thought that exposure to the sun's UV rays accounts for more than 90% of these tumors in white patients.¹

Although sun-protection campaigns may raise awareness of the dangers of excessive exposure to the sun, they do not always result in changes in behavior.²⁻⁴ This is of particular concern for high-risk groups, especially patients with a diagnosis of melanoma, since their risk of developing a second melanoma is greater than that of developing a first melanoma in the general population, and more than 8.2% of melanoma patients will develop a second tumor.^{5,6}

In a study carried out in patients with dysplastic nevus syndrome, it was observed that a number of patients continued to expose themselves to the sun for long periods, despite being aware that they were at high risk.⁷ Less than a third of first-degree relatives of patients with melanoma routinely use sunscreens or wear protective clothing.⁸ The results of these studies suggest that only modest changes in sun-protection behavior are observed in individuals not directly affected by skin cancer.^{9,10}

However, little information is available on those individuals who are directly affected by skin cancer. In a recent study undertaken in Canada, 27% of patients diagnosed with melanoma continued to believe that a sun tan was healthy and 21% continued to sunbathe regularly in spite of their diagnosis.¹¹ It has also been reported that a large number of these patients engage in outdoor activities without using sun protection.¹²

The so-called *teachable moment* refers to an event or turning point in an individual's life that invites or inspires that person to make a significant change towards practices associated with a healthier lifestyle. These events are often linked to personal health, a factor that has been extensively studied in relation to smoking cessation following heart attack or lifestyle changes among survivors of cancer. According to McBride et al,¹³ the degree to which an event such as diagnosis of cancer is sufficient to change behavior depends upon personal perception of risk and the level of anxiety this provokes. In the case of melanoma survivors, it has been reported that patients increase and improve skin self-examination following diagnosis, but it is surprising that sun protection is not greater, despite patients acknowledging that they receive extensive medical advice.¹⁴

The cultural perception of sun-tanned skin as being attractive and healthy may represent the greatest barrier

to changing sun-protection behavior in the general population.¹⁵ Little is known, however, about the factors that contribute to changing these practices in patients with a diagnosis of melanoma. An improved understanding of these factors could provide useful information on which to base specific guidelines.

We therefore proposed the following study to assess the impact of melanoma diagnosis on knowledge, attitudes, and behaviors relating to sun protection. Secondary objectives were to analyze whether age, sex, visible location of the tumor, aggressiveness of treatment, or feelings of anxiety or guilt had a positive effect on changing sun-protection behaviors and to assess whether cultural perceptions that a sun tan is healthy have a negative effect on such change.

Material and Methods

Patients and Inclusion Criteria

The study was undertaken at Hospital Regional Universitario Carlos Haya in Malaga, Spain, and was directed by the Department of Histology and Pathology at the University of Malaga.

A questionnaire on sun protection was given to patients who attended follow-up appointments in the melanoma unit of the hospital between June and September in 2008 and 2009.

Patients were included if they had been diagnosed with melanoma between 1 and 5 years previously and were aged between 18 and 70 years.

The questionnaire was voluntary and was completed while patients were waiting for their appointment and collected by the assistant. In order to encourage honest responses, the questionnaires were given the code under which they were included in the database for the hospital's melanoma registry and patients did not need to provide their name. The code could be used to obtain clinical and demographic characteristics from the melanoma registry using Microsoft Access 2003 software. An anonymous database was then used in the analysis, without patient names or chart numbers, only the numerical codes under which they were filed.

The questionnaire was administered to 195 patients who attended follow-up appointments and met the inclusion criteria for the study. All patients completed the questionnaire.

Questionnaire

A modified 44-item questionnaire that had been successfully employed previously to evaluate knowledge, attitudes, and behaviors relating to sun protection in patients with melanoma,¹¹ and approved by the Mc Gill University Health Center Institutional Review Board, was translated by a native-English bilingual translator and then back translated. The questionnaire contained a section on attitudes toward sun exposure and another on related behaviors before and after diagnosis; it also included a section on knowledge of sun-protection measures before and after diagnosis. Two additional questions were provided by psychologists

from Hospital Carlos Haya and added to the questionnaire (Appendix). These were designed to analyze feelings of anxiety and guilt, and they were based on the Horowitz Impact of Event Scale.

The comprehensibility of the different items was confirmed during the pilot phase.

Sun-Protection Behaviors Scale

To determine whether patients optimized their sun-protection behaviors and identify variables that were predictive of that change, 10 items (before/after) were chosen from the questionnaire addressing sun-protection behaviors, as recommended by the World Health Organization (WHO)¹⁶ (indicated with an asterisk in the Appendix). Once the questionnaire was complete, a construct validation of the new 10-item scale (before/after) was done by principal component factor analysis before analyzing the distribution of frequencies and the item-scale correlation, including in the analysis those items with a Pearson correlation coefficient greater than 0.3. The sampling adequacy of the factor analysis was assessed with the Kaiser-Meyer-Olkin measure and the Bartlett test of sphericity. Items were considered if they had communalities and saturations of more than 0.50 in the factor analysis. The internal consistency of the items for each of the resulting factors was assessed with the Cronbach alpha coefficient, considering alpha values of at least 0.7 as relevant. The stability of the items was assessed by repeating the questionnaire in 30 patients 4 weeks later (test-retest).

The different items had scores with ranges of 1-2 and 1-4, all in the same direction (as our aim was to compare total scores before and after diagnosis in the same patients, the items did not need to have the same scores). The overall maximum score that could be obtained was 34 and the minimum, 7. The patients were then classified into 3 categories according to their baseline score prior to diagnosis:

1. Category I: 7-16 points.
2. Category II: 17-25 points.
3. Category III: more than 25 points.

Patients in category I or II at baseline were considered to have improved their sun-protection behavior if they moved up at least one category following diagnosis, and those initially in category III were considered to have optimized their sun-protection behavior if they remained in the same category.

Predictors of Optimization of Sun-Protection Behavior

To avoid error due to multiple comparisons, only 9 variables were selected for inclusion in the analysis:

1. Sex (dichotomous qualitative): male/female.
2. Age (qualitative ordinal): <35/35-50/50-65/>65.
3. Educational level (qualitative ordinal): no schooling/primary-level education/secondary-level education/higher education.

4. Melanoma site (qualitative non-dichotomous): head and neck/trunk/arms/legs.
5. Aggressive treatment (qualitative dichotomous): yes/no; aggressive treatment was understood as the need to extend surgical margins, perform sentinel lymph node biopsy, or use interferon.
6. Sun-protection behavior prior to diagnosis of melanoma (quantitative): numerical score on the behavior scale.
7. Perception of sun tan as healthy prior to diagnosis (qualitative dichotomous): yes/no.
8. Feelings of anxiety following diagnosis of melanoma (qualitative ordinal): 1-2/3-4. Categories were grouped due to the small number of patients for some scores.
9. Feelings of guilt following diagnosis of melanoma (qualitative ordinal): 1-2/3-4. Categories were grouped due to the small number of patients for some scores.

Statistical Analysis

Questionnaire on Attitudes, Behaviors, and Knowledge (44 Items)

The data obtained on the 44-item questionnaire were included along with the required clinical data from the registry database (age, sex, age at diagnosis, educational level, type of sun exposure, phototype, tumor site, Breslow depth, widening of surgical margins in a second surgical procedure, sentinel lymph node biopsy, and use of interferon) in a new database constructed using the SPSS statistical software package.

The responses obtained before and after diagnosis of melanoma were compared using the non-parametric paired-sample Wilcoxon signed rank test. Two-tailed *P* values less than .05 were considered statistically significant.

Sun-Protection Behaviors Scale (10 Items Before/After)

To determine whether feelings of fear or guilt, use of aggressive treatment, visible tumor site, behaviors prior to diagnosis, perception of sun tan as healthy, sex, age, or educational level were predictors of change in behavior on the overall scale (as a qualitative variable, optimization or failure to optimize behavior, as described above) in the univariate analysis, *t* tests for independent variables and χ^2 tests were used for quantitative and qualitative variables, respectively. To develop a multivariate model, binary logistic regression was used, including all of the previously described predictors and using a backward stepwise elimination approach (*P* value for inclusion, <.05; *P* value for exclusion, >.10).

Results

Clinical and Demographic Characteristics

The clinical and demographic characteristics of the patients who completed the questionnaire are shown in Table 1. In

Table 1 Clinical and Demographic Characteristics of the Patients.

Age at diagnosis, y, mean (SD)	48 (17)
Sex, n (%)	
Female	123 (63)
Male	72 (37)
Phototype, n (%)	
I	15 (8)
II	120 (61)
III	48 (25)
IV	12 (6)
Type of sun exposure, n (%)	
Intermittent	144 (74)
Continuous	51 (26)
Site, n (%)	
Head, neck, neckline	54 (28)
Trunk	69 (35)
Arms	33 (17)
Legs	39 (20)
Breslow depth, n (%)	
<1 mm	102 (52)
≥1 mm	93 (48)
Aggressive treatment, n (%)	
No	93 (48)
Yes	102 (52)
Educational level, n (%)	
No formal schooling	21 (11)
Primary-level education	55 (28)
Secondary-level education	72 (37)
Higher education	47 (24)

total, 123 women (63%) and 72 men (36%) completed the questionnaire. The mean age at diagnosis was 48 years.

Description of the Overall Results on the Questionnaire Assessing Attitudes, Behaviors, and Knowledge Relating to Sun Protection

Statistically significant differences were observed before and after diagnosis for all items studied except for the use of sunbeds, use of tinted sunscreen, and perception of sun tans as healthy (Tables 2 and 3).

Description of Each Item

Sun-Protection Behaviors

Table 2 shows the results for sun-protection behaviors. Following diagnosis, most patients stayed in the shade, avoided the sun between 12 pm and 4 pm, and used

Table 2 Sun-Protection Behavior in Patients With Melanoma

		Before Diagnosis, n (%)	After Diagnosis, n (%)	P
1)	Try to stay out of the sun (1-4)*			<.001
	Never	60 (30.8%)	6 (3.1)	
	Sometimes	69 (35.4)	21 (10.8)	
	Often	60 (30.8)	108 (55.4)	
	Always	6 (3.1)	60 (30.8)	
2)	Avoid the sun between 12 pm and 4 pm (1-4)*			<.001
	Never	93 (47.7)	39 (20)	
	Sometimes	30 (15.4)	9 (4.6)	
	Often	48 (24.6)	30 (15.4)	
	Always	24 (12.3)	117 (60)	
3)	Use hats or protective clothing (1-2)*			<.001
	No	81 (41.5)	18 (9.2)	
	Yes	114 (58.5)	177 (90.8)	
4)	Sunbathe (1-4)*			<.001
	Always	21 (10.8)	6 (3.1)	
	Often	84 (43.1)	18 (9.2)	
	Sometimes	60 (30.8)	105 (53.8)	
	Never	30 (15.4)	66 (33.8)	
5)	Use sunscreen (1-3)*			<.001
	No	66 (33.8)	15 (7.7)	
	Sometimes	45 (23.1)	9 (4.6)	
	Yes	84 (43.1)	171 (87.7)	
6)	Sun protection factor (1-4)*			<.001
	Less than 15	60 (46.5)	6 (3.3)	
	15-29	42 (32.6)	24 (13.3)	
	30-49	21 (16.3)	24 (13.3)	
	Greater than 50	6 (4.7)	126 (70)	
7)	Reapply sunscreen every 30 min (1-3)*			<.001
	No	78 (60.5)	30 (16.7)	
	Sometimes	27 (20.9)	36 (20)	
	Yes	24 (18.6)	114 (63.3)	
8)	Use of sunscreen if outside on a sunny day (1-4)*		<.001	
	Never	174 (89.2)	75 (38.5)	
	Sometimes	18 (9.2)	24 (12.3)	
	Often	3 (1.5)	39 (20)	
	Always	0 (0)	57 (29.2)	
9)	Sun protection factor when walking (1-4)*			<.001
	Less than 15	12 (6.2)	3 (1.5)	
	15-29	6 (3.1)	9 (4.6)	
	30-49	0 (0)	9 (4.6)	
	More than 50	3 (1.5)	99 (50.8)	
10)	Application of sunscreen during a walk (1-2)*			<.001
	Face	18 (9.2)	63 (32.3)	
	All exposed areas	3 (1.5)	57 (29.2)	
11)	Sunbeds			.250
	Yes	9 (4.6)	0 (0)	
	No	186 (95.4)	195 (100)	
12)	Use of a tinted sunscreen or self-tan products			.090
	Yes	42 (21.5)	21 (10.8)	

Table 2 (continued)

		Before Diagnosis, n (%)	After Diagnosis, n (%)	P
13)	No	153 (78.5)	174 (89.2)	.001
	Go to the beach			
	Alone	36 (18.5)	4 (2.1)	
	With adults	150 (76.9)	137 (70.2)	
	With children	9 (4.6)	54 (27.7)	

*Items included in the overall sun-protection behavior scale. Possible scores on the different items are shown in parentheses.

Table 3 Advice Received and Attitudes Toward Sun Protection in Patients With Melanoma

		Before Diagnosis, n (%)	After Diagnosis, n (%)	P
Had received advice		135 (69.2%)	192 (98.5%)	<.001
Source of advice				.008
Family or friends		18 (12.5%)	3 (1.5%)	
Media		66 (33.8%)	15 (7.7%)	
Doctor		18 (13.8%)	168 (86.2%)	
Various		33 (16.9%)	6 (3.1%)	
How often advice had been received				.001
Once		48 (24.6%)	27 (13.8%)	
Twice		45 (23.1%)	75 (38.5%)	
3 or 4 times		51 (26.2%)	60 (30.8%)	
More than 4		3 (1.5%)	30 (15.4%)	
Belief that a suntan appears healthy		135 (69.2%)	120 (61.5%)	.063
Attitude toward sun exposure				<.001
Enjoy		114 (58.5%)	33 (16.9%)	
Avoid		81 (41.5%)	162 (83.1%)	

protective clothing and sunscreen. Prior to diagnosis, 47% of patients never avoided the hours of the day with the greatest risk due to sun exposure, and 20% have not changed this habit. In 56% of cases, patients admitted not using sunscreen or only using it occasionally prior to diagnosis, whereas 87% reported always using it following diagnosis. Among those who did use sunscreen prior to diagnosis, 46.5% used less than factor 15 protection, whereas after diagnosis 70% of patients used a protection factor higher than 50. The number of patients who reapplied sunscreen increased from 18% to 63%.

When questioned about whether they used sunscreen when going for a walk on a sunny day, 89% of patients responded that they never did so prior to diagnosis, whereas after diagnosis 38% of patients never used it and 32% used it occasionally or frequently. After diagnosis, only

29% of patients used sunscreen on all exposed skin areas when participating in outdoor activities.

Prior to diagnosis, most patients sunbathed alone or with other adults, whereas after diagnosis only 2% of patients sunbathed alone and the number who did so with children or adults increased.

Knowledge of Sun Protection

Table 3 shows the profile for advice received on sun protection and behaviors in patients with melanoma. In 69% of cases, patients reported having received guidance on sun protection prior to diagnosis, and 98% had received it after diagnosis.

Prior to diagnosis, most advice came from the media, whereas after diagnosis, the main source of advice came from the patient's doctor (13% prior to diagnosis and 86% after diagnosis).

Table 4 Anxiety and Guilt Scales

Following diagnosis, how did you feel?	
Calm	81 (41.5%)
Slightly anxious	12 (6.2%)
Quite anxious	90 (46.2%)
Extremely anxious	12 (6.2%)
Have you felt responsible or had feelings of guilt at any time?	
Not at all guilty	129 (66.2%)
A little guilty	18 (9.2%)
Quite guilty	45 (23.1%)
Very guilty	3 (1.5%)

Table 5 Perception of Change in Sun Protection Following Diagnosis of Melanoma

Do you feel that your attitude to sun protection has changed since your diagnosis?	
Yes	183 (93.8%)
No	12 (6.2%)
In what ways has it changed?	
I no longer sunbathe	54 (27.7%)
I sunbathe less often	123 (63.1%)
I sunbathe as often as I used to	18 (9.2%)
I sunbathe more than before	0 (0%)

Attitude Toward Sun Exposure

The number of patients who believed a sun tan to be healthy hardly changed following diagnosis (69% prior to and 61% after diagnosis). In contrast, the number of patients who valued sun exposure was reduced (58% prior to and 16% after diagnosis).

Perception of Change in Behavior, Anxiety, and Guilt

The results obtained on the scales for anxiety and guilt are shown in Table 4. Similar percentages of patients had grade 1-2 and 3-4 anxiety. Patients reported no sense of guilt at any point following diagnosis in 66% of cases. Patients' perception of change is shown in Table 5. In 94% of cases, patients stated that they had changed their attitude following diagnosis.

Content and Construct Validation of the Sun-Protection Behavior Scale

The selection of the 10 items to be assessed before and after diagnosis was predetermined by the WHO recommendations on sun protection, which provided the content validity for the scale (see items marked with an asterisk in Table 2).

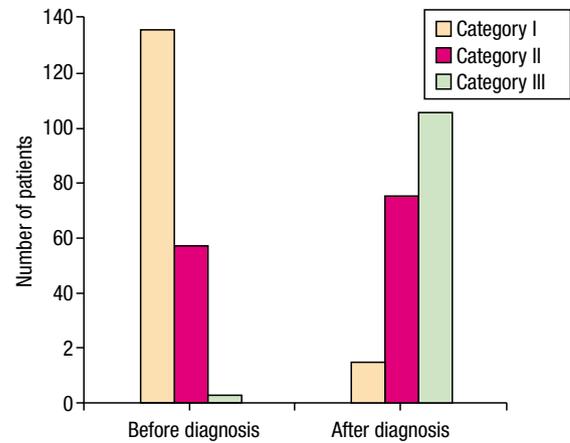


Figure 1 Classification in category I (inadequate), II (intermediate), and III (optimal) before and after diagnosis of melanoma.

The principal component factor analysis with varimax rotation allowed 3 components accounting for 71% of the variance to be defined from the sun-protection behavior scale: a) physical sun-protection measures (items 1, 2, 3, 4); b) use of sunscreen during intentional exposure to the sun (items 5, 6, 7); and c) use of sunscreen during non-intentional sun exposure (items 8, 9, 10). This provided construct validity to the scale. In the analysis of internal consistency, values above 0.70 were obtained for the Cronbach alpha coefficient.

The test-retest stability of the items was assessed by comparing the score obtained on each item by *t* test for paired samples; no significant differences were observed between the scores obtained during the initial evaluation and those obtained in the questionnaires completed by 30 patients 4 weeks later. The decision to allow a period of approximately a month to elapse between test and retest was based on the requirement to leave a sufficient gap for any learning effect to be absent while ensuring that the period was too short for changes in behavior to have occurred.

Description of the Results Obtained on the Sun-Protection Behavior Scale and Classification into Categories According to the Results Obtained

The results obtained on the sun-protection behavior scale were detailed earlier and are summarized in Table 2.

According to the different categories of sun protection established, 69.2% of patients were in category I prior to diagnosis, and therefore had inadequate sun protection, 29.2% were in category II, and only 1.5% were in category III, with adequate sun protection (Figure 1).

The mean baseline score was 14 points, and this increased to 23 points following diagnosis. Based on the established criteria for optimization of sun-protection behavior, 66% of patients improved their behavior.

Predictors of Improvement in Sun-Protection Behavior

In the dichotomous, multivariate logistic regression model, the probability of displaying “optimization of behavior” was determined by sex, sun-protection behaviors prior to diagnosis, and feelings of guilt and anxiety following diagnosis.

Thus, positive behavioral change was 4 times more likely in women (odds ratio [OR], 3.96; 95% confidence interval [CI], 1.92-8.14; $P < .001$). Repeated measures analysis of variance showed that women obtained higher final scores than men despite having similar mean scores at baseline (Figure 2).

We found that the probability of optimizing behavior was 1.26 for each unit lower on the scale prior to diagnosis, such that the lower the baseline score the greater the probability of optimizing sun-protection behavior (OR,

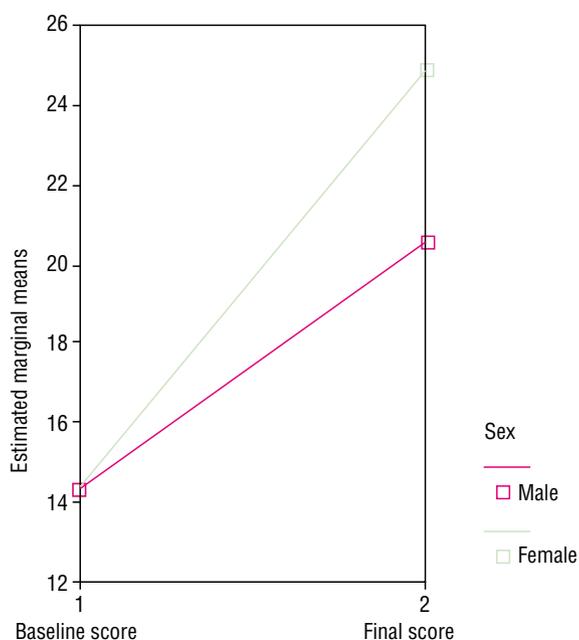


Figure 2 Graph showing the interaction between time and sex in relation to the crude scores obtained before and after diagnosis of melanoma. In the repeated measures analysis of variance, it can be seen that men and women had similar baseline scores but women had higher mean final scores after diagnosis.

1.26; 95% CI, 1.15-1.38; $P < .001$). Comparison of the scores obtained prior to diagnosis revealed that the subgroup of patients who improved had a lower mean baseline score than those who did not show improvement (13 points and 16 points, respectively).

In 80% of cases, patients who had inadequate sun-protection behavior at baseline (category I) improved their behavior, whereas only 23% of those whose sun-protection behavior was considered intermediate (category II) showed improvement. The patients who reported grade 3-4 feelings of anxiety following diagnosis were 3 times more likely to improve their behavior (OR, 3.2; 95% CI, 1.5-6.8; $P = .003$). Those who had feelings of guilt following diagnosis were 4 times more likely to improve their behavior (OR, 3.9; 95% CI, 1.69-9.0; $P = .001$).

No significant differences were observed for age, educational level, aggressive treatment, or tumor site in the group of patients who improved their behavior compared with those who did not. Likewise, no differences were observed according to whether or not patients believed a tan was healthy (Table 6).

Discussion

The last decade has seen numerous sun-protection campaigns implemented worldwide to promote responsible behavior and prevent melanoma and nonmelanoma skin cancer. Nevertheless, various studies have shown that increased awareness does not necessarily lead to improved attitudes and behaviors in the general population.^{17,18} In fact, despite 69% of our patients reporting having received advice on sun protection prior to diagnosis (a proportion that is higher than reported in other studies¹¹), 72% of those patients had inadequate sun-protection behavior.

Patients with a diagnosis of melanoma are aware of the risk of developing a second tumor, and this should act as a driving force for positive change in relation to sun-protection behaviors. A recent study by Freiman et al¹¹ found that 87% of patients reported a change in attitude following diagnosis, while in our study 94% indicated that their attitude had changed. Thus, on the surface the results appear encouraging. Unlike the study by Freiman et al, however, we also added an overall score, which revealed that only 66% of our patients improved their sun-protection behavior following diagnosis. As physicians, our goal should

Table 6 Predictors of Improved Behavior in the Multivariate Analysis

Variable	Type of Variable	OR	95% CI	P
Sex (male/female)	Qualitative dichotomous	3.96	1.92-8.14	<.001
Baseline score	Quantitative	1.26	1.15-1.38	<.001
Anxiety (1-2/3-4)	Qualitative dichotomous	3.18	1.49-6.75	.003
Guilt (1-2/3-4)	Qualitative dichotomous	3.89	1.69-8.96	.001

The following variables were included in the model, which was analyzed using a backward stepwise procedure ($P < .05$ for inclusion, $P > .10$ for exclusion): age, sex, educational level, melanoma site, aggressive treatment, score at baseline or prior to diagnosis, anxiety, guilt, and perception of suntans as healthy.

Abbreviations: CI, confidence interval; OR, odds ratio.

be for 100% of our patients to have responsible sun-protection behavior. Consequently, we must look carefully at the results and focus our attention in particular on those patients who did not improve their behavior.

It is concerning that, following diagnosis, 38.5% of patients reported never using sunscreen on a sunny day, and that of those who did, more than half only used it on the face and did not apply it to other exposed areas such as the neckline or arms. Furthermore, 20% of patients continued to go out in the sun between 12 pm and 4 pm, and 37% did not reapply sunscreen, thereby reducing the effectiveness of the product. It is striking that these habits continue despite 98% of the patients reporting having received information on sun protection following their diagnosis. Although knowledge is necessary, then, it is clearly not sufficient. One of the fundamental principles applicable to the study of human behavior is that immediate, tangible results (such as tanning) exert a greater influence than theoretical long-term outcomes (such as skin cancer).¹⁹ In patients with a diagnosis of melanoma, the theoretical outcome becomes a tangible result, and this may explain why the proportion of patients who change their behavior is greater than in the general population. Furthermore, previous studies have found that medical advice has a greater impact than education in the form of sun protection campaigns.^{17,20,21} Feelings of anxiety following diagnosis of a disease represent an important stimulus for change in the development of a healthy lifestyle,¹³ and this effect was apparent in our patients.

In our study, the number of patients who believed that a tan was healthy changed very little after diagnosis, and this contrasts clearly with the findings of other studies in which the proportion of patients with such a belief was significantly reduced.^{11,12} Nevertheless, in our patients this did not represent a barrier to improvement of sun-protection behavior.

It is noteworthy that in our study the patients who improved their behavior had lower baseline scores, perhaps due to a greater awareness of the causal relationship between sun exposure and melanoma. It is likely that this translates into feelings of guilt or responsibility for the disease, which was also significantly associated.

Another notable observation is that women showed a 3-fold greater improvement in behavior than men, a finding that is consistent with the results of previous studies in melanoma survivors¹⁴ and relatives of patients with melanoma.²² Furthermore, in our study, women obtained higher final scores than men.

An area in which substantial improvement is still required is the situation prior to diagnosis. Forty-eight percent of patients never avoided the sun between 12 pm and 4 pm, 34% never used sunscreen, and 46% of those who did use sunscreen used products with a sun protection factor below 15; furthermore, 60% never reapplied sunscreen and 89% did not use it when outside on sunny days.

One limitation of this study is that only the questionnaire relating to sun protection behaviors was validated. Furthermore, patients may be inclined to provide socially acceptable responses and therefore to overestimate their attitudes, behavior, and knowledge in relation to sun protection.

In the sun-protection behavior scale, greater importance was placed upon the use of sunscreens than physical

measures, since the questionnaire was used in a coastal city and, in our opinion, greater importance should be given to unintentional sun exposure (walking or other outdoor activities) in which the subject is unaware of the need for sun protection. In this type of unintentional sun exposure, patients more commonly use physical protection methods, since that are clothed, but they often pay inadequate attention to the need for sunscreens and this is an area we were particularly interested in analyzing.

The study was carried out in patients with a recent diagnosis of melanoma to avoid recall bias, but in future studies we could consider repeating the questionnaire after a few years to determine whether sun-protection behavior relaxes with time.

In conclusion, a diagnosis of melanoma carries with it an increase in awareness and a positive change in sun-protection behavior. Nevertheless, sun-protection measures remain inadequate. Identification of barriers to optimal sun protection could be the key to designing specific educational programs. Dermatologists must continue their efforts to promote sun protection in the general population and, particularly, in high-risk patients.

Comment

While this article was under revision, Troya et al²³ published an article in this journal describing a questionnaire on sun-protection measures validated in Spanish. Undoubtedly, this will be an excellent tool for use in future studies like this one to assess changes in attitudes, behaviours, and awareness in relation to sun protection in high-risk patients.

Conflict of interest

The authors declare that they have no conflicts of interest.

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Appendix. Questionnaire Distributed Among Patients With a Diagnosis of Melanoma

Code

Prior to diagnosis of melanoma

1. Did you think that a tanned person appeared healthier? Yes/No
2. What was your attitude towards the sun? Enjoyed/avoided
- 3*. Did you try to avoid the sun? Never/Sometimes/Often/Always
- 4*. In the summer, did you avoid being in the sun between 12 pm and 4 pm? Yes/No

- 5*. Did you wear a hat or clothing to protect yourself from the sun? Yes/No
- 6*. Did you often sunbathe? Never/Sometimes/Quite often/Very often
- 7*. Did you use sunscreen? Yes/Sometimes/No
- 8*. If yes, what number sun protection factor did you use? ____
9. Did you use tinted sunscreen or self-tanning products? Yes/No
- 10*. Did you reapply the sunscreen? Yes/Sometimes/No
11. How did you usually sunbathe or go to the beach? Alone/With children/With adults
- 12*. Did you use sunscreen when you went outside for more than half an hour on a sunny day? Never/Sometimes/Often/Always.
- 13*. If yes, what number sun protection factor did you use? ____
- 14*. How did you apply it? To all exposed areas/only on the face
15. Did you ever use a sunbed? Yes/No
16. Did you ever receive advice on how to protect your skin against the sun? Yes/No
17. How often? 1/2/3-4/>4
18. Who provided the advice? Family or friends/Media/Doctors/Others
19. Have you obtained information on sun protection from books, newspapers, the radio, or the television? Yes/No
20. How often? 1/2/3-4/>4

Following diagnosis

21. Do you think that a tanned person appears healthier? Yes/No
22. What is your attitude towards the sun? Enjoy/avoid
- 23*. Do you try to avoid the sun? Never/Sometimes/Often/Always
- 24*. In the summer, do you avoid being in the sun between 12.00 pm and 4 pm? Yes/No
25. Do you wear a hat or clothing to protect yourself from the sun? Yes/No
- 26*. Do you often sunbathe? Never/Sometimes/Often/Always
- 27*. Do you use sunscreen? Yes/Sometimes/No
- 28*. If yes, what number sun protection factor do you use? ____
29. Do you use tinted sunscreen or self-tanning products? Yes/No
- 30*. Do you reapply the sunscreen? Yes/Sometimes/No
31. How do you usually sunbathe? Alone/With children/With adults
- 32*. Do you use sunscreen when you go outside for more than half an hour on a sunny day? Never/Sometimes/Often/Always
- 33*. If yes, what number sun protection factor do you use? ____

- 34*. How do you apply it? To all exposed areas/only on the face
35. Have you ever used a sunbed since your diagnosis? Yes/No
36. Have you received advice on how to protect your skin against the sun? Yes/No
37. How often? 1/2/3-4/>4
38. Who provided the advice? Family or friends/Media/Doctors/Others
39. Have you obtained information on sun protection from books, newspapers, the radio, or the television? Yes/No
40. How often? 1/2/3-4/>4.
41. Has the diagnosis of melanoma changed your attitude toward the sun? Yes/No
42. If yes, indicate which of the following statements are true: I never sunbathe anymore/I sunbathe less often than I used to/I sunbathe as often as I used to/I sunbathe more than I used to
43. After diagnosis, how did you feel? Not anxious/Slightly anxious/Anxious/Extremely anxious
44. Have you felt responsible or had any feelings of guilt since your diagnosis with melanoma? On a scale of 1 to 4 (1 = not at all; 4 = a lot), how much have you felt that?

*Items included in the sun-protection behavior scale.

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