12. Screening for Skin Cancer—*Including Counseling to Prevent Skin Cancer*

RECOMMENDATION

There is insufficient evidence to recommend for or against either routine screening for skin cancer by primary care providers or counseling patients to perform periodic skin self-examinations. A recommendation to consider referring patients at substantially increased risk of malignant melanoma to skin cancer specialists for evaluation and surveillance may be made on other grounds (see *Clinical Intervention*). Counseling patients at increased risk of skin cancer to avoid excess sun exposure is recommended, based on the proven efficacy of risk reduction, although the effectiveness of counseling has not been well established. There is insufficient evidence to recommend for or against sunscreen use for the primary prevention of skin cancer.

Burden of Suffering

Over 800,000 new cases of skin cancer are diagnosed each year.[1] More than 95% of these are basal cell (BCC) and squamous cell (SCC) carcinomas, also referred to as nonmelanomatous skin cancers (NMSC). These are highly treatable and rarely metastasize, but local tissue destruction may cause disfigurement or functional impairment if these tumors are not detected early.[2] They account for approximately 2,100 deaths each year.[1] The risk of NMSC is increased by a personal history of NMSC; older age; light eyes, skin, or hair; poor ability to tan; and substantial cumulative lifetime sun exposure.[3–5]

Malignant melanoma (MM) is less common than NMSC but is far deadlier. An estimated 34,100 new cases and 7,200 deaths (2.2/100,000 population) from MM occurred in the U.S. in 1995.[1,6] The incidence rate varies by race: 9.2/100,000 in whites, 1.9/100,000 in Hispanics, and 0.7–1.2/100,000 in blacks and Asians.[7] In the past two decades, increases of 4%/year in MM incidence and nearly 2%/year in mortality have been reported.[6,8] With a median age at diagnosis of 53 years,[9] MM ranks second among adult-onset cancers in years of potential life lost per death.[10] Significant risk factors for MM besides white race include melanocytic pre-

cursor or marker lesions (e.g., atypical moles, certain congenital moles), increased numbers of common moles, immunosuppression, and a family or personal history of skin cancer, especially MM.[11–23] Fewer than 5% of the population have melanocytic precursor lesions, which have a high malignant potential and may account for as many as 40% of melanomas.[24] For persons with the rare familial atypical mole and melanoma (FAM-M) syndrome, the MM risk is increased 100-fold or more,[11–13] and the cumulative lifetime risk may approach 100%.[11] Persons with intermittent intense sun exposure or severe sunburns in childhood also appear to have an increased risk that varies by MM subtype.[17,19,20,25–27] Persons with poor tanning ability, freckles, or light skin, hair, and eye color may have a small increased risk of MM.[17–20,28]

Accuracy of Screening Tests

The principal screening test for skin cancer is physical examination of the skin by a clinician. Detection of a suspicious lesion constitutes a positive screening test, which then should be confirmed by skin biopsy. The true sensitivity and specificity of the skin examination are unknown.[29] In virtually all studies evaluating the accuracy of the skin examination, only clinically suspicious lesions were biopsied and only screen-positive persons were followed; therefore, sensitivity and specificity cannot be determined accurately. One study of persons presenting to free skin cancer screening clinics for screening by dermatologists estimated sensitivity of the examination using population incidence rates to estimate false-negative rates; sensitivities were 97% for MM, 94% for BCC, and 89% for SCC.[30] Two or more risk factors for skin cancer were present in 78% of those screened, however, so sensitivities may have been overestimated.[31] Among persons with positive screening clinic examinations, the likelihood of histologic confirmation has been reported to be 40% for MM, 43% and 57% for BCC, and 14% and 75% for SCC.[30,32] For persons presenting for skin examination to skin clinics, the likelihood of histologic confirmation given a clinical diagnosis of MM is 38–64% for dermatologists and 72–84% for skin cancer specialists.[33–35] Among patients biopsied by dermatologists who had histologically confirmed MM, the diagnosis was suspected in 62–85% of cases.[34,36] In a randomized community study evaluating screening by expert dermatologists, histologic examination confirmed the clinical diagnosis of SCC in 38% of cases and of BCC in 59%.[37] In vivo epiluminescence microscopy appears to improve dermatologists' diagnostic accuracy for skin lesions,[38,39] but it is not a practical screening tool for primary care physicians.

Primary care physicians and others lacking specialized training in dermatology would be expected to have greater difficulty in evaluating skin lesions. Several studies have reported that, compared to dermatologists, nondermatologists make significantly fewer correct diagnoses of skin le-

sions (including MM and BCC) from color photographs.[40–42] In one such study, at least five of six photographs of MM were correctly identified by 69% of the dermatologists but by only 12% of the nondermatologists; at least one of two atypical moles was recognized by 96% of the dermatologists but by only 42% of the nondermatologists.[40]

One factor affecting the yield of screening for skin cancer is the proportion of the body surface examined. Only 20% of MM occur on normally exposed body surfaces, in contrast to 85–90% of NMSC.[9,27] Dermatologists estimate that detection of MM is 2–6 times more likely with a total-body skin examination (TSE).[43,44] A second factor that affects yield is the frequency of examination. If the interval between examinations is too long, new cancers may not be detected before they have progressed to an advanced stage. There are no published data available, however, with which to determine the optimal frequency of examination in the general population; annual or biennial intervals have been recommended on the basis of clinical judgment. Poor patient compliance with recommendations for yearly total skin examinations may reduce the effectiveness of this intervention; in one study, only 22/524 (4.2%) patients returned for the yearly TSE that was recommended on the first visit.[45]

In terms of risk to the patient, no serious adverse effects associated with TSE and follow-up biopsy have been reported, and experts view it as acceptable and safe.[33] Embarrassment may be an adverse effect,[46] because modesty is one of the main reasons given for refusing a TSE.[44] Medical expenses may also be increased because office visits must be lengthened to accommodate complete undressing, "chaperoning," examination, and redressing,[46] and because more frequent referrals and biopsies are likely to result. There are no controlled studies evaluating any adverse effects of TSE.

Patient self-examination would be expected to be less accurate than physician examination in evaluating skin lesions. One study evaluated patients' ability to apply a seven-point checklist to the skin lesion that prompted their referral to a dermatologist.[35] The patient checklist had a sensitivity of 71%, specificity of 99%, and positive predictive value of 7% for MM diagnosis, using the dermatologist's clinical diagnosis as the "gold standard." The sensitivity and specificity using histologic diagnosis as the reference standard would likely be lower. No data were found evaluating the ability of patients to detect suspicious lesions, the accuracy of periodic skin self-examination, or the efficacy of self-examination instructions in reducing errors.

Effectiveness of Early Detection

Early treatment might reduce morbidity and disfigurement for patients with BCC and SCC,[2] but no studies were found that have evaluated

whether such cancers discovered by screening have a better outcome than those which present clinically.

For MM, there have also been no controlled trials evaluating the impact of screening on morbidity or mortality. A time-series study of an educational campaign to encourage MM screening by primary providers in Scotland found a trend toward a reduction in both thick tumors ($p < 0.05$) and mortality (not statistically tested) in women (but not men) after the campaign.[47] Women were overrepresented in the screened population, which may explain the difference in mortality by sex. No control group was included, so differences due to historical trends or other factors cannot be excluded. The authors noted that in Denmark, which has comparable incidence rates, the MM mortality in women rose during this period.

More data are available on the effect of screening by dermatologists on MM thickness. In two large case series of persons with atypical moles who were screened regularly by dermatologists, all MM detected were either thin (< 0.89 mm) or in situ.[13,15] Time series in the general population, and cohort studies in FAM-M syndrome kindreds and in persons with a prior MM, have reported that screening by dermatologists detected significantly thinner tumors when compared to historical population, kindred, or personal index cases.[47–51] Several countries have reported a consistent decline over the past 3–4 decades in median thickness of MM, although this decline has not been directly linked to screening programs.[52,53] None of these studies used concurrent unscreened controls to differentiate the effects of screening programs from historical trends or lead-time and length biases.

If clinician screening does in fact result in detection of significantly thinner MM, mortality might be reduced. Case series and a prediction model (validated on subsequent incident cases) have reported that survival is directly related to lesion thickness at the time of resection.[9,39,54–56] For example, 5-year survival is 95–99% for persons with lesions ≤ 0.75 mm, 66–77% for 1.51–4.0 mm, 41–51% for 4.76–9.75 mm, and 5% for those with disseminated MM. The likelihood of recurrence after resection also correlates with lesion thickness. A MM < 1 mm thick is associated with an 8-year disease-free survival rate of 90%, compared with 74% for lesions 1–2 mm thick.[57] Although it is possible that lead-time and length biases account for some of these differences, these data suggest that persons in whom thinner MM are detected experience a better outcome than those detected with more advanced disease.

Data on the effectiveness of early detection by skin self-examination are limited. Preliminary analyses from a population-based case-control study retrospectively evaluating the efficacy of skin self-examination in patients with MM suggest a protective effect of skin awareness and self-examination,[58,59] but final results from this study have not yet been published.

Primary Prevention

Primary prevention of skin cancer may involve limiting exposure to solar radiation (by limiting sun exposure, avoiding tanning facilities, and wearing protective clothing) or applying sunscreen preparations. Although the effectiveness of these maneuvers has not been evaluated in clinical trials, avoiding sun exposure or using protective clothing is likely to decrease the risk of MM and NMSC, since both types of cancer have been associated with sun exposure in numerous cohort and case-control studies.[3,4,17,19,20,25–27] Use of tanning facilities has not been directly linked to cancer risk, but skin damage after use is common.[60,61] Many adolescents report using such facilities,[61] and severe sunburns occurring at a young age may increase the risk of subsequent melanoma.[17,19,20,26,27] The principal adverse effect associated with avoiding exposure to ultraviolet and other solar radiation is failure to acquire a suntan, which may be perceived as undesirable by some.[48,62,63]

The evidence that sunscreens prevent skin cancer is less clear. Sunscreen agents are formulated and tested for their ability to prevent the acute effects of solar ultraviolet radiation (i.e., sunburn).[64] Most currently available sunscreens block ultraviolet B (UVB) wavelengths, and a few block ultraviolet A (UVA) rays.[65] Only the physical sunblocks (e.g., zinc oxide, talc, etc.) block all solar rays. A randomized controlled trial evaluated the regular use of UVA- and UVB-blocking sunscreens by persons ≥40 years of age with previous solar keratoses (which are precursors of SCC, although their risk of malignant transformation is low).[66] The development of solar keratoses over a 6-month period was significantly reduced, implying that the risk of SCC may also be reduced. The generalizability of the results achieved by these highly motivated volunteers is unknown, and the study did not adequately describe investigator blinding, lesion classification, or the adequacy of randomization. Studies in albino laboratory rodents have also reported that sunscreens can reduce the incidence of tumors resembling human SCC after UV radiation.[64,67–69] Animal data are more limited for MM, but a recent study in mice reported that sunscreen failed to protect against UV radiation-induced increases in melanoma incidence, although it did prevent sunburn.[70] In a fish model, both UVA and visible light, which are not blocked by many currently available sunscreens, were highly effective in inducing melanomas.[71] Several case-control and cohort studies found either no effect or a significantly increased risk of BCC[72] and MM[73,74] in sunscreen users, after adjusting their risk estimates for phenotype (e.g., hair color, tendency to sunburn). The increased risk found in several of these studies may be due to residual confounding, since in all studies adjustment for phenotype reduced the crude risk estimates. It is also possible that sunscreens may increase skin cancer risk by encouraging susceptible persons to prolong exposure of greater skin surface areas

to solar rays that are not blocked by most currently used sunscreens. There is as yet no direct evidence that sunscreens prevent skin cancer in humans, but clinical trials of sunscreen in humans are unlikely to be conducted due to cost and time constraints. Sunscreens are associated with mild to moderate side effects in 1–2% of users, including contact and photocontact dermatitis, contact urticaria, and comedogenicity, although these are readily reversible when use is discontinued.[65,75,76]

There are few data examining the effectiveness of counseling patients to protect themselves from sunlight. A case series evaluating counseling given at the time of removal of a skin cancer, and on a yearly basis thereafter, reported increased use of protective clothing and sunscreen and reduced deliberate tanning at 2–6-year follow-up.[77] This study included only the two-thirds of patients who complied with follow-up and was not able to determine how much of the effect seen was due to the surgery alone. There is also evidence from case series that public education can increase knowledge and beliefs about the health risks of sun exposure,[48,78] but cross-sectional surveys give conflicting results about whether knowledgeable persons act on this information.[62,63,79] Community and worksite educational interventions to reduce the risk of skin cancer, including one with a concurrent control group, have demonstrated significantly increased use of sun protection measures, such as hats, shirts, and staying in the shade, after the intervention.[80,81] Whether the results of such educational interventions can be generalized to clinician counseling is not known. No studies on the effectiveness of counseling in reducing skin cancer incidence or mortality were found.

Recommendations of Other Groups

The American Cancer Society recommends monthly skin self-examination for all adults[8] and physician skin examination every 3 years in persons 20–39 years old and annually in persons ≥ 40 years old.[82] The American Academy of Dermatology,[2,83] and a National Institutes of Health (NIH) Consensus Panel[84] recommend regular screening visits for skin cancer and patient education concerning periodic skin self-examinations. The NIH Consensus Panel also recommended that some family members of patients with MM be enrolled in surveillance programs.[84] The Canadian Task Force on the Periodic Health Examination does not recommend for or against routine screening for skin cancer or periodic skin self-examination, but suggests that TSE for a very select subgroup of individuals at high risk (e.g., those with familial atypical mole and melanoma syndrome) may be prudent.[85] The American Academy of Family Physicians recommends complete skin examination for adolescents and adults with increased recreational or occupational exposure to sunlight, a family or personal history of skin cancer, or evidence of precursor lesions; these recommenda-

tions are under review.[86] The American Cancer Society,[8] the American Academy of Dermatology,[2,83] the American Medical Association,[87] and the NIH Consensus Panel[84] all recommend patient education concerning sun avoidance and sunscreen use. The American Academy of Family Physicians recommends skin protection from ultraviolet light for all persons with increased exposure to sunlight.[86] The Canadian Task Force recommends avoidance of sun exposure and use of protective clothing, but it does not recommend either for or against sunscreen use for the prevention of skin cancer.[85] The American Academy of Dermatology,[88] the American Medical Association,[87] the American Cancer Society,[89] and the NIH Consensus Panel[84] have recommended avoiding artificial tanning devices.

Discussion

Basal cell and squamous cell skin carcinomas are very common but are slow-growing and rarely metastasize. It is unlikely that population screening would substantially improve the already excellent outcome of persons with these tumors. The principal potential benefit of periodic skin examination lies in discovering early MM. The sensitivity and specificity of skin examination by primary physicians, and the optimal frequency of such examinations, is unknown, however. MM is, in addition, uncommon in the general population (lifetime risk of about 1.0%).[90] Since 99% of patients who would be examined annually under a policy of routine screening would never have MM, it is also important to consider the potential adverse effects as well as the cost/benefit ratio of skin cancer screening. Neither of these has been adequately evaluated.[33,39] No controlled studies have demonstrated that screening for MM by primary providers improves outcome, although a time series study suggests a possible mortality benefit. There is thus weak evidence that screening by primary clinicians is effective in improving clinical outcome. In persons at very high risk for MM (i.e., those with melanocytic precursor or marker lesions), referral to skin cancer specialists for evaluation may be justified based on high burden of suffering, minimal adverse effects of TSE, and greater accuracy of the TSE by such specialists; however, there is no direct evidence that screening this population reduces mortality. There is currently only limited evidence of the efficacy of skin self-examination in reducing melanoma mortality, but preliminary results from a population-based case-control study appear promising.

There is fair evidence of the efficacy and safety of sun avoidance and use of protective clothing for the prevention of skin cancer, and weaker evidence to support avoiding artificial tanning devices. There is also fair evidence from one randomized controlled trial, supported by animal data, that sunscreens that block UVA and UVB rays are efficacious in preventing squamous cell cancer precursors, but data are limited on the efficacy of

sunscreens in preventing skin cancer. There is also good evidence of mild, reversible adverse effects of sunscreens. Community or worksite educational interventions may increase the use of these sun protection measures, but the effectiveness of clinician counseling in modifying such behaviors is not established.

CLINICAL INTERVENTION

There is insufficient evidence to recommend for or against routine screening for skin cancer by primary care providers using total-body skin examination ("C" recommendation). Clinicians should remain alert for skin lesions with malignant features (i.e., asymmetry, border irregularity, color variability, diameter > 6 mm, or rapidly changing lesions)[84] when examining patients for other reasons, particularly patients with established risk factors. Such risk factors include clinical evidence of melanocytic precursor or marker lesions (e.g., atypical moles, certain congenital moles), large numbers of common moles, immunosuppression, a family or personal history of skin cancer, substantial cumulative lifetime sun exposure, intermittent intense sun exposure or severe sunburns in childhood, freckles, poor tanning ability, and light skin, hair, and eye color. Appropriate biopsy specimens should be taken of suspicious lesions.

Persons with melanocytic precursor or marker lesions (e.g., atypical moles [also called dysplastic nevi], certain congenital nevi, familial atypical mole and melanoma syndrome) are at substantially increased risk for MM. A recommendation to consider referring these patients to skin cancer specialists for evaluation and surveillance may be made on the grounds of patient preference or anxiety due to high burden of suffering, the greater accuracy of TSE when performed by such specialists, and the relatively limited adverse effects from TSE and follow-up skin biopsy, although evidence of benefit from such referral is lacking.

There is also insufficient evidence to recommend for or against counseling patients to perform periodic self-examination of the skin ("C" recommendation). Clinicians may wish to educate patients with established risk factors for skin cancer (see above) concerning signs and symptoms suggesting cutaneous malignancy and the possible benefits of periodic self-examination.

Avoidance of sun exposure, especially between the hours of 10:00 AM and 3:00 PM,[65] and the use of protective clothing such as shirts and hats when outdoors are recommended for adults and children at increased risk of skin cancer (see above) ("B" recommendation). Counseling such patients to avoid excess sun exposure and use protective clothing is recommended, based on the established efficacy of risk reduction from sun avoidance, the potential for large health benefits, low cost, and low risk of

adverse effects from such counseling, even though the effectiveness of such counseling is less well established ("C" recommendation).

There is insufficient evidence to recommend for or against counseling patients to use sunscreens to prevent skin cancer ("C" recommendation). The routine use of sunscreens that block both UVA and UVB radiation may be appropriate for persons who have previously had solar keratosis and who cannot avoid sun exposure, in order to prevent additional solar keratoses, which have a small malignant potential.

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