Skin cancer: causes and groups at risk

In this article...
- Causes of and risk factors for skin cancer
- People in specific high-risk groups
- The importance of early identification of skin tumours

Author
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Abstract

This second in a two-part series focuses on the causes and risk factors of skin cancer, highlighting risk factors among the general population as well as in high-risk groups. Part 1, published last week, outlined the main types of skin cancer and the treatment options available for each type; this article stresses the importance of early identification and patient education to prevent skin cancer.

Ultraviolet (UV) exposure is responsible for 90% of skin cancers (Roberts and Black, 2009) and reducing UV exposure should lower the risk of developing skin cancer later.

Ultraviolet A (UVA) and ultraviolet B (UVB) light are considered to be the parts of the UV spectrum that cause carcinogenic changes in the skin. A clinical review by Wang et al (2001) suggested that efforts could be focused on developing UVB-protective sunscreens with maximal protection and broad coverage across the entire UV spectrum.

Simic et al (2010) identified that 80% of an individual’s lifetime exposure to ultraviolet radiation (UVR) occurs during childhood and adolescence, and this age group is an important target for education to reduce later skin cancer.

Non-melanoma skin cancer (NMSC) incidence has been shown to be associated with long-term sun exposure (Cancer Research UK, 2012a) and malignant melanoma (MM) incidence has been shown to be influenced by just one episode of severe sunburn (Cancer Research UK, 2012b). Other factors also influence the risk of developing and possibly dying from skin cancer.

Risk factors for skin cancer
Recognising risk factors and identifying high-risk groups are the first steps towards early detection. Simic et al (2010) said the most important exogenous factors are UV and ionising rays, as well as chemical factors including arsenic exposure and immunosuppressant treatment. Endogenous factors are genetically inherited skin types and genetic disorders.

The occurrence of basal cell carcinoma (BCC) increases proportionally to the degree of sunlight accumulation. Its occurrence decreases proportionally to the degree of skin pigmentation. This explains why BCCs occur more commonly on fair skin and areas of skin frequently exposed to sun. Simic et al (2010) provided quantitative data suggesting the main risk factors associated with BCC occurrence. Highest incidence levels were found in people over the age of 60 and agricultural workers (who are overexposed to UV rays). Most strikingly, the study found that those with skin types I and II (the lightest skin
Higher-risk group for skin cancer.

People who are immunocompromised due to daily immunosuppressant therapy, such as kidney transplant recipients, have an increased risk of skin tumours. In this group, the body’s ability to heal damaged DNA caused by harmful exposure to the sun/UVR is hindered by the body’s lowered immune response. There is a notable increase in the occurrence of squamous cell carcinoma (SCC), BCC, melanoma and Kaposi’s sarcoma as compared with the general population (Greenberg and Zwald, 2011).

Bath-Hextall et al (2008) identified other high-risk groups as people who have:

- Precursor lesions such as Bowen’s disease and actinic keratosis, which may develop into SCC, and those with previous NMSC;
- Xeroderma pigmentosum – an autosomal recessive genetic disorder of DNA repair in which the ability to repair damage caused by UV light is deficient;
- Albinism – this causes a lack of skin pigment and therefore an inability to tan, resulting in fewer protective mechanisms against DNA damage;
- Experienced burns or trauma – SCC can develop on these trauma sites;
- Basal cell naevus syndrome (also known as Gorlin syndrome) – gives an increased risk of two or more BCCs occurring before the age of 30;
- Exposure to arsenic, which is a known carcinogen associated with BCC and precursor lesions to SCC;
- Recessive dystrophic epidermolysis bullosa – a severe chronic disease that increases the risk of SCC by 85% by the age of 45;
- Psoralen UVA treatment – this is an immunosuppressive in skin, used to treat psoriasis. UVA treatment is estimated to increase the risk for both SCC and BCC by seven times (Situm et al, 2008).

Other groups at higher risk of developing skin cancer are:

- People who have experienced long-term UV exposure (for example, ex-servicemen develop non-healing lesions on high-risk sites on the head and neck);
- Those who have received previous radiotherapy (Karagas et al, 2007).

In addition, a recent meta-analysis concluded that overall sunbed exposure adds increasing, is enabling highly accurate assessment of pigmented lesions. DermNet NZ (2012) offers a self-directed

### Box 1. Risk factors for cutaneous melanoma

- Invasive cutaneous melanoma in one or more first-degree relatives
- Previous personal primary invasive melanoma
- Multiple banal melanocytic naevi (>100)
- Three or more clinically atypical melanocytic (dysplastic) naevi
- High solar exposure during childhood (before the age of 10)
- Pale Caucasian skin (skin type I or II)
- Red or blond hair
- Past history of one or more severe blistering sunburns
- Higher socioeconomic group
- Past sunbed use, especially before the age of 30
- Occupation (eg airline crew)
- Past pesticide exposure

*Established and postulated risk factors


### Table 1. Classification of skin types

<table>
<thead>
<tr>
<th>Skin type</th>
<th>Typical features</th>
<th>Tanning ability</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Pale white skin, blue/hazel eyes, blond/red hair</td>
<td>Always burns, does not tan</td>
</tr>
<tr>
<td>II</td>
<td>Fair skin, blue eyes</td>
<td>Burns easily, tans poorly</td>
</tr>
<tr>
<td>III</td>
<td>Darker white skin</td>
<td>Tans after initial burn</td>
</tr>
<tr>
<td>IV</td>
<td>Light brown skin</td>
<td>Burns minimally, tans easily</td>
</tr>
<tr>
<td>V</td>
<td>Brown skin</td>
<td>Rarely burns, tans darkly easily</td>
</tr>
<tr>
<td>VI</td>
<td>Dark brown or black skin</td>
<td>Never burns, always tans darkly</td>
</tr>
</tbody>
</table>

Source: DermNet NZ (2009)

### Table 2. Checklist for detecting malignant melanoma

<table>
<thead>
<tr>
<th>ABCDE</th>
<th>Glasgow seven-point checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - Asymmetry</td>
<td>Three major points: Diameter ≥6mm</td>
</tr>
<tr>
<td>B - Border irregularity</td>
<td>Change in size</td>
</tr>
<tr>
<td>C - Colour variation</td>
<td>Change in shape</td>
</tr>
<tr>
<td>D - Diameter ≥6mm</td>
<td>Change in colour</td>
</tr>
<tr>
<td>E - Elevation or enlargement or exudation</td>
<td>Oozing/crusting</td>
</tr>
<tr>
<td></td>
<td>Inflammation</td>
</tr>
<tr>
<td></td>
<td>Itch</td>
</tr>
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### References

- MacKie et al (2009) identified risk factors for melanoma and integrated them into a clinical population risk estimation tool to guide prevention efforts and identify people for preventive interventions. Risk factors for both BCC (Simic et al, 2010) and melanoma (Cho et al, 2005) are: UVR exposure; light hair colour; higher age; and family history.
- Further risk factors associated with melanoma incidence are: a history of severe sunburn; being male; and higher numbers of naevi. MacKie et al (2009) outlined the established and postulated risk factors for cutaneous melanoma (Box 1).
- Individual high risk factors (outlined in Box 1) are compounded when medical conditions (including the effects of immunosuppressive therapy) move people into a clinical population risk estimation tool to help guide prevention efforts and identify people for preventive interventions.
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dermoscopy course. Patients can access its website and educate themselves to develop increased awareness of signs and symptoms in changing pigmented lesions.

Robinson et al’s (2011) randomised controlled trial examined the effectiveness of the materials used to promote skin self-examination among recipients of kidney transplants. The results showed positive outcomes in terms of patients being receptive to performing self-examination, completing a dedicated workbook and acting on concerns. Robinson et al (2011) used clinical features associated with SCC to create the REACT mnemonic (Box 2) and developed an outline of the clinical features commonly associated with SCC (Box 3).

Consultant dermatologists managing patients’ care assess all worrying lesions, whether they are BCC, SCC or potential MM, in terms of the most effective treatment pathway. Multidisciplinary team decision-making enables a considered approach of those with a confirmed skin cancer. All NHS skin cancer multidisciplinary teams update their operational policies annually, referring to cancer service guidance from the National Institute for Health and Clinical Excellence (2010).

Prevention

MacKie et al (2009) said: “At a time when the incidence of many tumour types is decreasing, melanoma incidence continues to increase. Much of this increase is seen in relatively young adults and, consequently, the number of life-years lost per melanoma death is higher than that for most other solid tumours.”

While much public education focuses on presenting any concerns to GPs, clearly it should also focus on preventing/reducing UVR exposure using sun-safety measures.

Sun-protection behaviours include:

- Avoiding direct sunlight exposure (particularly between 11am and 3pm);
- Using sun-protective clothing, hats and sunglasses when exposed to direct sunlight for longer than 15 minutes;
- Using a broad-spectrum sunscreen with a minimum sun protection factor (SPF) of 30.

A balanced message is needed on the importance of UV light to help synthesise vitamin D within the skin, which protects bone function and reduces the risk of osteoporosis.

For most people, adequate vitamin D levels are obtained through regular daily activity and incidental exposure to the sun. During summer, the majority of people can maintain adequate vitamin D levels from a few minutes of exposure to sunlight on their face, arms and hands or the equivalent area of skin on either side of the peak UV periods (10am-3pm) on most days of the week (Cancer Council Australia, 2012).

Cod liver oil is a natural supplement, which contains a recommended daily allowance of vitamin D, so this daily supplement could be considered to be beneficial for people with a skin-cancer history who have to cover up from the sun (Cancer Research UK, 2012c).

Conclusion

Health professionals need to know their patient population and who is at the greatest risk of developing skin tumours.

- Non-melanoma skin cancer and melanoma incidence levels can both be improved with UVR protection/avoidance.
- Schools, social clubs, health agencies and the media need to encourage skin-cancer prevention behaviours; collectively, these institutions may have the ability to influence safer sun practice behaviour throughout all age groups.

BOX 2: REACT MNEMONIC

R represents a Red, rough spot, to be Evaluated with a partner if possible; and Act if the spot Changes in terms of size, bleeding, tenderness or texture. Telling the doctor and making an appointment within two weeks of discovering the spot. The full mnemonic can be found at tinyurl.com/Robinson-REACT.

Source: Robinson et al (2011)

BOX 3: CLINICAL FEATURES OF SCC

- Bleeding
- Diameter
- Elevated, raised
- Erythematous, inflamed
- Firm
- Painful
- Rough surface
- Scaling
- Stings, stabs, pricking
- Tender
- Ulcer
- Other: pigmented, asymptomatic, anatomic location

Source: Robinson et al (2011)

References


Cancer Council Australia (2002) Vitamin D. tinyurl.com/benefits-vit-D


Cancer Research UK (2012c) Vitamin D. Sunlight and Cancer. tinyurl.com/CRUK-vit-D


DermNet NZ (2009) Skin Phototype. tinyurl.com/Dermnet-skin-type


