

Tanning bed exposure and multiple early-onset basal cell carcinoma

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Summary

A man in his late 30s presented with multiple slightly erythematous small patches that had developed on his trunk. On clinical and dermoscopic examination, these lesions were compatible with basal cell carcinomas. The patient had a 10-year history of extensive use of UVA tanning lamps for aesthetic purposes. This suggests a link between UVA exposure and basal cell carcinoma development. Here, we review the possible pathogenetic mechanisms which could be operative in the UVA mediated basal cell carcinoma development.

KEY WORDS: UVA; basal cell carcinoma; skin cancer.

Introduction

The relationship between UVA and Basal Cell Carcinoma (BCC) is still unclear, but recently several studies have concluded that indoor tanning, emitting mainly UVA, increases significantly the risk of developing BCCs. Although BCC is usually non life-threatening, its wide prevalence represents an important social burden. Since the use of indoor tanning devices has become more and more popular, interventions of primary prevention could greatly influence the future prevalence of this disease. In this article, we report a case of multiple BCCs induced by UVA and review the possible pathogenetic mechanisms which could be operative in the UVA mediated basal cell carcinoma development.

Case report

A 39-year-old man was referred to our clinic for multiple erythematous small patches on his trunk. Some of them were covered with small scales and others had some pigmented areas. The lesions appeared several years ago and their number and size had increased during the years. Except for these patches, general examination was unremarkable and, in particular, there were no signs of Gorlin syndrome and no familial history for this syndrome was present. He presented evident signs of photodamage, such as solar lentigines, laxity, leathery appearance and wrinkles, and, with regard to his leisure activities and living style, he had used a tanning bed twice a week for 10 years without any sunscreen. The clinical appearance of the lesions were consistent with the diagnosis of basal cell carcinomas which was confirmed by dermoscopic analysis showing spoke wheel areas, dark globules, a blue-gray ovoid nest and arborizing vessels, highly suggestive features of pigmented BCC (Figure 1).

Discussion

The incidence of basal cell carcinoma has dramatically increased worldwide in the last decades, particularly among young women (1-7). This is probably related to people's behaviour and lifestyle:

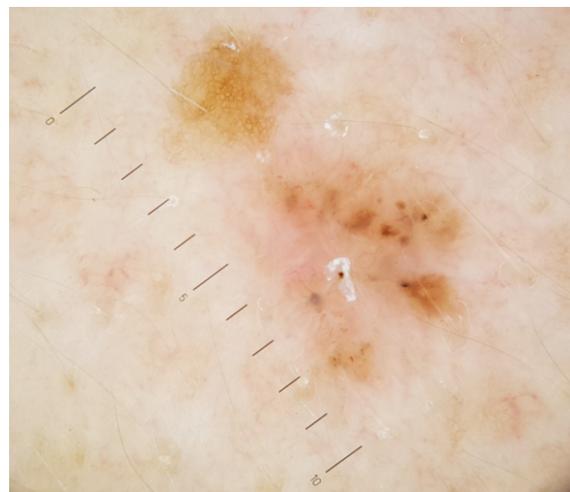


Figure 1 - Dermoscopic features of pigmented BCC: spoke wheel areas, dark globules, a blue-gray ovoid nest and arborizing vessels.

over the last decades, the use of tanning devices has become extremely popular, especially among young people (8, 9) and several studies have established a link between ultraviolet radiation and increased risk of both melanoma and non-melanoma skin cancer (NMSC) (10-15). This strong relation led the World Health Organization (WHO) in 2009 to classify ultraviolet (UV) radiation as carcinogenic to humans, placing it in the same category as tobacco smoke.

Tanning beds are important sources of UV exposure: they emit UVB (280-320 nm), approximately accounting for 5%, and mostly UVA (320-400 nm) (16). In particular, whereas modern tanning devices emit normally less UVB irradiance than from natural sun (<0.1-2.1%), UVA irradiance is significantly more elevated (16). The role of UVA, considered for a long time not relevant in skin carcinogenesis, has been recently revised, although its carcinogenic mechanisms are still not fully understood. It is well known that UVB induces the formation of cyclobutane pyrimidine dimers (CPDs) and pyrimidine-pyrimidone 6-4 photoproducts (6-4PPs), through a direct genotoxicity. These lesions are normally removed by the nucleotide excision repair (NER) system, a mechanism that prevents the cell death and mutation. If this system fails, a C>T transition mutation at dipyrimidine sites is possible, leading to carcinogenesis. UVA has not been considered responsible for a direct mutagenicity, but only for an oxidative DNA damage [mainly the oxidation of 7,8 dihydroguanine (8-oxoGua)] through the activation of endogenous chromophores that generate reactive oxygen species (ROS) (17, 18). However, through new techniques analyzing DNA damage, it has been demonstrated that UVA triggers the formation of CPDs (18), although less efficiently than UVB (19). Consequently, it has been postulated that UVA exerts its carcinogenic action by enhancing the effects of UVB (19). This hypothesis is supported by many pieces of evidence; in 1972 Willis et al. noted an augmentative effect on UVB-induced erythema after UVA irradiation (20). In the same period, Tyrrell found that dimer excision rate in *E. coli* was reduced after long wavelength radiation (21). A decade later, the same Author demonstrated the lethality of the interaction between longer and shorter wavelength on a human lymphoblastoid cell line (22). More recent studies have highlighted the possible involvement of UVA radiation in the impairment of NER system, through ROS production in cellular lines (23, 24). Moreover, UVA seems to increase UVB induced immune suppression (25). Taken together, these findings suggest that UVB-irradiation without UVA is less efficient in inducing skin carcinogenesis. As a matter of fact, UVB phototherapy is not associated with a significant cancer risk (26, 27).

The increased evidence that UVA could be involved in carcinogenesis is worrisome because of the high percentage of UVA emitted by modern tanning devices (16). This explains why people that use tanning devices are more likely to develop NMSCs, in a dose-dependent way, than the general population

(16, 28-35). For this reason, the Food and Drug Administration has recently reclassified tanning lamps as a class II medical device, so they are required to undergo general and special controls in order to assess their safety (36). In 2009 the International Agency for Research on Cancer classified UV radiation from tanning lamps as "carcinogenic to humans" (group 1) (37).

Despite these warnings, the prevalence of indoor tanning is rapidly increasing, especially among men and women under-35 (9, 31). Another alarming finding is the increasingly frequent use of tanning lamps by adolescents and children (38-41). Moreover, tanning salon operators offer often incomplete information about the risk, duration and frequency of exposure, leading to inappropriate behaviours (42): several surveys reveal that most tanning bed users expose longer than the recommended time and some of them exceed abundantly the number of sessions per year (43-45).

Whereas the relation that links tanning devices with melanoma and squamous cell carcinoma (SCC) is well known (33-35), the connection with BCC is still controversial. The IARC performed a systematic review of the literature till March 2006 and underlined that for BCC, the studies did not support any association (31). Later, two meta-analysis came to a different conclusion. According to these studies, indoor tanning increases significantly the risk of developing BCC (33, 34) and this risk is higher in those who used tanning beds between 25 and 35 years (33). Molinaro et al. have recently proposed a new risk prediction model for early-onset BCC that includes indoor tanning and the presence of a variant of the melanocortin 1 receptor gene (MC1R), that is associated with red hair and fair skin (46). Moreover, an interesting case report described a case of metastatic BCC in association with tanning bed use, underlining the link between this type of cancer and tanning devices (47).

Although NMSCs, and in particular BCCs, have usually a good prognosis: they have a striking prevalence among the general population, representing an important social burden (48, 49). For this reason, it could be useful to realize educational campaigns in schools and to broaden indoor tanning restrictions for children and teenagers, who seem to be more vulnerable to the carcinogenic action of UV.

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