

Changes in the Eyelids and Conjunctiva Caused by Ultraviolet Radiation

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ABSTRACT

The aim of this study was to show the frequency, sex and age distribution of eyelids skin tumor changes and degenerative changes of the conjunctiva for the period of three years (2011–2013) at the Department of Ophthalmology in Split. We analyzed the eyelids skin lesions in biopsy material at the Department of Pathology and the same were compared with the profession of the patients. In this period there were found 131 tumor changes of the eyelids. The most common tumor was the basal cell carcinoma (118) with the higher frequency in women. There were 10 squamous cell carcinomas with the equal representation among sexes and three melanomas. There were 79 female and 52 male patients. There were 299 pterygiums operated with the higher frequency in women (68.2%). Exposure to UV radiation, particularly UVB radiation is the most common causative factor for genetic abnormalities in cells and provoked factor in oncogenesis of skin tumors. In our research we found a correlation between changes in the eyelids and conjunctiva caused by UV radiation with the professional interest of the respondents. Due to high incidence of eyelids skin tumor changes in the population professionally exposed to UV radiation, medical professionals should be aware of the importance of the public education on the etiology of these tumors and the importance of the UV protection.

Key words: skin tumors, eyelids, UV radiation, exposure, profession

Introduction

Periorbital region and eyelids are the regions almost permanently and every day sun exposed parts of the skin^{1,2}. The levels of UV radiations rise significantly through depletion of ozone layer so skin tumors will become an important health problem in the future³. Less than 5% of the sunlight that reaches the earth's surface is ultraviolet radiation which is composed of UVA, UVB, and UVC wavelengths. UVC rays (200–290 nm) are high-energy, short wavelengths, and are almost completely absorbed by the stratospheric ozone layer.

UVB rays (290–320 nm) are lower-energy wavelengths, and the amount of rays reaching earth levels varies according to season, time and cloud cover but they are only 2% of the UV radiation on the earth's surface. UVB are mostly absorbed by the epidermis while as much as 70% are blocked by the stratum corneum. Acute effects are sunburn and related inflammation. Chronic effects are photoaging, immunosuppression and photocarcinogenesis. UVB damages mainly the DNA level inducing photolesions which can lead to gene modification and cell

transformation. UVB radiation is the major cause of sunburns, which is the leading risk factor for melanoma and non-melanoma skin cancers. Also, it can cause delayed skin pigmentation. UVA can be divided into UVA I, or far UVA (340–400 nm), and UVA II, or near UVA (320–340 nm). They are longest, lowest-energy wavelengths and comprise 98% of the UV radiation on the earth. UVA radiation is always present, independent of cloud cover or glass⁴. Epidermal malignant tumors are a group of skin cancer arising from epidermal cells. It includes mainly basal cell carcinoma (BCC) and squamous cell carcinoma (SCC), namely together non-melanoma skin cancer (NMSC). NMSC are the most frequent malignant tumors in Caucasians and its incidence is increasing worldwide^{5,6}.

Basal cell carcinoma accounts for approximately 75% of all the skin tumors.⁷ The raised incidence of skin tumors in both sex is also due to a depletion of the ozone layer and its inability to filter out the carcinogenic rays of ultraviolet light (UVB)^{7,8}. BCC grows slowly and metastatic spread is very rare (around 0.05%)^{8,9}. Squamous cell carcinoma

accounts for 10–20% of all skin malignancies and is the second most common skin cancer after BCC^{8,10}. It affects most commonly elderly white men after the age of 40. As well as BCC it is most consistently related to ultraviolet radiation^{8,10}. Therefore, outdoors occupation, less protective clothing and ozone layer depletion contribute mainly to this raising incidence^{8,10}. Contrary to BCC, which very rarely metastasize, lymphogenic spread of SCC is more often (5–7%) and this malignancy is a major cause of death among non-melanoma skin cancers (NMSC)^{8,10}.

Melanoma is a malignant tumor which evolves from melanocytes and is one of the most aggressive malignant tumors of the skin and mucosa. It is characterized by a high tendency of early lymphatic and hematogenous spreading accompanied with lower local aggressiveness. During the last four decades, a continuous increase in the incidence of melanoma (from 3 to 8% per year) has been registered worldwide, with the highest incidence in Australia, where melanoma is the fourth most frequent malignant tumor¹¹. In Western European countries, the survival of patients with melanoma has been prolonged in recent years, which can be explained by melanoma detection at an earlier stage. The incidence and mortality rates of melanoma in Croatia have been increasing by 140% and 50% respectively during the last two decades, which is in accordance with world trends^{12,13}. Melanoma represents approximately 3% of all malignancies in Croatia. According to the latest available data from the Croatian National Cancer Registry, there were 555 newly diagnosed melanoma patients in 2010 (260 women and 295 men). The melanoma incidence rate in Croatia was 12.6/100,000 (11.4/100,000 for women and 13.8/100,000 for men) in 2010¹⁴, whereas the mortality rate of melanoma was 0.39/100,000 (0.37/100,000 for women and 0.40/100,000 for men)¹⁵.

Normal ocular surface is covered by corneal and conjunctival epithelium. Pterygium refers to conjunctival or fibrovascular growth over the cornea. Ultraviolet light exposure appears to be the most significant factor in the development of pterygium. This may explain why the incidence is vastly greater in populations near the equator and outdoor work in situation with high light reflectivity, including use of hats and sunglasses as protective¹⁶.

The aim of this study was to determine the prevalence, sex and age distribution of eyelids skin tumor changes (basocellular, planocellular carcinomas and melanomas) and degenerative changes at the conjunctiva for the period of 3 years (2011–2013) at the Department of Ophthalmology in Split. We also analyzed 299 pterygiums operated at the Department of Ophthalmology in Split in the same period.

Patients and methods

In this retrospective study (2011–2013) 131 eyelids skin lesions in biopsy material were analyzed at the Department of Pathology in Split and the same were compared with the profession of the patients. Pathohistological analysis was routinely performed on H&E slides. We

also analyzed 299 pterygiums operated at the Department of Ophthalmology in Split at the same period. In the analysis of data materials we used descriptive statistics.

Results

Total number of eyelid skin tumors retrospectively collected and analyzed was 131 (Figure 1). The most common tumor (90%) was basocellular carcinoma (118). There were 10 (8%) squamous cell carcinomas and 3 melanomas (2%).

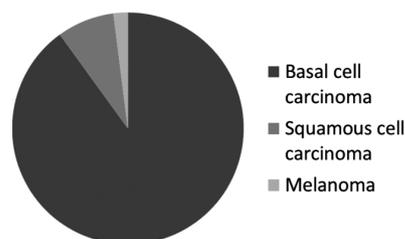


Fig. 1. Distribution of eyelid skin tumors.

There were 73 (62%) female and 45 (38%) male patients with basal cell carcinoma. Average age for male patients with basal cell carcinoma was 63 years and 69 years for female patients.

There were 5 (50%) male and 5 (50%) female patients with squamous cell carcinoma. Squamous cell carcinomas were diagnosed in average age of 72 years in male and 66 years for female patients (Table 1).

TABLE 1
AVERAGE AGE AND SEX DISTRIBUTION OF THE SKIN LESIONS IN THE 2011–2013 PERIOD

Histological type	Basal cell carcinoma	Squamous cell carcinoma	Melanoma
Average age /years/ M : F	63 : 69	72 : 66	59 : 48
Sex M : F	1 : 1.6	1 : 1	1 : 0.5

Among three melanomas, two were found in males and one in female. Average age for men was 59 years, and for women 48 years. Among 299 pterygiums there were 204 (68.2%) females and 95 (31.8%) male patients.

Among eyelid carcinoma patients there were 79 female patients and among them 55 (70%) were farmers. Among 52 male patients 39 (75%) were sailors and fishermen.

Discussion and Conclusion

The most common malignant eyelid tumor in analyzed material was basal cell carcinoma, as it is reported in other published literated data. In our research we found

a correlation between changes in the eyelids and the conjunctiva caused by UV radiation with the professional interest of the respondents. Exposure to ultra-violet, especially UV-B, radiation is the most common cause for these genetic abnormalities in cells. The photons of sunlight begin a series of genetic events in skin leading to cancer¹⁷.

The purpose of the surgical treatment is not only the excision of the lesion, but also to maintain shape and function of the eyelid¹⁸. Because presentation varies and histological examination is required for accurate diagnosis, any suspicious lesion occurring on the eyelids should be excised and biopsied. Undoubtedly, skin exposure to the UV

radiation is the main cause of skin cancer, with BCC being the most frequently occurring eyelids skin cancer. Chronological or intrinsic skin aging is an inevitable process which is a result of the passage of time. However, photoaging or extrinsic aging of the skin is a complex, cumulative process caused by the chronic exposition to UV radiation. Due to high incidence of eyelids skin tumor changes in the population professionally exposed to UV radiation, medical professionals should be aware of the importance of the public education on the etiology of these tumors and the importance of the UV protection.

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PROMJENE NA VJEĐAMA I SPOJNICI UZROKOVANE ULTRALJUBIČASTIM ZRAČENJEM

SAŽETAK

Cilj ovoga rada bio je prikazati učestalost tumorskih promjena na koži vjeđa i degenerativnih promjena na spojnici u razdoblju od 3 godine (2011–2013.) na Klinici za Očne bolesti u Splitu. Analizirane su kožne promjene na vjeđama u bioptičkom materijalu na Kliničkom zavodu za Patologiju, a iste su uspoređivane i sa zanimanjem ispitanika. Također su analizirani pterigiji operirani na Klinici za Očne bolesti u Splitu u istom razdoblju. U proučavanom razdoblju nađena je 131 tumorska promjena na vjeđama. Najčešći tumor bio je karcinom bazalnih stanica (118) sa češćim javljanjem u žena. Bilo je 10 planocelularnih karcinoma sa jednakom zastupljenošću među spolovima i 3 melanoma. Bilo je 79 ženskih i 52 muška pacijenta. Bilo je 299 operiranih pterigija s nešto češćim javljanjem u žena (68,2%). Izlaganje UV zračenju, posebice UVB zračenju je najvažniji poznati uzrok promjena genetskog materijala u stanici i provocirajući čimbenik u nastanku kožnih tumora i degenerativnih promjena spojnice. U našem istraživanju našli smo povezanost između promjena na vjeđama i spojnici koje su uzrokovane UV zračenjem sa profesionalnim zanimanjem ispitanika. S obzirom na visoku incidenciju tumorskih promjena na vjeđama u populaciji koja je profesionalno izložena UV zračenju, medicinski djelatnici bi trebali biti svjesni važnosti javne edukacije o etiologiji ovih tumora i važnosti zaštite od UV zračenja.