Epidemiology, diagnostics and treatment of non-melanoma skin cancers

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av Oscar Zaar

Fakultetsopponent:

Professor Gregor Jemec
Sjællands Universitetshospital – Roskilde, Danmark

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Oscar Zaar
Department of Dermatology and Venereology, Institute of Clinical Sciences, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden

Abstract
Skin cancer, including malignant melanoma and non-melanoma skin cancer (NMSC), is a growing problem due to the increasing incidence in Sweden and in other Caucasian populations. NMSCs are diagnosed as often as all other cancers combined and include basal cell carcinoma (BCC), squamous cell carcinoma (SCC), precursors to SCC such as Bowen’s disease (BD) and actinic keratosis (AK), as well as several rare skin cancers including Merkel cell carcinoma (MCC). The purpose of this thesis was to investigate novel aspects within the fields of epidemiology, diagnosis and treatment of NMSCs.

In study I, the incidence and clinical characteristics of Swedish patients with MCC was explored. During the study period from 1993 to 2012, the age standardised incidence of MCC almost doubled with an increase of 73-85 % depending on the population used for age standardisation. The overall incidence for women and men per 100,000 persons, using the world population for age standardisation, rose from 0.11 to 0.19 between 1993 and 2012.

In study II, the effectiveness of photodynamic therapy (PDT) for the treatment of BD was evaluated retrospectively for 423 lesions in 335 patients. The study showed that PDT was a relatively effective treatment with a complete clearance rate of 63.4 % after a median FU time of 11.2 months. BD lesions greater than 20 mm in size and a single session of PDT were factors associated with statistically worse outcome.

In study III, a novel irradiation protocol in PDT for multiple AKs using a stepwise increase of light intensity, staying below 50 mW/cm² during the whole treatment session, was compared to the conventional irradiation protocol to assess pain levels during treatment and effectiveness. Both protocols had the same total light dose of 37 J/cm². The novel treatment protocol led to a small but statically significant decrease in pain (Δ 1.1 points on a visual analogue scale, p<0.01). However, the clearance rate with the new protocol was slightly but significantly lower than that of the conventional protocol (91.2 % vs 93.7 %, respectively) (p=0.04).

In study IV, the chemical composition of lipids in BCCs was mapped using Time-of-Flight-Secondary-Ion-Mass-Spectrometry (ToF-SIMS). ToF-SIMS was able to identify different lipids in healthy and cancerous tissue. Furthermore, sphingomyelin lipids were found in aggressive BCCs whereas phosphatidylcholine lipids were observed in less aggressive tumours.

In conclusion, the incidence of MCC has increased the last 20 years, PDT is a relatively effective treatment modality in BD, novel illumination protocols with lower light intensity can decrease pain in PDT and ToF-SIMS can be used to identify the lipid composition of BCCs.

Keywords: non-melanoma skin cancer, basal cell carcinoma, merkel cell carcinoma, Bowen’s disease, imaging mass spectrometry, lipidomics, photodynamic therapy, pain.

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