

# Epidemiology, diagnostics and treatment of non-melanoma skin cancers

Akademisk avhandling som för avläggande av Oscar Zaars doktorsexamen vid Sahlgrenska akademien, Göteborgs universitet kommer att offentligen försvaras i Hörsal Arvid Carlsson, Academicum, Medicinargatan 3, Göteborg, den 22/3-2018, klockan 09.00

av Oscar Zaar

Fakultetsopponent:

**Professor Gregor Jemec**

Sjællands Universitetshospital – Roskilde, Danmark

Avhandlingen baseras på följande delarbeten

- I. Zaar O, Gillstedt M, Lindelöf B, Wennberg-Larkö AM, Paoli J. *Merkel cell carcinoma incidence is increasing in Sweden*. J Eur Acad Dermatol Venereol. 2016 Oct;30(10):1708-1713.
- II. Zaar O, Fougelberg J, Hermansson A, Gillstedt M, Wennberg A-M, Paoli J. *Effectiveness of photodynamic therapy in Bowen's disease: a retrospective observational study in 423 lesions*. J Eur Acad Dermatol Venereol 2017 Aug;31(8):1289-1294.
- III. O. Zaar, A. Sjöholm Hylén, M. Gillstedt, J. Paoli. *A prospective, randomised, within-subject study of ALA-PDT for actinic keratoses using different irradiation regimes*. Submitted for peer review
- IV. Munem M, [Zaar O](#), [Dimovska Nilsson K](#), [Neittaanmäki N](#), [Paoli J](#), [Fletcher JS](#). *Chemical imaging of aggressive basal cell carcinoma using time-of-flight secondary ion mass spectrometry*. Biointerphases. 2018 Jan 12;13(3):03B402. E-publication ahead of print.

**SAHLGRENKA AKADEMIN**



# Epidemiology, diagnostics and treatment of non-melanoma skin cancers

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/cm<sup>2</sup> 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/cm<sup>2</sup>. The novel treatment protocol led to a small but statically significant decrease in pain ( $\Delta$  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.

ISBN: 978-91-629-0448-7 (TRYCK)

<http://hdl.handle.net/2077/54538>

ISBN: 978-91-629-0449-4 (PDF)

