

Sun Exposure, Prevalence and Localization of Common Melanocytic Naevi in Swedish Children

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Maria Karlsson defended her PhD thesis at the Karolinska University Hospital, Stockholm on February 6, 2015. Her supervisors were Associate Professors Ylva Rodvall, Kerstin Wiklund and Professors Bernt Lindelöf, and Carl-Fredrik Wahlgren. Opponent was Professor Christian Ingvar, Lund University. Members of the evaluation committee were Professor Yvonne Brandberg and Associate Professors Harry Beitner and Ingrid Synnerstad.

Melanoma susceptibility is associated with having high numbers of common melanocytic naevi. Naevi start to appear in early childhood and are inducible by sun exposure. As latency between sun exposure and subsequent melanoma development may stretch for decades, naevi prevalence in children has been suggested as a suitable surrogate marker to monitor population trends in sun exposure.

The aims of this thesis were to analyse the effects of reported sun exposure and sun protection on naevi prevalence in Swedish children. Further, to review temporal changes in the body-site distribution of naevi in response to main pattern of sun exposure and to compare childhood naevi distributions with melanoma localization in adults at different latitudes of residing. The aim was also to validate the feasibility of mobile teledermatology for the remote assessment of naevi prevalence compared with standard manual counting of naevi.

Naevi prevalence and body-site localization were investigated among 7-year-old children in southern Sweden by performing two consecutive population-based cross-sectional studies in years 2002 and 2007. Children's sun travels, sun burns and sun protective regimens were reported by parental questionnaires. The results demonstrated that over the 5-year period, significant improvements in the use of various sun protective measures were reported in 2007 when compared with 2002. Correspondingly, the number of naevi per child had become significantly lower in 2007. In a further study, analysing changes in body-site specific naevi densities between 2002 and 2007, demonstrated that naevi had become significantly lower solely on the intermittently sun-exposed body sites, such as the trunk and limbs, but not on chronically or rarely sun-exposed body sites.

The comparison of body-site distribution of childhood naevi and melanoma in adults was performed by analysing the number and localization of naevi in 7-year-old children residing in



Fig. 1. Maria Karlsson defended her thesis on June 2, 2015. From left to right: Prof. Christian Ingvar (Opponent), Maria Karlsson, Assoc. Prof. Ylva Rodvall (main supervisor), Prof. Carl-Fredrik Wahlgren (supervisor) and Assoc. Prof. Kerstin Wiklund (supervisor).

northern and southern Sweden, respectively, with melanoma incidence and localization as reported to the Swedish Cancer Registry. Results demonstrated an overall two-fold higher incidence of melanoma, and an almost two-fold higher density of childhood naevi in southern Sweden. Gender profiles and distribution of childhood naevi matched significantly with melanomas in young and middle-aged adults. In southern Sweden slightly more naevi and melanomas were located on the trunk; a body site associated with intermittent sun exposure.

Mobile teledermatology was performed with an iPhone 4S camera imaging naevi on the back of children aged 7–16 years and in the same session, naevi were counted by the standard manual face-to-face procedure. Inter-method reliability (i.e. mobile teledermatology versus manual counting) and inter-rater reliability (between two independent dermatologists) were calculated with weighted kappa statistic. Mobile

teledermatology imaging showed substantial agreement between remote counting of total numbers of naevi on the back compared with the standard manual assessment.

In summary, the results of this thesis supported and extended the scientific basis for which naevi in children can be used as objective biomarkers of sun exposure. It also supported childhood naevi to be largely consistent with overall and subsite distributions of melanoma in relation to gender and latitude of residing. Mobile teledermatology proved valid for estimating naevi prevalence on the back and could provide a feasible methodology following trends in sun exposure in children. In a future perspective, assessment of childhood naevi may be implemented in population-based surveillance programs validating the effectiveness of public health campaigns aiming to reduce incidence of melanoma in Sweden.

List of original publications

1. Karlsson MA, Wahlgren C-F, Wiklund K, Rodvall Y. Parental sun-protective regimens and prevalence of common melanocytic naevi among 7-year-old children in Sweden: changes over a 5-year period. *Br J Dermatol* 2011; 164: 830–837.
2. Karlsson MA, Lindelöf B, Wahlgren C-F, Wiklund K, Rodvall Y. Mobile teledermatology is a valid method to estimate prevalence of melanocytic naevi in children. *Acta Derm Venereol* 2015; 95: 303–306.
3. Karlsson MA, Rodvall Y, Wahlgren C-F, Lindelöf B, Wiklund K. Changes in body-site distribution of common melanocytic naevi among 7-year-old Swedish children between 2002 and 2007. *Acta Derm Venereol* 2015; 95: 804–808.
4. Karlsson MA, Rodvall Y, Wahlgren C-F, Wiklund K, Lindelöf B. Similar anatomical distributions of childhood naevi and cutaneous melanoma in young adults residing in northern and southern Sweden. *Eur J Cancer* 2015; 51: 2067–2075.