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Increasing Incidence of Cutaneous Malignant Melanoma in Children and Adolescents 12–19 Years of Age in Sweden 1973–92

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One-hundred-and-seventy-seven cases of cutaneous malignant melanoma were reported to the Swedish National Cancer Registry in subjects below the age of 20 during the period 1973–92. One-hundred-and-fifty-four (87%) were re-examined histologically, and the original diagnosis of primary cutaneous malignant melanoma was verified in 88%. The age-specific mean annual incidence rate increased to 0.5/100,000 in 1983–92 from 0.2/100,000 in 1973–82. Cutaneous malignant melanoma remained extremely rare in children below the age of 12, where only two cases were found. In subjects aged 12–19, the incidence doubled to 93 cases in the second 10-year period compared to 41 in the first. In boys, most of the melanomas occurred on the trunk, and, in girls, on the legs. Sixty-three percent of the melanomas were of the superficial spreading type, which also was the most rapidly increasing type of melanoma. These results emphasize the importance of surveillance and intensified preventive measures in protecting children and adolescents from the harmful effects of excessive exposure to the sun.

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Cutaneous malignant melanoma (CMM) is considered to be very rare in children and adolescents. Approximately 2% of all melanomas have been estimated to occur in subjects younger than 20 years of age, and only 0.2% in the first decade of life (1). However, recent reports from Australia suggest an increasing incidence of CMM also in the young population (2).

There are particular problems in differentiating CMM histologically from benign pigmentary tumours in children (3). Therefore, data on melanoma incidence in the young obtained from cancer registries have to be interpreted with caution. When Malec & Lagerlöf (4) re-examined all cases of CMM in subjects aged 0–13 reported to the Swedish National Cancer Registry in 1959–71, only 1 out of 26 cases (4%) met the histologic criteria of malignant melanoma. The other tumours were reclassified as non-melanoma lesions, mainly Spitz's naevi. Over-registration of CMM in children has also been reported from Denmark (5) and Finland (6).

In Sweden, CMM has the most rapidly increasing incidence rate of all malignant tumours. The annual incidence rate, adjusted for age to the Swedish standard population (census 1970), increased from 7.5/100,000 in 1973 to 14.5/100,000 in 1992 (7). The aim of the present study was to investigate the incidence of CMM in Swedish children and adolescents below the age of 20 over two decades (1973–92). In order to minimize the effects of an eventual over-registration, a histopathological re-examination of the reported cases was undertaken.

MATERIAL AND METHODS

Data were obtained from the Swedish National Cancer Registry on all cases of CMM in subjects aged 0–19 during the period 1973–92. Information on melanoma site and cause of death, according to ICD-7 (the International Classification of Diseases, seventh revision) was also obtained from the Registry. Only cases with malignant melanoma of the skin (ICD-code 190) were included, and not cases with ocular melanoma (ICD-code 192) or genital melanoma (ICD-code 176 and 179).

Histologic material and copies of the pathology reports were requested from the pathology departments in question. The sections were stained with either haematoxylin and eosin or van Gieson stain. At re-examination, some of the tumours were subjected to immunohistopathological investigations. The specimens were re-evaluated by two or three pathologists (BB, BS and PW).

RESULTS

One hundred and seventy-seven cases of primary CMM in subjects younger than 20 years of age were reported to the Registry during 1973–92. In the same period, 20 cases were reported dead of disease, 5 in the first 10-year period and 15 in the second.

Histological re-examination

One-hundred-and-fifty-four of 177 (87%) of the reported cases were re-examined histologically. Of these 154 cases, it was evident from the pathology reports that 6 had originally not been classified as primary CMM, but had by mistake been reported as such to the Registry; four tumours originally and correctly classified as benign naevi, and two metastases. Of the remaining 148 cases, 126 were verified as primary CMM. In four cases, opinion differed between the three pathologists, and these lesions were classified as suspected melanomas. In 18 cases, the tumours were reclassified as non-melanoma lesions, mainly atypical naevi. Thus, the diagnoses primary CMM and suspected CMM were made in 130/148 (88%).

Most of the CMM did not differ histopathologically from melanomas found in adults. Seven (6%) of all CMMs arose in a naevus histologically of congenital type, and none of these melanomas was diagnosed in individuals before 15 years of age. Subjects below the age of 15 had thicker melanomas and a higher mortality rate than subjects aged 15–19. A detailed analysis of the histological examination is presented in (8).

Incidence of melanoma

Twenty-three of 177 reported cases could not be re-examined. Four of them were reported to have died from metastasizing

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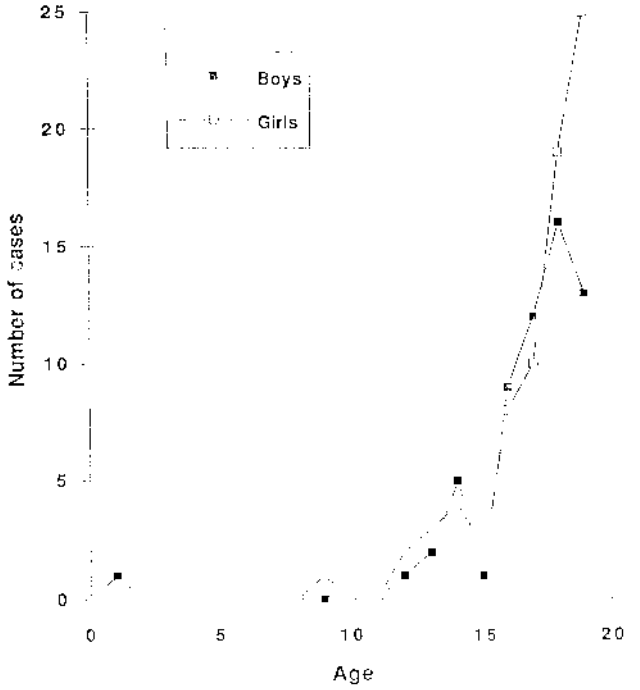


Fig. 1. Number of CMMs at different ages in the period 1973–92.

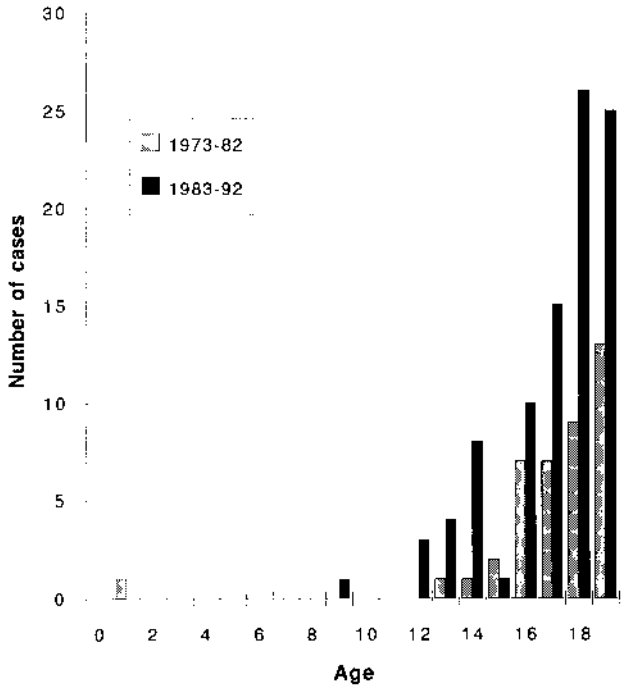


Fig. 2. Number of CMMs at different ages in the first year period, 1973–82, and in the second, 1983–92.

CMM and therefore were included as having had a melanoma. The remaining 19 not re-examined cases had a similar distribution with respect to age, sex and year of diagnosis as the re-examined ones. These 19 cases were excluded from the following analysis, as we could not histologically evaluate their melanoma diagnosis. Thus, 130 cases had a histologically verified or suspected CMM, and 4 of the not re-examined cases had died of disease. These 134 cases were included in the following analysis.

The number of cases increased with age (Fig. 1). In subjects below the age of 12, only 2 cases were found, 20 in subjects aged 12–15 and 112 in subjects aged 16–19. Forty-five percent of the subjects were boys and 55% girls, but no clear difference in incidence between the sexes was evident before the age of 18.

The incidence increased with time. Comparing the first 10-year period (1973–82) with the second (1983–92), the number of cases of CMM doubled from 41 to 93. Provided that there was a similar rate of over-registration of the not re-examined cases as of the re-examined, the mean annual incidence rate of CMM in individuals below 20 years of age increased from 0.2/100,000 in 1973–82 to 0.5/100,000 in 1983–92. The increase was evident already from 12 years of age (Fig. 2).

Site of melanoma

In boys, most of the melanomas (53%) were found on the trunk, 22% on the legs, 15% in the head and neck region, 3% on the arms, and in 7% the site was unknown. In girls, most of the melanomas (50%) were found on the legs, 30% on the trunk, 13% on the arms, 3% in the head and neck region, and in 4% the site was unknown. This sex-specific difference was found in subjects aged 12–15 and in those 16–19. CMM of the trunk in boys, and of the legs in girls, also had the highest rates of incidence increase (Fig. 3). Below the age of 12, there was one 9-year-old girl with a superficial spreading melanoma (SSM) on the thigh, and one 1-year-old boy with a CMM in the head and neck region. The melanoma of the boy could not be re-examined, but he was reported dead of disease 10 months after diagnosis.

Growth pattern of melanoma

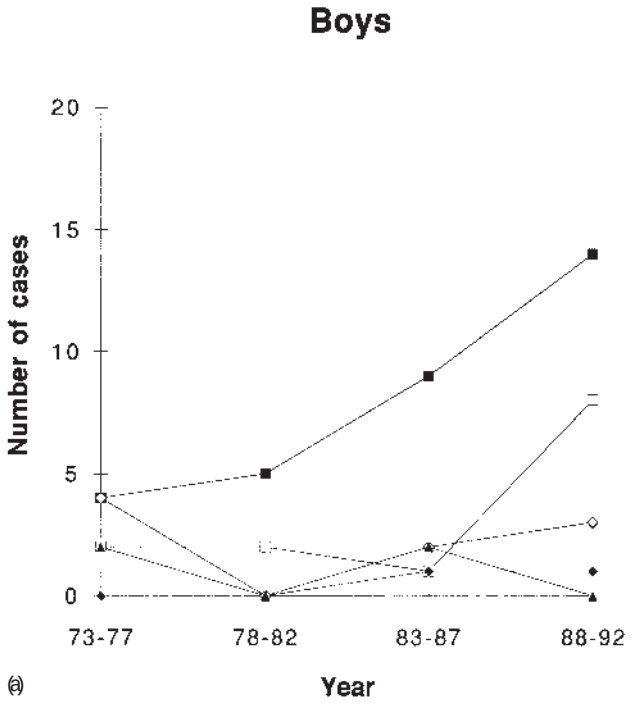
Of the verified primary CMM, 79/126 (63%) were classified as SSMs, 34 (27%) as nodular melanomas (NM), and 13 (10%) as other types of melanoma. In girls, SSM dominated in all age groups. NM were the most common type of melanoma in boys aged 12–15, and SSM in boys aged 16–19. During the period studied the numbers of NM and SSM both increased. The largest increase was found for the SSM (Fig. 4).

Mortality

Follow-up time ranged from 22 years to 9 months. The overall mortality rate was 13% (17/134), with a median survival time of 3 years and 7 months (range 10 months to 15 years and 4 months). During the time period studied, the younger individuals had a higher mortality rate than the older. Of the children below 16 years of age at diagnosis, 23% (5/22) died of disease, compared to 11% (12/112) of the individuals aged 16–19.

DISCUSSION

The reliability of the Swedish National Cancer Registry is high. Notifications of CMM have to be made by both the surgeon and the diagnosing pathologist or cytologist. The Registry also obtains information from death certificates and reports in cases where autopsy has been performed. The reporting rate for lethal skin tumours has been estimated at >99% (9). By re-examination of the reported tumours, we have tried to avoid



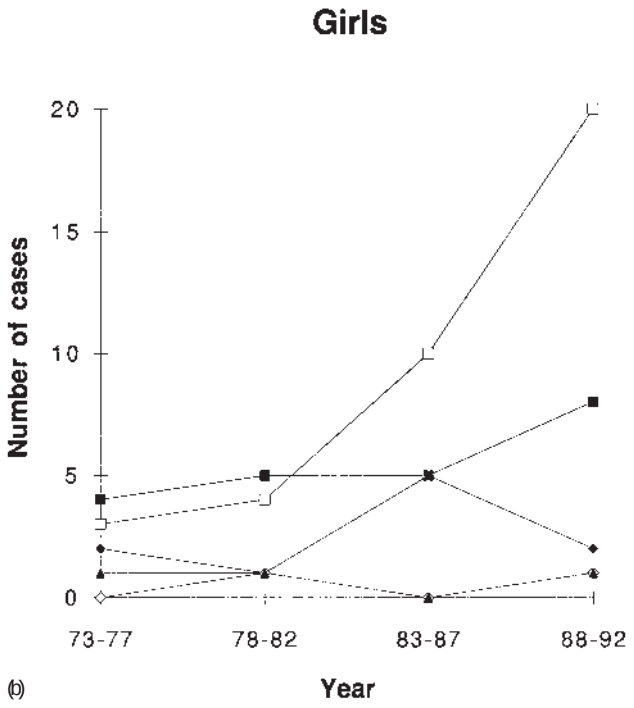


Fig. 3. Primary sites of CMM in boys and girls for 5-year periods, 1973–92. –◇– Head and neck; –■– trunk; –◆– arms; –□– legs; –▲– unknown.

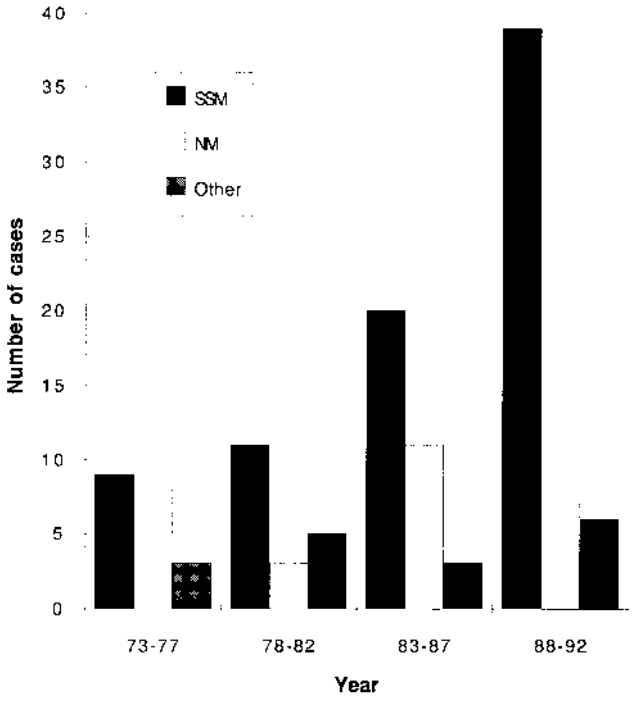


Fig. 4. Number of CMMs for 5-year periods, according to growth pattern, 1973–92.

the obvious risk of over-registration. In the present study, we chose to include only verified cases of CMM. This will lead to a certain degree of underestimation of the real incidence. Eleven percent (19/177) of the reported cases were excluded, as they were neither available for re-examination nor reported dead of disease, and presumably most of them had a correct diagnosis. This has been adjusted for when estimating the incidence rates. In addition, there may be occasional cases that have not been reported. It is difficult to estimate the size of this problem, as it is not compulsory to report recurrences to the Registry. Still, two cases of melanoma metastases were recorded, and in neither had a primary tumour been registered. On the other hand, all cases of re-examined fatal melanomas had had their primary melanoma reported. This makes us conclude that a possible underdiagnosis would not essentially influence our results.

Compared to the total number of CMM in Sweden, the proportion of CMM in children and adolescents remained low. During 1973–92, there were 20,729 cases of CMM reported to the Swedish National Cancer Registry. One percent (177/20,729) of the reported cases occurred in individuals below the age of 20. Nevertheless, in subjects aged 12–19 the number of cases doubled in the second 10-year period compared to the first. This rapid increase in melanoma incidence was similar to the increase in incidence in adults (7). The highest incidence rates were noted for superficial spreading melanoma, and for melanomas of the trunk in boys and of the legs in girls. This is also similar to the findings in adults (10, 11).

CMM remained extremely rare in children below 12 years of age (Fig. 1). The onset of puberty normally occurs between 9 and 14 years (mean 11 years for girls and 12 for boys) (12). Taking this into consideration, it is reasonable to believe that the true prepubertal melanomas remained extremely rare.

In a recent article Berg & Lindelöf (13) claim to describe the incidence of malignant melanoma of the skin in individuals below 20 years of age recorded in the Registry 1958–92. The study was done without histopathological re-examination. They conclude, in line with our findings, that the incidence increased in 1983–92 compared to 1973–82, but they overestimate the incidence in the first 10-year period by 40% and by 20% in the second (14). They fail to detect any increase in inci-

dence in girls before 15 years of age, and in boys before 16. At least 22% of all their cases, and 64% of the cases below the age of 14, cannot be substantiated. These differences cannot be explained by overreportation alone, as the diagnosis primary CMM was verified in 88% of the re-examined cases in our study. The high number of cases can possibly be obtained only if non-cutaneous melanomas are included, and if individuals with multiple primary melanomas are counted several times. They have probably also incorporated misreported cases originally diagnosed as benign pigmented naevi or melanoma metastases as well as tumours previously reclassified as non-melanoma lesions by Malec & Lagerlöf (4). This is not discussed nor mentioned in their article, so their results are difficult to evaluate.

It is less likely that the rapidly increasing incidence of melanoma in pubertal children and adolescents is explained by genetic changes. Rather, the changes in sun-related behaviour, with excessive UV exposure, are probably of major importance for the development of CMM already in teenagers. The occurrence of melanomas mainly on intermittently sun-exposed sites also in the young may further support the carcinogenic role of UV irradiation. The induction time from UV damage to melanoma formation may in fact be shorter than previously thought in susceptible individuals.

Surprisingly, a sex-related site distribution was found already in subjects aged 12–15, with most of the CMM on the trunk in boys, and on the legs in girls. Sex-specific differences in melanoma site have been ascribed different clothing habits of men and women. Additional explanations must be sought, as young boys and girls dress in much the same way in our country, even when sunbathing. Growth and sex hormones, affecting the sexes differently, may be of importance (15, 16).

Congenital melanocytic naevi are considered to be high-risk lesions for malignant transformation (17). During this 20-year period, only 7 of the re-examined melanomas occurred histologically in conjunction with a naevus of congenital type, and none before the age of 15. The prevalence of congenital melanocytic naevi has been estimated at 1.5 in 100 individuals (18), which in Sweden would correspond to 1,500 newborns with congenital melanocytic naevi each year. In view of this, the results do not support routine prophylactic excision of every congenital melanocytic naevus in children and adolescents. Instead, any pigmented lesion suspicious of malignant change, acquired or congenital, should be excised, regardless of the age of the patient.

Subjects below 16 years of age had a higher mortality rate, and thicker melanomas (8), than subjects aged 16–19. This may be due to a more aggressive biological behaviour of the tumours in the younger individuals. An alternative, or additional, explanation might be a late diagnosis due to too low a level of suspicion of malignant melanoma in this age group. Young age should not be taken as a guarantee against CMM.

The rapidly increasing incidence of CMM in the young lends support to intensified preventive measures to protect children and adolescents from the harmful effects of excessive sun exposure. Not only should parents be informed about protecting their children, but children and teenagers should be taught safe behaviour in the sun. Early prevention will also decrease the risk of melanoma later in adult life. Unless we succeed in breaking this trend of increasing incidence, CMM will become a substantial problem also among pubertal children and adolescents in the future.

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