Acta Derm Venereol 2001; 81: 415–417

CLINICAL REPORT

Occupational Non-melanoma Skin Cancer

ULRIKKE LEI, TANIA NICOLE MASMAS and GERDA FRENTZ*

Institute of Preventive Medicine, Hovedstadens Sygehusfællesskab, Kommunehospitalet, Copenhagen, Denmark

Non-melanoma skin cancer is historically known to be associated with certain professions. Reporting is mandatory in Denmark when occupational exposure is suspected. In a retrospective register-based study of all cases of suspected occupational non-melanoma skin cancer reported to the Directorate of National Labour Inspection and the National Board of Industrial Injuries in Denmark in the period January 1, 1984 to December 31, 1994, we assessed the extent to which occupational exposures today are of importance in the occurrence of non-melanoma skin cancer. A total of 74 individuals (11 women and 63 men) aged 32–82 years (median 58 years) had been reported. Of these, 15 cases (20%) were approved as being occupational, 37 (50%) were rejected and 22 (30%) were either shelved or could not be further clarified. Most commonly approved were exposures such as asphalt, tar, and the like, and ionizing radiation, and localization on the arms or multiple tumours. Unexpected occupational exposure could not be identified but continued reporting is recommended in order to follow this in the future. *Key words: Denmark; register-study.*

(Accepted September 26, 2001.)

Acta DermVenereol 2001; 81: 415–417.

Ulrikke Lei. 5, 3. tv, Bogensegade, DK-2100 Copenhagen Ø, Denmark. E-mail: ulrikke@dadlnet.dk

The first report of occupational non-melanoma skin cancer (NMSC) was made by Percival Pott in 1775 in describing cancer of the scrotum in chimney sweeps (1). Other classical occupational non-melanoma skin cancers have been described in people working outdoors and people working with welding, asphalt, tar and oil products, inorganic arsenic and ionizing radiation (2–7). In these industries, preventive measures have been taken since the beginning of the last century (8, 9).

To clarify if and to what extent occupational exposures may play a role for the development of non-melanoma skin cancer today, we reviewed the available information on potentially occupational cases of NMSC in the period 1984–94 in Denmark.

MATERIAL AND METHODS

In Denmark, verified as well as suspected cases of occupational illness have to be reported to the Directorate of National Labour Inspection (DNLI) and the National Board of Industrial Injuries (NBII). All reports (whether as primary or secondary diagnosis) registered with "skin cancer" in the DNLI in the period January 1, 1984 to December 31, 1994 have been reviewed, and information on sex, age, localization of skin cancer, occupation, exposures and year of reporting have been recorded. We obtained the ruling of NMSC cases from the NBII. The classification of NMSC followed the 8th International Classification of Diseases (ICD-8) (10). Occupational classification follows the Danish Classification of Occupations (11).

In the following, we have focused on the numerically predominant exposures, occupations and anatomical localizations, and on exposures classically associated with occupational NMSC.

RESULTS

Sixty-seven cases of skin cancer were reported to the DNLI, 49 of which could be regarded as NMSC. Eighteen cases were discarded as being non-NMSC: malignant melanoma ($n=18$), cancer labii ($n=4$), metastases to the skin ($n=2$), genital cancer ($n=1$) and not classifiable ($n=4$).

In the NBII, a further 25 persons were identified with a final diagnosis of NMSC; in these cases the entry diagnosis had been something else, usually skin disease without further specification.

Altogether 74 persons had thus been reported with a verified or suspected occupational NMSC; 11 women and 63 men aged between 32 and 82 years (median age 58 years). The clinical and/or histological diagnosis was basocellular carcinoma ($n=27$), spinocellular carcinoma ($n=8$), basocellular and spinocellular carcinoma ($n=5$) or not stated ($n=34$). A total of 15 (20%) cases were approved as being occupational, 37 (50%) were rejected, and 2 (3%) were shelved without approval. Among the remaining 20 (27%) cases, 5 had specifically asked not to have their case reported to the NBII, whereas no specific reason could be given for why the remaining cases had not been reported to the NBII. In the tables, the 2 shelved and the 20 remaining cases have been listed together. The number of reported and approved cases was evenly distributed through the years 1984 to 1994.

As can be seen from Table I, asphalt, tar and such-like, and artificial light sources are the predominant exposures, whereas asphalt, tar and such-like and ionizing radiation were the exposures most commonly approved as leading to occupationally related NMSC. The table also gives the ruling related to histological diagnosis; it can be seen that a specified histological diagnosis and both basocellular and spinocellular carcinoma at one time are more often approved. Table II indicates that NMSC occurred most frequently on the head and neck, but that tumours on the upper extremities and multiple tumours were more frequently approved. Age and sex were not related to particular exposure or anatomical localization of NMSC. Two representative case reports from the study are described below:

- A 78-year-old man working in the production of asphalt for 15 years, and in laying out asphalt for 2 years, had been exposed to the smoke from asphalt on the skin of the face, hands and forearms and stains of asphalt on the hands and forearms. Nineteen years prior to reporting, the first case

* This paper is dedicated to the memory of Gerda Frentz, who died on 9 November 1998.

© 2001 Taylor & Francis. ISSN 0001-5555

Table I. *Occupational exposure and histologic diagnosis in relation to the National Board of Industrial Injuries (NBII) ruling within the period 1984–1994*

	Person characteristics		Ruling		
Occupational exposure	Sex (M/F)	Age (range)	Approved (%) ($n=15$)	Rejected (%) ($n=37$)	Others (%) ($n=22$)
Farming, fishing and such-like	3/0	58 (43–60)	0 (0%)	3 (100%)	0 (0%)
Asphalt, tar and such-like	11/0	66 (47–79)	5 (45%)	2 (18%)	4 (36%)
Artificial light sources	16/0	51 (38–69)	3 (19%)	9 (56%)	4 (25%)
Oil products	4/0	59 (32–61)	0 (0%)	1 (25%)	3 (75%)
Ionizing radiation	4/4	64 (52–82)	4 (50%)	2 (25%)	2 (25%)
Others	25/7	58 (34–82)	3 (9%)	20 (63%)	9 (28%)
Histological diagnosis:					
Basocellular carcinoma	24/3	57 (32–82)	5 (19%)	11 (41%)	11 (41%)
Spinocellular carcinoma	7/1	63 (46–79)	3 (38%)	2 (25%)	3 (38%)
Basocellular and spinocellular carcinoma	5/0	73 (47–78)	3 (%)	–	2 (%)
Unspecified non-melanoma skin cancer	27/7	59 (34–80)	4 (12%)	24 (71%)	6 (18%)

Table II. *Localization of the non-melanoma skin cancer, sex, age and the National Board of Industrial Injuries (NBII) ruling within the period 1984–94*

	Person characteristics		Ruling		
Localization	Sex (M/F)	Age (range)	Approved (%) ($n=15$)	Rejected (%) ($n=37$)	Others (%) ($n=22$)
Head/neck	31/1	57 (32–82)	4 (13%)	13 (41%)	15 (47%)
Truncus	3/1	59 (40–77)	1 (25%)	3 (75%)	–
Upper extremities	6/4	63 (54–80)	6 (60%)	4 (40%)	–
Lower extremities	–	–	–	–	–
Multiple tumour	8/1	60 (47–78)	4 (44%)	4 (44%)	1 (11%)
Non-specified	15/4	59 (34–82)	–	13 (68%)	6 (32%)

of skin cancer had developed. Since then, recurrent cases of both basocellular and spinocellular carcinomas had occurred. In the NBII, the case was approved as being work-related.

- A 58-year-old woman clinical assistant exposed to Bucky irradiation. Worked 4–5 h a day, once a week holding lead plates used to protect patients being treated with Bucky. The assistant had no kind of protection herself. Three years prior to reporting, the patient developed a spinocellular carcinoma on the right second finger. She was treated with excision. There was no information regarding years of exposure. In the NBII the case was approved as being work-related.

DISCUSSION

The incidence of NMSC has increased during recent decades, generally ascribed to increased solar exposure (9, 12–16). In Denmark, 4866 cases of NMSC were reported to the Danish Cancer Registry in 1994 compared to 3009 cases in 1984 (17, 18). Both verified and suspected cases of occupational illnesses must be reported to the DNLI and NBII. However, this does not ensure that all new cases of NMSC which could be related to the occupational environment are in fact reported. The median age group for NMSC registered in the Danish Cancer Registry in 1994 was 65–69 years for men and 70–74 years for women (17); in our material, the median age was 58 years (57 years for men and 58 years for women). Young age at debut of tumour, atypical localization and low exposure to other non-occupational carcinogens, especially the sun, must lead to considerations of a possible occupational aetiology in cases of NMSC (19–21). Often, though not always, the tumour arises in the exposed area (13, 16). In this material, younger age than expected and predominance on the upper extremities for approved cases is in line with this (Table II). The material included classical cases of occupational NMSC with 5 cases on the arms/hands of workers exposed to asphalt, tar and such-like, and four cases in persons exposed to ionizing radiation (Table I). The review did not give rise to any suspicion of new, prior unknown, occupations causing NMSC.

Hygiene sins of the past seem partly eliminated, as no cases of scrotal cancer where found, previously shown to be caused by polycyclic aromatic hydrocarbons in for example soot, tar and oil products (2, 13). As these exposures still exist, increased use of industrial hygiene measures, such as protective clothing, isolated or closed system operations and the education of employees have had an effect (13).

Within the period 1984–91 skin disorders accounted for 16% (17,746/114,071) of all cases of potentially occupational illnesses reported to the DNLI (22). Thus reported cases of NMSC (a total of 74 during 11 years) constitute only a negligible part of the approximately 2200 yearly reported cases of occupational illness (22). In England, NMSC is considered to make up less than 1% of all occupational cancer (19). Comparable figures have not been published from other European countries. Almost 2/3 of all reported skin disorders

and about 1/4 of all reported suspected occupational illnesses are approved as being occupational (22). In comparison, only 1/5 of all reported cases of NMSC was approved as occupational in this study.

The work environment seems to play a causal role in some cases of NMSC in Denmark today. However, these constitute less than 2‰ of NMSC cases registered in the Danish Cancer Registry (17, 18, 23). Furthermore, it must be added that no firm conclusion can be made on NMSC and any relation to occupational exposure as we have no matched control group in this study. Further case-control studies on occupationally related NMSC are needed.

In order to identify potential new occupational hazards, it is crucial, also in the case of fairly benign cancers such as NMSC, that it is reported if occupational exposure is suspected as a contributory cause.

REFERENCES

1. Potter M. Percival Pott's contribution to cancer research. Natl Cancer Inst Monogr 1963; 10: 1–5.
2. Travis LB, Arndt KA. Occupational skin cancer. Postgrad Med 1986; 79: 211–217.
3. Beral V, Robinson N. The relationship of malignant melanoma, basal and squamous skin cancers to indoor and outdoor work. Br J Cancer 1981; 44: 886–891.
4. Vitasa BC, Taylor HR, Strickland PT, Rosenthal FS, West S, Abbey H, et al. Association of nonmelanoma skin cancer and actinic keratosis with cumulative solar ultraviolet exposure in Maryland Watermen. Cancer 1990; 65: 2811–2817.
5. Rhodes AR. Public education and cancer of the skin. What do people need to know about melanoma and nonmelanoma skin cancer. Cancer 1995; 75 (2 suppl): 613–636.
6. Hansen J, Olsen JH. Cancer morbidity among Danish female pharmacy technicians. Scand J Work Environ Health 1994; 20: 22–26.
7. Pukkala E. Cancer incidence among Finnish oil refinery workers. J Occup Environ Med 1998; 40: 675–679.
8. Grandjean P. Miljø, sundhed og samfund. Copenhagen: Nyt Nordisk Forlag Arnold Busck, 1991.
9. Suarez-Varela MM, Llopis Gonzalez A, Ferrer Caraco E. Non-melanoma skin cancer: a case-control study on risk factors and protective measures. J Environ Pathol Toxicol Oncol 1996; 15: 255–261.
10. Klassifikation af Sygdomme, systematisk del. 8. revision (International Classification of Diseases 8th edition). National Board of Health 1986, Schultz Grafisk A/S.
11. Dansk fagkode (Danish Classification of Occupations), 2nd ed. Copenhagen, Arbejdsdirektoratet, 4. kontor, 1986.
12. Emmet EA. Occupational skin cancer: A review. J Occup Med 1975; 17: 44–49.
13. Østerlind A. Non-melanom hudcancer i Danmark 1943–1982. Ugeskr Laeger 1986; 148: 798–802.
14. Strom SS, Yamamura Y. Epidemiology of nonmelanoma skin cancer. Clin Plast Surg 1997; 24: 627–636.
15. Staples M, Marks R, Giles G. Trends in the incidence of non-melanocytic skin cancer (NMSC) treated in Australia 1985–1995: are primary prevention programs starting to have an effect? Int J Cancer 1998; 778: 144–148.
16. Marks R. The epidemiology of non-melanoma skin cancer: who, why and what can we do about it. J Dermatol 1995; 11: 853–857.
17. Cancer incidence in Denmark 1994, Sundhedsstatistikken 1997:7. National Board of Health.
18. Cancer incidence in Denmark 1984. Copenhagen: The Danish Cancer Society, 1987.
19. Veys CA. Occupational cancers. BMJ 1996; 313: 615–619.
20. Grodstein F, Speizer FE, Hunter DJ. A prospective study of incident squamous cell carcinoma of the skin in the nurses' health study. J Natl Cancer Inst 1995; 87: 1061–1066.
21. Wahlberg JE, Johansson G. Skin cancer of the hand and arm in Sweden 1966–70 in relation to previous occupational exposure. Berufsdermatosen 1977; 25: 185–195.
22. Halkier-Sørensen L, Thestrup-Pedersen K, Petersen BH. Anmeldte og anerkendte arbejdsbetingede hudsygdomme i Danmark. (Abstract in English). Copenhagen: Industriens Forlag, 1994.
23. Cancer incidence in Denmark 1985–1993. Copenhagen: The Danish Cancer Society, 1988–1996.