

Increased incidence of malignant melanoma of the skin in workers in a telecommunications industry

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ABSTRACT In 1982 physicians at a hospital melanoma clinic in Montreal noticed that among their patients there had been seven men working in a single telecommunications company. This raised suspicions that working in that industry might be associated with development of malignant melanoma of the skin (MMS). A preliminary gross comparison with general population rates indicated that there was an increased risk in this working group. To estimate the risk of MMS more accurately, a standardised incidence ratio (SIR) was calculated based on the rates of MMS in the local population of the Greater Metropolitan Montreal Area for the years 1976-83. During that period, among workers in all plants for the company, 10 male cases of MMS were observed for an expected number of 3.7 (SIR = 2.7; 95% CI = 1.31-5.02). No cases were observed among female workers (expected = 1.3). The excess was significant among cases with a short latency (less than 20 years since beginning of employment). There was no apparent pattern of exposure based on job titles or departments.

In 1982 surgeons from the melanoma clinic of the Royal Victoria Hospital in Montreal noted that seven patients diagnosed as having malignant melanoma of the skin (MMS) between 1975 and 1982 had worked in one or more plants or offices of a single large telecommunications industry. MMS had rarely been associated with work. An excess risk had been observed among workers exposed to polychlorinated biphenyl (PCB),¹ asbestos,² and polyvinyl chloride (PVC).^{3,4} Workers in the pharmaceutical,⁵ electronic,⁶ and petrochemical⁷ industries, chemists,^{8,9} veterinarians,¹⁰ and coal miners¹¹ had on occasion been reported to be at increased risk but the case numbers were small. Potentially more significant risks of MMS developing were observed for employees of nuclear laboratories¹²⁻¹⁴ and for work in outdoor, sun exposed occupations.¹⁵⁻¹⁷ Exposure to ultraviolet light was suspected as causative in these instances, as it was in the observed increasing trend for trunk melanomas among office workers. The latter were assumed to be generally not sun exposed but possibly to have experienced brief, intense periods of exposure to sun during holidays.^{15,17} Ultraviolet light was also suspected as a factor in the increased risks for intraocular

melanoma observed among welders in two recent case-control studies.^{18,19} Only one study conducted in Sweden had observed an increased risk of MMS in a telecommunications industry.²⁰

The purpose of the present study was to assess the risk of MMS among the telecommunications industry workers as compared with the incidence rate in the Greater Montreal population.

Methods

POPULATION

All 9590 workers of the Montreal plants of the telecommunications company employed for six months or more between 1 January 1976 and 31 December 1983 constituted the study population. This included workers already employed as of 1 January 1976 as well as all new employees hired between 1976 and 1983.

ASCERTAINMENT OF CASES OF MMS

All cases of MMS newly diagnosed between 1 January 1976 and 31 December 1983 among residents of the Greater Montreal area (Montreal and Laval islands) were identified from the medical, pathological, and oncological archives of 30 local hospitals. Matching

with the Quebec Tumour Registry for the same period was performed to assess completeness of ascertainment and to add cases if necessary. For some cases, information not available in the original hospital review was obtained by contacting treating physicians.

When pathological reports obtained for cases gave equivocal diagnoses suggestive of MMS (four cases), we obtained histological material and referred it to a consulting dermatopathologist for further review. In all other cases unequivocal MMS histological diagnoses provided by hospital pathologists, including type and grade of tumour, were accepted without further analysis. Histological types accepted for the study included malignant melanoma not otherwise specified, superficial spreading melanoma, nodular melanoma, lentigo maligna melanoma, amelanotic melanoma, and acral lentiginous and "epitheloid cell type" melanoma.

Cases of MMS among telecommunications company employees were identified by linking the list of the workers to the list of cases among Montreal area residents, using surname, given name, sex, date of birth, and social insurance number.

Figures for the current population of the Greater Montreal area (the denominator for expected MMS rate calculations) were obtained from Statistics Canada census data for 1976 and 1981.²¹⁻²⁴

ANALYSIS

Using data provided by the company on date of first employment and date of termination, a person-year of observation (PYO) chart was calculated according to the method of Monson.²⁵

The PYO chart included workers active between 1 January 1976 or their later hiring date and the end of the observation period (31 December 1983) or sooner if they died.

Montreal rates calculated from census data and our hospital/tumour registry survey were then applied to the PYO among the workers to obtain expected values after standardisation for age and sex. Observed cases were then compared with expected values and a standardised incidence ratio (SIR) was calculated with the corresponding 95% confidence interval (CI) and *p* values. Calculation of SIR was also done with regards to latency.²⁵

Results

MMS IN THE MONTREAL AREA

Between 1 January 1976 and 31 December 1983, 852 incident cases of MMS were diagnosed among residents of the Greater Montreal area aged 15 and over (table 1). The annual rate of MMS increased from 4.99/100 000 in 1976 to 7.24/100 000 in 1983. The observed sex ratio showed a 1.2:1 female excess. Mean

Table 1 Incidence of malignant melanoma of the skin (for 100 000) by year of diagnosis and sex (Montreal area—1976–83)

Year of diagnosis	Men		Women		Total	
	No	Rate	No	Rate	No	Rate
1976	35	4.47	47	5.45	82	4.99
1977	38	4.86	56	6.50	94	5.72
1978	47	6.01	53	6.15	100	6.08
1979	43	5.50	71	8.24	114	6.94
1980	40	5.14	58	6.70	98	5.96
1981	57	7.33	63	7.28	120	7.30
1982	66	8.49	59	6.81	125	7.61
1983	45	5.79	74	8.55	119	7.24
Total	371	5.95	481	6.96	852	6.48

age at diagnosis was 54.4 for men and 52.3 for women. The incidence rate of MMS increased with age. Women showed higher rates than men until age 54, after which the reverse was observed. The annual rate increase was less pronounced among those aged 15 to 34 than in other age groups.

The distribution of cases according to histological types showed that 39.1% were superficial spreading melanoma, 17.0% nodular melanoma, 7.4% lentigo maligna melanoma, and 4.8% of other specified types (amelanotic, lentiginous, and epitheloid cell type or superficial and nodular); 31.7% were diagnosed only as malignant melanoma, without further specification of type. Thickness of tumour was unspecified in 60.7% of cases; 20.0% measured less than 1 mm, 9.6% less than 2 mm, 4.9% less than 3 mm, and 4.3% between 3 and 21 mm in depth.

When anatomical site of MMS was known (802 of 852 cases) tumours were more often observed on covered (68.6%) than on uncovered parts (31.4%) of the body. The leg was the most frequent site (29.7%). Skin of the thoracic portion of the trunk was the most common location in men (33.7%); leg melanomas were more common in women (64.0%).

At time of diagnosis, 93.3% of cases had no known metastasis. Among the 56 cases with metastasis, 35 (61.4%) were on the trunk, 11 (19.3%) on the legs and arms, and 10 (17.5%) on the head.

MMS AMONG WORKERS OF THE TELECOMMUNICATIONS COMPANY

Ten incident cases were diagnosed among workers of the telecommunications company during the period under study (table 2). All were men. Age at diagnosis varied from 24 to 64 (mean 47.9 ± 15.6; median 53.5). Nine were diagnosed between 1976 and 1980 and one between 1981 and 1983. Histologically, five were superficial spreading melanoma, two nodular, and three of unspecified type.

Seven cases occurred while the men were still employed. Two were engineers, one an installer, one

Table 2 Description of the ten cases of malignant melanoma of the skin among workers of a telecommunications company (Montreal 1976-83)

Case	Sex	Age at diagnosis	Year of diagnosis	Histological type	Location	Hiring year	Latency (years)	Longer type of work
1	M	27	1976	Unspecified	Chest	1967	8	Office
2	M	42	1977	Unspecified	Limb	1959	18	Engineer
3	M	31	1978	Superficial	Forearm	1969	8	Electrical engineer
4	M	53	1978	Unspecified	Shoulder	1948	30	Office (salesman)
5	M	54	1979	Superficial	Shoulder	1974	5	Office (computer specialist)
6	M	64	1979	Nodular	Abdomen	1951	29	—
7	M	24	1980	Nodular	Arm	1974	5	Installer
8	M	61	1980	Superficial	Abdomen	1942	38	Office
9	M	60	1980	Superficial	Back	1947	33	Installer
10	M	63	1982	Superficial	Back	1943	38	Office

an office worker, and job data at time of diagnosis were unknown for three. Three workers had left the company, each two years before the diagnosis.

The longest job held at the telecommunications company overall by most of the cases (5) was "office work." Other job titles included engineer (2) and installer (2); occupational details could not be obtained for one.

The information available made a detailed job title or job exposure matrix examination impossible. On the basis of the limited information provided, we could not specify any single job or exposure at higher risk for the development of MMS.

STANDARDISED INCIDENCE RATIO OF MMS

Altogether 9590 workers (74.6% men) were either employed by the company on 1 January 1976 or started employment at some time before 31 December 1983. Men contributed 51 456 person-years of employment and women 17 958 person-years. Expected values were calculated as 3.7 cases of MMS among men and 1.3 cases in women. The SIR for the 10 male cases was thus 2.7 with a 95% CI of 1.31-5.02 (table 3).

Five cases appeared with a latency of less than 20 years (expected number: 0.99). SIR (5.0) was statistically significant (95% CI = 1.63-11.75). For the five other cases having at least 20 years of latency, the SIR was 1.9 (NS).

Table 3 Malignant melanoma of the skin observed and expected by latency among male workers of a telecommunications company (Montreal 1976-83)

Latency	Observed	Expected	O/E	95% CI
< 20 years	5	0.99	5.0	1.63-11.75
≥ 20 years	5	2.69	1.9	0.60- 4.34
Total	10	3.68	2.7	1.31- 5.02

Discussion

MONTREAL SERIES OF MMS

As elsewhere in the world,^{26,27} the MMS rates in the

Montreal area increased between 1976 and 1983. In Montreal the increase was from 4.99 to 7.24 per 100 000. Women had higher rates of MMS than men as observed in one other recent study.²⁸ Age standardised analysis indicates that the observed increase is not related to a general aging of the population.

Although case numbers are small, distribution according to the three following histological types, superficial spreading melanoma, nodular melanoma, and lentigo maligna melanoma, is similar to that already published. Including only the cases with one of those histological types, 50.0% (333 of 666) of Montreal cases were diagnosed as superficial spreading melanoma, similar to series described in Scotland (56.6% or 640 out of 1131)²⁹ and in the United States (54.4%).³⁰ Forty per cent of cases were diagnosed as nodular melanomas in the Montreal study, 26.4% in the Scotland, and 31.6% in the United States, whereas 9.5% to 17% of cases in the three studies were lentigo maligna melanoma. The many malignant melanomas not further specified as to type in Montreal (31.7%) is due to our use of contributed diagnoses rather than systematic review of the 852 cases. In addition, diagnostic habits in Montreal may be more variable in that either American, British, or French classification schemes may be used.

ABSENCE OF CASES AMONG THE FEMALE WORKERS OF THE TELECOMMUNICATIONS COMPANY DURING THE SURVEY PERIOD

No case of MMS was observed among female workers in the survey period. While no systematic analysis of previous years has been attempted, we do know of two women diagnosed in 1974. The first one worked for the company as a cable forming and assembly worker, with a latency of 27 years. The second one worked 10 years for the company before she developed a MMS.

In addition, the observed female rate could be an underestimation of the true rate. In Quebec, as elsewhere, married women in daily life may choose either to keep their own surname or use their husband's surname. In Quebec hospital files, however, all women are registered under their own surname. Since

our method depended on company roll/hospital file linkage, female cases might be missed if they used their husband's names for work purpose. Other parameters for identification were used, such as Social Insurance Number and date of birth but that information was not always present in hospital files.

CASES OF MMS AMONG WORKERS OF THE TELECOMMUNICATIONS COMPANY

Data on job titles and specific exposures were unfortunately not available in sufficient detail to be contributory, although the crude information available did not seem to point to a specific area in the company plants. White collar workers are seen to be more at risk of MMS than those in blue collar occupations.³¹ The blue or white collar status of our cases of MMS was not available to us in the current study.

One of us (BC) recently performed a case-control study of choroidal melanoma in the Greater Montreal area.¹⁹ Of 30 cases ascertained and interviewed, one was an employee of the same telecommunications plant referred to in this study.

One previous study has observed a SMR of 2.6 in a telecommunications industry.²⁰ This SMR increased to 3.9 when departments where soldering work was done were considered. Interestingly, choroidal melanoma has been linked to welding occupation¹⁸ and to welding and soldering fumes¹⁹ in two recent studies. Unfortunately, specific information on welding, soldering, or related work in cable forming and installation was not available for the ten cases forming the present study of skin melanoma.

Two of our 10 cases of MMS were engineers. One study conducted in Sweden among electrical engineers showed SMR lower than expected for all causes of death and for all cancers except for MMS.³² Three deaths were observed and 0.9 was expected (SMR = 3.2, 95% CI = 0.7-9.4). Of the three cases, one was a telecommunications engineer and the two others worked in the power transmission industry.

LATENCY AND MMS

Among the 10 cases of MMS, there seemed to be two different patterns with regards to latency. The first one was characterised by short latency (5 to 9 years; n = 4) among three young workers (ages 24, 27, 31) and an older one (age 54) and the second by long latency (25 to 39 years; n = 5) among older workers (53 to 64 years old). Usually, cancers of occupational origin appear after a long latency.³³

The short latency observed in four men in the present study argues against an occupational origin and may simply be a random observation. Admittedly speculative alternative possibilities can be suggested, however. If there was a "causative" exposure it could have been a highly carcinogenic one introduced recen-

tly. If this were true more cases should continue to appear in the coming years. An "additive exposure," sustained either at work or outside it, could constitute another possibility. The four men in question had relatively well defined jobs: electrical engineer (8 years), computer specialist (5 years), cable installer (5 years), and office clerk (8 years). While three of the jobs are "technical," no common factor is obvious at present.

SUMMARY: A CLUSTER OF MMS?

Ten male incident cases of MMS were diagnosed between 1976 and 1983, nine of them clustered between 1976 and 1980. In addition to these ten cases, nine other cases are known to have been employed by the company and there has been one case of choroidal melanoma. They were not considered in the present study because they did not meet the criteria of inclusion: six were diagnosed before 1976 (1973 to 1975), one in 1977 but was working for a plant outside Quebec, and the final two were diagnosed after retirement. We do not know if the trend has continued after 1983 but, if rates for company workers remain above those for the general population or increase, an occupational exposure is a likely contributing cause. If rates of MMS decrease to an expected rate after 1983 this would suggest either that the workers had been exposed to a risk factor which is no longer present in the environment or that the cluster represents a random event.

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