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by [Liden C](#), [Wahlberg JE](#)

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Work with video display terminals among office employees

V. Dermatologic factors

by Carola Lidén, MD, Jan E Wahlberg, MD¹

LIDÉN C, WAHLBERG JE. Work with video display terminals among office employees: V Dermatologic factors. *Scand J Work Environ Health* 11 (1985) 489—493. According to some reports, mainly from Norway, work with a video display terminal (VDT) has been suspected to cause skin rashes. In conjunction with an epidemiologic study of some 550 office employees, 74 persons, who complained of skin symptoms, were examined by occupational dermatologists. The objective was to see whether the findings from earlier reports could be confirmed, whether any type of rash could be suspected to depend on VDT work, and whether positive findings might be explained by means of physical data. Many different diagnoses were made, but no case demonstrated the clinical picture described among VDT operators from Norway. Subjects with seborrheic dermatitis, acne, and rosacea were overrepresented in the exposed group. Whether this occurrence was due to physical factors, psychological factors, or pure chance is still unclear. This study and observations from our clinic imply that a relationship might exist between VDT work and aggravation of seborrheic dermatitis, acne, and rosacea and probably poikiloderma of Civatte.

Key terms: acne, anamnestic skin symptoms, electrostatic charge, epidemiologic study, objective skin lesions, poikiloderma of Civatte, rosacea, seborrheic dermatitis.

On the basis of some case reports it has been discussed for some years whether work with a video display terminal (VDT) can give rise to skin rashes (11, 12, 13).

Physical exposure factors that have been proposed as causes of skin symptoms in the office environment are, eg, self-copying (carbonless) paper, electrostatic charging, small atmospheric charged particles, and electrostatic field. It has also been suggested that psychological mechanisms might contribute to complaints concerning discomfort of the eyes and musculoskeletal system and headache (5).

The questionnaire in the epidemiologic health study of some 550 office employees (5) included an item concerning current skin symptoms on the face and hands. The subjects who reported current symptoms were interviewed and examined by occupational dermatologists. The clinical findings were compared with the subjective symptoms and physical exposure factors presented in earlier reports of the study (5, 6).

The objective of the dermatologic examination was to determine whether the findings from the Norwegian case reports could be confirmed, whether any type of skin lesion could be suspected to have been provoked or worsened by VDT work, and whether positive findings might be explained by means of physical data.

Subjects and methods

The questionnaire concerning subjective disorders and symptoms was answered by 536 subjects (395 VDT operators and 141 referents). It included a question concerning skin symptoms reading as follows: "Have you ever had symptoms in the form of skin rash (skin lesions, redness, eczema, dry skin, itch or the like) on the face, neck, hands or arms?" All the subjects (N = 96) who stated that they currently had symptoms were called to an interview and clinical examination at their respective places of work (table 1). This examination took place in the winter months (November 1982—February 1983). All who were at work came to the examination, but 22 were absent because of vacation, "parent's leave," shift work, journey on official business, or retirement.

Case histories of earlier and current skin diseases and symptoms were recorded. Questions were asked concerning a suspected relation between skin lesions and the subjects' work, especially VDT work. The lesions were recorded as follows. *Objective skin lesions* (visible in the examination) were classified according to diagnosis. *Anamnestic skin symptoms* (not visible in the examination, but during the last year suffered or experienced as an "unpleasant feeling" on the skin) were classified according to probable diagnosis. The sites of objective and anamnestic skin lesions were recorded, as was also the subjects' own suspicion of work-related impairment. A prescription or referral for further investigation owing to skin disease was issued if required.

¹ Department of Occupational Dermatology, Karolinska Hospital and National Board of Occupational Safety and Health, Solna, Sweden

Reprint requests to: Dr C Lidén, Department of Occupational Dermatology, National Board of Occupational Safety and Health, S-171 84 Solna, Sweden.

The result of the dermatologic examination was compared with particulars of the subjective symptoms, the work, and the physical exposure factors measured by earlier reported methods (5, 6). The factors were VDT exposure/nonexposure, sex, eye symptoms, musculoskeletal symptoms, headache, VDT work (time at VDT, type of work), work with self-copying (carbonless) paper, temperature, air humidity, electrostatic charge, electrostatic field strength (10 cm in front of the VDT), type of floor, light air ions close to the face and in the room, ultraviolet radiation (UV_A) from the terminals and against the ceiling.

The various dermatologic diagnoses were grouped, and each group was compared regarding exposure or nonexposure. (See table 3 of the Results section, 46 exposed and 15 referents.) For each group and for the total examined group comparisons were made with the rest of the entire population (379 exposed and 126 referents) in respect to the mentioned particulars of the subjective symptoms, the work, and the physical exposure factors.

The subjects who did not come to the examination despite having reported skin symptoms in the questionnaire were similarly compared with the rest of the entire population and with all subjects examined with objective or anamnestic skin lesions. They did not differ significantly from those examined nor from the rest of the entire population in respect of the aforementioned factors, with one exception. The dropout group had less contact with self-copying (carbonless) paper. This occurrence was affected by the fact that newspaper employees were overrepresented in the dropout group.

In the statistical evaluation the chi-square test and the t-test were used. All tests were two-tailed.

Results

Altogether 74 subjects who had reported current skin symptoms in the questionnaire were interviewed and examined (table 1). Six of them denied that they had ever had skin symptoms, and seven had lesions at sites other than the ones to which the question referred, eg, on legs or trunk. It was judged that they had filled in the form incorrectly. Sixty-one subjects had current skin lesions or had recently had the symptoms inquired about in the questionnaire.

Altogether 15 types of skin lesions were recorded for the 61 subjects (table 2). Thirty-seven had objective lesions when examined, and seven of the 37 suspected these to have been worsened by their work. Thirty-eight subjects had anamnestic skin symptoms, and 12 of the 38 suspected these to have been worsened by their work. In some cases there were two or more diagnoses.

None of those examined had or had had rashes resembling those reported among VDT operators in Norway (8, 11, 13).

Observed and anamnestic eczematous lesions were mainly sited on the hands. Anamnestic records of dry, reddened, and/or itching skin were related mainly to the face. Of the eight subjects with suspected work-related symptoms of dry, reddened, and/or itching skin, seven were VDT operators.

The four subjects with rosacea (table 2) were all VDT operators. Two of them stated that their skin disease was aggravated during their work, but they did not indicate the VDT in particular as a cause of the impairment.

For some of the various comparisons mentioned in the Subjects and Methods section tendencies towards or statistically significant ($p < 0.05$) differences could be established. There was a tendency towards a higher frequency of the diagnoses seborrheic dermatitis, acne, rosacea, and perioral dermatitis (group III, table 3) among the exposed subjects than among the referents in the clinically examined group (28 % for the exposed and 7 % for the referents).

A tendency towards a more positive electrostatic charge (6) was found in the group with seborrheic dermatitis, acne, rosacea, and perioral dermatitis (group III, table 3) in comparison with the rest of the entire population (mean for group III 1.5 kV/m, 0.01 m from the subject and for the rest of the population -1.4 kV/m, 0.01 m from the subject) ($p < 0.01$). The same tendency was found when this diagnosis group was compared with the rest of the clinically examined subjects (mean for the rest of the examined -1.8 kV/m, 0.01 m from the subject) ($p < 0.05$).

There was a tendency for more complaints about dryness, redness, itch, and/or papules (group I, table 3) among the women than among the men in the entire population (7 % for the women and 3 % for the men).

When all the subjects with objective or anamnestic skin symptoms (table 3) were compared with the rest of the entire population, it appeared that they had complained more of eye discomfort ($p < 0.01$), musculoskeletal symptoms ($p < 0.05$), and headache ($p < 0.01$). The same difference appeared for the group with dryness, redness, itch, and/or papules (group I, table 3).

Otherwise no statistically significant differences were found.

Discussion

Occasional case reports of facial rashes in conjunction with VDT work have been published.

Rycroft & Calnan (12) reported the cases of four male VDT operators who developed red spots on their cheeks in conjunction with their work. A relation to VDT work was suggested, as no other explanation appeared.

Tjønn (13) reported that 35 VDT operators with facial rash in Norway in 1979-1980 were examined

Table 1. Subjects who had reported skin symptoms and were interviewed and examined and those who reported such symptoms but did not come to the examination or who had answered the questionnaire incorrectly.

	Participants			Dropouts		
	Exposed	Referents	Total	Exposed	Referents	Total
Present skin lesions according to questionnaire	74	22	96	.	.	.
Did not come for examination	.	.	.	15	7	22
Examined and interviewed	59	15	74	.	.	.
Answered questionnaire incorrectly						
No skin symptoms	.	.	.	4	2	6
Other sites	.	.	.	6	1	7
Skin lesion according to interview, examination	49	12	61	.	.	.

Table 2. Type of objective skin lesions found in the examination and of anamnestic skin symptoms, as well as the stated suspicion of work-related impairment among 61 subjects.

Type of lesion	Objective skin lesions (37 subjects)		Anamnestic skin symptoms (38 subjects)	
	Number of diagnoses	Thereof stated suspicion of work-related impairment	Number of diagnoses	Thereof stated suspicion of work-related impairment
Dry skin alone	6	1	9	5
Redness, itch and/or dryness	1	—	10	3
Papules, unclassified	3	—	4	—
Eczema	12	1	10	1
Seborrheic dermatitis	4	1	2	1
Acne	3	1	—	—
Rosacea	4	2	—	—
Perioral dermatitis	1	—	—	—
Cheilitis	—	—	1	1
Telangiectasis, single	2	—	—	—
Vitiligo	2	—	—	—
Chloasma	1	1	1	1
Psoriasis	3	—	—	—
Pustulosis	—	—	2	—
Urticaria	—	—	2	—
Total	42	7	41	12

by dermatologists; 16 of the cases of facial rash were judged to be caused by some factor at work. The symptoms were transitory itch, redness, desquamation, and sometimes papules on the cheeks. Various provocation tests and experiments were made. The hypothesis was that very few VDT operators experienced rashes. A research project was initiated to investigate whether a relation existed with static electricity, electric fields, and airborne particles (3).

Nilsen (11) reported that six female VDT operators among 94 at the National Telephone Company in Bergen, Norway, developed facial rashes. [These cases are included in Tjønn's report (13).] They consisted of transitory redness and sometimes papules on the cheeks which appeared on workdays and disappeared on nonworkdays. Dermatologic examination ruled out contact allergy, increased photosensitivity, or other known skin diseases. Provocation tests with VDT exposure did not succeed in reproducing the skin lesions. Suspicion of a relation to VDT work was stated, but the exact cause could not be established.

Table 3. Grouping of the objective skin lesions and the anamnestic skin symptoms of 61 subjects (46 exposed and 15 reference subjects).

	Exposed subjects	Referents	Total
Group I (dryness, redness, itch, papules)	24	5	29
Group II (eczema)	18	4	22
Group III (seborrheic dermatitis, acne, rosacea, perioral dermatitis)	13	1	14
Group IV (telangiectasis, vitiligo, chloasma, psoriasis, pustulosis, urticaria)	9	5	14

Lindén & Rolfsen (8) reported 10 cases of facial rash suspected to be due to VDT work. These cases are also included in Nilsen's and Tjønn's materials (11, 13).

These case reports have described a fairly uniform clinical picture which could not be diagnosed as any earlier known skin disease. The symptoms have been

of relatively short duration and clearly related to time at work. It has not been a matter of impairment of individuals with earlier skin disease. Various conceivable causes of the skin symptoms were discussed, eg, low relative humidity and static electricity (11, 12, 13), electrostatic field, and the deposition of airborne particles (13). Ultraviolet light as a cause was ruled out after technical investigation (12, 13). Psychological factors were judged to have aggravated possibly but not to have caused the symptoms (11).

Cato Olsen (3) measured the electrostatic field and the deposition of airborne particles on the face and advanced a hypothesis stating that these factors could be the cause of the symptoms of the VDT operators in Bergen. This hypothesis has been further discussed in relation to the results of the present study (6).

Two American epidemiologic questionnaire-based surveys of the health hazards of VDT work touched superficially on the question of skin symptoms (4, 10). The response rate in both studies was low, 23–75 % (10) and 18–52 % (4), in different subgroups. Only in one subgroup did VDT operators report a significantly higher incidence of skin symptoms than subjects unexposed, but this occurrence was not further analyzed (10).

Experience from the present study

The questionnaire in our study (5) included a question relating to skin symptoms: "Have you ever had symptoms in the form of skin rash (skin lesions, redness, eczema, dry skin, itch or the like) on the face, neck, hands or arms?" Among the 395 VDT operators and 141 referents all the subjects answering "Yes, present symptoms" were subjected to a dermatologic examination. In the clinical examination and interviewing of the 74 subjects available, many different skin diseases and symptoms were found to have contributed to the affirmative answers (table 2).

None of the subjects examined had facial rashes such as those associated with VDT work in Norway. The examination was made during the winter when, according to the studies referred to, the symptoms are most manifest (8, 11). Only a small proportion of the examined subjects themselves suspected that their skin symptoms were impaired by any factor at work (table 2). This suspicion applied to the following 8 of the 15 diagnoses: dry skin; redness, itch and/or dryness; eczema; seborrheic dermatitis; acne; rosacea; cheilitis; and chloasma.

It is improbable that all the types of skin lesions found would be caused or worsened by VDT work or any other work environment factor. The subjects were therefore divided into different diagnosis groups for the statistical comparison with objective and anamnestic skin symptoms and physical exposure factors.

The physical exposure factors represent the results of measurements on an occasion which did not coincide with the time of the dermatologic examination.

Several of the factors have a considerable seasonal variation (6). The only physical factor for which a difference existed between a diagnosis group and the entire population was electrostatic charge. The group with seborrheic dermatitis, acne, and rosacea had a tendency towards the occurrence of a more positive charge than the rest of the population. The method of measuring this factor gave only a rough estimate however (6); therefore too much weight must not be assigned to this finding. But it is worth noting that these diagnoses were also more frequent among the subjects exposed to a VDT than among the referents.

The subjects who, according to the interviews and examinations, had current or anamnestic skin symptoms had concomitantly a higher incidence of eye and musculoskeletal symptoms and headache than the rest of the population. The subgroup of subjects with dryness, redness, itch, and/or papules exhibited the same difference.

After the examinations and interviews 13 subjects were considered to have answered the question on current skin symptoms incorrectly. Conceivable explanations may be (i) an unclear formulation of the question, (ii) carelessness in filling out the questionnaire owing to its extensiveness, or (iii) psychological factors, eg, a need to accentuate symptoms. This matter has not been analyzed. It cannot be ruled out that those who replied that they had *no* present skin symptoms had not also answered incorrectly to some extent. Such an occurrence was found in an epidemiologic study of hand eczema (1). An examination and interview of all the participants in the epidemiologic study would be necessary to decide this point.

Experience from the Department of Occupational Dermatology, Karolinska Hospital

If skin lesions caused by VDT work were common in the Stockholm area, the number of referrals to the Department of Occupational Dermatology, Karolinska Hospital, would presumably have been large. Only seven such referrals, however, were received in the period 1979–1984. In three of these cases we could not rule out a relation between the skin lesions and VDT work (unpublished data). They are as follows:

Case 1. A 44-year-old woman with marked redness of cheeks, nose, and chin was the subject in case 1. Onset occurred after a few months of VDT work. The symptoms appeared during the workday and week and improved on weekends. She was almost asymptomatic after she terminated VDT work. The preliminary opinion was rosacea(?).

Case 2. A 51-year-old woman with complete vitiligo experienced redness and a pricking sensation on the neck, chin, and tip of her nose that had started after six months of VDT work. She exhibited abundant telangiectases on the neck and reported minor com-

plaints of a pricking sensation after technical measures had been taken to prevent electrostatic charging, which previously had been very pronounced and caused problems with the VDT. The clinical picture was that of poikiloderma of Civatte (2).

Case 3. A 47-year-old woman who had always been sensitive to sunlight reported redness, smarting pain, and a pricking sensation on the neck and in the decollete area, more on the right than on the left side. She exhibited abundant telangiectases on the neck. The woman considerably improved, especially as regards smarting pain, one month after she terminated her VDT work. The clinical picture was that of poikiloderma of Civatte.

What factor or factors may have caused the skin lesions in these three cases is at present unknown. The time relation between the clinical course and VDT work is, however, noteworthy.

Rosacea

Rosacea is a labile skin disease which is impaired by several external factors (9, 14). Rosacea was diagnosed in four cases in the clinical examination at the workplaces and one of the referred patients (case 1) may have had rosacea. For this reason a questionnaire-based survey was made of any impairment caused by VDT work among 179 patients of working age with rosacea or perioral dermatitis (7). Forty-two subjects worked with a VDT, and eight of them stated that their skin disease (rosacea in all cases) was aggravated by the work. These subjects were interviewed and examined. One reported increasing redness in the face during work and improvement on nonworkdays, five stated that improvement occurred during lengthy leave, and two noticed no change during leave. However, none of the eight had suspected that VDT work aggravated their skin disease *before* they received the questionnaire.

The material indicates that office work or possibly VDT work might contribute to the aggravation of rosacea in certain subjects. What work factor might be the cause is, however, unclear.

Conclusions

In the special dermatologic examination no case was found with the clinical picture associated with VDT work in Norway. The present study and our own clinical experience indicate, however, that there may

be a relation between VDT work and an aggravation of seborrheic dermatitis, acne, and rosacea, and possibly also the provocation of poikiloderma of Civatte. It is unclear whether this relation is due to physical or psychological factors.

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