

ANALYSIS OF ETIOLOGICAL FACTORS OF SQUAMOUS CELL SKIN CANCER OF DIFFERENT LOCATIONS

3. The Arm and the Hand

Gunnar Swanbeck and Lars Hillström

From the Department of Dermatology, Karolinska sjukhuset, Stockholm, and the Department of Dermatology, University Hospital, Uppsala, Sweden

Abstract. The medical records of 154 patients with squamous cell skin cancer on the hands and the arms reported to the Cancer Registry of the Swedish National Board of Health 1958-65 have been analyzed. The purpose of the investigation was to evaluate the importance of different etiological factors of squamous cell cancer of the skin, particularly concerning possible relation to skin diseases and dermatological treatment given to the patients in the past. There was 1 case of psoriasis, 1 case of acrodermatitis atroph. chronica Herxheimer and 7 cases with eczema, among the patients. In 4 cases, the cancer appeared in burn scars; 5 patients had earlier had X-ray treatment on the site where the cancer was revealed, and 5 cases developed cancer on the place of earlier mechanically trauma. In 7.8% of the cases, the cancer had metastasized.

In total there were 129 patients with skin cancer on the hands (mainly on the dorsal part) and only 25 with cancer on the arms. This condition and the finding that most patients with skin cancer on the hands were outdoor workers indicates that sunlight exposure plays a dominant role in the development of squamous cell cancer on the skin. The age-specific incidence rate increases exponentially with age. The incidence rate of this form of cancer is also higher in the southern than in the northern part of Sweden.

This study is the third part of an investigation on squamous cell skin cancer in Sweden. The aim of the investigation was mainly to analyze possible etiological or associated factors in the individual cancer cases. The first part was published in 1969 (15) and the following in 1970 (7).

We have been especially interested in the possibility of an association between squamous cell skin cancer (s.c.s.c.) and different kinds of dermatological therapy given to these patients in the past, a problem which has been discussed in several earlier papers (1-15). Our study is based

upon data from medical records of patients reported to the Cancer Registry of the Swedish National Board of Health.

As the possible etiological factors of s.c.s.c. on different areas of the body may be of various types (e.g. extensive sunlight on the face and on the hands, chronic ulcers on the legs), it has been convenient to discuss different parts of the body in separate papers. The present study deals with squamous cell skin cancer on the hands and arms.

MATERIAL AND METHODS

The Cancer Registry of the Swedish National Board of Health began its work on January 1, 1958. Since then, all cases of cancer in Sweden are reported to this organization. The Cancer Registry (C. R.) was complete up to and including 1963 when this investigation began, but a certain number of reports from the years 1964-65 were also available.

A list of all reported cases of s.c.s.c. during the above mentioned time was obtained from the C. R. The data concerning the patients included sex, age, place of abode, reporting clinic and location of the tumor on the body. Copies of the patients' medical records were then requested and examined.

The total number of patients with s.c.s.c. on the arms and hands reported during the period was 159. Five patients had to be left out of the investigation as they were found to have been incorrectly reported as cases of s.c.s.c. to the C. R.

RESULTS

Hands

During the period studied 129 cases with s.c.s.c. located on the hands were reported. Of these,

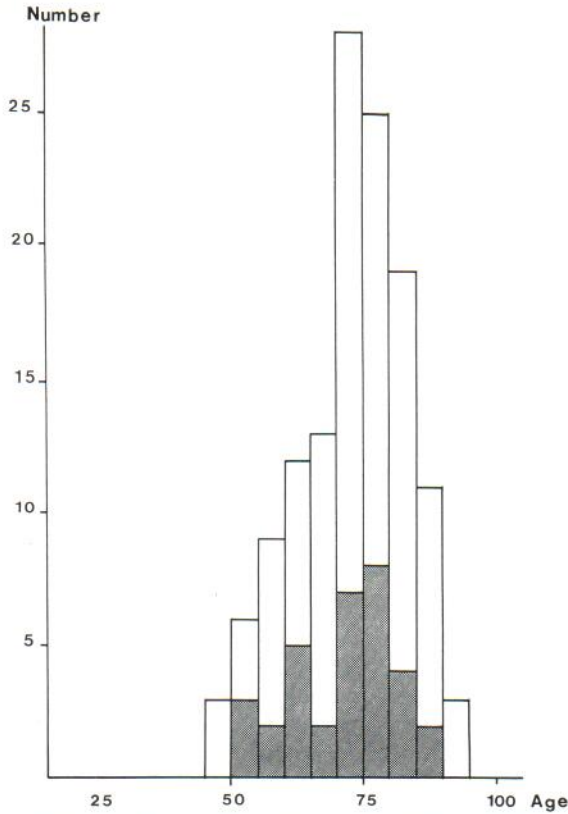


Fig. 1. Age and sex distribution of the patients with squamous cell skin cancer on the hands. Dark areas represent women; white areas, men.

96 were men, and 33, women. The age distribution of the material is given in Fig. 1. Among the men, 47 cases had exophytic cancer while 49 cases had an ulcerated cancer or the cancer in an ulceration. Among the women, 12 cases were exophytic and 21 ulcerated or in ulcerations. Two

Table I. Distribution of the squamous cell cancers by localization and etiological or associated factors

	Hand	Arm	Total
Burn injury	3	1	4
Mechanical injury	4	1	5
Eczema	3	4	7
Psoriasis	—	1	1
Acrodermatitis chronica atrophicans Herxheimer	1	—	1
X-ray treatment	2	3	5
X-ray work	1	—	1
Finsen-treated lupus vulgaris	—	1	1
Unspecified	115	14	129
	129	25	154

Table II. Metastatic frequency with respect to localization of the tumor

Metastases	Hand	Arm	Total
Lymph nodes	3	2	5
Metastases in other organs	5	2	7
	8	4	12

cases had cornu cutaneum. The right hand was the site of the cancer in 61 men. Of these, 46 cases had the cancer on the dorsum manus, 14 on the fingers, and 1 in the vola manus. Of the 35 cases with cancer on the left hand 26 had the cancer on the dorsum manus, 8 on the fingers, and 1 in the vola. The corresponding figures for women were: the right hand, 13, 2 and 2, and the left hand, 9, 7 and 0. Etiological or associated factors could be found only in a minority of the cases. Of the total, there were 3 cases with cancer in the scar after burn injury, 4 cases with earlier mechanical trauma at the site of the cancer, 3 cases had previously had eczema, 1 case of acrodermatitis chronica atrophicans Herxheimer, 2 cases reported earlier X-ray treatment on the hands, and there was one physician

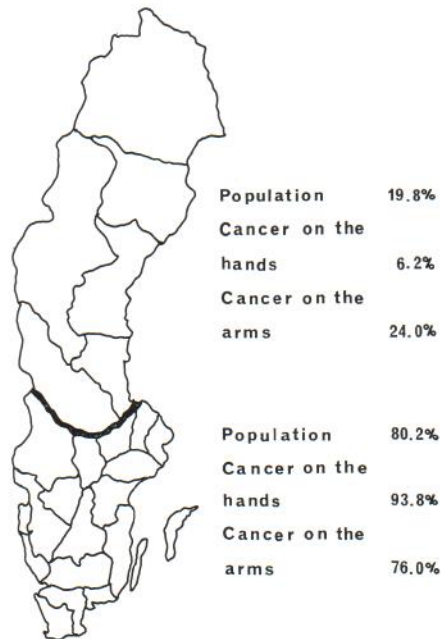


Fig. 2. Map showing the counties of Sweden. The thick line indicates the northern and southern parts of Sweden according to our division.

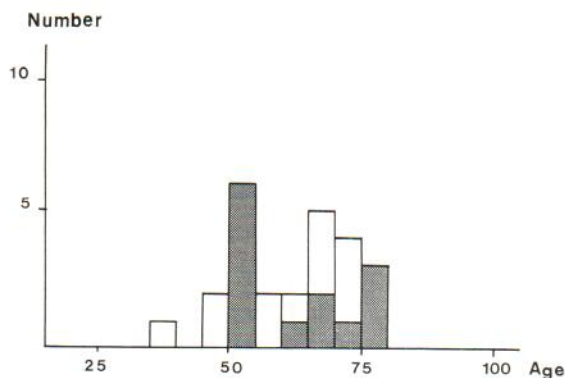


Fig. 3. Age and sex distribution of patients with squamous cell skin cancer on the arms. Dark areas represent women; white, men.

who had been working with X-rays for many years (Table I). Three cases had metastases only to regional lymph nodes and 5 cases had metastases also to other organs such as lungs, liver and brain (Table II). The 8 cases with metastases were distributed equally between ulcerated and exophytic cases.

As in the two earlier papers (6, 15) we have divided Sweden into a northern and a southern part (Fig. 2). The northern part contains 19.8% of the population, while 80.2% live in the southern part. In the present material there were 8 cancer cases (6.2%) from the northern part, while

Table III. Number of patients with s.c.s.c. on the hands in relation to occupation

Occupation unknown	28
Farmers	28
Factory workers	6
Merchants	5
Woodsmen	4
Craftsmen	3
Sailors	3
Carpenters	3
Linemen	2
Enginemen	2
Transport workers	2
Printers	1
Foremen	1
Telegraph workers	1
Road workers	1
Fishermen	1
Photographers	1
Physicians	1
Engineers	1
Teachers	1
General workers	1
Total	96

93.8% of all cases came from the southern part. The over-representation of cancer cases in the southern part is statistically highly significant ($p < 0.001$).

We are able to ascertain earlier occupations or professions from the medical records for 68 of the 96 men. Of the 68 cases there were 28 farmers or men working on farms, 4 woodsmen, 4 fishermen or sailors, 6 factory workers, and the rest were about equally distributed among outdoor and indoor workers (Table III).

Arms

There were considerably fewer cases with s.c.s.c. on the arms than on the hands. In the present study we found only 25 cases with s.c.s.c. on the arms; of these, 11 men and 14 women. The age distribution is given in Fig. 3. There were 14 exophytic growing cancers and 11 ulcerated or in ulcerations. Thirteen cases had their cancer on the lower arm, 2 on the elbow, and 10 on the upper arm. One case had the cancer in a burn scar, 1 case in a psoriatic plaque, 1 in a scar after mechanical trauma, 4 cases had or formerly had eczema on the place for the cancer, 3 cases had been treated with X-rays on the skin area

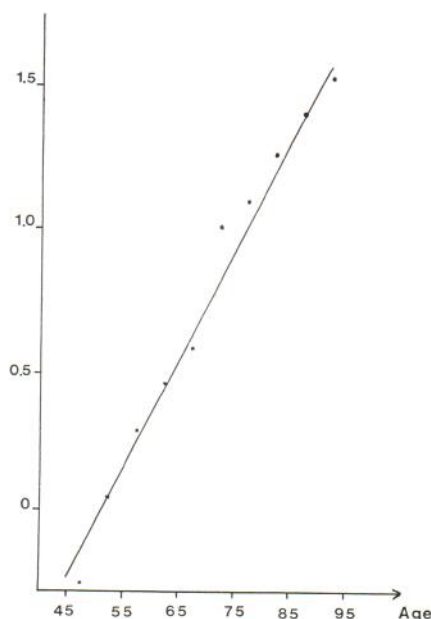


Fig. 4. Number of squamous cell cancer cases with tumors on the hands and the arms per 100 000 people in different age groups per year (age-specific incidence rate).

where the cancer developed, and 1 case had the cancer at the site where he once had a Finsen-treated lupus vulgaris (Table I). Two cases had metastases to lymph nodes only and 2 had generalized metastases (Table II).

Six cases came from the northern part of Sweden which is 24% of the total number of cases with s.c.s.c. on the arms. The occupation or profession was found in the medical records for 9 of the men and one of the women. There was 1 farmer, 1 stone worker, 1 railroad worker, 1 engineer, 2 teachers, 1 painter, 1 postman and 2 clerks.

The number of skin cancer cases per 100 000 of the population for different age groups per year (age-specific incidence rate) is given in Fig. 4. Fig. 4 represents the whole material, the hand and the arm groups taken together. The frequency increases exponentially with age, with a doubling of the incidence rate taking place about 7.5 years.

DISCUSSION

Most s.c.s.c. cases of the upper extremity were found on the dorsal part of the hand. There are considerably more men than women affected by skin cancer on this region of the body. The typical outdoor workers (farmers, woodsmen, railroad-workers, road-workers, sailors and fishermen) form the largest group, 40 out of 68 patients whose occupation was found in the medical records. In the working part of the Swedish population these categories taken together form a relatively small group (about 10%). These facts strongly support the generally accepted concept that sunlight is the dominant etiological factor in s.c.s.c. (2, 11, 16). This concept is also supported by the significantly higher incidence rate of s.c.s.c. on the hands in the southern part of Sweden than in the northern part. The amount of ultraviolet sun radiation reaching the ground is higher in the southern part of Sweden than in the northern part.

Etiological or associated factors to s.c.s.c. are summarized in Table I. For the hands there are 14 cases where such factors have been reported and for the arms, 11 cases. These figures are of about the same magnitude while the unspecified cases are far more common in the "hand" group. In the group with s.c.s.c. on the arms

we have found etiological or associated factors in nearly half the number of cases while we only found such factor for one-ninth of the number of cases in the group with s.c.s.c. on the hands. This information together with the fact that farmers and outdoor workers are strongly over-represented in the group with s.c.s.c. on the hands indicates that most cases of s.c.s.c. on the hands are caused by sun radiation.

In the present study the etiological or associated factors most commonly found turned out to be burn injury, mechanical trauma, eczema and X-ray treatment. This is in accordance with what we have found in our two earlier papers

It is interesting to note that as for s.c.s.c. of the lower limbs and the face the incidence rate of s.c.s.c. on the hands per 100 000 people increases exponentially with age and that the incidence rate is doubled in about 7.5 years.

Of the total number of cases reported in the present study (154) we found 12 with metastases which is 7.8%. Of the 12 cases with metastases, 5 had metastases only in regional lymph nodes.

In the present material we have found no over-representation of psoriasis or other skin diseases. It is questionable whether there is an over-representation of eczema cases, however. In no case was arsenic treatment for a skin disease reported in the medical history.

ACKNOWLEDGEMENT

This study has been supported by the Swedish Cancer Society.

REFERENCES

1. Arons, M. S., Lynch, J. B., Lewis, S. R. & Blocker, T. G.: Scar tissue carcinoma. Part I. A clinical study with special reference to burn scar carcinoma. *Ann Surg* 161: 170, 1965.
2. Belisario, J. C.: *Cancer of the Skin*. Butterworth, London, 1959.
3. Bock, F. G. & Burns, R.: Tumor-promoting properties of anthralin (1, 8, 9-anthracene). *J Nat Cancer Inst* 30: 393, 1963.
4. Currie, A. N.: The role of arsenic in carcinogenesis. *Brit Med Bull* 4: 402, 1947.
5. Gillberg, B. O., Zetterberg, G. & Swanbeck, G.: Petite mutants in induced in yeast by dithranol (1, 8, 9-trihydroxyanthracene), an important therapeutic agent against psoriasis. *Nature* 214: 415, 1967.
6. Greither, A. & Tritsch, H.: *Die Geschwülste der Haut*, p. 147. Georg Thieme Verlag, Stuttgart, 1967.

7. Hillström, L. & Swanbeck, G.: Analysis of etiological factors of squamous cell skin cancer of different locations. *Acta Dermatovener (Stockholm)* 50: 129, 1970.
8. Hövelborn, K.: Karsinomentstehung auf chronischen Dermatosen. (Psoriasis, Ulcus cruris und Lichen ruber verrucosus, spätexudatives Eksematoid.) *Derm Wschr* 28: 858, 1935.
9. Jung, H. D.: Der Hautkrebs in epidemiologischer Sicht. *Z Ges Hyg* 13: 98, 1967.
10. Lagerholm, B. & Skog, E.: Squamous cell carcinoma in psoriasis vulgaris. *Acta Dermatovener (Stockholm)* 48: 128, 1968.
11. MacDonald, E. J.: The epidemiology of skin cancer. *J Invest Derm* 32: 379, 1959.
12. Magnusson, A. H. W.: Hautkrebs. Klinische Studie mit besonderer Berücksichtigung der Radiumbehandlung. Norstedt & Söner, Stockholm, 1935.
13. Ormsby, O. H. & Montgomery, H.: Diseases of the Skin, p. 843. Lea & Febiger, Philadelphia, 1954.
14. Rook, A. J., Gresham, G. A. & Davis, R. A.: Squamous epithelioma possibly induced by the therapeutic application of tar. *Brit J Cancer* 10: 17, 1956.
15. Swanbeck, G. & Hillström, L.: Analysis of etiological factors of squamous cell skin cancer of different locations. *Acta Dermatovener (Stockholm)* 49: 427, 1969.
16. Urbach, F.: Geographic Pathology of Skin Cancer. *In The Biologic Effects of Ultraviolet Radiation* (ed. F. Urbach), p. 635. Pergamon Press, 1969.

Received April 6, 1970

Gunnar Swanbeck, M.D.
 Department of Dermatology
 Karolinska sjukhuset
 S-104 01 Stockholm 60
 Sweden