Thermography in occupational vasoneurosis

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SUMMARY. The results of thermographic examinations in 50 workers with symptoms of occupational vasoneurosis are presented. The author proves that there are 2 main types of positives thermographic findings in occupational vasoneuroses. The importance of thermography before and after cold immersion is stressed.

Key words: thermography, occupational vasoneurosis, chill test, thermal gradient (carpometacarpal region . fingers).

Many authors [1, 2, 3, 4] have published papers on the importance of thermography for the study of occupational vasoneurosis. We would like to present our results because they prove, that measuring thermal gradients between the carpo-metacarpal region and the fingers alone cannot detect as many occupational vasoneuroses as thermography before and after cold immersion.

METHODS

We use Chucker's method. The patient is not allowed to smoke for 24 hours before examination. Immediately before thermography, the patient takes off his jacket and turns up the sleeves of his shirt. Thermography starts with a thermogram of both hands. The hands of the sitting patient lie on a fine metal laced on a level with the patient's heart. After taking a thermogram, the technical assistant slips a pair of fine rubber gloves on to the hands of the patient, who immerses them in cold water 8-12 °C for 2 minutes. Then the patient pulls his hands out of the water and the technical assistant removes the gloves by cutting them with a pair of scissors. The patient lays his hands on the fine net again and for 45 minutes thermograms of the hands are taken at 5 minutes intervals.

Plethysmography after cold immersion and Louis - Prusik test (for ascertaining Raynaud's phenomenon) are also done for all patients.

RESULTS

We performed telethermographic examinations in 50 workers with symptoms of occupational vasoneurosis. We divided all patients into several groups according to the results of the thermographic examination.

There were 12 patients in the first group with normal thermographic findings. In these patients the temperature of both hands was slowly and steadily rising and reached the initial level at least 45 minutes after cold immersion. In 11 patients of this group we found no thermal gradient between the carpometacarpal region and the fingers before cold immersion, and in 6 patients also 45 minutes after this test. Only in 2 patients of this group slight alterations of plethysmograms, and in 1 patient a slight alteration of plethysmogram and simultaneously a slight Raynaud's phenomenon, were found (Fig. l-3).

13 patients represent the second group. In these patients the temperature was rising during the first 15-35 minutes after cold immersion, sometimes the temperature reached or exceeded the initial level, then the temperature fell and 45 minutes after cold immersion it was below the initial level. In 8 patients of this group we found no thermal gradient before cold immersion, but we found a gradient 45 minutes after cold immersion. In 4 patients the findings concerning the thermal gradient were reversed; the gradient was present before, but not after, cold immersion. In 9 pa-

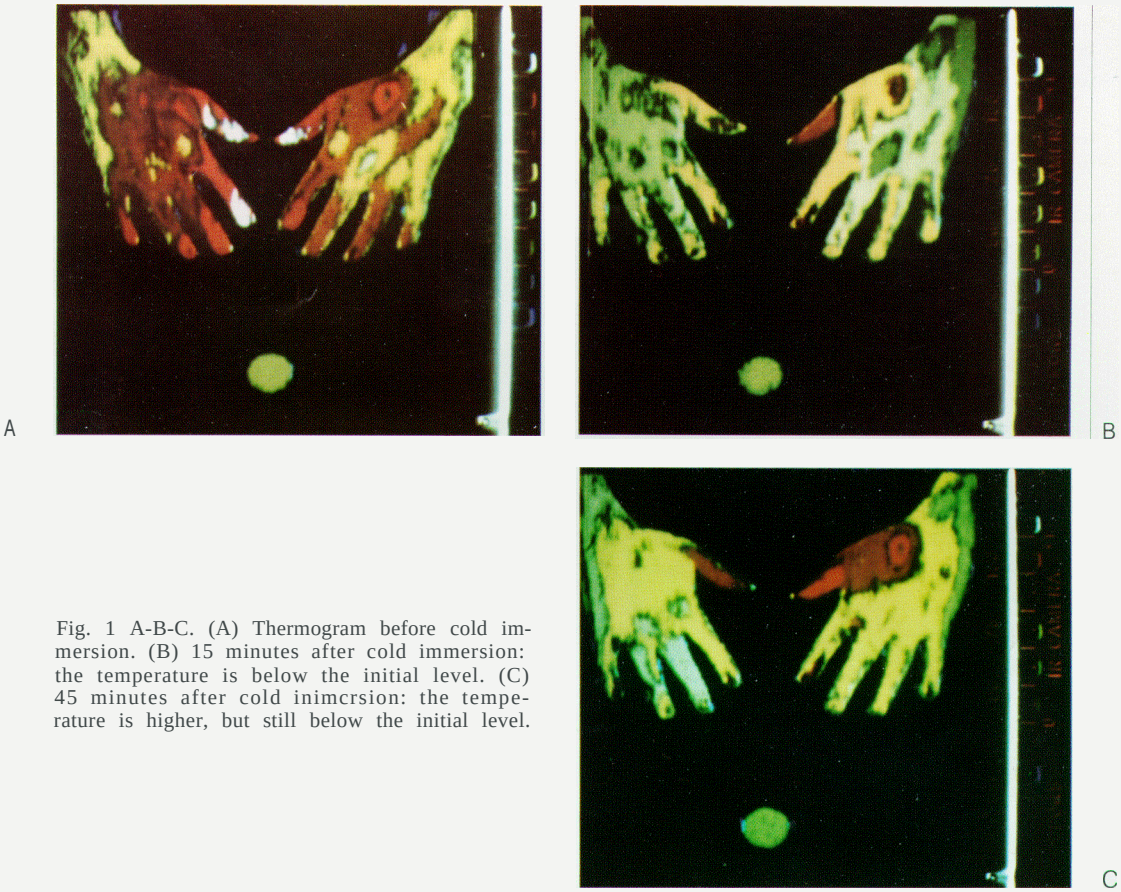


Fig. 1 A-B-C. (A) Thermogram before cold immersion. (B) 15 minutes after cold immersion: the temperature is below the initial level. (C) 45 minutes after cold inimcrsion: the temperature is higher, but still below the initial level.

tients of this group positive plethysmography or Raynaud's phenomenon were proved (Fig. 4-6).

There were 21 patient5 in the third group. In this group the temperature was steadily rising, but it didn't reach the initial level in 45 minutes after cold immersion. In 19 patients of this group we proved a thermal gradient before cold Immersion and also 45 minutes after it. Sometimes the gradient reachcd 8°C. Plethvsmographic changes and Raynaud's phenomenon were found in 15 patients.

There were 3 patients in the next group. In these patients we proved a thermal dissociation between the right and left hands. For example, recovery of the temperature of the right hand was fluctuating as in the second group of our patients and the temperature of the left hand was steadily rising as in the third groap. A thermal gradient before, and 45 minutes after cold immersion was found. In all these patients with thermal dissociation of the right and left hands plethysmographic changes were found.

In 1 patient we found an exceptional rise in temperature after cold immersion. The temperature rose quickly and steadily and 45 minutes after cold immersion it exceeded the initial level by 4°C. In this patient a thermal gradient was found before, and also 45 minutes after, cold immersion. Neither plethysmographic changes nor Raynaud's phenomenon were proved.

DISCUSSION

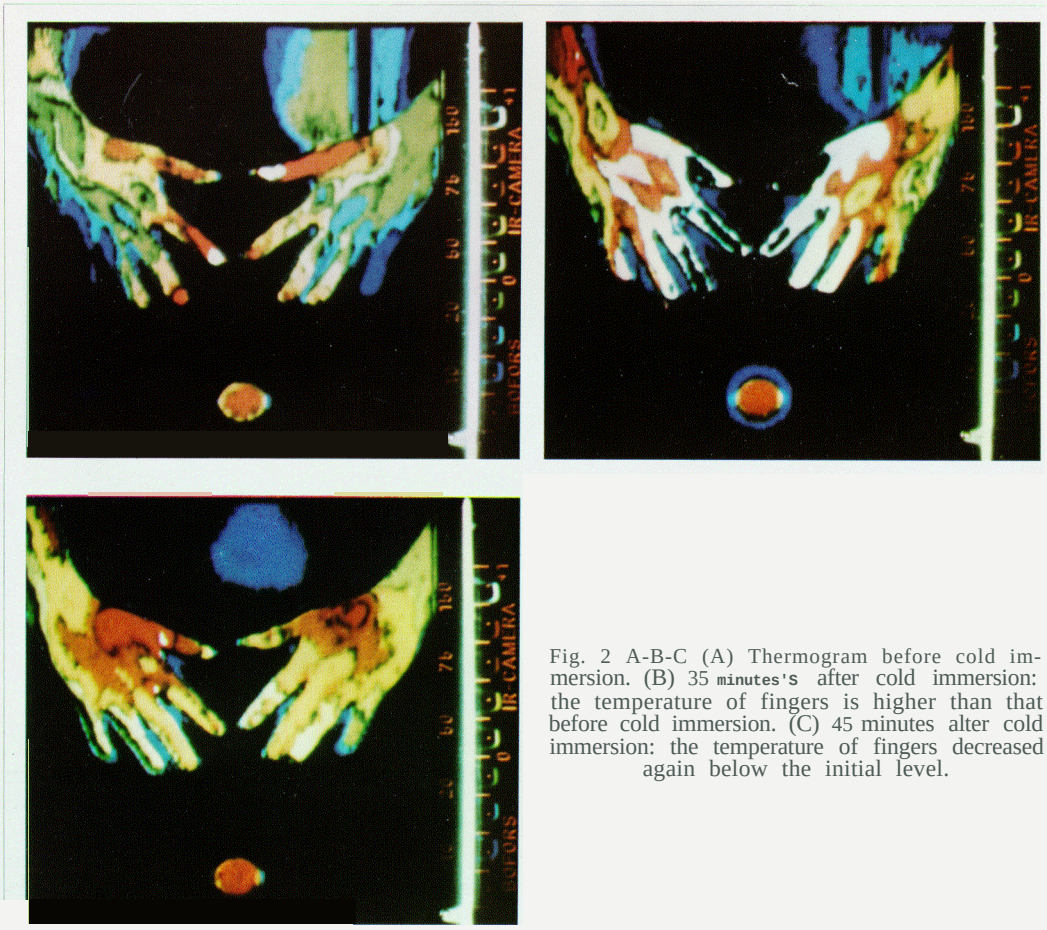
We divided the patients with positive results into 2 or 3 groups (the second, third and fourth group of our results).

All patients, in which the temperature was fluctuating and which 45 minutes after a cold immersion test was below the initial level. were put into the second group.

In the third group we concentrated all patients in which the temperature of the hands was steadily and slowly rising, but 45 minutes after cold immersion was below the initial level.

It is important that in more than half of the patients with fluctuating temperatures no therma1 gradient was proved before a cold immersion test. In these patients positive clinical and plethysmographic finding were ascertained. Therefore we affirm that measuring therma1 gradients cannot detect all cases of occupational vasoneuroses and it is necessary to perform cold immersion in all patients. On the other hand, we do not rule out the possibility of a connection between a thermal gradient and occupational vasoneurosis. The number of patients with a high thermal gradient in our third group proves this connection.

It is necessary to do the thermograms for 45 minutes. If they are done for a shorter period of time, the patients with Fluctuating temperatures after cold immersion tests might be considered as thermographically normal.



A B C

Fig. 2 A-B-C (A) Thermogram before cold immersion. (B) 35 minutes's after cold immersion: the temperature of fingers is higher than that before cold immersion. (C) 45 minutes alter cold immersion: the temperature of fingers decreased again below the initial level.

CONCLUSIONS

1. Thermography is very important for the investigation of occupational vasoneurosis.
2. Occupational vasoneurosis occurs often,

but not always, in patients with a thermal gradient between the carpometacarpal region and the fingers. Therefore, measuring this gradient does not suffice and cold immersion is necessary in all patients.

3. After a cold immersion test occupational vasoneurosis is manifested, on the whole, in two ways:
   a) the temperature of the hands is rising slowly and steadily, but 45 minutes after this test it is below the initial level.
   b) the temperature of the hands is fluctuating (rising and falling). 45 minutes after cold immersion the temperature is below the initial level.

REFERENCES

1. **ACCIARRI** L., **CARNEVALE** F., **DELLA SELVA** A.: Thermography in the hand angiopathy from vibrating tools. *Acta thermographica,* 1, 18-28, 1976.
2. **CHUCKER** F.. **FOWLER R.. MOTOMIYA T.. HURLEY W.:** Induced temperature transients in Raynaud's disease measured by thermography. *Angiology, 22, 580, 1971.*
3. **SCABARDI** M., **CUGOLA L., CARNEVALE** F.: Essai thermographique dans les troubles fonctionelles et organiques de la vascularisation du membre superieur. Paper presented at « Quatriéme séminairz de telethermographie dynamique » Tunis, 27-30 April 1975.
4. **TILILA M.:** A preliminary study of the «white finger », using thermographic and other diagnostic tests. *Work Environ. Health,* **1, 85, 1970.**