Thermography in breast cancer screening (first experience)

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SUMMARY. The Author examined more than 15,000 women who visited the Trento Tumor Center (Northern Italy) for breast cancer investigation.
The statistical results demonstrate the benefit of combining thermography with clinical results examination and history.

The correlation of the three investigations seems actually to be the method that assures the highest probability of early breast cancer detection.

Key words: thermography; breast cancer detection; mass screening programme.

INTRODUCTION

Since 1968, in our Tumor Center (Trento, Northern Italy), we have been using thermography for breast cancer investigation.

The purpose of the present study is to assess the role of thermography in early cancer detection.

PROCEDURES AND MATERIAL USED

The technical equipment we use is Smith's Pyroscan and Bofor's Thermograph. For breast x-ray examination we use Generay's Senograph and Siemen's Mammomath.

We considered 15,000 women who attended between 1973 and 1974, some of whom were already frequenting our Center for annual controls. The latter provide also the possibility of a time evolution study.

Daily, 60 - 70 women attended with an annual total of 12,000 to 15,000.

The operational steps we follow are: thermography, history for the risk factor evaluation and clinical examination. We send to mammography all the women that have a positive in at least one of these investigations (Fig. 1).

RESULTS

Using the sequence of methods, as illustrated above, we detected 201 cancers among the 15,000 women.

Among the positive thermograms (4905) we found 172 cancers and among the negative ones (10.095) 29 malignant tumors (Table I).

Tab. I. **Thermographic findings (15,000 exams).**

Thermography	*N°*	*N° of cancers*	
positive	4905	172	$P < 0.001$
negative	10.095	29	

The marked difference in the number of women found between the positive and negative groups, even if statistically significant ($P < 0.001$), is not so definite as to give thermography a primary role as a mass screening method.

The high percentage of false positives (about 30%) and the sufficiently high number of false negatives (14.5%) underlines the non-specificity of this method and suggests that we

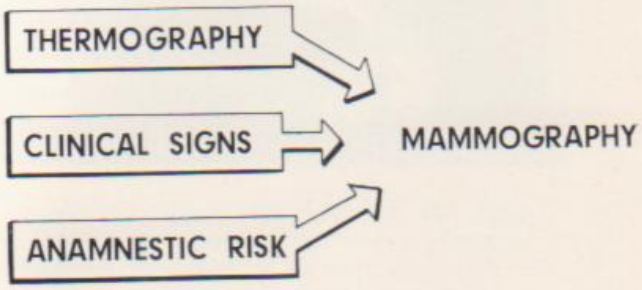


Fig. 1. Breast investigation.

should determine it's exact role in a mass screening programme.

It is quite interesting to compare the results of thermography with those of the clinical examination and history.

Of the 15,000 women examined, 2,900 of them had a positive clinical examination (164 cancers) and 12,100 a negative one (37 cancers) (Table II).

Tab. II. **Clinical findings (15,000 exams).**

Clinical signs	*N°*	*N° of cancers*	
presence	2900	164	$P < 0.001$
absence	12.100	37	

Among the women, with risk factors in their history (5,589) 113 tumors were detected; among those without any risk factor (9411) we found 88 cancers (Table III).

Tab. III. **Anamnestic risk (15,000 exams).**

Risk	*N°*	*N° of cancers*	
present	5589	113	$P < 0.001$
absent	9411	88	

DISCUSSION

From our experience one can see that thermography detects the highest number of cancers.

The use of thermography alone as a mass screening method is justified only if one is willing to miss a certain number of tumors that the thermographic examination is not able to detect (in our series 14.5% of false negatives).

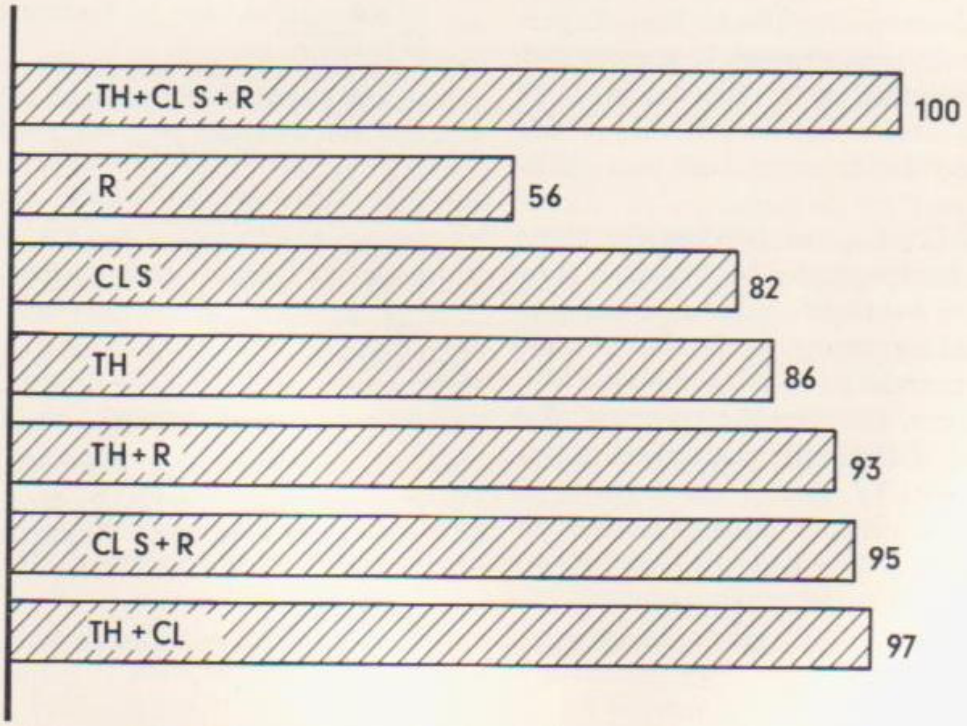
This exclusively instrumental technique could be quite interesting also because it would curtail the need for personnel, doctors in particular, with the possibility of increasing the number of women examined.

On the other hand it is quite evident that the combination of the three methods offers a higher probability of detecting the presence of cancer in the examined slice of population.

Let us assume that this probability is equal to 100 (in this way we exclude any possible error).

On this basis one can define a probability distribution that indicates the confidence limits of the single investigation or eventual combination of examinations.

From Graph 1 one can notice that among the 15,000 women examined, the history alone would have detected 56% of the cancers pre-



Graph 1. TH=Thermography; CL S=Clinical signs; R=Anamnestic risk.

sent, the clinical examination alone 82%, thermography alone 86%, thermography plus history 93% and so on.

Keeping these data in mind, one can decide the policy one should follow in a breast cancer screening programme. The choice is obviously influenced by different local factors such as: organising, economic and social problems.

One must never forget the different levels of diagnostic validity that each examination or combination of examinations, as chosen, would guarantee.

After our experience we strongly recommend the use of the three methods together; which, aside from giving the highest diagnostic precision, allow us to work in a more programmed and guided way: on the basis of an oncological risk evaluation, we may divide the female population examined into different groups.

From Table IV, one can see that for group (a) (negative thermography — negative clinical examination — negative history) the probability of finding cancer is absolutely minimal (nill in our series).

For this reason, this group of women, that represent 1/3rd of the entire population examined, may be sent to annual check-ups with tranquillity, with obvious advantages in operation and costs.

Group (b) must be considered with more caution, and can be sent on to mammography or to more frequent check-ups.

Women that belong to group (c) and mainly to group (d) must be sent immediately to mammography and eventually to biopsy.

Tab. IV. **Grouping of the female population on the basis of an oncological risk evaluation.**

Group	*Thermography*	*Clinical signs*	*Anamnestic Risk*	*Cancers %*
a	—	—	—	0
b	+	—	—	0.19
	—	—	+	0.43
c	—	+	—	1.33
	—	+	+	1.39
	+	—	+	1.55
d	+	+	—	8.8
	+	+	+	16.0

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