The role of contact thermography in the early diagnosis of breast cancer

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Summary. The finantial and menagement problems in a screening for breast cancer are fundamental. For this reason it is necessary to limit the screened population utilizing the risk factors and to select the most expensive and sophisticated methods by means of the cheaper and simpler ones. The role of Contact Thermography (C.T.) is stressed both as to its place in the screening program and as risk factor. The best results with the C.T. examination required a good experience in oncological biology.

Key Words: contact thermography; risk factors; breast cancer screening.

A) INTRODUCTION

In the last 10 yrs thermography (T.) in breast diseases met more criticism than enthusiasm. This could be due to an insufficient knowledge of the T. «language»; and to the comparison between T. and other diagnostic means through non-idoneous parameters.

1. It has in fact to be rembered that T. examination is a **real time diagnostic technique**, based on biological patterns of the lesions; the interpretation of the T. pattern is directly related to the time the examination has been performed.

2. As to the role the T. examination plays in the **study of breast cancer**, some considerations have to be kept in mind.

a) It is *impossible to screen* all the female population because of the huge costs which would be met;

b) It is therefore necessary to screen only a *selected high risk* group of women,

c) A more frequent screening is necessary in the study of high risk women; this requires the utilization of fairly cheap and non invasive methods. Contact thermography (T.) meets the above mentioned requirements.

d) The following *diagnostic protocol* could be advised: a) determination of the *high risk group*. For this purpose a soft-ware program has been developed, which can be utilized at whatever senologic Centre; β) *Performance of the C.T.* examination in high risk women. The C.T. patterns are subdivided in five classes[4] according to a scheme similar to the one utilized in the physical examination (P.E.). γ) *Physical examination* with numerical focalization of the collected data. For this aim the clinical diagnostic index (C.D.I.) [3] is utilized (Tab. I). The achieved results were evaluated according to the following 5 classes: class I:<-4; class II between -4 and -2; class III between –1 and +1; class IV between +2 and +4; class V>+4. δ) *Diaphanoscopy* was always performed; ε) *Cytological (C.) examination* of the breast secretion, when present, was performed. This diagnostic approach is suitable as first screening method and it may be performed all over the country. Further diagnostic necessities required the resort to senologic centres which should provide the following facilities: mammography (M.); xeromammography (X.M.), ultrasound (U.S.) and fine needle biopsy (N.B.). Following thisdiagnostic approach, the resort to the more expensive technique can be greatly reduced; in a personal series of 14.800 asymptomatic women performing a screening with P.E. and C.T., a resort to U.S. was necessary in 5,8% (860/14.800), a N.B. had to be performed in 4,4% (650/14.800) and, finally, a resort to M. was necessary only in 0.8% (120/14.800) of the examined women.

Tab. I. Clinical diagnostic index.

volume variations	
Volume reduction	**- 2**
"Volume variation (or stationary since more than 6 months)	- 1
Stationary since less than 6 months	0
Slight increase	+ 1
Considerable increase	+ 2
Feeling	
Soft-elastic	- 1
Tense-elastic	- 1
Parenchymatous or fatty	0
Fibrous	+ 1
Hard	**+ 2**
Shape	
Round	- 2
Regular, but not round	- 1
Slightly irregular (poorly defined)	0
Fairly irregular	+ 1
Distinctly irregular, with indentations	+ 2
Surface	
Smooth	- 2
Lobulated	- 1
Granular	0
Slightly irregular	+ 1
Clearly irregular	**+ 2**
Borders	
Regular and sharp	- 2
Partly shaded or slightly irregular	- 1
Irregular	0
Irregular or poorly defined _	+ 1
Mobility	
Considerable (on the gland)	- 2
Fair	- 1
Poor	0
Fixed to the gland	+ 1
Adhering to the subcutaneous fat	**+ 2**
(if skin retraction is present no further discussion is necessary)	
Projection	
Not bulging	- 1
Appreciable on the breast surface	0
Slightly bulging	+ 1
Well detectable projectjon	**+ 2**
Wincing on compression	
Considerable	- 2
Fair	- 1
Slight	0
Absent	+ 1
Discharge from the nipple	
greenish - purulent - milky	- 1
(in retroperiareolar nodules)	
sodden - serous-haematic - haematic	+ 1
Axillary nodes	
Absent (or small and soft)	
Present, with uncertain pattern	+ 1
Present, with suspect pattern	+ 2

B) THERMOGRAPHIC PATTERN INTERPRETATION

1. Being **C.T. examination a real time examination** it has to be considered as the logical integration of P.E. For this reason the C.T. examination has to be performed in the following way: recent patient history: truly, the C.T. pictures do demonstrate both the past and the present of the breast; inspection of the breast, this phase being very important; C.T. examination; palpation of the breast which has to be performed at last, since the C.T. patterns could be influenced by it if previously performed.

2. Since C.T. examination directly expresses the **biological behaviour** of the breast cancer, it is necessary for the Examiner to be skilled in oncology. In particular in the correct interpretation of C.T. pattern in breast cancer, it is necessary to know thoroughly the cell metabolism; the angiogenetic factor; the reproductive biorhythm; the functional vascular reflexes; the inflammatory association; the necrotic evolution; the way of tumour spread; the staging criteria, and the local immunologic reactivity.

All the above mentioned considerations justify the necessity for the senologist to perform by himself the C.T. examination; in fact, the photographic pictures of some phases of the C.T. examination - as performed by a technician - are not sufficient for a correct interpretation of the C.T. results. Only this way could some misunderstanding, about the reliability of T. in general and of breast T. in particular, be avoided.

C) RESULTS

The P.E. - C.T. screening of breast cancer has been performed at the Centre for Tumour Diagnosis and Therapy of Cesena since 1970.' Until 1980, 83, 456 tele-thermographic examinations (T.T.), 15, 342 C.T. examinations and 453 spectrothermographies (S.T.) have been performed.

The role, the C.T. examination plays, is here emphasized, taking in consideration 102 palpable breast cancers, 9/102 of which (8.8%) less than 1 cm in diameter. In this series the

C.D.I. and C.T. examination have been considered positive from class II upwards, this in order to reduce the false negative rate. Tab. II shows the achieved results, and emphasizes the decrease of false negative rate, thanks to the association of methods. The P.E. and C.T.

44515440 (7,5%) a middle risk and the remainder 5370/5940 (90,4%) a low risk group. Should, 70000 asymptomatic women be examined in a hypothetic hinterland of 200000 inhabitants, the required engagement would be as follows:

'a) *high risk* women: 1470 (2,1%); periodic

Tab. II. **False negative decrease through the association of diagnostic methods**. (102 histologically proved breast cancers).

Methods	No of Identified cancers	1	False negative decrease
C.D.I.	87/l 02		14.7%
C.D.I. + C.T.	91/102		10.7%
C.D.I. + C.T.	951102		6.9%
C.D.I. + C.T. + U.S. + C.	961102		5.9%
C.D.I. + C.T. + U.S. + C. + M.	98/l 02		3.9%

association increases the true positivity up to 89.3%. It must be stressed that, in the period March 1979 - December 1980, C.T. was able to identify 3 absolutely asymptomatic cancers. Also the incidence of false positivity has been taken in account. Referring to a series of 15.176 asymptomatic and negative women, the P.E. false positivity was 1,7% (258/15,176) the C.T. false positivity was 1.02% (154/15, 176). The judgement of C.T. false positive requires a long follow-up; in fact it is possible that the C.T. pattern precedes the P.E. and/or M. pattern. From this point of view the C.T. positivity could be considered a true risk factor.

D) CONCLUSION

According to the achieved results it must be underlined that the P.E. and the C.T. screening have to be applied to the whole population. However, for this purpose the high risk women have to be identified in order to avoid the extremely high costs the screening program would meet. This has been done in 5,940 asymptomatic women, 125/5,940 (2.1%) of whom would be considered a high risk group,

control, 3 times in one yr, for a total of 4410 exams/yr.

b) middle risk women: 52.50 (7,5%); periodic control 3 times every 2 yrs, being the exams/yr 7875.

c) low *risk* women: 63,280 (90,4%); control every 2 years. The exams/yr will be therefore 31,640.

On the whole, this screening program requires 43925 exams each yr. As to the more sophisticated exams, the same population would have to undergo 4067 U.S. examinations and 567 M. examination every yr. Finally, the possible use of C.T. patterns as ((risk factor)) was taken in account. For this purpose, 371 histologically confirmed breast cancers and 5940 healthy women were analysed by computer. The healthy women with class III at C.T. could have a risk of breast cancer 34.7 times higher than healthy women with class I or II at C.T., and 72.6 times higher with class IV-V at C.T. In the personal opinion, the C.T. examination has to be further evaluated in order to establish its reliability as a breast cancer risk factor.

Contact thermography, physical examination and fine needle biopsy in breast cancer screening. Experience at a familiary advisory bureau

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FREE COMMUNICATION

A) INTRODUCTION

The Familiary Advisory Bureau (FAB) is the ideal place where to perform an useful informative work in the gynaecological field and, therefore, also in senology.

At the FAB of the AIED (Italian Association of Demographic Education) in Genoa, 28.000 women haven been recorded yearly, starting 1970. Daily, 70 women were controlled, that means 24.000 women/yr (1980). Within 1984 an amount of 40.000 screened women could be reached. Since 1.5 FAB do exist in Genoa, they could be theoretically able to follow over 500.000 women yearly; this, obviously with adequate facilities and management.

B) THE SCREENING OF BREAST CANCER

At the FAB, the medical staff consists of gynaecologists providing both the clinical history and the physical examination (P.E.) of the breast. If any anomaly is detected, C.T. examination is performed. If some lumps are palpable, fine needle biopsy is performed. Should one of this examination be positive or suspect, the women will be sent to a Center with better facilities in order to perform mammography (M.) and/or needle biopsy.

C) RESULTS

Out of 24.000 medical controlled women, 3100/24000 (13%) were submitted to C.T. examination and 163/24000 (0.7%) to fine needle biopsy. The group of 3100 women studied by C.T. examination and partially with fine needle biopsy presented the following figures. Average age: 38 yrs; menarche: 12.3 yrs; pregancies: 1.8; abortion: 0.8; children: 1.1; nursing: 0.7; breast cancer in family history: 18.3%; menopause: 8.3%.

In this group the following breast diseases were found: 238 functional anomalies (7.6%); 15 inflammatory diseases (0.5%); 242 mammary dysplasia (7.8%); 90 benign masses (2.9%); 19 malignant masses (0.6%). The low number of detected cancers compared with the whole screened women (0.08%) is justified because the women were unselected (opposite to the Tumour Center) and above all the screened women were young. The availability of the 2 first steps for the screening of breast pathology in the same Center was greatly appreciated by all women.

D) CONCLUSION

The personal experience of 10 yrs in medical preventional practice at the FAB, in Genoa, lead to the following conclusions.

1. The most important advantage is to **immediately control**, by C.T. examination and fine needle biopsy, all the women in which a breast disease may be suspected through family history and/or P.E. examination. This management is very agreable for the women and allows also a rapid diagnostic conclusion.

2. In the **young women** the use of diagnostic methods alternative to X-rays is recommended in order to avoid the radiation hazard, which is higher in this age group and because the young breast is often more difficult to study with M. examination (dense breast).

3. The **contact thermography examination** reduces substantially the false negative rate of P.E. examination and is easily repeated. In conclusion, the old gynaecologist considered the breast as a ((surgical breast)), the young gynaecologist may consider it, thanks to the improved diagnostic techniques, a ((diagnostic breast)).

Diagnostic evaluation of breast cancer detection in the I.S.T. breast department

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Summary. From 1978 to 1980,10,220 women were examined at the I.S.T. Senology Center and 3110 women at different work-sites in Genoa. The breast cancer incidence was 16.5%~ in the first group and 1.2%c in the second one. This difference depended on clinical selection.

The role of C.T. has been evaluated, especially in a large group of population. The accuracy of C.T. was 74% The concordance between C.T. and age group and relative risk number respectively has been studied. The non invasivity and low cost of C.T. suggest its use in the repeated controts of high risk asymptomatic women. The interest of risk factors in a large screening program is emphasized.

Key words: breast cancer screening, risk factors, contact thermography.

A) INTRODUCTION

The multidisciplinary approach to breast cancer (etiology, epidemiology, diagnosis and therapy) is justified, being the former the most frequent tumour in females, responsible of approximately 4% of female mortality.[5]-[6] In spite of the fact that the most recent therapeutic advances improved the prognosis of breast cancer, the early diagnosis of this disease seems to be, until now, the most effective factor in reducing the mortality rate. Only the early diagnosis, in fact, can detect the tumour in a theoretically curable stage. The identification of some high risk group in women is necessary to develop a more easy and efficient selective screening of breast cancer. Clinical and experimental observations confirmed that the development of breast cancer is not always due to random events; several factors were identified, which can either independently or in association influence the probability of the occurence of breast cancer. Risk factors are: age, fertility, late pregnancy, family history, fibro-cystic disease, previous breast cancers, some metabolic disorders and alimentary factors.[7] Considering these factors, it is important to establish new protocols and improved techniques for the early diagnosis of breast cancer in high-risk patients. In the last few yrs, the traditional diagnostic methods, such as mammography (M.), xero-mammography (X.M.), cytology and fine needle biopsy, have been joined by new non invasive techniques, including ultrasonography and infra-red and contact thermography (C.T.).

B) METHODS

From 1977 to 1980, 13.336 out- and in-patients had undergone annual examinations at the Breast Screening Clinic of the I.S.T. Each patient was previously interviewed in order to assess its relative risk group and to choose consequently the more suitable diagnostic approach. The diagnostic methods were P.E. and C.T.; C.T. evaluation was performed following the **TRICOIRE** method." Other instrumental diagnostic methods were applied when warranted. The fine needle biopsy was performed in dubious cases.

CI RESULTS

The personal series (13.336 patients) consisted of 2 groups: the first represented by 10.226 patients who directly came to the I.S.T. Centre, the other represented by 3110 patients who were examined at their work-site (Tab. I). In the first group 169 breast cancers were detected (16.5%0), in the second one only 4 breast cancers were found, i.e. 1.2%0. This difference depends upon the fact that the I.S.T. patients were largely symptomatic while the work-site patients were symptom-free.

Tab. I. **Personal series.**

Provenience	No of patients	No of detected breast cancers
I.S.T. Centre	10.226	169 (16.5/1.000)
Work-site	3.110	4 (1.2/1.000)
Total	13.336	173 (12.9/1.000)

Totally, 173 breast cancers were detected, i.e. 12.9%c. A greater amount of positive cases was found in post-menopausal women detected breast cancer: (114/173: 66%).

1. The **histology** was available in 154/173 breast cancers; 128/154 (83%) were adeno-carcinomas and 13/154 (84%) were lobular carcinomas. The other types were rarer: papillary carcinoma (5/154: 2.8%), indifferentiated carcinoma (4/154: 2.5%), scirrhous carcinoma (1/154: 0.5%), carcinomatous mastitis (2/154: 1%), sarcoma (1/154: 0.5).

2. In the personal series of breast cancers, the **TNM classification** was based on the M. examination results.[1] The decreasing rate of T3-T4 cases, from 41% of diagnosed breast cancer in 1978 to 24% in 1980 must be stressed. Totally, in the whole period considered (3 yrs), the greater amount of breast cancers (70.5%) was classified in the Tl-T2 stage. Opposite, the lymph-node involvement did not change in this period, ranging between 48% in 1978 and 42% in 1980.

The comparison between the mammographic and pathologic TNM classification was considered: only in 40/169 breast cancers (24%) there was complete agreement between the 2 classifications. Considering separately the mammographic and pathologic classification of T and N there was an increase of concordance rate, respectively to 37% (63/169 concordance in T. classification) and to 53% (89/169 concordance in N classification).

3. Contact thermography was evaluated in 77 breast cancers histologically confirmed. In this group C.T. examination was positive in 57177 (74%). Graph 1 shows the incidence of breast cancers and C.T. accuracy according to

the age group. It seems evident that the 2 curves have the same trend, since there is no sole age group influencing negatively or positively the accuracy rate of C.T.

These remarks differ from those of M. examination whose accuracy is influenced by age (dense breast in younger women).

4. The **relative risk** (R.R.) of each woman according to the methods used at the I.S.T. Centre was calculated, based on the patient's history data. Graph 2 shows the incidence of
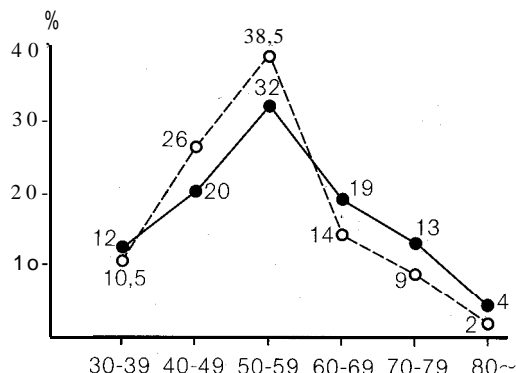
Graph. 1. Distribution of breast cancer (0) and C.T. accuracy (●) according to the age group.
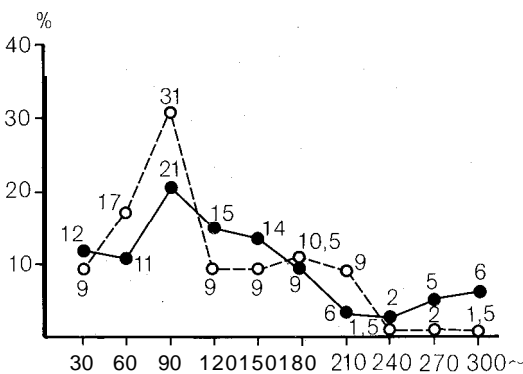
Graph. 2. Distribution of breast cancer (0) and C.T. accuracy (●) according to relative risk numbers.

breast tumour and the C.T. accuracy according to relative risk numbers. It seems evident that the incidence of C.T. accuracy is almost greater in the group 90 of relative risk. In the personal series of breast cancers, 75.4% was recognised in women with a relative risk group over 60.

D) CONCLUSION

1. The interest of the **high risk groups** breast cancers is demonstrated by the greater incidence of breast cancers in women with relative risk number greater than 60. In other words, it would be possible to examine only a restricted part of population, selected by the risk factors, and anyway to identify the greatest part of the breast cancers present in the whole population. This is a real advantage as regards the cost-benefit ratio when screening a large population.

2. Among the **diagnostic methods**, C.T. seems to-be useful above all in the 20-40 yrs old age group when M. in less efficient (dense breasts), and in particular for younger high-risk populations, which. require more frequent check-ups. Nevertheless, the C.T. false positive rate does not allow to study breast cancers with this method alone. The association of other diagnostic methods, chosen according to the clinical situation, is required.

3. The **TNM classification** appears the most useful method for the objective definition of local and general pattern of tumoural disease, for the planning of therapeutic programs and for the evaluation of their results. Nevertheless the breast cancer can be better assessed through other more refined biological parameters, such as hormone receptors,' histological grading'" and in particular cellular kinetic studies' which are being developed at the I.S.T.[9-10]

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MultidiSCiplinary approach to breast cancer: accuracy of contact versus infra-red thermography

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Summary. The efficiency of a multidisciplinary approach to the diagnosis of breast cancer is evaluated, identifying definite classes of clinical value for each method (physical examination - P.E.; thermography -T., ultrasound - U.S., mammography - M. and needle biopsy - N.B..). In the invasive breast cancer the replacement of M. by U.S. is also proposed. The complementary role of T. in the breast cancer diagnosis is pointed out. Finally the better fiability of contact T. versus infra-red T. in breast cancer diagnosis results in a large false positivity in the benign breast diseases.

Key words: breast cancer; multidisciplinary approach; contact thermography.

A) INTRODUCTION

Small breast cancers have most often no clinical symptoms[4] Mammography (M.) can certainly detect non palpable cancers,[3,5] namely by evidencing a group of micro-calcifications, but its accuracy in the small breast cancer is far lower than in the large ones[2]

Therefore, it is useful to investigate suspect breast disease with other diagnostic methods such as ultrasonography (U.S.) thermography (T.), needle biopsy (N.B.).

Aim of the present study is to assess the clinical value of these investigations in early diagnosis of breast cancer, and in particular to check the accuracy of contact T.,(C.T.) versus infra-red T. (I.T.).

B) MATERIAL AND METHOD

Totally, 284 breast cancers less than 5 cm in diameter were investigated by physical examination (P.E.), T., U.S., M. and finally N.B. Five diagnostic classes were considered: I (normal); II (benign); III (doubtful); IV (suspect); V (very suspect).

1. Each examination was considered to be **suspect** (IV) or **very suspect** (V) when: a)' *physical examination:* hardness and irregular shape of the nodule; fixation of the nodule to the surrounding tissues; *b) thermography: ((hot* spot)) or diffuse hyperthermia of the breast with anarchic vascular network; *c) ultrasound:* decreasing density of echoes in an irregular area or a poorly echogenic area without high-level echoes at its distal wall; *d) mammography:* increased density with irregular bor-

ders of the nodule and/or typical microcalcifications; e) *needle* biopsy: anaplastic cells.

2. Each examination was considered **doubff** ul (III) when the above mentioned patterns were not clearly defined.

3. Each examination was considered **benign** (II), when the typical patterns of malignancy were absent and **normal** (I) when no anomalies at all were present.

C) RESULTS AND DISCUSSION

1. Diagnostic accuracy of the Single method in breast cancer

a) Physical examination (Tab. I) gave a score of IV to V classes in 71%. Less than 2% of breast cancers had no clinical signs. In more than 23% no specific signs of malignancy were found, thus requiring instrumental examination.

b) Thermography was the worst instrumental method because the score of classes IV and V was only about 25% and that of class I (false negative) was about 25%. It must be stressed, however, that P.E. and T. are used in association; these 2 methods have therefore to be considered complementary to each other, since signs of P.E. suspicion (i.e. retraction) are usually associated with slowly growing cancer. This type of cancer has usually a lower thermogenic power and therefore it could appear cold at T. examination. On the contrary, the fast growing cancer is highly thermogenie and therefore very demonstrative at T. examination, while the P.E. could be, in those cases, irrelevant.

Tab. I. **Diagnostic accuracy of the single methods in breast cancer. (284** cases).

Diagnostic classes	P.E.	T.	M.	U.S.	N.B.	Combined diagnosis
	5 (1.8%)	70 (24.6%)	11 (3.9%)	15 (5.3%)	11 (3.9%)	-
II	36 (12.7%)	82 (28.9%)	22 (7.7%)	40 (14.1%)	9 (3.2%)	4 (1.4%)
III	41 (4.4%)	59 (20.8%)	16 (5.6%)	41 (14.4%)	12 (4.2%)	5 (1.8%)
IV	80 (28.2%)	56 (19.7%)	74 (26%)	57 (20.1%)	22 (7.7%)	45 (15.8%)
V	122 (42.9%)	17(6%)	161 (56.8%)	131 (46.1%)	230 (81%)	230(81%)
Total IV-V	202 (71.1%)	73 (25.7%)	235 (82.8%)	188 (66.2%)	252 (88.7%)	275 (96.8%)

c) Ultrasound gave a score of classes IV and V in about 66%; the false negative (class I) was about 5%; finally, a score of classes II and III was found in about 28%.

d) Mammography gave the better results in comparison with the other non invasive techniques. A score of classes IV and V was found in about 83%; the M. false negatives (class I) were about 4%; finally a score of classes II and III was found in about 13%.

e) Needle biopsy, gave obviously the best score of classes IV and V about 89%, the false negative (class I) about 4% and finally the score of classes II and III was about 7%.

2. MultidiSciplinary approach to breast cancer

The approach was based upon the comparison of the results of each method. However, in each method the clinical value of the same class is different. For example, a class V N.B. almost always corresponded to a cancer. According to this relative value of' each class in the different methods 4 categories (Tab. II) can be distinguished.

a) Cancer: class V N.B. (81% cases).

~*b) Suspicious cancer:* class IV N.B. and/or class IV or V M. (15,6%). Biopsy was mandatory since about 80% corresponded to a cancer.

c) Uncertainty: class III N.B. and/or class III M., class V P.E. or U.S. or T. Biopsy could be shortly delayed because these lesions corresponded to a cancer in less than 20%.

d) Benign lesions: class II M., class III or IV P.E., U.S., T. Biopsy could be indicated at once in the presence of a rapidly grow,ing tumour.

Tab. II shows the distribution of the personal series in the 4 categories (cancer, suspicion, uncertainty, benign lesion), according to the information obtained through multidisciplinary approach. For each patient, the most reliable information provided by each method was considered (i.e.: a patient Class I N.B. - Class V T. was considered in the category ((uncertainty)), a patient class III N.B. - Class V M. was classified in the category « suspicion »). The possible replace of M. by U.S. was considered. Tab. II shows the results obtained in the personal series with the multidisciplinary approach based on 5 examinations and those theoretically obtainable in the same series replacing M. with U.S.

In the invasive breast cancer this replacement can be proposed because in the preinvasive cancer it is not possible to renounce to the M. information (microcalcifications).

3. Comparison between the thermographic methods

Since the 2 thermographic methods actually utilised in medical fields are based on different physical properties (I.T.: no contact detection

Tab. II. **Combined multidisciplinary approach to breast cancer.**

Categories	Methods N.B. + M. (P.E., T., U.S.)		No cases	Methods N.B. + U.S. (P.E., T., M.)		No cases
Cancer	Class V N.B.		230	Class V N.B.		230
Suspicion	Class IV N.B. Cl&ses IV-V M.	22 23	45	Class IV N.B. Classes IV-V U.S. Class II U.S. Class IV M.	22 23 1 	46
Uncertainty	Class III N.B. Class III M. Class V T.	1 4 1	6	Class III N.B. Class V T. Class III U.S.	1 2 2	5
Benign lesion	Class IV P.E. Class III U.S. Other Classes I-II	1 1 1	3	Class IV P.E. Class III T. Other Classes I-II	1 1 1	3
Total			284			284

Tab. III. I.T. and C.T. in diagnosis of breast cancer. (80 cases).

C.T.		Classes			Total
		I - II	III	IV - V	
Classes	I - II	17	3	3	23
	III	4	5	–	9
	IV - V	6	12	30	48
	Total	27	20	33	C.T. / I.T.

Tab. IV. I.T. and CT. in benign breast diseases. (201 cases).

C.T.	I.T.	Classes			Total
		I - II	III	IV - V	
Classes	I - II	160	5	2	167
	III	11	3	–	14
	IV - V	8	2	10	20
	Total	179	10	12	C.T. / I.T.

of infra-red radiation emitted by the skin; C.T.: molecular spatial modification of cholesteric liquid crystals), their clinical fiability could be different. In fact, I.T. is more able to provide a « heat map » of the skin surface, while the vascular network is better demonstrated by C.T. For this reason the « cooling test » proposed in order to demonstrate the pathological vascular pathways in breast cancer is easier performed by C.T. Tab. III shows the comparative results of I.T., and C.T. in 80 breast cancers less than 5 cm in diameter. It could be seen indeed that 12/20 uncertain cases with I.T. (class III) became suspect or very suspect (class IV-V) with C.T. Totally (Tab. III), C.T. versus I.T. results in the examined series were as follows: classes IV-V (48/80 versus 33/80); class III (9/80 versus 20/80); classes I-II (23/80 versus 27/80). However, as benign diseases was concerned (Tab. IV) there was an excess of false positives in C.T. when compared with I.T. (Tab. IV).

Considering the feature of classes III, IV and V as false positives, total C.T. false positives were 17% (34/201) when total I.T. false positives were 11% (22/201). Particularly, 8/20 benign breast diseases were classified of classes IV-V at C.T. while only 2/12 were so classified at I.T.

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Comparison. between infra-red thermography and contact thermography the diagnosis of breast disease

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The results of infra-red thermography (I.T.) and contact thermography (C.T.) were compared in the same series of patients.

1. The **disavantages** of C.T. examination were:

a) *difficult approach* to some areas of the breast (i.e. infra-mammary area) depending on the lack of close contact between the C.T. plate and the breast surface;

b) impossibility or difficulty to examine *both breasts* at the same time;

c) *non objective evaluation* of C.T. pattern.

As for these parameters, the I.T. examination seems to be more reliable.

2. The advantages of C.T. examination were:

a) *lower cost* of the C.T:.-unit and also of its management. This is very important but one risk has to be kept in mind: being of easy purchase, the C.T. examination might be performed by unskilled personnel, causing two important draw-backs: *cx) misknowledge* of a lesion; I3) increase of *false positivity.*

b) *No climutized room* is required.

c) Great *easiness* to perform the CT examination.

For these last parameters, the C.T. examination may be able to furnish about the same information of the I.T. examination. Furthermore the ((real time D evaluation of the vascular network modification induced by the cooling test introduces some precious functional information. Finally, considering the important role of C.T. as a marker of high-risk groups, this in accordance with **STARK,** its usefulness has to be emphasized because of its low-cost and its reliability.

Contact thermography and echography in breast disease: personal experience

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A) INTRODUCTION

The role of contact thermography (C.T.) and of echography (U.S.) in breast disease has been studied.

1. Contact thermography guaranties the functional evaluation of the breast. This figure is very important in the younger women (dense breast) and in the dysplasic breast. This means that the C.T. examination may play an important role in the demonstration of risk factors, when detecting vascular anomalies in healthy women. Finally, in the clinically evident cancer, the C.T. examination plays a prognostic role being the invasivity of the tumour proportional to its thermogenic pattern.

2. Echography is comparable to mammography (M.) both methods providing in fact morphological and structural information. The

Tab. I. Accuracy of the association of physical examination, contact thermography and echography in breast diseases. (122 obs.).

Pathology	No cases	Diagnosis		Error
		Certain	Suspect	False positive or false negative
Carcinoma	*34*	29/34 (85%)	4/34 (12%)	1/34 (3%)
Fibroadenoma	*48*	37/48 (77%)	11/48 (23%)	0/48
cyst	*40*	39/40 (97.5%)	0/40 —	1/40 (2.5%)
Total	122	105/122 (86%)	15/22 (12%)	2/122 (2%)

U.S. examination is very useful in dense or dysplasic breast where M. is of no help. The U.S. accuracy in breast cancer is related to the size of the tumour, raising from 78% in Tl tumours to 93% in T3 ones. In the lumps, benign to M. examination, the U.S. examination may specify its liquid or solid structure, detecting also eventual intra-cystic carcinoma. Finally, some cysts hidden in dense breasts may be detected only by U.S.

3. The **association** of 2 methods to the physical examination (P.E.) is suggested, because the accuracy of the latter is not greater than 70%.

B) RESULTS

Tab. I shows the results obtained in 122 breast diseases studied with the 3 combined methods. The association of P.E., CT. and U.S. examinations lead to an 85% of true positive diagnoses in breast cancer, to 77% in fibro-adenoma and to 97.5% in breast cysts. In the same series, the association of the first 3 methods to the M. examination allowed a total accuracy of 97% in breast diseases.