Self-Breast monitoring with Thermal-camera
Sommario

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Introduction

Breast cancer is the leading cause of cancer death in all age groups in the West and affects about 1.7 million women every year across the planet. Before the age of 84, at least one in eight women is diagnosed with breast cancer and one in three dies from the disease.

The aim of this manual is to offer women the possibility of managing their own breast health independently - for preventive purposes - in analogy to what has been proposed for self-palpation, whose aims, moreover, to reduce breast cancer mortality have proved to be completely irrelevant.

Even the current model of prevention based on biennial mammographic screening between 49 and 59 years of age, in force in some countries, is not considered adequate by many because, in addition to causing various drawbacks (overdiagnosis), it would not concretely affect mortality.1-2

It is believed that breast thermography has a very high negative predictive index (>95%)3 so that in cases of normality, the presence of pathologies would be statistically irrelevant.

According to J. Wright4, “Tele-thermography is an excellent tool to identify breast pathologies of all sizes and especially young women benefit from it”.

Breast thermography is a very sensitive survey that can often reveal - especially in young women - several diseases that can precede cancer or even detect it at a very early stage.

Technological development now makes mini-cameras available, which can be used on smartphones, to monitor one’s state of health in a simple and risk-free way.

In particular, K. Cobin and K. Louison5 stressed the advantages of using mini-cameras applied on android systems to monitor the “diabetic foot”.

By analogy, we think that this kind of approach can also apply

References:
4 J. Wright’s medical director Tahoma Clinic – Thermography for Breast Cancer Prevention - Seattle’s Mammography Alternative. http://tahomaclinic.com -
to breast diagnostics and play an essential role in the effective prevention of breast cancer, also considering the current wide-spread use of smartphones and the expertise they have in their daily use, especially among the younger generations.

Instructions

1. What is a thermal imaging camera
2. How to use a thermal imaging camera on a smartphone
3. When to start self-control of your breasts
4. What are the aspects of a normal breast
5. What to do in case of anomalies
6. How to proceed

What’s a thermal imaging camera?

A thermal imaging camera (or even a thermographic camera) is a device that is sensitive to infrared radiation, capable of obtaining thermal images (or temperature maps) of selected areas of interest. They find application in various scientific fields (e.g. astrophysics), as well as being commonly used by different categories of professionals (architects, in-engineers, restorers, veterinarians, doctors, etc.) and can also have a familiar use to detect various types of inconveniences (wall humidity, foreign bodies in exhaust pipes etc.).

Examples
How to use a thermal imaging camera on a smartphone?

1. Purchase (possibly online) a thermal imaging camera compatible with your device (smartphone).

2. Configure the camera - following its instructions - with your device. In particular, you should install an application that allows your smartphone to connect to the thermal imaging camera by downloading it free of charge from the network.

3. Choose a palette from those available in the thermal imaging camera (usually the default one).

4. Position the camera so that the area of interest to be examined (in our case the breast) is perpendicular to the camera lens.

5. Ensure that you are in a thermally stable environment (e.g. away from heat sources or drafts).

6. After uncovering your breasts, wait for about 10 minutes before taking the snap in order to adjust your temperature to that of your surroundings (recommended temperature 20 - 22°C).

Alternatively, you can also have another person in front of you perform the shot - in a similar manner - if you do not have adequate equipment to perform the self-timer.
When do you start checking your breasts?

Self-control of one’s breasts can be performed at any age, but preferably after menarche stabilization. It is advisable, however, to start as soon as possible, preferably in the fertile age, when it is assumed that your breasts are healthy.

During this period, due to the characteristics of the breast (dense breasts), thermography allows information preferable to other types of investigations (mammography, in particular). After the first shot, the image should be stored in an electronic folder so that it can be compared with those of subsequent examinations.

We suggest an interval of about 6 months between an archived thermal photo and the next one, performing it in the intermediate phase (12th - 14th day) of the menstrual cycle and avoiding in the 6-8 hours preceding the examination behaviours that could interfere with the normal metabolic activity of the body (fatigue, alcohol and coffee abuse, exciting substances, states of stress or other).

What are the aspects of a normal breast?

In the absence of pathologies, the thermal values of corresponding areas of the udder show a relative symmetry, with a similar appearance between the two sides.

In addition, the transition between two thermally different areas is progressive and regular with an aspect that can be defined as blurred. Generally, the most thermally active areas are found in the upper quadrants (lighter colour or intensity), compared to the lower ones (darker colour or intensity). The only circumscribed elements that can be differentiated from the rest of the breast could be the nipples.

Note (figure)

The highest thermal zones are observed in the axillary regions (colour: white). Those less warm occupy the lower quadrants (colour: green), while in the upper quadrants there are physiologically higher thermal values (colour: yellow) lower than those of the neck, clavicular areas and thoracic wall (colour: red).
Since breasts are not identical between individuals (size, internal structure etc.), it is necessary for every woman to become familiar with the normal thermographic appearance of her breasts from the very beginning. Over time there will be slow progressive changes that, especially in the years before and during the menopause, are due to the increase in the adipose component compared to the glandular component. The process starts from the lower quadrants and is also associated with a trend towards a district reduction in thermal values.

What to do in case of any anomalies?

Possible thermographic abnormalities of the breast can be divided into:

“occasional” anomalies
“acute” anomalies;
“chronic” anomalies;

Anomalies from “occasional” causes (e.g. micro-trauma, intake of particular substances) tend to shrink rapidly and disappear within hours or days. These anomalies do not require confirmed disappearance - further checks.

“Acute” abnormalities, (e.g. mastitis, blood collection due to trauma), may persist longer, but generally for no more than 30 days. If the thermography indicates a progressive reduction until they disappear completely, these anomalies also do not require further investigation.

“Chronic” anomalies are those that last more than three months and/or persist over time. Abnormalities that last for over 90 days and/or tend to increase require further diagnostic investigation.

If significant changes (especially in unilateral abnormalities) are observed, consider the possibility of a pre-tumour or initial neoplastic pathology and take the above into account.
Suggestions

To confirm the presence of a possible anomaly, perform a new check in the corresponding period of the next menstrual cycle.

If during the next 2 monthly check-ups, i.e. after about 90 days, the thermal anomaly is unchanged or has progressed, it is necessary to contact your doctor (visit, personal and family history etc.) or contact a breast centre, where some presumable causes can be taken into consideration, such as:

» **Hormonal imbalances** in order to exclude an increase especially in estrogen, progestin and/or prolactin that may be responsible for treatable breast diseases, but predisposing to cancer. Hyperthyroidism and/or various other conditions can also be the cause of breast thermographic anomalies (drugs, contraceptives, etc.).

» **Genetic abnormalities** favouring the appearance of breast cancer, especially in sexually active women (BRCA 1/2, TP53 and PTEN etc.).

» **Instrumental confirmatory investigations** (ultrasound, MRI, etc.)..

**Note**

In each of the various eventualities (including negativity) continue the self-monitoring of your breasts on a monthly basis to ascertain whether:

1) **the thermographic anomaly remains stable or regresses (following treatment);**

2) **if the thermographic picture becomes negative again.**

If the thermographic anomaly tends to increase - even if no irregularities have been detected with other instrumental investigations - the risk of cancer remains high, especially in unilateral variants characterized by locally increased thermal values.

**Reason:** thermography is more sensitive than other investigations, so it can remain positive even if ultrasound scans, mammograms etc. are negative.
How to proceed

In order to obtain a correct representation of your breasts it is necessary, after having applied the mini-camera to a compatible Smart-phone, to insert it in a suitably prepared support:

1. a correct prefixed distance of the camera from the breast (to be adapted, but presumably between 30-40 cm);
2. ensure that the camera lens is perpendicular to the object to be examined (breast) by finding a suitable area for the purpose at a midpoint of the anterior chest wall;
3. take the shot and archive the image.

Instruments

Thermal imaging camera
- FlirOne Pro

Smartphone or tablet
- iPad Mini (Wi-Fi, 64GB)

Selfie-stick

Smartphone, Thermal imaging camera, selfie-stick

Positioning
Examples

<table>
<thead>
<tr>
<th>Age 20</th>
<th>Age 47</th>
<th>Age 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Normal</td>
<td>Bilateral anisothermia</td>
</tr>
</tbody>
</table>

-1°C

P.S.

The instrument presented can be used in various other applications including the “prevention of ischemic stroke” through the thermo-spatial detection of any abnormalities of the internal supraorbital regions which are sprayed by a peripheral branch of the internal carotid artery.

Thermography Image Processing

Corel PaintShop GIMP

Note how it is possible today to obtain an almost exact representation of the internal supraorbital regions
For more detail see:

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Pisa, 29 February 2020.