REVIEW ARTICLE
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THE STANDARDIZATON OF PHOTOGRAPHIC RECORDS FOR ONCOPLASTIC AND BREAST RECONSTRUCTIVE SURGERY

Padronização do registro fotográfico das pacientes submetidas à cirurgia oncoplástica e reconstrutiva da mama

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ABSTRACT

Medical photography is an important diagnostic logging tool, since it allows pre-and postoperative comparisons to be made and it disseminates knowledge to the scientific community. The evolution of digital imaging has made the use of cameras easier and has increased access to better quality equipment. Photography is an essential tool in dermatologists' and plastic surgeons' practices. Breast surgeons' recent acquisition of oncoplastic surgical techniques, reconstructive and breast remodeling surgery has led to the need for photographic records in the area. This photographic registration reproduces reality with maximum details and relevant information, as it follows a standardized way of positioning, backgrounds and photographic angles. This study aims to recommend the most appropriate camera, conduct basic equipment adjustments and standardize photographic records of patients undergoing reconstructive and oncoplastic breast surgery. A literature review was conducted in the Cochrane Library, Scielo Brazil, PubMed and Google.

KEYWORDS: Photography; breast; plastic surgery; mammoplasty.

RESUMO

A fotografia médica é uma importante ferramenta de registro, permitindo a comparação pré e pós-operatória, bem como a transmissão de experiência à comunidade científica. A evolução da fotografia digital facilitou o uso de câmeras fotográficas e favoreceu o acesso a equipamentos de melhor qualidade. Os dermatologistas e cirurgiões plásticos tradicionalmente utilizam a fotografia na prática clínica diária. Com a recente incorporação de técnicas cirúrgicas de oncoplastia, cirurgia reconstrutiva e remodelamento mamário, constata-se a importância da prática do registro fotográfico na mastologia. Esse registro deve reproduzir a realidade com o máximo de detalhes e informações relevantes, seguindo a padronização de posições, fundo e ângulos fotográficos. Este estudo visa sugerir a escolha da câmera fotográfica, orientar regulagens básicas do equipamento e padronizar o registro fotográfico das pacientes que serão submetidas à cirurgia oncoplástica e reconstrutiva da mama. Foi realizada revisão bibliográfica na Cochrane, Scielo Brasil, PubMed e Google.

PALAVRAS-CHAVE: Fotografia; mama; cirurgia plástica; mamoplastia.

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INTRODUCTION

Since its emergence in the first half of the nineteenth century, photography has become an important tool for registration in several scientific fields. The field of medicine quickly incorporated this image producing technique, since it is far superior to drawings, due to its wealth of details and fidelity to reality. With cameras, it was possible to register patients, surgical procedures, cells and tumors[1].

Artistic photography incorporates sophisticated techniques of laboratory or studio lighting effects. On the other hand, medical photography should reproduce reality with the maximum number of details and relevant information possible, and it should follow a standardized way of positioning, backgrounds and photographic angles[2-4]. It is an important diagnostic logging tool, which allows for pre-and postoperative comparisons and the dissemination of knowledge to the scientific community. The evolution of digital imaging has made camera use easier and has increased access to better quality equipment. Surgeons' recent acquisition of oncoplastic surgical techniques and reconstructive and breast remodeling surgery has led to the need for photographic records.

CHOOSING A CAMERA

When choosing a camera it is important to consider four main factors: resolution, convenience, creative control and cost[5]. After the introduction of digital technology in the 1980's, photography has had rapid development[6]. The cost of a camera has decreased and there is a great diversity of models available, which makes access to such equipment easier. Camera cost is usually directly proportional to quality, technology, and optional controls.

Regardless of the choice of equipment, a camera is only a tool. With a basic knowledge of photographic techniques, a surgeon can take great pictures of patients[6].

Types of cameras

Most compact cameras are typically point-and-shoot and have all automatic adjustments. Some more complex models have commands that enable their use in different conditions: portrait, landscape, night, close up, etc.[5]. These cameras do not allow the exchange of lenses and they have small sensors, which limits their use and the quality of the image. They require simpler handling procedures, and are lighter and cheaper.

D-SLR (digital single-lens reflex) cameras are for professional and semi-professional use. With them, the image is reflected by a mirror directly to a display instead of being captured by a sensor. Therefore, the image can be reproduced on an LCD screen behind the camera[5]. When a picture is taken, this mirror is collected and the sensor captures the image. D-SLR cameras allow for an exchange of lenses and they have many creative commands, which increases their range of use. They have larger sensors and better technology, and thus generate better quality images. They are bigger, heavier and more difficult to use. Additionally, they have a higher cost.

In the past few years, the industry created so-called micro system cameras or mirror-less cameras, which make up an intermediate category between compact and D-SLR. They combine the advantages of compact cameras (small and lightweight) and the advantages of reflex cameras (large sensors, the possibility to exchange lenses, and great quality images)[6]. They are not as expensive and are more convenient to carry in your daily purse. The latest models have bluetooth technology, which allows pictures to be transmitted to phones, tablets or computers without the use of cables, for easy archiving.

For surgeons that are beginners in photography, the use of a mirror-less camera is suggested, due to the previously mentioned advantages. For lovers and scholars of photographic techniques, D-SLR cameras are the best option.

Digital image resolution

The digital camera image is made as a sensor captures light, and is composed of millions of tiny elements, pixels. A pixel is the smallest point that forms a digital image. The word ***pixel*** is based on a contraction of ***pix*** from the word "pictures" and ***el*** for "element".

The number of pixels (measured in millions or megapixels-mp) influences the image magnification possibilities. A 15 × 10 cm photo needs 2 mp to be printed with excellent quality and a 28 × 35 cm photo requires 6 mp[5].

The number of megapixels a camera has does not determine image quality. Sensor size should be considered instead. The higher the camera sensor, the better the image quality[7].

There are now two types of sensors available: the CCD (charged-coupled device) and the CMOS (complementary metal-oxide semiconductor). The latter is more common in D-SLR cameras, while the CCD equip compact ones[5,6].

A camera that has a 3 to 6 megapixel resolution is suitable for the photographic record proposed for breast surgery[8].

CAMERA ADJUSTMENTS

The basics of photographic techniques

The "photographic triangle" is composed by the aperture, shutter speed and ISO (International Standard Organization)[6]. The congruence among these factors produces a good quality photo (Figure 1). The focal length, coverage angle and white balance should also be noted.

Digital cameras have automatic control for these parameters. But knowledge of adjustments allows you to improve image quality and correct errors that are not identified by the equipment[6].

Exposure: aperture and shutter speed

In photography, exposure means the amount of light that falls onto the digital camera sensor, which is controlled by the balance between aperture and shutter speed.

The aperture is a small set of blades in the lens and it controls how much light will enter the camera[5] (Figure 2). The blades create an octagonal shape that can be widened or shrunken down to a small hole. Aperture size is measured by *f-stops*. A high *f-stop* like *f*-22 means that the aperture hole is quite small and a low *f-stop* like *f*-3.5 means that the aperture is wide open. An analogy for aperture is the iris of an eye[6].

The shutter is a mechanical device that opens and closes, and controls the amount of time the sensor is exposed to light[5]. It would be like the camera's eyelids, and its movement is similar to blinking[6]. It is measured in fractions of a second. A normal shutter speed is around 1/125th of a second with a standard lens or mid-range zoom lens on the camera. Unless you have extremely shaky hands, this will give you a sharp picture most of the time.

As the shutter opens, the movement of the scene is registered. Shorter shutter speed times record "frozen" scenes, like drops of water coming out of a faucet (1/500th sec). On the other hand, if the shutter is opened for a longer period of time, a "blurry" image is created, like the classic waterfall veil image (1/30th sec)[5,6]. At shutter speeds slower than 1/30th of a second, it is quite difficult to hold the camera steady enough to get a sharp image, and the use of a tripod is necessary.

International Standard Organization

The last part of the "photographic triangle" is the ISO (International Standard Organization), which represents the sensor's sensitivity to light, in the equivalence to ASA (American Standards Organization) of the old 35 mm films[5].

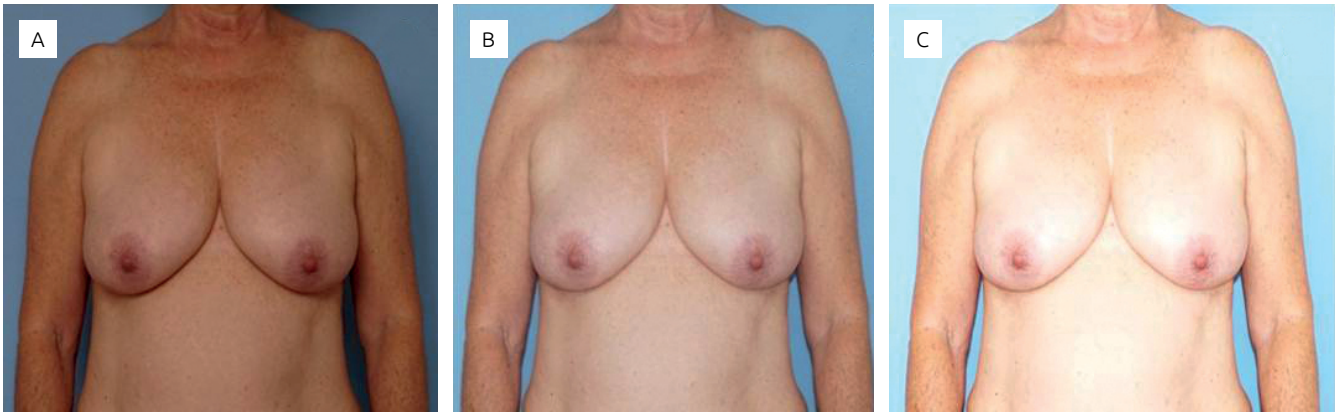


Photo: Paula Soares.

Figure 1. Exposure: A) dark photo; B) ideal photo; C) bright photo.

Photo: Cristina Medeiros.

Figure 2. Aperture sizes. Small aperture (*f*-22), less light strikes the image sensor. Large aperture (*f*-2.8), more light strikes the image sensor.

The ISO setting depends on the brightness of the space. In lighter rooms, ISO 100 must be selected, and in darker rooms, ISO 400 is preferred. When increasing the ISO above 400, the image can become grainy and lose its quality.

The ISO setting between 100 and 400 allows for good photographs in office environments[5,6].

Focal length

The measurement of focal length appears engraved on the body of the lens (Figure 3). Each lens has a coverage angle, which is the angle that the lens can capture the image. The shorter the focal length, the greater the coverage angle. A focal length of 14 mm has a coverage angle of 106º and a focal length of 135 mm has an angle of 18º.

A 50 mm lens is satisfactory for the use proposed by breast surgeons, as its angle of coverage is very similar to the central field of the human eye[8,9]. With this lens you can record images of the entire body or just the torso, which is the focus of interest for breast surgery.

White balance

Digital cameras can automatically correct different color temperatures by changing the white balance command (flash, sunlight, shade, fluorescent light, incandescent light). There are also manual settings to adjust incorrect assumptions from the automatic system[5] (Figure 4).

LIGHTING FOR PHOTOGRAPHY

Lighting has a fundamental role in photography. The ideal lighting when taking a patient's photo is that which registers the correct

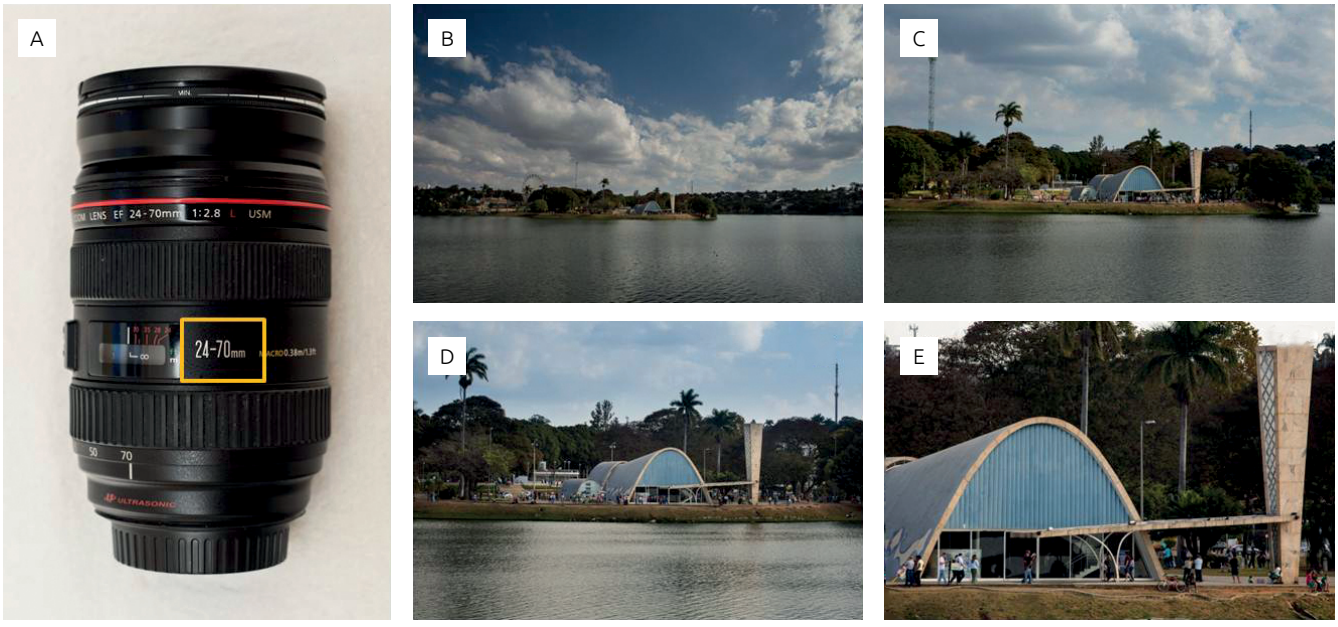


Photo: Cristina Medeiros

Figure 3. Focal length: A) Lens with focal length 24-70 mm; B–E) the same scene registered with different focal lengths (24, 70, 200 and 300 mm).

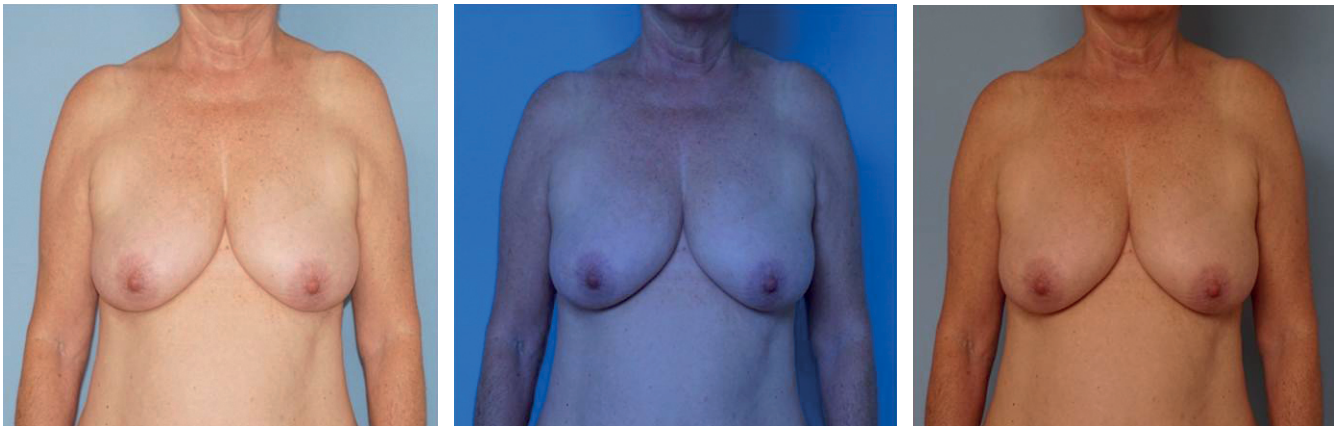


Photo: Paula Soares.

Figure 4. Differences in skin color and in the blue photographic background according to the white balance set in the camera.

skin color and the contours of the breast and the abdomen, which allows for a comparison of before and after the surgical procedure.

Different sources of light produce different colors, according to the Kelvin color temperature scale (Figure 5).

The natural light that enters through the window is very heterogeneous. It is more bluish at noon and more orange at the beginning and end of the day[6]. Artificial light can come from lamps on the ceiling or wall. Artificial lighting color varies with the type of bulb used. Tungsten light bulbs disperse orange light and fluorescent light bulbs have more of a bluish light. Led light bulbs can have different colors, which vary from warm white (2700-3500 k), neutral white (4000-4500 k) or cold white (5700-6500 k) (Figure 5).

In general, most exam rooms have sufficient lighting for clinical photography. Standard halogen or fluorescent light bulbs typically provide more than enough light, so long as the wattage of the bulbs is sufficient. Incandescent lights are not optimal for clinical photography, just as they are not optimal for an exam room.

Surgeons must observe the temperature color of the room light where photographs will be taken and be sure that the light is directed toward the area being photographed. The brain can adjust these variations, but to achieve proper lighting for photography, the camera must be set[6].

Light hardness and the use of a flash

Light hardness is defined by shadows that appear in the image, whether strong or mild (Figures 6A and 6B). Soft shadows are important for drawing volumes and contours of the torso and breast.

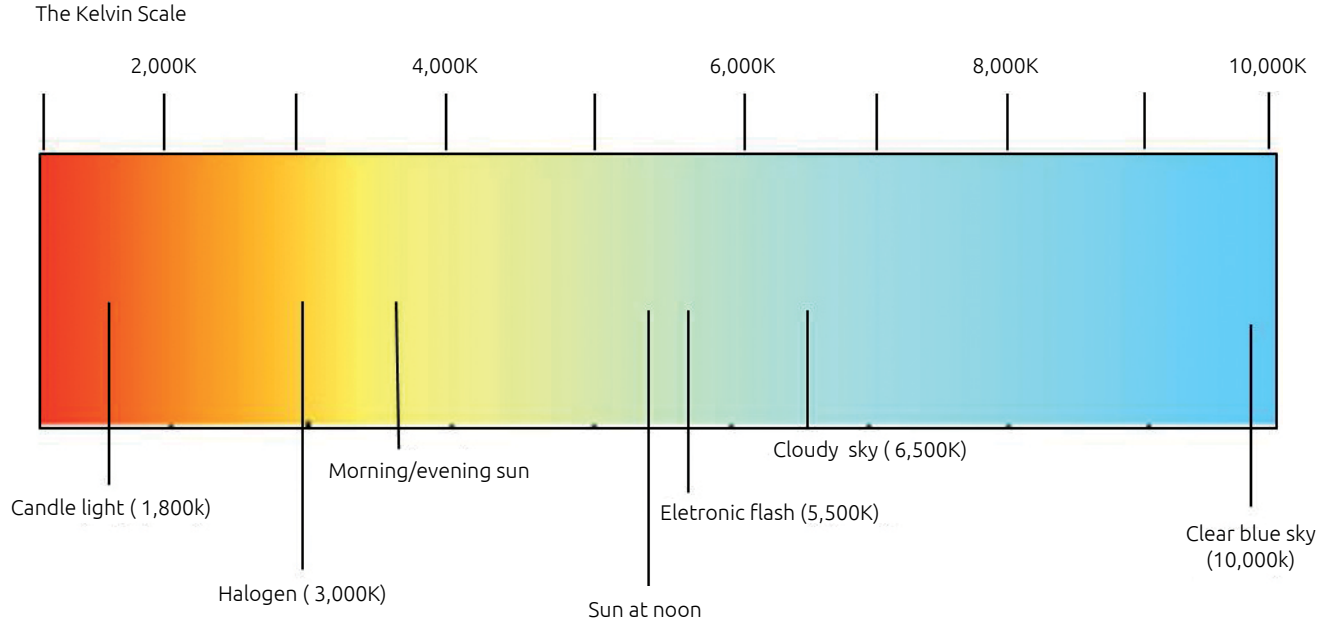


Figure 5. The color temperature of the Kelvin Scale.

Figure 6. Light hardness: A) strong shadow or " hard light"; B) "soft light"; C) the use of a flash, bouncing light off the ceiling or walls, scattering the rays and creating more natural light.

"Soft light" is defined when shadows are nonexistent or are discreet, with subtle edges that allow you to view what is inside of them[9].

"Hard light" causes strong and marked shadows and hides features[9].

Using the flash

A flash is used to correct or supplement the ambient light, especially when the ambient light is insufficient or is distributed irregularly[5,6,8,9].

The in-camera flash produces lighting that is flat, which gives the impression that the subject has been run over by a steam-roller. It is usually limited, causing very strong sparkles and remarkable shadows ("hard light")[9]. When buying a camera, it is important to evaluate the possibility of attaching an external flash with a rotating head, which allows light to bounce off of the ceiling or walls, scattering the rays and creating more natural light or ideal "soft light"[6,9] (Figure 6C).

THE STANDARDIZATION OF PHOTOGRAPHS

For two photos to be comparable, it is necessary to maintain the same aperture, shutter speed, ISO, photographic background and, especially, the same patient positioning in both[3,6,7,10]. It is essential to establish a routine for taking photos that starts with the patients signing the informed consent form[3].

The patient must be clearly identified in the picture. The use of a label with name initials, birth and registration date is suggested. A second option is to capture the patient data in the first photo of the sequence[3,7].

When composing the picture, it is recommended that environmental elements like tables, chairs, pictures and doors be removed[7].

Patients should not use jewelry, clothing, scarves or glasses hung around the neck[7,9,10,11].

Background

The photographic background should be smooth, uniform and opaque to prevent reflections[7,8,10,12]. It is suggested to use a fabric, a painted wall or even a retractable non-reflective backdrop.

The accepted backdrops are white, black, green, gray or blue[7]. However the darker backgrounds can interfere with pictures of dark skinned people and the white background can interfere with the pictures of light skinned people.

According to the Clinical Photography Committee of the Plastic Surgery Educational Foundation, light to medium blue is a good choice because it contrasts well with all skin tones[8,10,11] (Figure 7). Medium gray may also work well[7]. Patients should stand 50 to 90 cm from the backdrop[10,12].

Patient positioning

In clinical photography, patients should be at the center of the frame and must fill most of the photo[8,11]. In mirror-less and D-SLR cameras, it is possible to include gridline bars in the preview screen. The gridlines are very helpful for getting the shot straight and allowing for the correct torso positioning in the frame center in both horizontal and vertical references[11,12] (Figure 7).

To make standardization easier, the use of stickers on the floor which mark the correct positioning of the patient's legs to the front, oblique and profile photos, as well as their distance from the camera and the photographic backdrop is recommended[8,11].

The camera must be positioned at the same height as the patient's breast[10,11]. Photos taken from bottom to top or from top to bottom, which distort the body image must be avoided.

For patients undergoing oncoplastic and reconstructive breast surgery, six photos are proposed: frontal, dorsal, right profile, left profile, right oblique view, left oblique view.

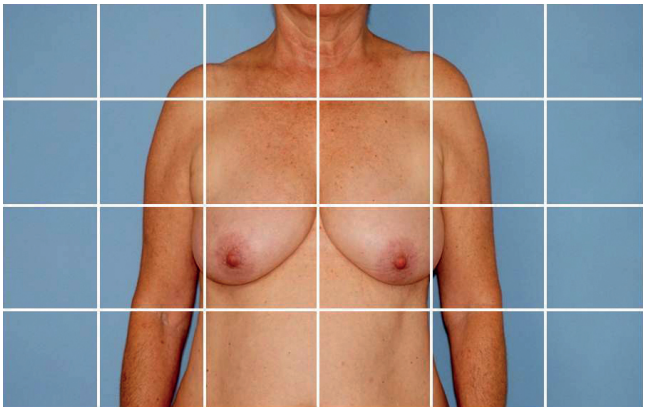
Frontal and dorsal view

The patient should stand comfortably erect with their arms at their sides. Their feet should be aligned with the appropriate tape marks on the floor[11].

Including the patient's abdomen in the frame is necessary in the photographic record for oncoplastic surgery, since it allows the possibility to evaluate the skin and adipose tissue available for breast reconstruction with the rectus abdominis myocutaneous flap. Similarly, the dorsal photo allows for the evaluation of the donor area to be used for breast reconstruction with the latissimus dorsi myocutaneous flap (Figure 8).

Oblique views

For oblique views, the distal arm should be moved back slightly[11,12]. Feet should be aligned with appropriate tape marks on the floor (Figure 8).



Fonte: Paula Soares.

Figure 7. Set the camera to show gridlines in the preview screen. They are very helpful for getting the shot straight, allowing the correct torso positioning in the center of the frame, and in horizontal and vertical references.

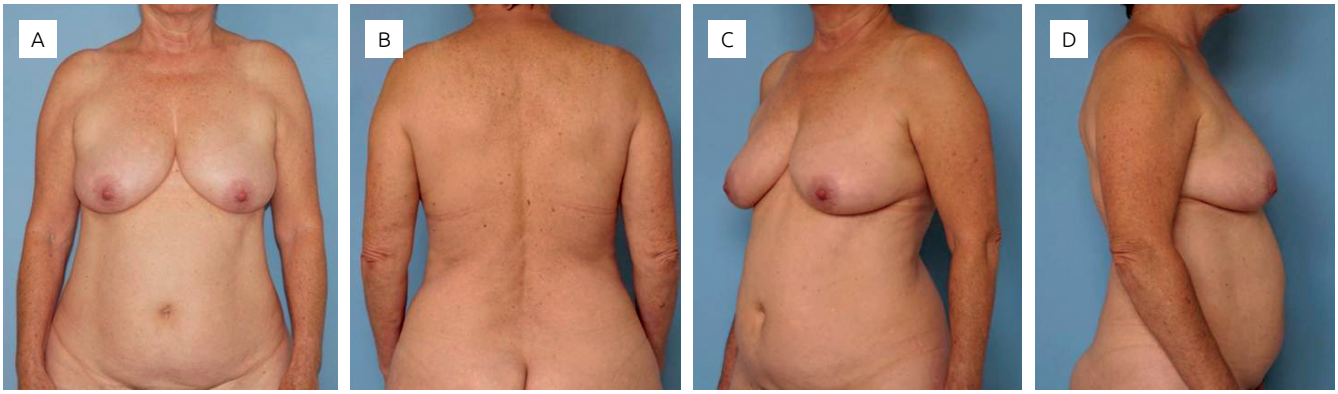


Photo: Paula Soares.

Figure 8. A) Frontal view: upper limit: ment; lower bound: pubic symphysis; B) dorsal view - upper limit: inferior nuchal line; lower bound: iliac crest; C) right and left oblique view. Upper limit: ment; lower bound: pubic symphysis; D) right and left lateral views. Upper limit: ment; lower bound: pubic symphysis.

Lateral views

In lateral views, the distal breast should not be visible[10-12].

CONCLUSION

Mastology is a medical specialty that has had continuous progress in the past two decades, both in genetics and molecular diagnostics and in incorporating oncoplastic surgical techniques. Good aesthetic results should be connected to oncologic treatment.

The photographic record of patients becomes a fundamental tool in clinical practice, allowing for decisions regarding surgical technique, pre-and postoperative comparisons, the registration of possible technical ability improvements for the staff, and the dissemination of knowledge to the scientific community.

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