

## ABSTRACT

This study aims to associate the findings of infrared thermography with the anatomy of pelvic floor muscles (PFM) in puerperal women.

## METHODS

This is a cross-sectional pilot study, involving 21 women between the ages of 18 and 40, recruited at Maternity, Without neurological disorders; parity up to 3 children; by vaginal delivery. Were excluded those who gave up or withdrew their consent to participate in the survey; those with presence of vasomotor disease; or in the use of vasomotor medication. For the execution of the study, na evaluation sheet was applied and a physical examination was carried out, including functional evaluation of the pelvic floor muscle (PFM) and thermographic analysis. The functional evaluation of the PFM was performed by visual observation, an evaluation method mentioned by the International Continence Society (ICS) as a resource wich has low-cost, is easy-to-use, non-invasive to pelvic floor region and well accepted by the patients, especially for women during the immediate postpartum period, when vaginal palpation is not indicated. The scale definitions are: degree 0 = no movement, degree 1 = weak movement, degree 2 = strong movement of inward / perineal elevation. The thermographic evaluation was performed using a thermographic camera of the Flir trademark, model one, with resolution of 480x640 pixels. The images were analyzed by specific software developed for the study and Flir software, resulting in the percentage of rainbow chart colours and the temperature indicated by each colour. The standard used for colour detection was HSV (hue, saturation and value)[1]. For the evaluation, the volunteer adopted the gynecological position, in dorsal decubitus position, with flexed knees, flexed and abducted hips, being naked from the abdomen downwards. The camera was positioned perpendicular to the perineum region, which turned to be the central point of the image consisted of a rectangle 5cm wide and 10cm long, room temperature from 18°C to 25°C, with ventilation facing upwards, humidity of 40% to 70%, evaluated by a digital thermohygrometer allocated in the room, without solar irradiation, illuminated by fluorescent lamps. It was standardized a patient camera distance of 20cm and acclimatization of the volunteers for 10 minutes before image acquisition. Three image records were performed during the morning shift, between 8am and 11am by the same evaluator. Regarding the colour analysis, the pixel count of each colour was used, resulting in the percentage of colours white, red, orange, yellow, blue, cyan, green and magenta. The total amount of pixels in each image was 307,200 pixels. The sum of the frequency of all colours reaches 100% in the thermographic evaluation, the colours were also classified as warm including white, red, orange and yellow and in cold colors containing green, cyan, blue and magenta. The data was analyzed by the Software Statistical Package for the Social Sciences (SPSS) 20.0 for Windows. To test the normality of data distribution the Shapiro-Wilk test was applied. Descriptive statistics were performed using means, medians, standard deviation and frequency. A P value <0.05 was adopted for statistical analysis. This research was submitted and approved by the Ethics Committee under the number 2.328.269.

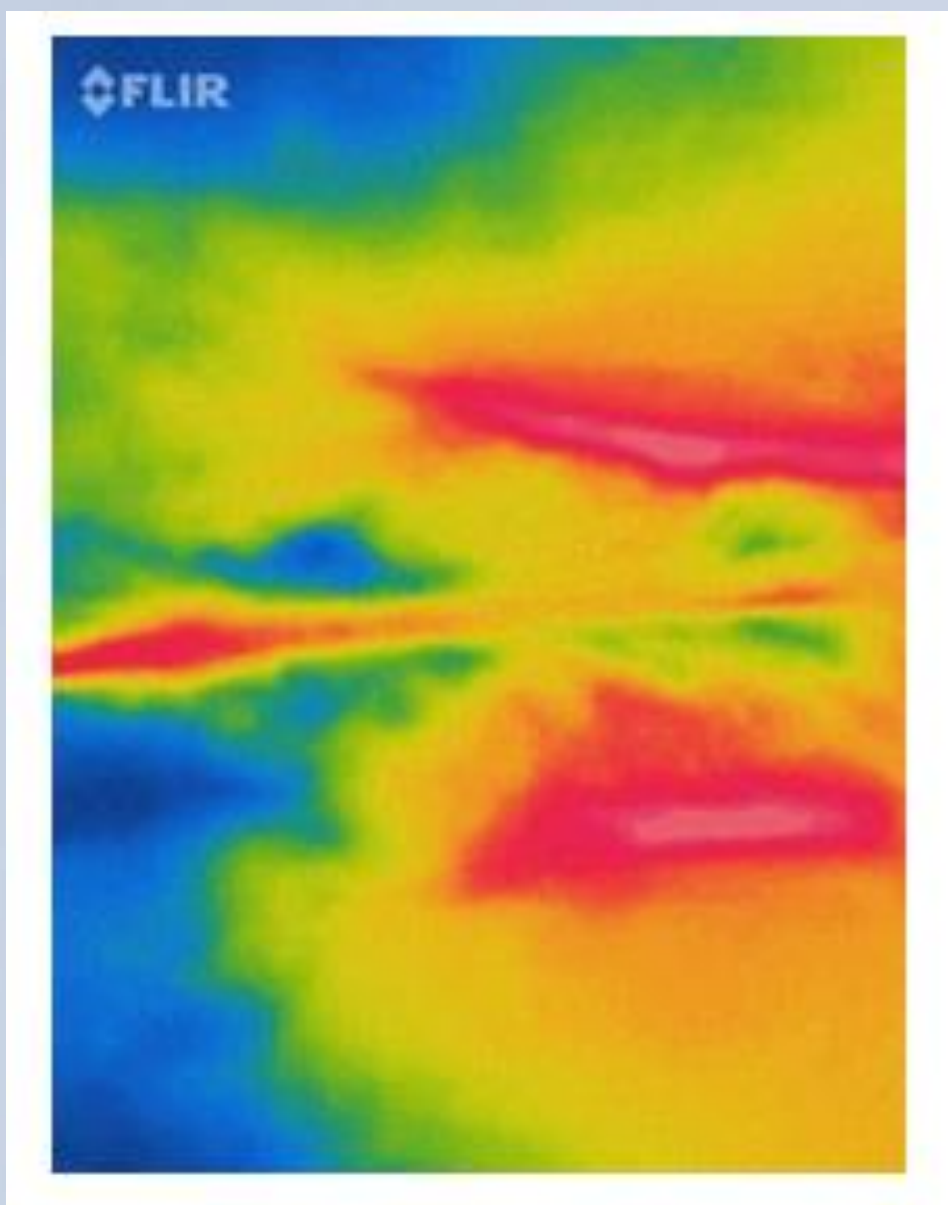


Figure 1 - Thermographic image of the pelvic floor region during rest.

## RESULTS

The characterization of the sample showed an average age of  $26.19 \pm 6.32$  years. Most of women presented a partner, completed high school graduation and reported total income between 2 to 3 minimum salaries. The gestation number ranged around  $2.23 \pm 1.48$  births. The weight gain during pregnancy presented an average of  $10.47 \pm 4.58$  kg. Gestational age according to the last menstrual period was  $39.11 \pm 1.56$  and the ultrasonography was  $39.76 \pm 0.84$ . The frequency of episiotomy section was 28.60% (n = 06) and laceration occurred in 47.60% (n = 10). Concerning the data of the new born, it was observed that the mean weight was  $3211.05 \pm 361.23$  g, the height was  $47.71 \pm 2.39$  cm, cephalic perimeter was  $34.26 \pm 1.78$  cm, thoracic perimeter of  $31.90 \pm 6.92$  cm and abdominal perimeter of  $32.42 \pm 1.60$  cm. In the evaluation of the pelvic floor, 66.67% (n = 14) of the volunteers presented grade 1 and 33.33% (n = 7) as grade 2. The most frequent color was green, blue and orange (Table 1). In the qualitative evaluation, it was observed that the majority of the volunteers presented a warm colour pattern in the centre of the thermographic image (Figure 1). In addition, minimum and maximum temperature of the pelvic floor area observed by thermographic evaluation were respectively  $34.80 \pm 3.50$  °C and  $37.17 \pm 3.11$ °C.

Most of the volunteers presented grade 1 in the evaluation of the pelvic floor. The literature showed since gestation and vaginal delivery may lead to decreased MAP strength due to damage to nerves, muscles and connective tissue. Some studies show a greater tendency to develop PAD over time after vaginal delivery. This demonstrates the importance of studying the region and acting early. The use of thermography in the pelvic floor area is still recent, however, in other anatomical regions this tool has already been consolidated. It was observed that the stains considered to be warmer were arranged in the centre of the image. The temperature of the skin depends on the heat exchange between the body and environment but especially on the blood transport to the skin. It is known that in the postpartum period, it is still expected that an increase in the circulation of the pelvic floor area due to vaginal delivery. It is also known that we will find the physiological lochia. The thermography was chose as an evaluative resource which may have to be added to other forms of evaluation of the pelvic floor region already recommended in the literature. It is worth mentioning that the evaluative features of PFMs for intracavitary application are limited for immediate postpartum use, due to physiological loachia.

Categories	Frequency (%)
Red	17.26±6.41
Orange	19.45±6.65
Yellow	11.86±4.06
Green	24.79±6.66
Cyan	6.07±2.09
Blue	20.02±8.57
Violet	0.00
Magenta	0.24±0.17
White	0.28±0.62

Table 1 - Values of the proportion of coloration present in thermographic images.

## CONCLUSIONS

The pelvic floor in postpartum women presents a warm colour pattern in the centre of the thermographic image which indicates a higher skin temperature elevation among this region.

## REFERENCES

- 1 - Lei T, Wang Y, Fan Y, Zhao J. Vector morphological operators in HSV color space. Science China Information Sciences, 2012;56(1), 1–12.
- 2 - Vermandel A, De Wachter S, Beyltjens T, D'Hondt D, Jacquemyn Y, Wyndaele JJ. Pelvic floor awareness and the positive effect of verbal instructions in 958 women early postdelivery. International Urogynecology Journal, 2014;26(2), 223–228.