

The influence of physical exercise in the treatment of ovarian cancer – Case report



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ABSTRACT

Introduction: The main characteristic of ovarian cancer is that it is a silent disease that usually does not present symptoms, signs or manifestations at an early stage. Physical exercise is an intervention that can help the patient recover after ovarian cancer

treatment. This paper is a case report that analyzed the impacts of physical exercise during and after ovarian cancer treatment. **Objective:** In general, the aim of this study was to describe the benefits of running, weight training and functional exercises for a woman who has undergone treatment for ovarian cancer. **Materials and Methods:** This is a retrospective case study that used the research tools of Scielo, Google Scholar, Lilacs and Pubmed for bibliographic survey and information available on the internet. The research was submitted to and approved by the Research Ethics Committee under registration CA: 08023519.0.0000.5427. **Results:** The frequency of training performed by the patient was 6 sessions per week. On the prescription of running training, weight training and functional exercises as educational. The markers used to monitor the patient's general health were made by blood count and these did not present deleterious conditions during the follow-up by the physical education professional. **Conclusion:** During the chemotherapy treatment and after the discovery of the metastasis, physical exercise was present in the maintenance of the patient's general health and did not negatively impact the blood count tests.

Keywords: Physical exercise, Ovarian Cancer.

1 INTRODUCTION

The ovaries are glands that are part of the female reproductive system and their main function is the production of the sex hormones progesterone and estrogen. Each woman has two ovaries (right and left), which are in the pelvis and connect to the uterus through the fallopian tubes. Three types of cells make up these organs: epithelial, which line the surface; germination, which produce the eggs; and glodulous thecae, which produce female hormones.

The regulation of the menstrual cycle is influenced by the secretions of progesterone and estrogen. In this process, each egg is released by the ovaries, alternately, and is routed through the fallopian tubes to the uterus. The egg attaches itself to the inner walls of the uterus and when fertilized by the sperm, forms a zygote.



The different cells that make up the ovary can undergo unexpected morphofunctional changes and this process is called malignancy. This is how tumor cells are formed, which are differentiated by loss of function or morphological changes in ovarian tissue. These modifications give rise to malignant or benign tumors (MASSABKI, VALENTE, 2011).

The main characteristic of ovarian cancer is that it is a silent disease, because it usually does not present symptoms, signs or manifestations at an early stage. Normally, 80% of the disease is discovered when it is already in the advanced stage (ARAÚJO, OLIVEIRA, OLIVEIRA, 2011).

The symptoms, when present, lead to late diagnosis and in these cases, the mortality rate increases. This makes preventive exams fundamental in the early detection of the disease (MASSABKI, VALENTE, 2011).

Early diagnosis of the disease is difficult and usually happens when there is any manifestation of the following symptoms: pelvic, abdominal and back pain; increased abdominal volume; or the sum of the symptoms described above (CÂNDIDO, FILHO, LIMA, VIOTTI, 2010).

The tests that can detect ovarian cancer are: transvaginal ultrasonography to discover pelvic tumors, ultrasonography to discover the malignancy and benignity of pre-existing diseases, and tumor marker CA-125 (BARACAT, FERNANDES, LIPPI, 2003).

The appearance of ovarian cancer in women before the age of 30 is very rare, since it mainly affects white women over 50 years of age. In clinical anamnesis, factors that lead to the incidence of this cancer can be traced, such as: family history of first-degree relatives with the disease, obesity and menopause (ARAÚJO, OLIVEIRA, OLIVEIRA, 2011).

There are cases of women with endocrine disorders, resulting in high levels of estrogen, testosterone, and luteinizing hormone. This decreases the production of follicular hormones, leading to changes that can generate cellular derangement. Additionally, associations of abnormal stimuli originating from the hypothalamic-pituitary axis are capable of producing multiple follicular cysts that develop in the ovary (GOIS, 2017).

Thus, for staging, the pathology is divided into four stages:

- ✓ Stage I: Tumor confined to one of the ovaries (IA) or both ovaries (IB);
- ✓ Stage II: A tumor that invades structures near the ovary by continuity, such as the fallopian tubes, uterus, and other tissues.
- ✓ Stage III: Tumor with invasion of the peritoneum or lymph nodes of the pelvis or abdomen;
- ✓ Stage IV: Tumor with occurrences of lung, liver, brain, and other tissue metastases.

Ovarian cysts are dependent on hormonal influences due to the menstrual cycle. These can be classified into: Follicular Cysts (FC) - develop in the ovaries of younger women, resulting in the maturation of the Graaf follicle when it is not ruptured and when immature does not reabsorb fluid after ovulation; Corpus Luteum Cysts (MCI) - occur after ovulation and are caused by increased



secretion of progesterone that results in increased fluid in the uterus. Theca-lutein cyst (TC) – develops in women who have taken ovulation-inducing medications; Polycystic Ovarian Syndrome (PCOS) – With a high incidence among women in the reproductive phase (GOIS, 2017).

The practice of regular physical activity is essential for a healthy life and brings significant systemic improvements with the improvement of cardiorespiratory and neuromuscular fitness (FRISON, KESSLER, SEIXAS, 2010).

Positive aspects have been proven in studies, demonstrating that physical exercise has a great influence on the anti-treatment of cancer. Thus, it can be characterized as a non-pharmacological treatment, being specific to each case (VIERA, 2007). In addition to being preventive, this intervention can be important during and after chemotherapy treatment, where patients complain a lot of fatigue, reduced muscle strength, pain, and other symptoms (FRISON, KESSLER, SEIXAS, 2010).

Therefore, physical exercise is a fundamental part of the treatment because it also helps to improve the quality of life and better performance of daily activities of patients. It should be performed after medical clearance on a regular basis and with the help of a qualified physical education professional.

Responses to physical exercise for cancer patients have shown beneficial effects, causing improvement in cardiovascular and functional capacities, increased energy levels, in addition to helping with sleep periods, rest, improving hemoglobin levels, weight control and decreasing the frequency of vomiting and diarrhea. This, associated with chemotherapy and radiotherapy treatments, improves psychological perceptions and functionality of the lower limbs (OLIVEIRA, 2015).

In view of the above, it is necessary to list the results obtained with the intervention of physical exercise in a patient with ovarian cancer. It is worth emphasizing that, due to the specificity of the pathology, only one patient was followed up and her individuality will be considered. Additionally, it is valid to indicate that ovarian cancer can be asymptomatic and can lead to death. Thus, this work is also a means of encouraging women to pay attention to the necessary care and prevention in the course of life, especially in the phase of greater pathological development. Therefore, appropriate management helps in prompt recovery, improvement of response to treatment, and development of quality of life.

In addition, the combination of physical exercise and cancer treatment can provide a significant improvement in the treatment and, especially, in the perception of the evolution of the treatment. Nevertheless, this is a report that presents a professional conduct of physical education, which should be considered when studying the case in populations affected by it.



2 OBJECTIVE

In general, the aim of this study was to describe the benefits and training of running, resistance and functional exercises for a patient with ovarian cancer.

3 METHODOLOGY

This study has a quantitative and qualitative characteristic, according to the methods of approach, making a retrospective of the volunteer in relation to the disease and consisting, through the deductive method, a direct descriptive research in a case report. Scielo, Google Scholar, Lilacs and Pubmed were used as a search tool with the following keywords: "ovarian cancer" and "physical exercise". This study was submitted to and approved by the Ethics Committee CA: 08023519.0.0000.5427.

The presented is a particularly representative case study where data are collected, recorded with excellence, followed by data collection such as field research, analysis and qualitative reports (SEVERINO, 2007).

The volunteer who participated in this work is a female native of Barra Bonita, a small town in the state of São Paulo, with a degree in mathematics. Her age is 53 years old and when she was stricken by the disease she was 47 years old. Currently, his main occupation is to reflect on sustainable attitudes, travel to various places in the world and develop social work, concomitant with a daily practice of running training.

Before the discovery of the disease, the volunteer was in perfect health, she did not feel anything abnormal or different in her daily life, but she found out about the disease when she began to feel some different symptoms. The first signs were a swollen abdomen and a feeling that urine was pressing on the bladder. That's when she decided to go to the doctor to find out what was the best course of action with professional follow-up.

Thus, in October 2011, the volunteer was diagnosed with stage III ovarian cancer, that is, with the disease progressing. Upon receiving the news, the patient did not let herself be discouraged, always thinking about the people she loved and how strong she would have to be. She underwent total hysterectomy surgery, and then began chemotherapy. During the process, 6 cycles were performed with repeated dosages every 21 days.

When the treatment ended in March 2012, she was emotionally strengthened, as she had faced the biggest challenge of her life. With the end of the cycles and discharge, he decided to run a marathon that would be in the month of October in 2013. Fulfilled, she wanted to demonstrate to the people in her life the feeling of freedom she felt. The race, with the challenge of the marathon, was the means to express his overcoming and establish his change in his lifestyle.



Despite the desire to complete a long-distance race, the patient was initially sedentary. Thus, he sought out a physical education professional to give him adequate instructions on the processes of adaptations in long-distance races and after 7 months of follow-up, he signed up for the marathon. During this preparation period, after discharge, the volunteer was again faced with the recurrence of the same pathology. This news came after examinations carried out periodically in January 2013.

Treatment resumed in March and ended in July of that year. During this period, he continued his training as normal. On October 6, 2013, at Ibirapuera Park in São Paulo, the patient participated in her first marathon in the company of 16,000 athletes. Running the 42 kilometers of the race after 14 months of training, 4 and a half months undergoing chemotherapy and without ever having run before.

During the treatment period, tests were performed, such as:

Transvaginal ultrasound or better known as transvaginal ultrasound: it is a type of diagnostic examination that is performed with the patient lying on a stretcher in a gynecological position, that is, positioned with the legs parted and with the buttock more elevated by a pillow, knees bent, resting the feet on the stretcher. The probe is inserted into the vaginal canal with the condom and a lubricating gel, facilitating the introduction and passage of the probe. Thus, by means of high-frequency sound waves, images are sent of the organs and pelvic structures, such as the ovaries, uterus and fallopian tubes, to a monitor, allowing diagnostic evaluation by the gynecologist.

Positron Emission Computed Tomography (PET-CT): PET is an imaging test that evaluates the metabolism of the structures analyzed, more especially bones, muscles, brain, lungs and liver, among other organs. In Oncology, PET-CT is frequently indicated for the detection of tumors and their metastases. It is a kind of radiography that generates detailed images that can be analyzed from any angle with quick results.

CA-125 blood tests: This test is specific to assess the amount of tumor markers in the blood. The CA-125 antigen is a protein present in most ovarian cancer cells and is used for monitoring during treatment and, if there is recessive, it is discovered by the test.

3.1 PHYSICAL TRAINING PROCESS

The physical training performed was monitored by a physical education professional, who structured the process with the exercises described below:

- ✓ Warm-ups with intervals of running and walking;
- ✓ General stretches;
- ✓ Postural exercises;
- ✓ Abdominal;
- ✓ Coordination and educational;



- ✓ Strengthening with localized exercises and with the use of the *medicine ball* and dumbbells;
- ✓ Specific, with aerobic runs with no pretension of performance, but of adaptation and conditioning.

The training sessions were carried out with the use of bicycles and running on an athletics track. The patient, before starting the training accompanied by a physical education professional, had started the practice of running on her own and ended up being injured, having quadriceps muscle injuries, pubic cartilage, plantar fasciitis and two micro fractures in the hip.

When the trainer began to adapt to the training, he realized that the patient was more likely to be injured due to the lack of a coach. So he started abdominal strengthening, exercises that used his own body weight, interval running on the track and pedaling. She spent some time doing this type of training for better adaptation and one of the main characteristics was willpower, desire to overcome and work together with medical monitoring.

With all the preparation, the coach became aware that it would probably be necessary to adopt stimuli that would intersperse running and walking into long-term stimuli. Its cardiovascular part was preserved, although some chemotherapy drugs cause cardiac alterations.

And in the same year she was unable to run because her case regressed, the patient had a small metastasis. During this period, the patient continued the exercises of light strengthening, track work, speed and coordination. During the chemotherapy cycles, I took the day off or performed the stimuli on a bicycle with light intensity. The trainer carried out a general assessment, with an interview and detection of the level of functional, psychological and physical comfort that the volunteer felt. And if it was the case, I would make the substitution as:

Pedaling on the stationary bike, trampoline activities, pedaling activities with a bicycle on the street (A widely used conditioning accessory).

Localized exercises, especially with low intensity, moderate and increasing in the following days. As time went by, the conditioning and adaptation to the efforts became more and more evident, making the chemotherapy more pleasant. All with many observations and a thorough follow-up of the treatment routine to provide support.

4 RESULTS

The training methods used in the present study were carried out by the prescription of a physical education professional according to each phase that the volunteer was in her physical condition. Based on their physical capacities, adaptation training was initially performed and, according to the progress of chemotherapy treatment, a subjective perception scale was used to control intensity. The training volume was lower than when compared to the treatment-free period.



The training was prescribed based on the following items:

- ✓ Training sessions were held 6 times a week (Monday to Saturday);
- ✓ Carried out in 2 periods, morning/afternoon;
- ✓ Duration of 1 hour and a half to 2 hours per day;
- ✓ In the mornings, I trained at the bodybuilding and interval gym;
- ✓ In the afternoon, I did aerobic training characterized by running on the street, an athletics track and a stationary bike.

The training began with strengthening exercises due to the patient's injuries. When the patient trained alone (without professional follow-up), she reported limiting injuries. During the strengthening period, the following exercises were performed standing with the elastic band:

- ✓ Hip extension and flexion;
- ✓ Hip adduction and abduction;
- ✓ Thigh elevation;
- ✓ Heel lift.

After his recovery, adaptation and general physical conditioning training began, with the help of specific materials in order to provide balance and isometric stimuli, such as:

- ✓ Stand on the inflatable functional disc;
- ✓ Stay on a mini trampoline (use of both legs/unilateral);
- ✓ Jumping on trampoline;
- ✓ *Dribbling* on the trampoline.

The educational tools used on the athletics track were 5 exercises with a distance of 20 meters, such as:

- ✓ *Skipping*;
- ✓ *heels*;
- ✓ *Hop run*;
- ✓ *Dribbling*;
- ✓ *Kick out*.

The abdominals used were performed in 5 sets of 10 to 20 repetitions such as:

- ✓ rectus abdominis;
- ✓ Oblique;
- ✓ Lumbar;
- ✓ Postural (leaning against the wall sitting and standing);
- ✓ Localized with *medicine ball* 3 to 5 times with 10 movements;
- ✓ Squats with the use of the arms, with rotation of the trunk, with extension and flexion of the trunk.



Exercises for standing isometrics:

- ✓ Squats with bent legs;
- ✓ Leg opening with several levels.

Isometric exercises with a weight bar:

- ✓ Semi-squat;
- ✓ Semi-squats/lunges;
- ✓ Short movements in the flexor;
- ✓ Seated adduction appliances.

In all activities, the patient's trainer used a specific training periodization, considering the patient's responses during and after the chemotherapy treatment. The variables are shown below (Table 1):

Table 1. Descriptions of the training variables

TYPE OF TRAINING	INTERVENTION	FREQUENCY	INTENDENCE	DURATION	EXERCISES
		WEEKLY			USED
			3 Series of 8 - 12		
	DURING THE	6 times	Sub max reps		
	TREATMENT	(Monday to Friday)	(variation per week).	40 min.	
STRENGTH AND					Lengthening
	INTERVALS		w/ 30 - 50% of 1RM (range		Exer. Postural
			1-3 min).		Strengthenings
					Localized abdominals
	AFTER THE	6 times	3 - 5 sets of 6 - 12 reps		(medicine ball).
	TREATMENT	(Monday to Friday)	Sub maxima or w/ 55 -	40 min.	
			75% of 1 RM (interval 1 -3 min)		
			(variation per week).		
	DURING THE	6 times	30 - 50% based on HR	60min.	
	TREATMENT	(Monday to Friday)	(Change per week).		Exercise Bike/
AEROBIC					Athletics track and
					street racing.
	AFTER THE	6 times	55 - 75% of the HR.	60 min.	
	TREATMENT	(Monday to Friday)			

Subtitle: MR: Maximum repetitions; HR: Heart rate, Min: minutes; Exer: Exercise.
Source: Authors

According to the evolution of the volunteer in her physical abilities, the intensity levels of her training were advanced.

Consequently an increase in more complex training levels and higher level of efforts, such as:



Weight training, more intense intervals, increasing distance in road running and on the athletics track.

Based on the leukogram tests that the volunteer underwent during the period in which she was undergoing chemotherapy, the medical treatments. With the intervention of the E.F., it was proven that no changes occurred. Although the volunteer had ovarian cancer and metastasized, there were no changes in the variables related to the results of the leukograms. Where leukocyte values can change with the increase of normal levels, happen due to infections, blood disorders. They can be caused by drugs or chemotherapy (PINHEIRO, 2019).

Based on the patient's exams, according to the results, an average of the exams was made and compared to the reference values. Values according to articles, tables of reference values, blood counts according to the method of analysis. However, it was seen that they are usually compared to the reference values according to (Table 2).

Table 2. Results of the patient's white blood cell markers.

Parameters	Mean / Standard Deviation*	Reference Values
Neutrófilos (/mm ³)	52.1 ± 5.49	45 - 75
Metamielócitos (/mm ³)	0 ± 0	0
Sticks (/mm ³)	1.4 ± 1.40	0 -- 5
Segmented (/mm ³)	50.7 ± 5.99	40 - 65
Eosinophils (/mm ³)	1.9 ± 0.90	1-- 5
Basophils (/mm ³)	0 ± 0	0 - 2
Typical lymphocytes (/mm ³)	38.9 ± 5.27	20 - 40
Monocytes (/mm ³)	7.1 ± 1.87	2-- 10
VCM (u ³)	84.9 ± 1.51	81 -100
CHM (pg)	27.7 ± 0.91	27- 34
CHCM (g/dL)	32.7 ± 0.72	31,5 - 36
Platelets (/mm ³)	197,286 ± 36849,76	150,000 - 400,000

*Average and standard deviation based on the results of the tests performed during treatment and compared with the normative reference value. Caption: MCV: Mean corpuscular volume; CHM: Mean corpuscular hemoglobin; HCCM: Mean corpuscular hemoglobin concentration.

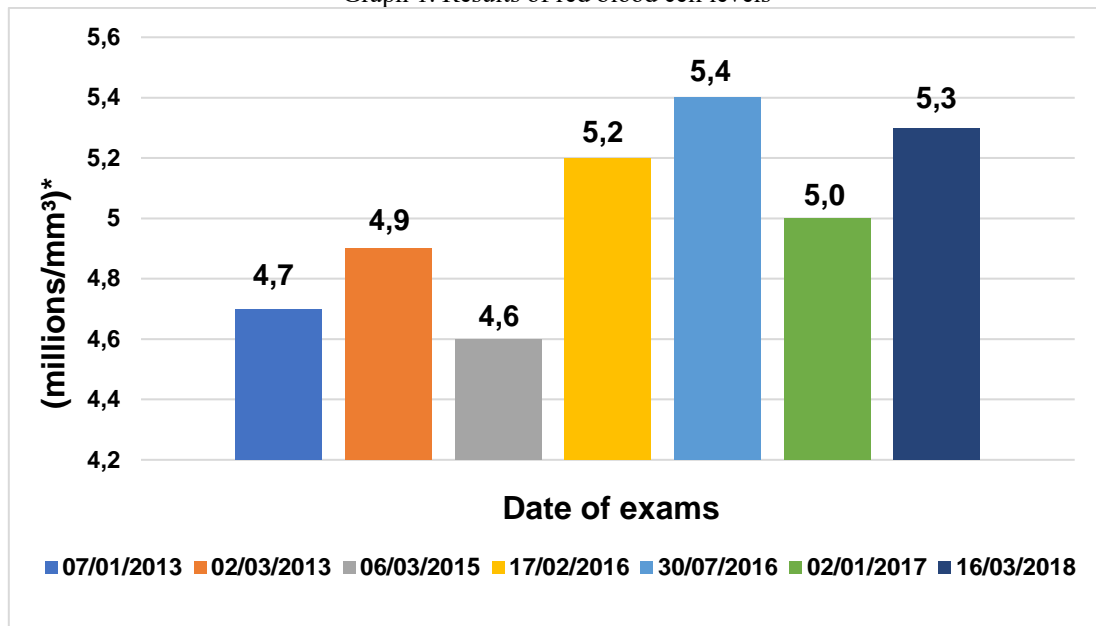
Source: Authors

In view of all the above, the results of the hematological markers are all described in the blood test, in the blood count, where they are subdivided by the hematological and leukorae markers.

The graphs below show the values of the hematological markers:

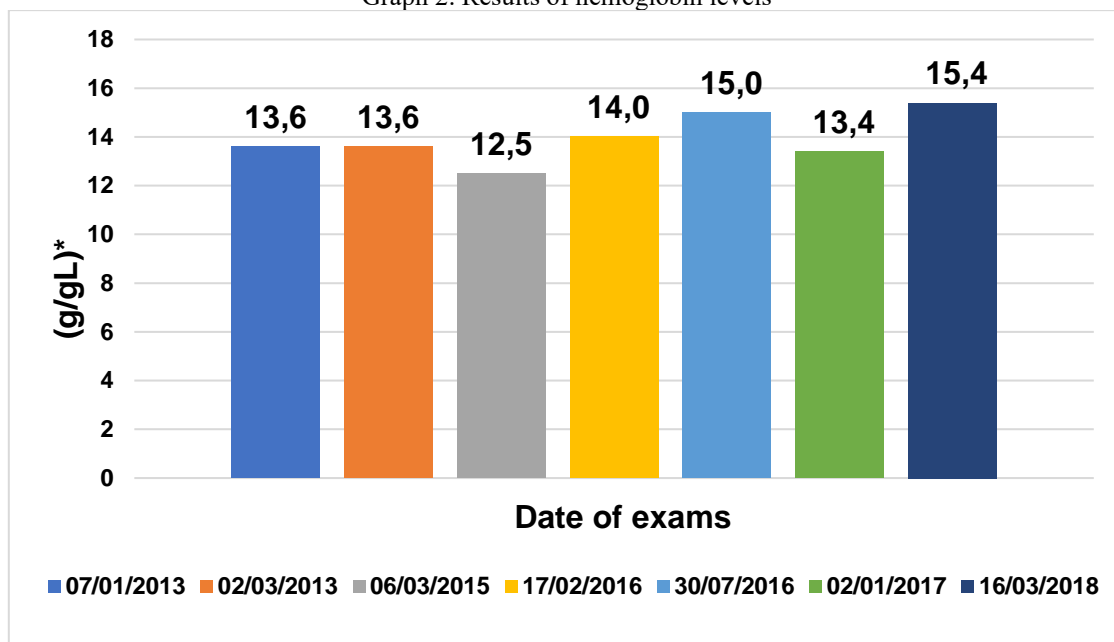


Graph 1. Results of red blood cell levels



*Reference values - 3.9 to 5.9 million/mm³. Source: Authors

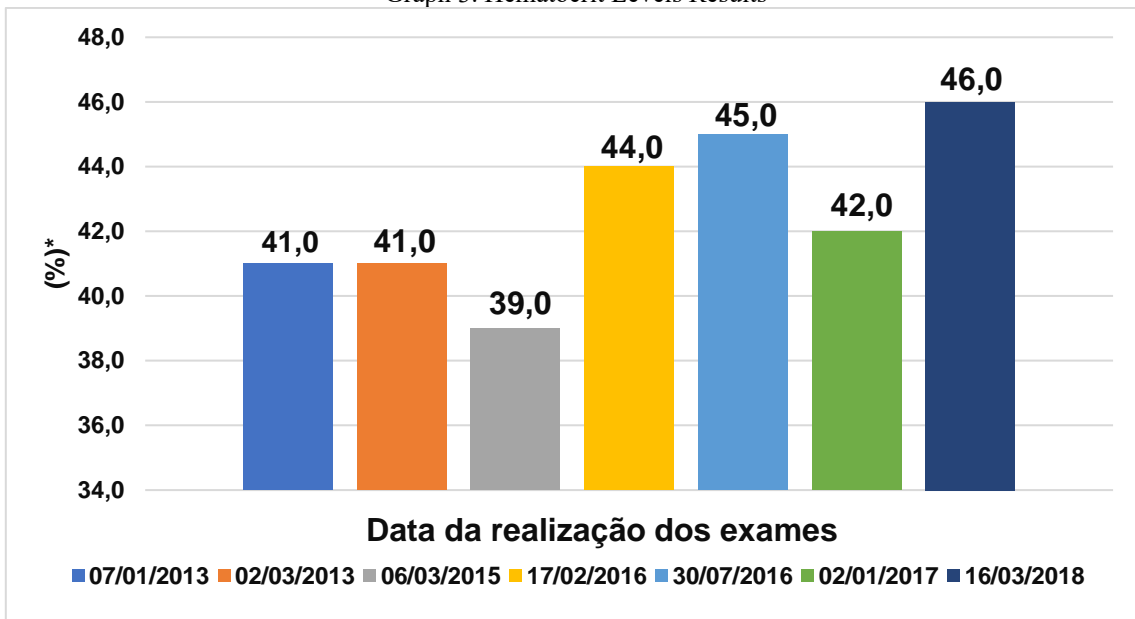
Graph 2. Results of hemoglobin levels



*Reference values - 12 to 16 g/gL. Source: Authors

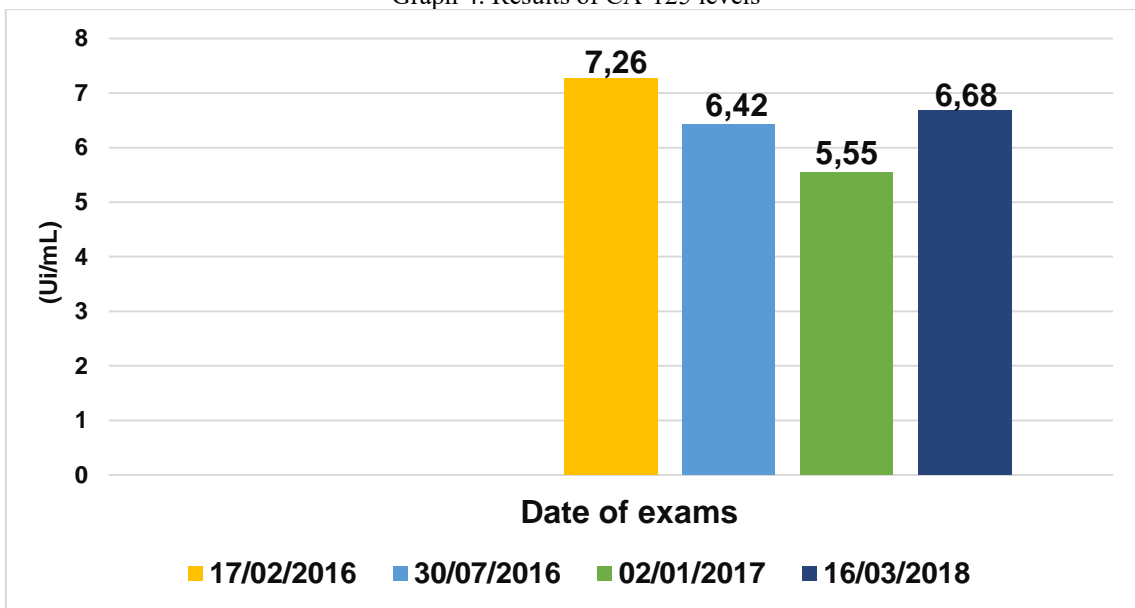


Graph 3. Hematocrit Levels Results



*Reference values - 35 to 47%. Source: Authors

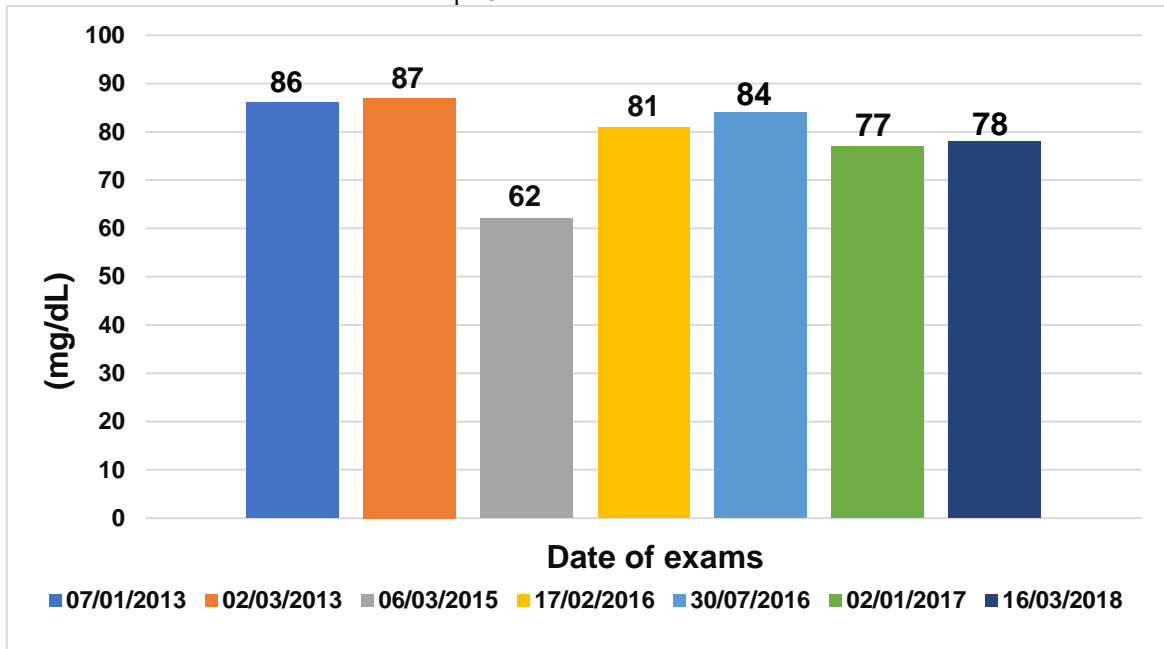
Graph 4. Results of CA-125 levels



*Reference values - Up to 35 Iu/mL. Source: Authors

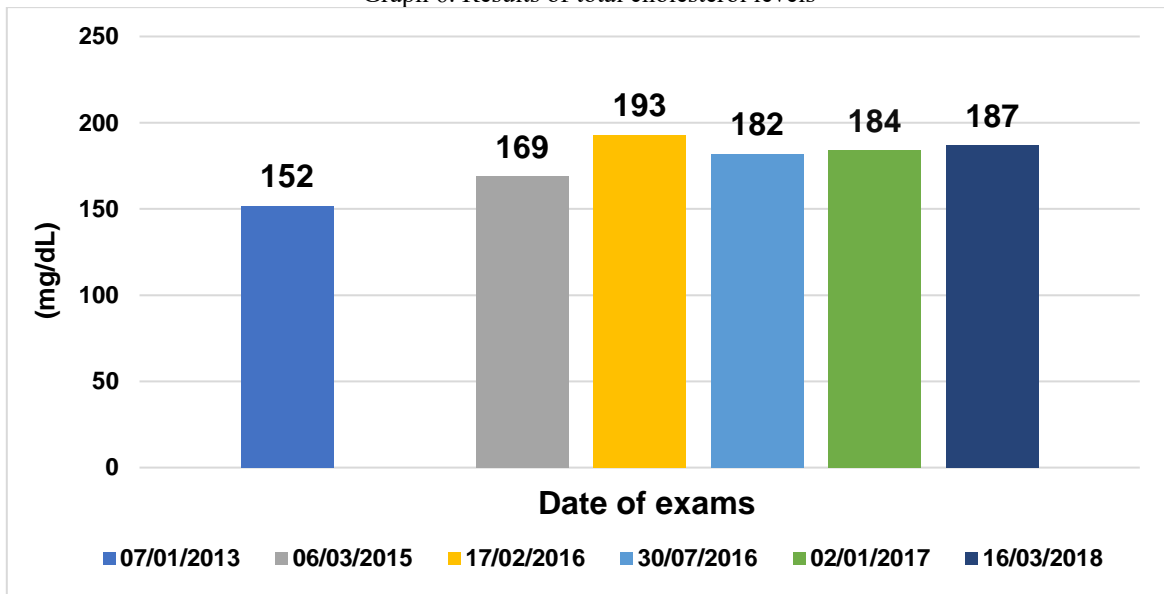


Graph 5. Glucose Levels Results



*Reference value less than 99 mg/dL. Source: Authors

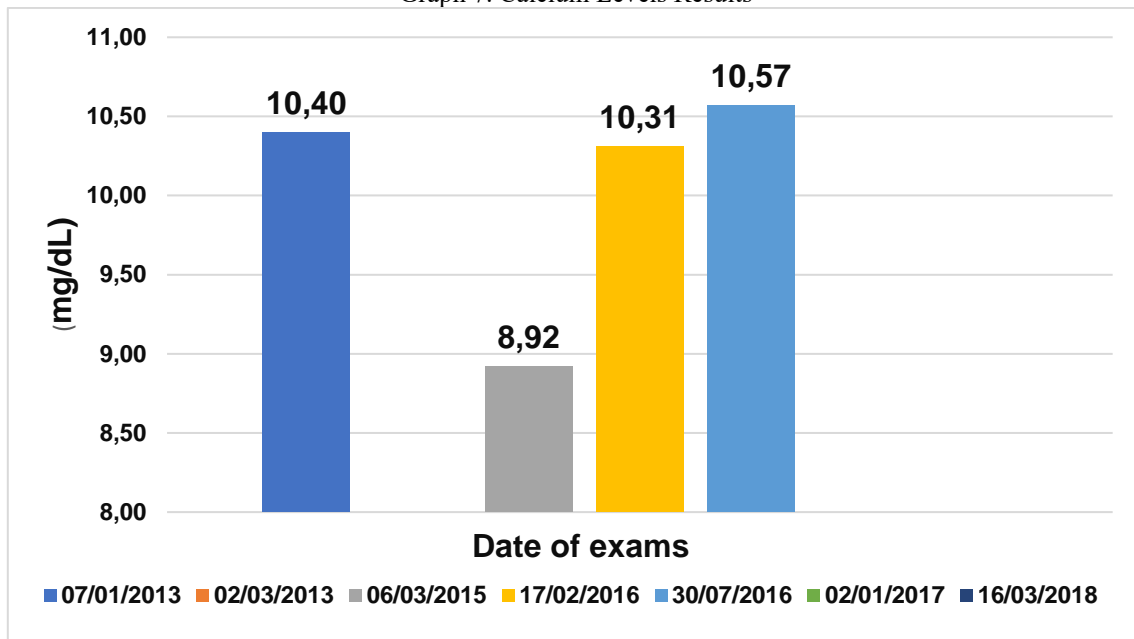
Graph 6. Results of total cholesterol levels



*Reference value - Less than 170 mg/dL. Source: Authors

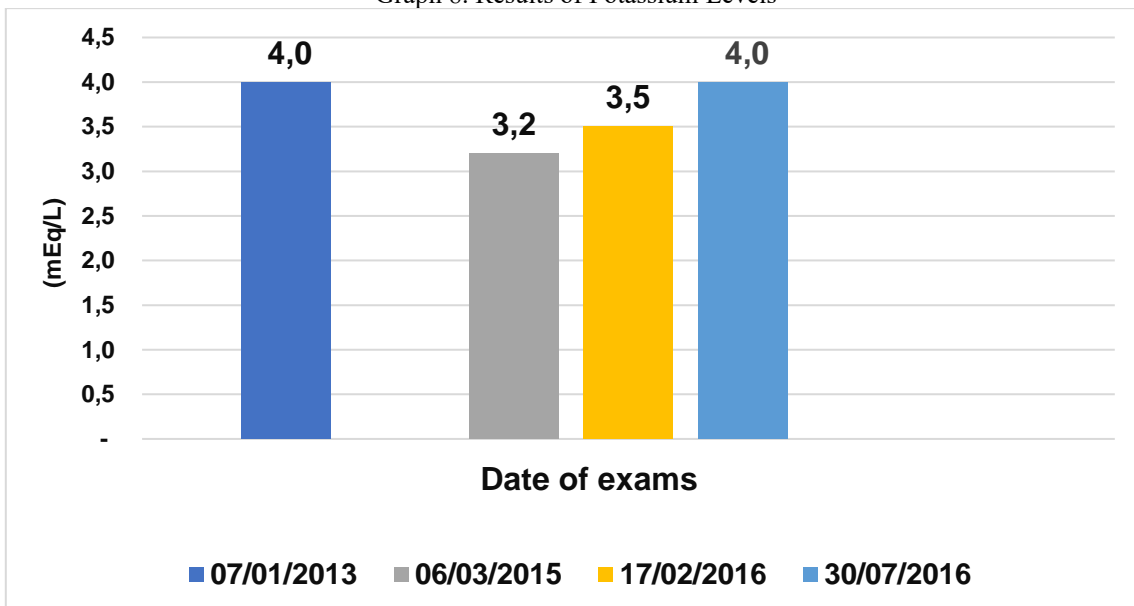


Graph 7. Calcium Levels Results



*Reference values - 8.5 to 10.2. Source: Authors

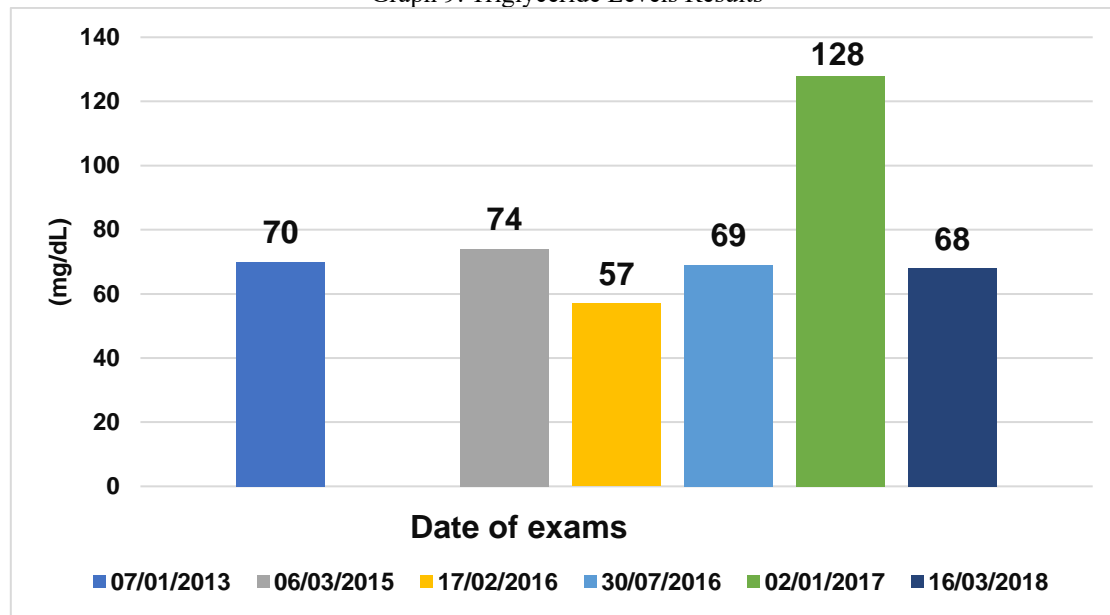
Graph 8. Results of Potassium Levels



Reference values - 3.5 to 5.5 mEq/L. Source: Authors



Graph 9. Triglyceride Levels Results



*Reference values - fasting less than 150 mg/dL and no fasting less than 175mg/dL. Source: Authors

5 DISCUSSION

The objective of this study was to describe the benefits of running, weight training and functional exercises for a patient with ovarian cancer.

Thus, we present the major causes of ovarian disorders in women, who are affected by polycystic ovary syndrome (PCOS). Happening due to 3 main causes such as: chronic ovulation, clinical and biochemical signs affecting women of reproductive age, causing hormonal dysfunction, interfering with ovulation or even amenorrhea (absence of menstruation). Leading to infertility, hirsutism (excessive hair growth in deprived places), hypertension, visceral obesity, metabolic syndrome, cardiovascular risk and insulin resistance. Associated with cardiac and metabolic risk factors. Type 2 diabetes mellitus and cardiovascular diseases, low respiratory fitness and maximal oxygen consumption, compared to women who ovulate normally. Causing endometrial and ovarian cancer (RENKE, 2018).

PCOS is affected in most women, with the prevalence of overweight and body obesity influencing the hormonal disorder (RIBEIRO, 2016). With the intervention of physical exercise with aerobic metabolic characteristics and resistance (strength), improvements in metabolic deficiencies caused by PCOS were found. These findings corroborate research that showed improvements in insulin resistance, lipolysis of adipose tissue and cardiovascular diseases, with a reduction in body weight and endocrine balance. It also provides increased stroke volume, decreased resting heart rate, and improved lipid catabolism. In mental disorders, causing a decrease in stress, anxiety, improved mood, and an increase in physical and mental disposition (JUNIOR, 2018).

In addition, according to the training methods used with the patient analyzed, aspects related to the intensity of the exercises for cancer patients are characterized by study protocols between 40



and 75% of 1 RM (reaching up to 100% of 1RM) and volume (sets, repetitions, amount of exercises, weekly frequency) varying according to the method applied and availability of schedules. On the other hand, for cyclic exercises (with aerobic and anaerobic predominance) the intensity is between 40 and 75% of VO₂ max (or 50 to 85% HR maximum), and can reach up to 100% of VO₂max/HRmax, with duration varying according to the method applied. Showing in the studies concerns in the process of adaptations and their development of oncological patients (NOGEUIRA, LIMA 2016).

Adaptations are necessary in the body to meet the energy demand in the practice of physical exercise, so these processes are determined by the type, intensity and duration of exercise. With the control and prescription of these variables, it is possible to make biochemical changes that maintain health (LIMA, LOPES, SILVEIRA, 2013).

Also based on the research, intense exercise is related to white blood cells, which provide the body's defense; red blood cells, which are related to oxygen transport; and platelets, which are important in blood clotting, can undergo changes. According to the intensity of the exercise, after its execution, the leukocytes (white cells) increase considerably, remaining with a high value up to 24 hours after exercise, which should not be confused with other inflammatory and infectious conditions of the body, which also course with an increase in defense cells.

Platelets also increase considerably, but their activation remains undetermined. Changes in red blood cells, such as red blood cells and hemoglobin (a protein present in red blood cells that will carry oxygen to the body's tissues) are more subtle than leukocytes and platelets. Regarding homeostasis, that is, the balance of the blood, studies show that high-intensity physical exertion can cause a procoagulant effect after the end of the effort and this process can lead to the appearance of thrombosis. In view of the above study, in line with biological individuality and intensity, physical exercise performed with control promotes beneficial changes that help in the transport of oxygen stimulating the immune system (LIMA, LOPES, SILVEIRA, 2013).

It is important to emphasize that, although this study is a case report, the data presented in the blood counts performed during treatment remained normal. To confirm this report, it is important that further research be conducted.

6 CONCLUSION

It is concluded that ovarian cancer is a silent disease, and in most cases it is discovered to be at an advanced stage. In view of this study, we can conclude that the intervention of physical exercise is beneficial to maintain the parameters of hematological tests in the reference parameters.

Thus, based on the results, it is not possible to infer that the intervention of physical exercise alone promoted modifications. However, exercise helped to maintain hematological and leucorain marker levels. These data suggest that protective effects on disease recurrence should be investigated.



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