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## MORPHOMETRIC FEATURES OF CHANGES IN THE MUSCLES OF THE ANTERIOR ABDOMINAL WALL AFTER IMPLANTATION OF THE CAPROMESH MESH COMBINED WITH PRP IN THE EXPERIMENT

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**Abstract.** Despite the use of meshes and other improvements, currently popular methods of surgical treatment of diastasis recti of the abdominal muscles and umbilical hernia have certain disadvantages and risks, especially in the group of patients with morbid obesity. The priority surgical intervention for diastasis and umbilical hernia under the conditions of morbid obesity is the performance of E-Milos video assisted operation. However, this type of procedure does not involve suture or stapled fixation of the mesh in the retromuscular space, which can lead to a number of complications. The analysis of the obtained results determines the relevance of this study.

**Purpose.** Carry out a quantitative morphometric assessment of the changes in the arteriomuscular-aponeurotic layer and muscles of the abdominal wall under the conditions of the E-Milos operation using meshes based on e-caprolactone treated with PRP (plasma enriched with growth factors) in the experiment.

**Materials and Methods.** The morphometric study involved the analysis of the muscles of the anterior abdominal wall after the implantation of the Capromesh based on e-caprolactone treated with PRP into the retromuscular space under the light-optical examination of micronutrients. Experiments were conducted on 16 sexually mature male Vietnamese pigs, which were divided into 4 groups.

**Results.** Measurements made in a group of intact animals showed that the outer diameter of small-caliber arteries was equal to  $(35.40 \pm 0.39) \mu\text{m}$ , the inner diameter was  $(16.95 \pm 0.15) \mu\text{m}$ , the media thickness was  $(6.36 \pm 0.06) \mu\text{m}$ , the Kernohan index (the ratio of the area of the lumen to the entire area of the vessel) was  $(22.90 \pm 0.18) \%$ . The height of the endotheliocytes of these vessels reached  $(6.12 \pm 0.06) \mu\text{m}$ , the diameter of their nuclei –  $(3.12 \pm 0.03) \mu\text{m}$ . The nuclear-cytoplasmic ratio in the studied cells was equal to  $(0.260 \pm 0.003)$ .

The thickness of the media of small caliber arteries on day 7 of the experiment increased from  $(6.38 \pm 0.06) \mu\text{m}$  to  $(6.60 \pm 0.06) \mu\text{m}$ , i.e. by 3.4 % ( $p < 0.05$ ), and adventitia thickness – by 24.7 % ( $p < 0.001$ ). Thus, the Wogenvoort index increased from  $(436.20 \pm 4.20) \%$  to  $(513.90 \pm 4.50) \%$ , i.e. by 77.7 %. It is also worth noting that the given morphometric indicators were statistically significantly ( $p < 0.001$ ) different from each other.

On day 14 of the experiment, the relative volume of damaged endothelial cells was  $(4.20 \pm 0.03) \%$ . This morphometric parameter exceeded the similar control by 1.8 times ( $p < 0.001$ ). The morphometric parameters of the small-caliber arteries of the soft tissues of the anterior abdominal wall of male Vietnamese pigs on day 21 of the experiment did not differ significantly from similar quantitative morphological indicators of the control observations.

**Conclusions.** On day 14 of the experiment, the structural rearrangement of small-caliber arteries did not significantly differ from similar vessels of control observations. The relative volume of damaged endothelial cells was equal to  $(4.20 \pm 0.03) \%$ . The morphometric parameters of the small-caliber arteries of the soft tissues of the anterior abdominal wall of male Vietnamese pigs on day 21 of the experiment did not differ significantly from similar quantitative morphological indicators of the control observations.

On day 21 of the experiment, the nuclear-cytoplasmic ratio in the studied muscle structures was equal to  $(0.055 \pm 0.002)$ , and the given morphometric parameter did not differ from the similar control, which indicated the preservation and stability of cellular structural homeostasis.

**Keywords:** hernia, implantation, arterial morphometry; media thickness; Kernohan index.

**Introduction.** Despite the use of meshes and other improvements, currently popular methods of surgical treatment of ventral hernias have certain disadvantages and risks, especially in the group of patients with morbid obesity. Classical open methods of allohernioplasty of ventral hernias are accompanied by a high frequency of complications and recurrences of 25–49 % [1,2,3]. With the introduction of minimally invasive methods of treatment of ventral hernias, the frequency of postoperative complications has significantly decreased [4,5]. However, a systematic review of a recently published meta-analysis suggests that IPOM and open allogeneoplasty is a safe procedure with comparable short-term and long-term results.

However, open methods of hernioplasty are burdened with a higher level of infection [6].

The priority surgical intervention for diastasis and ventral hernia under conditions of morbid obesity is the performance of the E-Milos video assisted operation [7,8,9,10]. To minimize wound complications and pain after hernioplasty, a new minimally invasive technique was developed that allows placing the mesh in the retroperitoneal space through a small transhernial incision, avoiding major trauma to the abdominal wall and contact with the abdominal cavity. However, this type of procedure does not involve fixing the mesh in the retromuscular space, which can lead to a number of such complications as twisting of the mesh, its migration, formation of fistulas, etc.

[9]. In a group of patients with hernias of the anterior abdominal wall and comorbid pathology accompanied by reactivity of the body, surgical intervention with the use of mesh implants does not always achieve the expected result [11]. Due to the high frequency of postoperative complications (11.8–50 %) and recurrence of the disease (6.5–15 %), surgeons are constantly developing new methods of allogeneoplasty [12]. An in-depth study of the combined use of meshes based on e-caprolactone, which are excellent matrices processed by PRP is interesting in our opinion.

**The aim of the study.** To conduct an experimental quantitative morphometric assessment of changes in the arteries of the muscle-aponeurotic layer and muscles of the abdominal wall under the conditions of the E-Milos operation using meshes based on e-caprolactone treated with PRP (plasma enriched with growth factors).

**Materials and methods.** The experimental study was performed at the Department of Operative Surgery with Topographic Anatomy of I. Horbachevsky Ternopil National Medical University. The experiment used 16 sexually mature male Vietnamese breed pigs, which were divided into 4 groups. Experimental animals were implanted with a Capromesh based on e-caprolactone treated with PRP (plasma enriched with growth factors).

Quantitative morphological characteristics of the blood vessels of the hemomicrocirculatory channel of the rectus abdominis muscle of Vietnamese male pigs are shown in Table 1.

Vessels of the hemomicrocirculatory bed were detected by impregnation of tissues with silver nitrate [13].

Experimental animals were divided into 4 groups. Group 1 – intact pigs, group 2 – animals on day 7 of the experiment, group 3 – pigs on day 14 of the experiment, group 4 – animals on day 21 of the experiment. The diameters of arterioles (DA), precapillary arterioles (DPA), hemocapillaries (DH), capillary venules (DCV) and venules (DV), density of microvessels (DM) per 1 mm<sup>2</sup> of tissue were measured on micronutrients. Morphometry of microvessels was carried out using a system of visual analysis of histological drugs, the images of which were displayed from a MICROMed SEOSCAN microscope on a computer monitor using a Vision CCD Camera. Morphometric measurements were performed using

Video-Test-5.0, KAARA Image Dose and Microsoft Excel programs on a personal computer. Quantitative morphological indicators were processed statistically. Processing of the received data was carried out at the Department of Systematic Statistical Research of I. Horbachevsky Ternopil National Medical University, Ministry of Health of Ukraine in the STATISTIKA software package (Stat.SoftInc., USA). The difference between the comparative morphometric parameters was determined by the Student and Mann-Whitney test [14].

Experiments and euthanasia of pigs were performed in accordance with the "General Ethical Principles of Animal Experiments" adopted by the First National Congress on Bioethics (Kyiv, 2001) and in accordance with the "European Convention for the Protection of Vertebrate Animals Used for Research and Other Scientific Purposes" of the Helsinki Declaration of the General assembly of the World Medical Association (2000).

**Results.** A comprehensive analysis of the data presented in the table established that on day 7 of the experiment, they changed significantly. Thus, the diameter of arterioles decreased from (15.90±0.12) μm to (14.50±0.15) μm. The given morphometric parameters were statistically significantly (p<0.001) different from each other. At the same time, the last quantitative morphometric index was lower than the previous one by 8.8 %.

At the same time, the precapillary arterioles also underwent a similar structural restructuring, the diameter of which decreased by 9.3 % under the given conditions of the experiment (p<0.001). The diameter of hemocapillaries in control observations was equal to (5.10±0.05) μm, and in the conditions of the studied experiment – (4.80±0.06) μm. It should be noted that the last morphometric parameter turned out to be with a pronounced statistically significant difference (p<0.001) smaller, compared to the previous indicator by 5.9 %.

The venous link of the hemomicrocirculatory bed (for capillary venules and venules) on day 7 of the experiment turned out to be expanded. Under the given conditions of the experiment, the diameter of the capillary venules increased by 14.6 % statistically significantly (p<0.001). The structure of the venules also changed, which were expanded by 12.3 %.

**Table 1**  
**Quantitative morphological indicators of blood vessels of the hemomicrocirculatory bed of the rectus abdominis muscle of experimental animals (M±m)**

Value	Group of observation			
	control	7 days	14 days	21 days
DA, μm	15.90±0.12	14.50±0.15***	15.80±0.15	15.86±0.12
DPA μm	10.14±0.09	9.20±0.09***	10.20±0.12	10.12±0.09
DH, μm	5.10±0.05	4.80±0.06**	5.15±0.06	5.08±0.05
DCV, μm	12.30±0.12	14.10±0.18***	12.90±0.15	12.80±0.12
DV, μm	22.80±0.21	25.60±0.24***	23.10±0.21	22.90±0.24
DM	3760.5±21.3	3853.4±22.5*	3720.4±24.6	3750.4±21.6

Note. \* - p<0.05; \*\* - p<0.01; \*\*\* - p<0.001, comparing with group 1

Morphometry of small-caliber arteries (outer diameter 25–56 μm) of the soft tissues of the anterior abdominal wall of Vietnamese male pigs was carried out. At the same time, the outer diameter (OD), inner diameter (ID), thickness of the media (TM), adventitia (TA), the height of the endotheliocytes (HE), the diameter of their

nuclei (DN), the nuclear-cytoplasmic ratio in the endotheliocytes (NCR), the relative volume of damaged endotheliocytes (RVDE), the Wogenvoort index (WI) was determined – the ratio of the area of the vessel to the area of the lumen, the Kernohan index (KI) – the ratio of the area of the lumen of the vessel to its area. The obtained

quantitative indicators were processed statistically. The difference between comparative morphometric parameters was determined by the Student and Mann-Whitney tests. The obtained morphometric parameters of the small-

caliber arteries of the soft tissues of the anterior abdominal wall in male pigs of the Vietnamese breed are shown in Table 2.

**Table 2**  
**Quantitative morphological indicators of small-caliber arteries of soft tissues of the anterior abdominal wall of experimental animals (M±m)**

Value	Group of observation			
	control	7 days	14 days	21 days
OD, $\mu\text{m}$	35.40±0.39	36.50±0.39*	35.60±0.42	35.50±0.42
ID, $\mu\text{m}$	16.95±0.15	16.10±0.15**	16.90±0.18	16.92±0.18
TM, $\mu\text{m}$	6.36±0.06	6.60±0.06*	6.42±0.08	6.40±0.09
TA, $\mu\text{m}$	5.95±0.06	7.42±0.06***	6.13±0.09	6.04±0.09
WI, %	436.20±4.2	513.90±4.5***	443.7±6.9	440.20±6.3
KI, %	22.90±0.18	19.40±0.15***	22.54±0.21	22.70±0.24
HE, $\mu\text{m}$	6.12±0.06	6.38±0.08*	6.15±0.07	6.14±0.09
BT, $\mu\text{m}$	3.12±0.03	3.40±0.03*	3.16±0.04	
TCK	0.260±0.003	0.275±0.003*	0.265±0.006	0.262±0.006
RVDE, %	2.30±0.02	12.90±0.12***	4.20±0.03**	2.40±0.06

**Note.** \* -  $p<0.05$ ; \*\* -  $p<0.01$ ; \*\*\* -  $p<0.001$ , comparing with group 1

A comprehensive analysis of the given quantitative morphological values established that they changed significantly on day 7 of the experiment. Thus, the outer diameter of small-caliber arteries increased from (35.40±0.39)  $\mu\text{m}$  to (36.50±0.39)  $\mu\text{m}$ . The given morphometric parameters were statistically significantly different from each other ( $p<0.05$ ). At the same time, the last quantitative morphometric indicator exceeded the previous one by 6.1 %. The inner diameter of the studied vessels under these experimental conditions was statistically significantly ( $p<0.01$ ) reduced by 5.0 %.

The thickness of the media of small caliber arteries on day 7 of the experiment increased from (6.38±0.06)  $\mu\text{m}$  to (6.60±0.06)  $\mu\text{m}$ , i.e. by 3.4 % ( $p<0.05$ ), and adventitia thickness – by 24.7 % ( $p<0.001$ ). In these experimental conditions, the Wogenvoort and Kernohan indexes, which determine the permeability of the studied vessels, also changed. Thus, the Wogenvoort index increased from (436.20±4.20) % to (513.90±4.50) %, i.e. by 77.7 %. It is also worth noting that the given morphometric indicators were statistically significantly ( $p<0.001$ ) different from each other.

The Kernohan index of small-caliber arteries decreased under the studied experimental conditions. Thus, in control observations, this indicator was equal to (22.90±0.18) %, and on day 7 of the experiment – (19.40±0.15) %. The last morphometric indicator with a pronounced statistically significant difference ( $p<0.001$ ) differed from the previous one and was reduced by 15.3 %.

The height of endotheliocytes of small-caliber arteries on day 7 of the experiment increased from (6.12±0.06)  $\mu\text{m}$  to (6.38±0.08)  $\mu\text{m}$ . A statistically significant ( $p<0.05$ ) difference was found between the given morphometric parameters, and the last quantitative indicator exceeded the previous one by 4.2 %. The diameter of the endotheliocyte nuclei of the studied vessels increased statistically significantly ( $p<0.05$ ) by 8.9 %.

Under these experimental conditions, the nuclear-cytoplasmic ratio in endothelial cells also changed,

which increased by 5.7 % ( $p<0.05$ ). The findings indicated a violation of structural and cellular homeostasis. The relative volume of damaged endotheliocytes in small-caliber arteries on day 7 of the experiment increased from (2.30±0.02) % to (12.9±0.12) % with a pronounced statistically significant difference ( $p<0.001$ ). i.e. 5.6 times. It should be noted that the thickening of the arterial wall, as well as the size of the endotheliocytes during this period of the experiment, is mainly caused by edema.

On day 14 of the experiment, the structural rearrangement of small-caliber arteries did not significantly differ from similar vessels of control observations. Morphometrically, an increased number of damaged endotheliocytes was detected. The relative volume of damaged endothelial cells was equal to (4.20±0.03) %. This morphometric parameter exceeded the similar control by 1.8 times ( $p<0.001$ ). The morphometric parameters of the small-caliber arteries of the soft tissues of the anterior abdominal wall of male Vietnamese pigs on day 21 of the experiment did not differ significantly from similar quantitative morphological indicators of the control observations.

During the morphometric study of muscles, the diameter of muscle fibers (DM), their nuclei (DN), the nuclear-cytoplasmic ratio in the specified structures, the relative volume of damaged muscle fibers (RVDM), the relative volume of the stroma (RVS) were determined), stromal-myocyte relations. When performing the specified measurements, H. H. Avtandilov's rules and recommendations of [15] were followed.

The measurements showed that in the intact rectus abdominis of male pigs of the Vietnamese breed, the diameter of the muscle fibers was equal to (13.42±0.12)  $\mu\text{m}$ , their nuclei – (3.080±0.018)  $\mu\text{m}$ , the nuclear-cytoplasmic ratio in studied structures – (0.054±0.002). The relative volume of damaged muscle fibers is (2.15±0.02) %. It is worth noting that these were mainly apoptotically changed muscle fibers.

The relative volume of the stroma in the studied anatomical structure was equal to (11.60±0.02) %, and the stromal-myocyte ratio was (0.130±0.001).

**Table 3**  
**Morphometric characteristics of rectus abdominis muscle structures of experimental animals (M±m)**

Value	Group of observation			
	control	7 days	14 days	21 days
DM, μm	13.42±0.12	14.60±0.15***	14.10±0.15*	13.90±0.12*
DN, μm	3.080±0.018	3.600±0.018***	3.400±0.015***	3.26±0.18**
NCR	0.054±0.002	0.0610±0.003*	0.0580±0.002	0.055±0.002
RVDM, %	2.15±0.02	6.60±0.03***	4.20±0.03***	2.30±0.06*
RVS, %	11.60±0.12	18.80±0.15***	18.10±0.15***	18.10±0.12***
SMR	0.130±0.001	0.233±0.003***	0.220±0.003***	0.220±0.003***

Note. \* - p<0.05; \*\* - p<0.01; \*\*\* - p<0.001, comparing with group 1.

On day 7 of the experiment, the diameter of the muscle fibers of the rectus abdominis muscle increased from (13.42±0.12) μm to (14.60±0.15) μm. A statistically significant difference was found between the given morphometric parameters (p<0.01). At the same time, the last quantitative morphological indicator exceeded the previous one by 8.0 %. Similarly, the diameters of the nuclei of the studied structures also changed on day 7 of the experiment. The increase in nuclei was equal to 16.9 % (p<0.001). Uneven disproportional changes in quantitative morphological characteristics of muscle fibers and their nuclei led to disruption of nuclear-cytoplasmic relations in the studied structures. Thus, in control observations, the indicated morphometric value was equal to (0.054±0.002), on day 7 of the experiment – (0.610±0.003). A statistically significant difference was found between the given morphometric parameters (p<0.05). At the same time, the last quantitative morphological value exceeded the previous one by 12.9 %.

The relative volume of damaged muscle fibers in these experimental conditions was equal to (6.60±0.03) %. It should be noted that the given quantitative morphological value exceeded the similar control (2.15±0.02) % by 3.1 times. A statistically significant (p<0.001) increase in stromal structures was noted in the studied muscle during this period of the experiment, the relative volume of which was equal to (18.80±0.15) % and with a pronounced statistically significant difference (p<0.001) it exceeded the similar control (11.60±0.12) %. At the same time, the stromal-myocyte ratio increased from (0.130±0.001) to (0.233±0.003), that is, by 1.8 times (p<0.001), indicating a marked increase in the stroma.

On day 14 of the experiment, a tendency towards normalization of the studied morphometric parameters was observed. Thus, the diameter of the muscle fibers of the studied muscle is from (14.60±0.15) μm to (14.10±0.15) μm. It should be noted that the given quantitative morphological indicators were statistically significantly (p<0.001) different from each other. Under these experimental conditions, the observed decrease in the diameter of the muscle fibers of the rectus abdominis muscle was equal to 3.4 %.

The conducted studies also established that on day 14 of the experiment, the diameter of the nuclei of muscle fibers also decreased. Thus, in control observations, the indicated quantitative morphological indicator was equal to (3.080±0.018) μm, and on day 14 of the experiment – (3.400±0.015) μm. A statistically significant (p<0.001) difference was found between the given morphometric parameters. It should be noted that the last quantitative morphological value exceeded the previous one by 10.4 %. Comparing the studied morphometric parameter

with the similar quantitative value of day 7 of the experiment, it was found that the diameter of the nuclei of the muscle fibers of the rectus abdominis muscle was found to have decreased by 5.5 % (p<0.01). Nuclear-cytoplasmic fibers in the studied muscle structures on day 14 of the experiment (0.056±0.002) did not differ significantly from the similar control indicator (0.054±0.002).

The relative volume of damaged muscle fibers on day 14 of the experiment was equal to (4.20±0.03) %. The given morphometric parameter with a pronounced statistically significant difference (p<0.001) exceeded the similar control indicator (2.15±0.02) % by 1.9 times. At the same time, the relative volume of damaged muscle fibers on day 14 of the experiment decreased by 37.1 % compared to day 7 of the experiment.

The relative volume of the stroma on day 14 of the experiment in the studied structure was equal to (18.10±0.12) %. The given morphometric parameter with a pronounced degree of statistically significant difference (p<0.001) exceeded the similar quantitative morphological indicator of the control group of observations by 56.0 %. The relative volume of the stroma in the studied muscle on day 14 of the experiment was also 2.7 % (p<0.001) smaller compared to day 7 of the experiment. The stromal-myocyte ratio in the studied muscle structure on day 14 of the experiment reached (0.220±0.003). This quantitative morphological indicator exceeded the stromal-myocyte ratio in control observations (0.130±0.001) by 69.2 %, which indicated an increase in connective tissue structures in the studied muscle. At the same time, it should be noted that the stromal-myocyte ratio on day 14 of the experiment was lower by 5.6 % (p<0.01) compared to the same morphometric parameter in the observations of group 1.

On day 21 of the experiment, the studied morphometric parameters also changed compared to the previous group of observations. Thus, under these experimental conditions, the diameter of the muscle fibers of the rectus abdominis muscle of Vietnamese male pigs was equal to (13.90±0.12) μm. The given morphometric parameter with a statistically significant difference (p<0.01) exceeded the similar quantitative morphological indicator of control male pigs of the Vietnamese breed by 3.6 %. The detected increase in muscle fibers of the rectus abdominis muscle in these observations can be explained by some of their enhanced function. Part of the muscle fibers after their damage is replaced by connective tissue, and full-fledged muscle fibers at the same time hyperfunction, i.e. perform the functions of the missing structures. It should be noted that the diameter of muscle fibers in this period of the experiment was smaller compared to day 14 of the experiment by 1.4 %, compared to day 7 – by 4.8 % (p<0.01).

The diameters of the nuclei of the studied muscle structures ( $3.26 \pm 0.018$ )  $\mu\text{m}$  were more than 5.8 % ( $p < 0.001$ ) compared to the similar control morphometric value. The given quantitative morphological value was smaller by 9.4 % ( $p < 0.001$ ) compared to the diameter of the nuclei of the studied muscle structures on day 7 of the experiment and by 4.1 % ( $p < 0.01$ ) compared to day 14 of the experiment.

On day 21 of the experiment, the nuclear-cytoplasmic ratio in the studied muscle structures was equal to ( $0.055 \pm 0.002$ ). It should be noted that the given morphometric parameter did not differ from the similar control, which indicated the preservation and stability of cellular structural homeostasis.

It should be noted that on day 21, the relative volume of damaged muscle fibers reached ( $2.30 \pm 0.06$ ) %. The specified muscle fibers were mainly apoptotically altered, and no structures with dystrophy and necrobiosis were found among them.

The relative volume of the stroma on day 21 of the experiment was equal to ( $18.10 \pm 0.12$ ) %. This morphometric parameter did not differ from the similar quantitative morphological indicator observed on day 14 of the experiment. It can be claimed that a stable amount of stroma was organized in the studied structures after the experiment. This was also confirmed by stromal-myocyte ratios, which reached ( $0.220 \pm 0.003$ ) on day 21 of the experiment. The given quantitative morphological indicator also did not differ from the similar one observed on day 14 of the experiment.

**Discussion.** Capromesh is consisted of a segmented copolymer of glycolide and  $\epsilon$ -caprolactone, which can be dissolved, and polypropylene monofilament fibers that cannot be dissolved. The part that will be examined is a miraculous matrix on which all the storage elements of PRP plasma rich in platelets are perfectly fixed. In the domestic and foreign sources available to us, we didn't observe such investigations. Our previous works detailed the nutritional morphometric and morphological assessment of polypropylene meshes coated with PRF – plasma membranes rich in platelets, as our research data showed the results of accelerated plantation of meshes in the tissue of the anterior abdominal wall in an experiment [16].

However, the production of membranes enriched with platelets is a much longer process, which increases the duration of the surgical intervention and they cover a much smaller area of the mesh implant, which in turn has a negative effect on the remodeling processes of the anterior abdominal wall after implantation. Conventional polypropylene meshes cannot be treated with PRP, unlike Capromesh, which perfectly absorbs all elements of PRP. Taking into account the specifics of the E-Milos operation, this combination of Capromesh + PRP according to the data of morphometric studies obtained by us in the experiment showed the most favorable conditions and acceleration of the mesh integration processes in the tissues of the anterior abdominal wall.

**Conclusions.** On day 14 of the experiment, the structural rearrangement of small-caliber arteries did not significantly differ from similar vessels of control observations. The relative volume of damaged endothelial cells was equal to ( $4.20 \pm 0.03$ ) %. This morphometric parameter exceeded the similar control by 1.8 times ( $p < 0.001$ ). The morphometric parameters of the small-caliber arteries of

the soft tissues of the anterior abdominal wall of male Vietnamese pigs on day 21 of the experiment did not differ significantly from similar quantitative morphological indicators of the control observations.

On day 21 of the experiment, the nuclear-cytoplasmic ratio in the studied muscle structures was equal to ( $0.055 \pm 0.002$ ), and the given morphometric parameter did not differ from the similar control, which indicated the preservation and stability of cellular structural homeostasis.

Quantitative analysis of the morphometric assessment of changes in the muscle layer of the anterior abdominal wall during the implantation of the Capromesh based on  $\epsilon$ -caprolactone treated with PRP in the late period of the experiment showed that during the implantation of the PRP-treated Capromesh mesh led to the least significant structural changes of the arteries and the most optimal remodeling of the anterior abdominal muscles. Thus, the most favorable signs of structural changes of the anterior abdominal wall were found in experimental animals for which Capromesh was used in combination with PRP.

**Prospects for further research.** The conducted studies justified the feasibility of further studying the morphological picture of changes in the muscle layer of the anterior abdominal wall after the implantation of the Capromesh based on  $\epsilon$ -caprolactone, treated with PRP, in order to develop recommendations for its use in clinical practice.

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**МОРФОМЕТРИЧНІ ХАРАКТЕРИСТИКИ ЗМІН  
М'ЯЗИВ ПЕРЕДНЬОЇ ЧЕРЕВНОЇ СТІНКИ  
ПІСЛЯ ІМПЛАНТАЦІЇ СІТКИ CAPROMESH В  
КОМБІНАЦІЇ З PRP В ЕКСПЕРИМЕНТІ**

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**Резюме.** Пріоритетним операційним втручанням при діастазі та пупкової грижі за умов морбідного ожиріння є виконання відео асистуваної операції E-Milos. Про те даний тип операції не передбачає шовної чи степленої фіксації сітки в ретромускулярному просторі, що може призводити до ряду ускладнень. Аналіз отриманих результатів визначає актуальність даного дослідження.

**Мета.** Провести в експерименті кількісну морфометричну оцінку змін артерій м'язово-апоневротичного шару та м'язів черевної стінки за умов виконання операції E-Milos з використанням сіток на основі e-sarprolactone, оброблених PRP (плазма збагачена факторами росту).

**Матеріали і методи.** Морфометричне дослідження передбачало аналіз м'язів передньої черевної стінки після імплантації сітки Capromesh на основі e-sarprolactone, оброблених PRP у ретром'язовий простір при світлооптичному дослідженні мікропрепаратів.

**Результати.** Виміри, проведені в групі інтактних тварин, показали, що зовнішній діаметр артерій дрібного калібру дорівнював (35,40±0,39) мкм, внутрішній – (16,95±0,15) мкм, товщина меді – (6,36±0,06) мкм, індекс Керногана (відношення площі просвіту до всієї площі судини) становив (22,90±0,18)%. Товщина меді артерій дрібного калібру на 7-у добу експерименту зростає з (6,38±0,06) мкм до (6,60±0,06) мкм, тобто на 3,4 % (p<0,05), а товщина адвентиції – на 24,7 % (p<0,001). Індекс Вогенворта при цьому збільшився з (436,20±4,20) % до (513,90±4,50) %, тобто на 77,7 %. На 14-у добу експерименту відносний об'єм пошкоджених ендотеліальних клітин дорівнював (4,20±0,03) %. Морфометричні параметри артерій дрібного калібру м'язових тканин передньої черевної стінки свиней-самців в'єтнамської породи на 21 добу експерименту суттєво не відрізнялися від аналогічних кількісних морфологічних показників контрольних спостережень.

**Висновки.** Кількісний аналіз морфометричної оцінки змін м'язового шару передньої черевної стінки при імплантації сітки Capromesh на основі e-sarprolactone, обробленої PRP у пізній період експерименту показав, що під час імплантації сітки Capromesh обробленої PRP призвело до найменш значущих структурних змін артерій і найбільш оптимального моделювання передніх м'язів живота.

**Ключові слова:** грижа, імплантатія, морфометрія артерій; товщина меді; індекс Керногана.

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