The State of the Hemomycocirculatory Bed of Adventitia of Varicose Veins of the Small Pelvis in Women with Chronic Inflammatory Diseases of the Internal Genital Organs

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Abstract
Hemomicrocirculatory system - is a complex structure that reacts in every pathological process even before the clinical period and takes the first blow. The study of microhemocirculation will provide an opportunity to solve the important for practical medicine questions of pathogenesis of many diseases, as for the prevention and treatment of regional disorders of blood circulation.

The objective of the research is to study the state of the hemomicrocirculatory bed (HMCB) of adventitia of varicose veins of the small pelvis (VVSP) in women with chronic inflammatory processes of the organs of the small pelvis (CIPOSP).

Materials and methods of research. To evaluate the restructuring of the HMCB of adventitia of VVSP, the operating material of 12 women of reproductive age was used. Mainly, there were pieces of the ovarian vein. The study of the HMCB in the vein wall was performed by the non-injecting method of silver impregnation according to V.V. Kupriyanov. To standardize the results, the condition of the HMCB of adventitia of the venous wall in norm was studied in 5 women of reproductive age, who died as a result of various traumas.

Results of the research. After the performed studies, the structural-morphological changes of the HMCB of the adventitia of the small pelvis veins were revealed. The dilatation of capillaries, postcapillaries, postcapillary venules was observed. The diameter of the vessels of the HMCB of the ovarian vein adventitia was: venule - $94.21 \pm 1.38 \mu M$ in comparison with the norm - $48.78 \pm 1.60 \mu M$ (p < 0.001); post-capillary venules - $46.76 \pm 1.04 \mu M$ in comparison with the norm - $28.29 \pm 1.01 \mu M$ (p < 0.001); the capillaries were $11.22 \pm 0.14 \mu M$ in comparison with the norm - $8.24 \pm 0.16 \mu M$ (p < 0.05), arterioles - $29.02 \pm 0.76 \mu M$ in comparison with the norm - $25.19 \pm 1.15 \mu M$ (p < 0.01). The architectonics of the arterioles is almost unchanged. Lumen of venules is filled with formed elements. The structure of capillaries is polymorphic. The capillary net was localized and concentrated or was formed as a thick planar net, the capillaries were expanded. There were arterio-venulous anastomoses. Endothelial nuclei are shortened. In some preparations, the diameter of the arterioles corresponded to the diameter of the collection venules.

Conclusions:
1. The first discovered by us changes in HMCB of adventitia of varicose veins of the small pelvis in women with CIPOSP can be one of the pathogenetic links of the development and progression of the varicose vein itself, which in turn aggravates the course of chronic inflammation.
2. The timely appointment of drugs that improve micrcirculation will enable to prevent the development of dystrophic changes in the vein wall, improve the course of chronic inflammatory processes and reduce or completely eliminate the syndrome of "chronic pelvic pain".

Keywords
hemomicrocirculatory bed; adventitia; varicose veins of the small pelvis; chronic inflammatory diseases of the pelvic organs

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Problem statement and analysis of the recent research

The phlebeurysm of the small pelvis is an actual problem of obstetrics and gynecology, as it is one of the factors of the development of "chronic pelvic pain" [3, 9, 11]. The incidence of the disease among women, who seek help from a gynecologist for chronic pelvic pain, is 30% [9, 11].

Often VVSP occurs in women with chronic inflammatory processes of the internal genital organs, mutually worsening the course of each of these pathologies. According to the Ministry of Health of Ukraine, inflammatory diseases of the reproductive system form 60-65% of all gynecological diseases [5, 7]. Cardinal pathogenetic sign of inflammatory...
reaction is a disorder of blood circulation [1, 2].

Recent studies indicate that VVSP - is a manifestation of connective tissue systemic damage. The leading cause of this pathology is dysplasia of the connective tissue (DCT). Morphological basis of DCT - is the decrease of the content of certain types of collagen or violation of the relationship between them, which leads to a decrease in the strength of the connective tissue. According to the literature data, up to 35% of practically healthy people have DCT, 76% of them are women [10].

T.A.Gadzhieva and T.G.Khelbnikova in 1986 studied morphology of HMCB of normal and varicose veins. The use of impregnation with silver nitrate according to V.V. Kupriyanov (1965) of the entire venous wall - does not give the desired result due to the significant thickness of the preparation. For receiving the thinner preparations of the veins, it was suggested that the vein wall be stratified into separate membranes and afterwards to perform the impregnation [4, 8].

In the available literature we did not find out information about the nature of the restructuring of the HMCB of the adventitia of the ovarian vein in VVSP and the CIPOSP, which became the reason for such studies.

The objective of the study is to study the state of the hemomicrocirculatory bed of the adventitia of varicose veins of the small pelvis (VVSP) in women with chronic inflammatory processes of the small pelvic organs (CIPOSP).

1. Materials and methods of the research

To evaluate the restructuring of the HMCB of adventitia of VVSP, the operating material of 12 women of reproductive age was used. Mainly, these were pieces of the ovarian vein. Study of HMCB in the vein wall was carried out by non-injecting method of impregnation with silver nitrate according to V.V. Kupriyanov. To standardize the results, the condition of the normal HMCB of adventitia of the venous wall was studied in 5 women of reproductive age, who died as a result of various traumas.

Statistical processing of the obtained results was performed on a personal computer using the STATISTIKA-6 program and the "Microsoft Excel" statistical function package using the Student-Fisher method, and the reliability of the results was considered at \( p < 0.05 \) [6].

2. Results of the research and their discussion

HMCB in adventitia is normally represented by small arteriolar and venular vessels of different diameters, as well as by capillaries. There are compactly located vascular nets (modules), which consist of arterioles, precapillaries, capillaries, postcapillaries and venules. Arteriolar branches, as a rule, are accompanied by one or two venular branches. Significantly smaller arterioles, which penetrate into the middle of the module and give rise to 4-10 capillaries in diameter (16.23 ± 0.65) microns, branch from arterioles. Each precapillary gives rise to 5-12 capillaries in diameter (8.23 ± 0.15) microns (Fig. 1).

![Figure 1](image.png)

**Figure 1.** The fragment of the HMCB module of the normal adventitia of the ovarian vein (sufferer M., 28 years old). Note.
1 – arteriole;
2 – venule;
3 – capillaries;
4 – precapillary;
5 – postcapillary venule;
6 – nerve bundle.
Impregnation with silver nitrate. Magnification: eyeglass 10; ocular lens 20.

At impregnated with silver nitrate total preparations of ovarian veins adventitia at the places of precapillary arterioles’ branching, there was a significant accumulation of smooth muscular cells in the form of a sphincter, which regulates the blood flow into the capillary bed of the module.

Hemocapillaries in the adventitial vein membrane are unevenly placed and the nature of their branching is diverse. In some adventitious areas, separate elongated capillary anses, in others - the large-loop and mid-loop capillary net of uniform diameter in the form of loops of oval or polygonal shape, size from (85-150) μm up to (190-280) microns have been found.

Along with the functioning capillaries in diameter (8.2 ± 0.15) microns, plasmic (up to 4.0 μm) and completely closed micro-vessels are observed. Between the capillaries there are nerve bundles with well-expressed fibrousness somewhere
The fibers that form the nerve bundle are clear, without thickening.

As a result of the fusion of 2-3 or more capillaries, as well as the gradual expansion of their lumen, postcapillary venules, whose diameter is \((28.26 \pm 1.07) \mu m\), are formed. When they enter the collection venules, they form a venular link of the HMCB (Fig. 1). Collecting venules are branching tree-like, forming venular loops of 60-100 \(\mu m\) in size and somewhere are connected by veno-venular anastomoses. In addition, there is a connection between the venules with vessels, the diameter of which is \(12.43 \pm 1.13 \mu m - 15.36 \pm 1.34 \mu m\), which have a structure similar to capillaries. In some areas, arteriolar-venular anastomoses were noted as a type of shunts and half-shunts with an adjustable blood flow. Some preparations showed lymphatic capillaries (80-115 \(\mu m\) in diameter) that are finger-like in shape. These capillaries are included in the lymph postcapillaries, which pass between the afferent arteriole and the transport venule.

To assess the restructuring of the HMCB of the adventitia of the venous wall of the small pelvic veins at the CIPOSP against the background of the VVSP, the operating material of 12 women was used. The structural-morphological changes of the HMCB of the adventitia of the small pelvis veins were revealed. The expansion of capillaries, postcapillaries, venules was observed. The diameter of the vessels of the HMCB of the adventitia of the ovarian vein is represented in Table 1.

The architectonics of the arterioles is almost unchanged. Lumen of venules is filled with formed elements. The structure of the capillaries is polymorphic. The capillary net was localized and concentrated or was shaped in the form of a thick planar net. Capillaries are dilated; the diameter of the individual ones was 20 microns.

There were arterio-venulous anastomoses. Endothelial nuclei are shortened. The changes found by us are confirmed by the literature data, namely, in the inflammation between the endothelial cells of the postcapillary venules, and then other microcirculatory vessels, there are wide clefts that easily pass the protein molecules. There is the evidence that the formation of such cracks - is the result of the active reduction of endothelial cells caused by inflammatory mediators (histamine, bradykinin, etc.) that act on specific surface receptors of endothelial cells [1].

In some preparations, the diameter of the arterioles corresponded to the diameter of the collection venules. In preparations of veins with the diameter of more than 10mm (III degree of dilatation) there were single structures on the type of loops, glomeruli (Fig. 2).

Such changes in the HMCB of adventitia of varicose veins are directed, obviously, at the increase of the blood flow to the vein wall and the increase of pressure in the adventitious vessels to eliminate the cause of the violation of venous outflow.

According to the literature data – the prolonged vasodilation leads to venous stasis, tissue infiltration by leukocytes, and violation of biological properties of blood. There are changes in lymphatic vessels, lymphostasis, microthrombosis.

3. Conclusions

1. The first discovered by us changes in HMCB of adventitia of varicose veins of the small pelvis in women with CIPOSP can be one of the pathogenetic links in the development and progression of the varicosity itself, which in turn aggravates the course of chronic inflammation.

2. Timely administration of preparations, that improve microcirculation, will enable to prevent the development of dystrophic changes in the vein wall, improve the course of chronic inflammatory process and reduce or completely eliminate the syndrome of “chronic pelvic pain”.

4. Prospects for further research

In order to perform clinical-morphological parallels, our next research will be aimed at studying the hemomicrocirculatory bed of the conjunctiva of the eyeball in women with varicose veins of the small pelvis and chronic inflammatory processes of the internal genital organs.
Table 1. Indices of restructuring of HMCB adventitia of varicose ovarian veins (M±m)

| Number of the examined patients, n | Diameter of microvessels (microns) |  |
|-----------------------------------|-----------------------------------|---|
|                                   | Venules                           | Post-capillary venules | Arterioles | Capillaries |
| Norm                              |                                   |                         |            |            |
| 5                                 | 48.78±1.60                        | 28.29±1.04              | 25.19±1.15 | 8.24±0.16  |
| CIPOSP with VVSP                  | 94.21±1.38                        | 46.76±1.04              | 29.02±0.76 | 11.22±0.14 |
|                                   | p <0.001                          | p <0.001                | p <0.01    | p <0.05    |

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