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## MORPHOLOGIC EVALUATION OF THE DILATED SPERMATIC VEINS IN CHILDREN WITH VARICOCELE

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## МОРФОЛОГИЧЕСКАЯ ОЦЕНКА РАСШИРЕННОЙ ЯИЧКОВОЙ ВЕНЫ ПРИ ВАРИКОЦЕЛЕ У ДЕТЕЙ

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Morphological method is one of the most objectives in assessing the condition of both varicose and convoluted veins in varicocele. In the present study fragments of varicose veins from children 12–18 years old with varicocele were investigated. The SEM studies showed numerous clusters on the clear surface of erythrocytes and other blood cells with strands of fibrin that may be precursors of the thrombi formation. Erythrocytes are the most numerous among the clusters of blood copuscles, echinocytes being their pathological forms. The data obtained should be considered in finding the method of surgical correction of this pathology.

*Keywords: varicocele, children, morphology*

Морфологический метод – один из самых объективных методов в оценке состояния варикозных вен и извитых вен при варикоцеле. Для изучения варикозного расширения вен были получены оперативно удаленные фрагменты у детей от 12 до 18 лет. Исследования SEM показали многочисленные скопления на прозрачной поверхности эритроцитов и других клеток крови с нитями фибрина, которые могут быть предвестниками образования тромбов. Среди кластеров образующихся элементов крови преобладают эритроциты и их патологические формы – эхиноциты. Выявленные особенности следует учитывать при выборе хирургической тактики коррекции этой патологии.

*Ключевые слова: варикоцеле, дети, морфология*

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**V**aricocele occurs in 15–20 % of adult men and up to 40 % of sexually matured boys [1, 2, 3]. This pathology is better studied at the left side of scrotum and can be the cause of the diminished testicular (sexual) function [4, 5, 6]. Structural changes in all membranes of varicose dilated veins have been noted. Hypertrophy of the muscle elements and intermuscular connective tissue has been observed in the middle membrane. The middle membrane is especially thin in those sites where it has changes in the form of plaques. The strong development of longitudinal-muscle elements has been observed in the racemose plexus where blood vessels have osculating walls [7, 8, 9].

Morphological method is one of the most objectives in assessing the condition of varicose and dilated veins in varicocele. Knowledge of the morphological status of varicose veins of the scrotum can be very important determining factor in finding a proper method for surgical intervention [10, 11]. However, there is little information about studies of structural changes in v. spermatica in varicocele. Studies of the veins with the similar structure in varicocele using scanning electron microscopy (SEM) were practically not carried out.

Aim of investigation was to study the features of the veins in varicocele in children using SEM.

**Material and Methods.** To study varicose veins fragments were obtained during operative excision of persons aged 12–18 years. Specimens were fixed in a 10–12 % solution of neutral formalin. After appropriate processing, the pieces were poured into paraffin and sections 5–7  $\mu\text{m}$  thick were prepared. A general morphological picture was studied on sections stained with hematoxylin and eosin.

The study and photography of the specimens were carried out using the Axioscope (Carl Zeiss, Germany) microscope with a digital camera ProgRes, CapturePro 2.6.

For SEM, the specimens, after fixing in 2.5 % glutaraldehyde solution on phosphate buffer, were subjected to dehydration in alcohol-acetone, then dried by a critical point in the HCP-2 apparatus and sputtered with gold in an IB-2 apparatus. We examined the specimens under a Hitachi S-405A microscope (Japan). Photographing was carried out from the monitor screen using a Canon digital camera.

Computer processing of the received data has been carried out with the use of applied MS Office 2010 (Microsoft Corporation, USA).

**Results and Discussion.** With light-optical examination the following three shells are clearly distinguishable in the veins: tunica intima, t. media and t. adventitia. Their characteristic feature is the close contact of the walls of the vessels that form the indicated cord.

Another feature of the plexus veins is rather narrow, partly collapsed lumens, the longitudinal dimensions of which sometimes several times as large as the dimensions of the diameter. Blood convolutions and mixed thrombus which are often intimately intertwined with intima are often revealed in the lumen of the veins.

SEM veins of the pampiniform venous plexus of the spermatic strand showed that t. media (Fig. 1) is the most developed layer. T. intima of the examined veins is rather polymorphic. Along with small folds lined with flattened endothelial cells, there are areas lined with higher endothelial cells of cubic and even prismatic shape. In t. media smooth-muscular and partly connective tissue fibers quite chaotically intertwined with each other still have a distinct circular localization.



Fig. 1. The vein lumen. The inner surface with small folds, interlacement of liso-fibers of t. media. SEM x100

The main relief of the inner surface of the veins is visualized by large folds and ridges, on the surface of which smaller folds are formed. The latter are lined with endothelium (Fig. 2).

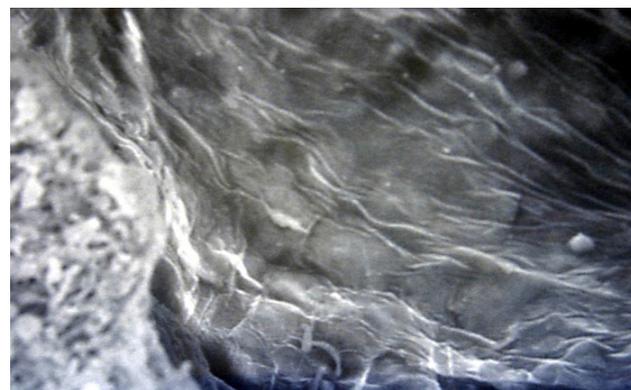


Fig. 2. Undulating surface of intima with furrows and crypts. SEM x1000

The study of varicose veins in varicocele with conventional methods of investigation made it possible to establish changes to occur in all three shells. However, it does not clarify the profound processes that tissues and cells undergo.

Light-optical scanning electron microscopy (SEM) significantly contributed to our understanding of changes at the cellular level in varicocele. Ultrastructural lesions occurring in the testicular vein indicate severe secondary degenerative changes in the vascular wall with the damage to angiogenesis.

Due to use of SEM found out the process of structural and functional rearrangement of endotheliocytes in the form of endothelial disfunction. The destruction of connective tissue fibers as their «loosening» occur [12]. The integrity and permeability of the cytoplasmic membrane of the cells of the connective tissue as well as the smooth muscle cells of the vessels suffers.

One of the characteristic features of the inner surface of the intima is the accumulation of blood cells in the deep furrows, red blood cells and fibrin strands being the most numerous.

Erythrocytes and other blood cells can be located on the surface of the endothelial lining, but more often they are defined in areas where the endothelium is desquamated.

With large magnifications along with discocytes (the normal form of erythrocytes) a lot of their pathological forms are visualized among the red blood cells localized on

the inner surface of the vessels, in areas either lined with the endothelium or without lining. Echinocytes (red blood cells with numerous processes) predominate (Fig. 3).



Fig. 3. Discocytes and pathological forms of erythrocytes, fibrin on the inner surface of vein. SEM x2000

Using pathogenetic approach the state of vascular endothelium and thrombus formation in patients can be

assessed by ELISA method that determines the level of such substances as nitric oxide (NO), von Willebrand factor, and endothelin-1.

Accumulations of erythrocytes and other blood cells with strands of fibrin indicate the initial stage of the thrombi formation.

In varicocele the type of the reflux in the vessels as well as the presence of the renal venous hypertension depend on the changes in the wall of the dilated veins. In these cases the method of venous anastomosis is used. The changes in the endothelium, studied by SEM and which can cause both thrombi formation in the site of anastomosis and unexpected complications must be considered [2, 12].

**Conclusions.** The SEM defines a numerous accumulations on the luminal surface of erythrocytes and other blood cells with strands of fibrin, which may be the precursor of the thrombi formation, have shown. Moreover, these deposits can be located on the holistic endothelial lining, but are more often found in the deendothelialized areas. Erythrocytes are the most numerous among the clusters of blood corpuscles, echinocytes being their pathological forms. The data obtained should be considered in finding the method of surgical correction of this pathology.

#### Disclosures:

The authors declare no conflict of interest.

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