# COMPLEX ULTRASOUND DIAGNOSTICS OF VARICOCELE IN ADOLESCENTS

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***Abstract.*** *One of the leading problems of modern medicine and demography is infertility. The purpose of the study was to improve the diagnosis of varicocele in adolescents through the use of multiparametric echography. Materials and methods of research. This work is based on an analysis of the results of ultrasound examination of 65 adolescents who received examination and treatment at the TashPMI clinic and EXPERT MEDICAL LLC from 2019 to 2022. on ultrasound machines SONOSCAPE S 22, Aplio 500 and Samsung HS70A. Research results. a sharp increase in the diameter of the veins indicated renospermatic venous reflux, characteristic of type I varicocele. The initial increase in the diameter of the veins in orthostasis with compensation by 10% and the absence of its increase after eliminating digital compression indicated in favor of ospermatic reflux, characteristic of type II varicocele. compression more than doubled indicated renospermatic and/or ospermatic reflux, which was typical for mixed type III varicocele. Conclusions. multiparametric ultrasound has opened up new opportunities in assessing the clinical forms of varicocele and its important in the management of adolescents suffering from varicocele.*

***Keywords:*** *varicocele, adolescents, multiparametric echography, dopplerography, color doppler mapping, power dopplerography, pulsed wave dopplerography.*

**Relevance.** One of the leading problems of modern medicine and demography is infertility. There is no doubt that one of the reasons for the demographic crisis and depopulation of the nation is the socio-economic situation in the country. At the same time, over 20% of families do not have children due to certain diseases. Currently, according to world statistics in Europe, the number of couples who do not become pregnant within 1 year reaches 15%, and in 50% of cases, infertility is associated with the “male factor”. While only 7.5% of men are diagnosed with infertility (Zhiborev B.N., 2011).

The development of male infertility is based on various factors, such as anatomical, physiological, immunological and psychological. Among the diseases that predispose to the development of male infertility, varicocele takes first place (in more than 30% of cases) (Cimador M., Di Race M.R., Castagnetti M. et al., 2012).

Considering the high percentage of infertility associated with the presence of varicocele, treatment should be considered as a reserve for the birth of desired children and a promising increase in the childbearing potential of the population. The main attention should be paid to the state of reproductive health in the group of children and adolescents, since up to 64% of diseases that pose a direct or indirect threat to the reproductive function of the male body occur precisely at this age. Considering the unfavorable prognosis of the consequences of this disease, as well as the fact that varicocele occurs mainly in young people and schoolchildren, its careful diagnosis is very important.

Until now, the main methods for diagnosing varicocele remain the assessment of complaints, collection of anamnesis, examination and palpation of the scrotal organs. If palpation of the scrotum is a routine technique for identifying varicocele, then the ultrasound diagnostic method is a non-invasive screening diagnostic method that allows to determine the dilatation of

veins at earlier stages, when it cannot be determined by palpation (Apolikhin O.I., Efremov E.A., Shekhovtsov S. Yu. Kastrikin Yu.V., 2017).

With the help of introduction of new methods of minimally invasive research, such as ultrasound with dopplerography, the possibilities of studying the vessels involved in the drainage of the pampiniform plexus have significantly expanded (Kadyrov Z.A., Ishonakov Kh.S., Sarkhadov N.Sh., 2010). These data indicate the relevance of the problem of early diagnosis of varicocele in adolescents and requires further study.

Purpose of the study. Improving the diagnosis of varicocele in adolescents through the use of multiparametric echography.

**Material and research methods.** This work is based on an analysis of the results of ultrasound examination of 65 adolescents who received treatment and examination at the TashPMI clinic and EXPERT MEDICAL LLC from 2019 to 2022. on ultrasound machines SONOSCAPE S 22, Aplio 500 and Samsung HS70A. In order to determine the structural changes in the gonads and the size of varicose veins of the pampiniform plexus, all patients received ultrasound echolocation of the scrotal organs in the gray scale echography mode. The study of hemodynamic changes in the veins of the spermatic cord and pampiniform plexus was performed using color doppler mapping (CDM), power doppler (PD) and pulsed wave doppler (PWD).

Ultrasound examinations were carried out in compliance with the following conditions. The patient arrived at the department with an empty bladder, the temperature in the room was not lower than 20˚C, and a heated gel (29-30˚C), used in ultrasound examinations, was used to relax the muscular elements of the scrotum. After optimal placement of the sensor to the mediastinum of each testicle, the cross-sectional area was measured along two axes, length and diameter. The resulting images were recorded, after which the size of each gland was measured using hardware calculation functions. The result of a comparative assessment of both genital glands was the possibility of comparing their sizes. The study was carried out in a supine position with slightly bent and spread legs and in a standing position. Scanning of the scrotal organs was performed in B-mode and the dimensions (length, width, thickness), volume (length x width x thickness x 0.523), shape, echogenicity and homogeneity of the testicular structure were determined. Using CDM and ED, the degree of testicular vascularization was assessed by the number of vascular signals. Absolute (peak systolic and end-diastolic blood flow rate) and relative quantitative indicators (resistance index) were studied using pulsed wave dopplerography. Testicular vessels (arteries and veins) were assessed in the projection of the spermatic cord and near the epididymis; parenchymal blood flow was determined in the projection of testicular tissue. Adolescent boys received the Valsalva maneuver (stress test), which assessed venous blood flow both at rest and under tension in the projection of the epididymis.

**Research results.** In order to clarify the hemodynamic type of disturbances in varicocele, the patient received transverse and longitudinal ultrasound scanning of the veins of the pampiniform plexus, and the cross-section of the most clearly visualized veins (initial diameter) was measured. After digital compression at the level of the inguinal canal, the patient was transferred to an orthostatic position. Then the veins of the pampiniform plexus and their diameter in clinostasis were assessed. The presence of pampiniform plexus of blood flow in the veins in clinostasis was recorded. After 30 seconds, continuing digital compression at the level of the inguinal canal in orthostasis, an ultrasound scan of the pampiniform plexus was performed. The diameter of the veins obtained during repeated examination was compared with the original dimensions. After cessation of digital compression, the measurement of the previously visualized vein was repeated.

The distribution of patients with varicocele according to severity was carried out according to the M.D. classification. Bomalasky et al. (1993), while the first degree was defined by palpation as a non-visualized dilatation of the veins of the spermatic cord and pampiniform plexus, limited in volume and length, detected only by straining, which was found in 14 (21.6%) adolescents.

Echographically, stage I varicocele was characterized by tortuous, tubular, anechoic structures near the testicles, which corresponded to dilatated veins of the pampiniform plexus with a caliber of 2-3 mm during the Valsalva maneuver in a gray scale mode, an increase in the diameter of the veins of 2 mm and> at the appendage, monophasic blood flow, speed 3– 6 cm/s, increased reverse blood flow (less than 2 sec), when performing tests in the color flow mode, static reflux into the spermatic vein was noted, which increases with the Valsalva maneuver.

The second degree of varicocele was detected in 35 (53.8%) adolescents, the signs of which were the presence of visually detectable varicose veins of the spermatic cord and pampiniform plexus. Characteristic for this group of patients was the collapse of dilated veins when the patient was transferred to a horizontal position. Teenagers often noted a feeling of heaviness during and after physical activity. The echographic criteria for grade II varicocele included an increase in the diameter of the veins of 2 mm and > in the epididymis and the middle third of the testicle; with IWD, monophasic and phasic blood flow was determined, with an increase in speed of more than 6 cm/s; when performing the Valsalva maneuver, small varicose veins with intermittent reflux were noted into the spermatic vein, increased reverse blood flow (2 sec and >), as well as greater staining of the testicular veins during colorectal circulation. This sign was characterized by significant progress on the left with venous expansion both in the standing and lying positions.

The third degree of varicocele was established in 16 (24.6%) teenage boys, with dilatation of the veins of the spermatic cord and pampiniform plexus, which looked like a conglomerate reaching the bottom of the scrotum. Patients in this group reported pain in the scrotum and testicle. The pain intensified with physical activity, often the pain radiated to the lower abdomen, lumbal region and thigh. The echographic criteria of the third degree were: an increase in the diameter of the veins of 3.5 mm and > to the lower pole of the testicle; with IWD, phasic blood flow was determined, a speed of more than 8 cm/s; with CDM, there was a clear dilatation and elongation of the vessels with continuous reflux at rest and did not increase with Valsalva maneuver, as well as increased staining of the testicular veins during colorectal circulation.

Of the other echographic symptoms of varicocele, it was necessary to determine whether the volume of the testicles was reduced or not (varicose orchopathy), which was visualized in 3 (4.6%) adolescents. With subclinical varicocele, the diameter of the testicular vein increased to 3–4 mm, and short-term reflux (up to 3 s) was detected during the Valsalve maneuver. A further increase in reflux parameters and vein diameter corresponded to more pronounced stages of the pathological process, such as a sharp increase in vein diameter, which indicated renospermatic venous reflux, characteristic of type I varicocele. The initial increase in the diameter of the veins in orthostasis with compensation by 10% and the absence of its increase after eliminating digital compression indicated in favor of ospermatic reflux, characteristic of type II varicocele. A slight increase in the diameter of the veins during compression in orthostasis and a progressive increase in the diameter of the veins after eliminating digital compression more than doubled indicated renospermatic and/or ospermatic reflux, which was typical for mixed type III varicocele.

Carrying out a study using this method allowed in most cases to suggest hemodynamically the type of varicocele, identify signs of renal venous hypertension and identify subclinical forms of the disease that are difficult to diagnose by palpation. Ultrasound comparison of the diameter of the veins when performing the Valsalve maneuver and the Ivanissevich maneuver (against the

background of compression and after its cessation) helped to identify differential signs of varicocele in adolescents.

**Conclusions.** Thus, multiparametric ultrasound has opened up new opportunities in assessing the clinical forms of varicocele and this is important in the management of adolescents suffering from varicocele. Studies have shown that, depending on the age of the teenager, tactical and methodological approaches are required: multiparametric echography, which is the diagnostic method of choice for diagnosing varicocele, and postoperative examinations, due to its wide availability, high repeatability, low cost, and absence of side effects.

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