

EXAMINATION AND PRENATAL CONSULTATION OF PREGNANT WOMEN WITH UROLOGICAL PATHOLOGY OF FETUS

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Apart from obstetricians and gynecologists, prenatal diagnostics of the urinary system disease in fetus needs to be supervised by the pediatric urologist to decide upon diagnosis and tactics. Cooperation of these experts in prenatal diagnostics determines the approaches which became the basis of the urological pathology diagnostics.

Despite cordocentesis and amniocentesis being very informative, they still remain dangerous and complicated and not popular in the regions of Russia; that is why our approach to prenatal diagnostics of the urinary system pathology is based on the none-invasive examination which practically has no limitation for use, – sonography.

The aim of the investigation is to improve the efficiency of prenatal detection of the urinary system pathology, and to ground the differentiated tactics of medical-diagnostic follow-up of postnatal babies using the developed methods and systematic approach to the evaluation of the urodynamics and renal blood-flow disorders in fetus.

TASKS:

- to define fetal urinary system failure and register urodynamic and hemodynamic disorders;
- to monitor detected changes at different gestation periods;
- to detect fetus with incurable development disorders to decide upon suitability of pregnancy prolongation;
- development of optimal postnatal treatment strategy depending on prenatal diagnosis and severity of defined functional disorders.

Considering sonography being the basic method for prenatal screening and fetus control, we proposed original ways of examination and data interpretation for clarification of development disorders, prognosis or renal function, and disease outcome.

Such position determines simplicity and availability of proposed principles of antenatal diagnostics of the urinary system pathology for wide range of experts



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including pediatric urologists, without application of invasive diagnostics and associated complications.

To solve these tasks, we applied the developed methods of ***prenatal urodynamic examination and Doppler ultrasound examination of renal blood flow.***

The developed methods of fetal urodynamic assessment is based on evaluation of the functional state of upper and lower urinary tracts with the use of volumetric and temporal data of the urine passage during “filling – emptying” period, with micturating cycle monitoring with sonography.

The volumetric examination of the urinary bladder activity during micturating cycle with its natural filling became the base of a new approach to study fetal urodynamic. With this purpose we have developed methods of ***antenatal ultrasonic cystometry at natural filling*** and ***antenatal ultrasonic dynamic pyelo-cystometry.***

The ***ultrasonic cystometry at natural filling*** is the basic method of studying of the lower urinary tracts urodynamic. The use of this method is indicated at presence of ultrasonic markers of the urinary system pathology to detect detrusor disorder, and also to examine the complications impact on the fetus during pregnancy and antenatal period.

This method presumes the urinary bladder size registration at longitudinal and transverse scan and its volume measuring. The urinary bladder volume was measured each 3–5 minutes during the whole micturating cycle.

This method resulted in protocol presenting diagram of micturating cycle of the fetus analyzed with developed qualitative and quantitative indicators

that facilitate assessment the functional state of the fetal detrusor – the reservoir function of the urinary bladder; its evacuation function, effectiveness and character of urination, and fetal diuresis. Assessment of interrelations between the urinary bladder volume and micturating cycle parameters gave the ground to determine variants of urodynamic disorders in fetal period. The worst were the variants of small volume urinary bladder dysfunctions which developed on the background of intrauterine development delay, chronic intrauterine hypoxia, and presence of morphofunctional immaturity symptoms.

It has been therefore defined that development of the urinary bladder dysfunction is determined by the influence of pregnancy complications. This gives the reason to consider them as intrauterine-formed states.

The *antenatal ultrasonic dynamic pyelocystometry* suggests synchronic registration of dilated pelvis of the fetus, ureter, and urinary bladder volume within micturating cycle. The latter facilitated to identify the variant of urodynamic disorders and presence of combined urodynamic disorders of the upper and lower urinary tracts. Thus, “stable” pyeloectasia due to organic obstruction of the ureter, “unstable” pyeloectasia due to functional disorders, and “fatal” pyeloectasia presenting hazardous urodynamic disorders, have been defined.

An important part of the prenatal diagnostics is evaluation of function of the affected kidney in fetus from the point of view of hemodynamics. *Dopplerography* allows to detect angioarchitecture changes and degree of hemodynamic disorders depending on the present pathology and gestation period. Evaluation of anatomic state and the character of renal blood flow in fetus is applied with B-mode Doppler, color and power Doppler imaging (CDI, PDI) and pulse Doppler. With the latter, we examined parameters of the Doppler curves spectrum – the highest and the lowest blood flow and resistance indices in magistral, segment, and interlobular arteries. This job demanded identification of normative parameters of the blood flow of the normal kidneys in fetus which had not been done until that time. Comparison of normal data with those obtained from fetus with urinary tract obstruction and urodynamic disorder detected three stages of hemodynamics disorder: light, average, and severe. Then we could decide upon the appropriate way to correct disorders which arise in the postnatal period.

So, when defining dilatation degree of the upper urinary tracts according to presence and expression of atrophic processes in renal parenchyma correlating with present disorders of renal hemodynamics, it is possible to define the type of the upper urinary tracts disease, to predict the disease outcome, and to consider appropriate strategy of postnatal follow-up.

During prenatal consultation, it is recommended that pediatric urologist used the developed diagnostic program which allows to perform antenatal identification of disorder, to consider pregnancy perspective and postnatal diagnostics and treatment.

This position makes possible to outline three groups of perinatal observation:

- group of fetuses with incurable diseases which demand therapeutic abortion;
- group of fetuses that need earlier postnatal observation and treatment in specialized surgical unit;
- group of fetuses under hazard of anatomic and functional disorders and demanding hospitalization with monitoring of detected abnormalities, depending on which the following treatment will be considered.

The suggested system of the diagnostics of the urinary system pathology in fetus, prenatal observation, allow to increase reliability of the antenatal diagnosis and prognosis, to schedule terms, amount, and tactics of treatment performed immediately after birth on the stage of pre-clinical symptoms, which on the whole will determine the outcome of the diagnosed pathological state, prevent development of live-threatening complications, decrease probability of birth babies with incurable diseases.

The present investigation has been the first research in fetal urology dedicated to urodynamics and renal hemodynamics of fetus, their dysfunction at prenatal development stage. A new method based on volumetric monitoring of the urinary bladder activity during micturating cycle, and Doppler ultrasound assessment of renal blood flow at different gestation periods, was proposed. For the first time urination of fetus was studied, normative parameters of renal hemodynamics in fetal period were developed. It is proved that detected antenatal disorders of urodynamics and hemodynamics are predictors of the development of the urinary bladder dysfunction and renal parenchyma dysplasia in postnatal period. Objective criteria and algorithm of antenatal diagnostics of incurable diseases of the urinary system were developed.

Development of program on prevention, prenatal correction, reasonable earlier treatment in the postnatal period or interruption of life-incompatible incurable states will decrease the number of severe development failures and disability rate, increase of the quality of life. This direction becomes more popular in pediatrics and demand much contribution and active research in order to decrease mortality rate and prevention of chronic pathologies detected at earlier childhood. Information received at prenatal period will facilitate more clear determination of algorithm of the postnatal observation and treatment which will result in decrease amount of expensive examination methods and terms of hospitalization.