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CLINICAL MEANING OF RAPID GROWTH
HYSSTEROMYOMA, APPROACHES TO THE
DIAGNOSTICS
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Introduction
Hysteromyoma is known as one of the leading
points in the structure of gynecological morbidity rate
in Russia; recently the growth of hysteromyoma inci-
dence has been marked in women of reproductive age,
as well as the tendency to the rejuvenation of sick
women contingent [11, 18, 21]. The actuality of growing
morbid rate in women of reproductive age is considered
because of preservation or restoration of
reproductive function and in connection with frequent
combination of hysteromyoma with pregnancy and
hyperplastic processes of endometrium [10, 12, 24].

In modern literature two causes of rapidly
growing hysteromyoma have been marked out: true,
which is connected with activization of proliferative
processes of myoendometrium, and false, which appears
as a result of inflammation and edema of nodes
[3, 11]. Thus, rapidly growing hysteromyoma de-
mands the increased oncological suspicion because of the
possibility of its combination with hyperplastic
processes of endometrium, precancer and cancer of
endometrium, ovary tumors and transformation to
leiomyosarcoma [1, 16]. The performance of nonade-
quate operation in such cases significantly impairs the
prognosis for a patient [1, 12, 16].

Timely and correct clinical assessment of vari-
ous types of rapidly growing hysteromyoma often
helps to specify the diagnosis and to determine the
adequate treatment of such patients. That is why it is
actual to search the criteria allowing to objectivize ex-
actly the diagnosis of rapidly growing hysteromyoma
in combination with endometrium pathology.

Methods of the investigation
For the achievements of the aim we have ana-
yzed clinico-laboratory data of 978 women at the age
of 24-56. The control group consisted of 268 (27,4%) pa-
tients without tumors of reproductive organs. All
the rest were divided into two groups: the first one
consisted of 478 (48,8%) patients with slowly growing
hysteromyoma; the second group included 232
(23,7%) patients with rapidly growing hysteromyoma
(the increase of uterus sizes was as ≥ 4 weeks of preg-
nancy during a year).

All the patients had ultrasound examination of
mammary glands and organs of pelvis minor (with
transvaginal detector), along with traditional clinic-
olaboratory examination; according to showings some
of them had mammography, cytologic examination of
material from ecto- and endocervix, aspirate from the
uterus cavity and hysteroscopy.

In addition to the listed above methods we
worked out and used the specifying method of diag-
nostics of rapidly growing hysteromyoma. This
method is based on the comparative estimating of
uterus volume and making structural analysis of en-
dometrial washes or menstrual discharges which flow
from the organ with tumor.

The estimating in these biological fluids the fi-
nal and interstitial products of peroxide lipid oxidation
(malon dialdegide in particular, which has the prop-
erty of cellular toxin) reflected the level of free radical
processes. The detection of malon dialdegide was car-
rying out according to the technique of J.A.Stroev and

Recently the method of structural analysis
(wedge-shaped dehydration) of biological fluids has
been widely spread in clinical medicine; it is based on
the extraction of information of overmolecular level in
phase of transformation of biological fluid into solid
condition [14, 19, 20].

For carrying out the morphostructural analysis
0,2 ml of supernatant of endometrial wash or men-
strual discharge was put on the glass. The drop was
dried at room temperature, at relative air humidity 60-
70% and at minimal mobility of air during 18-24
hours. The studying of structure forming elements of
the dehydrated drop (facii) and their photographs was
carried out with magnifying from x10 till x160, with
stereomicroscope Mz-12 (Leica) and colour digital
camera “Pixera” (USA). Morphometrical showings of
facii of endometrial wash were assessed with the pro-
gramme Image Tool.

The size of uterus with hysteromyoma is one of
the basic parameters in diagnostics and treatment.
Its assessment according to weeks of pregnancy in the
process of dispensary observation can be understood
by physicians rather subjectively, this makes difficult
to diagnose rapidly growing hysteromyoma.

For the objectification of uterus size and rate
of growth of hysteromyoma the ultrasound showings
were undergone the mathematical processing with the
formula offered by A.N. Strizhakov et al.(2000) and
J.M. Vikhliajeva (2004). The formula of drawn out el-
ipsoid was taken as a basis of calculation of uterus
volume:
\[
V_0=5236*A*B*C; A – the length of the
uterus, B- its anteroposterior size, C – its width.
\]

Because of hysteromyoma nodes the calcula-
tion of uterus volume was carried out according to the
modified formula (the volume of separate hystero-
myoma nodes of any localization was added to the volume (V0). Each hysteromyoma node was considered as a sphere, the maximal diameter of which was also assessed in ultrasound examination:
\[
V_i = 0.5236 \times (D_i)^3, \quad \text{where } V_i \text{ is the volume of } 1, 2, 3 \text{ nodes etc.}
\]
\[
V = V_0 + V_1 + V_2 + V_3, \quad \text{etc.}
\]
For the assessment of power of statistical interconnection between the investigated showings (V – uterus volume; Vi – hysteromyoma nodes) the correlation-regressive analysis was carried out and the coefficient of determination was defined.

The showings of malon dialdegide content and morphostructural features of endometrial washes or menstrual discharges were compared with the results of echographic examination of uterus sizes, cytological analysis of aspirates from uterus cavity and pathological results of endometrial cytologic brushings.

The results of the investigation and their discussion

The analysis of questionnaires showed that 80 (34,5%) of women with rapidly growing hysteromyoma complained of menometrorrhagia, 75 (32,3%) complained of pelvis pain, 12 (5,2%) had functional disturbance of adjacent organs, 45 (19,4%) had combination of symptoms, 20 (8,6%) didn’t complain of anything. 232 (48,5%) women with slowly growing hysteromyoma complained of menometrorrhagia, 101 (21,1%) had pelvis pain, 77 (16,1%) had combination of symptoms, 8 (1,6%) had functional disturbance of adjacent organs, 60 (12,2%) had no complaints.

The duration of the disease for 5 years was marked in 58,4 % women with slowly growing hysteromyoma and in 75,9 % with its rapid growth (p < 0,01) All the rest patients in both groups had the duration of the disease more than 6 years. The uterus sizes (according to pregnancy weeks) were normal in the control group; 7,8 ± 0,73 in women with slowly growing hysteromyoma, 13,7 ± 1,14 in women with rapid growth (p < 0,01). Operations in women with rapid hysteromyoma growth were performed in 97,8% of cases, in women with its slow growth in 74,9 %; all the rest had conservative therapy.

In addition the analysis of the number of nodes and the peculiarities of their localization was carried out. Submucous nodes were registered equally in both groups (p ≥ 0,05). Multiple hysteromyoma nodes were two times more often in women with rapid growth – 84 (36,2%) in comparison with the group with slow growth – 81 (16,9 % ± 1,7 %, p < 0,01).

The preferential localization of nodes among the patients of both groups were the fundus and the body of uterus: in 88, 1 ± 1,48% with slow growth and in 74,6 ± 2,8 with rapid growth. The localization of nodes in the area of uterus ribs was marked more often in women with rapid hysteromyoma growth (p < 0,05). In patients with slow growth the average size of the biggest node was 3,5 ± 0,12 cm, and in the group with rapid growth it was 6,9 ± 0,22 (p < 0,001).

The important factor which defined the treatment of women having hysteromyoma is the condition of endometrium. In 61 (26,3%) patients with rapidly growing nodes the structure of endometrium was normal, in 127 (54,7%) women the glandular hyperplasia was revealed, 3 (1,29%) had atypical hyperplasia, in 41 (17,6%) women the endometrius was diagnosed.

Besides, 1 patient (0,4%) had carcinosarcoma, 5 patients (2,2 ± 0,95%) had proliferated hysteromyoma, 37 patients (15,9 ± 2,4%) had combination of hysteromyoma with adenomyosis, and 11 patients (47,8%) had hysteromyoma with ovary tumors.

In patients having slowly growing hysteromyoma normal endometrium structure was revealed in 231 (48,3%) cases, glandular hyperplasia was diagnosed in 79 (16,5%), atypical hyperplasia in 4 (0,8%) cases, 87 (18,2%) patients had endometritis. It is important to note that 23 (4,8%) cases of endometrium cancer were revealed in patients of this group.

The duration of hysteromyoma in patients with cancer fluctuated from 6 to 27 years, it was 15,5 ± 0,25 years, in average. The frequency of revealing carcinosarcoma and ovary tumors in this group corresponded to the frequency of their revealing in patients having rapidly growing hysteromyoma: 3 (0,6%) and 213 (44,6%) cases. The frequency of proliferated hysteromyoma and adenomyosis in patients with slowly growing hysteromyoma was less: 1 (0,2 ± 0,08%) and 50 (10,5 ± 1,6%) cases (p < 0,05).

The received data allow to consider hysteromyoma as one of the main risk factors of tumors of reproductive organs (multiple primary tumors among them).

Nowadays, a lot of factors have been gathered which show the excessive activation of peroxide lipid oxidation and activity changing of antioxidant protective enzymes in some pathologic processes [6, 7, 9, 13]. The activation of peroxide lipid oxidation is considered as a mechanism of cellular pathology development and the reason of many cardiovascular, oncological, autoimmune diseases. The most aggressive are final and intermediate products of peroxide lipid oxidation, malon dialide in particular. It is possible that the increasing in number of oxidated proteins change cell functions, especially the receptor apparatus of membranes. The damage of antioxidant protection and the growth of peroxide lipid oxidation products leads to the changes in genetic apparatus and the disturbance in regulation of apoptosis and to the decreasing of cell activity limits [13]. The accumulation of malon dialide changes the receptor apparatus of the organ and promotes the intensification of pathologic process in tissues in connection with the loss of their sensitivity to hymoral influence [15]. In rapidly growing hysteromyoma nodes biochemical changes take place: the aerobic and anaerobic rate glycolysis is increased [16]. It is possible that the development of
hyperplastic endometriosis arises due to intensification of peroxide lipid oxidation reactions, which are evident in the increasing of lipid peroxidation products level [2, 22].

The determination of malon dialdehide was carried out in blood serum and menstrual discharges, and in these biological liquids the received results were the most evident.

<table>
<thead>
<tr>
<th>The investigated groups</th>
<th>Uterus volume (cm$^3$), M±m</th>
<th>Malon dialdehide, peripheral blood (nmol), M±m</th>
<th>Malon dialdehide, endometrial washes (nmol), M±m</th>
<th>Malon dialdehide, menstrual discharges, (nmol), M±m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (n= 268)</td>
<td>50,5 ± 1,0</td>
<td>0,71 ± 0,02</td>
<td>0,37 ± 0,01</td>
<td>0,62 ±0,07</td>
</tr>
<tr>
<td>Slowly growing hysteromyoma (n = 478)</td>
<td>243,7± 21,32$^2$</td>
<td>0,85±0,04</td>
<td>0,49±0,06$^1$</td>
<td>1,59±0,04$^4$</td>
</tr>
<tr>
<td>Rapidly growing hysteromyoma, true growth (n=191)</td>
<td>1636,0 ± 79,6$^3, 6$</td>
<td>1,74±0,07$^3, 6$</td>
<td>2,6± 0,05$^3, 4$</td>
<td>2,81± 0,08$^3, 6$</td>
</tr>
<tr>
<td>Rapidly growing hysteromyoma, false growth (n=41)</td>
<td>826,0± 21,2$^3, 6$</td>
<td>1,31±0,07$^2, 3$</td>
<td>1,45±0,05$^3, 9$</td>
<td>1,61±0,07$^2, 5$</td>
</tr>
</tbody>
</table>

The differences are true:
1$^p<0,05$, 2$^p<0,01$, 3$^p<0,001$ – in comparison with the control group; 4$^p<0,05$, 5$^p<0,01$, 6$^p<0,001$ – between the showings in the subgroups.

The table shows that the uterus volume in patients from the control group didn’t differ from the normal meanings. The coefficient of determination, calculated between the volume of hysteromyoma nodes and the uterus volume was 0,77 with slow growth and 0,65 with true rapid growth of hysteromyoma, this fact reveals the presence of strong and middle connection between the investigated parameters.

In the assessment of growth rate due to the received data for slowly growing hysteromyoma the average increasing of the organ during a year didn’t exceed 21,3 % (p < 0,05). In this given case the critical level of meaning (p) was defined concerning patients with slowly growing hysteromyoma. Along with the increasing in number and diameter of hysteromyoma nodes and uterus size the level of malon dialdehide in endometrial washes or menstrual discharges also increased.

In patients with preserver menstrual cycle the determination of malon dialdehide was carried out both in the stage of proliferation and secretion. From 231 women with slow hysteromyoma growth (having normal structure of endometrium), 131 (56,7%) patients were observed, and in the phase of secretion 100 (43,7%) patients were observed. Showling of malon dialdehide in the phase of proliferation was 0,5 ± 0,02 nmol, in the phase of secretion – 0,6 ± 0,02 nmol (p > 0,05).

Thus, the showings of malon dialdehide received both in the phase of proliferation and in the phase of secretion in women with hysteromyoma having normal structure of endometrium had small differences and didn’t depend on the phase of menstrual cycle.

The most demonstrative was the dynamics of malon dialdehide content in endometrial washes according to the increasing of endometrium pathology. Patients having hysteromyoma with normal structure of endometrium the investigated showing was 0,4 ± 0,05 nmol, and patients having hysteromyoma in combination with hyperplastic endometrium processes it was 1,7 ± 0,23 nmol (p < 0,01). Even more significant increasing was marked in patients having rapidly growing hysteromyoma in combination with atypical hyperplasia, the meanings were 3,0 ± 0,85 nmol (p < 0,05).

In patients having hysteromyoma with endometrium cancer the level of malon dialdehide was variable, it depended on the depth of invasia and differentiation of tumor. On the first and second stage of the disease (T1-2NoMo, G1) the level of malon dialdehide in endometrium washes was 0,61 ± 0,21 nmol, with T1-2 and G2 the maximum meaning of malon dialdehide was 1,11 ± 0,3 nmol (p < 0,01). In patients having the third stage of the disease (T1-3, Nx-1, Mo G3) the meaning was 3,02 ± 0,15 nmol (p < 0,001).

The analysis of structure forming elements which were revealed by the method of wedge-shaped dehydration of endometrial washes allowed to determine 3 types of facii, characterizing the condition of endometrium. The radial type, forming the so- called
“separate parts”, was always registered in women of control group (during both phases of menstrual cycle) and in 48.4% cases in patients having hysteromyoma with normal structure of endometrium. The combined type was found in patient having hysteromyoma in combination with hyperplastic endometrium processes, the radially was preserved, but a number of three ray fissures appeared; and then the three ray type appeared, which was specific for women with atypical hyperplasia and endometrium cancer. In the investigated material of women with endometrium cancer on the whole area of facii of endometrial washes the net of three ray fissures appeared.

Thus, pathognomonic sign of the increasing of endometrium pathology (in patients with rapidly growing hysteromyoma among them) is the increasing of specific proportion of area of three ray fissures (Str) and the decreasing of radiality area (Srad).

Thus, in patients of control group Str was 0.4 ± 0.06 mm², in patients having hysteromyoma with normal endometrium structure it was 1.1 ± 0.08 mm², and in patients having glandular hyperplasia and atypical hyperplasia of endometrium it was 2.1 ± 0.11 mm² and 3.2 ± 0.58 mm². This showing was maximal in patients having hysteromyoma in combination with endometrium cancer 6.7 ± 0.6 mm² (p < 0.05).

To determine the strength of interconnection between Srad and Str the tetrachoric Pearson coefficient was calculated, which was increased with the increasing of pathology of myoendometrium from 0.3 in the control group to 0.8 in patient having endometrium cancer.

The presented diagnostic approach providing nontraumatic method of taking material allows to get the information of tumor growth and endometrium condition in out-patient clinic with small amount of biological fluid (with minimal financial expenditures and in short terms). It helps to make the proper plan of treatment. Another important characteristics of this approach is the possibility of simultaneous carrying out of cytological biochemical and crystallographic methods of research which increases the exactness of diagnostics. It should be noted, that the given parameters must be assessed regularly due to normative documents; only this approach allows to make conclusions about slow or rapid growth of hysteromyoma.

The results of the investigation are the patent for the invention (Russian Federation) №2290639, given 27.12.2006. “Method of the evaluation of endometrium condition in female genitals neoplasms”, and the positive reply for the patent №2007106294 (006840) given 19.01.2008 “Method of the diagnostics of rapidly growing hysteromyoma”.

Conclusions:

1) Rapidly growing hysteromyoma is the disease which decreases reproductive possibilities of women; it is a risk factor of multiple primary tumors (hyperplastic processes of endometrium and endometrium cancer among them) of hormonodependent organs.

2) Mathematical analysis of uterus sizes received in ultrasound examination allows to specify the rate of hysteromyoma growth. In average annual increase of uterus volume not exceeding 12.5% the slow tumor growth takes place; in the increase of uterus volume to 14.9% there is a possibility of false hysteromyoma growth; in average annual increase of volume more than 21.3% we should consider true rapid hysteromyoma growth.

3) The level of malon dialdegide in endometrial washes or menstrual discharges correlates also with the degree of hyperplastic processes; the evaluation of this showing increases the effectiveness of the diagnostics.

4) For the more exact evaluation of endometrium in patients with hysteromyoma the traditional cytologic investigation of aspirate from the uterus volume should be supplemented with the structural analysis of facii of endometrial wash (or menstrual discharge) which reveals pathognomic signs of the increasing endometrium pathology, the increasing of area of three ray fissures on the surface of facii in particular.

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THE TOPICAL AND TEMPORAL CHANGES IN QUANTITATIVE ELECTROENCEPHALOGRAPHY OF HIGH QUALIFICATION ATHLETES OF DIFFERENT SPECIALIZATIONS DURING ONE YEAR TRAINING PROCESS

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The Sports Council (London) on behalf of the Open Section of the British Association of Sports Sciences commissioned a review to provide information pertinent to the formulation of a strategy that would guide fundamental sports science research in the UK and propose directions for future research. The four topics were peaking, talent identification, adherence and injuries (Burwitz L., et al., 1994). Neurobiofeedback has used since 1967 with the aim to treat some illness and with the aim to achieve the peak performance in athletes (Angelakis E., et al., 2007).

The relation between humane performance and their functional condition described as parabolic curve and carried in practice the notion of optimum functional condition. However, in spite of conspicuity of practical value of the problem of the functional condition, methods of its diagnostics and optimization remain it is not enough studied (Danilova N.N., 2003). With reference to the training process of the elite athletes there is very small number of the studies intercoupling the functional condition and electrical activities of the cerebrum, executed by method visual-logical description of electroencephalogram (EEG). Study of the quantitative factors of electroencephalogram (QEEG) will allow to get elaborating dates about relationship of QEEG with functional condition of athlete and to get new predictors to the athlete’s capacity.

The purpose of this investigation was to obtain the additional dates about QEEG of high qualification athletes during the large circle of there training and competition process.

The organization and the methods of investigation

The number of athletes have took participate in the study were 81. Athletic specialization was ski racing at 17 participant, biathlon were 6, hockey were 24, volleyball were 14, football were 10, box were 4, fight were 4, swimming was 1 and billiards was 1. The sportive qualifications of participants were following: the master of sport of international class – 3; the master of sport – 12; the candidate master of sport – 34; first category – 32. The participant’s age was 20 ± 1.7 years. Male persons were 57 and female persons were 24. The survey at starting-up period was performed at