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Ontgenetic peculiarities of sonographic indicators of the acrobats' uterus

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Abstract
The aim was to determine the peculiarities of linear sonographic dimensions of the uterus, its position and shape in the acrobats of the Ukrainian ethnic group of high level of sportsmanship in different periods of puberty. There were examined 122 acrobats of high level of sportsmanship. The girls' passport age was between 8 and 21 years old. Internal genital organs of all girls were examined using ultrasound diagnostic system of expert class Voluson 730 Pro (ATL, Austria) with a convex sensor RAB2-5L. The analysis of the obtained results was carried out using the licensed package Statistica 5.5 and nonparametric methods of estimation of indicators. At the pre-pubertal age, acrobats had shorter ($p < 0.05$) uterine length and width than non-sport girls. Acrobats at puberty had a smaller uterine length ($p < 0.01$) and width ($p = 0.057$). At the post-pubertal age, acrobats had significantly smaller uterine length ($p < 0.001$) and width ($p < 0.01$) than in girls of the control group. The uterine thickness in all periods of ontogenesis did not differ significantly between the acrobats and girls of the control group.

Introduction

The acrobats form a specific social-demographic group of the population, which requires constant medical control at pre-, pubertal and post-pubertal age. In order to assess the health status of female athletes and the prediction of their reproductive capacity, it is important to analyse the morphofunctional parameters of female genital organs [1, 2, 3].

The aim was to determine the peculiarities of linear sonographic dimensions of the uterus, its position and shape in the acrobats of the Ukrainian ethnic group of high level of sportsmanship in different periods of puberty.

Materials and Methods

There were examined 122 acrobats of high level of sportsmanship. Among them the first adult rank included 24 athletes, 38 girls were candidates for masters of sports, 46 – masters of sports, 14 – masters of international class sports. Experience in sports in all cases was more than three years. As a control group, there were examined 126 girls, who were not engaged in sports. The girls' passport age was between 8 and 21 years old. The average calendar age had significant differences. In the prepubertal period of ontogenesis, acrobats

had an average age of (10.13 ± 0.24) years, and girls who have not played sports – (9.652 ± 0.351) years; in puberty, acrobats had an average age of (13.35 ± 0.32) years, control group – (11.51 ± 0.26) years; in the postpubertal period, acrobats had an average age of (16.83 ± 0.22) years, girls of the control group – (16.04 ± 0.38) years.

All girls were devided into three groups according to their biological age: athletes of prepubertal period of ontogenesis, during puberty and athletes of postpubertal period of ontogenesis. Group 1 – the prepubertal period (the appearance of pubic fishing), it included 36 acrobats and 39 girls of the control group; group 2 – pubertal period (puberty to the appearance of menarche), it included 31 acrobats and 35 girls of the control group; group 3 – postpubertal period (fixed and ending puberty, the body reaches a definitive size), it included 55 acrobats and 59 girls of the control group.

Internal genital organs of all girls were examined using ultrasound diagnostic system of expert class Voluson 730 Pro (ATL, Austria) with a convex sensor RAB2-5L. The uterus was examined according to the following program: its position and shape and 3 linear dimensions (length, width and thickness) were determined. Measurement of the length and thickness of the uterus was performed during its longitudinal scan. The length is measured from the farthest point of the bottom of the uterus body to the projection of the inner throat, located in the corner between the body of the uterus and the cervix. Measurement of anterior-posterior size (thickness) was performed in the middle part of the uterus between the most distant points of the posterior and anterior walls. The uterine width was determined on the transverse ultrasound at the level of the tube angles. This section is perpendicular to that at which the thickness measurement was made.

The analysis of the obtained results was carried out using the licensed package Statistica 5.5 and nonparametric methods of estimation of indicators.

Results and Discussion

Using a method of non-invasive introscopy, such as ultrasound, we've monitored the growth and development of the uterus during various ontogenetic periods in acrobats and women who are not involved in sports. It was found that in the athletes and girls of the control group in the prepubertal period of ontogenesis, the uterus is predominantly larger in size, however, it is already growing in width and thickness at this age. In some female athletes and girls in the control group, the cervix is not yet clearly visualized. However, in some cases it is possible to determine that it is about 2/3 of the entire length of the uterus. The endometrium in girls of both comparison groups is poorly visualized or absent at all. In girls of this period, the analysis of the position and shape of the uterus did not reveal deviations of its norm, but it should be noted that in 18.3% of cases in acrobats the uterus had a cylindrical shape. The length of the uterus was 33.27 ± 1.92 cm in girls in the control group, 29.67 ± 2.14 cm in acrobats, and the difference between the comparison groups was significant ($p < 0.05$). We've found that acrobats had a significantly smaller ($p < 0.05$) uterine width (22.62 ± 2.94 cm) compared to girls not involved in sports (25.54 ± 1.74 cm). In the acrobats group, the average value of uterine thickness (11.99 ± 1.52 cm) is also smaller than in the girls of the control group (12.39 ± 2.68 cm), but the differences are not significant.

In puberty, uterine growth in length, thickness and width becomes more noticeable. At this age, the cervix is clearly differentiated in girls, an angle between the body of the uterus and the cervix begins to form. The ratio of the body of the uterus to the cervix is approximately 2: 1, that is, the cervix is almost half the length of the uterine body. In 96.8% of female athletes of this period, the shape of the uterus was normal, only 3.2% of acrobats had some deviations (bifid uterus and uterus with partial intrauterine septum). The position of the uterus in the pelvic cavity in acrobats of puberty at 94.4% was normal (anteversio-anteflexio), when the body of the uterus is tilted forward and the angle between the body of the uterus and the cervix is also opened in the front. In 5.6% of female athletes a retroversion was found when the body of the uterus was tilted back and the angle between the cervix and body is also opened behind. There were no abnormalities in the uterine shape and position in the control group.

Comparing the macrometric size of the uterus between female athletes and non-athletic girls, we've found significant differences in the pubertal period of ontogenesis. Thus, the length of the uterus in female athletes (34.27 ± 3.23 cm) is significantly smaller ($p < 0.01$) than in the control (45.03 ± 4.26 cm). The width of the uterus in female athletes (28.63 ± 1.47 cm) also tends to delay development ($p = 0.057$) compared to girls in the control group (30.92 ± 1.22 cm). The thickness of the uterus makes no significant difference when comparing groups of acrobats (18.64 ± 0.76 cm) and non-athletes (18.27 ± 1,91 cm) of puberty.

Particularly rapid growth of the internal genitalia is observed with the onset of menarche. With the onset of menstrual function on the ultrasounds of acrobats and non-athletes, the uterus is predominantly pear-shaped. Analyzing the shape of the uterus, we've found that 91.5% of female athletes did not have deviations, and in 8.5% of acrobats the shape of the uterus is not correct. In control girls in 94.6% of cases the shape of the uterus was correct and in 5.4% it was not correct. We've found such abnormalities: uterus with a partial intrauterine septum, arcuate uterus and bifid uterus. The normal position of the uterus was observed in 89.09% of female athletes and in 98.31% of non-athletes.

We've determined that in the post-pubertal period, the length of the uterus in acrobats (49.41 ± 2.6 cm) was statistically significantly smaller ($p < 0.001$) than in girls of the control group (56.97 ± 3.19 cm). The same pattern was determined for the width of the uterus (the difference between the comparison groups is significant, $p < 0.01$): in acrobats its dimensions were 39.88 ± 3.18 cm, in control – 43.97 ± 2.59 cm. The thickness of the uterus, as in previous periods of biological development, had no significant differences. In acrobats its size was 28.48 ± 3.63 cm, in girls who did not play sports – 28.95 ± 2.52 cm.

Conclusions

1. At the pre-pubertal age, acrobats had shorter ($p < 0.05$) uterine length and width than non-sport girls. In girls of both groups the position and shape of the uterus were normal.
2. Acrobats at puberty had a smaller uterine length ($p < 0.01$) and width ($p = 0.057$). In 3.2% of acrobats there were found some abnormalities in the shape of the uterus (with two horns and with a partial intrauterine septum) and in 5.6% of female athletes the uterus retroversio was detected. There were no abnormalities in the control group.
3. At the post-pubertal age, acrobats had significantly smaller uterine length ($p < 0.001$) and width ($p < 0.01$) than in girls of the control group. In 8.5% of acrobats and 5.4% of girls in the control group, the uterus with a partial intrauterine septum, arcuate uterus and bifid uterus were identified. In 10.91% of acrobats and in 1.69% of non-sport women, there were revealed differences in the position of the uterus. In the group of acrobats, except for retroversion, in 2.3% of cases, lateral position was detected.
4. The uterine thickness in all periods of ontogenesis did not differ significantly between the acrobats and girls of the control group.

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