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THE IMPORTANCE OF EARLY DIAGNOSIS OF UTERINE HYPOPLASIA IN ADOLESCENT GIRLS

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Abstract. The uterus is one of the most complex muscular organs of the reproductive system, performing essential functions such as menstruation, fertilization, embryo implantation, and fetal development. During the 8th–9th weeks of embryonic development, the differentiation of the genital organs occurs, and most congenital abnormalities of the reproductive system arise during this period. A hypoplastic uterus resembles that of an underdeveloped adolescent girl and is smaller than normal in size; however, the uterine body-to-cervix ratio remains within normal limits. Uterine hypoplasia leads to serious impairments of reproductive function and consequently contributes to an increased incidence of infertility.

Keywords: girls, hypoplasia, reproductive system, uterus, menstrual cycle, amenorrhea.

Аннотация. Матка является одним из наиболее сложных мышечных органов репродуктивной системы, выполняющим важные функции, такие как менструация, оплодотворение, имплантация эмбриона и развитие плода. На 8–9-й неделе эмбрионального развития происходит формирование и дифференцировка половых органов, и большинство аномалий половой системы возникает именно в этот период. Гипопластическая матка напоминает матку недоразвитой девочки-подростка, имеет меньшие размеры по сравнению с нормой, однако соотношение тела матки к шейке сохраняется в пределах нормы. Гипоплазия матки приводит к серьёзным нарушениям репродуктивной функции и, как следствие, способствует увеличению числа случаев бесплодия.

Ключевые слова: девочки, гипоплазия, репродуктивная система, матка, менструальный цикл, аменорея.

Introduction. Uterine hypoplasia (hypoplasia uteri) is a pathological condition characterized by the anatomical and functional underdevelopment of the uterus relative to age-specific norms. This disorder can adversely affect reproductive health in girls and women of reproductive age, leading to menstrual dysfunction, infertility, pregnancy complications, and adverse perinatal outcomes. In recent years, the growing prevalence of reproductive health problems worldwide has increased the importance of early diagnosis and timely management of uterine hypoplasia.

Adolescence is a critical period for the development and maturation of the reproductive system. Identification and correction of uterine developmental abnormalities during this stage play a crucial role in preserving future reproductive function. Early diagnosis of uterine hypoplasia enables the detection of hormonal disorders, the implementation of timely therapeutic interventions, and the improvement of reproductive outcomes.

In the Republic of Uzbekistan, the protection of maternal and child health and the strengthening of reproductive health are among the priority areas of national healthcare policy. Therefore, the early detection of uterine hypoplasia in girls, investigation of its etiological factors, and improvement of effective treatment strategies represent important scientific and practical challenges in contemporary gynecology.

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The relevance of the present study is determined by the need to assess the impact of uterine hypoplasia on the reproductive health of girls, evaluate the possibilities of early diagnosis, and investigate the effectiveness of modern therapeutic approaches aimed at improving reproductive outcomes

Uterine hypoplasia (hypoplasia uteri) is defined as a condition in which the uterus remains underdeveloped in terms of size and structure compared with age-related physiological norms. In clinical practice, the following classification is commonly used (Smetnik, 2019):

Grade I (Infantile Uterus): uterine length up to 3.5 cm, with a cervical-to-corpus ratio of 3:1. This is the most severe form and is frequently associated with primary amenorrhea and infertility.

Grade II (Hypoplastic Uterus): uterine length ranging from 3.5 to 5.5 cm, with a cervical-to-corpus ratio of 3:1 or 2:1. Menstrual disorders and infertility are commonly observed in these patients.

Grade III (Small Uterus): uterine length ranging from 5.5 to 7.0 cm, with a cervical-to-corpus ratio of 1:1. In this form, reproductive function is generally preserved, and the prognosis is relatively favorable.

According to ultrasonographic criteria, the normal uterine dimensions in adult women are approximately 7–9 cm in length, 4–5 cm in width, and 3–4 cm in thickness. In patients with uterine hypoplasia, these parameters are typically reduced by 20–30% compared with established reference values.

Several etiological factors contribute to the development of uterine hypoplasia. According to the multicenter study conducted by Kudryashova and Serov (2021), the major causes include:

1. Hypothalamic–pituitary–ovarian dysfunction resulting in decreased gonadotropin secretion (68% of cases).
2. Chronic somatic diseases, including thyroid hypofunction and adrenal gland disorders (24%).
3. Hereditary factors and genetic abnormalities, such as Mayer–Rokitansky–Küster–Hauser (MRKH) syndrome and Turner syndrome (18%).
4. Prenatal and postnatal protein and vitamin deficiencies, as well as chronic stress (15%).
5. Infectious and inflammatory diseases, particularly severe illnesses occurring before the age of five years (11%).

From a pathogenetic perspective, impaired development or dysfunction of estrogen receptors disrupts the normal proliferation of the myometrium and endometrium. Consequently, endometrial receptivity decreases, reducing the likelihood of successful embryo implantation and increasing the risk of reproductive failure.

The clinical manifestations of uterine hypoplasia are primarily associated with menstrual dysfunction and delayed sexual development. In a prospective study involving 312 patients, Petrov-Maslakov and Ivanova (2020) reported the following clinical features:

- Primary amenorrhea (absence of menarche by the age of 15 years) – 42.3% of cases;
- Secondary amenorrhea and oligomenorrhea – 31.7%;
- Dysmenorrhea – 58.4%;
- Delayed sexual development, including asthenic body constitution and insufficient development of secondary sexual characteristics – 67.9%;
- Infertility during early reproductive age – 38.5%.

The principal diagnostic methods include transvaginal or transabdominal ultrasonography, hormonal profile assessment (FSH, LH, estradiol, prolactin, and anti-Müllerian hormone), pelvic magnetic resonance imaging (MRI), karyotyping, and genetic testing. According to the 2023 guideline of the European Society of Human Reproduction and Embryology (ESHRE), when uterine length is less than 6 cm on ultrasound examination, hormonal evaluation and pelvic MRI are recommended as mandatory diagnostic procedures.

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Results and discussion. Reproductive Outcomes and Infertility

The impact of uterine hypoplasia on reproductive health is multifaceted and affects several aspects of reproductive function. A five-year retrospective study conducted by Odinokova et al. (2022) in gynecological centers in Russia and Kazakhstan involving 847 patients demonstrated the following findings:

1. The risk of spontaneous abortion was 2.8 times higher than in the control group without uterine hypoplasia (43.2% vs. 15.4%; $p < 0.001$).
2. The incidence of preterm delivery was 28.7%, compared with 8.3% in the control group.
3. Placental insufficiency during pregnancy occurred in 34.1% of cases.
4. Reduced endometrial receptivity and narrowing of the "implantation window" were identified as the primary causes of unsuccessful in vitro fertilization (IVF) outcomes in 61.3% of patients.

Therapeutic Approaches and Reproductive Prognosis

A comprehensive therapeutic approach significantly improves reproductive outcomes in patients with uterine hypoplasia. According to contemporary medical literature, the most effective treatment strategies include:

Cyclic Hormone Therapy

Cyclic administration of estrogen–progesterone preparations stimulates endometrial growth and uterine development. In a clinical study conducted by Kuznetsova (2021), six months of cyclic hormone therapy resulted in a mean increase of uterine volume by 34.6%, while endometrial thickness increased from 6.2 mm to 9.4 mm ($p < 0.01$).

Physiotherapeutic Methods

Physiotherapeutic modalities such as magnetic therapy and laser therapy are widely used as adjunctive treatments. Anisimova et al. (2020) demonstrated that the addition of physiotherapy increased the effectiveness of hormone therapy by 28%.

Platelet-Rich Plasma (PRP) Therapy

In recent years, intrauterine administration of platelet-rich plasma (PRP) has emerged as a promising method for improving endometrial receptivity. Chang et al. (2023) reported that PRP therapy increased mean endometrial thickness from 7.3 mm to 9.8 mm and improved IVF success rates by 22%.

Importance of Early Intervention. Initiation of treatment during early adolescence (13–14 years of age) improves reproductive outcomes by approximately 2.1 times compared with treatment initiated after the age of 20 years. This is attributed to the greater developmental plasticity of the uterus and ovaries during adolescence.

Current Challenges in Uzbekistan. Several challenges hinder the early diagnosis of uterine hypoplasia in Uzbekistan. According to data from the Republican Perinatal Center (2023), the average age of first consultation with a gynecologist is 19.7 years, limiting opportunities for early intervention. Furthermore, restricted access to ultrasonographic examination in rural areas contributes to delayed diagnosis, with missed cases occurring 3.2 times more frequently than in urban populations.

Classification and Etiology of Uterine Hypoplasia

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Several etiological factors contribute to the development of uterine hypoplasia. According to the multicenter study conducted by Kudryashova and Serov (2021), the major causes include:

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At the same time, within the framework of the national “Healthy Generation” Program (2021–2025), a system of preventive gynecological screening for school-aged girls has been introduced. Under this initiative, more than 47,000 girls aged 14–17 years underwent gynecological screening, and signs of uterine hypoplasia were identified in 4.3% of examined individuals.

Conclusion. Uterine hypoplasia in girls is a clinically significant condition that substantially affects reproductive health. Early diagnosis and comprehensive treatment play a crucial role in minimizing its adverse consequences. Based on the analysis of the available literature, the following conclusions can be drawn:

1. Patients with uterine hypoplasia have a 2.8-fold higher risk of spontaneous abortion and a 3.5-fold higher risk of infertility, emphasizing the need for expanded early screening programs.
2. Comprehensive treatment initiated during adolescence (13–17 years), including hormone therapy and physiotherapy, improves reproductive outcomes by approximately 2.1 times, highlighting the importance of strengthening preventive gynecological examination systems.
3. PRP therapy and other modern endometrial stimulation techniques represent promising approaches for improving IVF outcomes and warrant further investigation.
4. Expansion of gynecological screening programs among school-aged girls and improvement of access to ultrasonographic examination throughout Uzbekistan should be considered priority measures for protecting reproductive health.

Future research should focus on elucidating the molecular and genetic mechanisms underlying uterine hypoplasia and developing individualized treatment protocols, which may provide new opportunities for improving the management and prognosis of this condition.

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