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MANAGEMENT OF REPRODUCTIVE SYSTEM DISORDERS IN ADOLESCENT FEMALES WITH CONGENITAL FEMALE GENITAL TRACT ANOMALIES

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Congenital female genital tract anomalies in adolescent females represent a substantial component among the factors contributing to compromised reproductive health. Determining the prevalence of female genital tract anomalies in adolescents and developing strategies to manage associated reproductive disorders via hormonal profiling remain cornerstone objectives in modern pediatric and adolescent gynecology. To evaluate the functional characteristics of the reproductive system, we examined 54 adolescent females with female genital tract anomalies aged 10 to 20 years during the pre-pubertal and pubertal periods. For hormonal profile comparison, 20 age-matched healthy controls were evaluated. All patients underwent clinical assessment in accordance with the protocols of the Ministry of Health of Ukraine. Within the female genital tract anomalies cohort, a significant proportion comprised patients with vaginal and uterine atresia (12 cases, 22.2 %) and complete uterus didelphys with a double vagina (4 cases, 7.4 %). A transverse vaginal septum was identified in 5 patients (9.3 %), and a transverse septum coexisting with a bicornuate uterus was recorded in 2 cases (3.7 %). Among the cohort, the prevalence of a partial uterine septum was 29.6 % (16 cases), while a complete uterine septum was documented in 12.9 % (7 cases). A bicornuate uterus was detected in 3 girls (5.6 %), and an uncornuate uterus was found in 1 patient (1.9 %). Hymenal atresia (imperforate hymen) was diagnosed in 4 cases (7.4 %). Compared to healthy controls, patients with female genital tract anomalies demonstrated menstrual cycle irregularities and hormonal imbalances. To establish the prevalence of these disorders, routine clinical medical check-ups were conducted, incorporating standardized screening, pelvic ultrasonography, and magnetic resonance imaging. The choice of therapeutic strategy is dictated by the specific type of female genital tract anomalies and its associated menstrual dysfunction stemming from hypothalamic-pituitary-ovarian axis impairment. Surgical intervention is not universally warranted in all cases, being strictly reserved for severe structural and obstructive malformations.

Key words: female genital tract anomalies, reproductive health, management of reproductive disorders in adolescent females, menstrual dysfunction, hormonal profile assessment.

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КОРЕКЦІЯ ПОРУШЕНЬ РЕПРОДУКТИВНОЇ СИСТЕМИ У ДІВЧАТ-ПІДЛІТКІВ З АНОМАЛІЯМИ РОЗВИТКУ СТАТЕВИХ ОРГАНІВ

Серед чинників порушень репродуктивного здоров’я значну частку посідають аномалії розвитку жіночих статевих органів у дівчат-підлітків. Вагоме місце у сучасній гінекології та дитячій гінекології займають визначення частоти розвитку аномалій жіночих статевих органів у дівчат-підлітків, а також розробка заходів корекції репродуктивних порушень з аналізом гормонального статусу. Для з'ясування особливостей статевої системи нами обстежено 54 дівчат-підлітків з аномаліями розвитку жіночих статевих органів, які перебували у пре- та пубертатному періоді у віці від 10 до 20 років. Для порівняння гормонального статусу обстежені 20 здорових дівчаток аналогічного віку. Всі пацієнти проходили обстеження згідно з наказами МОЗ України. Серед дівчаток підліткового віку значну частку склали пацієнтки з атрезією піхви і матки – 12 (22,2 %) , а також з повним подвоєнням матки і піхви – 4 (7,4 %). Поперечна перетинка піхви була у 5 (9,3 %) дівчаток, а поперечна перетинка у поєднанні з дворогою маткою – у 2 (3,7 %) випадках спостереження. Серед пацієнток репродуктивного віку частота неповної перетинки матки склала 16 (29,6 %) випадків з аномаліями розвитку статевих органів, а повна перетинка матки – 7 (12,9 %). У 3 (5,6 %) дівчаток було виявлено дворогу матку, а в однієї дівчинки – однорогу матку (1,9 %). Атрезію гімена було діагностовано у 4 (7,4 %). У пацієнток з аномаліями розвитку статевих органів порівняно зі здоровими пацієнтками спостерігалися порушення регулярності менструального циклу та гормональний дисбаланс. Для встановлення частоти виникнення цих порушень проводилися планові медичні огляди дівчат-підлітків, які включали скринінгові обстеження, УЗД органів малого тазу, магнітно-резонансну томографію. Вибір лікувальної тактики залежить від типу аномалій розвитку статевих органів, що супроводжується порушеннями менструальної функції на тлі дисбалансу функціонування гіпоталамо-гіпофізарної-яєчникової системи у дівчат і не завжди потребують хірургічного втручання, окрім грубих органічних порушень.

Ключові слова: аномалії розвитку жіночих статевих органів, репродуктивне здоров’я, корекція репродуктивних порушень у дівчат-підлітків, порушення менструальної функції, гормональне обстеження.

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In the structure of gynaecological pathology in recent years, there has been a growing trend in the incidence of female genital tract anomalies (FGTAs) among adolescent girls [5, 6]. These developmental anomalies are predominantly diagnosed during the prepubertal stage of a girl's development, exerting an adverse effect not only on subsequent reproductive capability but also on adult sexual function. The wide variety of structural variants in female genital tract anomalies accounts for the significant variability observed in clinical presentations and reproductive outcomes.

Congenital anomalies of the uterus and vagina rank third after malformations of the cardiovascular and musculoskeletal systems; crucially, among patients presenting with reproductive impairment, the prevalence of these anomalies can reach 10–15 %. It is well established that FGTAs compromise

reproductive health by predisposing patients to obstetric complications and secondary gynaecological disorders, thereby reducing both quality of life and broader demographic indices [1, 2, 4].

A key challenge in managing reproductive tract anomalies in young patients is the difficulty of diagnostic confirmation during adolescence, a critical period for the early detection of congenital reproductive tract pathologies. Adolescent girls represent a distinct patient cohort requiring tailored clinical management due to the heightened vulnerability of their psyche to diverse external and internal stressors.

Reproductive health impairments in patients with FGTAs necessitate the development of a comprehensive framework of organizational measures to ensure timely diagnosis and prevent complications through subsequent therapeutic and rehabilitative protocols [3, 8, 12, 15].

The diagnostic, therapeutic, and prophylactic interventions are built upon principles fundamentally centered around the patient's quality of life. These encompass early screening of adolescent girls based on the implementation of advanced diagnostic technologies and the prompt initiation of treatment – including surgical intervention when indicated, depending on age, anomaly type, and concomitant gynaecological pathology – to preserve and facilitate subsequent reproductive capacity. Early detection and the optimization of screening and diagnostic methodologies for FGTAs will enable the refinement of preventive and therapeutic strategies, thereby reducing gynaecological morbidity, lowering the incidence of obstetric and perinatal complications, and improving both the psycho-physical well-being and quality of life of these patients [19].

The purpose of the study was to determine the incidence of female genital tract anomalies in adolescent girls, and to develop corrective measures for associated reproductive disorders based on an analysis of their hormonal status.

Materials and methods. The study was conducted at the Municipal Non-Profit Enterprise of the Kharkiv Regional Council "Regional Children's Clinical Hospital" from January 2022 to 30 June 2025. Ethical considerations governing interactions between researchers and participants were strictly upheld throughout the study to protect the rights, dignity, and safety of all involved parties and to prevent potential harm. For minors involved in the study, informed consent was obtained from their parents or legal guardians.

The study cohort comprised 54 adolescent girls with female genital tract anomalies in their pre-pubertal and pubertal stages, aged between 10 and 20 years. The mean age of the subjects was 14.8±2.6 years. To evaluate and compare hormonal status, a control group of 20 healthy girls of a corresponding age was established.

The classification and diagnostic guidelines co-developed in 2013 by the European Society of Human Reproduction and Embryology and the European Society for Gynaecological Endoscopy (ESHRE/ESGE) were utilized [10, 11].

All patients underwent an external gynaecological examination and transabdominal pelvic ultrasonography using standard techniques. Additionally, serum concentrations of gonadotropic and ovarian steroid hormones were determined, and medical genetic counselling was provided. Ultrasonographic evaluations were performed using a Siemens Acuson NX3 Elite system equipped with a transabdominal transducer.

Gynaecological status was determined during the examination of the external genitalia. Recto-abdominal palpation was used to ascertain the position of the uterus within the lesser pelvis, its shape, the presence of mass lesions, and tenderness in the adnexal regions.

In sexually active adolescent girls – defined as those who engage in sexual intercourse – a speculum examination and vagino-abdominal palpation were performed. On days 6–10 of the menstrual cycle, patients underwent diagnostic laparoscopy to evaluate and analyze uterine morphology. Uterine dimensions were measured in three planes: sagittal, transverse, and frontal.

Hormonal balance in patients with FGTAs was evaluated by measuring peripheral blood serum levels of pituitary tropic hormones – specifically, follicle-stimulating hormone (FSH), luteinizing hormone (LH), prolactin (PRL), and estradiol (E2) on days 2–5 of the menstrual cycle, and progesterone (P) on days 20–22.

Statistical analysis of the research data was performed using STATISTICA 6.0 software (StatSoft Inc., USA). Results were presented as mean (M) ± standard deviation (SD). To assess the risk of reproductive disorders in patients with genital tract anomalies, the odds ratio (OR) and 95 % confidence interval (CI) were calculated.

Results of the study. The diagnostic workflow for FGTAs was prolonged, spanning from 6 months to 2 years from the patient's initial clinical presentation to final diagnostic verification. The primary reasons for delayed classification of FGTA types were diagnostic discrepancies between two-dimensional ultrasonography and laparoscopy, both of which remain highly sensitive modalities for diagnosing female reproductive tract anomalies.

Magnetic resonance imaging (MRI) also exhibits high sensitivity for diagnosing reproductive tract malformations during adolescence. To facilitate proactive detection of FGTAs, we propose incorporating mandatory consultations with a paediatric and adolescent gynaecologist, alongside pelvic ultrasonography, during routine prophylactic screenings for adolescents aged 13–14 years.

Among the adolescent patients evaluated, a significant proportion presented with vaginal and uterine atresia – 12 cases (22.2 %). Complete uterus didelphys with a double vagina was observed in 4 patients (7.4 %). A transverse vaginal septum was diagnosed in 5 girls (9.3 %), while a transverse vaginal septum coexisting with a bicornuate uterus was identified in 2 cases (3.7 %). A uterine septum is one of the most prevalent congenital uterine anomalies and is associated with the highest complication rate compared to other variants. It also commands the greatest surgical interest, as its correction can be readily performed via hysteroscopy. In our study, a partial uterine septum was present in 16 cases (29.6 %), while a complete uterine septum was present in 7 cases (12.9 %).

All patients with a uterine septum underwent hysteroscopic metroplasty. A complete bicornuate uterus was diagnosed in 3 adolescent girls (5.6 %). In these three cases, corrective surgical intervention was performed to establish adequate menstrual outflow; specifically, the procedure involved the excision of a longitudinal vaginal septum to create a unified vaginal cavity.

In cases of a unicornuate uterus, the clinical management strategy depended on the presence of a rudimentary horn and whether it contained a functional endometrial cavity. This specific pathology was encountered in one patient (1.9 %) in our cohort. In this patient, who presented with a unicornuate uterus and a cavitated rudimentary horn, laparoscopic excision of the rudimentary horn along with the ipsilateral Fallopian tube was performed.

In cases of hymenal atresia, which was diagnosed in 4 girls (7.4 %), a cruciate (X-shaped) incision was performed. For patients with a transverse vaginal septum, hysteroscopic resection of the septum was conducted. Table 1 presents data on the specific types of FGTAs observed in the adolescent cohort, along with their respective patient frequencies.

Table 1

Distribution and clinical variants of female genital tract anomalies (FGTAs) in the adolescent cohort (n=54)

Type of Female Genital Tract Anomaly	Number of Patients	
	Abs, n	%
Utero-vaginal atresia	12	22.2
Complete uterus didelphys with double vagina	4	7.4
Transverse vaginal septum	5	9.3
Transverse vaginal septum coexisting with a bicornuate uterus	2	3.7
Partial uterine septum	16	29.6
Complete uterine septum	7	12.9
Bicornuate uterus	3	5.6
Unicornuate uterus with a rudimentary horn	1	1.9
Hymenal atresia	4	7.4
Total	54	100.0

Based on clinical and ultrasonographic data, the presence, nature, and severity of menstrual disorders observed in the cohort were evaluated. Particular attention was paid to menstrual cycle regularity. In addition to irregular cycles, the patients' medical histories revealed abnormal uterine bleeding (AUB) that had onset during early puberty.

The mean age at menarche was 13.2±2.1 years. Only 14 patients (25.9 %) presented with no deviations in menstrual cycle length or duration; the remaining adolescent females exhibited various types of menstrual irregularities. Specifically, primary amenorrhea was identified in 5 cases (9.3 %) and secondary amenorrhea in 6 cases (11.1 %), accounting for a combined prevalence of 11 cases (20.4 %).

Dysmenorrhea remains one of the hallmark symptoms characteristic of congenital genital tract anomalies, often prompting earlier clinical presentation and subsequent diagnosis of the underlying malformation. Abnormal uterine bleeding was observed in 7 adolescent patients (12.9 %), presenting predominantly as ovulatory dysfunction or juvenile bleeding. Furthermore, irregular intermenstrual bleeding was recorded in 5 patients (9.3 %) with FGTAs. A combination of multiple menstrual disorders coexisted in 7 girls (12.9 %).

Table 2

Hormonal profile parameters in adolescent females with female genital tract anomalies (FGTAs) and healthy controls

Hormonal Parameter	FGTA Patients	Healthy Controls (Control Group)
FSH (mIU/mL)	5.36±0.4	6.23±0.7
LH (mIU/mL)	4.33±1.6	4.61±0.4
Prolactin (ng/mL)	16.1±2.5	16.7±1.1
Estradiol (E2) (pmol/L)	285.2±24.5*	362.7±18.2
Progesterone (P) (nmol/L)	22.2±3.3*	32.3±1.1

Note: * $p<0.05$ compared to the control group.

The hormonal balance of patients with FGTAs was analyzed by determining the serum levels of pituitary tropic hormones: follicle-stimulating hormone (FSH), luteinizing hormone (LH), prolactin (PRL), and estradiol (E2) on days 2–5 of the menstrual cycle, and progesterone (P) on days 20–22 of the cycle.

Changes in FSH, LH, prolactin, and estradiol levels, combined with a significant decrease in progesterone levels observed in 62.5 % of adolescent females, were consistent with luteal phase deficiency. Serum LH and prolactin levels in adolescent patients with FGTAs were significantly lower than those in the control group.

Discussion. The choice of surgical approach depends on the specific type of FGTA, as surgical management of a uterine anomaly is not warranted in all cases [4]. All adolescent patients diagnosed with FGTAs underwent surgical correction aimed at restoring normal anatomical structure, alleviating dysmenorrhea and pelvic pain, and resolving cryptomenorrhea (false primary amenorrhea) [16].

Postoperative monitoring of patients with FGTAs prevents complications and safeguards their health. Early diagnosis of uterine and vaginal anomalies in girls improves their long-term quality of life, while appropriate postoperative rehabilitation preserves reproductive potential. To facilitate the early detection of FGTAs and mitigate adverse reproductive outcomes, screening protocols for adolescent females are strongly warranted [2, 5, 6, 7].

Disruption of hormonal homeostasis is a key driver of endocrine disorders affecting the reproductive system. Specific hormones, including estrogens, progesterone, and androgens, directly modulate the functional state of the reproductive organs. Consequently, we evaluated the serum levels of pituitary and ovarian steroid hormones in girls with congenital FGTAs [11, 17, 18].

Concurrently, a significant reduction in estradiol and progesterone levels was observed in the FGTA cohort, consistent with luteal phase deficiency and indicating functional impairment of the hypothalamic-pituitary-ovarian axis associated with FGTAs [4, 8, 20]. In summary, while the hormonal profile analysis of patients with FGTAs showed no statistically significant alterations in FSH, LH, and estradiol levels compared with baseline, reduced concentrations of estradiol and progesterone may be a key factor underlying reproductive dysfunction with diverse clinical manifestations, including AUB, infertility, and dysmenorrhea.

Conclusion

In patients with female genital tract anomalies (FGTAs), evaluating the hormonal status is essential to establish the prevalence and characteristics of associated reproductive endocrine disorders. Routine medical check-ups for adolescent females should ideally include consultations with a pediatric and an adolescent gynecologist, along with pelvic ultrasonography. Standardized screening protocols for adolescent patients are strictly warranted to facilitate the early detection of FGTAs and mitigate adverse long-term reproductive outcomes.

The diagnostic algorithm for FGTAs should include ultrasonography, hysterosalpingography, or laparoscopy, supplemented by highly sensitive modalities such as magnetic resonance imaging (MRI) during adolescence. The choice of surgical strategy must be tailored to the specific type of FGTA, as surgical correction of a uterine anomaly is not clinically warranted in all cases.

It is necessary to comprehensively evaluate the presence, nature, and severity of menstrual irregularities and disruptions in hormonal homeostasis in patients with reproductive tract pathology, particularly with respect to the development of luteal phase deficiency and associated functional impairment of the hypothalamic-pituitary-ovarian axis.

Prospects for further research. Key areas for future research include the optimization of pelvic ultrasonography and MRI protocols to guide high-precision reconstructive surgeries in adolescent patients, aimed at restoring menstrual outflow and preserving anatomical integrity without organ resection. Furthermore, the implementation of molecular diagnostics remains highly relevant to identifying genetic mutations underlying congenital malformations and detecting associated extragenital anomalies. Developing specialized psychological support and counseling programs tailored to these young patients represents another crucial vector for comprehensive care.

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