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LONG-TERM OUTCOMES AFTER CORRECTION OF ASYMMETRIC DUPLICATION OF THE UTERUS AND VAGINA IN ADOLESCENT GIRLS

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Tayanch so‘zlar: asimmetrik ikkilanishlar, o‘smirlar, jarrohlik tuzatish, uzoq muddatli natijalar, reproduktiv salomatlik.
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This article examines the long-term safety outcomes following correction of genital asymmetry in adolescent girls. Particular attention is given to postoperative follow-up, prevention of potential complications, and preservation of reproductive and gynecological health. The study emphasizes the importance of early diagnosis, appropriate treatment strategies, and continuous monitoring to ensure favorable long-term outcomes in this patient population.

O‘SMIR QIZLARDA BACHADON VA QINNING ASIMMETRIK IKKILANISHNI DAVOLASHDAN KEYINGI UZOQ MUDDATLI NATIJALAR

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Mazkur maqolada o‘smir qizlarda assimetrik anomaliyalarni jarrohlik yo‘li bilan tuzatishdan keyingi uzoq muddatli xavfsizlik natijalari tahlil qilinadi. Asosiy e’tibor operatsiyadan keyingi kuzatuv, mumkin bo‘lgan asoratlarning oldini olish, shuningdek reproduktiv va ginekologik salomatlikni saqlab qolishga qaratilgan. Tadqiqotda ushbu bemorlar guruhida ijobiy uzoq muddatli natijalarga erishish uchun erta tashxis qo‘yish, davolashning maqbul usullarini tanlash va uzluksiz monitoring muhimligi ta’kidlanadi.

ДОЛГОСРОЧНЫЕ РЕЗУЛЬТАТЫ ПОСЛЕ КОРРЕКЦИИ АСИММЕТРИЧНЫХ УДВОЕНИЙ МАТКИ И ВЛАГАЛИЩА У ДЕВОЧЕК-ПОДРОСТКОВ

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Данная статья посвящена анализу долгосрочных показателей безопасности после коррекции генитальной асимметрии у девочек-подростков. Особое внимание уделяется послеоперационному наблюдению, профилактике возможных осложнений, а также сохранению репродуктивного и гинекологического здоровья. В исследовании подчёркивается значимость ранней диагностики, выбора адекватных лечебных стратегий и непрерывного мониторинга для обеспечения благоприятных отдалённых исходов у данной категории пациенток.

1. Embryological and Clinical Background of Genital Asymmetry Duplications.

This rare congenital Müllerian anomaly, commonly characterized by duplication of the uterus accompanied by unilateral vaginal obstruction, is often associated with ipsilateral renal agenesis. Due to the close embryological relationship between the Müllerian and Wolffian duct systems, abnormalities in reproductive tract development are frequently accompanied by urinary tract malformations. This unique triad is collectively referred to as Herlyn–Werner–Wunderlich syndrome (HWWS), or Obstructed Hemivagina and Ipsilateral Renal Anomaly (OHVIRA) syndrome. It is an uncommon but clinically significant condition, typically diagnosed during adolescence after menarche, when patients present with obstructive symptoms such as severe dysmenorrhea, pelvic pain, or palpable masses[8]. The reported incidence of obstructed Müllerian anomalies ranges from approximately 0.1% to 3.8% in the general population; however, this is likely underestimated due to substantial diagnostic challenges. The rarity of the syndrome, combined with its often nonspecific clinical manifestations and delayed symptom onset after menarche, contributes to frequent misdiagnosis or delayed recognition. In many instances, early symptoms such as pelvic pain or dysmenorrhea are attributed to more common gynecologic conditions, leading to postponed referral and incomplete diagnostic evaluation [17]. This uncommon urogenital defect originates from abnormal development of the Wolffian (mesonephric) structures and the Müllerian ducts, emphasizing the critical interdependence of urinary and reproductive tract development. Impaired mesonephric duct development is thought to disrupt ipsilateral Müllerian duct fusion and canalization, ultimately resulting in uterine duplication with unilateral vaginal obstruction and associated renal anomalies. The syndrome was first described by Purslow in 1922, who reported the coexistence of uterus didelphys and an obstructed hemivagina. Subsequent studies refined this concept, and the com-

plete triad, including ipsilateral renal agenesis, was formally characterized by Herlyn and Werner in 1971, with further clinical details provided by Wunderlich in 1976[2]. Over time, this combination of anomalies has been recognized as a distinct developmental entity, reflecting a common embryological insult during early urogenital organogenesis. Advances in embryological research and imaging techniques have improved understanding of the syndrome's pathogenesis, supporting the hypothesis that defective mesonephric duct development can lead to secondary Müllerian anomalies through failed inductive signaling. This mechanism explains the frequent concurrence of genital tract obstruction and ipsilateral renal agenesis. Understanding this embryological basis is clinically essential, as delayed diagnosis may result in progressive complications, including hematocolpos, hematometra, retrograde menstruation, endometriosis, pelvic adhesions, and impaired reproductive potential [20].

2.Reproductive and Obstetric Outcomes in Genital Asymmetry: Long-Term Risks and Complications".

Although roughly 80% of individuals with uterus didelphys can achieve conception, obstetric outcomes are often less than optimal. These patients frequently experience higher incidences of preterm birth and spontaneous miscarriage, reflecting the structural constraints imposed by the presence of dual uterine cavities. Additionally, more than 80% ultimately require cesarean delivery, highlighting the persistent challenges in attaining favorable perinatal outcomes even after successful conception [10]. Therefore, close antenatal surveillance and tailored obstetric care are essential to optimize both maternal and fetal health in this population [10]. Persistent obstruction of one hemivagina can lead to retrograde menstrual flow into the abdominal cavity, significantly increasing the risk of secondary complications such as endometriosis, pelvic adhesions, and recurrent pelvic infections. These sequelae not only intensify chronic pelvic pain but may also jeopardize future fertility and complicate subsequent surgical management, emphasizing the importance of early detection and intervention [3]. The prevalence of congenital cervical anomalies, including uterus didelphys with obstructed hemivagina is estimated to be between 1 in 80,000 and 1 in 100,000 live births. Notably, about half of these patients also exhibit congenital vaginal agenesis, demonstrating the frequent co-occurrence of Müllerian duct anomalies and underscoring the necessity for comprehensive evaluation of the entire genitourinary tract in affected individuals [18]. Complete obstruction, resulting from fusion of the vaginal septum with the vaginal wall, can intensify clinical symptoms, producing more severe pelvic pain, dysmenorrhea, and hematocolpos. In contrast, partial obstruction may present with delayed symptom onset or more subtle signs, complicating timely diagnosis and increasing the likelihood of mismanagement. This heterogeneity in presentation underscores the need for individualized assessment and advanced imaging to accurately define anatomical relationships and guide appropriate surgical intervention [16]. Delayed recognition of obstruction can lead to recurrent infections and pyocolpos. Accumulated menstrual blood or purulent material behind the obstructed hemivagina provides a breeding ground for bacterial growth, predisposing patients to repeated pelvic inflammatory episodes, abscess formation, and chronic discomfort. Timely diagnosis and prompt surgical intervention are therefore crucial for preventing these complications and preserving both reproductive function and pelvic health [10]. While ultrasound remains a commonly used first-line imaging tool due to its accessibility, noninvasive nature, and cost-effectiveness, MRI provides enhanced delineation of the external uterine contour and a more comprehensive characterization of associated anomalies. This includes accurate identification of duplicated uterine cavities, obstructed hemivagina, cervical malformations, and concomitant renal abnormalities. By enabling multiplanar assessment and detailed soft tissue contrast, MRI supports optimal preoperative evaluation, contributes to precise surgical planning, and ultimately improves reproductive and functional outcomes in patients with complex congenital urogenital anomalies [2; 19].

3.Surgical Management of Genital Asymmetry: Minimally Invasive Approaches and Long-Term Outcomes".

The management of uterus didelphys complicated by an obstructed hemivagina, often classified under Herlyn–Werner–Wunderlich syndrome, generally employs minimally invasive surgical techniques, including laparoscopy and hysteroscopy. These procedures aim to relieve the obstruction, restore regular menstrual outflow, and maintain reproductive potential while minimizing postoperative morbidity. Laparoscopic evaluation provides detailed visualization of pelvic struc-

tures, allowing the surgeon to identify concurrent anomalies such as endometriosis or adhesions and safely excise the obstructive vaginal septum. Simultaneously, hysteroscopy enables direct inspection of the uterine cavities, ensuring precise localization and complete removal of the obstructive tissue. The combination of these approaches facilitates effective anatomical correction, reduces the likelihood of recurrent obstruction, and enhances both functional and fertility outcomes, in addition to shortening recovery times and reducing surgical risks [9].Surgical excision of the vaginal septum prevents the accumulation of menstrual blood, which can otherwise lead to hematocolpos, retrograde menstruation, and subsequent endometriosis. Restoring unobstructed vaginal outflow mitigates chronic pelvic pain, dysmenorrhea, and recurrent infections—common complications in cases of delayed diagnosis. Preserving the anatomical integrity of the reproductive tract is essential for future obstetric success, supporting normal menstrual function and potential conception. Furthermore, the minimally invasive nature of these procedures reduces postoperative adhesions, accelerates recovery, and improves cosmetic outcomes, making laparoscopy and hysteroscopy the preferred approach in managing Herlyn–Werner–Wunderlich syndrome [2;14].The primary objectives of these interventions are fertility preservation and prevention of long-term complications, such as endometriosis and pelvic adhesions. Successful surgical management ensures unimpeded menstrual flow, minimizing retrograde menstruation, which is a recognized contributor to endometriosis. Maintaining proper anatomical patency also prevents the formation of adhesions that could compromise tubal function and fertility potential. Timely and effective surgical correction alleviates chronic pain, reduces the risk of recurrent infections, and optimizes reproductive outcomes by preserving the structural and functional integrity of the uterus, cervix, and vagina. Additionally, these interventions significantly enhance patients' quality of life, reducing both physical discomfort and the psychosocial burden associated with chronic gynecologic conditions. The long-term success of such procedures relies on meticulous preoperative planning, accurate diagnosis, and the use of minimally invasive techniques to minimize trauma and facilitate recovery [9].

4.Long-Term Outcomes of Surgical Management in Uterus Didelphys with Obstructed Hemivagina.

The substantial variability observed in clinical manifestations and surgical strategies for duplicated uteri with unilateral obstruction, particularly in complex conditions such as Herlyn–Werner–Wunderlich syndrome, highlights the urgent need for standardized diagnostic criteria and harmonized management protocols. Differences in symptom presentation, anatomical configuration, and concomitant anomalies often contribute to delayed recognition and inconsistent therapeutic approaches, potentially compromising long-term reproductive, functional, and psychosocial outcomes. Implementing uniform diagnostic frameworks and evidence-based surgical guidelines would promote earlier detection, facilitate consistent selection of the most appropriate interventions, and enhance long-term patient outcomes while enabling more reliable cross-study and inter-center comparisons [4].This review aims to critically synthesize the current literature to delineate key anatomical, surgical, and patient-centered factors that influence favorable reproductive results and overall well-being following surgical correction. It incorporates data on fertility, obstetric outcomes, symptom resolution, and psychosocial adaptation, with the objective of clarifying determinants of long-term success and informing evidence-based clinical practice [2]. Hence, this paper aims to comprehensively synthesize the available literature, highlighting existing gaps in knowledge and proposing directions for future research to enhance both diagnostic accuracy and therapeutic strategies for these complex congenital anomalies. Given the intricacies of uterus didelphys with obstructed hemivagina, a careful and critical evaluation of surgical methodologies is essential. In particular, the ongoing debate between hemihysterectomy and more conservative approaches warrants thorough examination to determine their relative impact on long-term patient outcomes, including reproductive potential, symptom relief, and overall quality of life. This analysis seeks to provide clinicians with evidence-informed guidance to optimize individualized patient care while minimizing the risk of complications and preserving fertility wherever possible [8]. Equally important, the psychological effects of uterus didelphys with obstructed hemivagina and its surgical treatment, though less commonly studied, represent a crucial aspect of comprehensive care. Emotional and mental well-being—including anxiety, body image perception, sexual function, and social adaptation—can substantially influence patients' overall quality of life. Assessing

patient satisfaction and psychosocial integration is therefore essential to fully evaluate surgical success, as these metrics reflect how individuals adapt the outcomes of treatment into their long-term personal and daily life [7].

5. Conclusion.

The prevalence of congenital uterine anomalies in the general female population is estimated at approximately 5.5%. However, this rate rises markedly in certain clinical subgroups, reaching around 8% among women with infertility and up to 13.3% in those with a history of recurrent pregnancy loss. This trend suggests a strong correlation between uterine malformations and adverse reproductive outcomes. Structural uterine abnormalities can interfere with normal implantation, placentation, and fetal development, thereby contributing to infertility, early pregnancy loss, and obstetric complications. As such, congenital uterine anomalies constitute a significant and frequently underrecognized factor in reproductive failure, highlighting the importance of heightened clinical awareness, accurate diagnostic assessment, and individualized management strategies for affected women [19]. Among the various congenital uterine anomalies, the septate uterus is the most commonly observed subtype and is known to have a particularly negative impact on reproductive outcomes. The presence of a uterine septum is associated with elevated rates of infertility, recurrent miscarriage, preterm delivery, and other adverse obstetric events. These complications are largely attributed to impaired endometrial receptivity, altered uterine vascularization, and suboptimal conditions for implantation. Consequently, the septate uterus is considered the anomaly most strongly linked to reproductive failure, emphasizing the clinical significance of timely and accurate diagnosis [6].Incomplete resorption of the fused medial walls of the paramesonephric (Müllerian) ducts results in the formation of a septate uterus, a congenital anomaly consistently associated with reduced fertility, impaired implantation, and a heightened risk of recurrent miscarriage due to altered uterine cavity morphology and compromised endometrial receptivity [12]. Accurate differentiation between congenital uterine anomalies—particularly septate and bicornuate uteri—is essential for guiding appropriate clinical decisions. This distinction is critical because these conditions differ in embryological origin, anatomical structure, and therapeutic options. While hysteroscopic septum resection may improve reproductive outcomes in a septate uterus, a bicornuate uterus generally does not benefit from such intervention. Misclassification can therefore lead to inappropriate surgical management, unnecessary procedures, or missed opportunities for effective treatment, ultimately affecting fertility and pregnancy outcomes [1; 11].Three-dimensional transvaginal ultrasound (3D-TVUS) has become an indispensable tool for evaluating complex female genital malformations. By providing high-resolution, multiplanar images of both the uterine cavity and external contour, it allows precise differentiation between anomalies such as septate, bicornuate, and didelphys uteri, which may appear similar on conventional two-dimensional imaging. This detailed visualization is crucial for accurate diagnosis, individualized treatment planning, and reproductive counseling. Compared with more invasive techniques, 3D-TVUS is non-invasive, widely available, and cost-effective, and it is often combined with MRI or hysterosalpingography to confirm findings and assess associated anatomical variations. Its implementation in clinical practice has substantially improved the classification and management of uterine malformations, establishing it as a gold standard imaging modality [5; 15].Accurate diagnosis of uterine anomalies is essential, as inappropriate surgical interventions—such as septum resection in a bicornuate uterus—can paradoxically worsen reproductive outcomes or lead to complications. Advances in understanding the pathophysiology of these anomalies have demonstrated that variations in embryological development correspond to distinct histological structures and vascular patterns of uterine septa, which in turn affect their clinical significance and guide optimal management. Careful imaging and precise classification are therefore fundamental before any surgical decision is made.Minimally invasive hysteroscopic metroplasty is designed to restore normal uterine anatomy by resecting the septum and has been shown to improve pregnancy outcomes and live birth rates. When performed following thorough diagnostic imaging and accurate classification of uterine anomalies, this procedure can significantly enhance reproductive potential while minimizing surgical risks [15].

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