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Familial Case of Morris Syndrome: Clinical Observations

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ABSTRACT

Hormonal regulation plays a crucial role in human sexual development. Mutations in the androgen receptor gene may cause peripheral androgen resistance, leading to characteristic phenotypic manifestations. In complete androgen resistance, patients develop a female phenotype despite disrupted sexual differentiation, which is mediated by aromatization of testosterone into estrogen. One of the typical complaints reported by patients is the presence of a groin bulge, often bilateral, which is perceived as an inguinal hernia. Surgical treatment in the form of gonadectomy may result in impaired bone mineral metabolism or masculinization; on the other hand, delayed intervention increases the risk of malignancy. This article presents a familial case of Morris syndrome with a previously undescribed AR gene mutation (NM_001011645.3) in two girls aged 14 and 6 years. Both girls were admitted for elective repair of bilateral inguinal hernias observed since birth. During hernioplasty, testes were discovered and biopsied, revealing testicular tissue in the first case and tunica albuginea in the second. Based on intraoperative findings, further evaluation was performed, including ultrasound of the genitourinary system, hormonal testing, medical genetic testing, and consultations with endocrinologist and geneticist. In both cases, androgen insensitivity syndrome was confirmed (a hemizygous AR gene variant was identified in exon 7: HG38, chrX:67721856T>C, c.746T>C, resulting in the amino acid substitution p.Met249Thr). DNA sequencing revealed the AR gene mutation in the mother in a heterozygous state. No pathogenic variants were identified in the father, older sister, or brother. With parental consent, both patients underwent bilateral laparoscopic gonadectomy. The study highlights the importance of age, including in relation to sexual and phenotypic development, when determining the timing of surgical intervention. It also underscores the need for a comprehensive, multidisciplinary approach to address functional, social, and gender-related issues in these patients.

Keywords: Morris syndrome; androgen insensitivity; surgical strategy; bilateral inguinal hernias; children; case report.

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Семейный случай синдрома Морриса: клинические наблюдения

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АННОТАЦИЯ

Гормональная регуляция оказывает существенное влияние на половое развитие человека. Мутации гена андрогенного рецептора могут приводить к периферической андрогенной резистентности, что определяет фенотипические особенности пациентов. При полной резистентности к андрогенам у пациентов отмечается формирование женского фенотипа при нарушении полового развития, что определяется ароматизацией тестостерона в эстроген. Одной из жалоб пациентов является наличие грыжевого выпячивая, часто билатерального, в паховой области, что воспринимается как грыжи. Оперативное лечение в объеме гонадэктомии может привести к нарушению костно-минерального обмена, формированию маскулинизации, с другой стороны, взросление увеличивает риск малигнизации. В статье приведено собственное наблюдение семейного варианта синдрома Морриса с впервые описанной мутацией гена *AR* (NM_001011645.3) у двух девочек 14 и 6 лет. Обе девочки поступали для планового лечения билатеральных паховых грыж, наблюдавшихся с рождения. При выполнении герниопластики выявлены тестикулы, проведена биопсия, определившая ткань яичек в первом случае и белочную оболочку — во втором. В связи с полученными интраоперационно данными проведено дообследование, включившее ультразвуковое исследование органов мочеполовой системы, гормональное и медико-генетическое исследование, консультирование эндокринологом, генетиком. В обоих случаях подтвержден синдром андрогенной феминизации (в гене *AR* в экзоне 7 обнаружен вариант HG38, chrX:67721856T>C, c.746T>C в гемизиготном состоянии, приводящий к аминокислотной замене p. Met249Thr). У матери при секвенировании ДНК выявлена мутация гена *AR*, но в гетерозиготном состоянии. При исследовании материала отца пациенток, старшей сестры и брата патологических вариантов не обнаружено. С согласия родителей обеим пациенткам проведена билатеральная лапароскопическая гонадэктомия. Работа показывает значение возраста, в том числе для полового и фенотипического развития, на сроки проведения оперативного вмешательства. Кроме того, обоснована необходимость комплексного мультипрофильного подхода для решения функциональных, социальных и половых проблем пациента.

Ключевые слова: синдром Морриса; андрогенная феминизация; хирургическая тактика; билатеральные паховые грыжи; дети; клинический случай.

Как цитировать

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睾丸女性化综合征的家族性病例：临床观察

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摘要

激素调控在人类性发育过程中起着关键作用。雄激素受体基因的突变可导致外周雄激素不敏感性，从而影响患者的表型特征。在完全雄激素不敏感的情况下，由于睾酮被芳香化为雌激素，患者虽存在性发育障碍，但表现为女性表型。患者的典型主诉之一是腹股沟区双侧疝样膨出，常被误诊为腹股沟疝。行睾丸切除术可能导致骨矿代谢紊乱和一定程度的男性化改变；另一方面，随着年龄增长，恶性变的风险亦随之升高。本文报告一例家族性睾丸女性化综合征，在两名分别为14岁和6岁的女孩中发现了首次报道的AR基因突变（NM_001011645.3）。两名女孩因自出生起双侧腹股沟疝入院接受择期手术。术中行疝修补时发现睾丸结构，并进行活检：一例证实为睾丸组织，另一例为白膜组织。根据术中获得的资料，进一步开展了评估，包括泌尿生殖系统的超声检查、激素水平评估和医学遗传学检测，并由内分泌科医生和遗传科医生进行会诊。两例均确诊为睾丸女性化综合征（在AR基因第7外显子中检测到变异HG38, chrX:67721856T>C，即c.746T>C，处于半合子状态，导致氨基酸置换p.Met249Thr）。对其母亲进行DNA测序发现存在AR基因突变，呈杂合状态。对患儿父亲、姐姐及哥哥的基因检测未发现病理性变异。经家属同意，两名患儿均接受了双侧腹腔镜下睾丸切除术。本研究表明，年龄在手术干预时机的选择中具有重要意义，尤其是在性发育和表型形成方面。此外，文章还论证了采取多学科综合诊疗模式以解决患者功能、社会和性别相关问题的必要性。

关键词： 睾丸女性化综合征；雄激素不敏感；手术策略；双侧腹股沟疝；儿童；临床病例。

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INTRODUCTION

Sexual development during both prenatal and postnatal periods is largely determined by adequate levels of androgens. The period of embryogenesis is critical for the development of the reproductive system; therefore, pathological changes occurring at 8–14 weeks of gestation may lead to various disorders. In addition, such pathological changes are associated with mutations in the androgen receptor (*AR*) gene and abnormal secretion of sex hormones. The human *AR* gene is located on the X chromosome, at Xq11–12, and has 8 exons encoding a peptide of 919 amino acid residues [1, 2]. Androgen receptors are ligand-dependent transcription factors consisting of four functional domains: a large N-terminal domain (residues 1–555), a DNA-binding domain (residues 556–623), a hinge domain (residues 624–665), and a C-terminal ligand-binding domain (residues 666–919) [3]. Pathogenic variants in the *AR* gene result in reduced or lost AR function, leading to peripheral androgen resistance and defining the phenotypic characteristics of patients [4]. Three clinical variants are distinguished based on genotype: complete androgen insensitivity syndrome (CAIS), partial androgen insensitivity syndrome (PAIS), and mild androgen insensitivity syndrome (MAIS) [3, 5, 6].

Complete androgen insensitivity syndrome (also known as testicular feminization syndrome, Morris syndrome or OMIM 312300), is an X-linked genetic disorder associated with impaired sex differentiation [1, 7, 8]. Its prevalence ranges from 1 : 20,000 to 1 : 99,000 among individuals with a 46,XY karyotype [7, 9, 10]. According to retrospective studies, the incidence of CAIS among girls with inguinal hernias varies from 0.8% to 2.4%, whereas in patients with diagnosed testicular feminization syndrome, bilateral inguinal hernias are found in 50% to 80% of cases [3]. The condition was first described in 1953 by J. Morris in a cohort of 82 patients. He identified the distinguishing features of males with pseudohermaphroditism, including a female phenotype with well-developed secondary sexual characteristics, sparse axillary and pubic hair, underdeveloped labia, a blind-ending vagina, and the presence of testes located intra-abdominally or along the inguinal canal. These testes are capable of producing estrogens and androgens, and urinary gonadotropin levels are elevated [3, 11]. Patients with testicular feminization syndrome typically present with fully developed female external genitalia and absence or rudimentary derivatives of the Wolffian duct system [4]. As described by J. Morris, a blind-ending vagina and the presence of testes in the abdominal or inguinal region are almost always observed [7].

Feminization with the development of secondary sexual characteristics may be associated with aromatization of testosterone into estrogen. However, due to the absence of androgen action, patients typically exhibit sparse axillary and pubic hair growth [9]. The female phenotype also results from intrauterine estrogenization, which may stem from endogenous (maternal androgens, hormone-producing tumors) or exogenous (progestin intake) stimulation [12], and is further enhanced in the absence of testosterone and dihydrotestosterone effects on target organs. Phenotypic females typically first present to pediatric gynecologists during puberty due to primary amenorrhea [9]. The testes may be detected during imaging studies and misinterpreted as cysts or other pathological masses. When located in the inguinal canal, they are frequently mistaken for inguinal hernias, often bilateral. In some cases, parents consult pediatric surgeons for elective repair of inguinal hernias [3, 4, 9]. In the absence of orchiectomy, malignant transformation may occur [2, 3].

To date, over 1100 different pathogenic variants have been identified in the *AR* gene, including deletions, duplications, insertions, and point mutations, the majority of which are missense pathogenic variants [4, 13].

We present a familial case of Morris syndrome involving a previously undescribed *AR* gene mutation (NM_001011645.3). The parents are not consanguineous. The mother is 156.5 cm tall, with menarche at age 13–14; initial oligomenorrhea was followed by normalization of the menstrual cycle. She has no history of endocrine disorders or infertility. The father is 164 cm tall and has no known endocrine disorders. The patients are not citizens of the Russian Federation, which contributed to delayed and incomplete preventive specialist evaluations and lack of regular medical follow-up. The family includes three daughters and one son. The middle daughter and the son are healthy.

CASE DESCRIPTIONS

Case report No. 1

A 14-year-old girl (the eldest daughter) was admitted to the pediatric surgery department of a city children's hospital for elective hernioplasty for bilateral inguinal hernias.

Medical history. The patient was born from the first pregnancy, which was complicated by maternal preeclampsia and anemia. It was the mother's first delivery, post-term (after 40 weeks of gestation) and spontaneous. Birth weight was 3000 g, length 50 cm, Apgar score 7/8. In early childhood, the patient had rickets and intracranial hypertension. No history of endocrine disorders. The patient was under regular follow-up by an orthopedic traumatologist for scoliosis and pectus excavatum, an urologist for bilateral inguinal hernias, and a pediatrician for biliary dyskinesia.

History of present illness. Since early childhood, the patient had been followed by an urologist for bilateral inguinal hernia (bulging in the inguinal folds). Elective surgery was performed on July 6, 2022, during which oval-shaped structures resembling testes were found in the hernial sac. A biopsy was performed. The gonads were repositioned into the abdominal cavity, and bilateral inguinal canal repair was completed. Histological examination revealed testicular tissue in the maturation stage (Figure 1).

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Based on these findings, further inpatient evaluation was performed. Pelvic ultrasound revealed a vaginal remnant in the form of a fibrous band and absence of the cervix and uterus. Testicular dimensions were measured as follows: right testis, 3.2 × 2.4 × 2.7 cm, without follicular apparatus; left testis, 3.0 × 2.3 × 3.2 cm, without follicular apparatus. The patient was discharged to outpatient care and referred to a geneticist for karyotyping, after which a second-stage surgery—gonadectomy—was planned.

Physical examination. Height 155 cm (–0.69 SDS), weight 34.5 kg (–2.75 SDS), body mass index 14.33 (–2.31 SDS). The general condition was satisfactory; the patient plays football. She has an asthenic body build. Academically, she performs well, with intellectual development appropriate for her age. Signs of connective tissue dysplasia were observed (hyperextension of the elbow joints, hypotonia), along with scoliosis and pectus excavatum. According to the pediatric endocrinologist, sexual development was classified as Tanner stage II: Ma II–III, A I, P I–II, Me (–), clitoris of normal size, and female-type external genitalia.

A sex chromatin test performed on August 3, 2022, was negative. Karyotyping on August 4, 2022, showed 46,XY, interpreted by the geneticist as a balanced male karyotype with sex reversal. On November 7, 2022, sequencing was performed at the Medical Genetic Center of St. Petersburg using the Illumina platform with paired-end sequencing (2 × 150 bp). The average coverage depth was 245.53×, with 99.95% of targeted nucleotides covered at >10× depth. A previously unreported hemizygous *AR* gene variant was identified in exon 7: HG38, chrX: 67721856T>C, c.746T>C, resulting in an amino acid substitution (p.Met249Thr) with a coverage depth of 100×. This variant is located in a conserved region.

Laboratory evaluation of hormonal activity revealed the following: anti-Müllerian hormone 93 ng/mL (<12.6), inhibin B 334.1 pg/mL (<83.0), follicle-stimulating hormone (FSH) 1.69 mIU/mL (0.95–11.95), and testosterone 2.3 nmol/L (0.36–1.54). Bone age based on wrist joints radiographs corresponded to 14 years. Sanger sequencing confirmed that the variant was inherited from the mother. Thus, androgen insensitivity syndrome with 46,XY, AR c.746T>C (p.Met249Thr) was diagnosed.

Additional DNA sequencing of parental and sibling samples was performed. Using paired-end sequencing (2 × 150 bp) on the Illumina platform, a variant in exon 7 of the *AR* gene, HG38, chrX:67721856T>C, c.746T>C, resulting in an amino acid substitution (p.Met249Thr), was identified in the mother's sample in the heterozygous state. The same mutation was detected in the biological material of the younger sister (described in Clinical case No. 2). No pathogenic variants were identified in the biological samples of the proband's father, brother, or middle sister during sequencing. Thus, a pedigree was constructed for the sister and her relatives (Figure 2).

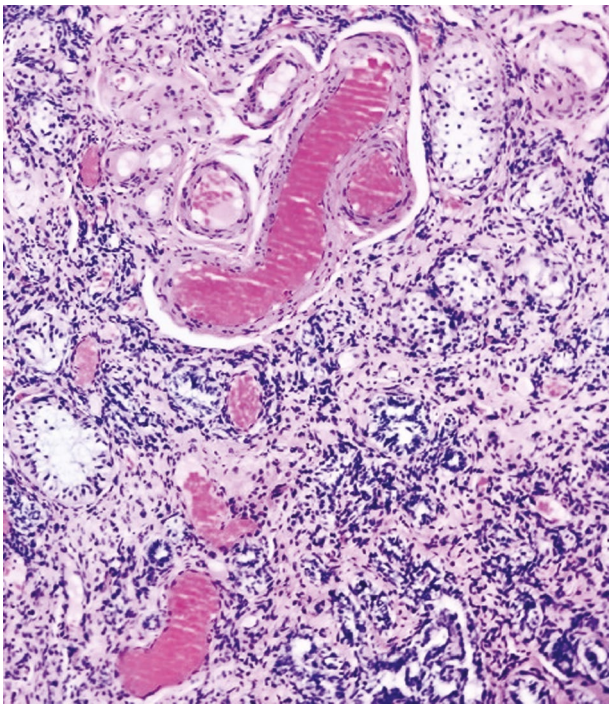

Fig. 1. Maturing testicular tissue revealed by histological examination, hematoxylin and eosin staining.
Рис. 1. Ткань яичка в стадии созревания, выявлена при гистологическом исследовании, окраска гематоксилином и эозином.

After additional evaluation, consultations with a pediatric endocrinologist and geneticist, and parental consent, repeat surgery was performed on January 18, 2023, consisting of bilateral laparoscopic gonadectomy and right inguinal canal revision. Macroscopically, testes was identified (Figure 3).

Histological examination confirmed the initial morphological diagnosis. The child was discharged for outpatient follow-up with a pediatric surgeon, pediatric endocrinologist, and psychologist.

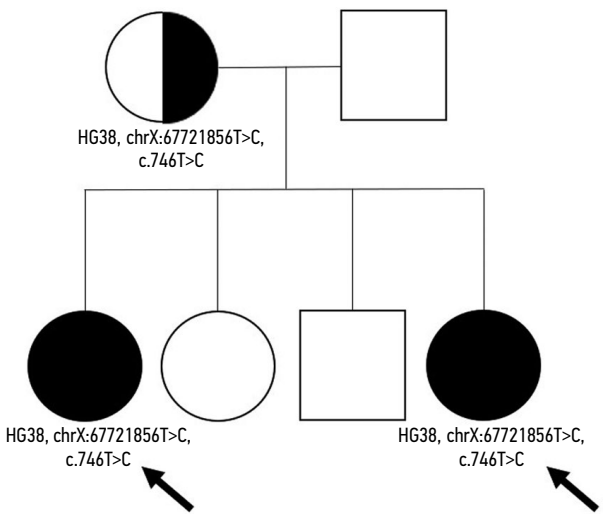

Fig. 2. Genealogic tree of the patients.
Рис. 2. Генеалогическое дерево пациентов.

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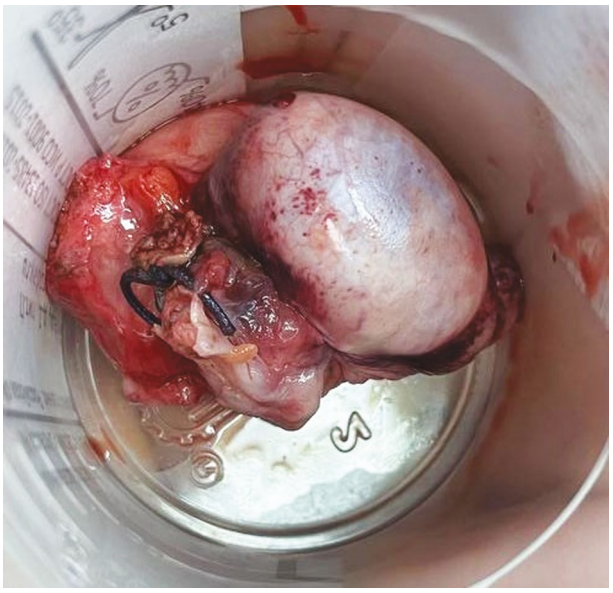

Fig. 3. Gross specimen of the testes.
Рис. 3. Макропрепарат тестикул.

Case report No. 2

A 6-year 10-month-old girl was admitted to the surgical department of a city children's hospital for hernioplasty for bilateral inguinal hernia.

Medical history. The child was born of the fourth pregnancy, which was complicated by an acute respiratory infection of unspecified etiology in the mother. The mother's first pregnancy resulted in the birth of a girl with Morris syndrome (diagnosed concurrently); the second, a healthy boy (11 years 9 months old); the third, a healthy girl (9 years 7 months old). The fourth delivery was full-term and spontaneous. Birth weight was 3200 g, length 54 cm, Apgar score 8/9. In early childhood, the patient had rickets. Currently, she is growing and developing according to her age, fully vaccinated, and is under follow-up by an orthopedic traumatologist with a diagnosis of «poor posture.»

History of present illness. Since early childhood, the patient had been under follow-up by a pediatric urologist for bilateral inguinal hernia. Elective surgery was performed on July 6, 2022. During the operation, testes were found within the hernia sac; biopsy was performed, the testes were repositioned into the abdominal cavity, and bilateral hernioplasty was completed. Histological examination of the superficial biopsy revealed only tunica albuginea without gonadal tissue. In light of these histology findings and similar results obtained from a histologic examination of the biopsy specimen of the elder sister, further evaluation was undertaken. Pelvic ultrasound revealed a vaginal remnant in the form of a fibrous band measuring 1.6 × 0.6 cm and absence of the cervix and uterus. Testicular dimensions were measured as follows: right testis 2.2 × 1.5 × 1.7 cm, without follicular apparatus; left testis 2.3 × 1.6 × 1.9 cm, without follicular apparatus. The patient was discharged for outpatient follow-up and referred to a geneticist for karyotyping; based on the karyotype results, a second-stage surgery—gonadectomy—was planned.

Physical examination. Height 119 cm (–0.25 SDS), weight 20.0 kg (–0.68 SDS), BMI 14.12 (–0.85 SDS). The general condition was satisfactory; the girl shows interest in drawing, is learning to read and write, and demonstrates normal intellectual development. Asthenic body type, sluggish. Signs of connective tissue dysplasia (elbow joint hyperextension) were noted. According to a pediatric endocrinologist, pubertal development was Tanner: pub I, external genitalia were female in appearance.

Karyotyping on August 30, 2022, showed 46,XY, interpreted by the geneticist as a balanced male karyotype with sex reversal. On October 21, 2022, sequencing was performed at the Medical Genetic Center of St. Petersburg using the Illumina platform with paired-end sequencing (2 × 150 bp). The average coverage depth was 277.53×, with 99.96% of targeted nucleotides covered at >10× depth. A previously unreported hemizygous *AR* gene variant was identified in exon 7: HG38, chrX: 67721856T>C, c.746T>C, resulting in an amino acid substitution (p.Met249Thr) with a coverage depth of 147×. This variant is located in a conserved region. Laboratory evaluation of hormonal activity revealed the following: anti-Müllerian hormone 116 ng/mL (<8.9), inhibin B 228.5 pg/mL (<83.0), FSH 2.7 mIU/mL (0.95–11.95), and testosterone 0.6 nmol/L (0.36–1.54). Bone age based on wrist joints radiographs corresponded to age 6 years. Sanger sequencing confirmed that the variant was inherited from the mother. Thus, androgen insensitivity syndrome with 46,XY, AR c.746T>C (p.Met249Thr) was diagnosed.

On January 18, 2023, with parental consent, bilateral laparoscopic gonadectomy with subsequent hernioplasty was performed as planned. The child was discharged under outpatient follow-up by a pediatric endocrinologist, pediatric surgeon, and psychologist.

DISCUSSION

Complete androgen insensitivity is more commonly diagnosed in cases with a positive family history, and less frequently during prenatal karyotyping of a fetus with a female phenotype, in girls with inguinal hernias, or in adolescent girls presenting with primary amenorrhea [3, 14, 15]. The endocrine profile of patients is altered, and the degree of alteration depends on the level of androgen insensitivity. An elevated or normal basal serum testosterone concentration is typically observed, along with high levels of luteinizing hormone [3]. This reflects impaired negative feedback regulation between androgens and the anterior pituitary. During puberty, an increase in testosterone levels is observed due to luteinizing hormone stimulation of steroid production by Leydig cells [16]. In the presented cases,

the first patient, aged 14 years at the time of examination, had a serum testosterone concentration 1.5 times above the reference values and was 2.3 nmol/L, whereas the 6-year-10-month-old patient, who had not yet entered puberty, showed testosterone levels within the normal range.

Inhibin B, synthesized by Sertoli cells in the seminiferous tubules of the testes and in ovarian follicles, regulates FSH secretion [15]. The elevated levels of inhibin B detected in both patients indicate preserved hormonal regulatory and spermatogenic functions of testicular tissue. In patients with CAIS, FSH levels do not exceed reference values because gonadal inhibin regulates FSH biosynthesis [3]. In both cases presented, FSH concentrations were within the normal range.

In response to FSH stimulation, Sertoli cells synthesize anti-Müllerian hormone, which induces regression of Müllerian duct derivatives in males [16]. Elevated anti-Müllerian hormone levels in both cases indicate absence of development of functional female reproductive organ.

The prevalence of inguinal hernia in the pediatric population is approximately 1–4%, with a 10 : 1 male-to-female ratio; the presence of inguinal hernia in phenotypic girls—especially bilateral hernia—represents an important diagnostic clue [17]. Upon such findings, prior to deciding on hernioplasty, additional routine examinations such as pelvic ultrasound or magnetic resonance imaging of the pelvic organs and hernia contents should be performed. If necessary, karyotyping or gonadal biopsy with subsequent histological analysis should also be conducted [18].

Management of patients with Morris syndrome involves addressing medical, social, and gender-related issues and requires a multidisciplinary approach [14, 19]. Surgeons are often the first to suspect or discover testicular tissue within a hernial sac, particularly in cases with insufficient preoperative evaluation [20]. When determining the true karyotype to guide therapeutic decision-making, several factors must be considered. On the one hand, the patient's age is important, as the endogenous hormonal milieu has a beneficial effect on the development of secondary sex characteristics [21]. On the other hand, the ectopic position of the testes increases the risk of malignancy, providing a rationale for surgical intervention [14, 22]. It should be noted that in early childhood and before puberty, the risk of tumor transformation is approximately 0.8%–2.0% [23, 24], but it increases with age, reaching up to 33% by 55 years [10]. In patients with CAIS, delaying orchiectomy until late adolescence allows for the development of a female phenotype and increased muscle mass through aromatization of androgens to estrogens [14, 22, 24]. After gonadectomy, patients require estrogen replacement therapy to induce or maintain pubertal development [12, 14]. In addition, estrogen therapy helps prevent osteoporosis [19]. In patients with PAIS or MAIS, gonadectomy and genital reconstructive surgery should be performed before puberty due to the high likelihood of virilization. Combined with psychological support, this approach helps avoid or minimize psychosomatic disorders [10, 14].

In the present cases, treatment strategies were guided not only by medical but also psychosocial considerations. On the one hand, performing gonadectomy during reproductive system development (case 1) or before puberty (case 2) may cause a number of complications described above. However, in the first case, timely removal of the gonads reduced virilization. On the other hand, to induce female puberty postoperatively, estrogen replacement therapy was initiated under the supervision of a pediatric endocrinologist.

CONCLUSION

Physicians should maintain a high index of suspicion when diagnosing bilateral inguinal hernia in girls. Particular emphasis should be placed on the roles of neonatologists, pediatricians, and pediatric surgeons. When planning preoperative evaluation, it is important to clarify the likely contents of the hernia sacs; if there is uncertainty, imaging of the pelvic organs should be performed to determine both the hernia contents and, when risk factors are present, the anatomy of the reproductive system. Suspected androgen insensitivity syndrome requires genetic confirmation. Decisions regarding the timing of surgical intervention should be based not only on clinical indications but also on the role of estrogens in the child's development. Patients with Morris syndrome require a comprehensive multidisciplinary approach to treatment and rehabilitation.

ADDITIONAL INFO

Authors' contribution: M.M. Al-Hares, V.Yu. Tamaev: supervision and surgical treatment of the patient, preparation and writing of the article; G.A. Mikhailov, I.A. Lisitsa: collection and analysis of literary sources, writing and editing of the article; A.N. Zavyalova: advisory assistance, literature review, editing the article; O.V. Lisovskii, D.O. Ivanov: development of the concept and structure of the article, text editing, final editing of the article. All authors have approved the publication version and also agreed to be responsible for all aspects of the each part of the work and ensured reliable consideration of the issues related to the accuracy and integrity.

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ДОПОЛНИТЕЛЬНАЯ ИНФОРМАЦИЯ

Вклад авторов. М.М. Аль-Харес, В.Ю. Тамаев — курация и хирургическое лечение пациентов, подготовка и написание текста статьи; Г.А. Михайлов, И.А. Лисица — сбор и анализ литературных источников, написание текста и редактирование статьи; А.Н. Завьялова — консультативная помощь, обзор литературы, редактирование статьи; О.В. Лисовский, Д.О. Иванов — разработка концепции и структуры статьи, анализ данных, окончательное редактирование статьи. Авторы одобрили версию для публикации, а также согласились нести ответственность за все аспекты работы, гарантируя надлежащее рассмотрение и решение вопросов, связанных с точностью и добросовестностью любой ее части.

Согласие на публикацию. Авторы получили письменное информированное добровольное согласие законных представителей пациента на публикацию персональных данных, в том числе фотографий, в научном журнале, включая его электронную версию. Объем публикуемых данных с законными представителями пациента согласован.

Источники финансирования. Отсутствуют.

Раскрытие интересов. Авторы заявляют об отсутствии отношений, деятельности и интересов за последние три года, связанных с третьими лицами (коммерческими и некоммерческими), интересы которых могут быть затронуты содержанием статьи.

Оригинальность. При создании настоящей работы авторы не использовали ранее опубликованные сведения (текст, иллюстрации, данные).

Доступ к данным. Все данные, полученные в настоящем исследовании, доступны в статье.

Генеративный искусственный интеллект. При создании настоящей статьи технологии генеративного искусственного интеллекта не использовали.

Рассмотрение и рецензирование. Настоящая работа подана в журнал в инициативном порядке и рассмотрена по обычной процедуре. В рецензировании участвовали два внешних рецензента: член редакционной коллегии и приглашенный редакцией специалист по теме статьи.

REFERENCES | СПИСОК ЛИТЕРАТУРЫ

1. Liu Q, Yin X, Li P. Clinical, hormonal and genetic characteristics of androgen insensitivity syndrome in 39 Chinese patients. *Reprod Biol Endocrinol*. 2020;18(1):34. doi: 10.1186/s12958-020-00593-0

2. Lanciotti L, Cofini M, Leonardi A, et al. Different clinical presentations and management in complete androgen insensitivity syndrome (CAIS). *Int J Environ Res Public Health*. 2019;16(7):1268. doi: 10.3390/ijerph16071268

3. Batista RL, Costa EMF, Rodrigues AS, et al. Androgen insensitivity syndrome: a review. *Arch Endocrinol Metab*. 2018;62(2):227–235. doi: 10.20945/2359-3997000000031

4. Kumar A, Sharma R, Faruq M, et al. Clinical, biochemical, and molecular characterization of Indian children with clinically suspected androgen insensitivity syndrome. *Sex Dev*. 2022;16(1):34–45. doi: 10.1159/000519047

5. Akcay T, Fernandez-Cancio M, Turan S, et al. *AR* and *SRD5A2* gene mutations in a series of 51 Turkish 46,XY DSD children with a clinical diagnosis of androgen insensitivity. *Andrology*. 2014;2(4):572–578. doi: 10.1111/j.2047-2927.2014.00215.x

6. Acién P, Acién M. Disorders of sex development: Classification, review, and impact on fertility. *J Clin Med*. 2020;9(11):3555. doi: 10.3390/jcm9113555

7. Damirov MM, Anchabadze IV, Medvedev AA, Eremenko MA. Clinical case of the complete form of androgen insensitivity syndrome (AIS). *Russian Sklifosovsky Journal "Emergency Medical Care"*. 2023;12(2):327–332. doi: 10.23934/2223-9022-2023-12-2-327-332 EDN: KNSDWM

8. Zheng GY, Chu GM, Li PP, He R. Phenotype and genetic characteristics in 20 Chinese patients with 46,XY disorders of sex development. *J Endocrinol Invest*. 2023;46(8):1613–1622. doi: 10.1007/s40618-023-02020-8

9. Shrestha A, Thapa A, Bohara K, Simkhada S. Complete androgen insensitivity syndrome diagnosed after inguinal surgery in era of modern technology: a case report. *Ann Med Surg (Lond)*. 2023;86(1):548–551. doi: 10.1097/MS9.0000000000001521

10. Tayts AN, Belozerov KE, Guslistova AV, Omelchuk KL. Tactics of androgen resistance syndrome management in the Russian Federation and a modern view of the problems of gender differentiation disorder. *Pediatria n.a. G.N. Speransky*. 2020;99(2):83–87. doi: 10.24110/0031-403X-2020-99-3-83-87 EDN: QDJMDO

11. Morris JM. The syndrome of testicular feminization in male pseudohermaphrodites. *Am J Obstet Gynecol*. 1953;65(6):1192–1211. doi: 10.1016/0002-9378(53)90359-7

12. Adamyan LV, Sibirskaya EV, Sharkov SM, et al. Difficulties in diagnosing disorders of sexual development. *Russian Journal of Pediatric Surgery*. 2019;23(1):44–47. doi: 10.18821/1560-9510-2019-23-1-44-47 EDN: YZRXXV

13. Kristesashvili J, Kobaladze L, Chipashvili M, Jibladze A. Sex assignment and psychosexual peculiarities of individuals with different forms of androgen insensitivity syndrome: A qualitative study. *Int J Reprod Biomed*. 2024;21(12):985–994. doi: 10.18502/ijrm.v21i12.15036

14. Hughes IA, Davies JD, Bunch TI, et al. Androgen insensitivity syndrome. *Lancet*. 2012;380(9851):1419–1428. doi: 10.1016/S0140-6736(12)60071-3

15. Starostina EA, Frolkova NV, Seidova SM, et al. Androgen insensitivity syndrome: preventive gonadectomy, pros and cons. *Obesity and metabolism*. 2024;21(1):85–91. doi: 10.14341/omet13024 EDN: OZRFUU

16. Galani A, Kitsiou-Tzeli S, Sofokleous C, et al. Androgen insensitivity syndrome: clinical features and molecular defects. *Hormones (Athens)*. 2008;7(3):217–229. doi: 10.14310/horm.2002.1201

17. Matalka L, Dean SJ, Beauchamp G, Sunil B. An early case of complete androgen insensitivity syndrome. *J Investig Med High Impact Case Rep*. 2023;11:23247096231157918. doi: 10.1177/23247096231157918
18. Farah S, El Masri D, Hirbli K. Complete androgen insensitivity syndrome in a 13-year-old Lebanese child, reared as female, with bilateral inguinal hernia: a case report. *J Med Case Rep*. 2021;15(1):202. doi: 10.1186/s13256-021-02738-0
19. Gallardo-Durán KG, De la Fuente-Cortez BE, Villarreal-Benavides TC, Garcia-Vielma C. Complete androgen insensitivity syndrome: diagnosis and multidisciplinary management. *Rev Med Inst Mex Seguro Soc*. 2023;61(1):117–122. (In Spanish)
20. Gavrilyuk VP, Kostin SV, Statina MI, et al. Syndrome of complete insensitivity to androgens of the 4-years-old child. *Russian Journal of Pediatric Surgery, Anesthesia and Intensive Care*. 2020;10(1):89–94. doi: 10.17816/psaic566 EDN: UBGMQI
21. Cools M, Wolffenbuttel KP, Hersmus R, et al. Malignant testicular germ cell tumors in postpubertal individuals with androgen insensitivity: prevalence, pathology and relevance of single nucleotide polymorphism-based susceptibility profiling. *Hum Reprod*. 2017;32(12):2561–2573. doi: 10.1093/humrep/dex300
22. Cools M, Drop SL, Wolffenbuttel KP, et al. Germ cell tumors in the intersex gonad: old paths, new directions, moving frontiers. *Endocr Rev*. 2006;27(5):468–484. doi: 10.1210/er.2006-0005
23. Hannema SE, Scott IS, Rajpert-De Meyts E, et al. Testicular development in the complete androgen insensitivity syndrome. *J Pathol*. 2006;208(4):518–527. doi: 10.1002/path.1890
24. Weidler EM, Linnaus ME, Baratz AB, et al. A management protocol for gonad preservation in patients with androgen insensitivity syndrome. *J Pediatr Adolesc Gynecol*. 2019;32(6):605–611. doi: 10.1016/j.jpag.2019.06.005

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