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Modern Approach to The Diagnosis and Treatment of Cryptharchism in Children

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Abstract: Cryptorchidism (from Greek "kryptos" - hidden, "orchis" - testicle) is a congenital anomaly in which the testicle is not lowered into the scrotum and is in its normal descent path or in an ectopic position. This is one of the most common congenital malformations of the genitourinary system in boys, occurring with a frequency of 1-3% among full-term newborns and up to 30% among premature infants.

Keywords: Cryptorchidism, Congenital Developmental Disorders of The Genitourinary System, Boys

Introduction

Cryptorchidism has important clinical significance not only as a cosmetic problem but also as a risk factor for serious complications. The unimposed testis is exposed to a higher temperature (1-2°C higher than in the scrotum), which leads to disruption of spermatogenesis and degeneration of the germinal epithelium. According to literature, cryptorchidism is the cause of infertility in 10-15% of male infertility cases and significantly increases the risk of developing testicular tumors by 4-8 times [2, 3].

The modern approach to diagnosing and treating cryptorchidism has undergone significant changes in the last two decades due to the development of new diagnostic methods, improvement of surgical techniques, and the introduction of minimally invasive approaches. Timely and correct diagnosis and adequate treatment at optimal times (up to 12-18 months of life) allow preventing irreversible changes in the testicular tissue and preserving its function.

This section is devoted to the analysis of modern approaches to the diagnosis and treatment of cryptorchidism in children, including clinical, instrumental, laboratory diagnostic methods, conservative and surgical treatment methods, as well as the prevention of complications.

Cryptorchidism remains a pressing problem in pediatric surgery and urology for several reasons:

1. High prevalence: According to various authors, cryptorchidism occurs in 1-3% of full-term newborns, 12-45% of premature infants, and 0.7-1% of boys by 1 year of life. This makes it one of the most common congenital anomalies of the urogenital system in boys [4].
2. Risk of irreversible damage to the testis: The germinal epithelium of the testis begins to degenerate as early as 6-12 months of age in cryptorchidism. Histological studies show that after 2 years of life, irreversible changes occur in the form of hyalinosis of the seminal tubules and fibrosis of the interstitium, which cannot be restored even after surgical correction [5].
3. Increased risk of malignancy: An unleashed testis has a 4-8 times higher risk of developing germinal tumors, including seminoma, nonseminoma, dysgerminoma, and other malignant neoplasms. The risk exists even after successful orchidopexy, although it decreases [6].
4. Reproductive function: Cryptorchidism is one of the leading causes of azoospermia and oligospermia in the etiology of male infertility. In bilateral cryptorchidism, the risk of infertility reaches 50-80%, even with timely surgical correction [7].
5. Psychological problems: The presence of cryptorchidism, especially if it remains untreated during school age, can lead to psychological problems, including inferiority complexes, disruption of self-esteem, and social maladjustment [8].
6. The necessity of differential diagnosis: It is important to distinguish true cryptorchidism from retroperitoneal testicle (hyperactive cremaster syndrome), as the latter can normally descend into the scrotum and does not require surgical treatment. Incorrect diagnosis can lead to both unjustified surgeries

and missing true cryptorchidism [9].

7. Evolution of surgical techniques: Over the past 10-15 years, there has been significant improvement in surgical techniques, including the introduction of laparoscopic and robotic approaches, which has reduced the trauma of operations and improved treatment outcomes, especially in high cryptorchidism [10].

Normally, the testis descends from the retroperitoneal space at the level of the kidney (8-10 weeks of intrauterine development) through the inguinal canal (10-12 weeks) to the scrotum (12 weeks of intrauterine development). Complete falling of the testis is completed by 35-36 weeks of gestation, therefore, cryptorchidism is much more common in premature infants.

Urological practice, despite its seeming routine nature, carries many potential risks of serious complications. The modern urologist and pediatrician daily encounters the need for palpatory examination of the genitals, the use of various diagnostic methods, work with patients of different age groups, and family problems of fertility, which creates prerequisites for the emergence of critical situations requiring emergency intervention.

According to international statistics, the frequency of cryptorchidism in newborns ranges from 0.7% to 4.0% of cases per 1000 newborns. Palpable forms are the most common - up to 80-90% of all cases, unpalpable intraabdominal cryptorchidism occurs in 10-20% of cases. Particular danger is posed by bilateral forms, in which mortality (in the sense of reproductive function loss) without adequate treatment can reach 75%.

The specifics of pediatric urology create unique conditions for the development of irreversible changes in the testicular tissue. A high level of parental anxiety, low awareness of the need for screening, delays in diagnosis and treatment, the need to use various imaging methods - all these factors can trigger the decompensation of normal testicular development or the development of irreversible morphological changes.

The primary care physician (pediatrician) often turns out to be the first medical worker to recognize cryptorchidism and refer the patient for specialized treatment. Limited decision-making time (critical window - first 6-12 months of life) requires a doctor to have deep knowledge of embryology, anatomy, and modern diagnostic methods.

According to the current legislation, every doctor, regardless of their specialty, is obligated to identify cryptorchidism when examining children. Failure to fulfill this obligation can lead to serious legal consequences, including criminal liability for omitting a diagnosis. At the same time, a correct and timely diagnosis and prescribed adequate treatment within the doctor's competence is legally justified and protected. International standards for medical education provide for the mandatory training of doctors in the diagnosis and treatment of cryptorchidism. Continuing medical education programs include regular updating of knowledge on diagnostic methods (physical examination, ultrasound, MRI), current recommendations for hormonal therapy and surgical treatment. Hormonal therapy (chorionic gonadotropin, GnRH) has limited effectiveness (15-30% for true cryptorchidism) and can be considered as an option for retroperitoneal testicles or as an alternative in certain cases, however, it is not a method of choice for true cryptorchidism. Orchidopexy remains the gold standard for treating true and unpalpable cryptorchidism, with high success (95-99%) and low risk of complications (0.5-2% testicular atrophy, 1-5% recurrence) when performed by an experienced surgeon. Minimally invasive methods (laparoscopic, robot-assisted orchidopexy) show promising results and allow for a reduction in surgical trauma, however, require special training from a surgeon and are not available everywhere. Two-stage orchidopexy is indicated for high intraabdominal cryptorchidism, when it is impossible to reach the scrotum with a single-stage operation, and involves microvascular extension of the spermatic cord.

Conclusion

Thus, cryptorchidism is a pressing problem in pediatric surgery and urology, occurring in 1-3% of full-term and up to 30% of premature newborns, with a high risk of irreversible complications in late diagnosis and treatment. Differential diagnosis between true cryptorchidism and retroperitoneal testicle is of fundamental importance for determining treatment tactics, as retroperitoneal testicle does not require surgical intervention, while true cryptorchidism requires active treatment. Clinical examination remains the primary and most important diagnostic method for cryptorchidism, allowing for the determination of the location of the testis and its palpability, but should be supplemented by instrumental

methods. Ultrasound examination is the primary method for confirming the diagnosis and location of the testis in palpable cryptorchidism (sensitivity 95-100%), while MRI is indicated for non-palpable cryptorchidism to determine the exact location of the testis. The optimal treatment period is up to 18 months of life (according to modern EAU and AAP recommendations), preferably up to 12 months, as the germinal epithelium of the testis begins to degenerate irreversibly after 6-12 months in cryptorchidism.

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