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Cryptorchidism and Reproductive Health: Childhood Issues and their Future Impact

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Abstract: The frequency of occurrence of cryptorchidism in children is presented. The main methods of diagnostics and treatment of the congenital pathology are considered first of all ultrasound examination, its reliability reaching 88% with palpable testes. Currently, there are about 250 methods of surgical treatment of organ anomalies. The most widely used techniques are Petriwalsky--Shoemaker and Fowler-Stephens one — or two-step orchidopexy. In some cases, they resort to hormonal therapy using chorionic gonadotropin, less often gonadotropin--releasing hormone, but the effectiveness of this therapy does not exceed 15% and depends on the height of the teste in the inguinal canal. With agenesis (aplasia), the teste is replaced with a silicone implant for a psychological and cosmetic defect. When analyzing the results of the correction of pathology in patients, there is a violation of fertility up to 50%, even with the timely release of the testicles.

Key points: cryptorchidism; violation of the position of the testicle; bringing the testicle down.

Diseases associated with pathology of the inguinal canal more often than other surgical issues in pediatric practice require planned surgical treatment and account for over 33% of cases [1–4]. At the current stage, specialists are improving surgical treatment techniques, aiming to reduce surgical trauma and the number of complication.

Cryptorchidism is a systemic disease, one of the external manifestations of which is a disruption in the process of testicular migration (maldescent) from its original location (mesonephros) to the scrotal cavity. In the ICD-10 classification, cryptorchidism is included under the class of diseases of the genitourinary system, rubric Q53.

This pathology can be diagnosed at any age, occurring in 10–20% of newborns (up to 30% in premature newborns), in 3% of one-year-old children, in 1% of cases during puberty, and in 0.3% of adult men.

Testicular malposition is also associated with pathology of the processus vaginalis of the peritoneum. It is known that the mesenchymal tissue, serving as the source of interstitial tissue, plays an important role in the hormonal regulation and migration of the testis during intrauterine development. Mesenchyme consists of fibroblasts, which subsequently differentiate into Leydig cells. The active production of dehydroepiandrosterone and testosterone by these cells determines the migration of the testis from the abdominal cavity into the scrotum.

The scrotum acts as a thermoregulatory protector for normally positioned testes. It is located away from the body, has thin skin with an absence of subcutaneous fat and an abundance of sweat glands. Due to its elasticity and the presence of the cremasteric reflex, the testes are protected from damaging effects of high temperatures. Therefore, for normal functioning, the testes must be located within the scrotum. Here, the most favorable temperature and conditions are provided for the formation and maturation of spermatozoa and for normal hormonal function.

One of the most important and severe consequences of cryptorchidism is the impairment of germinal function. Histological examination of undescended testes reveals a decrease in the diameter of seminiferous tubules and a reduction in the number of spermatogonia. Such changes are found in 90% of children over the age of 3 years. Even with timely orchidopexy, fertility impairment is noted in 50% of patients with bilateral and in 20% of patients with unilateral cryptorchidism. In a study by F. Hadziselimovic, azoospermia was observed in 89% of untreated children with bilateral cryptorchidism.

At birth, undescended testes contain normal spermatogenic cells. A decline in their number begins at six months of age and worsens depending on the location of the testis—the higher the testis is located, the fewer germ cells it contains. The first sharp decrease occurs by 18 months of age, and by two years, about 40% of undescended testes no longer contain spermatogenic cells. By the age of 3 years, almost 70% of ectopic testes completely lack sperm production, and by adulthood, this figure reaches 100%.

Unilateral cryptorchidism also causes damage to the contralateral testis, leading to its underdevelopment. Fertility decline is observed in 76% of men with a unilateral process. In cases of bilateral intra-abdominal testis location, only 4.1% of adult patients have viable spermatozoa.

The anomaly of testicular descent and differentiation is often considered an isolated pathological process resulting from hormonal and anatomical-mechanical disturbances [20]. It was found that among the main phenotypic features of most children (92%) with this pathology was an asthenic body build. The calculation of the Varga mass-to-height index indicated body mass deficiency in 67% of cases. The patients' skin was thin and easily stretchable (53%), and dolichostenomelia (abnormally long limbs) was noted in 25% of cases.

The morphological picture of the inguinal canal tissues was characterized by a significant increase in immature fibroblast forms and mast cells with an accumulation of glycosaminoglycan granules. Destruction and lysis of fibers were detected in the intercellular structures. Microcirculatory disturbances were evidenced by subendothelial edema, hemorrhages, and vascular congestion.

Testicular microlithiasis was detected in 10.2% of patients with cryptorchidism.

It is known that among untreated children, testicular atrophy occurs in 10–15% of cases, hypoplasia in 40–60%, and malignant transformation of the organ in up to 20%. In cases of bilateral cryptorchidism, infertility is diagnosed in 70% of observations. Other frequent complications of cryptorchidism include hydrocele, torsion, and cancer of undescended testes.

The risk of malignant transformation in patients with cryptorchidism is ten times higher than in men in the general population. Of all detected seminomas, half are diagnosed in undescended testes, particularly in cases of intra-abdominal testicular location. In addition to seminomas, men with cryptorchidism also show a high incidence of choriocarcinomas and teratoblastoma.

Long-term outcomes of surgical treatment show that infertility develops in 50–60% of patients operated on for cryptorchidism after the age of 5 years.

When the testis is located in the inguinal canal, and especially in the abdominal cavity, it is exposed to prolonged high temperatures, to which spermatogenic epithelial cells are highly sensitive. Histological examination of testicular tissue in untreated cryptorchidism reveals changes as early as the first year of life, and by the age of four, extensive collagen deposits are observed in the testes. By six years of age, the pathology becomes even more pronounced: seminiferous tubules are narrowed, the number of spermatogonia is reduced, and significant fibrosis forms around the tubules. At the end of puberty, the testes may retain normal size; however, the majority of spermatogenic epithelium is absent, leading to infertility in most patient.

Since cryptorchidism is an interdisciplinary problem involving a wide range of specialists (surgeons, pediatricians, endocrinologists), the high percentage of delayed referrals of children for surgical treatment is associated with untimely diagnosis and the lack of professional training at the outpatient care stage.

The method of examining and evaluating the patient is chosen based on the patient's age. Newborns and infants are examined in the supine position. Older children may be examined while standing with their legs crossed. During the examination, the inguinal, femoral, pubic areas, perineum, and the opposite side of the scrotum are assessed.

If the testis is found in the inguinal canal, it should be gently moved toward the scrotum. If it is possible to bring the testis down into the scrotal cavity, an attempt should be made to fix it there by moderately pressing the spermatic cord with the edge of the hand to suppress the cremasteric reflex—this helps differentiate between true and retractile forms of cryptorchidism. Palpation movements should be gliding and smooth, directed from top to bottom and from outside inward, along the inguinal canal from the anterior superior iliac spine toward the scrotum.

A retractile testis (false cryptorchidism) is normally descended but rises due to increased reflex activity of the cremaster muscle. Signs of a retractile testis include: when the child is relaxed (especially in a warm bath), the testis is located in the scrotum; the testis can be manually brought down into the scrotum and remain there without tension for some time; and the half of the scrotum on the examined side is well developed. In such cases, several sequential examinations at 2–3 month intervals can help avoid surgical intervention, as the testis may spontaneously descend into its normal position.

Ultrasound, computed tomography (CT), and scintigraphy are used to determine the localization of the testes. Among instrumental methods, ultrasound is the most accessible, with an accuracy of up to 88% for palpable testes.

The absence of testes in the inguinal canals, after excluding ectopic locations, indicates a "non-palpable testis syndrome." This presents the greatest diagnostic challenge, as the location of the organ cannot be determined preoperatively.

Diagnostic laparoscopy is currently the only method that allows confirmation or exclusion of intra-abdominal or inguinal testis location, the determination of their anatomical characteristics, and the diagnosis of an absent testis (monorchism) or absent testes (anorchism).

Assessment of follicle-stimulating hormone (FSH), luteinizing hormone (LH), and testosterone levels does not assist in clarifying the pathology in prepubertal individuals.

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