

THE ROLE OF ANATOMICO-PHYSIOLOGICAL CHANGES IN CRYPTORCHIDISM DEVELOPMENT AND MEASURES OF ITS PREVENTION

Eliava G.G.¹, Kasradze P.A.², Mzhavanadze R.G.³, Balashvili M.I.⁴ (Georgia)

¹Eliava Georgy Grigorievich - Doctor of Biological Sciences, Professor,
DEPARTMENT OF PHARMACY,
GEORGIAN TECHNICAL UNIVERSITY;

²Kasradze Pavel Aleksandrovich - Doctor of Medicine, Head of the Department,
DEPARTMENT OF MEDICAL REHABILITATION AND SPORTS MEDICINE,
ACADEMICIAN N. KIPSHIDZE CENTRAL UNIVERSITY CLINIC;

³Mzhavanadze Rusudan Givievna - Doctor of Medicine, Associate Professor;

⁴Balashvili Mariam Iraklievna - Doctor of Biology, Associate Professor,
DEPARTMENT OF ANATOMY, PHYSIOLOGY, BIOLOGY AND BIOCHEMISTRY,
STATE TEACHING UNIVERSITY OF PHYSICAL EDUCATION AND SPORT OF GEORGIA,
TBILISI, GEORGIA

Abstract: cryptorchidism is a quite wide-spread disease that is testified by statistical data on testicles descent to the scrotum in both prematurely born and mature infants.

Among the reasons of cryptorchidism development are anatomico-physiological peculiarities, which obstruct testicles descent to the scrotum, genital organs anomalies in case of healthy growth of the organism in general, hormonal disorders during antenatal (intra-uterine) period.

A special program of exercise therapy has to be set up in case of different kinds of cryptorchidism in order to avoid deterioration of the conditions.

Anatomico-physiological changes cause statistically the most wide-spread forms of cryptorchidism that has to be taken into account for early diagnosis of cryptorchidism and adoption of appropriate preventive measures.

Keywords: cryptorchidism, reproductive system, intra-uterine development, pathologies, testicles' position.

РОЛЬ АНАТОМО-ФИЗИОЛОГИЧЕСКИХ ИЗМЕНЕНИЙ В РАЗВИТИИ КРИПТОРХИЗМА И МЕРЫ ЕГО ПРЕВЕНЦИИ

Элиава Г.Г.¹, Касрадзе П.А.², Мжаванадзе Р.Г.³, Балашвили М.И.⁴ (Грузия)

¹Элиава Георгий Григорьевич - доктор биологических наук, профессор,
департамент фармации,
Грузинский технический университет;

²Касрадзе Павел Александрович – доктор медицины, профессор, руководитель департамента,
департамент медицинской реабилитации и спортивной медицины,
Центральная университетская клиника им. академика Н. Кипшидзе;

³Мжаванадзе Русудан Гивиевна - доктор медицины, ассоциированный профессор;

⁴Балашвили Мариам Ираклиевна - доктор биологии, ассоциированный профессор,
департамент анатомии, физиологии, биологии и биохимии,
Грузинский государственный учебный университет физического воспитания и спорта,
г. Тбилиси, Грузия

Аннотация: крипторхизм достаточно распространенное заболевание, о чем свидетельствуют статистические данные об опускании яичек в мошонку как у доношенных, так и недоношенных детей.

Причины крипторхизма различны: анатомо-физиологические особенности, мешающие опущению яичек в мошонку, anomalies половых органов в целом при нормальном развитии организма, гормональные нарушения во время внутриутробного развития.

Необходимо разработать специальную программу лечебной физкультуры при разных формах крипторхизма, для того, чтобы предотвратить ухудшение состояния.

Анатомо-физиологические изменения обуславливают статистически чаще всего встречающийся вид крипторхизма, что необходимо учитывать при ранней диагностике крипторхизма и проведении соответствующих превентивных мер.

Ключевые слова: крипторхизм, репродуктивная система, anomalies, внутриутробного развития, расположение яичек.

The issues of cryptorchidism prevention and treatment are one of the most relevant problems of medicine [13, 14].

Lots of factors have an impact on fetus condition and its adequate development [2, 3, 4, 5, 6, 7, 8, 15].

Harmful action of different environmental factors, including chemical and biological factors, development of anomalies during intra-uterine (antenatal) period as well as administration of various pharmaceutical preparations during pregnancy increase the risk of cryptorchidism development [9, 16, 17, 18].

Based on the above mentioned, the task of further study of mechanisms of etiological factors' action and displaying the new risk-factors is set that is important for making contribution in solution of infertility problem and for delivery of newborns without genital organ disorders.

These circumstances will promote an arrival of a new generation with normal reproductive system that is crucial for family strength and life continuation (reproduction).

As is known, cryptorchidism is a condition, when one or both testicles (testis) are not located at their place in the scrotum.

In the intra-uterine period testicles are located in the abdominal cavity of the fetus. Under normal conditions prior to labor takes place descent of testicles to the scrotum and even in case of premature infants, testicles have to be determined (located) in the scrotum at birth or at least in the first days after birth.

According to statistical data, cryptorchidism is a frequent occurrence. Among premature infants, there are 30% of cases of cryptorchidism, while in normal infants only 3% are encountered. But after one-year life, an independent descent of testicles to the scrotum occurs in 75-90% of children. Total frequency of cryptorchidism in one-year age population equals to 1-2%. Bilateral cryptorchidism occurs in 10% of patients [1, 11, 12].

There are different kinds of cryptorchidism.

In case of bilateral cryptorchidism both testicles are located in the abdominal cavity, while during unilateral cryptorchidism takes place a descent of only one testicle to a scrotum. In 50% of cases there is no descent of a right testicle, only 30% of cases fall on the bilateral cryptorchidism and in 20% of cases there is no descent of a left testicle.

During true cryptorchidism a testicle is permanently located in the peritoneum and in case of false cryptorchidism (testis redux) testicles migrate from the scrotum to the abdominal cavity and vice versa. The last type of disease emerges due to injuries and mechanical damages.

There may occur testicular ectopia, when the testicles drop not in the scrotum, but under the skin from the inner side of the thigh [10].

Hormonal disorders of mother's organism occurred during antenatal period of the fetus may be among the reasons of cryptorchidism development [12]. Such descent of testicles doesn't occur due to inguinal canal obstruction in the scrotum that is caused by the pathology of organism's intra-uterine development. Another one group of reasons is represented by abnormalities of genital organs formation in the fetus during normal development of a body in general.

Fetal chromosomal pathology due to some external chemical action or viral disease during the pregnancy (flu, toxoplasmosis, measles or venereal diseases) may be among the reasons.

Cryptorchidism development to a certain extent is influenced by non-narcotic pain relievers (analgesics) administration during a pregnancy. Intake of such non-narcotic pain relievers as Aspirin, Ibuprofen and Paracetamol has been studied.

Investigations showed that simultaneous administration of two medications during a pregnancy increases 16-times a risk of childbirth with cryptorchidism compared to those women who did not take these preparations [19].

Cryptorchidism as one of the symptoms of antenatal development delay is sometimes combined with other congenital anomalies, such as dysplasia of the auricle, abnormal occlusion, thoracic pathology, spinal curvature, umbilical or groin hernia, pathological form of a skull.

The most common is so-called groin form of a cryptorchidism. Gubernaculum testis pathology is considered as one of the reasons of cryptorchidism. It is regarded that the reason of testicle descent below a waist is associated with accelerated growth of a child height compared to visceral organs growth.

Testicle descent is provided by gubernaculum testis, which is located between the lower edge of a testicle and the scrotum. Proceeding from this fact, absence of gubernaculum testis or its congenital abnormality may be one of the reasons of cryptorchidism.

In addition to the reason associated with gubernaculum testis disorder, there are other hypotheses of undescended testicles, as well. Among them are the difference between growth rates of body and spermatic cord, compared to those of gubernaculum testis, increase of intra-abdominal pressure, which expels a testicle and induces its passing through inguinal ring.

Let's consider histological changes in a testicle during cryptorchidism.

The scrotum is a testicle thermal controller and preserves there a temperature 1-1,5°C lesser than body temperature.

Seminiferous epithelium cells are very sensitive to temperature rise. Histological studies have established that during cryptorchidism the substantial changes have been observed even during infant period (first year of a life), and collagen deposition is indicated by the 4th year. Based on this fact, cryptorchidism has to be removed during first year of a life.

By the 6th year, changes become even more evident. That's why, from the standpoint of pediatric surgery, such testicles should be removed. Spermatic ducts are narrowed, a number of spermatogoniums is reduced, and there is an expressed fibrosis around the ducts. After completion of sexual maturation, in case of cryptorchidism, testicles may keep standard sizes, but a major part of seminiferous epithelium is missing. That's why such ill persons are infertile as a rule.

We have to take into account that in roughly 10% of cases, cryptorchidism is combined with primary and secondary hypogonadism [1]. Despite the treatment, spermatogenesis remains diminished in testicles.

Leydig cells are not sensitive to temperature change, so their number doesn't reduce during cryptorchidism. Thus, endocrinal impotence is rare in occurrence in case of this pathology.

Timely diagnostics and treatment of cryptorchidism disease is of great importance for prevention of other illnesses.

Cryptorchidism promotes 20-40 times increase of testicular cancer development risk. Cancer develops in 10% of all cases. The likelihood of cancer development in undescended testicles is four times higher in case of abdominal (intra-abdominal) cryptorchidism, than during of inguinal cryptorchidism.

Fertility disorder takes place during cryptorchidism. In case of bilateral cryptorchidism, fertility is preserved in 30% of cases only. Fertility disorder is more expressed in case of higher position of testicles and during its longer lasting stay outside of the scrotum.

Scrotal hernia is a frequent occurrence during cryptorchidism as well; there is an increased risk of twisted testicles, especially in post-pubertal period.

There is a variety of cryptorchidism, associated with absence of one or two testicles in the scrotum and depended on testicle position. That's why, a distinction is made between intra-abdominal cryptorchidism (in 10% of cases), when a testicle is located in the peritoneum proximally to internal inguinal ring; inguinal cryptorchidism, when a testicle is positioned in inguinal canal, between external and internal inguinal rings; in 5% of cases a testicular ectopia is in evidence, when a testicle is located distally to internal inguinal ring, an ectopic testicle is manifested in the neighborhood of a groin (inguinal ectopia), in the vicinity of perineum, thigh (femoral ectopia), in the neighborhood of root of penis and pubis.

Anorchidism (congenital absence of testicles) is registered in 4% of cases, and false cryptorchidism (testis redux) is in last place; increased reflex of cremaster (a thin muscle which draws up the testicle) takes place in this case. The biggest activity of cremasteric reflex is observed at the ages from 2 to 7 years.

It should be noted that a child mustn't wear Pampers around the clock (within 24 hours). Long-term overheating of infant testicles may cause decrease in fertility (reproductive dysfunction) in the future. Use of Pampers is reasoned when taking a walk, while sleeping, but its round-the-clock use is not appropriate. Elder infants should wear free panties, which don't cause firm adherence of the scrotum to a body.

Preventive measures include serious preparation for future pregnancy, timely recovery from chronic infections, avoidance of stresses and physical loads within the first months of pregnancy, when visceral organs of a fetus start to form, we have to avoid a contact with harmful substances (repair works, involvement in hazardous production), we have to refuse the administration of non-narcotic pain relievers (Aspirin, Ibuprofen and Paracetamol).

There are a cases of acquired cryptorchidism, as well; it may develop as a result of injuries and herniotomy, too.

Thus, since the problem of infertility due to male issues is so acute worldwide, and frequently it is associated with reproductive system disorder in childhood, adoption of preventive measures is so necessary that includes delivery of necessary information in a form acceptable for population; the abovementioned issues have to be taken into account in educational medical programs; broadening of used pharmaceutical preparations spectrum and increased use of nonprescription drugs requires further study of drug action in order to eliminate the risk-factors of cryptorchidism development, associated with the effect of drugs.

References / Список литературы

1. *Eliava G., Mzhavanadze R., Balashvili M.* Genital organs morphology, functions and pathology. Publishing house "Georgika". Tbilisi, 2021. Pp. 57-59 (in Georgian).
2. *Eliava G.G., Tsintsadze T.G., Kasradze P.A., Mzhavanadze R.G., Balashvili M.I., Topuria L.S., Topuria E.S.* The role of anatomico-physiological peculiarities in pathogenetic mechanisms development. LXX International Correspondence Scientific and Practical Conference: "European Research: Innovation in Science, Education and Technology". March 10-11, 2021. London UK. Pp. 43-47.
3. *Eliava G., Mzhavanadze R., Balashvili M.* Urinary system morphology, functions and diseases. Teaching aid for students of medical, physical education and sports specialties. Publishing house "Georgika". Tbilisi, 2020. Pp. 1-121 (in Georgian).
4. *Eliava G., Tsintsadze T., Kasradze P., Mzhavanadze R., Balashvili M., Topuria L., Topuria E.* Mechanisms of electromagnetic radiation curative effect on human organism. Teaching aid for students of medical specialties, Publishing house "Georgika". Tbilisi, 2017. Pp. 1-87 (in Georgian).
5. *Eliava G., Gugeshashvili M., Kobeshavidze D., Khintibidze I., Jashi M.* Peculiarities of cardiovascular system functioning in antenatal and postnatal ontogenesis. Part III. Teaching aid for independent work of students of medical specialties. Publishing house "Georgian Quality Management University", Tbilisi, 2009. Pp. 1-80 (in Georgian).
6. *Eliava G., Tsatava I., Gugeshashvili M., Kobeshavidze D., Khintibidze I.* Peculiarities of cardiovascular system functioning in antenatal and postnatal ontogenesis. Part III. Teaching aid for independent work of students of medical specialties. Publishing house "Georgian Quality Management University". Tbilisi, 2009. Pp. 1-84 (in Georgian).
7. *Eliava G., Tsatava I., Gugeshashvili M., Kobeshavidze D., Khintibidze I.* Peculiarities of cardiovascular system functioning in antenatal and postnatal ontogenesis. Part III. Teaching aid for independent work of students of medical specialties. Publishing house "Georgian Quality Management University". Tbilisi, 2009. Pp. 1-63 (in Georgian).
8. *Eliava G.G., Kharabadze K.M., Shurghaia N.T., Sharashenidze N.D., Berulava L.G.* Effect of pregnant women's breathing passages respiratory irritations on cardiac activity of a fetus. Georgian Medical News. № 10(163), 2008, 17-20 (in Russian).

9. Matrimonial infertility / Under editorship of I.F. Yunda, Kiev, 1999. 516 p. (in Russian).
10. *Bets T.V., Zhukova M.A., Kuraeva T.A.* Morpho-somatic characteristic of children diseased with cryptorchidism and anorchism // *Pediatrics*, 1985. №2. Pp. 34-37 (in Russian).
11. *Vasyukova E.A., Kasatkina E.P., Makarova A.G.* Some medical-biological aspects of cryptorchidism // *Pediatrics*, 1980. № 6. Pp. 16-18 (in Russian).
12. *Karpova I.Yu., Svyazan V.V., Kozulina N.V., Grigoruk E.Kh., Stepanyuk S.F., Zalyaeva R.P.* Cryptorchidism as one of the basic problems of menfolk's reproductive potential decrease (Review) // *Medical almanac*, 2020. № 4(54) (in Russian).
13. *Latyshev O.Yu.* Cryptorchidism: outcomes and prevention. Thesis work.M., 2009. 143p. (in Russian).
14. *Matkovskaia A.N.* The role of family in prevention and treatment of cryptorchidism consequences. *Problems of endocrinology*, 1993. 32(2); 33-36 (in Russian). <http://doi.org/10.14341/probl11970>.
15. *Tkachenko B.I., Brin V.B., Zakharov Yu.M., Nedospasov V.O., Pyatin V.F.* Human physiology. Compendium / Under editorship of B.I. Tkachenko. M.: GEOTAR-Media, 2009. 496 p. ISBN 9978-5-9704-0964-0 (in Russian).
16. *Yusoufov A.A.* Treatment outcomes and rehabilitation of children with cryptorchidism. Diss. of candidate of medical sciences. Tver, 2014, 153 p. (in Russian).
17. *Fry J., Berry H.* Surgical problems in clinical practice. London: Edward Almond, 1987. 79-72.
18. Monarch Disease Ontology release 2018-09-29sonu – 2018-06-29-2018.
19. [Electronic Resource]. URL: <https://medportal.ru/mednovosti/analgetiki-pri-beremennosti-narushayut-razvitie-polovyh-organov-u-synovey/> (date of access: 26.01.2022).