Case Report

Bilateral undescended testes: its embryological and clinical importance

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Abstract

During routine cadaveric dissection of lower abdomen and groin region for first M.B.B.S students in department of anatomy, Shri Bhausaheb Hire Government Medical College, Dhule, a case of bilateral undesended testes was found in formalin fixed male cadaver. Cryptorchidism is a condition in which testes fail to move down to scrotum. In some children testes reach to scrotum but later on rise above, these are known as acquired undescended testes. Although exact cause of undescended testis is not known but failure of formation of androgens is important cause. If both testes are undescended, they may remain immature and results in infertility. Uncorrected cases may develop germ cell tumor.
Keywords: Cryptorchidism, Undescended testis, infertility.

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INTRODUCTION

The testes are male gonads which develop in abdomen and descend along posterior abdominal wall to scrotum through inguinal canal. They usually reach to scrotum before birth. Undescended testes fail to move down to scrotum. In some children testes reach to scrotum but later on rise above, these are known as acquired undescended testes. In some children testes lie in scrotum but can be pulled up in groin by cremasteric muscle in condition of cold, fear or anxiety, these are called as retractile testis. Sometimes there is interruption in the blood supply leading to its atrophy this condition is known as absent testis. Testes completely descent in scrotum in 97% of full term new born. If undescended, they complete their descent in first three months of life. The testicular vessels are given high in abdomen; testis drags its vessels and ductus deferens downward along with its descent. Although exact cause of undescended testis is not known but failure of formation of androgens is important cause. They usually lie along the usual path of descent. If it deviates from its path then the condition is known as ectopic testis.[1] Incidence of cryptorchidism is 30% of premature and 3-4% in full term male babies. Most of the undescended testes descend in scrotum by first year. If both testes are undescended, they may remain immature and results in infertility. Uncorrected cases may develop germ cell tumor. Histological section of undescended testis is normal at birth but at the one year there is atrophy and failure of development.[1]

CASE REPORT

During routine cadaveric dissection of lower abdomen and groin region for first M.B.B.S students in department of anatomy, Shri Bhausaheb Hire Government Medical College, Dhule, a case of bilateral undesended testes was found in formalin fixed male cadaver. For routine dissection of inguinal canal, one incision was taken from anterior superior iliac spine to pubic tubercle. Second incision was a median incision. A transverse section was taken along entire thickness of superficial fascia from anterior superior iliac spine to median plane. Superficial inguinal ring was identified as a triangular aperture in external oblique apponeurosis supereolateral to pubic

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tubercle. The spermatic cord was not found at superficial inguinal ring. Upper six digitations were separated from ribs, the muscle was vertically cut to iliac crest. External oblique was turned forward and internal oblique muscle identified. External oblique apponeurosis was divided vertically lateral to its line of fusion with internal oblique muscle and apponeurosis is turned inferiorly and inguinal ligament is identified between anterior superior iliac spine to pubic tubercle. Testis and epididymis were found on the superior surface of inguinal ligament on both sides. Right testis was smaller and located higher in inguinal canal as compared to left. **(Figure-1)** Body and tail of epididymis are separated from testis. Testis is transversely cut and structures are examined by hand lens. Coverings of spermatic cord are incised and reflected; ductus deferens and blood vessels are identified.

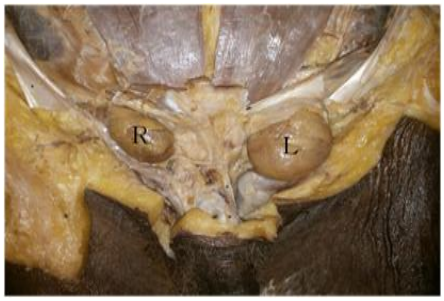

Figure 1: Showing right [R] and left [L] testes in right and left inguinal canal respectively

DISCUSSION

In present case, during cadaveric dissection bilateral undesended testes were found out in a male cadaver. For complete understanding of this condition, embryological study of development and descent of testis is important. Initially gonads appear in the form of pair of longitudinal ridges known as genital ridges which are produced by proliferation of coelomic epithelium over underlying mesenchymal condensation. Primordial germ cells initially appear at the wall of yolk sac and migrate along dorsal mesentry to primitive gonads. The epithelium of genital ridge proliferates and peneterates the underlying mesenchyme to form primitive sex cords. If the genotype of embryo is 44, XY then under influence of SRY (Sex determining region) gene located on short arm of Y chromosome, the primitive sex cords further proliferate and peneterate in medulla of testis or medullary cords. At the hilum, the cords form a network of tubules known as rete testis. Testis later on separated by fibrous membrane from surface epithelium. This fibrous membrane is known as tunica albugenia. Sustentacular cells of Sertoli are derived from surface epithelium. The mesenchyme lying between testis cords gives rise to interstitial cells of Leydig which secrete testosterone by 8th week of gestation. Testis cords get canalized to form seminiferous tubules which join rete testis. Reste testis, in turn, are connected with efferent ductules which links rete testis with ductus deferens.[2]

The descent of testis is associated with following events.

a) Atrophy of mesonephric kidneys along with enlargement of testis results in its downward movement.
b) Mullerian inhibiting substance (MIS) results in atrophy of paramesonephric duct, it helps in transabdominal descent of testis to deep inguinal ring.
c) Processus vaginalis enlarges and guides the testis to scrotum through inguinal canal.

At 26 weeks of gestation testes reach to deep inguinal ring from posterior abdominal wall. This movement of testes is a relative movement results from growth of abdomen. It is associated with enlargement of fetal pelvis and elongation of trunk of embryo. The process of descent of testes is controlled by androgens. The gubernaculum testis helps in formation of the path which is followed by processus vaginalis. Gubernaculum guides the testes to scrotum. Increase in intraabdominal pressure is also responsible for descent of testes. At 26 week testes descent to scrotum from inguinal canal. After complete descent of testes in scrotum, there is contraction of the inguinal canal.[1] Testes completely descent in scrotum in 97% of full term new born. If undescended, they complete their descent in first three months of life. The testicular vessels are give high in abdomen, testis drags its vessels and ductus deferens downward along with its descent.[1] Incidence of cryptorchidism is 30% of premature and 3-4% in full term male babies. Most of the undescended testes descend in scrotum by first year. If both testes are undescended, they may remain immature and results in infertility. Uncorrected cases may develop germ cell tumour. Histological section of undescended testis is normal at birth but at the one year there is atrophy and failure of development.[1] The occurrence of undescended testis is 2.7% -1.8% in full term term neonates which is decreased to 1.2% to 1.8% at one year of age.[3] Undecended testes are more prone for torsion than normally descended testes. Although exact cause of undescended testis is not known but failure of formation of androgens is important cause. They usually lie along the usual path of descent. If it deviates from its path then the condition is known as ectopic testis.[1] During the period of testicular development, if exogenous estrogen is administered to animal then it may lead to undescended testis at birth and small testis and oligospermia in adulthood.[4,5,6] on the basis of research studies, the same is true in human being also.[7,8] There is increase in human exposure to estrogen in last 50 years because of changes

in diet and more fatty body composition.[6] It increases maternal exposure to their own estrogen.[9] There is also increase in exposure of environmental estrogen, in the form of ubiquitous, pollutant chemicals, pesticides and commercial detergents. The reproduction of adult male is predetermined by factors in fetal life and childhood. Therefore there is urgent need to understrand the vulnerability of early developmental process to altered hormonal milieu.[10,11] Werdelin and Nilsonne classified species in which testicles are of following type. 1) Descended and scrotal, like in mammals. 2) Testicles that are descended but ascrotal, like in seals in which testicles are located subcutaneously, and 3) Undescended testicles which are deeply embedded in the body cavity, like in elephants.[12] The traditional interpretation behind testicular descent is that the scrotum provides a cool environment for optimal spermatogenesis.[13] Bedford (1978) explained that the epididymis acts as a site for cold-storage of sperm therefore epididymis is the prime mover for evolution of the scrotum.[14] Some theories explained that lower scrotal temperatures minimize gamete mutation rates[15]. Lower scrotal temperatures and reduced blood flow to the testicles combine to create a environment which is necessary to train or test sperm for a high quality ejaculate[16]. It has been suggested that the scrotum acts as a signaling device for promotion of male social or sexual competition[17]. Production and maintenance of viable sperm require lower testicular temperatures below body temperature.[18,19] Increase in temperature much above 37oC reduces sperm motility.[20] it also adversely affects sperm viability.[22] The skin of the scrotum is thin hence it helps in heat dissipation secondly the scrotal arteries are located adjacent to the veins which help in heat exchange mechanism. Because of these mechanisms, in human beings average scrotal temperatures are 2.5 to 3oC lower than body temperature[21] therefore scrotum provides an optimal environment for spermatogenesis and sperm storage. There are evidences that show that scrotum plays an active thermoregulatory role. When there is increase in temperature testicles descend in scrotum but on other hand when temperatures fall below a certain level then testicles are drawn for heat conservation. The cremasteric reflex mediated by the cremasteric muscle controls this mechanism of testicular ascend and descend.[22] Among the mammals with descended and scrotal testicles one of the important difference between male and female reproductive system is that the female reproductive tract is maintained at body temperature. In addition to chemical features vagina, the rise in temperature is responsible for activation of sperm under laboratory conditions. It is demonstrated that raising the temperature to body temperature (37oC) leads to capacitation of human sperm which were maintained in vitro at 20oC. Raising the temperature of sperm to body temperature results in increase in sperm motility.[23,24] Among mammals with descended scrotal testicles, ejaculation into the female reproductive tract leads to increase in temperature of the ejaculate to body temperature. The rise to body temperature at the time of depositing sperm into the vagina acts as highly appropriate trigger that leads to sperm activation and ensures that a sufficient sperms will be able to pass through the female genital tract to fertilize an egg. Hence, descended scrotal testicles help to prevent premature activation of sperm by keeping testicular temperatures below body temperature.[22] Activation involves: a) glandular activation at the time of ejaculation and b) temperature induced activation when the semen is deposited in female genital tract and subsequent capacitation and hyperactivation that occur when sperm reach the fallopian tube.[22] It is suggested that as increase in temperature increases lipid diffusibility in the sperm plasma membrane, which may increase membrane permeability and membrane-bound enzyme reactions. These reactions are responsible for hyperactivation and acrosome reaction.[22] Shrishailesh.D.M reported a case of testicular torsion in undescended testis in a 21 days old male term infant.[25]

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