THE EPIDIDYMIS AND ITS RELATION TO FERTILITY

THESIS

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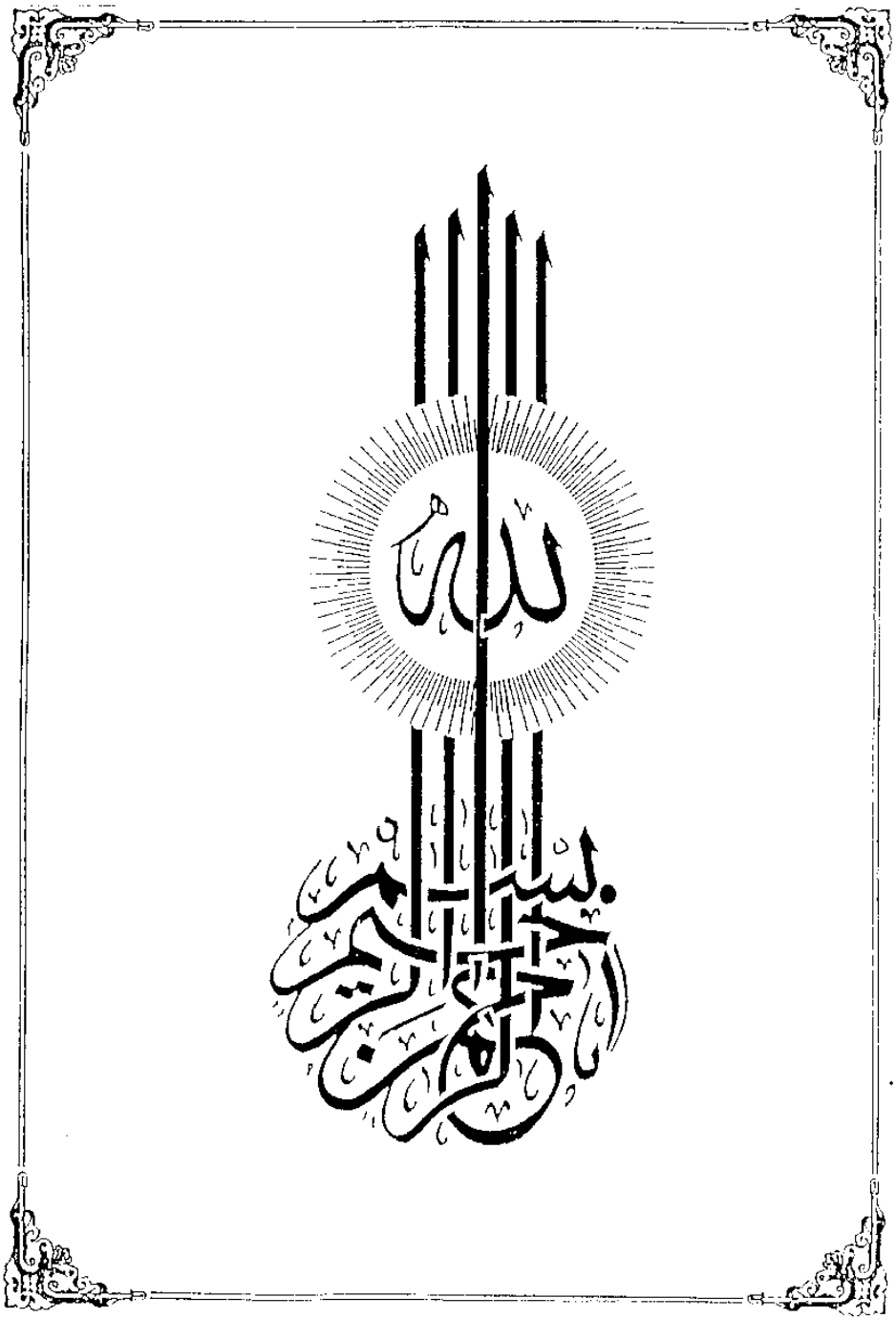

بسم الله الرحمن الرحيم

Dedicated To My Wife

And Children.

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INTRODUCTION

The epididymis has an important function in relation to male fertility. On one hand it is the anatomical pathway for the spermatozoa after leaving the testis and on the other hand it plays an important role through the creation of the suitable microenvironment required for the non fully mature spermatozoa on leaving the testis to become fully mature and capable of fertilization on leaving the epididymis. The creation of this microenvironment is controlled by certain specific factors.

The epididymal function may be impaired by some disorders, some of which are anatomical and the others are pathological.

The epididymis also has drawn attention in the recent years to become a potential site of attack as a male contraceptive.

ANATOMY OF EPIDIDYMIS

I- EMBRYOLOGY OF EPIDIDYMIS

Following fusion of the maternal and paternal gametes, the genotypic sex is determined in which the Y chromosome is present in the cells of the male embryo only.

Male and female embryos pass through a common indifferent or ambisexual phase, in which the two sexes are morphologically identical (Orgebin-Crist, 1981a).

The embryos of both sexes at first possess both mesonephric and paramesonephric ducts, which are arranged in a very definite manner. The mesonephric ducts (Wollfian ducts), communicating directly with the tubules of the mesonephros, lie at first parallel to each other, and at a considerable distance apart. As they pass towards the caudal end of the embryo they approach each other, and each becomes enclosed in a fold of peritoneum called the plica urogenitalis. More caudally, the ducts become closely approximated and finally open into the dorsal aspect of the ventral division of the cloaca (Romanes, 1981). The paramesonephric ducts (Mullerian ducts) develop as thickening of the coelomic epithelium ventral to the mesonephric duct. The epithelial area sinks in forming the Mullerian funnel which then grows caudally as a solid cord, later a duct.

At the lower end of the urogenital ridge, the paramesonephric ducts cross the mesonephric ducts ventrally to meet and fuse in the midline. The fused ducts form the uterovaginal canal which comes in contact with the urogenital sinus causing an elevation of its dorsal wall (the Mullerian tubercle). The mesonephric ducts open in the urogenital sinus on either side of the Mullerian tubercle (Orgebin-Crist, 1981a). She added that the fetal Sertoli cells secrete a distinct factor causing the paramesonephric ducts to regress, while the Leydig cells secrete androgens which preserve and permit the transformation of the mesonephric duct into the epididymis and ductus deferens.

By the third month, the seminiferous tubules of the testis become connected with the mesonephric duct through a fusion of the tubules of the mesonephros (primitive embryonic kidney) adjacent to the gonad with the rete testis. The number of tubules that take part varies considerably, but each forms one of the efferent ductules found in the adult (Romanes, 1981).

The efferent ductules becoming more convoluted where they join the mesonephric duct, form the lobules of the epididymis, while the duct of the epididymis is formed from the cephalic part of the mesonephric duct (Romanes, 1981).

The contorted, folded and tightly packed epididymal duct is encapsulated by an extension of the tunica albuginea of the testis to form the epididymis proper.

The efferent ductules provide the communication between the rete testis and the proximal epididymis. The ductuli aberrantes and the paradidymis are to be looked upon as persistent tubules of a more caudal portion of the mesonephros which have failed to become connected with the tubules of the testis. The appendix of the epididymis represents the more cephalic remnants of the mesonephros and its duct. According to Zondek and Zondek (1980), the epididymis of the neonate is relatively large in comparison to the testis. The size ratio epididymis/testis, changes during later years in favour of the testis, but the final proportion is already reached before puberty.

II- ANATOMY

*** Gross anatomy of the epididymis :**

The epididymis is a comma shaped structure that clasps the posterior margin of the testis and to some extent overlaps the posterior part of its lateral surface.

The upper larger part is the head of the epididymis and overhangs the upper extremity of the testis, to which it is

directly connected by several efferent ductules, by fibro-areolar tissue and by the serous covering of the organ. The inferior and small part is the tail of the epididymis. It is attached by loose areolar tissue and by the serous covering to the lower extremity of the testis.

The intervening body of the epididymis is applied to the posterior part of the lateral surface of the testis, but is separated from it by a slit like recess of their serous covering termed the "sinus of the epididymis" (Romanes, 1981).

The conventional division of the epididymis into caput epididymidis (head), corpus epididymidis (body) and cauda epididymidis (tail) can be made grossly in almost all species. However the exact boundaries of these areas are indistinct and vary from species to another (Turner, 1979).

The appendix of the epididymis is attached to the head of the epididymis, while the ductuli aberrantes and the paradidymis are laying along the posterior margin of the testis. Romanes (1981) reported that the appendix of the testis is sometimes duplicated.

* **Structure of the epididymis :**

The rete testis is connected to the epididymis through 15-20 minute tubules called the efferent ductules of the testis (Romanes, 1981). These efferent ductules pierce the tunica albuginea and enter the head of the epididymis. Each ductule is at first straight but soon becomes much convoluted and forms a little conical mass called "lobule of the epididymis". Within the head of the epididymis, the duct of each lobule opens into the single much convoluted duct which constitutes the chief bulk of the epididymis. This duct of the epididymis which is about 600 cm in length, begins in the head of the epididymis, and ends, after an extraordinarily tortuous course, at the tail by becoming the ductus deferens.

* **Epididymal vascularization :**

1- Arterial supply :

The epididymis is supplied by two vascular pedicles; the spermatic pedicle and the funicular pedicle. The spermatic pedicle is formed of two branches of the spermatic artery. One branch originates in the intra-abdominal segment of the spermatic artery which is further divided into several branches and irrigates the body. The other starts at the level of the inguinal canal and it rapidly divides into two or sometimes into even four branches and supplies the head of the epididymis. Clavert et al. (1981) reviewed that in

the funicular pedicle, two distinct arteries run towards the epididymis; the differential epididymal artery which originates from the iliac artery, then follows the vas deferens and spreads into the tail and the funicular artery which comes from the vesicular artery and supplies the vas and terminates at the level of the tail. The testicular artery before entering into the testis gives off one or two branches into the head of the epididymis and to the neighbouring connective tissue.

The epididymal arteries often communicate with the arteries on the testicular surface. Kormano and Nordmark (1977), reported that the differential epididymal artery has an anastomotic connection with the arteries of the head of the epididymis.

2- Venous drainage :

The testicular veins emerge from the back of the testis and receive tributaries from the epididymis. They unite and form a convoluted plexus, the pampiniform plexus (Goss, 1973).

3- Lymph system :

There is a direct connection between the testis and the epididymis via the lymphatic system. About six to eight