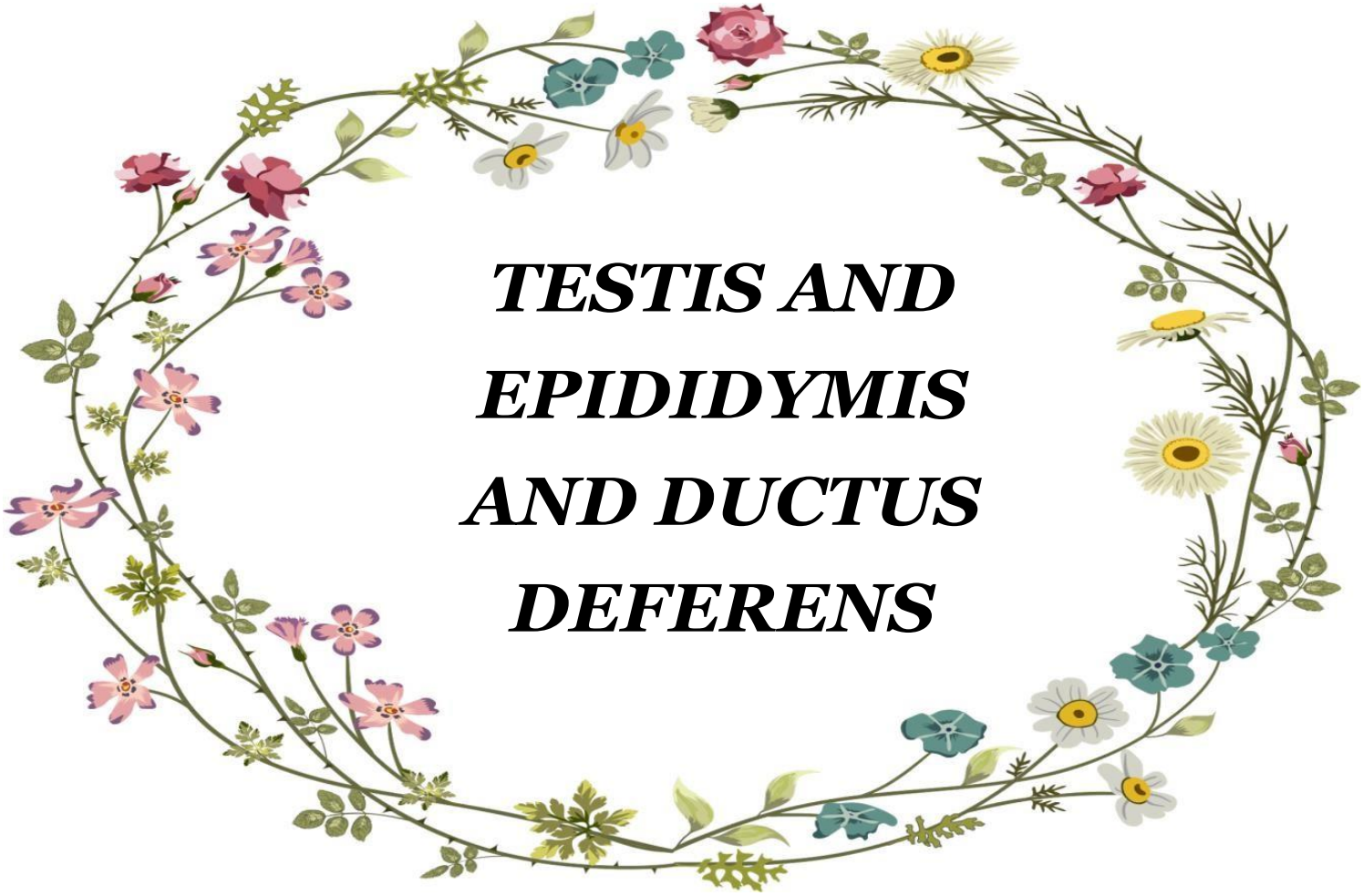
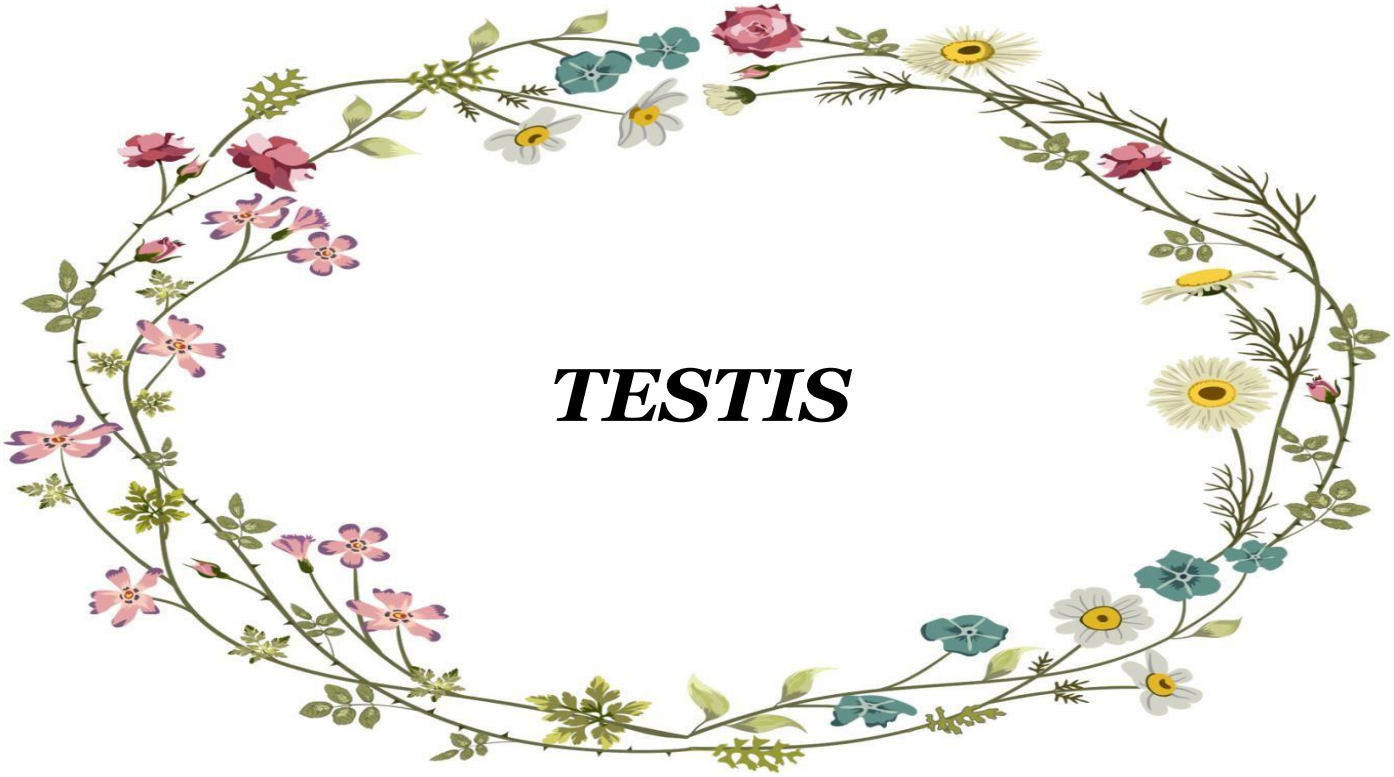


TESTIS AND EPIDIDYMIS AND DUCTUS DEFERENS


TESTIS

I. INTRODUCTION

The testis is the main male genital gland with a heterocrine function. Its exocrine function is the process of spermatogenesis, and its endocrine function consists of secreting testosterone. It is a paired organ situated in the scrotum of the perineum and intimately united to the epididymis forming a morphological and functional unit of the reproductive system.

II. DESCRIPTIVE ANATOMY

A- SITUATION

The testis is situated under the penis outside the abdominal cavity enclosed within the end of an elongated musculofascial pouch continuous, layer by layer, with the anterior abdominal wall. The testis projects into the scrotum of perineum. The left testis is lower down.

B- SHAPE

The testis is an oval organ flattened transversally with a long oblique axis backwards and downwards. It has a firm consistency and is painful when pressed. It has a smooth surface and is bluish-white in colour. The testis has two surfaces, medial and lateral, two borders, anterior and posterior, and two poles, upper and lower.

C- DIMENSIONS

The testis measures four centimetres in length, three centimetres in its anteroposterior diameter and is two centimetres and half wide and weighs twenty grams. Its dimensions increase during the first years of age particularly during puberty.

III. STRUCTURE

A- TUNICA ALBUGINEA

The tunica albuginea is a one millimetre thick unstretchable covering of fibrous tissue. It thickens at the upper part of the posterolateral surface of the testis forming the mediastinum testis. From the latter, incomplete septa radiate towards the rest of the covering. They divide the gland into some four hundred lobules communicating between each other. Each of which contains two to four highly convoluted seminiferous tubules.

B- TUNICA VASCULOSA TESTIS

The tunica vasculosa testis doubles inside the tunica albuginea and extends into the testis itself to line the surfaces of individual septa. It is made of arterial, venous and lymphatic plexi that enter and leave the testis lining its surface inside loose connective tissue.

C- TESTIS PARENCHYMA

The testis parenchyma is made of four hundred lobules. Thus, it contains more than 1000 seminiferous tubules scattered into a connective stroma. They all open into the rete testis.

The rete testis is a network of intercommunicating channels lying in the mediastinum testis.

The vasa efferentia are fifteen to twenty ducts from the rete which enter the commencement of the canal of the epididymis attaching the head of the epididymis to the testis.

Each tubule has a convoluted part and a straight part and is thirty to one hundred and fifty centimetres long and has a diameter of thirty to one hundred and fifty microns.

It shows several layers of cells, the outermost layer consists of spermatogonia then primary and secondary spermatocytes, spermatids and spermatozoa. The sustentacular cells of Sertoli are supporting cells through branching processes embedding the germ cells on a basement membrane. The interstitial cells of Leydig secrete testosterone, the male sex hormone.

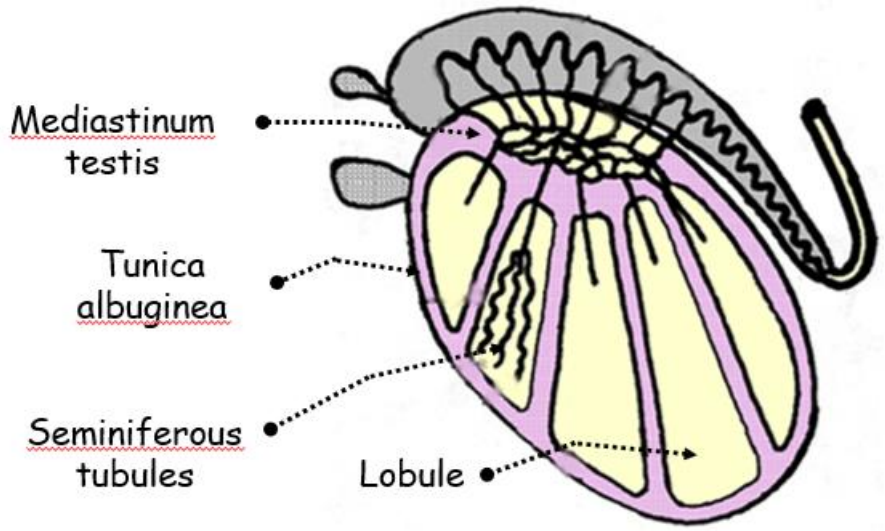


Figure 1: Sagittal section of the testis showing its structure

IV. SUPPORTS

The testes are firmly anchored to the anterior abdominal wall and enclosed in the scrotum. The supports of the testis consist of a layer-by-layer evagination of the anterior abdominal wall and downward prolongations of the coverings of the spermatic cord. (Figure 2)

From depth to surface, the tunica vaginalis is a double-layer serous membrane remnant of the fetal processus vaginalis overlying the front and lateral surfaces of the testis and the head of the epididymis forming the space of tunica vaginalis continuous with the parietal peritoneum. The parietal layer adheres firmly to the rest of the scrotum. The visceral layer is in contact with the testis. The space of the tunica vaginalis contains a recess between the body of the epididymis and the testis, the sinus of the epididymis.

The internal spermatic fascia is an investment derived from the transversalis fascia at the deep inguinal ring.

The cremasteric fascia and cremaster muscle continues the internal oblique and transversus aponeuroses and muscles as the spermatic cord passes through the ring into the inguinal canal.

The external spermatic fascia derives from the crura of the superficial ring made of external oblique aponeurosis.

The scrotum refers to the skin, dartos muscle and subcutaneous tissue enclosing the testes and their supports.

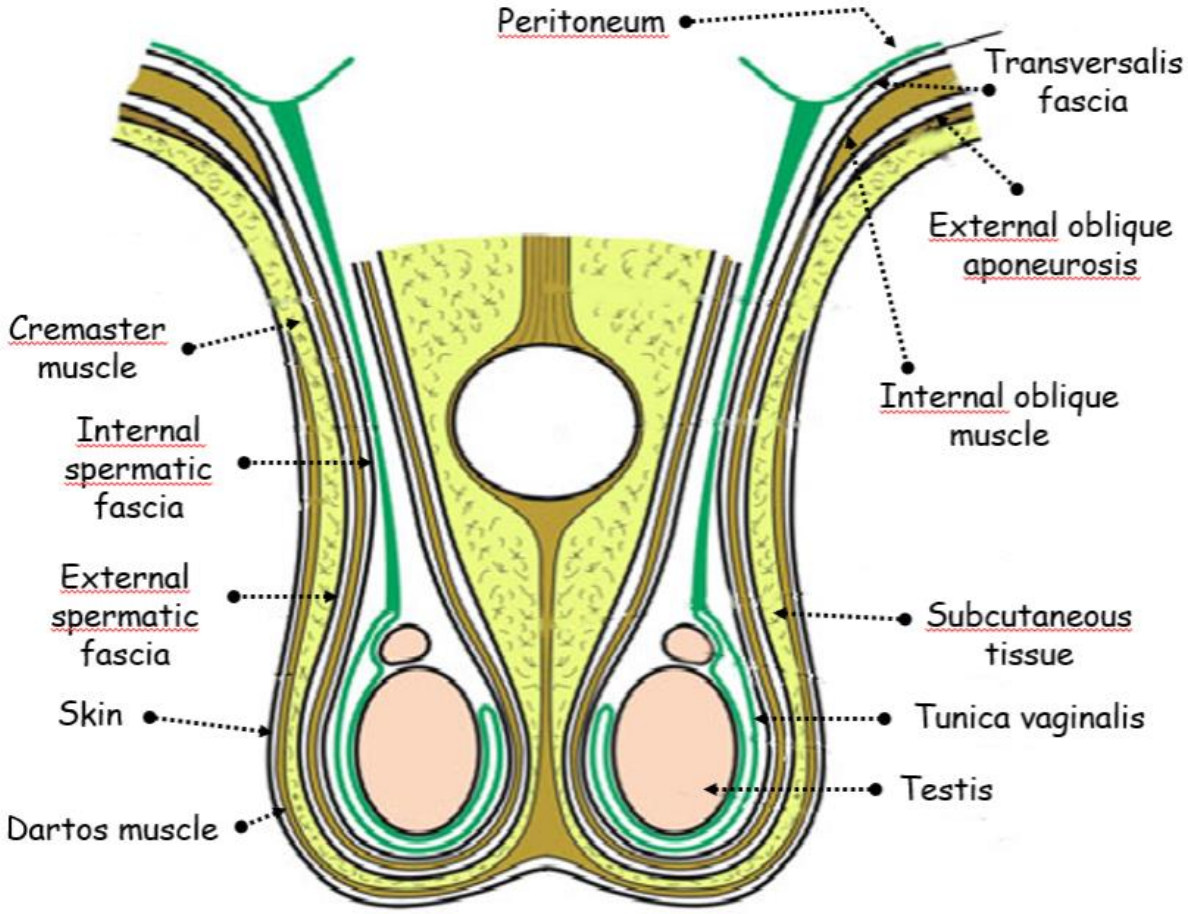


Figure 2: Coronal section of the scrotum and the testes showing their supports

V. ANATOMICAL RELATIONS

A- MEDIAL SURFACE

The medial surface of the testis stands next to the scrotal portion of ductus deferens and the septum of scrotum.

B- LATERAL SURFACE

The lateral surface of the testis is in contact with the epididymis from which it is separated by the sinus of epididymis a narrow slit between epididymis and testis.

C- ANTERIOR BORDER

The anterior border of the testis stands just below the scrotum.

D- POSTERIOR BORDER

The posterior border of the testis is flanked by the crescentic body of the epididymis and the commencement of the spermatic cord and its six constituents.

E- UPPER POLE

In the upper pole of the testis, stands the appendix testis, a sessile cyst of two or three millimetres of diameter. The upper pole of the testis is overlied by fibrous tissue that fixes the head of the epididymis to the mediastinum testis.

F- LOWER POLE

The lower pole of the testis fixes the tail of the epididymis by fibrous tissue.

EPIDIDYMIS AND DUCTUS DEFERENS

I. DESCRIPTIVE ANATOMY

A- EPIDIDYMIS

The epididymis is a single seven metres long tube. It is highly coiled and packed together by fibrous tissue. The result is five centimetres long and one-centimetre-wide mass narrowing from the head that is five millimetres thick to the tail which thickness doesn't exceed three millimetres.

Its upper pole is large and represents the head or globus major.

Its lower pole is small and represents the tail or globus minor flattened sagittally and continuous with ductus deferens.

The body of the epididymis is prismatic and triangular in cut and is applied in a crescentic manner to the posterolateral part of the testis. The epididymis ensures the storage and maturation of spermatozoa and constitutes the commencement of the spermatic tract.

B- DUCTUS DEFERENS

The ductus deferens, also known as the vas, is the direct continuation of the canal of the epididymis at the tail of the epididymis. It is columnar in shape, has a thick wall of smooth muscle and measures forty centimetres in length and two millimetres of internal diameter.

The vas has a firm consistency that can be recognised when palpating the spermatic cord, it is forty centimetres long and two millimetres wide with an internal diameter of half millimetre.

Its course begins inside the scrotum medial to the testis, then, it enters the spermatic cord, passes through the inguinal canal contained in the spermatic cord across the side wall of the pelvis just under peritoneum. It crosses the external iliac vessels in front, curves medially and forwards to cross the ureter in front and, finally, turns downwards approaching its opposite fellow side by side.

The vas dilates in fusiform manner as the ampulla of ductus deferens, a five millimetres wide storehouse of spermatozoa of five millimetres of diameter parallel and medial to seminal vesicle. At this point, it loses its thick muscle wall and merges with the outlet of the seminal vesicle to form the ejaculatory duct inside the prostate.

C- EJACULATORY DUCT

The ejaculatory duct passes obliquely through the prostate alongside the prostatic utricle and opens on the side of the urethral crest. It is two centimetres and half long and two millimetres wide narrowing from its commencement to its end which doesn't exceed half millimetre in its internal diameter.

II. STRUCTURE

A- TUNICA ALBUGINEA

The tunica albuginea of the epididymis is continuous with that of testis. It is thin and made of fibrous tissue.

B- DUCTUS OF THE EPIDIDYMIS

The wall is of thin fibrous tissue and the lining is of tall columnar epithelium with stereocilia.

C- DUCTUS DEFERENS

The ductus deferens has a very thick wall and narrow lumen. Its visceral muscle is arranged in three layers middle circular and inner and outer longitudinal with interweaving of fibres. The lining mucous membrane is a thin layer of dense fibrous tissue, surfaced with tall columnar epithelium with stereocilia. The adventitia of the epididymis is made of loose connective tissue.

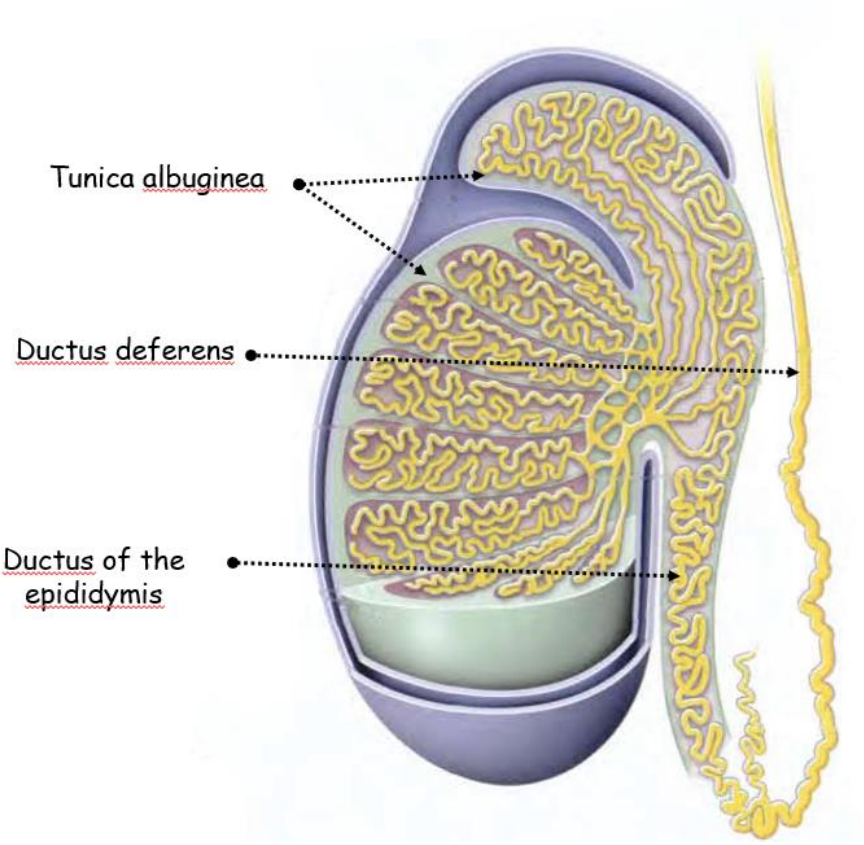


Figure 2: Sagittal section of the epididymis and testis (From KAMINA)

III. SUPPORTS

The spermatic cord suspends the testis and the epididymis to the pelvic cavity through the vas and to the abdominal wall through its three coverings, the internal spermatic fascia, the cremasteric fascia and cremaster muscle and the external spermatic fascia.

It extends from the upper pole of the testis until the deep inguinal ring. It is strictly complete outside the superficial inguinal ring and progressively looses its coverings since they remain evaginations of the anterior abdominal wall.

The spermatic cord contains ductus deferens as the most posterior constituent, testicular, cremasteric and of ductus deferens arteries as the arterial element, pampiniform plexus as the venous element, lymphatics the genital branch of genitofemoral nerve and processus vaginalis as the peritoneal element.

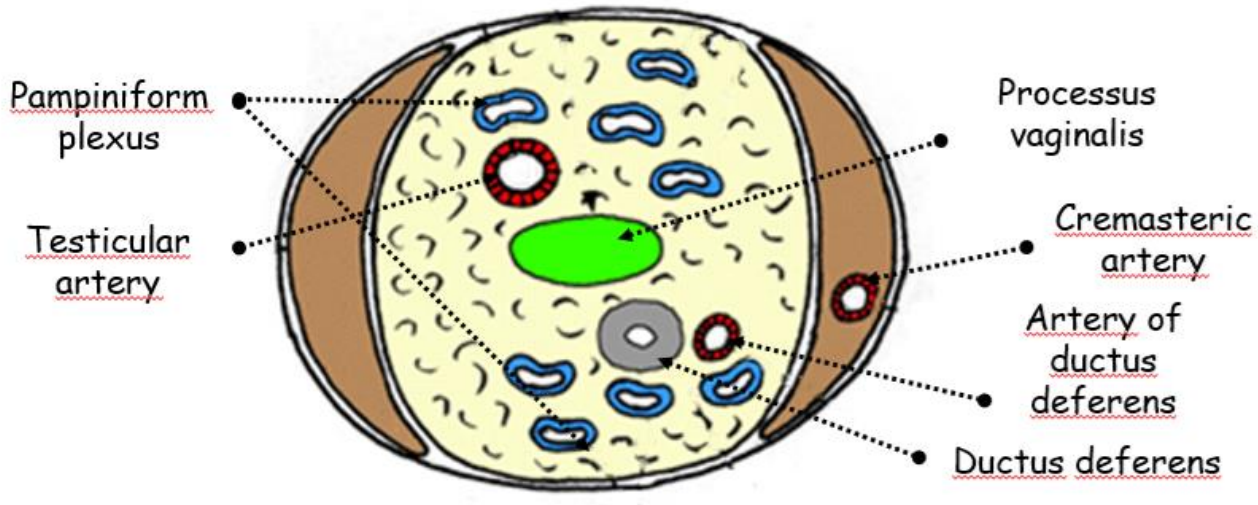


Figure 3: Horizontal section of the spermatic cord

IV. ANATOMICAL RELATIONS

A- EPIDIDYMIS

The head of epididymis is covered by tunica vaginalis and attached to testis by fibrous tissue in its inferior and lateral surfaces. The appendix epididymis is appended to its anterior part.

The body of epididymis is covered by tunica vaginalis in the superior part of its lateral surface. It is separated from the posterolateral part of the testis by the sinus of the epididymis forwards. Ductus deferens and spermatic cord stand towards its medial surface.

The tail of epididymis is covered by tunica vaginalis in its posterolateral part and attached to testis by fibrous tissue in its anterior surface. In its lower pole, it is prolonged by ductus deferens and fixed by fibrous tissue to the tunica vaginalis of testis.

B- DUCTUS DEFERENS

In the scrotum, the ductus deferens stands alongside the posterior border of testis, then the medial surface of epididymis and testis surrounded by genital vessels separated from the body of the epididymis by the posterior venous plexus. It is not covered by the tunica vaginalis of the testis and is in contact with the scrotal septum.

In the spermatic cord, the vas runs as the most posterior element behind all of the remaining constituents of the spermatic cord forwards, the testicular artery, the anterior and posterior pampiniform plexi, testicular lymphatics and nerves.

Its artery, the artery of ductus deferens, is applied against it.

The cremasteric artery is superficial.

In the inguinal canal, the ductus deferens is still surrounded by the genital vessels joined by the genital branches of genitofemoral and ilioinguinal nerves inside the walls of the inguinal canal.

In the iliac fossa, the ductus deferens is covered by the pelvic peritoneum and surrounded by inferior epigastric vessels below, external iliac vessels behind and laterally, obturator pedicle backwards and laterally, inferolateral surfaces of the bladder medially and the umbilical artery and ureter below.

In the pelvic cavity, it is, first, covered by the pelvic peritoneum, then, crosses the retrovesical fascia and runs between the base of bladder forwards and the ureter backwards next to the seminal vesicle laterally and above the base of the prostate.

BLOOD SUPPLY ; LYMPH DRAINAGE AND NERVE SUPPLY OF THE TESTIS AND EPIDIDYMIS AND DUCTUS DEFERENS

I. BLOOD SUPPLY

A- ARTERIES

The testicular artery arises from the aorta towards L2-L3 vertebrae, runs in the spermatic cord and in the scrotum towards the medial surface of the epididymis to which it gives off a branch, and reaches the back of the testis at its upper end. It, then, divides into medial and lateral branches. The latters sweep around horizontally following the axis of the testis within the tunica albuginea and the tunica vasculosa giving branches that penetrate the substance of the organ inside the septa and in the mediastinum testis.

The lateral branch supplies the lower two thirds of the lateral half of the testis.

The medial branch supplies the upper third of the lateral half and the medial half of the testis.

The anterior and posterior arteries of the epididymis may arise from a common trunk. The anterior artery supplies the head of the epididymis when the posterior artery runs along the medial surface of the body of the epididymis and anastomoses with the artery of ductus deferens, it supplies the body and tail of the epididymis.

The testicular artery is subject to many anatomical variations including its origin higher from the aorta or from the renal or suprarenal arteries, its number double or triple and its supply; the arteries of the epididymis can participate to the supply of the testis.

The artery of the ductus deferens arises from the superior or inferior vesical arteries and runs in the lateral ligament of the bladder until the base of the bladder. It, then, accompanies

the ductus deferens and ends at the tail of epididymis anastomosing with testicular and cremasteric arteries.

The cremasteric artery rises from the inferior epigastric artery, crosses the inguinal canal and the spermatic cord and ends at the tail of epididymis anastomosing with the testicular artery and the artery of ductus deferens.

The inferior vesical artery supplies the ampulla of ductus deferens.

B- VEINS

The intraseptal venules of the testis reach the tunica vasculosa testis and the mediastinum testis, from which several veins pass upwards in the spermatic cord and surround the testicular artery with a mass of six to ten intercommunicating veins constituting the pampiniform plexus.

In the inguinal canal, the plexus may have separated out into about four veins which join to form two that leave the deep inguinal ring, perhaps becoming single on psoas major on the posterior abdominal wall, the testicular vein.

The left vein invariably joins the left renal vein and the right is said to drain directly into the inferior vena cava.

They drain the testis and the head and body of the epididymis.

The cremasteric veins are anastomosed veins with the pampiniform plexus at the tail of the epididymis which they drain. They travel the inguinal canal and flow into the inferior epigastric vein.

II. LYMPH DRAINAGE

Lymphatics of testis run back with the testicular artery to para-aortic nodes lying alongside the aorta at the level of origin of the testicular arteries towards L2 vertebra.

Lymphatics of ductus deferens drain into external and internal iliac nodes.

III. NERVES

The sympathetic supply of the testis and spermatic tract is held by T10 segment of the cord through greater or lesser splanchnic nerves to the coeliac ganglion. Postganglionic grey fibres reach the testis along the testicular artery as the testicular plexus. The sensory nerves of the testes follow the same way. The testes have no parasympathetic supply.

IV. SURGICAL APPROACH

The vas is now renamed the ductus deferens. But sterilization of the male by division and ligation of the tube is still popularly known as vasectomy, more accurately, vasotomy and has not yet been dubbed a deferential dochotomy. The spermatic cord containing the firm tubular ductus is palpated between the thumb and fingers at the top of the scrotum and a transverse incision made so that the ductus can be dissected out and a small length of it removed. Each remaining cut end is turned back on itself and ligated and the same procedure is then carried out on the opposite side.

V. CONCLUSION

The testes have a major role in spermatogenesis and thus fertilization. They ensure spermatozoa production and storage. The spermatic tract consists of series of highly coiled tubes straddling the scrotum, the iliac fossa and the pelvis to permit the physiological site of the testes outside the abdominal cavity. Thus, the spermatic tract meets several anatomical relations.