The Anatomical and Physiological aspects of vasectomy

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SUMMARY

The anatomy and physiology of the vas and the physiological changes that occur after vasectomy is discussed.

DEVELOPMENT

The testis develops from the genital ridge of the intermediate cell mass medial to the mesonephros. The primitive germ cells arise from the yolk sac area. They are entodermal in origin and the initial 500-1,000 cells migrate to the genital ridge where they multiply and later form the germ cells.

In the male the medulla which is the inner component of the genital ridge develops to form the testis while the outer cortex is compressed to form the tunica albuginea.

Communication between the testis and the Mesonephric duct which becomes the vas deferens is established by means of the mesonephric tubules which also form part of the epididymis and efferent ductules. The mesonephric duct which first opens in the urogenital sinus is slowly displaced caudal-wards after the development of the ureter to the prostatic part of the urethera. It is then called vas deferens.

VAS DEFERENS

The vas deferens which is developed from the mesonephric duct is the continuation of the duct of the epididymis and extends to the seminal vesicle where it joins the duct of the seminal vesicle to become the ejaculatory duct. It is 45 cm. in length and 2.5 mm. in diameter with a lumen which is 0.5 mm.

It is divided into five portions:–

(1) the tunica vaginalis (epididymal) portion where it runs on the medial side of the epididymis – this part is coiled and the site of the incision should not be near it for it may render re-anastomosis in a later period, if necessary difficult,

(2) the scrotal portion,

(3) the inguinal portion where it runs along the spermatic cord in the posterior part of it and reaches the deep inguinal ring where it bends lateral to the inferior epigastric artery and goes upwards in front of the external iliac artery to form,

(4) the pelvic (retroperitonial) portion. Here it goes backwards and downwards into the lesser pelvis crossing the obliterated umbilical artery, obturator and vesical vessels, the ureter anteriorly and runs medially over the upper end of the Seminal vesicle where it then forms,

(5) the ampullary portion. Histologically it is lined by non-ciliated columnar epithelium lying on a basement membrane. In certain areas in the epididymal portion it contains ciliated epithelium. It is then covered by an outer longitudinal and a thick inner circular muscle fibres. External to this is an areolar coat. The presence of this thick muscle coating aids in the macroscopic identification of the vas during vasectomy with ease.

In vasectomy the portion of the vas that is involved is the scrotal part where it is in the spermatic

cord. To reach the vas here, it has to be dissected from the various layers as follows:– Skin along with the Dartos muscle, membranous part of the superficial fascia (Scarpas fascia), external spermatic fascia, Cremasteric muscle and fascia and the internal spermatic fascia.

These fascial layers are utilised to bury either the testicular (proximal) end or the distal end of the cut vas so as to prevent recanalisation of the cut vas. This interposition of the fascial layer may account for the great effectiveness of vasectomy (Population Report 1973). The vas does not have a separate fascial layer. As mentioned earlier it has an areolar coat.

The vas in the spermatic cord is accompanied by the testicular artery, pampiniform plexus of veins, artery to the vas, Cremasteric artery which is a branch of the epigastric artery, lymphatic vessels, genital branch of the genito femoral nerve and the testicular plexus of the symphathetic nerves. The vas is supplied by the artery to the vas which is a branch of the superior vesical artery. If this artery is avoided during vasectomy, avascular necrosis of the upper and lower stumps is minimal. This helps when reanastomosis is considered later.

PHYSIOLOGY

The vas acts as a conveyor of sperms from the testis. Sperms develop from the seminiferous tubules of the testis through the action of FSH & LH from the Anterior Pituitary. The spermatozoa are propelled along the vas by the secretory pressure and by the contraction of the muscle fibres in the surrounding fascia.

Isolated vas deferens has been shown to demonstrate spontaneous motility. Nor-adrenaline produces vas contractility in vitro experiments (Ventura and associates). Hence it is possible that the sympathetic nervous system may be responsible for the powerful contraction of the vas, in vivo. So during ejaculation co-ordinated contraction of the vas, propel sperms from the epididymis to the urethra by the release of noradrenaline (Hackett and Waterhouse). Hence longitudinal incisions over the vas may prevent severance of the symphathetic nerves.

The sperms from the epidiymis are immature and have limited motility. By the time they reach the ampullary portion of the vas, they attain maturity.

PHYSIOLOGY AFTER VASECTOMY

It takes approximately four to twelve weeks for the sperms to disapper from the semen in most of the patients, but it may take as long as six months (Population Report 1973). Azoospermia has been reported after six ejaculations but most require twelve ejaculations (Freund and Davies).

The vas proximal to the ligation becomes dilated and filled with a milky fluid containing large numbers of live and dead spermatozoa and macrophages. The spermatozoa ingested by the macrophages then degenerates. As a result of this the cells of the epididymis are rich in lipofusion (Phadke).

Due to the obstruction and degeneration of the spermatozoa, some antigenic components are absorbed and transfered to basal capillaries and this may be responsible for the development of antibodies against the sperms.

Sperm agglutinating and sperm immobilizing antibodies have been demonstrated in vasectomised patients (Ansbacher). About 30 – 50 per cent of the vasectomised individuals show these antibodies within a period of six months. The significance of these antibodies is still unknown.

Vasectomy does not change the sexual potency or ejaculation or any change in seminal volume. The endocrine status remains the same. This is supported by the normal plasma testosterone after vasectomy. Moreover there is normal spermatogenesis as shown by testicular biopsy (Hackett & Waterhouse 1973).

Failure to propel sperms and to fertilise an ovum after a successful reanastomosis may be due to the interference of the nerve supply to the vas, as mentioned earlier and to the production of antibodies after vasectomy, although success rate, varies from 30 – 90 per cent.

CONCLUSION

Male sterilization in the future may play a major role in population control. It is becoming impossible to have adequate economic development to keep up to the pace of population growth. So, better understanding of the anatomy and physiology of vasectomy is essential before one ventures into it.

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