Evaluation of High ligation operation in varicocele as regard to semen parameters, testicular functions and postoperative complications

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Abstract

Background: A varicocele is a collection of dilated veins in the pampiniform plexus that drains the testicles and is located in the upper scrotum just above the affected testis. Varicocele is the most common correctable cause of male infertility. A clinical varicocele is observed in 10–20% of the general population, in 35–40% of men with primary infertility and in up to 80% of men with secondary infertility. **Aim of Work:** This study was conducted to evaluate the high ligation operation **(Palomo Technique)** in varicocele as regard to: Semen parameters (volume, concentration, motility and percentage of normal morphology of sperms), serum levels of (LH and FSH) and complications of the procedure. **Patients and Methods:** This clinical study was conducted on forty patients with varicocele in Ain Shams University Hospital from March to October 2017. The indications of surgery were primary varicocele with infertility, chronic scrotal pain or both. **Results:** The average operative time for the first 20 operations was 60 minutes for unilateral operations and 90 minutes for bilateral cases. With increasing familiarity with the technique, there were no recurrence, complete postoperative semen analysis obtained from the 37 patients revealed a significant improvement following the surgery, FSH levels were decreased after surgery than before and testosterone levels increased after surgery indicating significant improvement in testicular functions, but there were no significant differences in baseline LH. **Conclusion:** Varicocelectomy is recommended for all patients with varicocele related scrotal pain and primary infertility with at least abnormality of one semen parameter as regard the count, motility and abnormal forms. Our results point out that high ligation varicocelectomy in the treatment of varicocele is successful in our selected group of patients as there was significant improvement occurred in all semen parameters, also there was neither recurrence nor testicular atrophy postoperatively.

Recommendations: Further studies on a larger scale of patients are needed to confirm the results obtained this work.

Key words: High ligation operation, Varicocele, Semen, Testicular function, Postoperative complications

Introduction

A varicocele is a collection of dilated veins in the pampiniform plexus that drains the testicles and is located in the upper scrotum just above the affected testis. Varicocele is the most common correctable cause of male infertility ***(Ivovic, 2009).***

A clinical varicocele is observed in 10–20% of the general population, in 35–40% of men with primary infertility and in up to 80% of men with secondary infertility (***Schlesinger et al., 1994***). It is the cause of pain in 2–14% of men suffering from chronic scrotal pain ***(Kass et al., 1992)***. The enlargement of veins affects the testicular blood circulation and it is certainly not necessary to have a varicocele on both sides to affect both testicles ***(Ficarra et al., 2004)***.

The adverse effect of varicocele on spermatogenesis can be attributed to many factors such as an increased testicular temperature, increased intratesticular pressure, hypoxia due to attenuation of blood flow, reflux of toxic metabolites and hormonal profile abnormalities ***(Fuzisawa et al., 1989)***.

Physical examination is still the standard diagnostic method for varicocele, but it is usually difficult to estimate the existence of varicocele by use of physical examination alone. Some varicoceles are impalpable and asymptomatic and are diagnosed only with ultrasound evaluation owing to thick scrotal skin and a strong cremasteric reflex ***(Kim et al., 1998).*** The non-palpable enlargement of the venous plexus of the spermatic tone, which is diagnosed only by ultrasound, angiography or any other imaging method, is defined as subclinical varicocele ***(Marsman et al., 1994)***.

Several approaches for the management of clinical varicoceles are being used ***(Barroso et al., 2009).*** These approaches may include retroperitoneal, microsurgical inguinal or subinguinal approaches, laparoscopic repairs or radiographic embolization. Every approach is associated with variable success and complications ***(Simforoosh et al., 2007)***.

Despite extensive information being available on varicocele and many studies on different surgical solutions, the ideal method of varicocele ligation is still a matter of controversy ***(Nyirády et al., 2002)***.

Varicocelectomy by the Palomo technique (high ligation) remains an often used procedure because of the low rates of recurrence, low cost, low rates of testicular atrophy and easy performance. A modified Palomo procedure was developed, which used an inguinal approach with ligation of the vascular pedicle above the vas deferens. This is performed with preservation of the testicular artery and ligation of the testicular vein and lymphatics ***(Barroso et al., 2009).***

Aim of work

This study will be conducted to evaluate the high ligation operation **(Palomo Technique)** in varicocele as regard to: Semen parameters (volume, concentration, motility and percentage of normal morphology of sperms), Serum levels of (LH and FSH) and Complications of the procedure.

Anatomical background

A-Gross anatomy of scrotum and testis:

1-Scrotum

The scrotum is a fibromuscular pouch divided by a median septum (raphe) forming 2 compartments, each of which contains a testis, epididymis and part of the spermatic cord. Layers of the scrotum consist of skin, dartos muscle, external spermatic fascia, cremasteric fascia and internal spermatic fascia, which is in close contact with the parietal layer of the tunica vaginalis ***(Loukas et al., 2010).*** See fig.1.

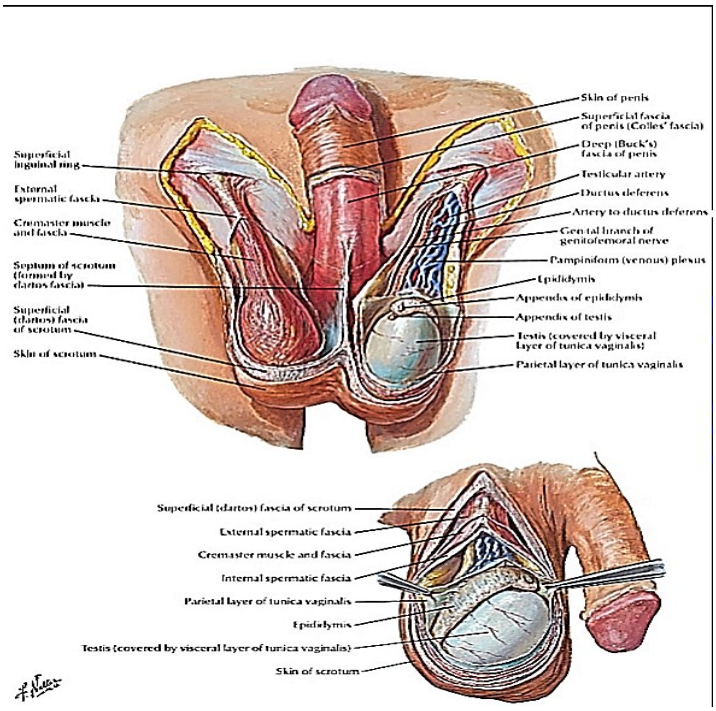

Figure (1): The scrotum, muscle layer and contents. ***(Frank, 2006.)***

The skin and dartos layers of the scrotum are supplied by the perineal branch of the internal pudendal artery in addition to the external pudendal branches of the femoral artery. The layers deep to the dartos muscle are supplied by the cremasteric branch of the inferior epigastric artery. The veins of the scrotum accompany the arteries, eventually draining into the external pudendal vein and subsequently the greater saphenous vein. Lymphatic drainage of the skin of the scrotum is by the external pudendal vessels to the medial superficial inguinal lymph nodes ***(Anson, 1966).***

The scrotum has a rich sensory nerve supply that includes the genital branch of the genitofemoral nerve (anterior and lateral scrotal surfaces), the ilioinguinal nerve (anterior scrotal surface), posterior scrotal branches of the perineal nerve (posterior scrotal surface) and the perineal branch of the posterior femoral cutaneous nerve (inferior scrotal surface) ***(Wein, 2007).***

2-Testes

The testes are the primary male reproductive organ and are responsible for testosterone and sperm production. Each testis is 4-5-cm long, 2-3-cm wide, weighs 10-14 g and is

suspended in the scrotum by the dartos muscle and spermatic cord ***(Anson, 1966).***

Each testis is covered by the tunica vaginalis testis, tunica albuginea and tunica vasculosa. The tunica vaginalis testis is the lower portion of the processus vaginalis and is reflected from the testes on the inner surface of the scrotum, thus forming the visceral and parietal layers. Beneath the visceral layer of the tunica vaginalis is the tunica albuginea, which forms a dense covering for the testes ***(Wein, 2007).***

Internal to the tunica albuginea is the tunica vasculosa, containing a plexus of blood vessels and connective tissue. Bilateral testicular arteries originating from the aorta, just inferior to the renal arteries, provide arterial supply to the testes. The testicular arteries enter the scrotum in the spermatic cord via the inguinal canal and split into two branches at the posterosuperior border of the testis. Additionally, the testes receive blood from the cremasteric branch of the inferior epigastric artery and the artery to the ductus deferens. The pampiniform plexus drains both the testis and epididymis before coalescing to form the testicular vein, usually above the spermatic cord formation at the deep inguinal ring. Lymphatic drainage via the testicular vessels

passes into the abdomen, ending in the lateral aortic and pre-aortic nodes. The tenth and eleventh thoracic spinal nerves supply the testes via the renal and aortic autonomic plexuses. ***(Loukas et al., 2010).*** See fig.2.

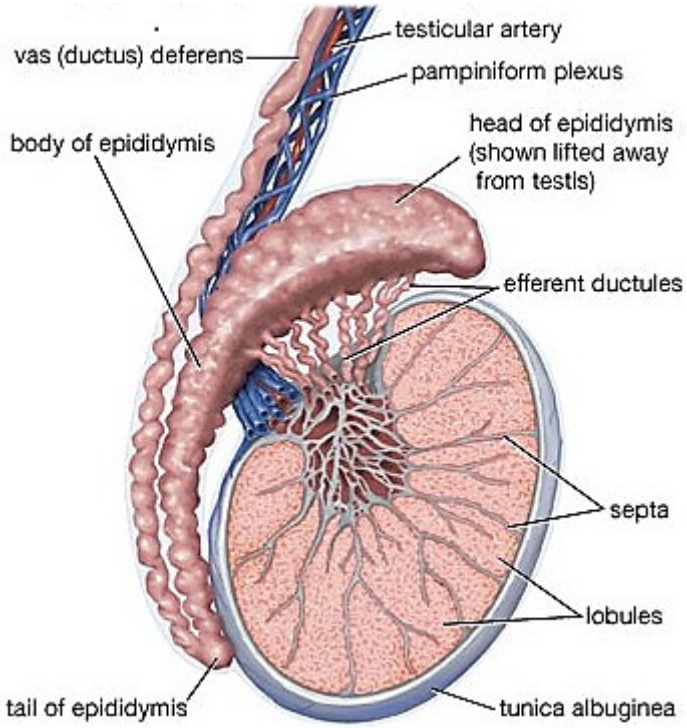

Figure (2): Internal structure of Testis and epididymis. ***(Robert, 2008).***

B- Anatomy of the Spermatic cord:

The spermatic cord: see fig.3.

It is a cord-like collection of structures that pass through the inguinal canal to and from the testis. The contents of the cord are covered with three concentric layers

of fascia derived from the layers of the anterior abdominal wall. The spermatic cord begins at the deep inguinal ring and ends at the testis ***(Loukas et al., 2010***).

Structures in the spermatic cord:

1-The vas deferens:

The vas deferens forms part of the male internal genitalia where it transports sperm from the epididymis to the ejaculatory duct, it is a paired 30-45 cm muscular small caliber tube ***(Loukas et al., 2010).***

2- Blood vessels:

a. Arteries:

- **Internal spermatic artery (testicular artery):** it is a branch of abdominal aorta arising at the level of the second lumbar vertebra.it traverses the retroperitoneum within a bundle of lymphatics and veins medial to the ureters in the abdominal and pelvic cavities before joining the vas deferens to enter the inguinal canal within the spermatic cord ***(Loukas et al., 2010).***
- **External spermatic artery (the cremastric artery):** it is a branch of the inferior epigastric artery and supplies the

fascial coverings of the cord anastomosing with testicular artery ***(Loukas et al., 2010).***

- **Artery of the vas deferens**: it is a branch of the inferior vesical artery from the internal iliac artery accompanies the vas deferens to anastomose with the testicular artery at the testis ***(Loukas et al., 2010).***

b. Venous:

Pampiniform plexus is a network of many small veins found in the human male spermatic cord. It is formed by the union of multiple spermatic veins from the back of the testis and tributaries from the epididymis ***(Robert, 1995).***

The veins of the plexus ascend along the cord in front of the ductus deferens. Below the superficial inguinal ring they unite to form three or four veins, which pass along the inguinal canal, and, entering the abdomen through the deep inguinal ring, coalesce to form two veins. These again unite to form a single vein, the testicular vein, which opens on the right side into the inferior vena cava, at an acute angle, and on the left side into the left renal vein, at a right angle ***(Robert, 1995).***

The pampiniform plexus forms the chief mass of the cord. In addition to its function in venous return from the

testes, the pampiniform plexus also plays a role in the temperature regulation of the testes. It acts as a heat exchanger, cooling blood in adjacent arteries ***(Robert, 1995).***

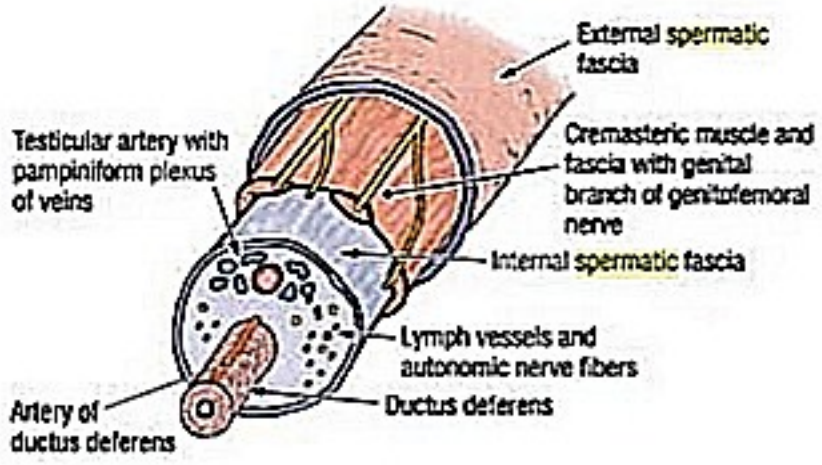

Figure (3): Transverse sector through the spermatic cord. ***(Patrik, 2009.)***

3- Lymph vessels:

Which drain the testis and immediately associated structures but not the scrotal wall. They consist of two sets, superficial and deep, the former starts on the surface of tunica vaginalis, the latter in the epididymis and body of the testis .they form four to eight collecting trunks which ascend with the spermatic veins in the spermatic cord and along the front of psoas major to the level where the spermatic vessels cross the ureter and end in the lateral and preaortic groups of lumbar glands ***(Anson, 1966).***

4- Nerves:

Pelvic autonomic fibers on the ductus deferens the autonomic nerve supply of testis originates from paraaortic ganglia. Main function is the sympathetic innervation of testicular vessels. Ramus genitalis from the genitofemoral nerve originates from the lumbar plexus (L1-2) and passes through the inguinal canal. It supplies the scrotal skin, cremastric muscle and tunica dartos ***(Loukas et al., 2010).***

5- The remains of processus vaginalis:

Is an embryonic developmental out pouching of the peritoneum. It is present within the spermatic cord ***(Loukas et al., 2010).***

Coverings of the spermatic cord:

1. External spermatic fascia: outermost covering of the spermatic cord and testis, it is continuous at the superficial inguinal ring with the deep fascia enveloping the externa abdominal oblique ***(Robert, 1995).***
2. Cremastric fascia and muscle:
    - Intermediate fascial covering of the spermatic cord and testis it is continuous at the "internal inguinal

ring" with the deep fascia enveloping the internal abdominal oblique.

- Ensheaths the cremaster muscle which is derived from the internal abdominal oblique muscle ***(Robert, 1995).***
- Internal spermatic fascia: innermost fascial covering of the spermatic cord and testis, it is continuous with the transversalis fascia at the deep inguinal ring ***(Robert, 1995).***