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Laparoscopic Varicocelectomy: My Personal Experience of 4000 Cases

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Varicocele accounts for 40% of male infertility. Laparoscopic varicocelectomy was used for the treatment of a series of 4000 men. The operation was a high bilateral ligation. The average time for the operation was 1 hour and 15 minutes. There were no complications and patients were discharged on the same day of the operation. Testicular damage from varicocele was permanent, and the usual percentage was 10% of total testicular tissue examined. The surgery was very well accepted by patients. Semen parameters improved among 80% of the patients, with 45% of their wives becoming pregnant. There is clearly a role for video laparoscopic varicocelectomy in the treatment of male infertility.

Key words: Varicocele – Laparoscopic varicocelectomy – Male infertility – Abnormal semen

It is common knowledge that fertility is declining worldwide, with a rate of 25% among couples[1,2]; of that number, the male contribution is conservatively at approximately 45%.[3] While there are multiple causes in the male, one major cause is varicocele, which now cannot be ignored or even brushed off as controversial. In fact, both the American Society for Reproductive Medicine and the American Urological Association have found that varicocele causes infertility.[4] The incidence of varicocele can vary between 19% and 41% (the incidence is more reflective to that of 41%).[5,6]

Varicocele has been shown not to begin at adulthood, but more likely at adolescence or

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childhood. Two large studies by Oster[7] and Steeno *et al*[8] showed the incidence of varicoceles before adulthood at 16.2% and 14.7%, respectively. The term varicocele refers to varicose veins affecting the testicle, when the valves of the veins are incompetent and leaking with backflow.[9] As a result of leakage, there is a backflow of renal blood down these veins. This renal reflux results in toxic damage to both spermatogenesis and male hormone production by the Leydig cell.[10]

Consequently, the testes are damaged in varying progressive stages over time. There is hyperthermia, testicular shrinkage and atrophy, sperm membrane damage, chromosomal breaks, spermatogenic arrest, maturation arrest, Sertoli cell destruction, and germinal epithelial sloughing. Male hormone production also declines, which affects health, and accelerates andropause. In its earlier subclinical stages, varicocele is diagnosed by Doppler ultrasound, whereas in its later more advanced clinical stages, the swollen veins become palpable. The condition is bilateral, but may appear to manifest unilaterally.

When medically indicated for clinically significant varicoceles, many treatment options have been used over time.[11] On the whole, the treatment for the varicocele is surgical by occlusion of the testicular veins. The previous common approach is the inguinal route, but there is a 40% recurrence rate.[12] Scrotal varicocelectomy is not practiced because of its poor smaller vessels and poor results. Thus, a high peritoneal varicocelectomy approach through the abdomen is more effective because there are fewer and larger varicose veins.[13,14]

Methods

Patients

This study involved 4000 laparoscopic varicocelectomies for infertility from 1995[15] to 2015. Their ages ranged from 26 and 68 years. The majority were in the age group of 30 to 34 years, with a 3-year history of infertility. These men had semen analysis. Indications for varicocelectomy for these clinically significant varicocele patients are (1) infertility, some of the patients with compromised semen parameters, (2) hypogonadism, (3) testicular hypotrophy, (4) aesthetic issues with large varicose-like veins in scrotum, and (5) scrotal pain. The varicoceles were diagnosed by clinical and Doppler examination.

The technique of laparoscopic varicocelectomy was conducted as follows. Patients were treated as a same-day surgery. General anesthetic was administered in a supine position. Shaving of the abdomen and the scrotum allowed both laparoscopy and testicular biopsy to be performed. The skin of the abdomen and scrotum was scrubbed with an antiseptic solution followed by povidone iodine paint. Sterile drapes were applied.

Technique

Microsurgical testicular biopsy

Using a Zeiss operating microscope, an epidural needle (16 G) biopsy was performed on a left or right scrotal median raphe. This simple atraumatic approach was highly acceptable and without complications. Previously, a 0.5-cm incision had to be made on the scrotum until the tunica albuginea was exposed and incised. The testis was squeezed so that the yellow-colored testicular tissue emerged (known as the seminiferous tubules), which was then cut using a small pair of curved scissors (biopsy specimen). The tissue was immersed in a Bouins solution for histology.

Laparoscopic varicocelectomy

Laparoscopic surgery by the three-port approach proceeded with the creation of a carbon dioxide pneumoperitoneum using a Veress needle inserted through the umbilicus. Three complications may be encountered with the Veress needle inserted:

1. Veress needle point may be extraperitoneal, not having penetrated deeply enough. This can be caused by obesity or very muscular abdominal walls. Another situation that can be encountered is the needle is plunged into either of 2 abdominal columns of tissue that run between the pubis and the umbilicus on each side of the midline, giving the false impression of the presence of extensive intra-abdominal adhesions beneath the umbilicus. The lack of free-flowing CO_2 as shown by the insufflator gauge and failure to show loss of liver dullness were signs indicative of this problem. This was resolved by repeating the procedure, making new punctures at different sites within the umbilicus, until pneumoperitoneum was successfully achieved.
2. The needle seemed to be in the peritoneal cavity, but the CO_2 gas passed intermittently and stopped completely. This was caused by needle tip entrapment in the omentum. Gas collected and appeared as a swelling in the omentum. Total withdrawal and reinsertion of the needle should overcome this problem. The needle tip can also cause a small bleed from trauma to the

omental vessels. A more worrisome complication was hematoma of the mesentery caused by needle puncture. Hematoma could also occur from accidental damage to the blood vessels in the posterior abdominal wall. A patient must be examined for all these complications once the laparoscope is successfully introduced and hemostasis is ensured by cautery or application of pressure over the hematoma.

3. When intestinal adhesions to the abdominal wall were suspected (e.g., evidence of old scars), it was best not to use the Veress needle; instead, a probe with a hypodermic needle attached to a syringe containing saline was used. If fecal material was withdrawn, the operation was abandoned. The patient was given antibiotics and admitted to hospital for observation.

A 20-mL needle syringe containing saline was inserted to test that the needle was in the intraperitoneum before passing CO_2 through the Veress needle. The saline should flow freely and no blood or fecal contents should be withdrawn. The CO_2 supply attached to the Veress needle should flow freely, resulting in abdominal distention, with subsequent loss of liver and splenic dullness. When gas flow stopped, it was an indication that the abdomen was ready for laparoscopy.

A 5-mm trocar was then introduced transumbilically. As it entered the abdominal cavity, gas escapes through the side port, which was kept open during the start of the procedure, followed by a 5-mm laparoscope using a 3-chip video camera clipped onto the eyepiece, allowing a clear view of the abdominal cavity and pelvis. In patients where transumbilical trocar puncture may pose a risk to the intestine, a 2-mm trocar should be used instead, thus minimizing any trauma to the intestine should this occur. A 2-mm laparoscope was inserted into the trocar to view the abdomen. This was a useful procedure to adopt when faced with these circumstances. Two 0.5-cm transverse skin incisions were made over the lateral aspect of the abdomen on both sides of the umbilicus and the 2 trocars would then be introduced.

The testicular vascular bundle of each side was identified. The right bundle was operated on first. The vascular bundle was traced down vertically to its entry into the internal ring and the vas deferens was also noted to emerge from the ring medially and running into the pelvis. These landmarks were always observed before proceeding further. About one-third of the distance up from the internal ring, the parietal peritoneum over the bundle was lifted up with pointed forceps and a 1-cm transverse incision was made. A pair of right-angled pointed hooks was introduced through the lateral portals, and the connective tissue between the vessels was separated by teasing it apart.

First the testicular artery was identified and isolated. It was a pinkish vessel with varying degrees of prominence of pulsation. Unless the artery was isolated and recognized with certainty, the operation did not proceed. The artery was marked with a suture thread underneath it so it would not be mistaken for the testicular veins and be ligated inadvertently. More than 1 artery may be encountered: there may be as many as 3 on each side. Because of tiny branches arising from the main arterial trunk, arterial bleeding can occur that can be quite substantial and pulsatile. This can be stopped by firm pressure with the forceps or with the use of a sponge plug, which creates coagulation and occlusion of the bleeding vessel.

The testicular veins were exposed and clipped in 2 places with very small titanium clips and cut in between to prevent recanalization. Bundles of veins were occluded in this fashion until all were dealt with. Where possible, lymphatic vessels were preserved to reduce the risk of hydrocele formation. After the operation was completed, the small peritoneal incision was sutured. The operation proceeded with the left side in the same manner as with the right side.

On the left side, difficulties were often encountered because of adhesions of the descending colon over the testicular bundle, which prevented access to the vessels until the adhesions were divided, the colon was freed, and the vascular bundle was exposed. The severity of the colon adhesions could vary from minor adhesions that were easily divided and freed to very extensive ones, along the long length of the colon.

Once the surgery was completed, the abdomen was decompressed and reinflated with CO_2 to see if there was bleeding from the operated area. If bleeding was detected, hemostatic sponges were inserted into the wound to stop the bleeding.

At the conclusion of the operation, CO_2 was expelled completely from the abdomen and the lateral abdominal incisions were sutured. The umbilical puncture did not require suturing unless the umbilicus was very shallow.

Follow-Up

Patients recovered in 4 to 6 hours and were discharged from the day surgery ward and re-

Table 1 Semen parameters before and after laparoscopic varicocelectomy

Semen parameters	Varicocelectomy		Patients with improvement, %	Normal values
	Before (mean ±SD)	After (mean ±SD)		
Volume, mL	2.5 ± 1.01	2.9 ± 1.41	77.2	1–5
Density, m/mL	55.4 ± 23.08	72.0 ± 19.06	95.4	>20
Motility, %	51.4 ± 9.01	57.2 ± 9.23	90.9	>40
Morphology, %	6.5 ± 2.83	10.5 ± 3.45	95	>14
HBA, %	69.0 ± 8.27	80.5 ± 9.27	86	>80
S-DNA, %	71.5 ± 7.20	80.0 ± 8.30	100	>70

viewed in the clinic. Patients recovered well and returned to work in 2 to 3 days. Sexual intercourse resumed in 1 to 2 weeks and sports were resumed in 2 to 3 weeks.

The first response to the varicocelectomy was assessed by semen analysis 4 weeks later. During this time, patients were given mesterolone, zinc, vitamin E, and a dietary supplement (Exsativa; Arcopharma, Lugano, Switzerland). In the more severe cases of sperm defects, patients were administered alternating doses of follicle-stimulating hormone 150 IU injections twice weekly and hCG 5000 IU weekly. This was done for a period of 3 months or longer, until improvement occurred, as monitored by semen analysis.

Results

Among the consecutive 4000 patients treated with bilateral laparoscopic varicocelectomy, the duration of the surgery varied between 1 and 2 hours; however, the majority took only 1 hour and 15 minutes. The patients returned home 4 to 6 hours after surgery and were back to work after 2 to 3 days.

Every case of testicular biopsy that was performed showed a certain degree of damage. The extent of damage of the seminiferous tubular elements varied from 1% to 70%. A usual testicular biopsy specimen of a single tan fragment measuring 0.5 cm in maximum diameter consisted of approximately 90 seminiferous tubules. A few of these were completely sclerosed, accounting for less than 10% of the area of testicular tissue in the planes of section examined. The remainder showed a mild degree of peritubular fibrosis/hyaline sclerosis, with disorganization of spermatogenesis and sloughing of spermatogenic epithelium into the lumen. There was no evidence of dysplasia or malignancy. The appearances were consistent with the clinical diagnosis of varicoceles.

Table 1 shows the semen parameters before and after laparoscopic varicocelectomy. The semen volume increased from 2.5 to 2.9 mL. The density also varied from 55.4 to 72.0 m/mL. The motility improved from 51.4% to 57.2%. The morphology also improved from 6.5% to 10.5%. The rates of hyaluronan-binding assay (HBA) and sperm (S)-DNA were equally higher.

On the whole, semen quality improved in 80% of cases, with a pregnancy rate of 45%. These results support the laparoscopic technique for the treatment of varicoceles.

Discussion

A varicocele is a cystic dilation of the pampiniform plexus. It can be divided into large, medium, and small sizes. In its subclinical stages, it can be diagnosed by Doppler examination using a handheld ultrasound Doppler instrument.

Our study showed the feasibility and successful results of treating the varicocele using the video laparoscopic approach because of its bigger vascular vessels. The 4000 patients treated is a large series of cases. The duration of the surgery was 1 hour and 15 minutes for most, for both left and right varicoceles. Each patient also returned home 4 to 6 hours after surgery and to work after 2 to 3 days. The bilateral laparoscopic varicocelectomy is, therefore, an important approach. The surgery time and hospital stay are usually less than that required for open varicocelectomy, which is in agreement with a prospective comparative study between laparoscopic and open techniques.[16]

The technique requires skills and experience. It is a same-day surgery procedure, resulting in rapid recovery, cost savings, and is well accepted by the patient. The important feature of the surgery is the degree of magnification obtained through the video laparoscopy, enabling a complete and thorough bilateral ligation of the testicular veins, without risk

of injury to the testicular artery. Some surgeons have reported using the 2-port laparoscopic technique with comparable recurrence and complication rates, but citing the advantage in terms of operating time and cosmetics, especially in adolescents.[17,18] No morbidity and mortality were encountered in the study, with little likelihood of recurrence of the condition. The semen profile was improved, including a decreased sperm DNA fragmentation rate as observed in a review of varicoceles and DNA fragmentation[19] and successful pregnancy favor this approach as an established, safe, and effective treatment of male infertility.

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