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# Comparison of Outcomes of different Varicocelelectomy Techniques: Open Inguinal, Laparoscopic and Subinguinal Microscopic Varicocelelectomy

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## Abstract

**Background:** Testicular vein dilation and aberrant tortuosity within the cord of sperm is known as Varicocele. In the average adult population, Varicocele affects about 16% of people.

**Aim and objectives:** To evaluate and contrast various approaches to treating primary Varicocele by examining each procedure's results Varicocele in terms of the technique's effectiveness and postoperative outcomes.

**Patients and methods:** In this study, 45 patients with primary Varicocele who were seen at the Al-Hussein and Sayed Galal hospitals of Al-Azhar University were included. They used a computer to classify them randomly. Fifteen patients in Group A undergo open inguinal varicocelelectomy, fifteen in Group B undergo laparoscopic varicocelelectomy, and fifteen in Group C undergo subinguinal microscopic varicocelelectomy.

**Results:** Regarding improvements in the parameters of semen and postoperative problems, the open subinguinal operation and the laparoscopic varicocelelectomy yielded nearly identical postoperative outcomes. The benefits of microsurgical varicocelelectomy as a varicocele treatment include no hydrocele formation, a decreased risk of recurrent Varicocele, and superior sperm motility and count improvement.

**Conclusion:** Treatment for Varicocele The benefits of microsurgical varicocelelectomy include an improved increase in sperm count and motility, no hydrocele formation, and a decreased risk of recurrent Varicocele.

**Keywords:** Varicocelelectomy techniques; Open inguinal; Laparoscopy; Subinguinal microscopic

## 1. Introduction

A testicular vein's abnormal dilatation and tortuosity into the spermatic cord is known as varicocele. Varicocele affects roughly 16% of adults in the general population. About 40% of male patients at infertility clinics have varicoceles, though the precise correlation between them and poor spermatogenesis is unclear. For more than half of the males, correcting the varicocele improved the semen parameter.<sup>1,2</sup>

Using straightforward tools, laparoscopic varicocelelectomy is a form of minimally invasive therapy that is simple to do. Not only is it simple to treat the bilateral varicocele using the same ports, but it is also possible to undertake other treatments, such as orchidopexy and hernia surgery, at the same time. When obesity and recurrent disease are issues, this is the best course of action. Its ability to visualize and magnify the damaged vessels makes it easier to manage them and discover aberrant collateral

channels, one of the leading causes of postoperative recurrence. Laparoscopic varicocelelectomy yields less postoperative morbidity, a shorter recovery period, and a quicker return to regular activities than the open procedure. Consequently, we advise against using the traditional open technique for varicocele ligation instead of the laparoscopic approach.<sup>3</sup>

Patient selection is essential since laparoscopic varicocelelectomy is effective in treating testicular pain. However, it seems that people who present with low-grade varicocele or severe radiating pain are not as likely to profit from this procedure.<sup>4</sup>

Improvements in the parameters of semen and postoperative complications were nearly equal between the open subinguinal operation and the laparoscopic varicocelelectomy. While laparoscopic varicocelelectomy offered the benefit of using fewer analgesics and requiring a shorter hospital stay, open subinguinal operation required less time.

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When laparoscopic instrument availability and expense are obstacles, exposed inguinal (loupe magnified varicocelectomy) is generally a successful surgery.<sup>5</sup>

This study aims to evaluate and compare various approaches to treating primary varicocele while examining each procedure's results. Varicocele in terms of the technique's effectiveness and postoperative outcomes.

## 2. Patients and methods

This study included 45 patients with primary varicocele who were seen at the Al-Hussein and Sayed Galal hospitals of Al-Azhar University. They used a computer to classify them randomly into. Fifteen patients in Group A undergo open inguinal varicocelectomy, fifteen in Group B undergo laparoscopic varicocelectomy, and fifteen in Group C undergo subinguinal microscopic varicocelectomy.

**Inclusion criteria:** Men with primary varicocele (unilateral or bilateral) between 18 and 50 years, indication of surgical intervention were symptomatic (scrotal pain, dragging sensation, primary infertility)

**Exclusion criteria:** Patient age < 18 years and > 50 years, secondary varicocele, recurrence varicocele after operation, and Patient not fit for general anesthesia

The length of the operation, the kind of anesthetic, the learning curve, the need for analgesics during the procedure, the length of hospital stay, any postoperative problems (such as hydrocele or changes in testicular volume), and the improvement of semen parameters.

### Methods

#### Preoperative assessment

Conduct a comprehensive assessment of the Patient's medical history, perform a detailed physical examination, provide standard preoperative tests, and utilize Doppler examination to accurately establish the severity of reflux and varicocele. Before the procedure, all patients in both groups were administered intravenous antibiotics by their caregivers.

#### Operative Management

**Open inguinal Varicocelectomy:** In our study, 15 patients underwent open inguinal varicocelectomy as follows:

Every Patient underwent spinal anesthesia for the surgery. The examiner detected the outside border of the inguinal canal's perimeter by touching it along the cord of sperm while the Patient was lying on their back. A transverse incision measuring 2-3 cm in length was performed directly above the cord, positioned at a level about two finger-widths underneath the external inguinal ring. The Camper's and Scarpa's fascia were separated by electrocautulation. The

cut was made deeper, revealing the spermatic cord. The object was secured using an Alis or Babcock instrument, dissected using a blunt technique, and raised using the index finger.

The protective coating of the cord was incised, the outer layer of the spermatic cord was carefully separated, the internal spermatic fascia and cremasteric muscles were opened, and the enlarged veins of the pampiniform plexus were dissected and securely tied with a 2-0 vicryl suture. For most laparoscopic procedures, we successfully tied off veins ranging from one to three. However, in subinguinal cases, the number of veins ligated varied between two and seven. Carefully dissecting and ligating dilated veins can preserve the arteries and lymphatics. The dermis and outer connective tissue layer were sutured together sequentially.

**Laparoscopic Varicocelectomy:** In our study, another 15 patients underwent laparoscopic varicocelectomy under general anesthesia as follows:

Every Patient who had an endotracheal intubation had general anesthesia administered. To move the colon cephalad, they were put in the Trendelenburg position. Using a transperitoneal technique, a sub-umbilical mini-incision was made to introduce a Veress needle for the first induction of pneumoperitoneum using carbon dioxide insufflation. A safety LO-mm trocar sheath device may be inserted using the same incision once intra-abdominal pressure reaches 14 mmHg. Next, a pressure of 14 mmHg was established. The camera was put through that port, and the viscera and abdominal cavity were examined methodically. In order to prevent damage to the inferior epigastric vessels, Two extra functional ports were implanted at a position just below the navel and to the side of the rectus muscle in the lower quadrants on both the right and left sides, with direct visualization using laparoscopy. The diameter of the left port may measure 5 mm, while the diameter of the correct port may measure 10 mm.

Thoroughly examine the Doom triangle. The major components of the posterior pelvic anatomy that are carefully identified are the vas deferens is, gonadal vessels, and iliac vessels. The posterior peritoneum that covers the spermatic arteries is elevated and incised using laparoscopic forceps, scissors, or electrocautery just above the internal ring. Identification of veins was made straightforward by gently pushing on the ipsilateral hemiscrotum. The vascular pedicle was extracted from the parietal peritoneum after being firmly grasped at a distance of approximately 3 to 5 cm. The testicular vein was surgically isolated and ligated by clipping and dividing it. This was done after separating it from the artery and lymphatic vessels. The clipping was performed approximately 3 to 5 cm away from the more resounding ring of

the inguinal canal.

When hemostasis was ensured, the peritonectomy was left open without closure, and the same process was carried out on the opposing side. Once the varicocele ligation was complete, absorbable sutures were used to seal the trocar site and achieve hemostasis of the abdominal wall prior to trocar removal.

Subinguinal microscopic varicocelectomy:

The external inguinal ring's position is determined. At this level, a 1.5–2 cm skin incision was done following Langer's guidelines. Using electrocautery, the fascias of Camper and Scarpa are opened, allowing for a clear visualization of the spermatic cord and external ring. After inserting two retractors into the incision, cephalad and caudally retracting, the cord of sperm was located, ringed with a Babcock clamp, raised out of the incision, and covered with either a piece of gauze or a non-toothed forceps, then went on to investigate the spermatic cord regarding the existence of extrinsic spermatic veins that pierced the inguinal canal's floor rather than accompanying the cord vessels. After noting the external spermatic veins, 5/0 or 6/0 proline ties were doubly ligated and split. It was noted how many external spermatic veins there were. The operative field had an operating microscope (Leica M690 Heerbrugg, Switzerland). The process's microscopic phase uses an 8-12 power magnification.

Following the identification of the cremasteric artery, the exterior and internal spermatic fasciae and the cremaster are opened, revealing the internal spermatic arteries. In addition to helping to locate the testicular arteries, dripping 2% lidocaine solution on the spermatic cord was found to considerably lessen pain from the wound after surgery. After that, the vas deferens and related arteries are located and protected using a rubber sheet.

The adjoining adventitia and lymphatics are removed from each internal spermatic vein after being separately mobilized. Except for the vassal veins, every vein in the spermatic cord was split and doubly ligated using 6/0 proline ties. The

### 3. Results

Table 1. comparisons between studied groups as regard age of the studied patients.

		GROUPS			STAT. TEST	P-VALUE
		Group A (n=15)	Group B (n=15)	Group C (n=15)		
AGE (YEARS)	Mean±SD	32.9±8.3	31.3±6.1	30.7±5.6	F=0.41	0.661 NS
	Range	20-48	22-43	22-40		

F: F value of ANOVA test. NS: p-value>0.05 is considered non-significant.

Regarding age, There was no discernible disparity of statistical significance (p-value=0.661) between the groups under study. Group A's The age of the individuals ranged from Twenty to forty-eight years old, according to the calculated average age of 32.9±8.3. Group B's The age of the individuals ranged from Twenty-Two to Forty-Three years old, with a calculated average age of 31.3±6.1 years. Group C's age range was Twenty-Two to forty years old, with a mean age of 30.7±5.6 years.

number of external (cremasteric) and interior (spermatic) veins ligated during the dissection was noted. The lymph ducts are counted and kept intact.

The arteries' color, shape, and pulse can be used to identify them. While 1% papaverine or 3% xylocaine irrigation is employed to widen the arteries maximally and aid in their identification, suspected arteries may also be evaluated. Additionally, the quantity of external (cremasteric) and internal spermatic arteries found was counted and classified according to location. The internal spermatic artery was categorized as either independent (no dissection was required to separate the artery from the veins) or found among a complex of veins (artery adherent to two or more minor or medium veins).

The skin and superficial fascia are closed in layers when the process is finished.

Postoperative Follow up

Every Patient had either an open or laparoscopic varicocelectomy, and our results include the outcomes of the postoperative improvement test, as well as a follow-up scrotal ultrasound and semen analysis performed six months later.

Statistical Analysis

The data was analyzed in version 24 of the Statistical Program for Social Science (SPSS). Frequency and percentage were used to express qualitative data. The statistical information was presented as mean±SD. The mean, or average, is the central value—The quotient obtained by dividing the sum of the values by the entire amount of values —of a discrete set of integers. The measure of a set of values' dispersion is called the standard deviation (SD). A low standard deviation (SD) suggests that the values are generally near the set mean. A higher standard deviation indicates the data spread over a broader range. When comparing data normally distributed between more than two groups, a one-way analysis of variance (ANOVA) is utilized. The chi-square test was employed to compare non-parametric data sets.

Table 2. comparisons between studied groups as regard laterality of the studied patients.

LATERALITY	GROUPS	GROUPS						STAT. TEST	P-VALUE
		Group A (n=15)		Group B (n=15)		Group C (n=15)			
Unilateral		9	60%	5	33.3%	9	60%	X <sup>2</sup> =2.84	0.241 NS
	Bilateral	6	40%	10	66.7%	6	40%		

X2: Chi-square test. NS: p-value>0.05 is considered non-significant.

Regarding laterality, There was no discernible disparity of statistical significance (p-value=0.241) between the groups under study. Six patients (40%) and nine unilateral patients (60%) made up group A. There were 10 bilateral patients (66.7%) and 5 unilateral patients (33.3%) in group B. Six patients (40%) and nine unilateral patients (60%) made up group C.

Table 3. contrasts between the study groups with reference to the patients' current symptoms.

PRESENTING SYMPTOMS	GROUPS	GROUPS						STAT. TEST	P-VALUE
		Group A (n=15)		Group B (n=15)		Group C (n=15)			
Pain		5	33.3%	6	40%	5	33.3%	X <sup>2</sup> =1.52	0.822 NS
	Swelling	6	40%	3	20%	5	33.3%		
	Sub-fertility	4	26.7%	6	40%	5	33.3%		

X2: Chi-square test. NS: p-value>0.05 is considered non-significant.

Regarding the presenting symptoms, There was no discernible disparity of statistical significance (p-value=0.822) between the groups under study. Five patients (33.3%) in group A reported pain, six patients (40%) reported edema, and four patients (26.7%) reported subfertility. Six patients (40%) in group B reported pain, three patients (20%) reported edema, and six patients (40%) reported subfertility. Within the C group, five patients (33.3%) reported pain, five (33.3%) reported edema, and five (33.3%) reported subfertility.

Table 4. comparisons between the study groups on the patients' Varicocele grade.

VARICOCELE GRADE	GROUPS	GROUPS						STAT. TEST	P-VALUE
		Group A (n=15)		Group B (n=15)		Group C (n=15)			
Grade II		2	13.3%	3	20%	4	26.7%	X <sup>2</sup> =0.89	0.926 NS
	Grade III	7	46.7%	7	46.7%	6	40%		
	Grade IV	6	40%	5	33.3%	5	33.3%		

X2: Chi-square test. NS: p-value>0.05 is considered non-significant.

Regarding Varicocele grade, There was no discernible disparity of statistical significance (p-value=0.926) between the groups under study. Two grade II patients (13.3%), seven grade III patients (46.7%), and six grade IV patients (40%) were present in group A. Three patients in grade II (20%), seven in grade III (46.7%), and five in grade IV (33.3%) made up group B. Four patients in grade II (26.7%), six in grade III (40%) and five in grade IV (33.3%) comprised group C.

Table 5. comparisons between the groups under study with reference to the patients' post-operative problems.

POST-OPERATIVE COMPLICATIONS	GROUPS	GROUPS						X <sup>2</sup>	P-VALUE
		Group A (n=15)		Group B (n=15)		Group C (n=15)			
Erythema		7	46.7%	0	0%	7	46.7%	10.1	0.006 S
	Infection	2	13.3%	0	0%	1	6.7%		
	Epididymitis	3	20%	2	13.3%	1	6.7%		
	Hydrocele	3	20%	0	0%	0	0%		
	Recurrence	2	13.3%	4	26.7%	0	0%		

S: p-value<0.05 is considered significant. X2: Chi-square test.

NS: p-value>0.05 is considered non-significant.

statistically significant variation in post-operative erythema (p-value=0.006) across the groups under study. Seven patients (46.7%) from group A, 0 patients (0%), and 7 patients (46.7%) from group C experienced it. Regarding post-operative infection, There was no discernible disparity of statistical significance (p-value=0.343) between the groups under study. Two patients (13.3%) from group A, 0 patients (0%), and 1 patient (6.7%) from group C all experienced it. Regarding post-operative epididymitis, There was

no discernible disparity of statistical significance (p-value=0.562) between the groups under study. Three patients (20%) from group A, two patients (13.3%) from group B, and one patient (6.7%) from group C all experienced it. statistically significant variation in post-operative hydrocele (p-value=0.04) across groups under study. Three patients(20%) from group A, zero patients(0%) from group B, and zero patients(0%) from group C experienced it. Regarding post-operative recurrence, there was no statistically significant difference (p-value=0.099) between the groups under study. Two patients (13.3%) from group A, four patients (26.7%) from

group B, and zero patients (0%), from group C experienced it.

*Table 6. contrasts between the groups under study in terms of the patients' operating times.*

		GROUPS			STAT. TEST	P-VALUE
		Group A (n=15)	Group B (n=15)	Group C (n=15)		
OP. TIME (MIN)	Mean±SD	46.3±5.1	26±4.3	46±5.7	F=78.1	< 0.001 HS
	Range	40-60	20-35	40-60		

F: F value of ANOVA test. HS: p-value <0.001 is considered highly significant.

Significant statistical difference (p-value<0.001) in operative time between the groups under study. Group A's operation time ranged from 40 to 60 minutes, with a mean of 46.3±5.1 min. Group B's operative time ranged from 20 to 35 minutes, with a mean of 26±4.3 minutes. Group C's operative time ranged from 40 to 60 minutes, with a mean of 46±5.7 minutes.

#### 4. Discussion

Ali et al.<sup>6</sup> conducted a comparable investigation, comprising 60 patients split into two groups of thirty each, group A having a mean age of 25.3±2.1 and group B having a mean age of 24.4±3.4 (P value 0.593).

The study found no statistically significant differences in the presenting symptoms between the two groups (open, laparoscopic, and sublingual microscopic). Of the group A patients, five reported pain, four reported subfertility, and six reported scrotal swelling. Of the group B patients, six reported pain, three reported subfertility, and six others reported scrotal swelling. Of the group C patients, five reported pain, five reported subfertility, and five more reported scrotal swelling. In our study, 100% of patients in both groups complained of pain following surgery.

In this study, the postoperative complications between groups A, B, and C differed significantly (P value 0.006). Among these, there was no significant difference between groups regarding wound infection (two patients in group A, two patients in group B and 1 in group C, P value 0.343"), epididymitis (three patients in group A, two patients in group B and 1 in group C, P value 1.15"), hydrocele There were three individuals in group A, no individuals in group B, and the P value was 0.041. Regarding recurrence, there were two individuals in group A, four in group B, and no individuals in group C, with a P value of 0.099.

A comparable study was conducted by Al-Kandari et al.<sup>7</sup>, comprising 120 individuals who showed a noteworthy distinction in postoperative complications in both open and laparoscopic methods. Fifty-two patients in the surgically performed open group and ten individuals in the laparoscopic group experienced postoperative

hydrocele; recurrence occurred in 7 open group patients and 9 laparoscopic group patients.

Our investigation showed a notable variation in operation time between the two groups. Group A's operation time ranged from 40 to 60 minutes, with a mean of 46.3±5.1 min. Group B's operative time ranged from 20 to 35 minutes, with a mean of 26±4.3 minutes. Group C's operative time ranged from 40 to 60 minutes, with a mean of 46 minutes and a P value of greater than 0.001

However, another investigation carried out in 2009 by Shamsa et al.<sup>8</sup> revealed that, under general anesthesia, the mean operating times for laparoscopies were 30.0±5.5 minutes, and for open varicocelectomies, they were 27.0±3.5 minutes.

The varicocelectomy techniques employed have no bearing whatsoever on the course of the treatment. Thus, employing any of these techniques can enhance patients' post-operative conditions, enhance their ability to conceive, and lessen surgical problems.<sup>9</sup>

The postoperative hospital stay in our study revealed a significant difference (p-value<0.001) between the two groups in terms of hospital stay. Within group A, 15 patients (93.3%) spent a day in the hospital, while 1 (6.7%) did not remain. Twelve patients (80%) in group B did not require hospitalization, whereas three (30%) spent one day there. In group C, 15 patients (93.3%) spent one day in the hospital, while 1 (6.7%) did not stay there.

We conducted postoperative test improvement for patients in both groups (Scrotal U/S and Semen analysis), and there was no statistically significant difference (p-value=0.128) in test improvement between the examined groups. Eight patients (53.3%) in Group A, eleven patients (73.3%) in Group B, and thirteen patients (86.7%) in Group C showed improvement on tests.

#### 4. Conclusion

Management of varicocele Microsurgical varicocelectomy offers several advantages, such as the prevention of hydrocele formation, a lower incidence of recurrent varicocele, and significant enhancements in sperm count and motility.

#### Disclosure

The authors have no financial interest to declare in relation to the content of this article.

#### Authorship

All authors have a substantial contribution to the article

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## Conflicts of interest

There are no conflicts of interest.

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