

# Laparoscopic Versus Inguinal (Ivanissevich) Varicocelectomy

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## ABSTRACT

**Objective:** To compare the postsurgical outcome of laparoscopic and open inguinal varicocelectomy.

**Study Design:** Quasi-experimental study.

**Place and Duration of Study:** Department of Surgery, Liaquat University of Medical and Health Sciences, Jamshoro, from July 2003 to June 2007.

**Methodology:** One hundred seven patients underwent either open inguinal or laparoscopic varicocelectomy. Diagnosis was made by clinical examination and color Doppler scan in doubtful cases. Pre-operative semen analysis was done in all patients. Operative time, postoperative analgesic requirement in number of tablets, hospital stay in days, improvement in semen parameters in subfertile subjects, pain on visual analog score. and postoperative complications were recorded and compared between the two groups.

**Results:** There were 50 patients in each group, with age ranging from 12-50 years (26.9±7.67 in open inguinal and 26.2±7.08 in laparoscopic group). Average operative time was 34.8±7.89 minutes for open inguinal and 43.8±8.95 minutes for laparoscopic group. The analgesic requirement was 16.3±1.58 tablets in the open inguinal and 11.3±2.23 in the laparoscopic group. Postoperative pain was significantly less in the laparoscopic group. There was statistically significant ( $p < 0.001$ ) improvement in sperm count as well as motility in both groups irrespective of procedure.

**Conclusion:** The open inguinal (Ivanissevich) procedure and laparoscopic varicocelectomy had almost equivalent post-operative outcomes regarding improvement in semen parameters and postoperative complications. Open inguinal procedure had a shorter operating time while laparoscopic varicocelectomy had the advantage of less analgesic requirement and short hospital stay. On the whole, open inguinal (loupe magnified) varicocelectomy is an effective procedure where availability and costs of laparoscopic instruments are barriers.

**Key words:** *Varicocele. Inguinal. Laparoscopic. Postsurgical outcome. Varicocelectomy. Ivanissevich procedure.*

## INTRODUCTION

Varicocele is the most common surgically correctable cause of male infertility. The incidence of varicocele is 10-20% in the general population and 35-40% in infertile males.<sup>1</sup> Varicocelectomy as a possible cure for a varicocele causing impaired semen parameters is still the recommended treatment.<sup>2</sup> Repair of varicocele may halt any further damage to testicular function and may result in improved spermatogenesis as well as enhanced Leydig cell function.<sup>3,4</sup> The goal of varicocele surgery is the complete disruption of internal venous drainage of the testis, except the vein of vas deferens, while preserving the internal spermatic arteries, vas deferens, spermatic cord and the lymphatics.

Several methods are used, differing primarily in the approach used to reach the vessels. These include the traditional open surgical approaches like retroperitoneal (Palomo), Inguinal (Ivanissevich) and subinguinal. In

addition, minimally invasive procedures, such as percutaneous embolization and laparoscopic varicocele ligation are also in use nowadays. Percutaneous embolization have few proponents in the third world setting because it requires a significant degree of technical expertise. Furthermore, associated radiation exposure while performing the procedures can only be detrimental to the already compromised testicular function.<sup>5,6</sup> Surgical ligation remains the principal modality of therapy chosen by most surgeons.

As laparoscopic varicocelectomy has gained popularity, reports have suggested that laparoscopic varicocele ligation has the potential advantages of reduced morbidity, reduced analgesic requirements and a more rapid rate of return to work compared with the standard open surgical approach.<sup>7,8</sup> Inguinal (Ivanissevich) approach on the other hand is the most commonly used procedure due to the familiarity of surgeons with the anatomy of the inguinal canal and the anatomical reason that external spermatic vein has been found to be dilated in 16% to 74% cases.<sup>9</sup> This vein cannot be approached by retroperitoneal or laparoscopic techniques and therefore, the inguinal approach should be preferred. The aim of this study was compare the laparoscopic and inguinal varicocelectomy procedure with respect to postoperative complications, hospital

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stay, analgesic requirement and improvement in semen parameters in infertile men.

## METHODOLOGY

The study was conducted over a period of 4 years at the Department of Surgery, Liaquat University of Medical and Health Sciences, Jamshoro, from July 2003 to June 2007. All patients having a history of infertility, presenting with any symptom of varicocele and asymptomatic patients referred from recruitment centres during their medical checkups and diagnosed as having varicocele were included in the study.

A total of 107 patients above the age of 12 years underwent varicocelectomy during this period. Seven patients were lost in follow-up and therefore, excluded from the study. The remaining 100 cases who completed their follow-up were included in the final analysis. Varicocele was diagnosed mainly by careful physical examination and color Doppler ultrasound in subclinical cases. Physical examination was performed in each patient in a warm room with the patient in an upright position. The grade (grade I to III) and laterality (unilateral or bilateral) of varicocele were determined by inspection and palpation. Grade-I was small varicocele, detected by palpation with difficulty but increased by Valsalva's maneuver; grade-II was moderate grade, detected easily by palpation without Valsalva's maneuver; grade-III was large varicocele, detected visually at a distance.

Pre-operative semen analysis was carried out in all patients aged 18 years and above by masturbation after 4-5 days abstinence. For treatment purposes patients were divided into open inguinal group and laparoscopic group. The operative approach was selected by patient after providing full information to the patient regarding the two procedures and the two groups were well matched for age and grade of varicocele. All procedures were performed by a single surgeon. Out of the hundred evaluable patients, 50 cases were operated by open inguinal approach (Ivanissevich's procedure). Under spinal anaesthesia, the patient was placed in a reversed Trendelenburg position and a 3-5 cm incision was made through the skin, subcutaneous tissue and external oblique muscle. The cord was gently grasped with Babcock clamp and the external spermatic fascia was incised sharply. The vas deferens with its vessels were bluntly dissected away from spermatic veins. Cord dissection was performed under loupe magnification (3.5 x) and all visible internal and external spermatic veins were ligated and transected. Great care was taken to preserve the spermatic artery. The wound was closed in a usual manner. In the laparoscopic group, patients were operated by insufflative laparoscopic varicocele ligation. The patient was placed in a supine position and after induction of general endotracheal anaesthesia, a

10 mm port was placed supraumbilically by open (Hasson) method. After adequate pneumoperitoneum, laparoscope was inserted and two other 5 mm working ports were placed in the lower abdomen according to laterality of varicocele under direct laparoscopic vision. Spermatic vessels were exposed by T-shaped peritoneotomy. Spermatic veins were clipped doubly without division. Care was taken to spare spermatic arteries. On completion of the procedure, ports were closed in a standard fashion. Postoperatively, all patients received 500 mg acetaminophen tablets from the first postoperative day as an analgesic.

The postsurgical outcome was assessed by physical examination of the scrotum for any complications like persistence, hydrocele, hematoma, recurrence, wound infection and testicular atrophy in the follow up period. Improvement in semen parameters was assessed by repeating semen analysis after six months postoperatively in those patients who had abnormal semen analysis preoperatively (sperm count < 20 millions/ml and/or motility < 50%) according to the World Health Organization criteria. Pain severity was compared with help of the visual analogue scale (VAS) score on the first, third and fifth postoperative day where the patient was asked to grade his pain by marking any point on a 10 cm straight line marked from 0-10.<sup>10</sup> Zero was no pain where as 10 was extreme unbearable pain, hampering the daily routine, work or sleep.

Analgesic requirements were determined by the mean number of tablets recorded by the patient in the postoperative period. All procedures were performed in an inpatient setting. Patients were called on the day of operation. Their hospital stay was recorded by the mean number of hours till the discharge of the patient. The operative time was recorded by the mean number of minutes from time of incision till closure of wound/ports. Patients were followed for a minimum of six months; weekly for the first month and then monthly for the next five months. Informed consent was obtained from every study subject. Data was recorded on a standardized data collection form.

Data analysis was performed on SPSS version-10.0. Frequency and percentages were computed to present categorical variables like laterality, grading and postoperative complications. A chi-square test was applied to compare the significance of the proportions of these categorical response variables between the two groups. All continuous response variables like patient's age, pre and postoperative spermograms, operative time duration, length of postoperative hospital stay, dose of analgesia and postoperative pain score (VAS) were presented by mean  $\pm$  SD. Student's t-test was applied to compare the means of these variables between the two groups. To compare pre and postoperative spermograms, a paired sample t-test was applied. Statistical significance was taken at  $p < 0.05$ .

## RESULTS

Most of the study subjects 52% in the open inguinal group and 56% in the laparoscopic group were young and in their third decade of life. Their mean age was 26.9±7.67 years in the open inguinal group and 26.2±7.08 years in the laparoscopic group with age ranging between the 12-50 years. The mean ages were insignificant between the two groups (26.9±7.67 vs. 26.2±7.08, p=0.888). Age distribution is presented in Table I. A majority of the patients in both groups presented with visible deformity while 13 patients in each group presented with infertility as shown in Table I.

A majority of the patients of both groups (92% open inguinal and 94% laparoscopic) had left unilateral varicocele, while only 4% of the open inguinal group and 6% of the laparoscopic group had bilateral varicocele (Table II). Thirty two (64%) patients of the open inguinal group and 34 (68%) patients of the laparoscopic group had grade-III varicocele while 18 (36%) patients of the open group and 16 (32%) of the laparoscopic group had grade-II varicocele. However, this grading was statistically insignificant between the two groups (Table I).

Pre-operative spermograms of subfertile patients showed a mean ± sperm count as 12.46±5.11 millions/ml in the open inguinal group and 12.92±5.35 millions/ml in the laparoscopic group, while motility was 25.0±13.8% and 25.4±14.3% respectively. There was statistically significant postoperative improvement in the sperm count and motility in both groups (p < 0.001) as shown in Table II.

The mean operative time (minutes) of inguinal varicocelectomy was significantly less than that of laparoscopic varicocelectomy (34.8±7.89 vs. 43.8±8.95, p < 0.001). However, the mean length of the postoperative hospital stay (hours) was significantly less

**Table II:** Pre-operative and postoperative spermograms of subfertile patients.

Operative procedure	Semen parameter	Pre-operative Mean ± SD	Postoperative Mean ± SD	Difference	p-value
Open inguinal (n=13)	Count (million/ml)	12.46±5.11	23.7±10.3	11.2	< 0.001
	Motility (%)	25.0±13.8	43.5±11.9	18.5	< 0.001
Laparoscopy (n=13)	Count (million/ml)	12.92±5.35	25.5±10.1	12.6	< 0.001
	Motility (%)	25.4±14.3	43.8±11.0	18.5	< 0.001

Statistically significant difference between pre-operative and postoperative outcomes at 5% level of significance, however, difference between groups was insignificant.

in the laparoscopic group than the open inguinal group (37.2±11.9 vs. 53.3±13.1 hours). On comparison of postoperative pain severity by mean graded pain score (VAS) on the first, third and fifth day, there was significantly less pain in the laparoscopic group than the open inguinal group (p-value 0.004 on the first and < 0.001 on the third and fifth postoperative days). The same pattern of statistical significance was observed in the requirement of postoperative analgesia (number of analgesic tablets). The postoperative, analgesic requirement was significantly less in the laparoscopic group than the open inguinal group (11.3±2.23 vs. 16.3±1.58 tablets of acetaminophen, p < 0.001) as summarized in Table III.

**Table III:** Postoperative subjective outcome as measured by operative time, hospital stay, analgesia requirement and pain grading.

Postoperative subjective outcome	Open inguinal (n=50)	Laparoscopy (n=50)	p-value
Operative time	34.8±7.89	43.8±8.95	< 0.001
Postoperative hospital stay (hours)	53.3±13.1	37.2±11.9	< 0.001
Number of analgesic tablets	16.3±1.58	11.3±2.23	< 0.001
Pain scale at 1st postoperative day	7.82±0.77	7.34±0.87	0.004
Pain scale at 3rd postoperative day	5.80±0.78	5.02±0.71	< 0.001
Pain scale at 5th postoperative day	3.60±0.65	2.10±0.65	< 0.001

Difference between groups was significant at 5% level of significance.

**Table I:** Demographic features, presenting complaints and mode of presentation.

Variables	Operative procedure				p-value
	Open inguinal (n=50)		Laparoscopy (n=50)		
	Number of patients	Percentage	Number of patients	Percentage	
<b>Age range (years)</b>	26.9±7.67		26.2 ± 7.08		0.888
11-20	12	52	10	20	
21-30	26	20	28	56	
31-40	10	4	11	22	
41-50	2		1	2	
<b>Presenting complaints</b>					
Asymptomatic	16	32	15	30	
Feeling of heaviness/ dragging sensation pain	26	52	28	56	
Visible deformity	6	12	7	14	
Infertility/Subfertility	32	64	34	68	
Testicular atrophy	13	26	13	26	
<b>Mode of presentation laterality</b>					0.695
Left unilateral	2	4	1	2	
Bilateral	46	92	47	94	
<b>Grade</b>					0.673
Grade-II	4	8	3	6	
Grade-III	18	36	16	32	
	32	64	34	68	

The recurrence of varicocele was observed in 2 patients in each group followed by wound infection which was observed in 3 (6%) patients of open inguinal and 1 (2%) patient in laparoscopic varicocelectomy. Hydrocele and haematoma were observed in the open inguinal group (2% each). The over all frequency of postoperative complications was 8 (16%) in the open inguinal group and 6 (12%) in the laparoscopic group. However, this difference was statistically insignificant ( $p=0.193$ ). The postoperative complications are summarized in Table IV.

**Table IV:** Postoperative complications.

Postoperative complications	Operative procedure				p-value
	Open inguinal (n=50)		Laparoscopy (n=50)		
	No. of patients	Percentage	No. of patients	Percentage	
Persistence	0	0	1	2	--
Severe pain	0	0	2	4	--
Recurrence	2	4	2	4	0.999
Wound infection	3	6	1	2	0.617
Hydrocele	1	2	0	0	--
Haematoma	1	2	0	0	--
Spinal headache	1	2	0	0	--

Statistically insignificant difference at 5% level of significance.

## DISCUSSION

Varicocele has been shown to be the most common etiologic cause of male infertility.<sup>11</sup> Traditionally, open surgical procedures like inguinal or retroperitoneal (Palomo), have been used for varicocele ligation, while subinguinal approaches with the use of magnification represent some of the recent advances in open surgery for the management of varicocele. Laparoscopic varicocelectomy among the minimally invasive procedures is getting popularity as an alternative procedure with the reported advantages of simplicity, minimal invasiveness, better convalescence and less analgaesic requirement postoperatively.<sup>7</sup> On the contrary, there are studies which suggest that laparoscopic varicocele ligation has no superior results when compared to the subinguinal approach with the use of magnification and has equivalent or variable results when compared to the Palomo or inguinal approaches.<sup>12-14</sup> Laparoscopy is also said to be attended with complications of transperitoneal approach and high equipment costs.<sup>15</sup>

Inguinal varicocelectomy using a magnifying loupe on the other hand is a still more commonly practiced procedure in developing countries, due to the increased costs of an operating microscope with higher magnification. It carries less risk of recurrence as compared to laparoscopic or Palomo procedure where the vessels are ligated high in the peritoneum and are unable to ligate external spermatic vessels.<sup>14,15</sup> Therefore, we prospectively compared the postsurgical outcome parameters of two commonly performed procedures to treat varicocele at our institute.

In the present study, varicocele was observed in the third decade of life in a majority of patients of both groups. This age presentation is in consistence with

other local studies,<sup>16</sup> but is contrary to studies in the developed world where varicocele is diagnosed and treated at a younger age group.<sup>17</sup> The probable reasons include early diagnosis due to regular medical checkups at the school level, whereas in a third world setting, patients only turn up when they become symptomatic or are referred from recruitment centres during their medical checkups for selection. A majority of the patients in this study 64% in open group and 68% in laparoscopic group had grade-III varicocele. The age group involved was older and the grade of varicocele was severe as compared to west. Therefore, there is a strong need for early and regular checkups during school age to diagnose and treat the disease at an earlier stage to prevent patients from various complications of the disease.

In terms of laterality of varicocele, 92% of patients of open inguinal group and 94% of laparoscopic group had left unilateral varicocele, while the other cases were bilateral. This finding is consistent with earlier reports that a right sided varicocele is quite rare and the incidence of bilateral varicocele is 2.5-65% depending on the modality of the diagnosis.<sup>16</sup>

It is widely accepted that varicocelectomy improves semen parameters in patients with varicocele, with a 60-80% recovery rate.<sup>18</sup> Schlesinger *et al.* reviewed 16 studies that assessed the effect of varicocelectomy on sperm density and reported that postoperatively significant improvements were demonstrated in 12 studies.<sup>18</sup> Schlesinger *et al.* also reported that sperm motility improved after varicocelectomy in 5 out of 12 studies.<sup>18</sup> The present study showed the same improvement in postoperative sperm density as well as motility irrespective of operative procedure.

The laparoscopic approach requires a longer operating time as compared to open inguinal varicocelectomy. The present finding is also in accordance with a study by Poulsen and colleagues, in which reported mean operating times were 35 and 45 minutes<sup>19</sup> and another study showed mean operating times of 19.1 and 52.3 minutes for the open and laparoscopic group respectively.<sup>14</sup>

Several studies have suggested that laparoscopic varicocelectomy has the advantage of a shorter hospital stay. As a matter of fact, day care surgery is not as well established in our country as it is in most other countries of third world. Therefore, patients of both groups in this study were treated as inpatients. The hospital stay was significantly shorter (37.2 vs. 53.3 hours) in the laparoscopic group as compared to the open inguinal varicocelectomy group. This finding is in agreement with reports by Pouslen *et al.* and Lynch *et al.*<sup>19,20</sup>

In this study, the average total number of analgaesic tablets required postoperatively was significantly higher (16.3 vs. 11.3) in the open inguinal group as compared

to the laparoscopic group. This finding is in agreement with the report by Lynch *et al.*<sup>20</sup> A similar pattern was observed when the mean graded pain score was compared between two groups. Two patients in the laparoscopic group suffered severe pain in abdomen probably due to pneumoperitoneum, whereas one patient in the open inguinal group suffered severe spinal headache.

The postoperative complication rate is another criterion for comparing the two methods. The overall complication rate in the study was a little higher in open varicocelectomy as compared to laparoscopic varicocelectomy (8 vs. 6) cases. However, this difference was statistically insignificant. Wound infection was more common (6%) in the open inguinal group as compared to the laparoscopic group (2%). Recurrence of varicocele which is thought to be dependent on the pre-operative grade of varicocele was observed in 2 patients in both groups in this study. This fact has been well documented in different studies that the higher the grade of pre-operative varicocele, the greater will be the chances of recurrence, which may be secondary to the existence of multiple collateral venous channels.<sup>21,22</sup> The same can be true in this study because the majority of patients in both groups had grade-III varicocele. This finding is not in contrast with other studies which have reported a high rate of recurrence in laparoscopic varix ligation.<sup>14,20</sup> Persistence or recurrence of varicocele is the most frustrating complication and can occur in 9-16% of patients.<sup>23</sup> In this series, the persistence of varicocele was seen in one patient in the laparoscopic group. The high persistence rate in retroperitoneal or laparoscopic varicocelectomy is usually due to the presence of parallel inguinal and retroperitoneal collaterals which may exit the testis and bypass the retroperitoneal area of high ligation, rejoining the internal spermatic vein proximal to the site of ligation.<sup>24</sup>

Postoperative hydrocele is mainly due to lymphatic obstruction and occurs in 10-33% of cases irrespective of technique.<sup>25</sup> In this series, one patient in the open inguinal group and none in laparoscopic group developed hydrocele. This finding is in agreement with other studies which suggest that the laparoscopic approach has less incidence of hydrocele because of better visualization of cord structures.<sup>14</sup> However, the follow-up period was not enough to justify hydrocele formation, since most hydrocele first appear more than 9 months after varicocelectomy. The development of microsurgical techniques has led to a decline in the incidence of complications like hydrocele and testicular injury. Various studies had suggested that the complication rate was significantly lower with the use of higher magnification such as microscopy,<sup>26</sup> but there have been concerns about possible costs and training for the use of microscopy in developing countries.

## CONCLUSION

Laparoscopic varicocelectomy was not markedly superior to open inguinal varicocelectomy using loupe magnification. Both procedures had equivalent outcomes with regard to improvement in semen parameters and postoperative complications. The open inguinal operation had the advantage of a short operative time, whereas laparoscopic varicocelectomy had the advantage of less analgesic requirement and a shorter hospital stay. We recommend open inguinal operation as an effective procedure where availability and costs of laparoscopic instruments are barriers. Furthermore, laparoscopic surgery requires more extensive resources and general anaesthesia.

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