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Laparoscopic ligation of testicular veins for the treatment of varicocele - indication, technique and surgical results

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Abstract

Object: To evaluate the outcome of laparoscopic varicocelectomy in terms of perioperative and postoperative parameters with special emphasis on improvement in symptoms, semen analysis and restoration of fertility.

Background: Varicoceles demanding treatment can be managed by various options like open varicocelectomy, laparoscopic varicocelectomy or by percutaneous embolization. Laparoscopic varicocelectomy have advantage of minimum morbidity, shorter mean hospital stay and early return to work with the advantage of treating bilateral varicoceles without any additional incisions hence can be considered as a preferable surgical technique in the management of symptomatic varicocele.

Material and Methods: This randomized controlled prospective study was conducted in the department of General surgery, Govt RDBP Jaipuria Hospital attached RUHS College of Medical Science, Jaipur over a period of two year from Sep. 2017 to Aug. 2019. All the patients with clinically significant varicoceles were included in this study. The patients underwent transperitoneal 3-port laparoscopic high ligation of the testicular vein.

Results: A total of 26 patients underwent laparoscopic varicocelectomy without any morbidity or conversion to open the procedure. The mean operating time to complete the procedure was 42.4 min. There was no significant blood loss with minimal need of analgesic in the post operative period. There were no major postoperative complications. The mean hospital stay was 2 days. Most of the patients resumed their routine work within 3 days of surgery. Semen analysis showed improvement in terms of sperm concentration, sperm count and improved motility.

Conclusion: Our study concludes that Laparoscopic varicocelectomy is a safe, feasible and effective procedure for varicocele treatment with favorable outcomes in terms of cosmesis, pain, improvement of symptoms and restoration of semen parameters and fertility.

Keywords: Laparoscopic varicocelectomy, semen analysis, fertility, pain

Introduction

Varicocele is defined as an abnormal dilatation and tortuosity of pampiniform plexus of veins, with a marked left sided predominance. Varicocele is considered as one of the important causes of male infertility ^[1] and prepubertal testicular hypotrophy ^[2]. It is well known that the ipsilateral testis in patients with varicoceles is smaller than the other side ^[3]. The incidence of varicocele in the general population and in infertile population is about 18% and 35%, respectively. Some cases present with scrotal or inguinal aching discomfort or dragging pain. Classical description of varicocele is the consistency of “Bag of Worms” that can be decompressed when patient is in supine position ^[4].

Varicocele is a clinical diagnosis established by physical examination. Typically, a Doppler ultrasound examination demonstrating more than three veins 3.5 mm or larger in diameter with reversal of venous flow with Valsalva maneuver is consistent with diagnosis of varicocele ^[5]. Mild discomfort can be managed by wearing an scrotal supporter or snug-fitting underwear during strenuous activity or exercise.

Etiology

There are two types of varicocele:

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1. Primary
2. Secondary.

In 95% cases no cause for varicocele could be found. This is called primary varicocele. When the varicocele is secondary to obstruction of testicular vein then it is called secondary varicocele. The obstruction of the testicular vein may be due to retroperitoneal tumor or kidney tumor.

Clinical feature

1. Asymptomatic - detected during medical examination or evaluation of infertile male
2. Constant dragging pain in Testis aggravated by standing & relieved by lying down
3. Impaired sperm quality
4. Cosmetic attention
5. Swelling in scrotum
6. Testicular hypertrophy

The ideal varicocele treatment should be safe, effective, and minimally invasive. Various treatment modalities for varicocele are

- a. Open surgical procedures: Three open surgical approaches are currently used- Subinguinal [Marmar], Inguinal [Ivanissevich], Retroperitoneal [Palomo].
- b. Laparoscopic varicocelectomy
- c. Percutaneous embolization [4]
- d. Microsurgical varicocelectomy [7]

Each technique has advantages and disadvantages and conflicting results have been obtained by different studies. Laparoscopic varicocelectomy is a commonly performed procedure done under general anesthesia. It is curative in majority of patients. It involves clipping and division of testicular veins before these enter the deep inguinal ring. Laparoscopic varicocelectomy have the advantage of very low incidence of significant complications.

Advantages of laparoscopic varicocelectomy include

1. Increased magnification.
2. Facilitating more accurate identification of vessels, such as spermatic collateral veins, (i.e. veins running alongside the spermatic cord, a possible cause of recurrence if left alone), lymphatics (the ligation of which can lead to hydrocele formation) and the internal spermatic artery.
3. Moreover, laparoscopic varicocelectomy is safe even after prior inguinal surgery.
4. The characteristic supra-inguinal access allows for high ligation of fewer veins vs a more labour-intensive subinguinal approach.
5. In cases of bilateral varicoceles, an additional incision, with its attendant effects, is avoided.

Aims & Objectives

1. To study the safety and advantage of the procedure.
2. To compare scrotal and lower abdominal pain before and after surgery.
3. To compare semen analysis before and after surgery.

Method & Material

Inclusion criteria

1. Patients aged between 18 year to 40 year
2. Varicocele grade 4 and 5
3. Patients fit for general anesthesia

Exclusion criteria

1. Below 18 years and above 40 year
2. Existing contraindication to laparoscopy
3. Patient with renal malignancy.
4. Recurrent varicocele.

Type of study: Randomized controlled study

Study period: This study was conducted over a period of two year from Sep 2017 to Aug 2019.

Study population: The study will be conducted in department of general surgery R.U.H.S college of medical science & attached Government R.D.B.P Jaipuria Hospital, Jaipur.

Methodology: Patient aged from 18 year to 40 year with varicocele will be taken for the study. Each patient /parents will be explained about the study and consent for participation will be taken. Patient will undergo for a detailed history taking, physical examination & all relevant investigations and pre anesthetic checkup. Varicocele repair will be done by laparoscopic ligation of testicular vein. All patients will be called for follow up visit at one week, one month and three months. Parents will be advised to contact, if any concern in the immediate postoperative period. Postoperative follow up will be done for outcome measurements (Infertility, post operative hydrocele formation, testicular atrophy and recurrence rate.

Pain is assessed using Visual Analogue Scale:-In our study, a total number of patients presented with complaints of pain to the Surgery department were 26. These patients were examined and they were given visual analogue pain points after thorough examination according to predetermined scale [11].

Statistical analysis: Data will be analysed using the SPSS software package version 12. For continuous variables, data will be expressed as mean \pm SD and comparison between the two groups will be carried out using two-sided t-test. Categorical variables will be expressed as frequency number and percent and comparison between these variables will be carried out using χ^2 tests.

Indication of surgery

Asymptomatic varicocele with >20% volume loss of Testis (>2ml)
Symptomatic varicocele- Impaired sperm quality, Pain, Cosmetic reasons

Results

A total of 26 case were studied.

Table 1: Age Incidence

Age in Years	Total No.	Percentage
20-25	6	6.7
25-30	10	9.5
30-35	6	6.4
35-40	4	4.4

Table 1 shows the age incidence

Average age in our study is 30 years. Highest age incidence noted in the age group of 20-25 years of age group consisting of 6.7% of cases followed by the age group of 24-30 years of age group. Least incidence noted in the age group of 35-40 years of age with 4.4% of cases.

Table 2: Laterality

Side	Number	Percentage
Bilateral	3	10.2
Left	24	92.3
Right	2	7.6

Table 2 shows the percentage of cases depending on laterality

Predominantly, varicocele is seen on left side consisting of 92.3% of cases followed by bilateral varicocele which constitute 10.2%. Unilateral right-sided varicocele is extremely rare. Only 2 cases among 26 cases (7.6%) is seen.

Table 3: Grade of varicocele

Grade	No.	Percentage
4	15	29.44%
5	11	23.46%

Table 3 shows grade of varicocele

Total no. of cases is 26 among them some patients have bilateral varicocele. Thus, total no. of varicocele became 20, of which 15 (29.44%) varicoceles are graded as 4, 11(23.46%) varicoceles are graded 5 seen.

Table 4: Complaints with varicocele

Complaint	No.	Percentage
Pain	6	26.4
Infertility	9	32.4
Both	11	47.2

Table 4 shows complaints with varicocele

In our study, the patients attended surgery Department with complaints of pain and discomfort associated with varicocele and infertility. Among 26 patients 6 patients (26.4%) came with complaints of pain and persistent discomfort, 9 patients (32.4%) presented with infertility and remaining 11 (47.2%) presented with both complaints.

Table 5: Shows symptomatic relief in patients with pain

Pain	No.	Percentage
Completely resolved	3	11.5
Partial response	15	57.7
Persistent pain	7	26.9
Worsened	1	3.8

Pain is assessed using visual analogue scale

In our study, a total number of patients presented with complaints of pain to the surgery department were 28. These patients were examined and they were given visual analogue pain points after thorough examination according to predetermined scale.

And followup of these patients is done at 3 months, 6 months after surgery.

Table 6: Shows improvement of sperm count

Average sperm count	Pre-op	3 Months Post-op	6 Months
	61.1 million	76.1 million	98.1 million

Table 5 shows symptomatic relief in patients with pain

Of the 28 cases who presented with pain, in 3 patients (11.5%) pain was completely resolved. There is partial improvement in pain in 15 patients (57.7%). Out of the remaining 7 patients, pain persisted in 4 patients (14.25%) and pain worsened in 1 patients (3.8%).

Table 7: Shows improvement in average motility

Average motility	Pre-op	3 Months Post-op	6 Months Post-op
	42.2%	59.5%	63.2%

Table 6 shows improvement of sperm count

Average sperm count pre-operatively is 61.1 millions/mL. After 3 months post-operatively, sperm count improved to 76.1 millions/mL. After 6 months, it improved to 98.1 millions/mL which is nearly double the pre-operative count.

Table 7 shows improvement in average motility

Average sperm motility in pre-operative period is 42.2%. After 3 months post-operative period, it improved to 59.5%. After 6 months, average sperm motility is 63.3%.

Table 8 and Table 9 shows the semen parameters before and 3 month and 6month after laparoscopic varicocelectomy. The semen volume increased from 2.9 to 3.2 mL. The viability also varied from 65.4 to 85.0 m/mL. The motility improved from 42.2% to 63.2%. 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.

Table (10, 11) comparative study of different parameters and pie digrame show post operative complation.

Table 8: Semen parameters pre op and 3 month laparoscopic varicocelectomy

Semen Parameters	Varicocelectomy		P Value
	Pre OP	3 month	
Volume	2.9	3.2	P<0.001
Count	61.1	98.1	P<0.05
Motility	42.2	63.2	P<0.05
Viability	65.2	82.1	P<0.05

Table 9: Semen parameters pre op and 6 month laparoscopic varicocelectom

Semen Parameters	Varicocelectomy		P Value
	Pre OP	3 month	
Volume	2.9	3.1	P<0.001
Count	61.1	76.1	P<0.001
Motility	42.2	59.5	P<0.05
Viability	65.2	76.5	P<0.001

Table 10: Laterality

	Our Study	Hitoshi <i>et al.</i>
Left	92.3%	79%
Right	7.6%	0%
Bilateral	10.2%	21%

Table 11: Grade wise incidence of varicocele

	Our Study	Onozawa <i>et al.</i>
Grade 4	29.44%	30%
Grade 5	23.46%	44.4%

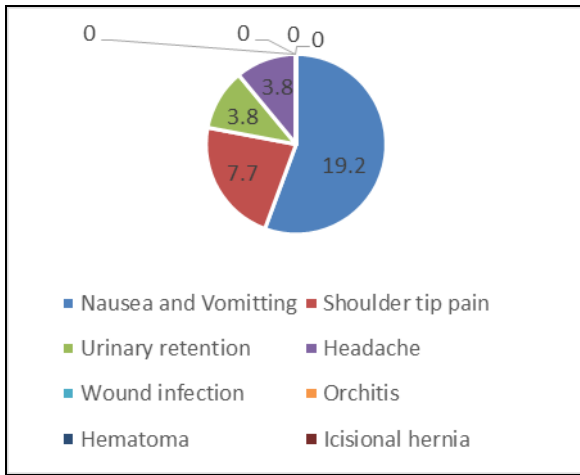


Fig 1: Pie diagram showing the Post OP Complications

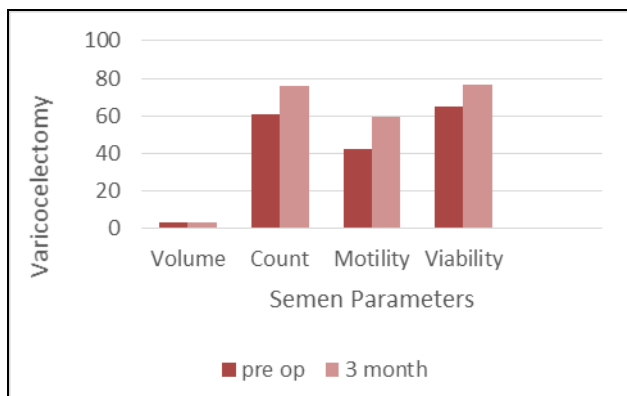


Fig 2: Bar diagram showing Pre Op and 3 month laparoscopic varicocele

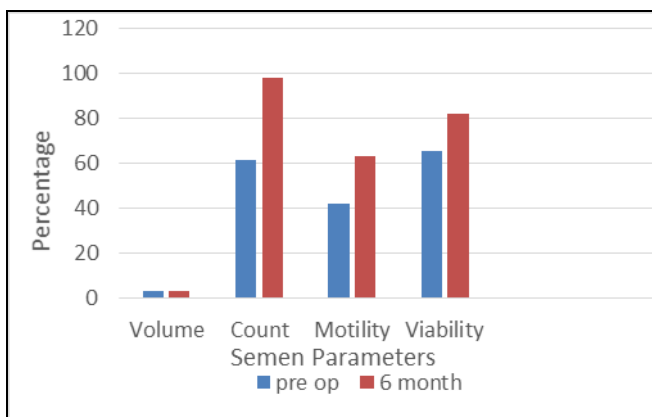


Fig 3: Bar diagram showing Pre Op and 6 month laparoscopic varicocele

Discussion

The incidence of varicocele has been reported as comprising one-third of infertile men, but in only one-fifth of patients, varicocele is caused for infertility. Most males with varicocele are fertile. All these factors contribute to difficulties in the evaluation of therapeutic intervention of varicocele. Although an adequate consensus is not available, based on the literature and clinical experiences supporting its benefit, varicocele is the chosen treatment of varicocele in many institutes. This was based on the concept that early correction of varicocele will alter not only the progressive decline in fertility but will also prevent future infertility in younger male patients. The relatively higher rate of reversal of the seminal parameters and the fewer incidences of recurrent varicocele after

laparoscopic varicocele can be attributed to better visualization and access provided by the laparoscopic approach. Although laparoscopic varicocele has been performed by many surgeons on a day-surgery basis, the mean hospital stay after laparoscopic varicocele in our study was relatively longer than was anticipated. Almost all our patients prefer to remain in the hospital and do not wish to resume the activities until complete pain relief. In addition, the local health system covers the majority of the costs. The mean hospital stay after laparoscopic varicocele was not affected by whether the disease was unilateral or bilateral. Meta-analysis and literature analysis showed that the results after laparoscopic varicocele are comparable to other surgical procedures. The laparoscopic approach has the advantage to treat simultaneously bilateral varicocele.

In the present study, screening of varicocele was conducted by palpation and colour Doppler scrotum. It is widely accepted that varicocele improves semen parameters in patients with varicocele with a 60% - 80% recovery rate. Schlesinger *et al.* reviewed 16 studies that assessed the effect of varicocele on sperm density and reported that post-operative significant improvements were demonstrated in 12 studies [8].

Schlesinger *et al.* also reported that sperm motility statistically improved after varicocele in 5 of 12 studies. The present study followed the same pattern; varicocele significantly increased sperm density in the post-operative followup.

The present study was compared with various previous studies regarding the effectiveness of laparoscopic varicocele, which were shown below. Further studies with larger numbers of patients are needed to confirm the results.

Age incidence

A total of 26 patients were included in our study. The youngest was 18 years old and the oldest was 40 years old. Mean age is 27 years. Our study is in comparison with Onozawa *et al.* study who has studied a total of 64 patients. In his study, the mean age is 34 years [9].

Laterality

Majority is seen on left side consisting of 92.3% of cases followed by bilateral varicocele of 7.6%. Unilateral right-sided varicocele is extremely rare. A study conducted by Hitoshi *et al.*, showed that left side varicocele is present in 53 patients among 64 patients with varicocele. Thus, in their study left-sided varicocele consisting of 79% of cases, which is almost equivalent to our study as shown in parameters.

Semen analysis

In our study, we have analysed the volume, sperm density and motility. We have noticed that there is no significant increase in volume of semen. But there is significant increase in sperm density and sperm motility. The results in sperm parameters in the study conducted by Gouda El-Labban on laparoscopic varicocele are shown in Table.

Our study is in comparison with Gouda El-Labban in terms of sperm density and sperm motility. Pregnancy rate of 22% is reported in our study. As sample size and duration of study is small, it is not compared to other study [10].

In our study out of 26 patients, 1 patients had post-op hydrocoele. No incidence of recurrence of varicocele and atrophy of testis is seen.

Conclusion

Testicular varicoceles are an important disorder leading to

significant symptoms like pain in some patients and associated with sub-fertility in others. Accurate diagnosis is important, as correct treatment may lead to resolution of symptoms and improvement in sperm count in sub-fertile patients.

Laparoscopic varicocelectomy is a minimally invasive procedure that is easy to perform with simple instruments. The clear visualisation and magnification provide control of the affected vessels, thus decreasing incidence of post-operative recurrence.

Compared to open varicocelectomy, laparoscopic varicocelectomy had shorter convalescence, early return to normal activities and less operative morbidity. The semen analysis performed showed that subjects with laparoscopic varicocelectomy had better quality semen.

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