

# Effect of Varicocelectomy on Seminal Parameters and Infertility: A Prospective Study

Y Shajahan<sup>1</sup>, Vineeth K Adiyodi<sup>2</sup>

<sup>1</sup>Additional Professor, Department of Surgery, Government T. D. Medical College, Alappuzha, Kerala, India, <sup>2</sup>Senior Resident, Department of Urology, Government Medical College, Kozhikode, Kerala, India

## Abstract

**Introduction:** Ectatic and tortuous veins of the pampiniform plexus of the spermatic cord are found in approximately 15% of male adolescents, with a marked left-sided predominance. Varicocele has been recognized as a relatively infrequent cause of male infertility. Not <15% of male adolescents with varicocele recognized as male infertility, taken into consideration after serial physical and seminal evaluation, underwent varicocelectomy and got fairly good result comparable to previous studies.

**Aim of Study:** The aim of this study is to study the effect of varicocelectomy on seminal parameters and infertility.

**Materials and Methods:** A prospective study was conducted in patients who attended the Urology/General Surgery Outpatient Department/Infertility Clinic with varicocele from April 2012 to April 2013 in Government T.D. Medical College, Alappuzha. Study variables include mainly physical examination findings and seminal parameters including sperm count, motility, and morphology. Improvement in seminal parameters such as increase in sperm count, sperm motility, and sperm morphology variation after surgery was taken as the indicators of the beneficial effects of varicocelectomy. Although we tried various approaches of surgery, our choice was inguinal approach as it was easy and less morbid.

**Results:** Total as well as age-wise incidences were categorized in different grades. Seminal analysis of all aspects pre and postoperatively at two different intervals 3<sup>rd</sup> and 6<sup>th</sup> months was monitored and the result was analyzed. We noticed in our study, a statistically significant improvement in the seminal parameters and improvement in fertility rates up to 58% which is comparable with other previous studies.

**Conclusion:** Thus, this study shows that there is an increase in the incidence of varicocele in male infertility, and about 58% became fertile after varicocelectomy which is comparable to other studies conducted before.

**Keywords:** Varicocelectomy, Varicocele, Semen analysis

## INTRODUCTION

Tortuous veins of the pampiniform plexus of the spermatic cord are found in approximately 15% of male adolescents, with a marked left-sided predominance.<sup>1</sup> Varicocele has been recognized as a relatively infrequent cause of male infertility.<sup>2</sup> The incidence of varicocele in men among the general public has been estimated to be around 15%. As the generally accepted incidence of infertility in males is around 5%, it is quite clear that not all patients with varicocele are infertile. However,

around 1/3 of the men evaluated in infertility clinics have varicocele. Varicocele is the most successfully treated pathology among infertile men.<sup>3</sup>

Bennett in 1889 described improved seminal fluid after varicocele ablation.<sup>4</sup> Once present, they are not thought to regress. The significant prevalence of varicocele in adolescence, the association of varicocele with male infertility, and the improvement in semen quality noted in infertile men after varicocele ligation have recently brought increased interest to study adolescent varicocele and its associated spermatogenic dysfunction.

### Pathophysiology

Approximately, 90% of varicoceles are left-sided.<sup>5</sup> Due to retrograde flow of blood in the internal spermatic vein is responsible for venous dilation and tortuosity, differences in the configuration of the right and left internal spermatic veins, and their embryologic origins

### Access this article online



www.surgeryijss.com

Month of Submission : 02-2017  
Month of Peer Review: 03-2017  
Month of Acceptance : 04-2017  
Month of Publishing : 05-2017

**Corresponding Author:** Dr. Y. Shajahan, Shamiana, Chirakkadavam, Kayamkulam - 690 502, Alappuzha, Kerala, India.  
Phone: +91-9847276875. E-mail: dr.yshajahan@yahoo.com

are thought to contribute to this marked left-sided predominance. Varicocele formation has been attributed to one of three primary factors: Increased venous pressure in the left renal vein, collateral venous anastomoses, and incompetent valves of the internal spermatic vein.

### Pathology of Testicular Dysfunction

The presence of a varicocele is known to be associated with an adverse effect on spermatogenesis in a subset of men.<sup>6</sup> The pathophysiology of this testicular dysfunction has been attributed to one or a combination of several mechanisms, including reflux of adrenal metabolites, hyperthermia, hypoxia, local testicular hormonal imbalance, and intratesticular hyperperfusion injury. The toxic effect of varicocele may be manifested as testicular growth failure, semen abnormalities, Leydig cell dysfunction, and histologic changes (tubular thickening, interstitial fibrosis, decreased spermatogenesis, and maturation arrest). Lyon and Marshall (1982) found ipsilateral volume loss in 77% of testes associated with a varicocele; this was confirmed by Steeno (1991), who documented diminished ipsilateral volume in 34.4% of boys with a Grade 2 varicocele and 81.2% of boys with a Grade 3 varicocele.<sup>4</sup> Since testis volume increases rapidly during adolescence, it should not be surprising that differences in testis size are most easily appreciated in teenagers.<sup>7</sup> This ipsilateral growth failure is reversible in some cases after varicocele ablation.

### Diagnosis

Patients with a varicocele should undergo detailed evaluation which includes medical and reproductive history, a physical examination, and at least two semen analyses. The physical examination is the most important part of the diagnosis and should be performed with the patient in both the recumbent and standing positions. The examination is best performed if the patient is relaxed and the scrotum is warm.<sup>8</sup> There are 3 grades of varicoceles. Grade 1 varicoceles are palpable only with the Valsalva maneuver. Grade 2 varicoceles are large enough to be palpably detected without the Valsalva maneuver. Grade 3 varicoceles are visible through the scrotal skin when the patient is at rest.

### Grading of Varicoceles

Grade: Findings

- 1 (small): Palpable only with the Valsalva maneuver
- 2 (moderate): Palpable without the Valsalva maneuver
- 3 (large): Visible through the scrotal skin.

The success of a varicocele repair depends in part on the pre-operative grade of the varicocele. The larger the varicocele, the more likely that it is associated with impairment in semen quality. Repair of larger varicoceles results in significantly greater improvement in semen

quality than does repair of smaller varicoceles (Steckel *et al.*, 1993; Jarow *et al.*, 1996).

The diagnosis of varicoceles can also be achieved radiographically, but the physical examination remains the “gold standard.” Radiographic tests such as real-time scrotal<sup>9</sup> ultrasonography and color Doppler ultrasonography, spermatic venography, radionuclide<sup>7</sup> scanning, and thermography have been used to diagnose varicocele. Typically, an ultrasound examination demonstrating veins 3.5 mm or larger in diameter, with reversal of venous flow after the Valsalva maneuver, is consistent with the diagnosis of a varicocele.<sup>10</sup>

The surgical procedures include

- a. High ligation of testicular vein
- b. Scrotal approach
- c. Laparoscopic TV ligation.

### Aim of Study

The aim of this study is to study the effects of varicocelectomy on seminal parameters and infertility.

## MATERIALS AND METHODS

The proposed study will be conducted in patients who attend the Urology/General Surgery Outpatient Department/Infertility Clinic with varicocele during the period from April 2012 to April 2013 in Government T.D. Medical College, Alappuzha.

### Study Design

This was a prospective study.

### Study Variables

1. Clinical findings
2. Semen parameters including count, motility, and morphology.

### Inclusion Criteria

Grades 1-3 varicocele (clinically palpable varicocele) were included in the study.

### Exclusion Criteria

1. Testicular atrophy
2. Orchidectomy
3. Klinefelter syndrome
4. Secondary varicocele were excluded from the study.

The diagnosis of varicocele was based on clinical findings. Other investigations such as semen analysis were also done. Improvement in semen parameters such as increase in sperm count, motility, and morphology after surgery was taken as the indicators of clinical benefit from varicocelectomy.

The choice of surgery is the classical inguinal approach. Patient was kept in supine position after giving spinal/local anesthesia. A 2 cm incision is made over the medial aspect of the inguinal region at the level of the external ring. The spermatic cord structures are hooked out; vas deferens, artery to vas, testicular artery, and lymphatic vas were identified. The wound was closed in layers after achieving full hemostasis.

Absorbable subcuticular sutures were preferred for closure. Patient was discharged the following day if post-operative period provided, the post-operative period was uneventful. Patient was put on a course of antibiotics following the surgery. All patients who underwent surgery were followed up during the 3<sup>rd</sup> and 6<sup>th</sup> months with repeat semen analyses.

## RESULTS

A total of 6500 patients and 6742 patients attended the urology/general surgery/infertility outpatient departments in 2012 and 2013, respectively. Of these, 292 and 283 patients came with infertility and varicocele in 2012 and 2013, respectively. The percentage of infertility among the cases is 4.5% and 4.2%. Of the total number of infertility cases, varicocele accounted for infertility in 182 (2012) and 168 (2013) patients.

As observed in Tables 1 and 2, the incidence of varicocele in infertility patients was 182 out of 292 in 2012 and 168 out of 283 in 2013. In this study, 60% of infertility patients had varicocele.

In hospital admission, out of 840 admissions, varicocele patients accounted for about 12.14% (2012) and about 11.89% (2013) of the admissions (Table 3).

Varicocele is very rare in prepubertal children. However, they occur with moderate incidence in children of 9 years of age and older. It seems that the physiological changes during puberty are responsible for varicocele formation in adolescents. This study was conducted on the varicocele men with infertility problems. The age group was between 25 and 40 years.

This Table 4 shows that the majority of patients presenting with varicocele fell in an age group between 26 and 35. This is because most of the men get married during this age group and present with infertility. Sometimes in old age, long-standing severe varicocele produces azoospermia.

### Grading

In this study, 11.6% of patients had Grade 1 varicocele, 56.7% of patients had Grade 2 varicocele, and 31.7% had Grade 3 varicocele with mild oligozoospermia

**Table 1: Percentage of cases with infertility attending the outpatient department**

Year	Total number of cases	Infertility (%)
2012	6500	292 (4.5)
2013	6742	283 (4.2)
Total	13242	575 (4.3)

**Table 2: Percentage of cases with varicocele**

Year	Total number of cases	Varicocele patients (%)
2012	6500	182 (2.8)
2013	6742	168 (2.5)
Total	13242	350 (2.6)

**Table 3: Comparison with other previous similar studies**

Reference study	Number of patients	Number of patients with varicocele (%)
Dubin and Amelar	1294	512 (39)
Henry <i>et al.</i>	166	32 (19)
Steward	195	48 (25)
Jonson	120	38 (32)
Rodriguez	455	108 (24)
Rigau and Cocket <i>et al.</i>	600	246 (41)
Aagjes and Vander vijver	742	180 (24)
Marks <i>et al.</i>	1255	480 (38)
Past department study	220	99 (45)
Present study	575	350 (60)

**Table 4: Percentage of varicocele versus age**

Age group	Number of patients (%)
20-25	6 (10)
26-30	20 (33.3)
31-35	31 (51.66)
36-40	3 (5)

responding to medical therapy and hypothermic practice. Hence, patients' selection in Grade 1 is those who are not responding to medical therapy or Grade 1 with severe oligozoospermia. There is no direct effect between the grade of varicocele and severity of semen abnormality (Figures 1 and 2).

### Semen Analysis

Varicocele usually presents with oligozoospermia, decreased sperm motility and with abnormal morphology (increasing tapering forms). Macleod introduced the concept of stress pattern associated with varicocele. This stress pattern has the above three characteristics (Figures 3 and 4).

This study shows that 81% of patients had decreased sperm count below the level of adequacy (Table 5).

After varicocelectomy, 41.7% of patients showed count >60 million, 28.3% of patients showed count between

20 and 60 million. Out of 60 patients, 2 patients had azoospermia<sup>10</sup> (both patients Grade 3 varicocele), and no improvement was noted (Tables 6 and 7).

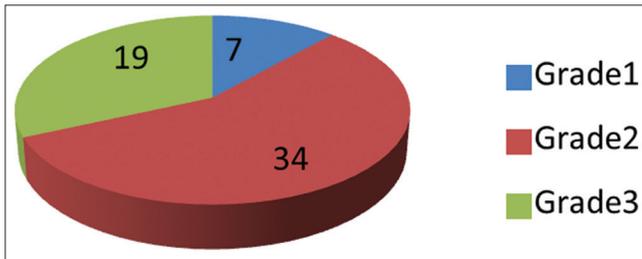


Figure 1: Grading frequency

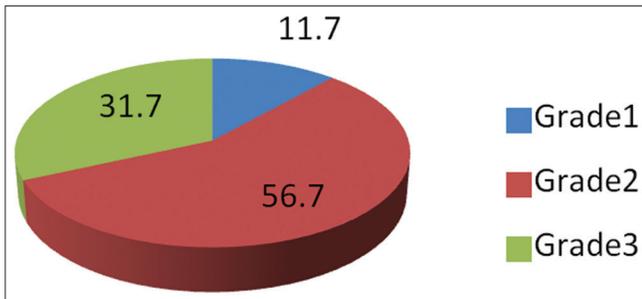


Figure 2: Grading percentage

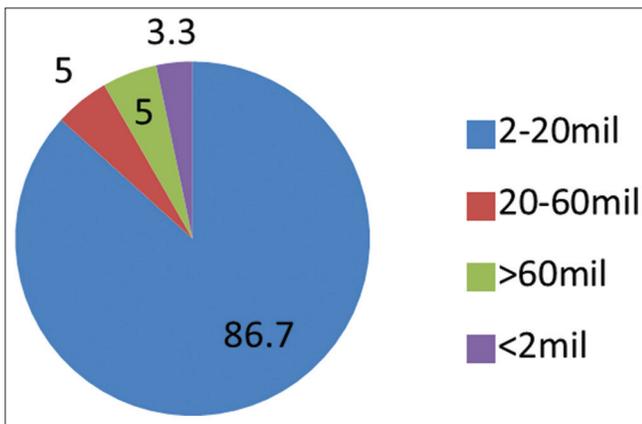


Figure 3: Seven analysis-percentage

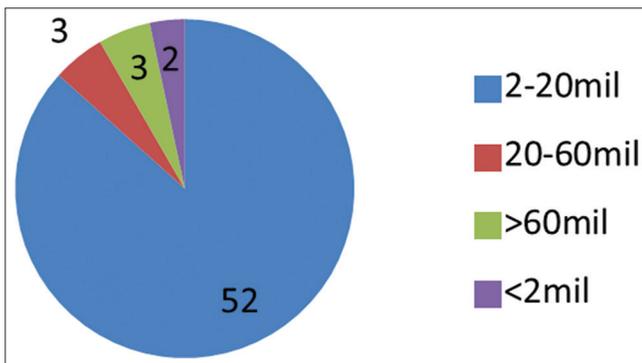


Figure 4: Seven analysis-frequency

### Post-varicocelelectomy Sperm Count

After varicocelelectomy, 41.7% of patients showed sperm count >60 million and 28.3% of patients showed count between 20 and 60 million. Out of 60 patients, 2 patients had azoospermia; both of them were Grade 3 patients.

Table 5: Improvement of semen count after surgery

Grade	Total number of patients	Number of patients showing count improvement (%)
1	7	6 (85)
2	34	28 (82)
3	19	12 (63)
Total	60	46 (76)

#### After surgery count improvement up to normal level

Grade	Total number of patients	Number of patients with count >60 million (%)
1	7	4 (57)
2	34	16 (47)
3	19	5 (26)
Total	60	25 (41.7)

#### After surgery count improvement up to adequate level

Grade	Total number of patients	Number of patients with count 20-60 million (%)
1	7	2 (28)
2	34	10 (29)
3	19	5 (26)
Total	60	17 (28.3)

Table 6: Count difference grade (post 3 months)

Count difference	Grade			Total
	1	2	3	
No improvement				
Count	2	10	9	21
% within grade	28.6	29.4	47.4	35.0
Improvement				
Count	5	24	10	39
% within grade	71.4	70.6	52.6	65.0
Total				
Count	7	34	19	60
% within grade	100.0	100.0	100.0	100.0

### Chi-square tests

Pearson Chi-square	Value	df	Asymptotic significant (two-sided)
	1.871 <sup>a</sup>	2	0.392

Table 7: Count difference grade (post 6 months)

Valid	Frequency (%)	Valid percent	Cumulative percent
Group 1	16 (26.7)	26.7	26.7
Group 2	17 (28.3)	28.3	55.0
Group 3	25 (41.7)	41.7	96.7
Azoospermia	2 (3.3)	3.3	100.0
Total	60 (100.0)	100.0	

**Table 8: Morphology difference grade (post 6 months)**

Morphology difference	Grade			Total
	1	2	3	
No improvement/no change				
Count	7	26	16	49
% within grade	100.0	76.5	84.2	81.7
Improvement/change				
Count	0	8	3	11
% within grade	0.0	23.5	15.8	18.3
Total				
Count	7	34	19	60
% within grade	100.0	100.0	100.0	100.0

**Table 9: Comparative study of improvement in semen quality**

Reference and year	Number of patients rate (%)	Improvement in semen quality (%)	Pregnancy
Tulloch 1952	30	66	30
Scott and Young 1962	166	70	31
Hanley and Harrison 1962	60	70	30
Charney and Bonn 1968	104	61	24
Macleod 1969	108	74	41
Gunter 1975	60	63	52
Dubin and Amelar 1977	986	70	53
Lome and Ross 1977	80	78	51
Mcfadden and Mehan 1978	68	62	40
Newton <i>et al.</i> 1980	149	66	34
Marks <i>et al.</i> 1986	130	51	39
Past departmental study 1994	56	84	60.7
Present study 2012-13	60	81	58

**Table 10: Pregnancy rate**

Grade	Number of patients	Number of pregnancy (%)
1	7	6 (85)
2	34	21 (61)
3	19	8 (42)
Total	60	35 (58)

### Motility

The stress pattern indicates that varicocele interferes with sperm motility. This study shows that, in 91% of patients, semen has below the normal level of motile sperm percentage. Some semen analyses showed only sluggishly active sperms and no actively motile sperms. However, after surgery, about 81% of patients had improved sperm motility percentage. About 28 patients, i.e., 46% had normal sperm motility and 38.29% had <50% sperm motility (Table 8).

### Morphology

According to Macleod in varicocele patients, abnormal tapering forms are common and are 15% in the total count. However, in this study, the details of abnormal forms are not clearly studied because the semen analysis was done

in different oratories by different technicians. Hence, identification and differentiation of tapering forms are not well established. This study represents only abnormal and normal forms of spermatozoa. Above 30% of normal forms in the semen are normal. Semen analysis showed that 33% of patients with varicocele had subnormal level of morphologically normal sperms compared to normal individuals. The entire Grade 1 patients had above 30% of normal forms, and Grades 2 and 3 had 32% and 42% below the normal forms (Tables 9 and 10). Hence, after surgery, about 85% of patients showed improvement in morphology and had more than 30% normal forms.

## CONCLUSION

1. The incidence of varicocele in infertility cases is 2.6%.
2. The mean age group admitted for varicocelectomy is 26-35 years.
3. About 56.5% of patients had Grade 2 varicocele.
4. About 83% of varicocele patient had severe oligospermia. Varicocelectomy definitely improves the semen count. After surgery, 76% of patients had count improvement.
5. Severity of varicocele reflects in semen analysis. Grade 3 shows very poor quality than Grade 1.
6. Azoospermia is not a contradiction for varicocelectomy. However, unfortunately, in this study, no count improvement is observed in azoospermic patients. Two patients who were studied obtained nil effect.
7. Varicocelectomy severely affects the motility of the sperm. About 91% of patients had below normal motility.
8. Nearly 81% of patients had motility improvement after varicocelectomy.
9. Morphology is not much affected by varicocele. Only 33% of patients had below normal morphology.
10. Varicocelectomy improves the morphology also. After surgery, 85% of patients had improved % of the normal forms.
11. Nearly 81% of patients had semen quality improvement after varicocelectomy.
12. Nearly 58% of patients became fertile after surgery.
13. Grades 1 and 2 patients show better prognosis than Grade 3.
14. More patients achieved pregnancy between 3 and 12 months after surgery.
15. None of the patients had post-operative complications.
16. Mild degree varicocele with mild Oligospermia responds to medical treatment and proper advices.
17. In this study, the choice of surgery preferred was inguinal approach as the procedure was very easy

- to perform and also done as a day-care procedure.
18. Palamos approach was equally good but time-consuming and required more hospital stay.
  19. However, there are controversies regarding this outcome.
  20. Grade-wise comparison of count, motility, and morphology after surgery showed marked improvement though statistical significance is not that much.

Thus, this study shows that there is an increase in the incidence of varicocele in male infertility, and about 58% became fertile after varicocelelectomy which is comparable to other studies conducted before.

## REFERENCES

1. Tulloch W. A consideration of sterility in the light of subsequent pregnancies. II. Sub fertility in the male. (Tr. Edinburgh Obst. Soc. Session 104). Edinb Med J 1951- 1952;59:29-34.
2. Aafjes JH, van der Vijver JC. Infertility of men with and without varicocele. Fertil Steril 1985;43:901-4.
3. Rigau LJ, Stinberger EJ. Relationship of varicocele to sperm output and fertility of male partners in fertile couples. Urology 1978;120:691-4.
4. Vermeulen A, Vandeweghe M. Improved fertility after varicocele correction: Fact or fiction? Fertil Steril 1984;42:249-56.
5. Mehar DJ. Results of ligation of internal spermatic vein in the treatment of infertility in azoospermic patients. Fertil Steril 1976;27:110.
6. Pricolo R, Croce P, Salvatori P. Male varicocele analysis of the incidence. Minerva Chir 1990;45:395-400.
7. Marks JL, McMahan R, Lipshultz LI. Predictive parameters of successful varicocele repair. J Urol 1986;136:609-12.
8. Driuk NF, Khakimov SH, Tkachuk LS, Furmanenko ED, Sakun VM, Khokholia AV. Current methods of treatment of varicocele. Klin Khir 1990;7:25-8.
9. Petros JA, Andriole GL, Middleton WD, Picus DA. Correlation of testicular color Doppler ultrasonography, physical examination and venography in the detection of left varicoceles in men with infertility. J Urol 1991;145:785-8.
10. Thomas AJ Jr, Geissinger MA. Current management of varicocele. Urol Clin North Am 1990;17:893-907.

**How to cite this article:** Shajahan Y, Adiyodi VK. Effect of Varicocelelectomy on Seminal Parameters and Infertility: A Prospective Study. IJSS Journal of Surgery 2017;3(3):45-50.

**Source of Support:** Nil, **Conflict of Interest:** None declared.