ORIGINAL ARTICLE

Evaluation of Changes in Semen Parameters Following Varicocelectomy in Varicocele Patients

Satish Parihar, Gurbir Singh, Ab Hamid Wani, Rahul Singh, Mithlesh Wanchoo

Abstract

Background: Varicocele is an abnormal degree of venous dilatation in pampiniform plexus of testis. The male infertility causes are multifactorial and varicocele occupies a significant position with a prevalence of 19-41% in cases of primary infertility and 45-81% among cases of secondary infertility. **Methods:** The study was conducted in the Department of Surgery, Government Medical College, Jammu. A detailed history was taken from all the patients followed by physical examination. Scrotal ultrasonography was carried out for detecting the varicocele and further grading. A total of 42 male patients were included. **Results:** Maximum patients were in the age group of 21-40years of age. Most of the patients presented with grade IV varicocele with 47.6%. The mean pre-op volume was 2.46±0.949ml and the mean post-op volume was 2.90±0.753ml. The mean pre-op motility was 51.60±19.313% and the mean post-op motility was 58.40±16.839%. The mean pre-op concentration was 41.80 ±24.856million per ml and the mean post-op concentration was 43.00 ±22.128million per ml. **Conclusion:** There is definite improvement in sperm parameters with statistically significant increase in semen volume, sperm motility and sperm concentration following varicocele repair. The grade of varicocele is also essential as lower grades of varicocele shows higher rates of improvement in semen parameters post-varicocelectomy.

Keywords

Varicocele, Varicocelectomy, pampiniform plexus, spermatic vein

Introduction

Varicocele is an abnormal degree of venous dilatation in pampiniform plexus of testes. Normally reverse blood flow is prevented by small one way valves. Therefore, absent or incomplete valves in the internal spermatic vein is accompanied by a retrograde blood flow down this vein and cremasteric vein to the pampiniform plexus. This phenomenon leads to increase of 2.5°C of scrotal temperature and several other changes i.e loss of spermatocyte and spermatid.[1] Although no mechanism has conclusively explained infertility in men with varicocele, number of potential mediators have been suggested including scrotal hyperthermia, testicular venous hypertension and hypo-perfusion, oxidative stress, hormonal disturbances, dilution of intratesticular substrates, imbalances of hypothalamic pituitary gonadal axis, testicular hypoxia and backflow of toxic metabolites (renal and adrenal).[2] Primary varicocele involves defective valves while secondary varicocele results from venous compression by outside factors such as retroperitoneal tumors. Microscopic evaluation of spermatic vein fragments has revealed alterations in the longitudinal muscle layers in addition to a decrease in the number of nerve elements and "vasa-vasorum" in the vessel wall.[3] These findings suggest a defective contractile mechanism of blood transport through the pampiniform plexus. Hydrostatic pressure has been

PG Department of General Surgery, Government Medical College, Jammu
Correspondence to: Dr. Satish Parhiar, Associate Professor, Department of General Surgery, Government Medical College, Jammu
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shown to increase by as much as five-fold in vasography studies of the spermatic veins.[4] This reverses the pressure gradient thereby leading to a hypoxic state. Biopsies of varicocele affected testes show a decrease in E-cadherin and alpha-catenin at the Sertoli-Sertoli junction and subsequent disruption of the blood testis barrier which contribute to defects in sperm production.[5] The nucleus of the sperm becomes condensed during the final stages of spermatogenesis and histones are replaced by cysteine-rich protamines. Sperm deoxyribonucleic acid becomes more resistant to damage mediated by heat stress and other factors especially ROS. Varicocele may affect the final stages of spermatogenesis and lead to changes in sperm parameters and functions.[6] AIMS: To evaluate the prevalence and effect of varicocele repair on sperm motility, sperm concentration and semen volume.

Material and Methods:

The study was conducted in the Department of Surgery, Government Medical College and Hospital, Jammu (Jammu and Kashmir). The study was performed according to the guidelines of the ethical committee of the institute.

Design: This is a prospective study.

Inclusion

1.Patients who are symptomatic with complain of pain.
2.Patients who are asymptomatic with documented infertility.
3.Clinically palpable varicocele.
4.A male presenting with palpable varicocele and abnormal semen analysis is a candidate for varicocele repair even if he's not currently attempting to conceive but has a desire for future fertility.

Exclusion

1.Hypogonadisms
2.Recurrent varicocele
3.Subclinical varicocele
4.Congenital urogenital abnormalities
5.Abnormal hormonal profile
6.Other systemic illness
7.Patients unwilling to undergo treatment.

A total of 42 patients were included in the study. After obtaining proper informed consent were evaluated pre operatively including:

1)Complete history
2)Physical examination preferably in a warm room
3)Semen Analysis
4)Scrotal ultrasonography

The varicocele diagnosis was assigned according to the World Health Organization grading (WHO 2010).

"Subclinical: not palpable, visible only in sonography.
"Grade 1: palpable only during Valsalva maneuver when upright.
"Grade 2: palpable when upright with no Valsalva maneuver but not visible.
"Grade 3: both palpable and visible through the scrotal skin when upright with no Valsalva maneuver.

Sarteschi ultrasonographic classification of varicocele.

"Grade I: venous reflex at the emergence of the scrotal vein only during the valsalva maneuver; hypertrophy of the venous wall without stasis.
"Grade II: supratesticular reflex during the valsalva maneuver; venous stasis without varicosities.
"Grade III: peritesticular reflux during the valsalva maneuver; overt varicocele with early stage varices of the cremastric vein.
"Grade IV: spontaneous basal reflux that increases during the valsalva maneuver, possible testicular hypotrophy, overt varicocele, and varicosities in the pampiniform plexus.
"Grade V: spontaneous basal reflux that does not increase during the valsalva maneuver, testicular hypotrophy, overt varicocele and varicosities in the pampiniform plexus.

In all patients, preoperative semen analysis was performed using two different semen specimens, each obtained by masturbation and at least 3 weeks preoperatively and 3 months after varicocele treatment. Specifically the abstinence period is 2-3 days in all cases.

Normal Semen Parameters:

¢Sperm Volume: >1.5ml
¢Sperm concentration: >15 million/ml
¢Total Sperm Count: >39 million
¢Sperm progressive motility: >32%

Statistical Analysis: All estimated results were expressed as mean±SD. Mean values were assessed for significance by paired student t test. Frequency and percentages were used for the categorial measures. Probability values $p<0.05$ will be considered statistically significant.

Results

A total of 42 male patients were included in our study. Youngest patient was 19 years of age and eldest was of 47 years of age. Maximum patients were in the age group of 21-40 years of age. (*Table I*)

In all the 42 patients left side is involved with none of the patient presenting with right sided varicocele. In our study, most of the patients presented with grade IV varicocele with 47.6% followed by grade III varicocele with 40.4%. Grade II was present in 4.76%, grade V was present in 7.14% while none of the patient with grade I varicocele.

Table I: Age distribution of the patients with varicocele.

S.No.	Age Group(years)	Frequency	Percentage(%)
1.	=20	10	23.8%
2.	21-40	29	69.06%
3.	>40	03	7.14%
	Total	42	100%

Table II: Distribution of patients according to grading of varicocele

Clinical Grading	Frequency	Sonographic Grading	Frequency	Percentage
Grade I	02	Grade I	00	0%
		Grade II	02	4.76%
Grade II	17	Grade III	17	40.4%
		Grade IV	20	47.6%
Grade III	23	Grade V	03	7.14%
Total	**42**		**42**	**100%**

Table III: Comparison of semen volume (Pre-Op and Post-Op)

S.No.	Volume (in ml)	Pre-Op		Post-Op	
		Frequency	Percentage	Frequency	Percentage
1.	<1.5ml	03	7.1	Nil	00
2.	=1.5ml	39	92.9	42	100
	Total	42	100%	42	100%

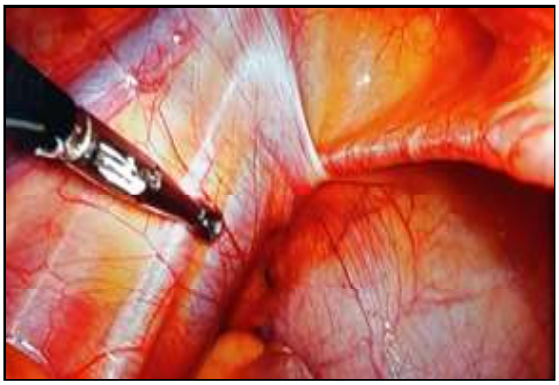

Fig. 1 Identification of triangle of Doom.

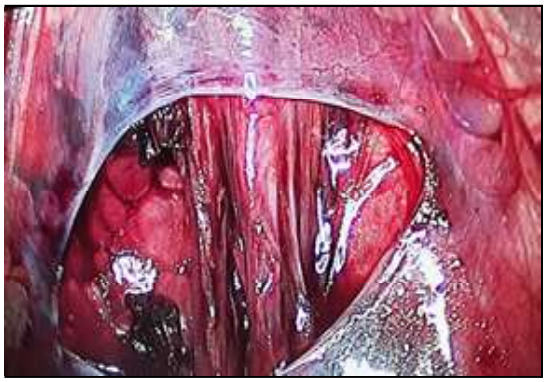

Fig. 2 Identification of testicular veins

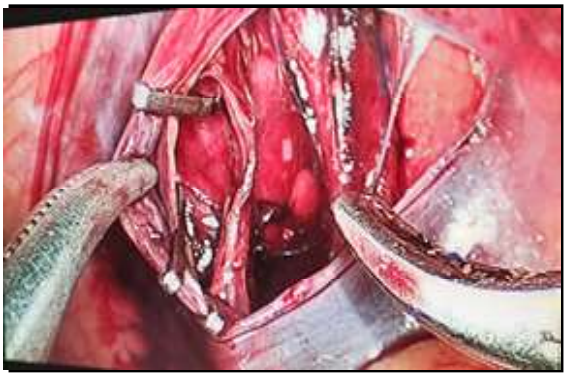

Fig. 3 Ligation and clipping of testicular veins.

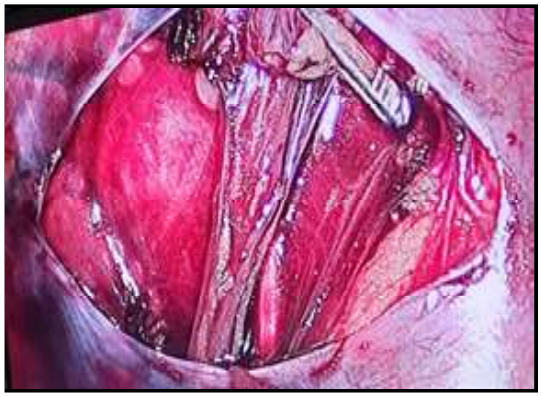

Fig. 4 Veins after clipping.

Table IV: Comparison of sperm motility preoperatively and postoperatively.

S.No.	Motility (percentage)	Pre- OP		Post-OP	
		Frequency	Percentage	Frequency	Percentage
1.	<32	07	16.66%	03	7.1%
2.	=32	35	83.33%	39	92.9%
	Total	42	100%	42	100%

Table No. V: Concentration of sperm in semen (pre-op and post-op)

S.No	Concentration(in million per ml)	Pre-Op		Post-Op	
		Frequency	Percentage	Frequency	Percentage
1.	<15	3	7.1	3	7.14
2.	=15	39	92.9	39	92.9
	Total	42	100	42	100

(***Table II***)

In our study, 3 patients had less than 1.5 ml of volume of semen while 39 patients had more than 1.5ml of volume. The mean pre-op volume was 2.46ml with standard deviation (SD) of ±0.949. Post-operatively volume of semen improved. None of the patient having less than 1.5ml of volume post-operatively. The mean post-op volume was 2.90ml with SD of ±0.753. (*Table III*)

In our study, 7 patients had less than 32 percent while 35 patients had motility more than 32 percent. The mean pre-op motility was 51.60% with SD of ±19.313. Out of 7 patients, motility of 4 patients improved postoperatively to more than 32 percent. The mean post-op motility was 58.40% with SD of ±16.839. (*Table IV*)

In our study, 3 patients had concentration less than 15 million per ml while 39 patients had more than 15million per ml of sperm concentration. The mean pre-op concentration was 41.80million per ml with SD of ±24.856. Percentage remained same in the study group postoperatively also. The mean post-op concentration was 43.00 million per ml with SD of ±22.128. (*Table V*)

All the patients underwent laparoscopic varicocelectomy.

Discussion :

In our study, 70% of the patients belongs to age group of 21-40 years with mean age of 25.43yrs. In the study by Ghayda RA *et al,* 41.9% patients were in the age group of 30-40 years.[7] In the study by Shabana et al, the mean age was 28.3years.[8] In the study by Blumer et al, the mean age was 34.0 ±4.7 years.[9] In the study by Morshed MS et al 60% of the patients was in the age group of 26-35years of age with mean age of 28.3±6.0 years.[10] In the study by Cakiroglu B *et al* the mean age of patients was 24.53±8.13years.[11] In the study by Samplaski MK et al the mean age of the patients was 35.8years.[12] In our study, all the patients presented with left sided varicocele. In the study by Ghayda RA et al left sided varicocele was seen in 48.9% and bilateral was seen in 51.9% patients with none of the patients with right sided varicocele.[7] In the study by Morshed MS *et al* left sided varicocele was seen in 86.7% of the patients and bilateral involvement was seen in 13.3% of the patients.[10] In the study by Samplaski MK *et al* left sided varicoceles alone were present in 53.5% of the patients, none of the patients with right sided varicocele and 46.5% of patients with bilateral varicoceles.[12] In our study, a significant improvement was found in semen volume and sperm motility. The mean pre-op volume in the study was 2.46±0.949 ml which improved to mean post-op volume of 2.90±0.753ml with p value less than 0.001. In the study by Samplaski MK *et al* the mean baseline ejaculate volume was 3.0±1.5 ml and mean ejaculate volume after varicocelectomy was 3.3±3.9ml representing a mean 10.6% increase from baseline.[12] In our study, significant improvement was seen in sperm motility after varicocelectomy. The pre-op motility was 51.60±19.313% which improved to 58.40±16.839% post-operatively with p value less than 0.001. In the study by Grober et al the mean pre-op motility was 51.70±4.20 % which improved to 64.30±6.60% postoperatively.[13] In the study by Cakiroglu B et al the mean pre-op motility was 15.4±8.0% which improved to 20.4±8.4% postoperatively.[11] Hsieh et al in the study found sperm motility increased from 31.8% to 47.5%.[14] Significant post varicocelectomy improvement in sperm motility was also seen in studies by Kamal et al and Cayan et al.[15,16] In our study, the mean pre-op sperm concentration was 41.80±24.86 million/ml and mean post-op sperm concentration was 43.0±22.13 million/ml with p value of 0.376. The post-op sperm concentration is improved however the study findings are not statistically significant. In the study by Cayan *et al* mean pre-op concentration was 30.97±2.46 million/ml and mean post-op concentration was 34.57±3.58 million/ml.[16] Abdel-Meguid et al in the study

got 14.1 million/ml mean improvement in sperm concentration.[17] However, the study conducted by Bakri et al did not found significant improvement in sperm concentration and motility following varicocelectomy.[18] In the study by Kakade A *et al,* highest improvement in seminal parameters was seen in lower grades (grade I and II) of varicocele as opposed to higher grades.[19] This means significant progress after surgery can be expected in varicocele Grade I and II. In another study by Polito et al, Grade I varicoceles showed the most significant improvement in sperm density and motility.[20] However in our study, maximum patients presented with grade III and grade IV varicoceles in which significant improvement in sperm concentration was not seen. This was in concordance with studies stated above.

Conclusion

From our study, this is concluded that there is definite improvement in sperm parameters with statistically significant increase in semen volume, sperm motility and sperm concentration following varicocele repair with laparoscopic varicocelectomy. The grade of varicocele is also essential when it comes to treatment as lower grades of varicocele shows higher rates of improvement in semen parameters post-varicocelectomy. There is improvement in sperm parameters but period of this study was too short to show whether fertility improves or not. Hence we conclude that surgical interventions in any grades of varicocele proved to be measure to arrest the disease progression.

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Conflicts of Interest

There are no conflicts of interest.

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