Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v31i7.7110

PROSPECTIVE COMPARATIVE STUDY OF OPEN AND MICROSCOPIC (LOUPE -4X MAGNIFICATION) VARICOCELECTOMY USING SEMINAL AND HORMONAL PARAMETERS IN GRADES II AND III VARICOCELES

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ABSTRACT

BACKGROUND

Varicocele affects various parameters of male fertility, and varicocelectomy produces significant improvement in these parameters. Both seminal and hormonal factors are found to be affected by varicocele. Varicocele is an important cause of infertility and it is important to know the effects of varicocelectomy to prognosticate and treat varicocele effectively.

AIMS

To find out seminal & hormonal abnormalities in cases of grade II & III varicoceles and analyse the results of sub inguinal opening & microscopic (loupe) method of varicocelectomy on seminal & hormonal parameters.

METHODS

60 patients with varicocoele who underwent open and loupe 4 microscopic varicocelectomy were compared for seminal and hormonal parameters pre-operatively and post-operatively and the results were statistically analysed.

RESULTS

There were significant postoperative increases in serum Testosterone and seminal parameters like sperm concentration, count, motility and morphology. There was significant reduction of serum FSH (Follicle – Stimulating Hormone) and LH (Luteinizing Hormone) after surgery in both groups. Operative time was higher in microscopic technique and lesser complications.

CONCLUSIONS

Both open & microscopic subinguinal varicocele ligation resulted in significant improvement in all seminal parameters, testicular volume & serum testosterone with significant decrease in serum FSH & LH in patients with grade II & III varicoceles.

KEYWORDS: Varicocelectomy, Semen Analysis, Hormonal Assays, Infertility.

INTRODUCTION

Varicocele is the enlargement and tortuousity of the veins in the pampiniform plexus of spermatic cord. It is prevalent in about 15% of adolescent males with approximately 90% of them occurring on the left side mainly.[1] Spermatic concentration and motility is significantly decreased in 65% to 75% of subjects with varicoceles and infertility is seen in a high percentage of individuals with varicocele than the rest of the population.[2] Surgical intervention is usually indicated in presence of infertility, discomfort and poor testicular growth in adolescents.. Surgical correction of varicocele leads to significant elevation of serum testosterone and free testosterone level.[3] Varicocele even in patients older than 40 years has improved sperm concentration and motility to a level which is statistically significant, however no greater degree of improvement in semen characteristics is observed in this group between grade II & III ligation which were followed up for 6 months.[4] There are several Varicocele ablation procedures. In our study we plan to find out seminal abnormities and hormonal abnormalities in grade II & III Varicoceles and to compare open sublingual and loupe sublingual procedure of Varicocele ligation using seminal & hormonal parameters.

Aims and Objectives

To find out seminal & hormonal abnormalities in cases of grade II & III varicoceles and analyse the results of sub inguinal opening & microscopic (loupe) method of varicocelectomy on seminal & hormonal parameters.

MATERIALS AND METHODS

The proposed study was conducted in the Department of General Surgery, Safdarjung Hospital, New Delhi from September 2009 to March 2011. The study was conducted in a total number of 60 patients. They were selected from those who were attending male infertility clinic and Surgery OPD.

The study was conducted in males between the age of 15 and 45 years with grade II and III varicoceles. The study included both fertile and infertile men. Patients with epididymoorchitis, urinary tract infection, retroperitoneal tumors, renal cell cancers, local skin infections, those unfit for surgery, those unwilling to undergo follow-up after a period of 3 months post surgery and those with persistent varicocele after previous surgery were excluded.

Patients presenting in Surgical & Urology OPD of Safdarjung Hospital with grades II & III varicoceles were included in the study divided into two groups, one was operated by subinguinal opening method & the other undergone subinguinal microscopic approach. Randomization was done using computer generated randomized table. Patients of both groups were evaluated clinically, by laboratory tests and sonographically preoperatively & 3 months after surgery.

Colour Doppler ultrasonography was used to confirm physical findings and to determine testicular volume. Testicular volume was determined by following formula:
Testicular volume-0.71 x Length x Breadth x Depth.

Semen Analysis

Semen analysis was performed according to the WHO guidelines (1999). The patients were asked to come after at least 3-5 days of abstinence from sex. The parameters studied were semen volume, Sperm concentration, sperm motility, sperm morphology.

Hormonal analysis: Levels of FSH, LH and testosterone were estimated in the serum of all the patients by enzyme immunoassay.

Routine examinations were performed in all patients for PAC (Pre anaesthetic check- up), purpose which included. The patients in group A were subjected to open subinguinal varicocelectomy and those of group B were subjected to Loupe subinguinal varicocelectomy. All cases were performed under spinal anaesthesia. Follow up was done at 1 week and 3 months.

Statistical Analysis

The two surgical procedures were compared in terms of seminal & hormonal parameters, durations of surgeries, complication rates & failure rates (recurrences).

Statistical analysis was performed using Student's t test or Chi square test as applicable. Statistical significance was defined if P value was <0.05. Comparisons between the two grades (II & III) of varicocele & also between fertile & infertile groups were done in terms of post operative improvement of seminal & hormonal parameters using Students't test. P value <0.05 was considered statistically significant.

RESULTS

A total of 60 patients of grade II & III varicoceles were included in our study. All of them were having unilateral varicoceles on left side. Of them 30 patients underwent subinguinal open varicocelectomy (group A) & the other 30 underwent loupe varicocelectomy (group B).

Our study included patients in the age group of 15 to 45 years. The mean age of prevalence of varicocele in our study was 25.63±4.53 years.

Grade II varicoceles were present in 24(40%) and grade III in 36(60%) of the total number of patients in our study group. In group A, the number of grade II patients was 11 (18.33%) & there were 19 (31.67%) patients with grade III. In group B, there were 13(21.67%) grade II varicocele patients & 17(28.33%) grade III varicocele patients.

	Infertility	**Heaviness in Scrotum**	**Fullness & Swelling in Scrotum**	**Pain in Scrotum**
Total 60 patients	40(66.67%)	13(21.67%)	18(30%)	4(6.67%)
Group A	20	8	7	3
Group B	20	5	9	1
Grade II	16	3	4	1
Grade III	24	10	14	3
Table: 1 symptoms of varicocoele				

There is a difference in the volume of the right & left testis by 0.67 cc which is 4.58% of the volume of the left testis. In group A the left testis was 14.58 ±0.56 cc & in group B it was 14.7 ±0.64 cc.

The average volume of the affected testis after surgery in all the 60 patients totally was 15.25 ±0.64 ml. In group A patients, it was 15.09 ±0.63 ml & in the group B it was 15.41±0.62 ml.

In all the grade II varicocele patients the mean testicular volume on affected side was 14.71±0.6 cc and in all the grade III varicocele patients the mean volume of the affected testis was 14.67 ±0.61 cc. The testicular mean volume on affected side in group A grade II patients was 14.72 ±0.45 cc & it was 14.65 ±0.65 cc in the grade III patients. In group B grade II patients, it was 14.71 ±0.74 cc & in the grade III patients, it was 14.69 ±0.59 cc.

Hormonal Analysis

The mean serum FSH in all the 60 patients was 15.07 ±0.93 m IU/ml preoperatively and 9.47 ±0.74 m IU/ml postoperatively (P < 0.001). In group A, the mean value was 15.03 ±1.41 m IU/ml

preoperatively & 9.44 ±0.73 m IU/ml (P<0.001) postoperatively. Preoperative value in group B was 15.11 ±1.43 m IU/ml & it was 9.5±0.75 m IU/ml (P<0.001) postoperatively.

Mean serum FSH in m IU/ml	**Group A**	**Group B**
Preoperative value	15.03	15.11
Postoperative value	9.44	9.5
P value	0.001	0.001
Mean serum LH in m IU/ml	Group A	Group B
Preoperative value	9.74	9.76
Postoperative value	9.23	9.23
P value	<0.05	<0.05
Mean serum testosterone in m IU/ml	Group A	Group B
Preoperative value	5.5	5.49
Postoperative value	9.31	9.76
P value	0.001	0.001
Table 2: Hormonal parameters		

Group A grade II patients had 15.04 ±1.41mIU / m l as the preoperative value & the post operative mean value was 9.42 ±0.74 ml ; the grade III patients had a mean value of 15.02±1.41 mIU/ml preoperatively & 9.46 ±0.75 m IU/ml postoperatively (P < 0.0001) In group B, the mean preoperative value in grade II & grade III was 15.06 ±1.43 m IU/ml & 15.16 ±1.43 mIU /ml The postoperative value in grade II & grade III group B patients was 9.44±0.74 m IU/ml (P<0.001) & 9.53±0.75 m IU/ml (P < 0.001) respectively.

Mean Serum FSH in mIU/ml	**Grade II**		**P Value**	**Grade III**		**P Value**
	Preoperative	Postoperative		Preoperative	Postoperative	
Whole group	15.05	9.43	0.001	15.09	9.49	0.001
Group A	15.04	9.42	0.001	15.02	9.46	0.001
Group B	15.06	9.44	0.001	15.16	9.53	0.001
Mean FSH Values	Preoperative	Postoperative		Preoperative	Postoperative	
Whole group	9.74	9.22	<0.05	9.76	9.24	<0.05
Group A	9.73	9.21	<0.05	9.75	9.25	<0.05
Group B	9.75	9.23	<0.05	9.77	9.23	<0.05
Mean serum testosterone level	Preoperative	Postoperative	P value	Preoperative	Postoperative	P value
Whole group	5.505	9.45	0.001	5.485	9.64	0.001
Group A	5.51	9.15	0.001	5.49	9.51	0.001
Group B	5.50	9.75	0.001	5.48	9.77	0.001
Table 3: Mean hormonal values across groups						

Seminal Parameters

The mean volume of ejaculate in all the 60 patients before surgery was 2±0.025 ml. In group A the pre operative volume of ejaculate was 2±0.025 cc. In group B the pre operative mean volume of ejaculate was 2±0.025 cc.

Preoperatively all the 60 patients had a mean sperm concentration of 16.86±2.9 million/ml & after surgery it was 24.67±3.2 million/ml (P<0.001). In group A the mean value of sperm concentration was 17.13±3.1 million/cc before surgery &24.44±3.3 million/ml (P<0.001) after surgery. In group B it was 16.59±2.8 million/cc before surgery & 24.9±3.1 million/ml (P<0.001) after surgery.

Mean Sperm Concentration in m IU/ml	**Group A**	**Group B**
Preoperative value	17.13	16.59
Postoperative value	24.44	24.9
P value	0.001	0.001
Mean sperm count in million/ejaculate	Group A	Group B
Preoperative value	34.34	33.89
Postoperative value	48.8	49.8
P value	0.001	0.001
Mean sperm motility in % normal	Group A	Group B
Preoperative value	38.6	38.53
Postoperative value	42.2	42.96
P value	<0.05	<0.05
Mean sperm morphology in % normal	Group A	Group B
Preoperative value	40.06	40.27
Postoperative value	42.2	42.96
P value	0.01	0.01
Table 4: Seminal parameters		

DISCUSSION

We found that the varicocele patients mainly presented between the age of 15-40 years, patients below the age of 15 years were not present in our study due to hospital criteria. None of the patients in our study group was above 40 years similar to the finding of Zucchi A et al who found a mean age of 26 years and a range of 17 to 40 years.[5]

The grades of varicocele found in different studies have been variable. Many have included grade I in their studies & in other cohort studies it was considered to be present in normal asymptomatic subjects. In our study we did not take grade I varicocele. We have found that grade II varicoceles occurred in 24 (40%) of our patients (n=60) and in the rest 36 (60%) patients it was grade III varicocele.

It is an important finding in our study where fertility has been investigated. In our study infertility was present in 40(66.67%) of patients who came for their varicocele treatment & the rest 20(33.33%) were fertile. Others have reported varying incidence of infertility in their studies on varicocele. Sinescu I et al reported an incidence of 58(55.77%) (n = 104)[6] & an incidence of 86.76% (59 patients n = 75) was seen by Zaheer K.[7]

We found that the mean testicular volume on the effected side was 14.64 ±0.6 ml & on the contra lateral side it showing a difference of 4.57% which was significant. Zini A[8] et al found a significant (P < 0.001) difference in left & right testes in patients with varicoceles & Zucchi A et al who found a low volume of the testis in his study.[5] We have also found in our study that the left testis showed an increase in the mean volume by 0.61 cc which is 14.17% of the preoperative value which is significant (P < 0.001)

In our study both grade II & grade III varicocele showed statistically significant improvement in the volume of the affected testis after varicocelectomy.

Cantatore C et al found significantly high level of FSH in varicocele patients.[9] Su LM et al found a decrease in serum FSH from a mean preoperative value of 15.21 m IU/ml to a mean postoperative value of 10.82 m IU/ml i.e. by 28.86% Cayan S et al[10] also observed a statistically significant decrease in serum FSH by 32.89% after varicocelectomy in patients with varicoceles.[11] The mean preoperative value of serum FSH in all the 60 patients was 15.07±1.42 m IU/ml & after surgery it was 9.47 ±0.74 cc. In our study we have noted a fall in serum FSH by 37.16% of the preoperative value which is statistically significant (P<0.001) both group A & B patients had almost equal preoperative mean value of serum FSH and they differed by only 0.09 m IU/ml which is insignificant.

The mean preoperative serum FSH in group A was 15.02±1.41 m IU/ml & after surgery it was 9.44±0.73 m IU/ml showing a decrease in the level of serum FSH by 5.58 m IU/ml which is 37.15% of the preoperative value. The P value in this case is <0.001.
In group B before surgery the mean serum FSH was 15.11±1.43 m IU/ml & post operatively it was 9.5±0.75 m IU/ml which showed a decline in serum FSH after surgery by 5.61 m IU/ml which is 37.13% of the preoperative value. This decline in the mean value of serum FSH is significant (P<0.001). Both Grade II and Grade III had significant decrease in Serum FSH postoperatively.

Cocuzza M et al observed no significance difference in the improvement of FSH between different grades of varicoceles after varicocelectomy.[12] The fertile patients had a mean preoperative FSH level in fertile & infertile patients differs by 2.87 m IU/ml which is insignificant. Kantartzi PD et al found that varicocele patients with infertility had a higher serum FSH level than the fertile patients with varicocele.[13]
A decrease in serum FSH by 27% (3.54 m IU/ml) was seen in postoperative patients & it was significant (P<0.001). The mean value of serum LH in our study was at a higher normal range. Yamamoto M et al found elevated serum LH level in varicocele patients.[14] Pasqualotto FF et al also supported this finding as they observed that patients with varicoceles, both fertile and infertile had a statistically significant increase in serum LH.[15] A decrease in serum LH by 5.53% (0.54 m IU/ml) was seen in preoperative and postoperative patients and it was significant (P<0.05).

Though the mean value of serum testosterone in our study was normal it was at a lower normal range.

There is an increase in the mean value of serum testosterone by 4.05 m IU/ml which is 73.77% the preoperative value. This increase is statistically significant (P < 0.001) Rodriques-netto Junior N and de Castro MP who found statistically significant improvement in serum testosterone after varicocelectomy.[16] The positive effect of varicocelectomy on serum testosterone was also found by Zarri lli et al.[17]
The testosterone level before surgery, in group A was 5.5 ±0.69 mIU /ml in group B it was 5.48 ±0.67 mIU /ml So there is a difference in the value of preoperative mean testosterone by 0.02 m IU/ml which is insignificant.
There is a difference in the mean serum testosterone by 0.19 m IU/ml between grade II and grade III which is insignificant. An increase in serum testosterone by 3.91 m IU/ml i.e. 71.35% was seen in fertile and infertile patients and it was significant (P<0.001).
There is an increase in the mean serum testosterone in the infertile patients after surgery by 4.09 m IU/ml which is 74.22% of the preoperative value and this is significant (P < 0.001).

Tanrikut C et al found significant (70% patients showed improvement by 50-100%) improvement in serum testosterone after varicocelectomy (n=325) in both fertile and infertile patients with no significant difference in the improvement between the fertile and infertile patients (p > 0.05).[18]

The normal level of sperm concentration is >20 million/ milliliter(mL) of semen.. Basar MM et al also observed that there is a statistically significant lower level of sperm counts in patients with varicoceles when compared with the control group (p<0.01).[19] There is an increase in the mean sperm concentration by 7.81 million/ml i.e. 46.32% of the preoperative value. This increase is statistically significant (P<0.001). Yamamoto et al found statistically significant improvement in the sperm concentration (P<0.002) after varicocelectomy (n=51).[14] Zucchi A et al also observed significant improvement in sperm concentration after varicocelectomy (n=43).[20] There is a difference in the mean value of preoperative sperm concentration by 0.54 million/ml in group A and B which is insignificant.

The mean sperm concentration in fertile and infertile patients differs by 9.75 million/ml which is significant. The mean sperm concentration before surgery in fertile patients had an increase in sperm concentration by 7.35 million/ml (31.26%) after surgery which is significant (P<0.001).
The sperm motility in group A rise by 8.59% after surgery and in group B by 10.57%. The percentage of increase of sperm motility in group A and B differs by 1.98% which is not significant.

The fertile patients had a mean preoperative sperm motility of (50.85 ±2.3) % and the infertile patients had their preoperative sperm motility of (32.43 ±2.2) %. So the mean sperm motility in fertile and infertile patients differs by 18.42% which is significant. Pascualotto FF et al also found a significant difference between the sperm motility in the fertile men (53.9%) and in infertile men (37.2%) with varicocele.[15]
An increase in sperm motility by 3.9% among fertile patients after surgery was seen and it was significant (P<0.05).
In the fertile patients the mean post operative sperm motility was 54.75% and it was 36.5% in the infertile group. So there is a difference 18.12% in the post operative mean values of sperm motility in fertile and infertile patients which is significant and is due to different preoperative base levels.

The mean sperm morphology in all the 60 patients was (40.17 ±2.4) % The normal level of sperm morphology is >50% normal. Hauser R. Et al found that there is no effect of varicocele on sperm morphology.[21] Gat Y et al who found a statistically significant improvement of sperm morphology after varicocelectomy.[5] On the contrary Ku JH et al found that varicocelectomy lead to improvement in all the parameters except sperm morphology.[22] Likewise Ozden C et al were also of the view that varicocele surgery improves all semen parameters except sperm morphology.[23]

There was a significant change in sperm morphology in both grade II and grade III postoperatively. Enciso M et al found that infertile patients with varicoceles have a lower sperm concentration compared to fertile patients with varicocele.[24]
In the fertile patients the mean post operative sperm motility was 54.75% and it was 36.5% in the infertile group. So there is a difference 18.25% in the post operative mean values of sperm morphology in fertile and infertile patients which is significant and is due to different preoperative values.

Surgical Time
In our study the mean surgical time required in group A was 35±7.5 minutes and in group B was 50±7.5 minutes. The difference in the mean surgical duration in the two groups is statistically significant.
The complication rate is 13.3% and the complication rate in those operated by subinguinal Loupe method is 0%. This difference in complication rate is statistically significant, P-0.038 (calculated by Pearson chi square test). Similarly the recurrence rate in group A is 13.3% having a similar statistical significance. This is comparable to the results provided by Goldstein et al.[25]

Ghanem H et al compared subinguinal microscopic varicocelectomy with retroperitoneal varicocelectomy and found that the recurrence was 0% and hydrocele as a complication occurred in 5 (1.6%) of cases (n-304).[26]

CONCLUSIONS

Both open & microscopic subinguinal varicocele ligation resulted in significant improvement in all seminal parameters, testicular volume & serum testosterone with significant decrease in serum FSH & LH in patients with grade II & III varicoceles. The microscopic technique resulted in significantly reduced rates of recurrence & postoperative hydrocele, although with a longer operating time.

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