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Original Article

Efficacy of varicocelectomy in improving semen parameters in patients with clinical varicocele

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Abstract

Despite various studies published in the recent years, efficacy of varicocelectomy and its influence on semen parameters, particularly sperm count, motility and morphology has not yet been determined. Conflicting results obtained in different studies, accounts for sparked interest in varicocele management and its effects on seminal parameters. Therefore, present study was designed in an attempt to evaluate the effect of varicocelectomy on the semen parameters by analyzing reports that included men with varicoceles who had both preoperative and postoperative semen examination done. To determine the efficacy of varicocelectomy in improving semen parameters semen parameters (count, motility and morphology) by analyzing reports that included men with varicoceles who had both preoperative and postoperative Spermatogram. The present retrospective study enrolled 50 patients in Tripoli University Hospital medical center, Tripoli /Libya.

Varicocele was graded by Dubin grading system by palpation in standing and during Valsalva maneuver under adequate exposure and scrotal Doppler ultrasound Macro and microscopic assessment of semen samples was carried out according to WHO guidelines 2010. The surgical approach used for varicocelectomy was inguinal (low ligation procedure), post operative semen analysis done after 6 months from surgery. Significant improvement in semen parameters (viz sperm counts/ml, sperm counts/ejaculate and sperm motility) were observed after varicocelectomy. We noted no effect of patient's age on the degree of improvement in semen parameters post operatively. Preoperatively, men with Grade IV varicoceles had lower sperm counts and sperm motility, but significant improvement was observed post-operatively compared to men with Grades II and III varicoceles.

Keywords: Varicocelectomy; Patients; Semen; Sperm; Tripoli; Libya.

Citation: Rajab Basem, Alsayes Mohamed, Othman Malak , Marwan Ekram Efficacy of varicocelectomy in improving semen parameters in patients with clinical varicocele https://doi.org/10.26719/LJM17-2.12**Received**: 06/10/2023; **accepted**: 27/10/2023; **published**: 31/12/2023

Introduction

A varicocele is an abnormal dilatation of the testicular veins in the pampiniform venous plexus in the scrotum caused by venous reflux [1]. This of veins drains blood from the testicles back to the heart. The vessels

originate in the abdomen and course down through the inguinal canal as part of the spermatic cord on their way to the testis. Varicoceles are a common cause of low sperm production and decreased sperm quality, which can cause infertility. However, not all varicoceles affect sperm production. Varicoceles can also cause testicles atrophy [2, 3]. Varicocele is a very common finding in young men, The prevalence of varicocele is approximately 15% in general population, 25%-40% among men with primary infertility and 45% to 81% among men with secondary infertility.[3] Isolated left-sided lesions are seen in 78% to 93% of varicocele patients, unilateral right-sided lesion has a reported incidence of 1% to 7%, bilateral varicocele is found in 2% to 20% of cases [4].

Etiology of varicocele is thought to be multi-factorial, the anatomic differences in venous drainage between the left and right internal spermatic veins varicoceles are much more common in the left testicle than in the right because of several anatomic factors[2], including angle at which the left testicular vein enters the left renal vein, lack of effective antireflux valves at the juncture of the testicular vein and renal vein, increased renal vein pressure due to its compression between the superior mesenteric artery and the aorta (ie, nutcracker effect) and another cause that veins valves that are supposed to prevent backflow fail (venous insufficiency); and Physical exertion during puberty may lead to the development of varicocele whereas physical exertion at a later age can aggravate the condition but does not modify the prevalence of varicocele.

Several hypotheses for pathophysiology of how varicocele leads to impaired spermatogenesis and infertility. heat exchange is the main hypothesis, The pampiniform plexus controls the temperature around the testicle by an efficient drainage of the testicle venous blood into the internal spermatic vein. This mechanism keeps the temperature in the scrotum 1-2°C lower than the core body temperature. In varicocele patient's dilatation of the pampiniform plexus led to testicular hyperthermia which cause damage to DNA synthesis, gene expression and protein synthesis in the nucleus of the Seminiferous tubules cells and/or Leydig cells[2]; venous stasis and reflux lead to elevate spermatic vein catecholamines; increased venous pressure in the pampiniform plexus, which limits the arterial inflow at the testicular level and interferes with the osmotic regulation of the metabolic products exerting detrimental effect on testicular epithelium[5] and hormone disturbance due to decrease of intra-testicular testosterone level secondary to Leydig cell disturbance [6]

It is usually asymptomatic (between 2% and 10% have symptoms) and only rarely causes pain, vary from sharp to dull discomfort, increase with standing or physical exertion, especially over long periods. The scrotum swelling varies from small dilated veins up to described as feeling 'like a bag of worms'. Patients may report scrotal heaviness .Infertility investigations. The high prevalence of varicoceles in sub fertile males emphasizes that they are the most important cause of poor

sperm production and reduced semen quality [7].

Careful examination, with the patient standing, is the most important method of detection, scrotum on the side of the varicocele hangs lower than on the normal side, dilation and tortuosity of the veins increase with standing and usually decrease on lying down, the varicocele cannot usually be palpated with the patient lying down, performing the Valsalva maneuver whilst standing increases the dilation and dubbin and Amelia varicocele grading system [1]

There are no established effective medical treatments, some evidence slows the progress from subclinical to palpable varicoceles but they have no effect on the onset of testicular growth arrest. Surgical repair of subclinical varicoceles is not usually recommended, although opinions differ [8]

This study Aims to determine the efficacy of varicocelectomy in improving semen parameters semen parameters (count, motility and morphology) by analyzing reports that included men with primary varicoceles who had both preoperative and postoperative Spermatogram

Materials and Methods

This study was conducted in Tripoli University Hospital, Tripoli / Libya, at Jan. 2020 up to Jan. 2021. The present study enrolled 50 patients with clinical palpable Varicocele (grads II, III , IV) unilateral or bilateral and at least one abnormal semen parameter , and had surgical varicocelectomy are done (low ligation) in Tripoli universal hospital، in this trial the mean age of patients was 28 year, the patient age ranged from 40 18 –years , those patients with clinical Varicocele was graded by Dubin grading system by physical examination , (palpation in standing and during Valsalva maneuver under adequate exposure) and scrotal Doppler ultrasound, post operative semen analysis done after 6 months from surgery.

After three to five days of sexual abstinence, non-use powders or other things or shampoo in sample equality because they kill sperm and access the lab after the sample collection in a 30-minute semen samples were obtained by masturbation and collected in a sterile plastic container, Macro and microscopic assessment of semen samples was carried out according to WHO guidelines 2010.

Inclusion criteria: Age between 18 - 40 yrs old, patients with clinically palpable unilateral or bilateral, and patients with clinically palpable varicoceles either unilateral or bilateral (grades II-III-IV)

Exclusion criteria: The patients who were below 18 and above 40 yrs. old of age, the patients with Sub clinical or recurrent varicocele, the patients with normal semen analysis or Azoospermia and Secondary varicocele (i.e., Carcinoma)

Statistical analysis: The statistical analysis was computerized using the statistical program for social sciences (SPSS version 21) that used for data entry and analysis descriptive statistic were used and all results are presented as frequencies ،mean ±stander deviation and percentages. Categorical data were compared using t-test for quantitative if appropriate ،P-value less than 0.05 was considered as significant.

Routine information: Name / Age / Sexual abstinence/ Sample time (Collection / Received) / Sample date/ performed / Place of collected sample.
Semen parameter: Semen volume (ml) By pipette; semen pH: by stripe; liquefaction (30 min in incubation); viscosity (high / low); color and sperm agglutination
Microscopic examination: Sperm Count / ml, 20 micros from semen and 20 micros from normal slain and are mixed for 5 minutes, 20 micro is taken from the mixture put on the chamber and it is counted Count (millions / ejaculate). Sperm count / ml * Semen volume (ml), RBC count, WBC count, epithelial cell, and bacteria.
Morphology examination: Normal shape and Abnormal shape
Motility examination: Rapid linear progressive motility, slow moderate linear motility, and immotile sperms
Table1: Age distribution is shown.

Age range	No. of patients (n=50)	Percentage
<20	4	8.00
21-30	29	58.00
31-40	17	34.00
Mean ±SD	< 20	04
Range	18-40	
Median	28	

3.2 Distribution of the main complain at present (pain, swelling, infertility).
As per clinical history, patients presented with symptoms of either pain/discomfort or scrotal swelling or infertility. Minimum duration of symptoms was two months and

Results
The fifty patients were collected for this study to apply efficacy of varicocelectomy in improving semen parameters (count, motility and morphology) in patients with clinical varicocele, mean age 28,34 years the patients age ranged from 18-40 years, this study conducted in Tripoli University Hospital at medical center Jan. 2020 up to Jan. 2021.
3.1 Age group distribution
The youngest patient in the present study was 18 years and the oldest patient was 40 years old. The mean age of patients under study was 28.3 years (Range 18-40years), also this study revealed more than half of patients were aged between (21-30) years with frequency of 56%, also the lest frequency 8% was at age group <20 years (table 1)
maximum were eight months. Majority of patients i.e., 24 out of 50 (48%) presented with chief complaint of scrotal swelling whereas 18 out of 50 (36%) presented with complaints of scrotal pain/discomfort (table 2). A total of eight out of 50 (16%) patients presented with infertility.

Table 2: Distribution of the main complain.

Complaint	No.	Percentage
Scrotal Pain /discomfort	24	48%
Scrotal Swelling	18	36%
Infertility	8	16%
Total	50	100%

3.3 Distribution of varicocele side, unilateral (right or left) or bilateral.

A total of 44 out of 50 (88%) patients presented with unilateral (left sided) varicocele whereas 6 out of 50 (12%) presented with bilateral varicocele (table 3). None of patient presented with isolated right sided varicocele.

Table 3: Distribution of varicocele side, unilateral or bilateral.

Varicocele side	No.	Percentage
Unilateral left side	44	88%
Unilateral right side	0	0%
Bilateral right and left sides	6	12%
Total	50	100%

3.4 Distribution of scrotal Doppler ultrasound finding (Grad II, III, IV).

The severity of varicocele was assessed by the Dubin-Amelie classification. Patients were graded from II to IIV depending upon severity of varicocele. We observed that most of the patients 30 out of 50 (60%) presented as grade II disease (table 4). Grade III and Grade IIV varicocele was observed among 4 (8%) and 16 (32%) patients respectively.

Table 4: Distribution of percentage of patients according to grads.

Varicocele Grad	No.	Percentage
GRAD II	30	60%
GRAD III	4	8%
GRAD IV	16	32%
Total	50	100%

3.5 pre-operative and post-operative comparison of Semen Analysis.

After three to five days of sexual abstinence, semen sample were obtained by masturbation and collected in sterile plastic container, macro and micro assessment of semen sample was carried out according to WHO guidelines2010. The Mean value of sperm count/ml among pre-operative patients and post-operative patients were 48.9 (Range 16-105 million/ml) and 70.1 (range20-120 million/ml). Sperm, The mean value of sperm count/ejaculate among pre. and post-operative patients were 128.3 (S.D 66.6, Median 95) and 171.1 (S.D 75.0, Median 165). The Mean percentage motility observed among pre-operative patients was 59.1(S.D. 15.7, Median 60), whereas among post-operative patients mean percentage motility observed was 67.2 (S.D 14.4, Median 65). The mean percentage morphology observed among pre-operative patients was 27.0 (S.D. 5.6, Median 28), whereas among post-operative patients mean percentage morphology observed was 28.8 (S.D 5.7, Median 33). Significant improvement in sperm counts/ml, sperm counts/ejaculate and sperm motility (post operatively) after varicocelectomy was observed. Results of both semen parameters pre-operatively and post- operatively are depicted in Table 5

Table 5: Pre-operative and post-operative comparison of Semen Analysis.

Pre-operative			Post-operative	
Normal value	Mean	*SD	Mean	***SD**
pH 7.2	7.7	0.2	7.8	**0.2**
Volume 1.5 ml	3.0	0.4	3.1	**0.4**
Counts/ml 15x106	48.9	28.4	70.1	**28.2**

Counts/ejaculate 39x106	128.3	66.6	171.1	**75.0**
Motility % 40%	59.1	15.7	67.2	**14.4**
Morphology % 4%	**27.0**	**5.6**	**28.8**	**5.7**

3.6 Comparison of semen analysis according to different grades of varicocele before and after treatment.
In this study We compared pre-operative and post-operative semen parameters with respect to grade of varicocele, Preoperatively, men with Grade IV varicoceles had lower sperm counts and sperm motility compared to men with Grades II and III varicoceles. Statistically significant improvement was observed post- varicocele repair in semen parameters in men with Grade IV varicoceles compared to men with grade II and grade III varicoceles (figure 1).

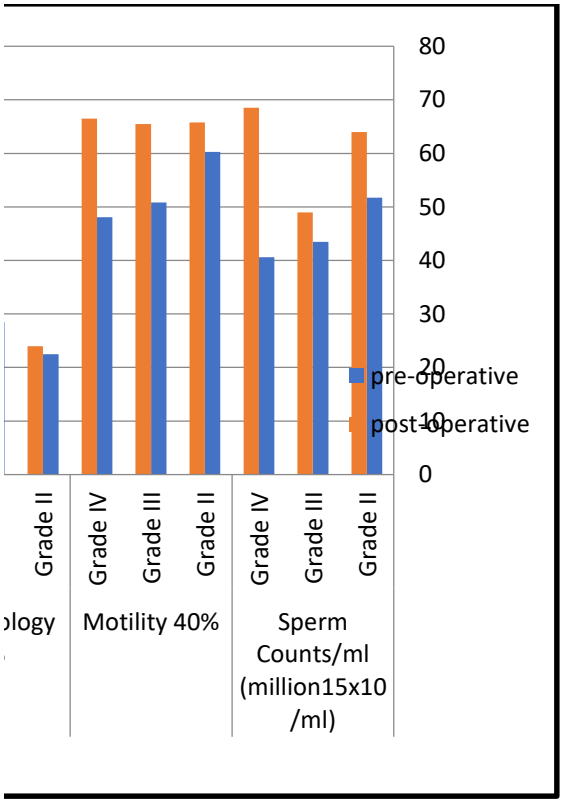

Figure 1: Comparison of semen analysis according to grades of varicocele pre. And post-operative.

DISCUSSION

Varicocele is abnormal dilatation and tortuosity of veins of the pampiniform plexus that drain the testis. It is more common on the left than on the right.as in table 3, 88% of varicocele on left side. Varicocele is among the most common causes of male infertility. It is also one of the most controversial issues. Several trials have demonstrated the efficacy of varicocelectomy in improving male infertility

The present study was conducted to evaluate the effect of varicocelectomy on the semen parameters (count,

motility and morphology), by analyzing preoperative and postoperative semen data after 6 months from operation Though large number of reports have shown a significant attenuation of oxidative stress markers occurs after varicocelectomy and also significant improvements in sperm DNA integrity has been demonstrated in men after varicocele repair[8] On the other hand many authors have suggested no improvement in the semen parameters after correction of varicocele[6]. Conflicting results obtained from different studies attempting to answer the question of whether or not varicocelectomy improves seminal parameters, accounts for the sparked interest in varicocele management. Thus, present study was conducted to evaluate the effect of varicocelectomy on the semen parameters, by analyzing preoperative and postoperative semen data. Varicoceles first appear during adolescent age group. Studies have proved that varicocele is a progressive disease and it causes increasing testicular dysfunction over time. Therefore, age of presentation is important to indicate the degree of dysfunction caused by varicocele. The youngest patient in the present study was 18 years and the eldest patient was 40 years old. The mean age of patients under study was 28.3 years (SD: 5.7, Median: 28, Range: 18-40 years).

A total of 29 out of 50 (56%) patients were in the age group 21-30 years, followed by 17 out of 50 (34%) in the age group 31-40 years and only four out of 50 (8%) of the enrolled patients were younger than 20 years of age. Thus, in the present study majority of patients who presented with varicocele were in their young age. Similarly mean age observed among study group by Shabana et al was 28.3 ± 7.4 years.2 Whereas, mean patient age observed by Sampalski et al was 35.8 years (Range 23-62 years).[9]

Evaluation of the semen is the primary investigative tool in the assessment of male infertility. Through its cellular and chemical components, human semen can provide information on the functional properties of the organs producing this fluid i.e., the testis, epididymis, accessory glands and thus, reflect the deleterious effect of varicocele on spermatogenesis.[6]

On comparing, pre-operative and post-operative results of semen analysis, this study observed a beneficiary effect of varicocelectomy on semen parameters in terms of sperm count/ml, sperm count/ejaculate and sperm motility. Similar to our study, Belzile and colleagues recorded mean increase of sperm concentration. Also, Shabana et al observed a statistically significant increase in sperm density and progressive motility [3]. Other studies also reported improvement in post-repair sperm concentration and total sperm motility.[9]

Huang et al found that preoperative sperm count had a favorable association with successful varicocelectomy, and that a preoperative sperm count of 12 × 106 /ml or greater was able to predict successful varicocelectomy with a sensitivity of 77.6% and specificity of 77.4%. The study noted no effect of patient age on the degree of improvement in postoperative semen parameters in the present study.

Similar to our study, Comhaire and Kunnen found that the age of the man did not influence the fertility prognosis after treatment [10]. Also, Reşorlu et al and Liguori et al reported no significant alterations in sperm concentration and motility rates after ligation between the different age groups [11]. Whereas contrary to our study, Lipshultz and Corriere suggested that varicoceles were associated with testicular atrophy that was progressive with age [12]. In addition, Zini et al., found similar sperm parameters and spontaneous pregnancy rates following varicocelectomy in couples with advanced paternal age (>40 years) compared with younger couples. This indicates that varicoceles cause progressive impairment of testicular function and hence fertility over time. So, in patients presenting early in life with varicocele, option of treatment should be considered even if patient is having normal semen parameters [20]. Though findings of our study are comparable to some other studies available on this subject in literature, but the effect of varicocelectomy on improvement in semen parameters among elderly cannot be truly commented upon because none of the participants of our study were above 40 years of age.

This study analyzed, based on the clinical grade, sperm motility and sperm concentration parameters in men with varicocele and evaluated the changes and its correlation among pre-operative and post-operative patients as discussed in (table 4). Mean Sperm counts (million/ml) were 51.7, 43.4 and 40.6 in patients with Grade II,III and IV varicocele (pre-operatively) and were 64, 4 and 68.5 among patients with Grade II,III and IV (post- operatively) respectively. Mean sperm counts/ejaculate (million/ejaculate) was 133, 121.5, 101.3 among patients with Grade II, III and IV varicocele (pre-operatively) and 156, 140.6, 147.1 among patients with Grade II, III, and IV varicocele (post-operatively) respectively. The mean percentage of motile sperms was 60.2, 50.8 and 48 in patients with Grade II, Grade III, and Grade IV varicocele (pre-operatively) and 65.7, 65.5 and 66.5 among patients with Grade II, III, IV varicocele (post-operatively) respectively. Thus, preoperatively, men with Grade IV varicoceles had lower sperm counts and sperm motility compared to men with Grades II and III varicoceles.

Statistically significant improvement was observed post-varicocele repair in semen parameters in men with Grade IV varicoceles compared to men with Grade II and Grade III varicoceles. Similarly, Steckel et al grouped 86 men by varicocele size. Preoperatively, men with Grade IV varicoceles had lower sperm counts and total motile count compared to men with Grades II and III varicoceles [13]. Post varicocele repair, a comparison of percent change in Total Motility Count among the groups revealed that men with Grade IV varicoceles improved to a greater degree (128%) than men with Grade I (27%) or Grade III(21%)

varicoceles. Repair of larger varicoceles resulted in greater improvements in semen parameters than repair of small or medium sized varicoceles [14]. Another study found that greater improvements in sperm density were seen in the patients with a Grade IV varicocele, as compared with Grades II or III [15]. Similarly, Ishikawa and Fujisawa found that improvements in semen parameters were greater after repair of Grade III (7.4 × 106 /ml pre to 11.0 × 106/ml post repair) or IV (7.8 × 106 ml pre to 12.2 × 106 ml post repair), as compared with Grade II[16]. While there were some early studies that demonstrated that there was no association between varicocele grade and degree of improvement in semen parameters after repair, more recent data seems to support an association [9, 17]

Thus, the present study supports the finding, that pre- operative varicocele grade impacted post varicocelectomy semen parameters, with the improvements in semen parameters being directly related to the grade of the varicocele. Varicocele is one of the most debatable issues in the field of male infertility mainly with regard to surgical intervention. Many scholars believe that the surgical repair of varicocele should include a very narrow group of infertile men [18, 19]. Nevertheless, there are no widely accepted criteria regarding the selection of this group of men. The fact that some men with varicoceles are fertile should not minimize the potentially detrimental role of this abnormality. It would be reasonable to claim that varicocele is uniformly detrimental. Taken together, these findings suggest that varicocelectomy improves seminogram.

CONCLUSION

The Present study supports the fact that, Varicocele exerts a deleterious effect upon sperm Count, Motility and Morphology and repair of varicocele leads to improvement in all these seminal parameters.

The repair of larger varicocele seems to be a predictor for better post-repair semen parameters. Varicocele is a treatable cause of male infertility

(primary and secondary), so patients undergoing varicocelectomy should have a pre- operative and post-operative Spermatogram routinely.

Thus, based on the available evidence, it is clear that there is a benefit in treating men with a varicocele.

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