Evaluation of the Effect of Varicocelectomy on Semen Parameters and Fertility

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Abstract

Background: Varicocele is the major reversible cause of male infertility. It is observed in 35%–40% of all men with primary infertility and in up to 80% of those with secondary infertility. While varicocele can be associated with testicular discomfort and atrophy, the negative effects of varicocele on male fertility and semen parameters, as well as recent evidence identifying varicocele as a risk factor for hypogonadism, are the most relevant ramifications of the condition.

Objective: To evaluate the negative effect of varicocele on semen parameters (concentration, motility, volume and morphology) and the outcome of varicocelectomy on semen parameters and paternity in infertile men.

Patients and Methods: This is a prospective study done in the period from January 2008 to October 2012 at Iraq, Baqubah teaching hospital and private clinic in which 120 patients are included (those men who are infertile and diagnosed to have varicocele on physical examination), all those patients are sent for 3 seminal fluid analysis in different times and different labs , those with impaired semen parameters are subjected to varicocelectomy through high scrotal incision this had been underwent by the same consultant surgeon, then follow up of these patients was done at 3,6,12 months by seminal fluid analysis.

Results: The results were as follow, grade 3{(45 patients) the semen parameters improvement were as follow. Mean sperm count from10..6 x106 mL preoperatively to 36.4 x106ml post operatively. Mean sperm Motility improve from 21.3% to 31.4%. Mean semen Volume from 1.3 ml to 3 ml. Serm morphology were abnormal sperm in 18 patients preoperatively , and in 8 patients only post operatively remain abnormal sperm morphology}. Grade 2 {(25 patients) the improvement were as follow. Mean sperm count from17.3 x106ml to 32.4x106ml. Mean sperm Motility from25.4% to35.6 %. Mean semen Volume from 1.9 ml to3ml. Sperm morphology were abnormal in 9 patients preoperatively and in 5 patients postoperatively}. Grade 1 {(20 patients) the improvement were as follow, Mean sperm Count from21.5 x106ml to36.7x106ml, Mean sperm Motility from31.6% to 36.2%, Mean semen Volume from 2.8ml to 3.8 ml, Sperm morphology were abnormal in 6 patients preoperatively and in 2 patients postoperatively. Subclinical varicocele (30 patients) the improvement was very little as follow, Mean sperm Count from 25.4x106ml to 28.3 x106ml, Mean sperm Motility from 23.3% to 26.4%, Mean semenVolume from 2ml to 2.3 ml, Sperm morphology were abnormal in 5 patients preoperatively and in 3 patients postoperatively, 8 (6.66%) patients from grade 3 had got pregnant during the 12 months after operation, 3(2.50%) patients from Grade 2 got pregnancy within 12 months of follow up after operation. One(0.83%) patient got pregnancy from Grade 1 during 12 months of follow up after surgery.

Conclusion: Infertile men with clinical varicocele are a good candidate for varicocelectomy and they will get benefits in term of semen parameters improvement and in parity.

Key words: Varicocele and varicocelectomy, infertility, seminal fluid parameters.

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Received: 8th May 2016

Accepted: 24th July 2016

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Introduction

Infertility affects 10-15% of couples who are trying to conceive and malefactors account for 40-50% [1,2].

Varicocele is the major reversible cause of male infertility. It is observed in 35%-40% of all men with primary infertility and in up to 80% of those with secondary infertility [3]. Based on a 15% prevalence of infertility in the population, approximately 20% of men with varicocele have evidence of infertility, while 80% do not [4].While varicocele can be associated with testicular discomfort and atrophy, the negative effects of varicocele on male fertility and semen parameters, as well as recent evidence identifying varicocele as a risk factor for hypogonadism, are the most relevant ramifications of the condition [5,6]. The higher incidence of varicocele in men with secondary infertility suggests its progressive nature, which might be explained by a progressive testicular dysfunction involving both spermatogenesis and steroidogenesis. The negative impact of varicocele on spermatogenesis has been documented by a progressive reduction in the size of testicle ipsilateral to the varicocele [7]. Several theories have been formulated to explain the testicular impairment caused by varicocele, including hypoxia, autoimmunity, elevated testicular temperature, reflux of catecholamine, and increased oxidative stress. However, none of them can completely explain the variable modulating effect of varicocele on male fertility. Recently, the oxidative stress theory has emerged as an important contributory factor due to findings of an association between elevated reactive oxygen species and impaired sperm function in men with varicocele. Additionally, reduction of oxidative stress markers has been noted after varicocele repair. Notwithstanding, varicocele continues to be a topic of heated debate in andrology and related areas; with supporters as well as opponents of its association with subfertility [8]. It is now believed that varicocele develops from absent or incomplete valves in the internal spermatic vein, accompanied by a retrograde blood flow down this vein and the cremastric vein to the pampiniform plexus. This pheno¬menon leads to on increase of 2.5ºC of the scrotal temperature and several other changes, i.e. loss of spermatocyte and spermatid [9]. How¬ever, increased cadmium, even in unilateral varicocele, can accumulate bilaterally and then induce apoptosis and decrease sperm concen¬tration [10].

Varicocele is also known as the most surgically correctable cause of male infertility, and its repair is the most commonly performed surgical procedure in order to correct male infertility [11].Varicocele is also considered to be responsible for early ejaculation and spontaneous abortion although this has not been proven definitely[12,13,14,15,16]. A varicocele is defined as an abnormal dilatation of the pampiniform plexus of veins of the testis. The vast majority of children and adolescents with varicocele have no subjective symptoms. The complete work-up of patient diagnosed with a varicocele involves a physical exam in supine and prone position with and without Valsalva, and the use of ultrasound to measure testicular volume and blood flow [17]. The American Society for Reproductive Medicine (ASRM) Practice Committee guideline indicates that adolescent males who have a varicocele may be considered as candidates for varicocele repair if they have objective evidence of reduced testicular size. If objective evidence (typically ultrasound) of reduced testicular size is not

present, then adolescents with varicocele should be followed annually [18].

The most current guidelines in 2008 by the Best Practice Committee of the American Society for Reproductive Medicine recommend treatment of a varicocele in the infertile patient when all of the following conditions are met: (1) varicocele is palpable on physical examination; (2) the couple has known infertility; (3) the female partner has normal fertility or a potentially treatable cause of infertility; and (4) the male partner has abnormal semen parameters or abnormal results from sperm function tests. Patients with subclinical varicocele are not candidates for varicocele treatment due to a lack of demonstrated efficacy in this population (Yamamoto et al, 1996). On occasion, large varicocele will produce clinical symptoms such as dull hemiscrotal discomfort or sense of heaviness and these patients will benefit from varicocele treatment.

Scrotal ultrasonography is not recommended in the screening of varicoceles and does not take the place of physical examination. The ASRM/SMRU Committee Opinion suggests scrotal ultrasonography in the setting of an "inconclusive examination." The EAU guidelines take it a step further by stating that clinically palpable varicoceles should be confirmed by color Duplex ultrasonography (CDU). The WHO Manual for the Standardized Investigation, Diagnosis and Management of the Infertile Male is cited as the source for varicocele confirmation by CDU, however its dogmatic emphasis on further investigation of Grade 1 and subclinical varicoceles by CDU and thermography is not representative of the other aforementioned reports [19].

This study aims to evaluate the negative effect of varicocele on semen parameters(concentration, motility, volume and morphology) and the outcome of varicocelectomy on semen parameters and paternity in infertile men.

Patients and Method

This is a prospective study conducted at Baquba teaching hospital and private clinic in the period from january 2008 to October 2012 during which 120 patients who attended the hospital and clinic for their primary and secondary infertility and some with symptomatic (painful) varicocele as well.all patients were male and excluded from this study any patient with infertility with wife problem, with azoospermia, undescended testis and Primary and secondary testicular failure and with seminal fluid infection.

The diagnosis of varicocele is made while examining the patient in standing and supine positions and is generally categorized into three grades according to Dubin and Amlar. The Dubin and Amlar criteria are: grade I, not visible in supine position, palpable only with a Valsalva maneuver in a standing position; grade II, not visible in supine position, palpable in the standing position without a Valsalva maneuver; grade III, visible through the scrotum in the standing position without a Valsalva maneuver.

After thorough history and clinical examination those patients with clinically diagnosed having varicocele and those with subclinical varicocele(subclinical varicocele, defined as a varicocele not palpable on physical exam and identified only using Doppler ultrasonography using a venous diameter of ≥3 mm and reversal of flow) were sent for doppler ultrasound study(DUS) for scrotum(both testes) to determine the size of testes , vein diameter (varicocele grade) and retrograde flow with Valsalva maneuver, then all these patients subjected to three seminal fluid analysis in 3 different labs with 3 different times to assess the semen parameters (volume, sperm count ,

sperm motility ,morphology, PH. and presence of infection), those patients with impaired seminal fluid parameters (120 patients with clinical and subclinical varicocele) were subjected to surgical treatment by same consultant surgeon, through high scrotal incision which is about 3 cm in length and ligation of the veins. Then follow up of these patients with serial seminal fluid analysis with in 3, 6, 12 months interval.

Results

The range of patients age was between 17 -45 year , the mean age was 34 year ,the distribution of patients according to age groups shown in Figure (1).

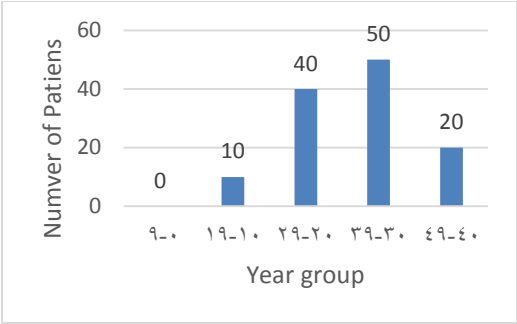

Figure (1): Shows the distributions of patients according to age groups

On clinical examination 90 (75%) patients were with clinical varicocele, and 15 (12.50%) of these patients were having right sided subclinical varicocele as well which had been discovered by ultrasound study, 30 (25%) patients were with subclinical varicocele diagnosed by Doppler ultrasound study. As shown in Figure (2).

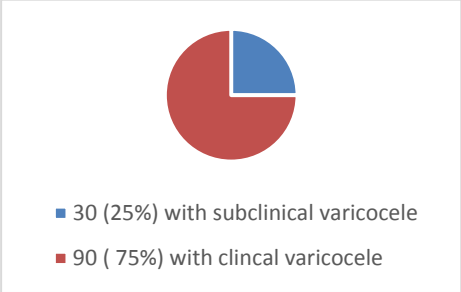

Figure (2) :Shows the number and percentage of patients with clinical and subclinical varicocele.

On clinical and Doppler ultrasound study assessing for grades it was as follow, 20 (16.66%) patients with grade 1, 25 (20.83%) patients with grade 2, 45 (37.50%) patients with grade 3 and 30(25%) patients with subclinical varicocele.

Regarding the semen parameter preoperatively

The effect on semen parameters founds to be related to the grade of varicocele so in grade 3 patients there are more changes in parameters , regarding sperm counts was range between 8.5 x106ml-1 to 12.3 x106 ml-1 (Mean was 10.6x106 ml) , motility was range between (19% to 22.5%) and the mean was (21.3%). Volume range between (I ml to 1,5 ml), the mean was(1.3 ml), the sperm morphology were abnormal sperm in 18 patients.

Grade 2 sperm count range between 16.3x106ml to 18.6x106ml ,the mean was (17.3x106ml, sperm motility ranged between 24.8% to 27.3% , the mean was 25.4% , semen volume were ranging between 1.5 ml to 2.1 ml , the mean volume was 1.9 ml.the sperm morphology were abnormal sperm in 9 patients.

Grade 1 Sperm count range between 19.4x106 ml to 22.6x106ml , the mean was 21.5x106 ml Sperm motilityrange between

29.4% to 32.2% , the mean was 31.6% , semen volume range between 2.6 to 3 ml , the mean was 2.8 ml , sperm morphology was abnormal in 6 patient.

The subclinical spermcount range between 23.4x106ml to 26.4.3 x106ml ,the mean was 25.4x106ml, sperm motility range between 21.8% to 24.1 .3% , the mean was23.3% , semen volume range between 1.3ml to 2,4ml , the mean was 2 ml, sperm morphology were abnormal sperm in 5 patients.

Table (1): Shows the semen parameters preoperatively according to grades.

No. of Patients	Grade	Mean Sperm count *10^6 ml	Mean Sperm motility %	Mean Semen volume/ml	No of patients with Normal sperm	No of patients with Abnormal sperm
20	I	21.5	31.6%	2.8	14	6
25	II	17.3	25.4%	1.9	16	9
45	III	10.6	21.3	1.3	27	18
30	subclinical	25.4	23.3	2	25	5

No. of patients	Grade	MeanSperm count *10^6 ml	Mean Sperm motility %	MeanSemen volume/ml	morphology	
					No of patients with normal sperm	No of patients with abnormal sperm
20	I	36.7	36.2	3.8	18	2
25	II	32.4	35.6	3 ml	20	5
45	III	36.4	31.4	3 ml	37	8
30	subclinical	28.3	26.4	2.3	27	3

Post operatively the improvement in semen parameters in the clinical cases were as follow Grade 3 Sperm count become32.4x10^6 ml to 38.6 x10^6 ml , the mean was 36.4x10^6 ml, sperm motility became 29.7% to 32.2% ,the mean was 31.4% , semen volume become 1.8 ml to 3.5 ml , the mean was3 ml, sperm morphology the abnormal sperm remain in 8 patients only.

Grade 2 sperm count become 28.5x10^6 ml to 36.2x10^6 ml, the mean 32.4x10^6 ml , perm motility become 31.4% to 37.8% , the mean was 35.6% , semen volume become 2.3 ml to 3.8 ml ,the mean was 3 abnormal sperm morphology remain in 5 patients.

Grade 1 sperm count become 31.2x106 ml to 38.4 x106 ml,the mean was36.7x106 ml , sperm motility become 32.4% to 39.7% ,the mean was 36.2% , semen volume become 3 ml to 4.6 ml , the mean was 3.8 ml, abnormal sperm morphology remain in 2 patients.

Ten (8.33%) patients from grade 3 got improve of their semen parameter after 3 months from the operation , the rest are improving later after 6 months(8) (6.66%) patients and 12(10%) patients after 12 months. Eight (6.66%) patients from grade 3 got paternity during the 12 months follow up.

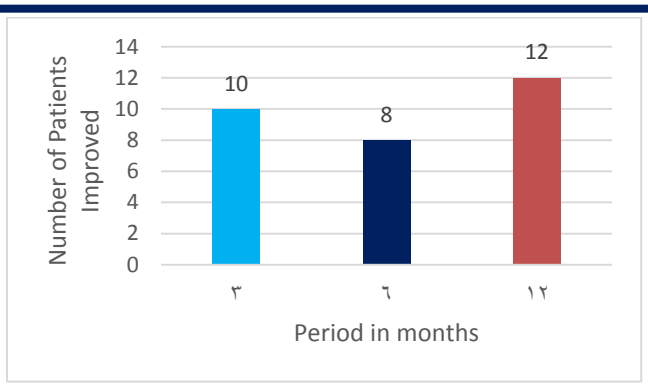

Figure (3): Shows the number of patients with grade 3 got improvement of semen parameters during follow up period.

Grade 2 the improvement after 3 months was in 5 (4.16%) patients and 7 (5.83%) patients after 6 months and 8 (6.66%) patients after 12 months, 3 (2.50%) patients got paternity from grade 2 during 12 months follow up.

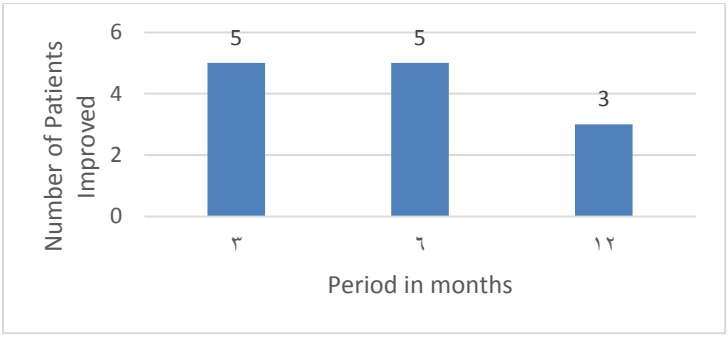

Figure (4): Shows the number of patients with grade 2 got improvement of semen parameters during follow up period.

Grade 1 the improvement after 3 months was in 3 (2.50%) patients, after 6 months in 3(2.50%) patients and after 12 months in 4 (3.33%) patients. One(0.83%) patient only got paternity from grade 1.

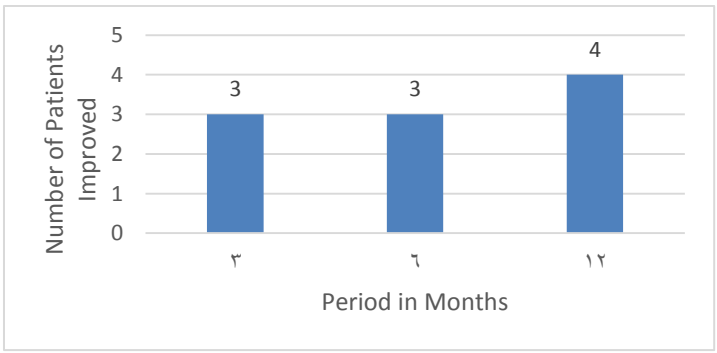

Figure (5): Shows the number of patients with grade 1 got improvement of semen parameters during follow up period.

Table (3): Shows the number and percentage of patients improved after varicocelectomy with grades.

Grade	No. of patients improved after 3 months	No. of patients improved after 6 months	No. of patients improved after 12 months	Total No. of patients improved	Percentage %
I	3	3	4	10	50%
II	5	5	3	13	52%
III	10	8	12	30	66.66%
Subclinical	4	2	4	10	33.33%

The subclinical cases

Little improvement was notice in this group. Sperm Count become 27.2x106 ml to 29.4x106 ml, the mean was 25.4x106 ml . sperm motility become 25.3% to 27.5% , the mean was26.4% , semen volume become 2ml to 2.7ml , the mean was 2.3 ml , abnormal sperm morphology remain in 3 patients, 4 (3.33%) patients got improvement after 3 months and 2 (1.66%) patients after 6 months and 4 (3.33%) patients after 12 months. No patients got paternity during 12 months follow up.

Discussion

Many studies, including several randomized controlled trials (RCTs) support a benefit to semen parameters in infertile or subfertile men after treating them with varicocelectomy, providing high-level evidence in favor of treatment. In addition to individual studies, meta-analyses evaluating both prospective and randomized studies have also indicated a favorable effect of variocelectomy on semen parameters [20, 21].

This coincide with this study result in which there are improvement in both parity and seminal fluid parameters in infertile men that we treat them with varicocelectomy.

A recent meta-analysis quantified the improvement in several semen parameters, finding an increase in sperm density of 12.32 million sperm per ml and in motility of 10.36%, and found that varicocelectomy improves seminal oxidative stress, sperm DNA damage, and sperm ultramorphology [22].

Clinical randomized controlled trials showed that seminal density increased and forward movement enhanced after treatment of varicocele 23, similar to our finding here in which both density and motility had been improved. Acommon cause of male infertility is Severeoligoasthenospermia. Varicocele repair surgically with varicocelectomyresultedin the induction or enhancement of spermatogenesis for most men with azoospermia or severeoligoasthenospermia, and varicocele repair should be considered for all men with azoospermia and severe oligoasthenospermia as it improved their semen parameters [24]. Though in my study I exclude all azoospermic men but regarding oligoasthenospermic men who are treated with varicocelectomy they had got good benefit from such treatment modality and result in improvement in count and motility of their semen with end result of successful parity in some. Sperm motility, total number of motile sperm, and percentage of sperm

with normal strict morphology can be significantly increased after varicocele repair [25].

The range of pregnancy after va¬ricocelectomy varied from 20 to 50% in the li¬terature [26, 27]. In this study the percentage of successful pregnancy within one year was 12.5%, several other researchers showed that varicocelectomy does not impact pregnancy outcomes [28].

Most guidelines suggest an initial two SAs while others have recommended three tests to provide a better overview of fecundity due to the intrinsic variability [29,30].

In the result of present study we did 3 semen fluid analysis in different times and labs to overcome any lab error. Most varicocele occur on the left side. It is reported that a palpable left-sided varicocele occurs in 85% to 90% of cases, while a palpable right varicocele is normally found in cases of bilateral varicoceles [31]. In this study we got the same finding that only (12.5%) of our patient got subclinical right sided varicocele in association with left side one.

The presence of and repair of subclinical varicocele are seldom clinically significant in the setting of male factor infertility [32, 33, 34]. We prove the same thing in which we found very little improvement in semen parameters in subclinical varicocele and no pregnancy had been achieved after treatment with varicocelectomy.

In this study I found that the percentage of patients with varicocele with infertility that got improved after varicocelectomy is 50% - 66.66% depend on the grade of the varicocele and in 33.33% in the subclinical cases so this mean mostly about two third of patients will get benefit from varicocele repair specially high grade one.

In conclusion, We conclude that infertile men with clinical varicocele are a good candidate for varicocelectomy and they will get benefits in term of semen parameters improvement and in parity.

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