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Research Article

Varicocele Treatment: Angiographic embolization versus varicocelectomy

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Abstract: Varicocele is a dilatation of the pampiniform plexus of the testicular veins, the varicocele repair has been shown to reverse a spectrum of effects contributing to men with impaired fertility, it can be treated either by surgical ligation or angiographic occlusion of the spermatic veins. The aim of this study is to compare the outcome of percutaneous varicocele embolization versus surgical ligation with regard to changes in semen parameters. In this retrospective study, a total of 61 patients underwent varicocele correction. The patients were divided into two groups according to the treatment procedure; group (A) 31 patients treated by angiographic embolization of the spermatic vein and group (B) 30 patients treated by surgical ligation. The semen analysis of both groups was reviewed pre-treatment and one year after treatment for volume (ml), concentration (Sperm $x10^6$ per ml), motility (% motile), morphology (% normal shape) and total motile sperm count (TMSC) (Sperm $x10^6$). The t-test was used to measure levels of statistical significance. The mean age for group (A) was 28 years old ranged between (19-41 years) and 28.83 years ranged between (20-43) for group(B). After one year follow-up, when comparing the semen parameters pre and post-treatment for each group separately, it has been found a significant improvement in concentration, motility and TMSC for both groups P. values ≤ (0.05). The morphology improved significantly in group (A) P. value≤ (0.05), but not quite significant in group (B) P. value = (0.16). No significant improvement was noted in the volume of ejaculate for both groups P. values = (0.7829) and (0.2486) for group (A) and group (B) respectively. During one year follow-up it has been found that the two methods were successfully improved the semen parameters with no significant differences between them, thus improving the fertility in terms of sperm parameters. Considering the advantages of angiographic embolization technique of being low cost, no general anesthesia, short hospital and recovery times, it is more recommended than the surgical technique.
Keywords: Varicocele, pampiniform plexus, angiographic embolization, surgical ligation

INTRODUCTION

Varicoceles is abnormal enlargement of the pampiniform venous plexus in the scrotum, associated with male factor infertility due to the observations that varicoceles are seen more commonly among infertile men and have been associated with abnormalities in semen analysis [1, 2]. It is also associated with testicular atrophy and abnormal seminal factors contributing to male factor infertility [3]. It is more frequent in the left side, but some studies reported that it is frequent of bilateral or right-sided in about 10 to 15% [4-5]. Varicocele occurs in 10-15% of the general male population and in 30-50% of infertile men and 8–23% in young healthy male individuals [6-8].Many studies agreed that varicocele is a major cause of male infertility [3, 6, 9].

Varicocele repair will reliably improve sperm production. Initial reports of randomized trials involving patients who did not have a clinical varicocele or did not have evidence of abnormal semen parameters have raised questions regarding the role of varicocelectomy [10].

Percutaneous varicocele embolization has been shown to be an equally effective means of varicocele treatment as surgical ligation and it can be performed on an outpatient basis [11-14].

There are two approaches to varicocele repair; surgery and percutaneous embolization. Surgical repair of a varicocele may be accomplished by various open surgical methods, including retroperitoneal, inguinal and subinguinal approaches, or by laparoscopy. Percutaneous embolization treatment of a varicocele is accomplished by percutaneous embolization of the refluxing internal spermatic vein(s). None of these methods has been proven superior to the others in its ability to improve fertility; it depends up on the treating physician's experience and expertise, together with

options available [15]. There are several ways to diagnose varicocele, venography provides an opportunity to confirm the clinical diagnosis by detecting retrograde flow into the pampiniform plexus; it also allows anomalies in the venous anatomy to be defined. Angiographic embolization may therefore offer a more anatomical approach to the primary treatment of varicocele than ligation and provides particular advantages in the recurrence of varicocele [16]. However, the debate between microsurgery and interventional radiology is not determined yet. The aim of this study is to compare the outcomes of percutaneous varicocele embolization versus surgical ligation with regard to changes in semen parameters.

MATERIALS AND METHODS

A retrospective review of the records from the urology and infertility clinics revealed 61 patients who had varicocele correction performed during three years (2009-2012), group (A) a 31 patients who underwent angiographic embolization (50.8%), while group (B) a 30 patients who underwent surgical ligation (49.2%). The average age of the group (A) and group (B) were 31.23±6.98 years (range 19-42years) and 29.43±6.66 years (range 20-43 years), respectively.

Patients were diagnosed clinically, by ultrasound and spermatic vein angiography; all cases were left sided varicocele of grade one, two and three. All angiographic embolization procedures performed on an outpatient basis under local anesthesia, the right jugular approach done using the Seldinger technique, the left renal vein is then selected and embolized by either platinum coil in 13 patients (41.9%) or sodium tetradecyl sulfate as the sclerosant in 6 patients (19.4%) or both in 12 patients (38.7%). Postprocedural hemostasis is then achieved at the puncture site by manual compression. Surgical ligation was carried out under general anesthesia using an operating microscope at *20 magnification. All spermatic veins were identified and ligated. The semen analysis of both groups was reviewed pre-treatment and one year after treatment for volume (ml), concentration (Sperm $x10^6$/ml), motility (% motile), morphology (% normal shape) and total motile sperm count (Sperm $x10^6$). Patients, who underwent more than one semen analysis measures, had their measures averaged together. Patients with previous history of scrotal trauma, hydrocele and delayed testicular descent were excluded from the study for both groups.

RESULTS

The average age of the group (A) and group (B) were 31.23±6.98 years (range 19-42) years and 29.43±6.66 years (range 20-43) years, respectively.

Table 1: The differences in percent in one year post-treatment semen analysis for the two groups

Procedure	Semen Parameter	Pre-treatment	Post- treatment	% Difference
(A) Angiographic **Embolization**	**Volume (ml)**	2.98±0.71 (2-5)	3.03±0.52 (2-4.5)	(1.6±37) **%** (P = 0.7829) **(NS)**
	Concentration (Spermx10^6/ml)	77.19±51.42 (8-172)	111.48±43.74 (35-195)	**(31**±18)**%** (P ≤ 0.0001) (ES)
	Motility (%motile)	34.81±13.31 (14-65)	51.65±16.60 (18-72)	(32.60±20)**%** (P≤0.0001) (ES)
	Morphology (% normal)	24.52±13.12 (5-60)	45.32±15.69 (20-75)	(45.90±20) **%** (ES) (P ≤0.0001)
	TMSC (Million)	78.32± 63.70 (4.6-228)	174.09±90.98 30-395	(55±30)- **%** **(P ≤ 0.0001) (ES)**
(B) Surgical ligation	**Volume (ml)**	3.14±1.77 (0.5-7.5)	2.87±1.17 (0.4-6)	(-9.41±51)**%** **(**P = 0.2486) **(NS)**
	Concentration (Spermx10^6/ml)	38.16±34.82 (0.1-121)	60.56±56.79 (0.3-233.3)	(36.99±38) **%** (P = 0.0072) (VS)
	Motility (%motile)	20.20±15.05 (2-45)	33.07±18.10 (1-65)	(38.91±17)**%** (P = 0.0007) (ES)
	Morphology (% normal)	26.87±18.96 (5-85)	34.27±21.14 (2-90)	(21.59±10)**%** (P=0.1551) (NQS)
	TMSC (Million)	37.62±63.60 (0.02-213.6)	77.44±104.66 (0.08-419.94)	(51.42±39)**%** (P=0.0067) (VS)

The semen volume shows a little improvement in the angiographic embolization group (1.6±37%) but not significant, (p value= 0.7829), while decreased in the surgical ligation group (-9.41±51**%**) but also not significant (*p* value= 0.2486). The sperm concentration, sperm motility and total motile sperm count were improved significantly for both the angiographic embolization group and the surgical ligation group (p values≤ 0.05) for all these parameters. (Table1).

The improvement in semen parameters for the angiographic embolization versus surgical ligation showed no statistical deference between the two procedures in improving the semen volume, sperm concentration, sperm motility and total motile sperm

count. (*p* values = 0.3373, 0.4322, 0.1901 and 0.6887) respectively in Table-2.

Table-2: Differences in semen parameters for Angiographic Embolization versus Surgical ligation

Seminal Improvement	Angiographic Embolization % deference	S. Ligation % deference	*P* value
Volume (ml)	(1.6±37) %	(-9.41±51)%	(P=0.3373) (N.S)
Concentration (Spermx10^6/ml)	(31±18)%	(36.99±38) %	(P=0.4322) (N.S)
Motility (%motile)	(32.60±20)%	(38.91±17)%	(P=0.1901) (N.S)
Morphology (% normal)	(45.90±20) %	(21.59±10)%	(P≤0.0001) (ES)
TMC (Million)	(55±30)- %	(51.42±39)%	(P=0.6887) (N.S)

The morphology improved significantly in the angiographic embolization group *P* ≤0.0001, but not quit significant in surgical ligation group (*P*=0.1551). Table1, when comparing the two procedures the analyses demonstrated that the angiographic embolization improved the sperm morphology more than surgical ligation (*P*≤0.0001) Table2.

Table-3: Pooled Data

	Pre-treatment	Post-treatment	Change	P. value
Volume (ml)	3.06±1.33	2.95±0.89	-0.11±0.44	P=0.4476 (N.S)
Concentration (Spermx10^6/ml)	57.16±47.91	86.44±56.34	29.34±8.43	P≤0.0001 (E.S)
Motility (%motile)	27.62±15.88	42.51±19.59	17.89±3.71	P≤0.0001 (E.S)
Morphology (% normal)	25.67±16.17	39.89±19.24	14.22±3.07	P≤0.0001 (E.S)
TMC (Million)	58.30±66.37	126.55±108.66	42.29±29.34	P≤0.0001 (E.S)

When describing the whole sample (61 patients), as the type of procedure was not associated with change in seminal parameters, it has been found that there was a significant improvement in the sperm concentration, motility, morphology and total motile count after treatment. (*P*≤0.0001) for all these parameters. The volume did not influenced by the two procedures. (*P*=0.4476). The angiographic embolization improved the sperm morphology more than surgical ligation, when analyzing the whole sample regardless the type of treatment the study showed a significant improvement in all semen parameters except the volume.

DISCUSSION

It has been proven that sperm parameters improved in patients affected by varicocele once this varicocele is corrected, thus fertility restored [17-18]. Also there is a clear positive association between semen characteristics and the success of pregnancy, [19-20] the question "which is better for treating varicocele, surgical ligation or angiographic embolization" is still to be widely argued. In literature, to our knowledge, only one study supported the fact that angiographic embolization is feasible and have the same clinical outcomes as surgical ligation in improving male fertility (in terms of improving the semen quality) [16].

Shlansky-Goldberg et al [13] retrospectively compared the results of 346 men who underwent correction of their varicoceles for infertility (surgical ligation 149, angiographic embolization 197) and reported that there was no statistical difference between the techniques based on changes in sperm density, total sperm count and motility (p values = 0.44, 0.84 and 0.80) respectively. Tanahatoe et al [21]retrospectively studied 61 patients with varicoceles, 50 treated with embolization and 11 patients with untreated varicoceles and reported, embolization of a varicocele in infertile men significantly improved semen in terms of improvements of concentration and motility. Ferguson et al retrospectively reviewed 116/87 patient with varicocele, within 2 years after angiographic embolization, the study showed a highly significant increase in motility,($p < 0.001$). Sperm density showed a trend towards improvement, ($p < 0.10$, and there was no significant change in semen volume or morphology. Feneley MRet al [16] retrospectively studied 154 infertile patients, (100 surgical ligation) and (84 angiographic embolization). The study showed significant improvement in sperm

concentration in 83% of patients undergoing embolization and 63% of those surgically ligated, and concluded that angiographic embolization is an effective alternative to surgical ligation of varicocele. H. Yavetz et al [22] prospectively studied the efficacy of surgical ligation versus angiographic embolization of the spermatic vein in 137 infertile men suffering from left varicocele and concluded with improvement of sperm quality (sperm concentration, total sperm count and Sperm motility) was significant in both (angiographic embolization group) and (Ivanissevich high ligation group), with better results in (Ivanissevich high ligation group). Nieschlag E et al[11] prospectively randomized 71 infertile men, 38 patients were treated by surgical ligation and 33 by angiographic embolization, and reported significant increase in (sperm number and sperm motility) 12 months after correction and stated angiographic embolization technique is at least have the same results as in the established surgical procedures. Sayfan et al [23] also prospectively studied 119 patients underwent varicocele correction by high retroperitoneal ligation, lower inguinal ligation, and embolization. They found only slight improvement in the seminal parameters, with statistical significance only in the surgical groups. In this study, the two procedures significantly improved the semen parameters, except for the volume, which is not affected by correction. The study also showed no statistical significant differences between the two procedures in term of semen volume, sperm concentration, sperm motility and total motile sperm count

CONCLUSION

During one year follow-up, varicocele correction improves the male infertility by improving the semen parameters. Varicocele embolization offers the same results as in the established surgical ligation, with less morbidity, short hospital stay, short recovery time, outpatient basis procedure, less expensive and no general anesthesia, it is more recommended than surgical ligation techniques. Although the results of our study do not definitely conclusive, because of the lack of information regarding the conception rates, but it highlights the role of varicocele correction in improving semen parameters and the feasibility of the embolization in the treatment of varicocele.

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