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ORIGINAL ARTICLE

Does varicocele grade predict the postoperative changes of semen parameters following left inguinal micro-varicocelectomy?

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Abstract *Objective:* To evaluate the relationship between preoperative grade and postoperative changes of semen parameters following left inguinal varicocelectomy.
Methods: This study included 44 patients undergoing left microsurgical inguinal varicocelectomy. Internal spermatic veins were classified as large (4 mm or more in diameter), medium (2–4 mm), or small (2 mm or less). Changes in sperm activity, morphology and count were estimated perioperatively. The intraoperative findings and semen parameters were compared between varicocele groups of grades 2 and 3.
Results: Both sperm motility and count improved significantly postoperatively (from (31.9 ± 16.3)% to (47.3 ± 15.5)%, from (28.1 ± 28.1) × 10^6/mL to (52.1 ± 74.2) × 10^6/mL). In varicoceles with grade 2 and 3, significant differences were found in the number of large veins (0.4 ± 0.6 *vs.* 1.2 ± 0.7, $p < 0.001$) and ultrasonographic maximum diameters of spermatic vein in supine and standing positions (2.3 ± 0.4 cm *vs.* 2.8 ± 0.6 cm, 3.1 ± 0.7 cm *vs.* 3.9 ± 0.7 cm, $p = 0.001$ and 0.001 respectively). However no difference of changes in sperm motility and count was detected ((16.3 ± 13.5)% *vs.* (14.4 ± 12.6)%, (30.5 ± 84.4) × 10^6/mL *vs.* (12.9 ± 20.6) × 10^6/mL respectively, $p = 0.65$ and 0.40 respectively).
Conclusion: Preoperative varicocele grade might not predict postoperative semen changes regardless of possible existence of anatomic and ultrasonographic associations.

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1. Introduction

Varicoceles are abnormally dilated pampiniform plexus in the scrotum which may cause impaired testicular function. They are more common on the left side. Varicoceles occupy 19%—41% of men with primary infertility and 45%—81% of men with secondary infertility [1,2]. Reports have shown that repair of varicocele might improve the male fertility status [3,4].

Clinically, varicocele grade is determined by physical examination. Relationship between preoperative grade and the postoperative response in semen quality is still controversial. Some reports showed that postoperative outcomes were significantly associated with the clinical grade of varicocele [5,6], while other result was completely different [7].

Therefore, to clarify the contradictions, we attempted to estimate the relationship between preoperative grades of varicoceles and postoperative improvement of semen parameters following microsurgical inguinal varicocelectomy in subfertile men.

2. Patients and methods

A total of 46 adult men with left varicocele underwent microsurgical inguinal varicocelectomies in our clinic between May 2011 and February 2014. The protocol and informed consent were approved by the Institutional Review Board, and that all subjects gave informed consent. All patients presented with infertility at least 1 year of unprotected intercourse and had clinically palpable varicoceles. They all had impaired semen quality (at least one of the following semen parameters: sperm motility<50%, normal morphology<20% or sperm count $<20 \times 10^6$/mL). Of these men, two patients with azoospermia were excluded. Forty-four men were followed up with physical examination and ultrasound to evaluate recurrence, hydrocele formation and testicular size for at least 6 months after the day of surgery. The mean age of the men undergoing primary varicocele repair was 27.7 ± 5.6 years. The varicocele grade distribution of the left-side varicoceles units ($n = 44$) was as follows: one was grade 1, 59.1% grade 2 (26/44), and 38.6% grade 3 (17/44) varicoceles (Table 1).

Table 1 Patient characteristics of left inguinal varicocelectomy.

Variable	*n*(%)
Total patients	44(100)
Patients with nutcracker syndrome	3(4.5)
Patients having external spermatic vein or veins	15(34.1)
Varicocelectomy indications	
Infertility	44(100)
Primary infertility	31(70.5)
Secondary infertility	13(29.5)
Grade	
1	1(2.3)
2	26(59.1)
3	17(38.6)

Varicocele was clinically diagnosed by physical palpation and classified as grade 1 (palpable only with the Valsalva maneuver), 2 (palpable without the Valsalva maneuver) or 3 (visible through scrotal skin). Diagnosis was confirmed by color Doppler ultrasound with room temperature between 21.5 and 23.5 °C. The maximum diameters of internal spermatic vein were measured and recorded at inguinal level in both supine and standing positions with the detection of vein reflux by color Doppler ultrasound. Patient who was found anteroposterior diameter ratio between the distended and narrowed portions of the left renal vein over 4.0 was diagnosed as nutcracker syndrome. Routine urine examinations were checked perioperatively to investigate proteinuria or hematuria. All semen samples were obtained pre-operatively and postoperatively by masturbation with as a sum of days of sexual abstinence (3—5 days) as possible. Multiple data from the semen analyses were averaged to allow comparison as a single parameter.

All of the microsurgical inguinal varicocelectomies were performed under general anesthesia by the same surgeon (X.K.W). A 2—3 cm incision was made over the inguinal canal. The external oblique fascia was sharply opened. The spermatic cord was dissected with a pusher and surrounded by a Penrose drain. The dissection plane was close to the internal inguinal ring. A Zeiss NC-4 operating microscope (Carl Zeiss, SIP: 6623502157) was used intraoperatively. The internal spermatic vessels were exposed under 10 × magnification. The vas deferens vasal veins and arteries were identified and preserved. A second Penrose was placed between the vas deferens and the internal spermatic structures. Internal spermatic artery or arteries were preserved. All veins including external spermatic vein were doubly ligated with clips or 4-0 silk ties and divided. Spermatic veins were flattened on a micro-ruler and classified as large (4 mm or more in diameter), medium (2—4 mm), or small (2 mm or less).

Changes in sperm motility, morphology and count were estimated perioperatively. Then clinical grades were compared with anatomic findings and semen parameters. The statistical analyses were performed using the two-sample paired *t* tests and Chi-square analyses using SPSS Statistic version 21.0 software (IBM, NY, USA). Values were presented as the mean ± SD. Differences were considered significant if $p < 0.05$.

3. Results

In the 44 patients, both sperm motility and count significantly improved postoperatively. The mean sperm motility increased from (31.9 ± 16.3)% (mean ± SD) preoperatively to (47.3 ± 15.5)% postoperatively ($p < 0.001$, paired *t* test) and the mean sperm count increased from (28.1 ± 28.1) × 10^6/mL preoperatively to (52.1 ± 74.2) × 10^6/mL postoperatively ($p = 0.02$, paired *t* test). Although the mean normal morphology slightly improved from (23.9% ± 12.1)% preoperatively to (26.6 ± 9.3)% postoperatively, there was no difference between them ($p = 0.2$, paired *t* test). Therefore, changes in motility and sperm count were both measured pre-operatively and postoperatively as parameters to evaluate the relationship between grades and outcomes.