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CHANGES IN EJACULATE INDICATORS AFTER USING MICROSURGICAL TECHNIQUE IN THE TREATMENT OF MEN WITH VARICOCELE IN INFERTILITY

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Abstract

Introduction

Varicocele is one of the frequently identified and corrected causes of male subfertility. However, varicocele correction results in improved sperm quality only in 60 – 70% of subfertile men. At the same time, it is not completely clear which semen parameters improve to a greater extent, and what is the proportion of patients with an improvement in parameters to normozoospermia.

Objectives. To assess qualitative changes in semen after microsurgical varicocelectomy according to WHO 2021 Laboratory manual of semen analysis.

Materials & methods. This study analysed qualitative changes in sperm in infertile men after varicocelectomy. All patients had a clinical varicocele, for

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which microsurgical varicocelectomy was performed. The study included 100 subfertile men with varicocele and abnormal sperm parameters.

Results. In the postoperative period (after 6 months), the main semen parameters increased significantly. Also, the proportion of patients with isolated asthenozoospermia decreased by 22% ($p < 0.05$), the proportion of patients with oligoasthenozoospermia decreased by 14% ($p < 0.05$). The proportion of patients with normospermia was 35% ($p < 0.0001$). In patients with oligoasthenozoospermia significant improvement in sperm to normospermia was observedin 19% of cases.

Conclusions. Varicocele repair leads to an improvement in the quality of the ejaculate in subfertile men with palpable varicocele and pathozoospermia, with the most significant improvement in sperm motility. However, only in a third of patients semen quality improved to to normal levels. Additionally, varicocelectomy demonstrated high efficacy in patients with oligoasthenozoospermia.

Keywords: Semen; semen analysis; infertility; varicocele; varicocelectomy; asthenozoospermia; oligoasthenozoospermia.

Introduction

Varicocele is rightfully considered the most frequently detected and corrected cause of primary and secondary male subfertility. According to the literature, varicocele is detected in 35-40% of men suffering from infertility [1]. Although the exact mechanisms of the influence of varicocele on male fertility are still widely discussed, research results show that varicocele negatively affects spermatogenesis [2].

Most studies have found that surgical treatment of varicocele leads to improvement in ejaculate parameters, however, not all authors confirm this [4]. Some authors in randomized clinical trials have found low effectiveness of varicocelectomy in subclinical varicocele and normospermia [1, 5].

New data suggest that the impact of varicocelectomy is not limited to changes in traditional ejaculate parameters, but also includes an increase in the frequency of

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spontaneous pregnancies and pregnancies after the use of assisted reproductive technologies. The American Urological Association (AUA) and the American Society for Reproductive Medicine (ASRM) recommend surgical correction of varicocele in men with clinical varicocele and pathozoospermia [3].

H. Ding et al. (2012) and E. Persad et al. (2021) in their meta-analyses indicated that microsurgical ligation of the veins of the spermatic cord is the most acceptable surgical technique for the treatment of clinical varicocele in men with infertility in comparison with traditional open (without the use of microscopic equipment) and laparoscopic methods, endovascular vein occlusion [5, 6]. However, varicocele correction leads to an improvement in sperm quality only in 60–70% of subfertile men. At the same time, it is not entirely clear which spermogram parameters improve to a greater extent and what is the proportion of patients with an improvement in parameters to normozoospermia.

Objective of the study: To evaluate ejaculate parameters after microsurgical varicocelectomy in accordance with the 2021 WHO standards.

Materials and Methods

The prospective study included data from 100 men aged 21 to 55 years suffering from infertility and clinical varicocele. All patients underwent microsurgical inguinal and subinguinal ligation of the veins of the spermatic cord with preservation of arteries and lymphatic ducts under spinal or intravenous anesthesia at the Republican Specialized Scientific and Practical Medical Center of Urology (Tashkent, Uzbekistan) from January 2021 to December 2024. The study was approved by the Local Independent Ethics Committee of the Republican Specialized Scientific and Practical Medical Center of Urology (Protocol No. 5 dated April 2, 2018).

Before and after varicocelectomy (after 6 months), patients provided ejaculate for examination. The main ejaculate parameters (ejaculate volume, sperm concentration, percentage of progressively motile forms and total motility) and qualitative characteristics of the ejaculate (normospermia, oligospermia, asthenozoospermia, combined oligoasthenozoospermia) were assessed in

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accordance with the 2021 WHO standards (in accordance with the 95% percentile reference values) [7].

The presence of varicocele was determined by palpation, as well as by Doppler ultrasound examination of the vessels of the scrotal organs based on the WHO classification of 2000 (subclinical varicocele, clinical varicocele - I, II, III degrees) [14].

Patients with azoospermia and normospermia, not in an infertile marriage, with subclinical varicocele and in the presence of other causes of male subfertility were excluded from the study.

Statistical analysis. Statistical analysis of the data was performed using the data structuring packages — "Microsoft Office Excel 2019" ("Microsoft Corp.", Redmond, WA, USA) and statistical analysis "IBM SPSS© Statistics ver. 21.0" ("SPSS: An IBM Company", IBM SPSS Corp., Armonk, NY, USA). The values of the indicators by groups were presented as a sample mean value and standard deviation (M ± SD). After checking the distribution of values for normality using the Kolmogorov-Smirnov test, the significance of the relationship was assessed using the Student (t) test; at $p < 0.05$, the difference was considered statistically significant.

Results

The average age of patients was 31.2±5.0 years, the duration of the infertility period was 42.9±30.1 months. Varicocele on the left was detected in 65 (65%) men, on the right - in three (3%) cases. Varicocele on both sides was found in 32 (32%) cases.

Table 1. Semen parameters before and after varicocelectomy.

Parameters*	Before	After	p
Semen volume, ml	3,4 ± 1,1	3,3 ± 1,2	> 0,05
Sperm concentration, mln/ml	63,8 ± 15,4	89,0 ± 17,3	< 0,05
Progressive motility, %	13,2 ± 4,4	24,4 ± 6,3	< 0,05
Total motility, %	34,3 ± 6,3	47,9 ± 7,9	< 0,05
Total motile sperm count, mln	88,6 ± 21,3	156,0 ± 26,1	< 0,05

Note. * Parameters are presented as mean and standard deviation (M ± SD)

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The main spermogram parameters improved significantly in the postoperative period. Some improvement was observed in 65% of patients, while in 25% of patients the sperm parameters worsened. The dynamics of the main spermogram parameters are shown in Table 1.

Table 2. Qualitative changes of semen parameters after varicocelectomy

Parameters*	Before	After	p
Normozoospermia, n (%)	-	35 (35)	< 0,05
Asthenozoospermia, n (%)	76 (76)	54 (54)	< 0,05
Oligoastenozoospermia, n (%)	21 (21)	7 (7)	< 0,05
Oligozoospermia, n (%)	2 (2)	4 (4)	> 0,05

Note. * Indicators are presented in absolute numbers and percentages— n (%)

Significant changes were also noted in the qualitative characteristics of the spermogram in the postoperative period (Table 2). The proportions of patients with asthenozoospermia and oligoasthenozoospermia after varicocele correction decreased significantly. In 35 (35%) patients, sperm quality improved to the level of normozoospermia. At the same time, normozoospermia after varicocelectomy was more often observed in patients with initial asthenozoospermia (30 out of 35; 86%), while only 4 patients with oligoasthenozoospermia (11% of the normozoospermia group, 19% of the group of patients with initial oligoasthenozoospermia) and 1 patient with oligozoospermia after varicocele correction had normozoospermia.

Discussion

The relationship between varicocele and spermogram parameters may vary. The microcirculation disorder that develops with varicocele leads to an increase in active oxygen forms and oxidative stress in testicular cells, and oxidative stress is currently considered the key pathophysiological mechanism of pathospermia in varicocele [8].

Although the exact relationship between improvement in sperm parameters and surgical treatment of varicocele has not yet been established, meta-analyses of recent randomized clinical trials demonstrate a significant improvement in

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ejaculate parameters after varicocelectomy [9], which is consistent with the results of our study.According to many authors, varicocelectomy improves primarily sperm motility [10]. Our study confirms this postulate. However, it should be noted that we also observed a significant increase in sperm concentration.

According to A.B. Shomarufov et al. (2021), K. Almekaty et al. (2019), microsurgical varicocelectomy improves the quality of ejaculate up to normozoospermia in 41% of operated patients, in general improvement is observed in 65% and 70% of patients [11, 12]. In our study, these figures were 35% and 65%, respectively, which corresponds to the data of the above-mentioned authors.

The study also showed high efficiency of varicocelectomy in men with oligoasthenozoospermia — improvement of ejaculate parameters was observed in 62% of cases. According to N. Enatsu et al. (2014), the efficiency of varicocelectomy in patients with severe oligospermia was only 41%, which is slightly lower in comparison with our data [13]. This is probably due to the initially lower spermogram parameters in contrast to our sample.

Limitations of the study

The study has some shortcomings, such as the lack of complete data on the results of varicocele correction, i.e. the occurrence of natural pregnancy, and a small number of patients involved. However, despite the above shortcomings, the results are statistically significant and valid, and therefore can be applied to the general sample of patients with varicocele.

Conclusion

Varicocele correction improves ejaculate quality in subfertile men with palpable varicocele and pathozoospermia, with sperm motility improving most significantly. However, sperm quality improves to normal levels only in a third of patients. Varicocelectomy also demonstrates high efficiency in men with oligoasthenozoospermia.

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