

# Evaluation of the Effectiveness of Microsurgical Varicocelelectomy in 2871 Patients with Male Infertility

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**Abstract Background.** Varicocele is a widespread pathology among adolescents and adult men, which can be accompanied by subfertility, impaired testicular growth and development, hypogonadism and often requires surgical treatment. **Purpose of the study.** Retrospective analysis of the results of transinguinal microsurgical varicocelelectomy in patients with primary and secondary infertility. **Material and methods.** In the period from November 2005 to January 2022, 2871 patients with a diagnosis of varicocele and infertility were examined and treated at Republic Medical Center of Urology, where patients underwent microsurgical varicocelelectomy with a transinguinal approach under spinal anesthesia. The mean age of the patients was  $30.16 \pm 0.09$  (years) (min. 18, max. 60 years). The mathematical analysis of the obtained data was carried out on a personal computer using the Microsoft Excel program, 2019. The Student and Fisher criteria were used. Differences were considered statistically significant at  $p < 0.05$ . **Results.** Of the 2871 patients, 2595 (90.4%) were operated on for the first time, of which 1735 patients underwent transinguinal unilateral microsurgical varicocelelectomy, in 860 patients on bilateral. As a result, 3455 varicocelelectomies were performed for the first time in 2595 patients. The remaining 276 (9.6%) patients underwent microsurgical varicocelelectomy, also through inguinal access, for recurrence of the disease, which had previously been operated on in other clinics. At the same time, of these, 105 (3.7%) patients were with primary infertility, 6 (0.2%) - secondary. **Conclusions.** In patients with infertility and varicocele, the onset of spontaneous pregnancy after transinguinal microsurgical varicocelelectomy was 1129 (39.3%), the recurrence rate in primary patients was 0.46% and there was no recurrence after reoperations.

**Keywords** Varicocele, Infertility, Surgical treatment, Recurrence

## 1. Introduction

Varicocele is a common pathology among adolescents and adult men, which may be accompanied by subfertility, impaired testicular growth and development, hypogonadism, and possible clinical manifestation as pain and discomfort in the testicular region of the lesion.

Varicocele is determined in 15% of adult men, 25% of patients with pathospermia and 35-40% of patients with infertility [1,2,3,4]. According to the literature data, the prevalence of varicocele in men with primary infertility is 35-44%, with secondary infertility – 45-81% [1,4]. It is believed that increased scrotal temperature, hypoxia and reflux of toxic metabolites can lead to testicular dysfunction and infertility as a result of increased oxidative stress and DNA damage [4]. It should be noted that the exact relationship between a decrease in male fertility and varicocele has not been proven. But, according to the data of

numerous studies, the improvement of ejaculate parameters after surgical varicocelelectomy in patients with pathospermia has been proved [23], and also after varicocelelectomy the restoration of sperm DNA damage and reduction of oxidative stress are possible [4,23].

However, surgical treatment is not always effective in treating varicocele. According to RCT data, varicocelelectomy does not increase pregnancy rates in the subclinical form [24]. In addition, among men with normal ejaculate parameters, there were no advantages of surgical treatment of varicocele compared with dynamic observation. That is why, for several decades, the issues of surgical treatment of varicocele have remained a subject of discussion, as well as the degree of effectiveness of existing various methods of intervention.

**The purpose** of our study was a retrospective analysis of the results of transinguinal microsurgical varicocelelectomy in patients with primary and secondary infertility.

## 2. Material and Methods

In the period from November 2005 to January 2022, 9292

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patients diagnosed with infertility were examined and treated at RSSPM Center of Urology, of which 2871 (31.0%) patients were found to be associated with the presence of varicocele of varying degrees, for which patients underwent microsurgical varicocelectomy with transinguinal access.

The average age of patients diagnosed with varicocele and infertility was  $30.16 \pm 0.09$  (years) (min.18, max.60 years). The age of patients with primary infertility and varicocele was  $29.36 \pm 0.09$  (years) (18-54), secondary infertility and varicocele  $33.96 \pm 0.25$  (years) (23-60), table 1.

**Table 1.** Distribution of patients with primary and secondary infertility and varicocele depending on age and side of the lesion

Varicocele and the side of the lesion	Primary infertility, n (%)	Secondary infertility, n (%)	Total, n (%)
One side	1591 (83,5)	315 (16,5)	1906 (100,0)
both sides	780 (80,8)	185 (19,2)	965 (100,0)
Total, n (%)	2371 (82,6)	500 (17,4)	2871 (100,0)

**Table 2.** Initial ejaculate parameters in patients with infertility and varicocele

Initial parameters of the ejaculate	n (%)
Azoospermia	111 (3,9)
Asthenozoospermia	197 (6,9)
Cryptozoospermia	26 (0,9)
Normospermia	1592 (55,5)
OAT	18 (0,6)
Oligozoospermia	821 (28,6)
Oligoasthenozoospermia	12 (0,4)
Oligoteratozoospermia	55 (1,9)
Teratozoospermia	29 (1,0)
Total	2871 (100)

Of the 2871 (100%) patients, 2595 (90.4%) had a primary intervention, the remaining 276 (9.6%) had a secondary intervention, due to the recurrence of the disease, which were

previously operated on in other clinics. Semen analysis was performed according to the standards established by WHO (2010). The results of sperm analysis at the initial treatment of patients are shown in Table 2.

Patients underwent microsurgical varicocelectomy with transinguinal access under spinal anesthesia. The results obtained during the study were subjected to statistical processing. Mathematical analysis of the obtained data was performed on a personal computer using Microsoft Excel, 2019. Student's and Fisher's criteria were used. Differences at  $p < 0.05$  were considered statistically significant.

### 3. Results

Our analysis of 2871 patients with primary and secondary infertility, depending on the presence of a newly diagnosed varicocele or recurrence of the disease, taking into account the side of the lesion, showed the following picture, Table 3.

The analysis of the long-term result of primary interventions in 2595 (90.4%) patients showed that transinguinal microsurgical varicocelectomy in 1735 patients was performed on one side, in 860 - on 2 sides (1720 operations). As a result, a total of 2595 patients were underwent 3455 varicocelectomies for the first time, and, of these, in 16 (0.46%) we found a recurrence of the disease, Table 4.

Among the 276 (9.6%) patients who were underwent transinguinal microsurgical varicocelectomy due to the recurrence of varicocele in the long term, no one developed a recurrence of the disease.

The analysis of the onset of spontaneous pregnancy after performing microsurgical varicocelectomy showed that, out of 2871 patients, 563 (19,6%) who fell out of the study and whose fate remained unknown were not reached by phone. It was found that 1129 (39.3) married couples became pregnant at various times after varicocelectomy, 1179 (41.1) did not become pregnant, see Table 5.

**Table 3.** Distribution of patients depending on the primacy and recurrence of varicocele, the side of the lesion and the type of infertility

Side of the lesion	Varicocele and primary infertility	Varicocele and secondary infertility	Recurrence of varicocele and primary infertility	Recurrence of varicocele and secondary infertility	Total
One side	1436	299	155	16	1906 (66,4%)
Both sides	689	171	91	14	965 (33,6%)
Total	2125	470	246	30	2871 (100%)

**Table 4.** Recurrence rate of the disease after transinguinal microsurgical varicocelectomy, n=2595

Side of the lesion	Varicocele and primary infertility	Varicocele and secondary infertility	Total
One side	1436	299	1735
both sides	689	171	860
Total patients	2125	470	2595
Total varicocelectomies	2814	641	3455
Recurrence of varicocele, n (%)	15 (0,53)	1 (0,15)	16 (0,46)

**Table 5.** The frequency of pregnancy after varicocelectomy depending on the type of infertility

Infertility	Pregnancy			
	Yes	No	Couldn't reach via call	Total, n(%)
Primary, n (%)	756 (31,9)	1065 (44,9)	550 (23,2)	2371 (100)
Secondary, n (%)	373 (74,6)	114 (22,8)	13 (2,6)	500 (100)
Total, n (%)	1129 (39,3)	1179 (41,1)	563 (19,6)	2871 (100)

**Table 6.** The frequency of pregnancy after varicocelectomy in patients with primary infertility, depending on the initial parameters of the ejaculate

	Initial parameters of the ejaculate	Pregnancy			
		Yes	No	Couldn't reach via call	Total
Primary infertility	Azoospermia	5 (4,8)	58 (55,2)	42 (40,0)	105 (100)
	Asthenozoospermia	82 (46,6)	54 (30,7)	40 (22,7)	176 (100)
	Cryptozoospermia	-	13 (54,2)	11 (45,8)	24 (100)
	Normospermia	514 (39,3)	509 (38,9)	285 (21,8)	1308 (100)
	OAT	-	10 (76,9)	3 (23,1)	13 (100)
	Oligozoospermia	155 (23,4)	358 (54,2)	148 (22,4)	661 (100)
	Oligoasthenozoospermia	-	5 (55,6)	4 (44,4)	9 (100)
	Oligoteratozoospermia	-	39 (76,5)	12 (23,5)	51 (100)
	Teratozoospermia	-	19 (79,2)	5 (20,8)	24 (100)
	Total	756 (31,9)	1065 (44,9)	550 (23,2)	2371 (100)

**Table 7.** The frequency of pregnancy after varicocelectomy in patients with secondary infertility, depending on the initial parameters of the ejaculate

	Initial parameters of the ejaculate	Pregnancy			
		Yes	No	Couldn't reach via call	Total
Secondary infertility	Azoospermia	-	5 (83,3)	1 (16,7)	6 (100)
	Asthenozoospermia	17 (81,0)	4 (19,0)	-	21 (100)
	Cryptozoospermia	-	2 (100,0)	-	2 (100)
	Normospermia	239 (84,2)	40 (14,1)	5 (1,8)	284 (100)
	OAT	-	4 (80,0)	1 (20,0)	5 (100)
	Oligozoospermia	117 (68,8)	47 (27,6)	6 (3,5)	170 (100)
	Oligoasthenozoospermia	-	3 (100,0)	-	3 (100)
	Oligoteratozoospermia	-	4 (100,0)	-	4 (100)
	Teratozoospermia	-	5 (100,0)	-	5 (100)
	Total	373 (74,6)	114 (22,8)	13 (2,6)	500 (100)

The analysis showed that in primary infertility after varicocelectomy, the onset of spontaneous pregnancy was 31.9%, while in secondary infertility this figure was 74.6%. The analysis of the frequency of spontaneous pregnancy in primary infertility, depending on the initial parameters of the ejaculate, showed the following picture, see Table 6.

The analysis of the frequency of spontaneous pregnancy in secondary infertility, depending on the initial parameters of the ejaculate, showed the following picture, see Table 7.

## 4. Discussion

According to the literature, varicocele is determined in

35–40% of patients with infertility [1,2,3,4]. Among our 9292 patients who came to our Urology Center and were diagnosed with infertility, 2871 (31.0%) had varicocele. According to the literature, where the examination and treatment of 224 patients was carried out, unilateral varicocele was detected in 46.4%, bilateral - in 53.5%, while varicocele of the I degree was determined - in 28.1%, II degree - 44.2%, III degree - in 27.7% [5]. Among our 2871 patients, varicocele on one side was in 66.4%, on 2 sides in 33.6%, while varicocele of I degree was found in 11.4%, II - in 80.6%, III - in 8.0% of patients.

Historically, there are various options for surgical treatment of varicocele. According to the literature, the most

effective is microsurgical access [6,7], after which the incidence of complications and relapses is lower than after other methods [8]. For example, according to the literature, after microsurgical inguinal or subinguinal varicocelectomy, the recurrence rate of the disease is the lowest and is 0.4%, hydrocele 0.44% [8,9,10,11]. We confirmed the data of the literature and the indicated indicator among our patients was 16 (0.46%) cases of relapse out of 3455 primary microsurgical transinguinal interventions (Table 4). Complications in the form of hydrocele, which caused discomfort in patients, were not registered by us.

According to the literature, the average time to improve ejaculate parameters after surgical treatment of varicocele is about 6 months [12,13], while spontaneous pregnancy occurs on average 6–12 months after varicocelectomy [14,15]. According to the literature, the highest incidence of spontaneous pregnancy was after performing microsurgical subinguinal varicocelectomy in 41.97% of all cases (Watanabe et al., 2005). In 37.69% of cases, spontaneous pregnancy occurred after performing surgical treatment of varicocele according to the Palomo method (Cayan et al., 2000), in 30.07% - after performing laparoscopic varicocelectomy (Watanabe et al., 2005), in 33.2% - with selective embolization of spermatic veins (Yavetz et al., 1992) and in 36% of all cases after Ivanissevich's operation. At the same time, it is worth noting that statistically significant differences were identified between the techniques used for the surgical treatment of varicocele ( $p = 0.001$ ) [16,17,18,19].

Our study showed that among patients after transinguinal microsurgical varicocelectomy performed at the Center for Urology, at a period of 5 to 15 months, 1129 (39.3%) couples had a spontaneous pregnancy.

In the literature, there are somewhat contradictory data on the need to perform varicocelectomy in patients with normal ejaculate parameters in patients with infertility. Since in RCTs that included men with normal ejaculate parameters, there were no advantages of surgical treatment of varicocele compared with observation. But, in a 2013 Cochrane Review and other comparative studies, the authors concluded that there was an increase in pregnancy rates after varicocelectomy in men with unexplained infertility [20,21]. Among our patients with infertility, in 1592 (55.5%), i.e. in the vast majority, the normal parameters of the ejaculate were determined, while 1308 (45.6%) suffered from primary infertility, 284 (9.9%) - secondary. Analysis of spontaneous pregnancies among patients with normal sperm counts showed that 47.3% had spontaneous pregnancies after surgery, 34.5% had no spontaneous pregnancies and 18.2% of patients were unreported. Also, in 2019, interesting and promising data on future studies appeared in the literature regarding patients with azoospermia and varicocele. It has been reported that after microsurgical varicocelectomy, men with non-obstructive azoospermia (NOA) have been reported to have spermatozoa, which increased the likelihood of a natural pregnancy or using assisted reproductive technologies (ART) [22]. Our analysis showed

that among our patients with infertility and varicocele, 111 (3.9%) had NOA (Table 2). At the same time, of these, 105 (3.7%) patients were with primary infertility, 6 (0.2%) - secondary. However, according to the indications, they performed varicocelectomies. According to long-term results, it was possible to find out that of all patients with NOA, 5 (4.8%) with primary infertility became pregnant with ART.

## 5. Conclusions

Transinguinal microsurgical varicocelectomy is an effective and safe operation with a recurrence rate of 0.46%.

In patients with infertility and varicocele, the onset of spontaneous pregnancy after transinguinal microsurgical varicocelectomy was 1129 (39.3%).

Men with an established diagnosis of varicocele and infertility, but with normal ejaculate indicators, it is advisable to perform varicocelectomy, since in this contingent the frequency of spontaneous pregnancy was 47.3%.

Men diagnosed with infertility and non-obstructive azoospermia in the presence of varicocele are advisable to surgically treat it, since some patients have a chance to have children with ART.

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