

Analysis of the Results of Different Methods of Surgical Treatment of Varicocele

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Abstract – This work is based on the results of treatment of 376 patients with left-sided varicocele. Of 376 patients, 363 (96.5%) patients had varicocele for the first time and 13 (3.5%) patients had a relapse. The patients were between the ages of 11 and 18. Depending on the method of surgery, 2 groups of patients were identified. 181 (48.1%) patients underwent conventional surgical interventions (Ivanissevich's or Polomo's operations), which made up the comparison group. 195 (51.9%) patients underwent subinguinal selective operations (antegrade endovascular sclerotherapy of the left testicular vein and Marmara operation), which were included in the main group. Selected 26 practically (control group) healthy children data of ultrasound and Doppler ultrasound of the testicular veins, we took as the norm. During the surgical treatment of varicocele, an individual, differentiated approach was chosen for each patient depending on the hemodynamic type. The analysis of the surgical treatment of patients with varicocele revealed a relapse of the disease in 15% of cases. The developed methods of treatment, taking into account the type of blood flow, are low-traumatic and exclude the possibility of recurrence. The proposed methods of surgical treatment of varicocele have reduced the number of complications from 24.8% to 2.3%.

Keywords – Varicocele, Children, Subinguinal Selective Operations, Ultrasound Doppler, Hemodynamic Type.

I. RELEVANCE

According to the WHO, "... the etiology of male infertility is currently represented by almost 30 reasons. In this case, the idiopathic form accounts for up to 16-25% of all cases and varicocele is the cause of infertility in 9-40% of patients. «Such large differences in these indicators indicate the controversy of this situation. The prevalence of varicocele among children and adolescents aged 10-18 years reaches 19%.

Early detection of varicocele can correct impaired fertility and maintain reproductive function in childbearing age. Adolescents, like fathers-to-be, socially represent demographic potential. Therefore, this disease is attracting increased attention not only from a medical, but also from a socio-demographic position.

The existing methods of surgical treatment do not in all cases relieve the patient of infertility and cannot guarantee the recurrence of the disease. So, according to Dunphy L. (2019) "venous renal hypertension on the left due to compression of the mouth of the left renal vein (aorto-mesenteric forceps) leads to the development of retrograde blood flow along the left testicular vein, and, as a result, varicocele occurs". Therefore, there is still an opinion that ligation of the left spermatic vein is a pathogenetically justified method of treatment, since one of the main causes of varicocele is a violation of venous outflow through the left renal vein system and its valve insufficiency. However, this condition is also possible in healthy people, so it remains unclear why not everyone has varicocele. Despite the large number of proposed methods of operations, the choice of the optimal method of surgical treatment of varicocele remains a subject of discussion (Gurevich A.I.).

II. THE AIM OF THE STUDY

Was to improve the results of diagnosis and surgical treatment of varicocele in children.

III. MATERIALS AND RESEARCH METHODS

This work is based on the results of treatment of 376 patients with left-sided varicocele who received treatment at the 2-clinic SamMI for the period from 1997 to 2018. Of 376 patients, 363 (96.5%) patients had varicocele for the first time and 13 (3.5%) patients had a relapse. The patients were between the ages of 11 and 18. The average age of the patients was 16.5 ± 2.3 years. Depending on the method of surgery, 2 groups of patients were identified. In 1997-2010. 181 (48.1%) patients underwent conventional surgical interventions (Ivanissevich's or Polomo's operations), which made up the **comparison group**. 2008 to 2018 195 (51.9%) patients underwent subinguinal selective operations (antegrade endovascular sclerotherapy of the left testicular vein and Marmara operation), which were included in the **main group**.

Selected 26 practically (**control group**) healthy children data of ultrasound examination (UE) and ultrasound Doppler (UD) of the testicular veins, we took the norm. In addition, 17 adult men with varicocele over 20 years of age were studied, in whom sperm analysis was performed before and after surgery. All patients admitted with a diagnosis of varicocele underwent a complex of clinical, laboratory and instrumental studies.

Ultrasound examinations of the scrotum were routinely performed with the patient in a horizontal position, lying on his back, and no preliminary preparation was required. In all cases, both testicles were necessarily examined, which made it possible to carry out a comparative assessment. To assess the condition of the testicular vein, all patients underwent ultrasound Doppler. Vein diameter and duration of the reflux wave were measured both at rest and during the Valsalva test. The state of spermatogenesis was assessed in accordance with the WHO guidelines.

IV. RESEARCH RESULTS

Not all patients with asymptomatic varicocele were operated on, but only those who had grade II and III disease. Patients with grade I varicocele underwent surgical treatment only when they had one of the above signs of the disease. A comparative analysis of clinical symptoms (Table 1) showed that the asymptomatic course of varicocele was the highest number 328 (81.4%) of all examined patients.

Table 1. Revealed symptoms of varicocele in the study groups

Symptoms	Comparative group (n=181)	Main group (n=195)	Total
Asymptomatic course	156 (81,7%)	172 (81,1%)	328 (81,4%)
Pain and discomfort in the left groin and testicle area	17 (8,9%)	16 (7,6%)	33 (8,2%)
Scrotal enlargement	11 (5,8%)	15 (7,1%)	26 (6,4%)
Testicular hypotrophy	7 (3,6%)	9 (4,2%)	16 (4,0%)
Total	191 (100%)	212 (100%)	403 (100%)

$$\chi^2=0,583; \text{ critical value } \chi^2=7,815 (p<0,05); p=0,901 (p>0,05)$$

Note: one patient had 2-3 symptoms at the same time.

When performing varicocelectomy until 2010, they used exclusively traditional conventional methods. Of the comparison group, 103 (56.9%) patients underwent Ivanissevich's operation and 78 (43.1%) patients underwent Palomo's operation. The distribution of patients in the comparison group according to the degree of disease and the choice of surgical intervention are presented in Table 2.

Table 2. Distribution of patients in the comparison group depending on the degree of varicocele and the choice of surgery

Varicocele grade	Comparative group (n=181)	
	abs.	%
I degree	1	0,6
II degree	71	39,2
III degree	109	60,2
Total	181	100

Since 2011, in the surgical treatment of varicocele, depending on the clinical course of the disease and the hemodynamic type, we choose an individual, differentiated approach for each patient. Thus, all patients of the main group with primary varicocele with renospermatic I type (106 - 82.2%) and mixed type with prevalence of renospermatic reflux (III A type 23 - 17.8%) used antegrade endovascular sclerotherapy of the left testicular vein.

The method of varicocelectomy developed by us - antegrade endovascular sclerotherapy of the left testicular vein (AES LTV) is a minimally invasive method of treating varicocele (patent for invention No. IAP 04234, Intellectual Property Agency of the Republic of Uzbekistan "Method for treating varicocele"), interruption of pathological blood flow.

The proposed method has several advantages:

- Minimally invasive.
- Does not require expensive equipment - cost effective.
- The leakage of the sclerosing substance into the renal vein and its reflux into the veins of the groin-like plexus are excluded.
- Reliably prevents the development of postoperative complications and recurrence of the disease.
- The length of hospital stay for patients is reduced.

The indicators of treatment results were as follows: the course of the postoperative period, the nature of the healing of the postoperative wound, the time of the patient's stay in the hospital (bed-day), the duration of the operation (min), the duration of the temperature (days), UD signs of persistence of reno- or ileo-testicular pathological venous refluxes (Table 3).

The use of ultrasound and Doppler sonography for postoperative monitoring of the results of surgical treatment of varicocele indicates the need for this non-invasive and more informative research method.

Table 3. The incidence of postoperative complications in patients after varicocelectomy

Complication type	Patient group				Total, n=376	
	Comparative group n=181		Main group n=195			
	aбс.	%	aбс.	%	aбс.	%
Testicular hypotrophy	5	2,75	-	-	5	1,3

Hydrocele	5	2,75	1	0,5	6	1,6
Number of patients with complications	10	5.5	1	0,5	11	2,9
$\chi^2=1,977$; critical value $\chi^2=9,488$ ($p=0,05$); $p=0,741$ ($p>0,05$)						

The median postoperative follow-up time was 12 months. In addition to the disappearance of signs of varicocele, in the long-term postoperative period spermogram indices were compared, the effect of surgical treatment on the onset of pregnancy in women in a sexual couple was assessed.

Long-term results were analyzed in 236 (62.8%) of 376 operated patients with varicocele (Table 4).

Table 4. The number of patients observed in the late postoperative period

Hemodynamic type	Comparison group n=105		Main group n=131				Total	
			AES LTV (n=89)		Operation Marmar (n=42)		(n=236)	
	abs	%	abs	%	abs	%	abs	%
I type	17	16,2	78	59,5	4	3,0	99	41,9
II type	5	4,8	-	-	32	24,4	37	15,7
III A type	2	1,9	11	8,4	-	-	13	5,5
III B type	1	0,9	-	-	6	4,6	7	3,0
In the preoperative period, hem.type not identified	80	76,2	-	-	-	-	80	33,9
$\chi^2=130,970$; critical value $\chi^2=13,277$ ($p=0,01$); $p<0,001$ ($p<0,01$) AES LTV AЭC								
$\chi^2=105,744$; critical value $\chi^2=13,277$ ($p=0,01$); $p<0,001$ ($p<0,01$) Operation Marmar								
$\chi^2=151,152$; critical value $\chi^2=13,277$ ($p=0,01$); $p<0,001$ ($p<0,01$) Comparison group								

To assess long-term results, patients underwent a thorough survey, outpatient and inpatient examination. Long-term results were studied in the period from 1 to 12 years. One of the main indicators characterizing the effectiveness of surgery for varicocele is the frequency of disease relapses. When studying the nature of the relapse, the hemodynamic type of varicocele was compared. Of 236 patients observed in the late postoperative period, the hemodynamic type of pathological venous reflux according to Coolsaet (1980) in the preoperative period was determined in 156 (66.1%), in 80 (33.9%) patients from the comparison group in the preoperative period, the hemodynamic type was not defined.

In a retrospective analysis of long-term results, the overwhelming majority of patients with relapses were of types II and III (85.0%), in patients of the comparison group, where the hemodynamic type was not taken into account when choosing a surgical intervention.

Relapse of varicocele was observed in 20 (8.5%) patients, out of 236 examined in the long-term, while in the group of patients operated on in 2005-2010, this indicator reached 17.1%. Subsequently, due to the application of the above innovations and measures of disease prevention, the frequency of disease relapses was reduced in the main group of patients to 1.5%.

In order to identify the quality of life of the patients we operated on in the long-term postoperative period, the reproductive function of 78 volunteers over 18 years old was studied, in whom the spermogram was examined earlier in the preoperative period.

Table 5. The state of spermatogenesis and the function of the gonads in a group of men with varicocele before and after surgery n = 17

Indicators	before surgery	after operation	WHO standards	P
Ejaculate volume (ml)	2,5±0,8	3,8±0,8	2,0-6,0	0,259325

Sperm concentration (mln / ml)	36,0±33,0	61,0±33,0	more than 20	0,915370
Live sperm (%)	42,0±4,0	77,0±4,0	more than 50	0,019002
Actively motile sperm (%)	29,0±14,0	36,0±14,0	more than 25	0,960042
Sedentary (%)	25,0±6,0	23,0±6,0	more than 25	0,906946
Normal forms (%)	31,0±11,0	37,0±11,0	more than 50	0,949158
Spermatogenesis cells (%)	2,3±0,3	2,0±0,3	1-2	0,484782
Fructose (mM / L)	14,0±4,3	13,0±4,3	more than 13,0	0,870450
Citric acid (mM / L)	13,1±5,3	13,9±5,3	more than 53,0	0,915688
Zinc ions (mM / L)	0,9±0,3	1,5±0,3	more than 2,0	0,167265

Table 5 shows the results of a study of ejaculate in adult men for comparative analysis before and after surgical correction. There was a higher scatter of digital indicators for all parameters of the ejaculate. The value of each parameter before surgery was close to the values of the same parameters in adolescents. After surgery, the level of sperm motility did not change; the number of normal forms of germ cells did not increase.

Table 6 shows the results of assessing the state of spermatogenesis in patients 2-4 years after surgery. The results obtained indicate the normal state of the ejaculate parameters corresponding to the WHO standards for adults.

Since 2016, male fertility was assessed according to a program developed by us (certificate of official registration of a computer program No. DGU 05025, Intellectual Property Agency of the Republic of Uzbekistan "Program for assessing and predicting the reproductive state in men after various types of surgery with varicocele disease"), including objective and subjective signs, instrumental data on which it is possible to assess the reproductive state of men after varicocelectomy.

By the presence of points scored from the program by objective signs and instrumental data in the postoperative period, the reproductive state was assessed in 96 men who underwent varicocelectomy in our clinic in various ways in childhood. Of these, 17 (17.7%) were men from the comparison group and 79 (82.3%) were men from the main group (Table 6).

Table 6. Distribution of patients depending on the assessment and prediction of the reproductive state in men after different types of operations for varicocele

Study groups	Research results					
	Favorable		Moderately favorable		Adverse	
	abs.	%	abs.	%	abs.	%
Comparison group (n=79)	43	54,4%	24	30,4%	12	15,2%
Main group (n=17)	14	82,4%	2	11,8%	1	5,8%
χ^2 criterion between groups	$\chi^2 = 25,023$; critical value $\chi^2 = 9,21$ ($p=0,01$); $p<0,001$					
Total (n=96)	57	59,4%	26	27,1%	13	13,5%

As can be seen from Table 8, the reproductive state of men in the main group improved in contrast to men in the comparison group. Thus, a favorable result in the main group was 82.4% (in 14 out of 17 men); while in the comparison group, this indicator

was 54.4% (in 43 out of 79). In general, for all the results taken together, a reliable best value was obtained in the main group (between the groups, the criterion $\chi^2 = 43.087$; Df = 3; $p < 0.001$).

Thus, in a retrospective analysis of long-term results, the overwhelming majority of patients with relapses were of types II and III (85.0%), in patients of the comparison group, where the hemodynamic type was not taken into account when choosing a surgical intervention.

V. CONCLUSION

1. The conducted analysis of the surgical treatment of patients with varicocele revealed a relapse of the disease in 15% of cases, during the study it was determined that the latter were associated with the fact that the types of hemodynamics were not taken into account.

2. The developed method of treatment, taking into account the type of blood flow, is low traumatic and excludes the possibility of relapse.

3. The proposed methods of surgical treatment of varicocele made it possible to reduce the number of complications from 24.8% to 2.3%.

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