

DOI: <https://doi.org/10.17816/uroved34863>

Varicocele and its effect on fertility

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Varicocele is recognized as one of the most common urological diseases, but its true prevalence is a matter of debate. In the present study, during a screening examination of 442 young men (mean age 21.6 years), grade I varicocele was detected in 7.2%, grade II – in 42.1%, and grade III – in 15.2% of men, varicocele was absent only in 35.5% of men. In 41% of cases, varicocele was diagnosed in isolation on the left side, in 36.5% of cases, bilateral varicocele was detected, and in 22.5%, varicose veins of the spermatic cord were detected on the right. Pathozoospermia was found in 47.3% of patients with grade II varicocele and 61.2% with grade III varicocele. The data obtained in the course of the study showed a significant effect of varicocele and its duration on sperm quality, in particular, on sperm morphology.

Keywords: varicocele; male infertility; pathozoospermia.

To cite this article:

Zamyatnin SA, Gonchar IS, Schmidt AA. Varicocele and its effect on fertility. *Urology reports (St. Petersburg)*. 2021;11(2):105-111. DOI: <https://doi.org/10.17816/uroved34863>

Received: 17.05.2020

Accepted: 08.06.2021

Published: 23.06.2021

DOI: <https://doi.org/10.17816/uroved34863>

Варикоцеле и его влияние на фертильность

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Варикоцеле признают одним из самых распространенных урологических заболеваний, однако его истинная распространенность является предметом дискуссии. В настоящем исследовании при скрининговом обследовании 442 молодых мужчин (средний возраст 21,6 года) варикоцеле I степени выявлено у 7,2 %, II степени — у 42,1 % и III степени — у 15,2 % мужчин, варикоцеле отсутствовало только у 35,5 % мужчин. В 41 % случаев варикоцеле диагностировано изолированно с левой стороны, в 36,5 % случаев — выявлено двустороннее варикоцеле и в 22,5 % варикозное расширение вен семенного канатика определялось справа. У 47,3 % пациентов с варикоцеле II степени и у 61,2 % с варикоцеле III степеней выявлена патозооспермия. Полученные в ходе исследования данные показали существенное влияние варикоцеле и его длительности на качество спермы, в частности, на морфологию сперматозоидов.

Ключевые слова: варикоцеле; мужское бесплодие; патозооспермия.

Как цитировать:

Замятнин С.А., Гончар И.С., Шмидт А.А. Варикоцеле и его влияние на фертильность // Урологические ведомости. 2021. Т. 11. № 2. С. 105–111.

DOI: <https://doi.org/10.17816/uroved34863>

INTRODUCTION

Varicocele is an abnormal dilatation of the efferent veins of the pampiniform plexus, which causes one-third of all cases of male infertility [1–3]. This postulate, which until recently caused no doubts in the global medical community, in recent years has provoked discussions again. This was contributed by several publications that induced a different view of this problem [4–6], and the authors refer reasonably to the fact that the priority for couples with infertility is the birth of a healthy child and not the improvement of sperm quality. In this regard, adherents of this approach argue that the true influence of varicocele and varicocelectomy on fertility can be properly assessed only in those couples where female infertility is ruled out, but relatively few studies exist [6, 7]. Nevertheless, most andrologists recognize varicocele as one of the major causes of male infertility [8–10].

A review of literary sources revealed that varicocele is present in 15% of the entire male population. This pathology is often diagnosed at age 14–16 years, which is confirmed by the data of a large-scale study of school-children. In this age group, available data present that varicocele was diagnosed in 9.5% of boys and in 11.8% of army conscripts aged 18–20 years during the prophylactic medical examination [9, 11]. In men with primary infertility, the frequency of the detection of the dilatation of the pampiniform plexus veins is much higher and, according to different studies, ranges from 19% to 40% of cases. In patients with secondary infertility, varicocele is diagnosed in 80% of cases, which confirms the theory of the significance of this pathology for male fertility [1, 2, 12–14].

The generally accepted notions indicate that the dilatation of the efferent veins of the pampiniform plexus develops mainly unilaterally on the left, and bilateral disease is diagnosed much less often (i. e., <10% of cases). An isolated right-sided pathological process is extremely

rare and requires additional diagnostics to rule out retroperitoneal pathology [14–16]. Despite generally accepted foundations, some studies have reported that bilateral dilatation of the spermatic cord veins occurs in 38%–50% of cases [12, 17].

This study aimed to determine the incidence of varicocele in men aged <30 years, including bilateral and right-sided cases, and to analyze the effect of varicose veins of the spermatic cord on the development of pathozoospermia.

MATERIALS AND METHODS

A screening examination of 442 young men (cadets, group 1) aged 17–29 (average age, 21.6) years was performed. Group 2 included 63 patients (average age, 21.2 years) who underwent surgical treatment for grade II and III varicoceles. The efficiency of varicocelectomy was assessed after 12 months.

Depending on age, the patients in group 1 were stratified into six subgroups corresponding to the course of the study (Table 1).

All men enrolled in this study underwent a comprehensive urological examination, including the spermogram; the results of which were analyzed in accordance with national clinical guidelines [3]. To identify varicose veins of the spermatic cord, all men underwent physical and ultrasound examinations of the scrotal organs. The grade of the varicocele was determined according to the conventional clinical classification of Lopatkin (1978): Grade I varicocele occurred when the dilated veins were not visible and palpable only during the Valsalva test. Grade II varicocele was diagnosed when the dilated veins of the pampiniform plexus were detected by visual assessment and palpation. Finally, grade III occurred if the testicular volume with dilated veins decreased. In all cases, the diagnosis of varicocele was confirmed by ultrasound data.

Table 1. Distribution of representatives of the 1st group depending on age ($n = 442$)

Таблица 1. Распределение представителей 1-й группы в зависимости от возраста ($n = 442$)

Subgroup	Average age, years	Number of patients	
		n	%
1	18.4	62	14.0
2	19.0	65	14.7
3	20.0	52	11.8
4	21.2	92	20.8
5	22.1	88	19.9
6	23.6	83	18.8
Total		442	100.0

Statistical analysis of the research results was performed using Statistica v. 10.0 with the application of commonly used medical statistics methods. Differences were considered significant at $p < 0.05$.

RESULTS AND DISCUSSION

In this study, varicose veins of the spermatic cord were diagnosed in 285 (64.5%) men of group 1. Such a high prevalence of varicocele is apparently explained by conducting a survey of a limited cohort of young men (average age, 21.6 years). Grade I varicocele was detected in 32 (7.2%) patients, and grades II and III were identified in 186 (42.1%) and 67 (15.2%) patients, respectively (Table 2).

The frequency of pathozoospermia detection in men with grade II and III varicoceles was quite high and accounted for 47.3% and 61.2% of the cases, respectively. In patients with grade I varicocele and in men without signs of varicose veins of the spermatic cord, the incidence of pathozoospermia was significantly lower and accounted for 25.0% and 27.4% of the cases, respectively. Laboratory signs of pathozoospermia were detected in all 63 patients of group 2 who underwent surgical treatment for grade II and III varicoceles.

The disease was detected mostly on the left side (41.0% of cases). Interestingly and very importantly, of all

men examined, bilateral varicose veins of the spermatic cord were diagnosed in 36.5% of cases, and the isolated right-sided varicocele was found in 22.5% of cases (Table 3).

Our data are consistent with the findings of several major scientific studies published in recent years [11, 25] and indicate the need to continue research on this field, which may lead to the revision of current opinions.

Disease prevalence, clinical significance, and localization were analyzed in conjunction with the assessment of the qualitative and quantitative parameters of the spermogram. In this study, we did not find a significant correlation in the detection rate of pathozoospermia between bilateral and unilateral left-sided varicoceles (38.5% and 40.1%, respectively) ($p > 0.1$). Moreover, isolated right-sided pathozoospermia was found much less often, i. e., only in 20.4% of cases. All patients of group 2, who underwent surgery, were treated for left-sided varicocele.

The concept of pathozoospermia includes the pathological changes not only in the morphological structure of the spermatozoa but also the assessment of their mobility and concentration [18, 19]. Among 442 male patients examined, pathozoospermia was detected in 180 (40.7%) patients in group 1. Out of 157 men without signs of varicocele, 43 (27.4%) showed signs of pathozoospermia.

Table 2. The frequency of detection of pathozoospermia and normozoospermia in men of the 1st group ($n = 442$)

Таблица 2. Частота выявления патозооспермии и нормозооспермии у мужчин 1-й группы ($n = 442$)

Varicocele grade	Normozoospermia		Pathozoospermia		Total	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
No signs of varicocele	114	72.6	43	27.4	157	35.5
I	24	75.0	8	25.0	32	7.2
II	98	52.7	88	47.3	186	42.1
III	26	38.8	41	61.2	67	15.2
Total	262	59.3	180	40.7	442	100.0

Table 3. Localization of varicocele in men of the 1st group

Таблица 3. Локализация варикоцеле у мужчин 1-й группы

Affected side	Varicocele grade						Total	
	I		II		III		<i>n</i>	%
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%		
Left-sided varicocele	9	7.7	86	73.5	22	18.8	117	41.0
Right-sided varicocele	12	18.8	42	65.6	10	15.6	64	22.5
Bilateral varicocele	11	10.6	58	55.8	35	33.6	104	36.5
Total	32	11.2	186	65.3	67	23.5	285	100.0

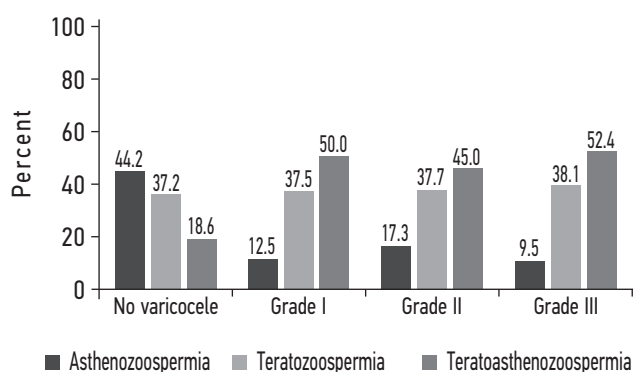


Fig. 1. Structure of pathozoospermia in patients of the 1st group ($n = 180$)

Рис. 1. Структура патозооспермии у пациентов 1-й группы ($n = 180$)

The structure of pathozoospermia in the patients analyzed is presented in Figure 1.

To differentiate the effect of varicocele on various laboratory markers, we performed a detailed analysis of the morphological changes in the ejaculate and compared the changes according to the presence and severity of varicose veins of the spermatic cord.

Published studies have shown that the development of, for example, asthenozoospermia is often caused by a defect in the genome and, to a lesser extent, depends on varicocele [19]. Several andrologists believe that varicocele has a predominant effect on the development of teratozoospermia. In the present study, certain disorders of the morphological structure of spermatozoa were noted in 82.7% of the patients with varicocele and in 55.8% of men without varicocele.

The assessment of the influence of the affected side on the proportion of morphologically intact spermatozoa showed slightly worse indicators in bilateral cases compared with left-sided and right-sided varicocele; however, this difference was not significant.

As was shown earlier, pathozoospermia was significantly more often detected in patients with grade II and III varicoceles, mainly due to the presence of teratozoospermia. The proportion of morphologically healthy spermatozoa in patients with teratozoospermia decreased significantly if the patient has varicocele (Fig. 2).

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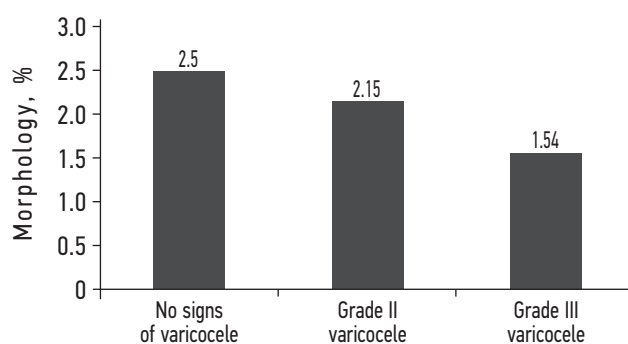


Fig. 2. The proportion of morphologically healthy sperm in patients of the 1st group with teratozoospermia

Рис. 2. Доля морфологически здоровых сперматозоидов у пациентов 1-й группы с тератозооспермией

Our data confirm the detrimental effect of varicose veins of the spermatic cord on the quality characteristics of the ejaculate. Interestingly, when we analyzed the factors that worsened the morphological parameters of the ejaculate, we revealed a negative influence of the time factor, that is, the duration of the presence of the varicocele. In patients with grade II and III varicoceles, a negative correlation was found between the number of morphologically intact spermatozoa and the duration of varicocele within 6 years of follow-up. Thus, longer disease duration may worsen proportionally the morphology of spermatozoa. At 12 months after surgery, the results of the examination of patients revealed an increase in the proportion of morphologically healthy spermatozoa by an average of 1.9%.

CONCLUSION

Our data indicate a high incidence of not only left-sided varicocele but also bilateral and isolated right-sided varicocele. In all such cases, right-sided varicose veins of the spermatic cord can be a symptom of a serious retroperitoneal disease and, if necessary, require additional examination. Our data showed a significant effect of grade II and III varicoceles on sperm morphology. Thus, further study is necessary to determine the influence of disease duration on the morphology of sperm.

ADDITIONAL INFORMATION

Conflict of interest. The authors declare no conflict of interest.

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