










ХИРУРГИЯ. АНДРОЛОГИЯ SURGERY. ANDROLOGY

DOI 10.22363/2313-0245-2022-26-1-96-102

RESEARCH ARTICLE
НАУЧНАЯ СТАТЬЯ


Reproductive potential repair in men with varicocele

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Abstract. Relevance. In majority of men, varicose veins of the testicle—varicocele—does not cause discomfort and is asymptomatic, and scrotal pain only bothers 10 % of patients. In 2/3 of cases, varicocele is a clinical finding. In this case, varicocele is the most common cause of male infertility. **Aim of the study.** Recovery of the reproductive potential of patients with varicocele. **Materials and Methods.** In 219 patients with varicocele, we've carried an ejaculate study out (WHO, 2010) 3, 6, 12 months after surgical treatment of varicocele. We considered the reproductive function restored by normozoospermia in the ejaculate and the onset of pregnancy in the spouse during the follow—up period of 12 months. **Results and Discussion.** The 2/3 men of the 219 patients with varicocele had ejaculate abnormalities. The age of patients who were diagnosed with pathospermia was 31+11 years. 66 (39.5 %) patients with varicocele had spermatozoa with reduced mobility. After surgical treatment (varicocelectomy according to Marmara), normozoospermia was present almost in every second man. Nevertheless, the number of pregnancies in a married couple was higher than 6 months after varicocelectomy—24(32.8 %). The surgical method of treatment of varicocele allows to restore the reproductive function of a man in 30 %. In our study, normozoospermia after varicocelectomy was recorded in almost every second patient. Ultrasound changes in the testicle with varicocele are an unfavorable prognosis for the restoration of male fertility. **Conclusion.** Surgical treatment of varicocele can recover the reproductive potential of almost every second man of reproductive age. Moreover, a greater number of pregnancies six months right after the operation were registered in spouses.

Keywords: varicocele, male infertility, ejaculate pathology, reproductive potential, scrotal ultrasound

Author contributions. Concept, design and definition of intellectual content: G.E. Roitberg, T.V. Tarasova. Literature search and data acquisition: J.V. Dorosh, I.V. Saushev. Manuscript preparation and editing: E.P. Tyurina, I.V. Shuligina.

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Received 31.07.2021. Accepted 25.10.2021.

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

For citation: Roitberg GE, Dorosh JV, Tarasova TV, Saushev IV, Tyurina EP, Shuligina IV. Reproductive potential repair in men with varicocele. *RUDN Journal of Medicine*. 2022;26(1):96–102. doi: 10.22363/2313-0245-2022-26-1-96-102

Introduction

Recently, a lot of attention has been paid to the male factor of infertility. [1—5]. Male infertility occurs in 30—50 % of cases [6—10]. According to many experts, varicocele is the main cause of male infertility [3]. Varicocele occurs in 15 % of the male population in general [1, 11]. And still there is a clear dynamics of the increase in morbidity, depending on the age of the patient. Thus, in boys aged 11—14 years, varicocele occurs in 7.8 %, and at the age of 15—19 years — 14.1 % [12]. According to Levinger U. et al. the prevalence of varicocele progresses by about 10 % as the age of a man increases by ten years [13]. Varicocele is diagnosed in 18 % of patients aged 30—39 years; 24 % in 40—49 year old patients; 33 % in 50—59 years old patients; 42 % in 60—69 years old patients; 53 % in 70—79 years old men and 75 % in 80—89 years old [13].

In the majority of cases, varicocele does not cause discomfort and is asymptomatic, and only 10 % of patients are concerned about scrotal pain [14]. In 2/3 of cases, varicocele is a clinical finding when examining the patient and palpating the dilated veins of the spermatic cord. In 30 % of cases, subclinical forms of varicocele can be detected by ultrasound of the scrotum.

The role of varicocele in the development of male infertility is still unknown. But what we know, is that the renal vein is located between the aorta and the superior mesenteric artery, which can lead to the formation of «aorto-mesenteric forceps» and retrograde blood flow into the testicular vein, followed by an increase in hydrostatic pressure and venous testicular hyperemia [1]. All these factors together lead to an increase in the temperature of the scrotum, the development of hypoxia. Spermatogenesis is a temperature-sensitive process that occurs best at a temperature of 35—36 °C [15].

In patients with varicocele, the temperature of the scrotum increases by 2—2.5 °C due to retrograde blood flow in the testicular vein [16]. At the same time, the expression of heat shock protective proteins decreases, which contributes to the induction of heat stress [17]. Heat stress, in turn, exacerbates apoptosis and the synthesis of reactive oxygen species [18].

The prevalence of varicocele in men with infertility is 25—35 %, and in patients with secondary infertility — 50—80 % [12]. However, there is still disagreement about the necessity and methods of correcting disorders in the ejaculate in varicocele [1, 19, 20]. Therefore, when identifying varicocele, several questions arise: the need for surgical treatment; methods and timing of correction of violations in the ejaculate; the realization of the reproductive potential of a man: the desire to achieve pregnancy in the spouse in a natural way. Objective: recovery of the reproductive potential of patients with varicocele.

Materials and methods

We've analyzed the results of treatment of 219 patients with diagnosed varicocele in 2018. All patients gave their consent to the processing of personal data and participation in the investigation. The study was approved by the local ethics committee of Pirogov Russian National Research Medical University, Moscow, Russian Federation. Criteria for inclusion in the study: the presence of varicose veins of the spermatic cord, the age of 18—50 years, the patient's consent to surgical treatment. Exclusion criteria, acute inflammatory diseases of the reproductive tract, hydrocele, genetic abnormalities, violation of reproductive function in the spouse.

All patients underwent a standard clinical examination, determination of the hormonal profile, and ultrasound of the scrotum. Blood hormones (follicle-stimulating hormone, luteinizing hormone, total testosterone) were determined in blood serum by immunofluorescence.

Ultrasound of the scrotum was performed on the Logiq 5 device, using a linear sensor with a frequency of 7 MHz. Ultrasound signs of varicocele we considered: convoluted course and expansion of the veins of the spermatic cord more than 3 mm, the change in the direction of blood flow to the opposite during the Valsalva test. We paid special attention to the size and structure of the testicle.

The study of the ejaculate (WHO, 2010) was carried out at the time of the initial treatment of the patient and 3, 6, 12 months after surgical treatment of varicocele.

Surgical treatment of varicocele was performed in all patients according to the Marmara method.

The reproductive potential of patients with varicocele was assessed by the onset of pregnancy in the spouse during the follow — up period of 12 months.

The Student’s test (Statistica version 7.0) was helpful to perform the statistical analysis. For dependent variables, the paired criterion was used, and for independent variables, the unpaired Student’s criterion was used. The significance threshold was set at $p < 0.05$.

Results and discussion

Among all men ($n=219$) included in the study, pathospermia was detected in 167 (76.2 %). In these patients, we’ve determined the reproductive potential for the next years.

The average age of all patients with stated semen abnormalities was 31+11 years. The distribution of patients by age is shown in Figure 2. In 45 (27 %) men, infertility was primary, in the rest —122 (73.0 %) secondary.

Complaints of a feeling of heaviness in the left half of the scrotum were presented by 14(8.3 %) patients, pain in this area was noted by 27 (16.1 %) men. In most of the patients, men were found to have varicocele of the 2nd degree 105 (62.8 %), the 3rd degree was in 49(29.5 %) people, in the remaining 13(7.7 %)-of the 1st degree.

During the initial treatment of patients with varicocele, according to the ejaculate data, the most impaired sperm motility was detected in 66 (39.5 %) people. The distribution of patients depending on the detected disorders in the ejaculate is shown in the fig. 1.

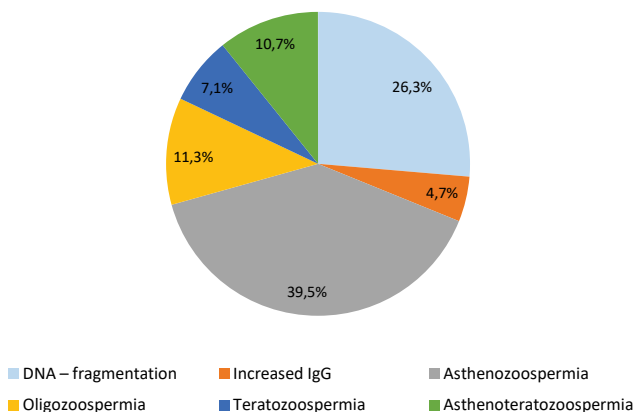


Fig. 1. Distribution of the patients according to the detected disorders in the ejaculate

Рис. 1. Распределение пациентов в зависимости от выявленных нарушений в эякуляте

In 59 (35.3 %) patients with varicocele the ultrasound revealed violations of the structure and volume of the testicle (Fig. 2). The testicular volume was reduced to an average of 19.2+2.1 ml.

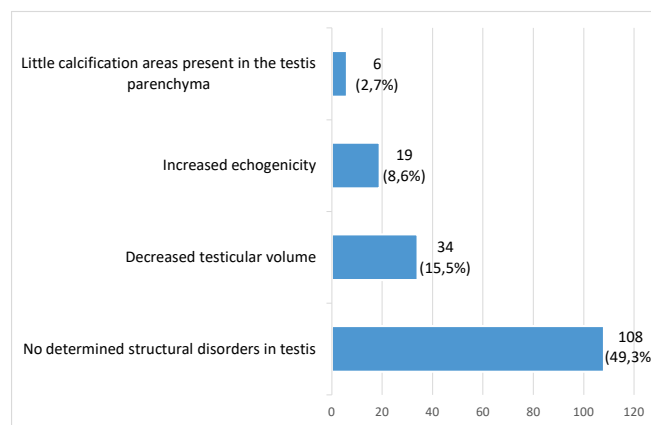


Fig. 2. Distribution of patients with varicocele depending on the detected changes in the testicle during scrotal ultrasound

Рис. 2. Распределение пациентов с варикоцеле в зависимости от выявленных изменений в яичке при УЗИ мошонки

After clinical examination, all patients had undergone a surgical treatment of the varicocele on the Marmara. The ejaculate was restored to the normozoospermia indicators in 73(43.7 %), of which almost half of the men had improved ejaculate indicators by the 6th month of follow-up (Fig. 4). The total number of motile spermatozoa increased from 17.32 ± 11.07 to 34.64 ± 9.81 ($p < 0.05$), and the proportion of normal morphological forms increased from 1.2 ± 0.8 % to 6.1 ± 1.7 %.

The distribution of patients depending on the follow-up period, as well as the rate of recovery of normal ejaculate parameters and the achievement of physiological pregnancy in the spouse is shown in Figure 3. The majority of physiological pregnancy occurred 6 months after varicocelectomy—24(32.8 %).

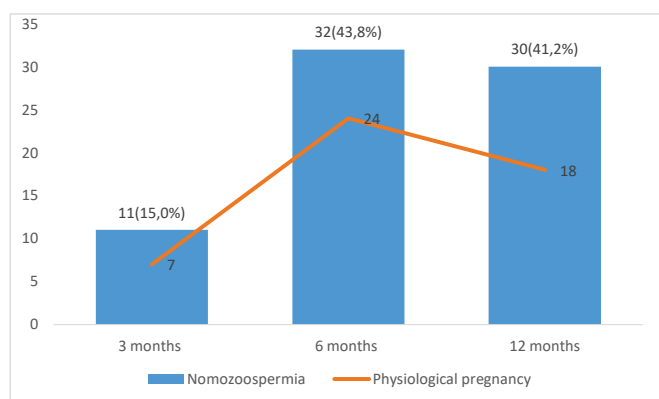


Fig. 3. Dynamics of natural pregnancy in patients after varicocelectomy

Рис. 3. Динамика наступления беременности естественным путем у пациентов после варикоцелэктомии

As it has been stated by The World Health Organization, there're about 800 million people suffering from the problems related to infertility [21]. Among the causes of male infertility, varicocele is the most common, affecting 11.7 % of fertile men and about 40 % of men who cannot achieve pregnancy [22]. Varicocele is often the cause of disorders of the exocrine and endocrine functions of the testicles, leading to impaired spermatogenesis [21, 23].

The clinical varicocele is quite simple to diagnose by applying physical and instrumental examination of

the patient [23, 24]. Indications for varicocelectomy are hypotrophy, testicular atrophy, pathospermia, and scrotal pain [17, 24].

The degree of influence of varicocele on the reproductive function in men is still a matter of discussion among the authors. However, the results of the study by Alsaikhan B. et al. demonstrate the presence of dilated spermatic cord veins in every third male with primary infertility and up to 80 % of men with secondary infertility [12]. In our study, the main part of patients were also with secondary infertility (73 %). Surgical treatment of varicocele allows to restore the reproductive potential of a man in 30 % [12]. In our study, normozoospermia after varicocelectomy was recorded in 43.7 % of patients. Ultrasound changes in the testicle in patients with varicocele are an unfavorable prognosis in terms of restoring male reproductive function. Such patients need additional pathogenetic treatment in the postoperative period to restore sperm fertility.

Shamsa A. et al has evaluated the results of surgical treatment of varicocele in 1,711 patients in a retrospective way [25]. In the postoperative period, not only the sperm concentration increased by 11.9 % ($p < 0.001$), but also the motility and morphology of sperm ($p < 0.01$) [25]. According to Shiraishi, K., men with non-obstructive azoospermia ($n=83$) after Marmara surgery were found to have sperm in the ejaculate in 24 % [7]. Meta-analysis data show that after surgical treatment of varicocele (regardless of the method of operation), 44 % of patients had sufficient sperm concentration in the ejaculate to refuse IVF and perform insemination [3].

Conclusion

Normozoospermia in varicocele is present in 23.8 % of men. Pathospermia in varicocele was recorded in 2/3 of cases. And still, only 1/3 of patients have primary male infertility. Surgical treatment—varicocelectomy by the Marmara method allows to restore the reproductive potential in 43.7 % of men. The greatest number of pregnancies in the spouse were recorded 6 months after the operation (32.8 %). Therefore, for six months,

such men need rehabilitation in order to restore their reproductive potential.

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Восстановление репродуктивного потенциала у мужчин с варикоцеле

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Аннотация. *Актуальность.* У большинства мужчин варикозное расширение вен яичка — варикоцеле — не вызывает дискомфорта и протекает бессимптомно, боль в мошонке беспокоит только 10 % пациентов. В 2/3 случаях варикоцеле является клинической находкой. При этом варикоцеле является наиболее частой причиной мужского бесплодия. *Цель.*

Восстановление репродуктивного потенциала пациентов с варикоцеле. *Материалы и методы.* У 219 пациентов с варикоцеле мы проводили исследование эякулята (ВОЗ, 2010) через 3, 6, 12 месяцев после хирургического лечения варикоцеле. Мы считали репродуктивную функцию восстановленной по нормозооспермии в спермограмме и наступлению беременности у супруги за период наблюдения — 12 месяцев. *Результаты и обсуждение.* Из 219 пациентов с варикоцеле нарушения в эякуляте были у 2/3 мужчин. Возраст всех пациентов, у которых были выявлены нарушения в эякуляте, был 31+11 лет. У 66 (39,5 %) пациентов с варикоцеле были обнаружены сперматозоиды со сниженной подвижностью. После хирургического лечения (варикоцелэктомия по Мармару) нормозооспермия была почти у каждого второго мужчины. При этом больше беременностей в супружеской паре было через 6 месяцев после варикоцелэктомии — 24 (32,8 %). Хирургический метод лечения варикоцеле позволяет восстановить репродуктивную функцию мужчины в 30 %. В нашем исследовании нормозооспермия после варикоцелэктомии была зафиксирована почти у каждого второго пациента. Ультразвуковые изменения в яичке при варикоцеле являются неблагоприятным прогнозом восстановления фертильности мужчины. *Выводы.* Хирургическое лечение варикоцеле позволяет восстановить репродуктивный потенциал почти у каждого второго мужчины репродуктивного возраста. Причем большее количество беременностей у супруги были через полгода после операции.

Ключевые слова: варикоцеле, мужское бесплодие, патоспермия, репродуктивный потенциал, УЗИ мошонки

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Информация о конфликте интересов. Авторы заявляют об отсутствии конфликта интересов

Поступила 31.07.2021. Принята 25.10.2021.

Для цитирования: Roitberg G.E., Dorosh J.V., Tarasova T.V., Saushev I.V., Tyurina E.P., Shuligina I.V. Reproductive potential repair in men with varicocele // Вестник Российского университета дружбы народов. Серия: Медицина. 2022. Т. 26. № 1. С. 96–102. doi: 10.22363/2313-0245-2022-26-1-96-102

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