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ENDOVASCULAR SURGERY OF THE ILIAC VEINS WITH BILATERAL VARICOCELE AND VARICOSE VEINS OF THE PELVIC ORGANS IN MEN

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In this study an analysis of the examination and treatment of 66 patients with bilateral varicocele, varicose veins of the pelvic organs due to ileal venous compression was performed. The obtained data testify to the need to review existing approaches to the surgical treatment of bilateral and recurrent varicocele. Carrying out balloon angioplasty and stenting in varicose veins of the pelvic veins in men due to the syndrome of ileal venous compression is currently an innovative and promising direction in urological practice at the interface of specialties.

Keywords: aorto-mesenteric compression syndrome; iliac venous compression; May-Thurner syndrome; bilateral varicocele; recurrent varicocele; varicose disease.

ЭНДОВАСКУЛЯРНАЯ ХИРУРГИЯ ПОДВЗДОШНЫХ ВЕН ПРИ ДВУСТОРОННЕМ ВАРИКОЦЕЛЕ И ВАРИКОЗНОЙ БОЛЕЗНИ ВЕН ОРГАНОВ МАЛОГО ТАЗА У МУЖЧИН

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В настоящей работе мы провели анализ результатов обследования и лечения 66 пациентов с двусторонним варикоцеле, варикозной болезнью вен органов малого таза вследствие подвздошной венозной компрессии. Полученные нами данные свидетельствуют о необходимости пересмотра существующих подходов к оперативному лечению двустороннего и рецидивного варикоцеле. Проведение баллонной ангиопластики и стентирования при варикозной болезни вен малого таза у мужчин вследствие синдрома подвздошной венозной компрессии в настоящее время является инновационным и перспективным направлением в урологической практике на стыке специальностей.

Ключевые слова: синдром аортомезентериального сдавления; подвздошная венозная компрессия; синдром Мея – Тюрнера; двустороннее варикоцеле; рецидивное варикоцеле; варикозная болезнь.

INTRODUCTION

The effectiveness of surgical treatment of varicocele is currently the subject of disputes between urologists. The least studied aspect of this problem is bilateral and recurrent varicoceles. In the current guidelines, there are no standards for managing these patients, both in terms of diagnosis and treatment. Multiple and ineffective treatment attempts for chronic prostatitis are most common.

Attempts at the surgical treatment of venogenic erectile dysfunction also have extremely low effectiveness. With an extended examination of these patients,

Table 1

Ultrasound classification of varicose veins of the prostate (Kapto A.A., 2017)

Таблица 1

Ультразвуковая классификация варикозного расширения вен простаты (Капто А.А., 2017)

Stage	Varicosity	Maximal diameter of veins, mm	Blood flow velocity, cm/s	Blood flow velocity with Valsalva test, cm/s
1	Visible	< 4	< 3	< 5
2	Significant	5–10	3–5	5–15
3	Pronounced	> 10	> 5	> 15

iliac venous compression is often verified as the cause of varicose veins of the pelvic organs. In this paper, we present our experience in the surgical treatment of patients with bilateral varicoceles and varicose veins of the pelvic organs due to May–Thurner syndrome.

MATERIALS AND METHODS

From July 2015 to February 2018, 66 patients aged 17 to 69 years (average 32.3 years) with bilateral varicoceles, varicose veins of the pelvic organs, and May–Thurner syndrome were examined. Patients reported pain in the lower abdomen and in the external genital area, dysuria (irritative and obstructive symptoms), erectile dysfunction (worsening of morning, spontaneous, and adequate erections), pathospermia (oligo-, asteno-, and terato-zoospermia), and pyospermia with repeatedly treated chronic prostatitis and recurrent varicocele.

The diagnosis of varicocele was made during physical examination and was confirmed by data from color Doppler ultrasound [1]. Detection of veins of 3.5 mm in diameter or larger with reverse venous blood flow after the Valsalva test with ultrasound examination of the scrotal organs verified the diagnosis of varicocele [2, 3].

The diagnosis of varicose veins of the pelvic organs was confirmed by transrectal ultrasound (TRUS) with the use of the criteria for varicose veins of the pelvic organs in men (varicose veins of the paraprostatic plexus more than 5 mm and/or the presence of a blood flow reflux in a Valsalva test with duplex angiography using a rectal sensor) [4] and the classification proposed by A.A. Kapto in 2017 (Table 1) [5].

Diagnostic testing for iliac venous compression syndrome was performed using magnetic resonance imaging (MRI) or computed tomography (CT)-phlebography, and X-ray contrast phlebography. In the analysis of MRI and CT-phlebography data, the criteria for aortomesenteric and iliac venous (vertebroarterial) compression were determined. Criteria for aortomesenteric compression included the determination of the aortomesenteric angle (normal is 28–65°) and the aortomesenterial distance (normal is 10–34 mm) [6, 7]. The criteria for iliac venous (vertebroarterial) compression included determination of the lower lumbar lordosis angle (normal is 134.33–136.76°) and the iliac vein tunnel diameter (normal is 4.18–4.50 mm) [8].

Pronounced symptomatology in the pelvic organs with varicocele and the presence of iliac vessel compression and collateral circulation, according to the data from phlebography, were signs of ileopelvic venous hypertension and determined indications for endovascular surgery of the iliac veins. Surgical treatment of iliac venous compression syndrome included puncture of the femoral or popliteal vein under the supervision of ultrasound, multi-projection phlebography, balloon angioplasty, stent implantation, stented segment postdilation, and control phlebography. For implantation, elgiloy alloy (based on nickel, cobalt, and chromium) Wallstent-Uni Endoprothesis venous stents (Boston Scientific) were used.

RESULTS

It was found that 24 patients (36.4%) had a previous varicocelectomy, and 14 patients (21.2%) had been surgical patients in our facility. In more than one-half of cases, the concomitant diseases included chronic prostatitis, erectile dysfunction, hemorrhoids, and varicose veins of the lower extremities.

According to TRUS, all patients had bilateral varicose veins of the paraprostatic venous plexus of more than 5 mm, which corresponded to stages 2 and 3 of varicose veins of the prostate according to the previously proposed classification [5].

In the analysis of MRI and CT-phlebography data (Table 2), May–Thurner syndrome alone was detected in 41 patients (62.1% of cases); May–Thurner syndrome in combination with left renal vein compression syndrome in aortic mesenteric clamp (nutcracker syndrome) was seen in 24 patients (36.4% of cases), and May–Thurner syndrome in combination with retroaortic left renal vein (posterior nutcracker syndrome) was noted in one patient (1.5% of cases).

Our analysis of the MRI and CT-phlebography data, as well as X-ray contrast phlebography, enabled the proposal of our own classification of arteriovenous obstructions in the ileocaval segment:

1) central proximal: high aortic bifurcation, in which the right common iliac artery compresses the lower section of the inferior vena cava before it is divided into the iliac veins (Fig. 1, *a*);
2) central distal: high aortic bifurcation, in which the right common iliac artery compresses the lower section of the inferior vena cava at the point of its division into the iliac veins (Fig. 1, *b*);
3) left proximal: the right common iliac artery compresses the left common iliac vein (May–Thurner syndrome) (Fig. 1, *c*);
4) left distal: compression by the left external and/or left internal iliac artery of the left external iliac vein (Fig. 1, *d*);
5) right proximal: compression by the right common iliac artery of the right common iliac vein (Fig. 1, *e*);
6) right distal: compression by the right external and/or right internal iliac artery of the right external iliac vein (Fig. 1, *f*).

The central proximal arteriovenous obstruction of the ileocaval segment was detected in 4 patients (6.1%), central distal arteriovenous obstruction was noted in 7 patients (10.6%), left proximal obstruction was seen in 52 patients (78.8%), left distal arteriovenous obstruction was seen in 31 patients (47%), right proximal obstruction was seen in 1 patient (1.5%), and right distal arteriovenous obstruction was seen in 1 patient (1.5%). Various combinations of arterio-

Table 2

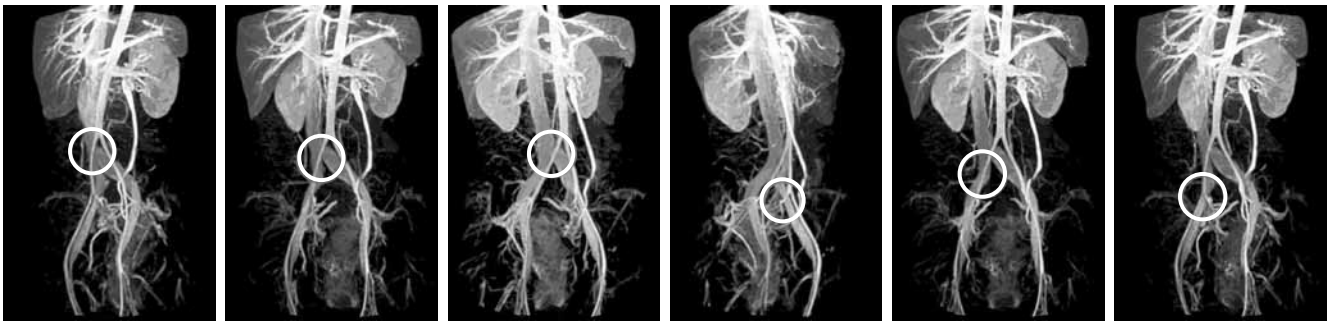
MRI and CT-phlebography results (*n* = 66)

Таблица 2

Результаты МРТ- и КТ-флебографии у наблюдаемых больных (*n* = 66)

Value	AMA, °	AMD, mm	LLLA, °	IVTD, mm
Minimum	9.6	2.49	112.2	1.17
Maximum	114.9	32.3	133.7	4.01
Average	39.0	13.0	124.0	2.62

Note: AMA, aortomesenteric angle; AMD, aortomesenterial distance; LLLA, lower lumbar lordosis angle; IVTD, iliac vein tunnel diameter



a *b* *c* *d* *e* *f*

Fig. 1. Magnetic resonance imaging of the inferior vena cava and small pelvic vessels: (*a*) central proximal arteriovenous obstruction of the ileocaval segment; (*b*) central distal arteriovenous obstruction of the ileocaval segment; (*c*) left proximal arteriovenous obstruction of the ileocaval segment or May–Thurner syndrome; (*d*) left distal arteriovenous obstruction of the ileocaval segment; (*e*) right proximal arteriovenous obstruction of the ileocaval segment; and (*f*) right distal arteriovenous obstruction of the ileocaval segment (*modeling*)

Рис. 1. Магнитно-резонансное исследование нижней полой вены и сосудов малого таза: *a* — центральный проксимальный артериовенозный конфликт илеокавального сегмента; *b* — центральный дистальный артериовенозный конфликт илеокавального сегмента; *c* — левый проксимальный артериовенозный конфликт илеокавального сегмента, или синдром Мея – Тюрнера; *d* — левый дистальный артериовенозный конфликт илеокавального сегмента; *e* — правый проксимальный артериовенозный конфликт илеокавального сегмента; *f* — правый дистальный артериовенозный конфликт илеокавального сегмента (*моделирование*)

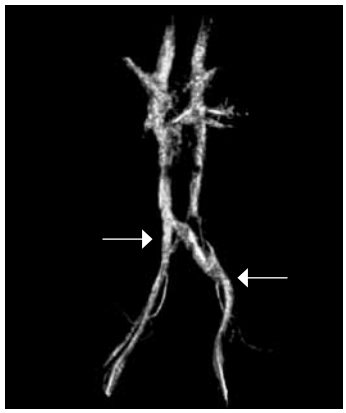


Fig. 2. Magnetic resonance imaging of the inferior vena cava and small pelvic vessels. Left proximal and left distal types of arteriovenous obstruction of the ileocaval segment. The left arrow indicates the place of compression of the left common iliac vein by the right common iliac artery. The right arrow indicates the place of compression of the left external iliac vein by the left external iliac artery

Рис. 2. Магнитно-резонансное исследование нижней полой вены и сосудов малого таза. Левый проксимальный и левый дистальный типы артериовенозных конфликтов илеокавального сегмента. Левой стрелкой указано место компрессии левой общей подвздошной вены правой общей подвздошной артерией. Правой стрелкой указано место компрессии левой наружной подвздошной вены левой наружной подвздошной артерией

venous obstructions in the ileocaval segment were revealed in 32 (48.5%) of 66 patients (Fig. 2).

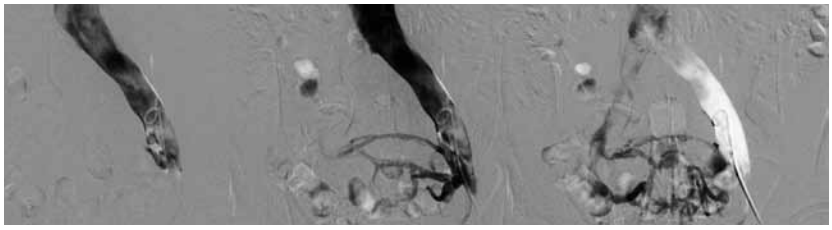
Pronounced symptomatology from the pelvic organs with bilateral varicoceles and phlebography results showed compression of the iliac vessels and collateral circulation. These signs of ileopelvic venous hypertension were indications for angioplasty and stenting of the left common iliac vein. From March 2017 to February 2018, stenting of the left common iliac artery was performed in 13 patients. Surgical treatment of iliac venous compression syndrome included the following stages: (1) vein puncture (femoral, popliteal, and jugular) under ultrasound control; (2) multi-projection intraoperative phlebography showing the collateral circulation of the left iliac vein; (3) balloon angioplasty of the left iliac vein; (4) implantation of one stent into the left iliac vein; (5) post-dilation of the stented segment; and (6) control phlebography showing the patency of the left iliac vein and the absence of collateral circulation. Two stents were placed in the left common iliac vein in one patient, and stents in each of the left and right common iliac veins were also placed in one patient.

CLINICAL CASE

Patient M., a 38-year-old athlete, presented with constant pronounced dull and acute pain in the lower abdomen and in the perineum and absence of morning, spontaneous, and adequate erections. It was revealed that in 1995 he had an Ivanissevich surgical repair on the left side, later that year he had varicocelectomy on the left with the scrotal approach, and in 2015 he had surgery on the left using the Marmar technique. Subsequently, the development of a stage 2 bilateral varicocele was noted. As a result, the patient underwent simultaneous bilateral varicocelectomy in December 2016 with excision of the cysts of the epididymides of both testicles and grafting of the right and left testicle tunica by the Winckelmann method from the middle scrotal approach along the Wesling line. After bilateral varicocelectomy, the initial symptoms of pronounced dull and acute pain in the lower abdomen and in the perineum and the absence of morning, spontaneous, and adequate erections were noted.

According to the results of multiple spermiological examinations, no data were obtained for pathospermia and pyrospermia. According to TRUS, chronic fibrotic calculous prostatitis and stage 2 varicose veins of the pelvic organs according to the A.A. Kapto classification were verified [5]. According to dynamic TRUS in June 2016, which was 5 months after the last surgery for bilateral varicocele, varicose veins of the prostate gland did not decrease and complaints of pain in the pelvic region and deterioration of erection began to increase. The intake of veinotonic supplements and phosphodiesterase type 5 inhibitors did not provide the expected effect. As a result, MRI of the inferior vena cava and small pelvic vessels was performed in December 2016 at the Medical Diagnostic Center Ramsi Diagnostics (Moscow). The results of MRI-phlebography rule out aortomesenteric compression (nutcracker syndrome). In March 2017 in the E.O. Mukhin City Clinical Hospital (Moscow), radiology-guided endovascular angioplasty and stenting of the left common iliac and left external iliac veins were performed for the first time with a positive outcome for the patient with a recurrent bilateral varicocele, pelvic pain, erectile dysfunction, and varicose veins of the pelvic organs with May–Thurner syndrome (Figures 3–9).

Given that fibrous adhesions (commissures) in the compressed iliac vein, which are the inevitable pathogenetic link of this disease, are found in most cases, we consider it necessary to perform angioplasty before stenting. On the other hand, performing only balloon angioplasty may be ineffective, and stent implantation is mandatory. For the implantation, a Wallstent-Uni Endoprothesis venous stent (Boston Scientific) made of elgiloy alloy (an alloy based on nickel, cobalt, and chromium) with a diameter of 16 mm and a length of 90 mm was used.



a *b* *c*

Fig. 3. Antegrade ileocavography of patient M., 39 years old, with pronounced pelvic symptoms (pain, erectile dysfunction, and chronic calculous prostatitis) due to May–Thurner syndrome: (*a*) antegrade catheterization of the left common iliac vein; (*b*) note retrograde reflux and contrast of the venous plexus of the small pelvis (collateral circulation) with the introduction of radiopaque substance; (*c*) after contrasting the venous plexus of the small pelvis, the radiopaque substance is redistributed into the right common iliac vein. The diameter of the right common iliac vein is 1.4 times smaller than the diameter of the left common iliac vein

Рис. 3. Антеградная илеокаваграфия у пациента М., 39 лет, с выраженной тазовой симптоматикой (боли, эректильная дисфункция, хронический калькулезный простатит) вследствие синдрома Мея – Тюрнера: *a* — антеградная катетеризация левой общей подвздошной вены; *b* — при введении рентгеноконтрастного вещества отмечается его ретроградный заброс и контрастирование венозных сплетений малого таза (коллатеральное кровообращение); *c* — после контрастирования венозных сплетений малого таза рентгеноконтрастное вещество перераспределяется в правую общую подвздошную вену. Диаметр правой общей подвздошной вены в 1,4 раза меньше диаметра левой общей подвздошной вены

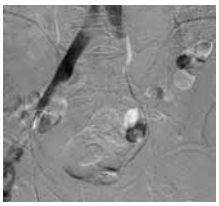


Fig. 4. Antegrade ileocavography of patient M., 39 years old, from March 2017. There was a compression of the left common and left external iliac veins. Surgical approach was from the left popliteal vein with the patient in the prone position

Рис. 4. Антеградная илеокаваграфия пациента М., 39 лет, от 28.03.2017. Отмечается компрессия левой общей и левой наружной подвздошных вен. Оперативный доступ из левой подколенной вены. Положение пациента на животе

Fig. 5. Balloon angioplasty of the left common and left external iliac veins of patient M., 39 years old, from March 2017. Surgical approach was from the left popliteal vein with the patient in the prone position

Рис. 5. Баллонная ангиопластика левой общей и левой наружной подвздошных вен пациента М., 39 лет, от 28.03.2017. Оперативный доступ из левой подколенной вены. Положение пациента на животе

Fig. 6. Implantation of one stent into the left common and left external iliac vein of patient M., 39 years, from March 2017. Surgical approach was from the left popliteal vein with the patient in the prone position

Рис. 6. Имплантация одного стента в левую общую и левую наружную подвздошную вены пациента М., 39 лет, от 28.03.2017. Оперативный доступ из левой подколенной вены. Положение пациента на животе

Fig. 7. Post-dilation of the stented segment of the left common iliac vein of patient M., 39 years old, from March 2017. Surgical approach was from the left popliteal vein with the patient in the prone position

Рис. 7. Постдилятация стентированного сегмента левой общей подвздошной вены пациента М., 39 лет, от 28.03.2017. Оперативный доступ из левой подколенной вены. Положение пациента на животе

Fig. 8. Post-dilation of the stented segment of the left external iliac vein of patient M., 39 years old, from March 2017. Surgical approach was from the left popliteal vein with the patient in the prone position

Рис. 8. Постдилятация стентированного сегмента левой наружной подвздошной вены пациента М., 39 лет, от 28.03.2017. Оперативный доступ из левой подколенной вены. Положение пациента на животе

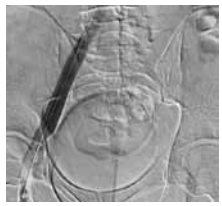
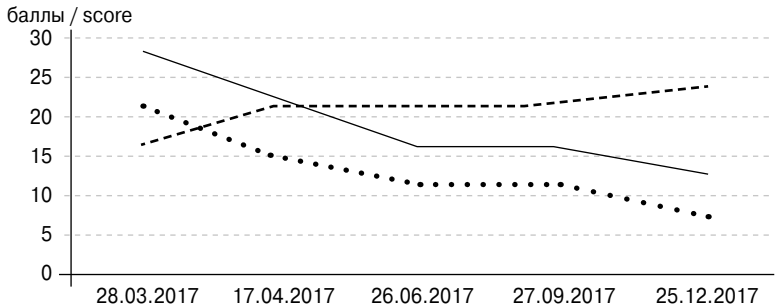


Fig. 9. Control phlebography of patient M., 39 years old, from March 2017. Surgical approach was from the left popliteal vein with the patient in the prone position. Note the patency of both iliac veins and the absence of collateral circulation

Рис. 9. Контрольная флебография пациента М., 39 лет, от 28.03.2017. Оперативный доступ из левой подколенной вены. Положение пациента на животе. Проходимость обеих подвздошных вен и отсутствие коллатерального кровообращения

Postoperative management included anticoagulant therapy with rivaroxaban 20 mg per day for 6 months after surgery and ultrasonic angioimaging of the iliac vessels on day one, at 2 weeks and 1, 3, and 6 months after surgery. The results of surgical treatment were assessed with the International Index of Erectile Function (IIEF-5), International Prostate Symptom Score, and National Institutes of Health Chronic Prostatitis Symptom Index questionnaires, and also with the use of TRUS prior to surgery and at 1, 3, 6, and 9 months after surgery (Fig. 10). In the immediate postoperative period (within an hour), complaints about pain in the pelvic region have practically disappeared, and a week after the surgery, the patient noted restoration of erection without any specific therapy.

Four months after angioplasty and stenting, the maximum diameter of prostate veins was reduced by 45% according to TRUS data, and the absence of antegrade blood flow in the color Doppler TRUS of the prostate at rest and at the Valsalva test was noted. The result was stable over the next 5 months of follow-up. Thus, there was a decrease in venous plethora of the prostate, which was accompanied by a reduction in pain syndrome and recovery of sexual function. The result was stable for 9 months of follow-up without treatment of pain syndrome, chronic prostatitis, and erectile dysfunction.



	28.03.2017 до операции / before surgery	17.04.2017 после операции / after surgery	26.06.2017 после операции / after surgery	27.09.2017 после операции / after surgery	25.12.2017 после операции / after surgery
-------- МИЭФ-5 / IIEF-5	16	21	21	21	23
• • • • • • • I-PSS	21	15	11	11	7
———— NIH-GPSI	28	22	16	16	12

Fig. 10. Results of IIEF-5 survey responses before and after angioplasty and stenting of the left common iliac and left external iliac veins (patient M., 39 years old)

Рис. 10. Результаты анкетирования до и после ангиопластики и стентирования левой общей подвздошной и левой наружной подвздошных вен (пациент М., 39 лет)

DISCUSSION

May–Thurner syndrome as a cause of ileofemoral thrombosis and chronic pain syndrome is well studied in surgical and gynecological practice. Data on its role in the development of urological problems in men are practically absent in the scientific medical literature. M.D. Bomalaski et al. (1993) described an unusual case of detection of varicocele in a young man due to compression syndrome of the left common iliac vein [9]. The varicocele was caused by venous collateral veins and did not disappear after the ligation of the testicular vein. This example illustrates the need to refrain from standard surgical techniques in such situations. At the same time, the modern diagnostic algorithm in patients with varicocele is not focused on the detection of May–Thurner syndrome. Until recently, patients with recurrent varicocele because of ileofemoral compression because of May–Thurner syndrome were at a dead end in terms of their further management by urologists and andrologists. Radiology-guided surgical treatment of compression syndrome of the left common iliac vein (May–Thurner syndrome) is mainly performed in gynecological and surgical practice. In March 2017, we performed for the first time a radiology-guided endovascular angioplasty and stenting of the left common iliac and left external iliac veins in a case of recurrent bilateral varicocele, pelvic pain, erectile dysfunction, and varicose veins of the pelvic organs in May–Thurner syndrome. This was reported at the 12th Congress of the Professional Association of Andrologists of Russia in Sochi in May 2017 [10], at the 10th St. Petersburg Venous Forum in November–December 2017 [11], at the 23rd All-Russian Congress of Cardiovascular Surgeons in Moscow in November–December 2017 [12], and at the XVII Congress of the Russian Society of Urologists in Moscow in November 2017 [13, 14]. Later, in July 2017, J.R. Stern et al. reported stenting of the left common iliac vein in a 22-year-old patient with a recurrent left-sided varicocele because of May–Thurner syndrome. According to the authors, this was the world's first report on the successful treatment of varicocele due to May–Thurner syndrome that was resistant to conventional surgery [15].

CONCLUSIONS

Approaches to managing patients with bilateral and recurrent varicocele need to be rethought. In such patients, the probability of the presence of iliac venous compression syndrome is extremely high. In these cases, it is considered expedient to perform MRI of the inferior vena cava and small pelvic vessels as a non-invasive and highly informative evaluation method. The procedure enables verification with a high accuracy of both aortomesenteric compression (the cause of the renospermatic varicocele) and iliac venous compression (the cause of the ileospermatic and mixed types of varicocele). The surgical treatment of varicocele for such patients without ruling out iliac venous compression syndrome is considered inappropriate because of the high probability of relapse and the increase in pelvic symptoms. The implementation of balloon angioplasty and stenting in varicose veins of the small pelvis in men due to the syndrome of ileal venous compression is currently an innovative and promising direction in urological practice at the confluence with radiology-guided surgery.

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