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

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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,
Ilial 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].

Diagnostics 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].

<table>
<thead>
<tr>
<th>Stage</th>
<th>Varicosity</th>
<th>Maximal diameter of veins, mm</th>
<th>Blood flow velocity, cm/s</th>
<th>Blood flow velocity with Valsalva test, cm/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Visible</td>
<td>&lt; 4</td>
<td>&lt; 3</td>
<td>&lt; 5</td>
</tr>
<tr>
<td>2</td>
<td>Significant</td>
<td>5–10</td>
<td>3–5</td>
<td>5–15</td>
</tr>
<tr>
<td>3</td>
<td>Pronounced</td>
<td>&gt; 10</td>
<td>&gt; 5</td>
<td>&gt; 15</td>
</tr>
</tbody>
</table>

**Table 1**

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

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

<table>
<thead>
<tr>
<th>Value</th>
<th>AMA, °</th>
<th>AMD, mm</th>
<th>LLLA, °</th>
<th>IVTD, mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>9.6</td>
<td>2.49</td>
<td>112.2</td>
<td>1.17</td>
</tr>
<tr>
<td>Maximum</td>
<td>114.9</td>
<td>32.3</td>
<td>133.7</td>
<td>4.01</td>
</tr>
<tr>
<td>Average</td>
<td>39.0</td>
<td>13.0</td>
<td>124.0</td>
<td>2.62</td>
</tr>
</tbody>
</table>

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

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; (d) left distal arteriovenous obstruction of the ileocaval segment; (e) right proximal arteriovenous obstruction of the ileocaval segment; (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 Мей — Тюрнера; (d) левый дистальный артериовенозный конфликт илеокавального сегмента; (e) правый проксимальный артериовенозный конфликт илеокавального сегмента; (f) правый дистальный артериовенозный конфликт илеокавального сегмента (моделирование)
veins were also placed in one patient. and stents in each of the left and right common iliac were placed in the left common iliac vein in one patient, and the absence of collateral circulation. Two stents phlebography showing the patency of the left iliac vein (5) post-dilation of the stented segment; and (6) control vein; (4) implantation of one stent into the left iliac vein; (3) balloon angioplasty of the left iliac native phlebography showing the collateral circulation of the ileopelvic vessels with bilateral varicoceles and phlebography results 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 ieliac 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.
Postoperative management included anticoagulant therapy with rivaroxaban 20 mg per day for 6 months after surgery and ultrasonic angiography 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 for 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.
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.

**REFERENCES**


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