

Evaluation of effectiveness of endovascular embolisation for the treatment of pelvic congestion syndrome – preliminary study

Ocena skuteczności wewnątrznaczyniowej metody embolizacji w leczeniu zespołu przekrwienia biernego miednicy - badania wstępne

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Abstract

Objectives: *The Aim: The aim of the study was to evaluate the effectiveness, safety and clinical outcomes of endovascular embolisation of pelvic congestion syndrome (PCS).*

Material and methods: *This prospective, observational study carried out between January and May of 2014 encompassed 24 female patients aged 22-44 years (average - 31 years) diagnosed with PCS. Diagnosis of PCS was established by medical history, physical examination, transvaginal Doppler ultrasound examination and confirmed by MRI. The patients were qualified for phlebography and ovarian vein embolization with 0.035" detachable coils and/or microcoils. Pelvic pain scores were assessed before and 3 months after the procedure with the visual analog scale (VAS; 0 – no pain, 10 – unbearable pain).*

Results: *Embolisation procedures were performed in 23 out of 24 patients. Nineteen patients underwent unilateral and 4 patients bilateral embolisation of the ovarian vein. In one case, safe and selective vessel catheterization was not possible due to the anatomical variant of venous flow. Nineteen patients underwent unilateral embolisation of the left ovarian vein. Four patients had the left and right ovarian veins embolized; in one of them, the internal iliac vein was additionally closed (the two-stage procedure). The technical success rate was 96%. Procedures lasted 23-78 minutes (32 minutes on average). An average of 40 ml of contrast was administered during the procedures. The total mean radiation dose at the reference point was 389 mGy (from 127 mGy to 1112 mGy). A decrease in pelvic pain intensity according to VAS was considered a clinical success. The median VAS pelvic pain score before the procedure was 8. Three months after the procedure median pelvic pain score decreased to 1 ($p < 0.001$). In two cases, the ovarian vein was injured and the contrast medium extravasated, which was clinically insignificant. In one case, a small injection site haematoma developed.*

Conclusion: *Embolisation is a minimally invasive, effective and safe method of treatment for PCS. The cooperation between gynaecologists and interventional radiologists is essential for successful outcomes.*

Key words: **embolisation / pelvic congestion syndrome / ovarian vein embolisation /**

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Krzysztof Pyra, et al. Evaluation of effectiveness of endovascular embolisation for the treatment of pelvic congestion syndrome – preliminary study.

Streszczenie

Cel pracy: Celem badania była ocena skuteczności, bezpieczeństwa i wyniku klinicznego przeznaczeniowej embolizacji zespołu przekrwienia biernego miednicy.

Materiał i metody: W prospektywnym, obserwacyjnym badaniu od stycznia do maja 2014 do zabiegu embolizacji PCS zakwalifikowano 24 chore, w wieku od 22 do 44 lat (średnio 31). Diagnozę postawiono na podstawie objawów klinicznych, badania fizykalnego, przezpochwowego USG Doppler i/lub MRI. Pacjentki zakwalifikowano do badania czynnościowego układu żylnego, flebografii i ewentualnej embolizacji żył jajnikowych przy użyciu spiral. Oceniano średnie nasilenie dolegliwości bólowych miednicy w wizualnej skali analogowej VAS przed i 3 miesiące po zabiegu embolizacji.

Wyniki: Zabieg wykonano u 23 z 24 chorych. U 19 chorych wykonano jednostronną embolizację lewej żyły jajnikowej. U 4 pacjentek wykonano embolizację lewej i prawej żyły jajnikowej. Sukces techniczny wyniósł 96 %. Procedury trwały od 23 do 78 min (średnio 32 minuty). W czasie zabiegu podano średnio 40 ml kontrastu. Łączna średnia dawka promieniowania w punkcie referencyjnym wyniosła 389 mGy. Za sukces kliniczny uznano zmniejszenie stopnia natężenia bólu w miednicy mierzonej w skali VAS. Średni ból miednicy w skali VAS przed zabiegiem wynosił 8 pkt. Trzy miesiące po zabiegu ból miednicy w skali VAS zmniejszył się do 1 ($p < 0.001$). W dwóch przypadkach doszło do wynacynienia środka cieniującego bez znaczenia klinicznego.

Wnioski: Embolizacja w leczeniu PCS jest małoinwazyjną, skuteczną i bezpieczną metodą leczenia. Współpraca ginekologa i radiologa zabiegowego odgrywa tutaj kluczową rolę.

Słowa kluczowe: embolizacja / zespół przekrwienia biernego miednicy /
/ okluzja żył jajnikowych /

Introduction

Chronic pelvic pain (CPP) is still a diagnostic and therapeutic challenge. The condition can affect even every third woman and be the reason for 20% of outpatient gynaecological visits [1]. The diagnosis and treatment of CPP account for 35% of diagnostic laparoscopies and 15% of hysterectomies [2]. The causes of CPP involve inflammatory pelvic diseases, endometriosis, structural abnormalities of fallopian tubes, pelvic varices and many others.

Pelvic congestion syndrome (PCS) is a common cause of chronic pain within the pelvis minor, which is underlain by the presence of varices and incompetent veins in this region [3]. Pelvic varices can be visualized in about 10-15% of women, typically below the age of 45 years. Not all women in this group experience the symptoms of CPP. The aetiology of PCS has not been fully elucidated. The theory regarding the pain due to dilated veins decreased blood flow velocity in the pelvic veins was first put forward by Taylor in the 1940ties. One of the risk factors of PCS is insufficiency or lack of the valve apparatus in the ovarian and parametrial veins. Vein incompetence results in reverse flow in the ovarian veins; consequently, the venous vessels become markedly dilated and varices form. Valveless ovarian veins are diagnosed in 40% of cases on the left and in 35% on the right side. The development of pain is not only the result of increased blood volume, pressure and reverse flow, but also the resultant vein ischaemia, impairing the tropism of endothelial cells and smooth muscles, which react by secreting substance P as well as neurokinin A and B. The implicated predisposing factors include multiparity, family history of chronic pelvic pain and prolapse of reproductive organs [1,4].

In the majority of women, PCS manifests with non-cyclic abdominal or pelvic pain occurring for at least 6 months. PCS is characterised by chronic, dull, continuous pain (which can last many hours or days). The pain usually increases on prolonged

standing, during menstruation, sexual intercourse and pregnancy. The non-specific symptoms include headaches, flatulence, nausea, vaginal discharge, vulva swelling, and sensations of lower extremity oedema, urinary urgency, general fatigue and mood depression. Some patients with the diagnosis of PCS report only slight or no pain episodes within the abdomen while complaining of hip pain or perineal and lower limb varices [5].

Imaging examinations are required to confirm the diagnosis of PCS. The examinations can be divided into non-invasive, e.g. ultrasound (US), magnetic resonance imaging (MRI), and minimally invasive – computed tomography (CT) or dynamic examinations such as phlebography, which enables to assess the function of valves and competence of the venous system. Before establishing the diagnosis of PCS, it is essential to eliminate the remaining possible diseases.

MRI is an important tool for non-invasive endometriosis diagnosis and should be performed before treatment, especially surgery. This increases the probability of detecting small endometrial implants [6]. Transvaginal ultrasound examinations combined with Doppler imaging of the pelvis are preferable. They allow visualizing pelvic venous plexuses and dynamic examination of blood flow. Unaffected venous plexuses are relatively straight structures of the diameter < 4 mm. In patients with clinical suspicion of PCS the following findings may be observed: pelvic venous plexus dilation > 6 mm, decreased velocity or reverse blood flow (especially during the Valsalva manoeuvre), dilated arcuate veins passing through the uterine muscle and ovarian polycystic lesions [7].

CT and MRI findings reveal dilated and irregular venous vessels within the adnexa. The CT scans disclose isodense varices (compared to the remaining venous vessels) while the T2-dependent sequences of MRI show their hyperintensity. The SPACE sequence is particularly convenient to evaluate those lesions (Figure 1).

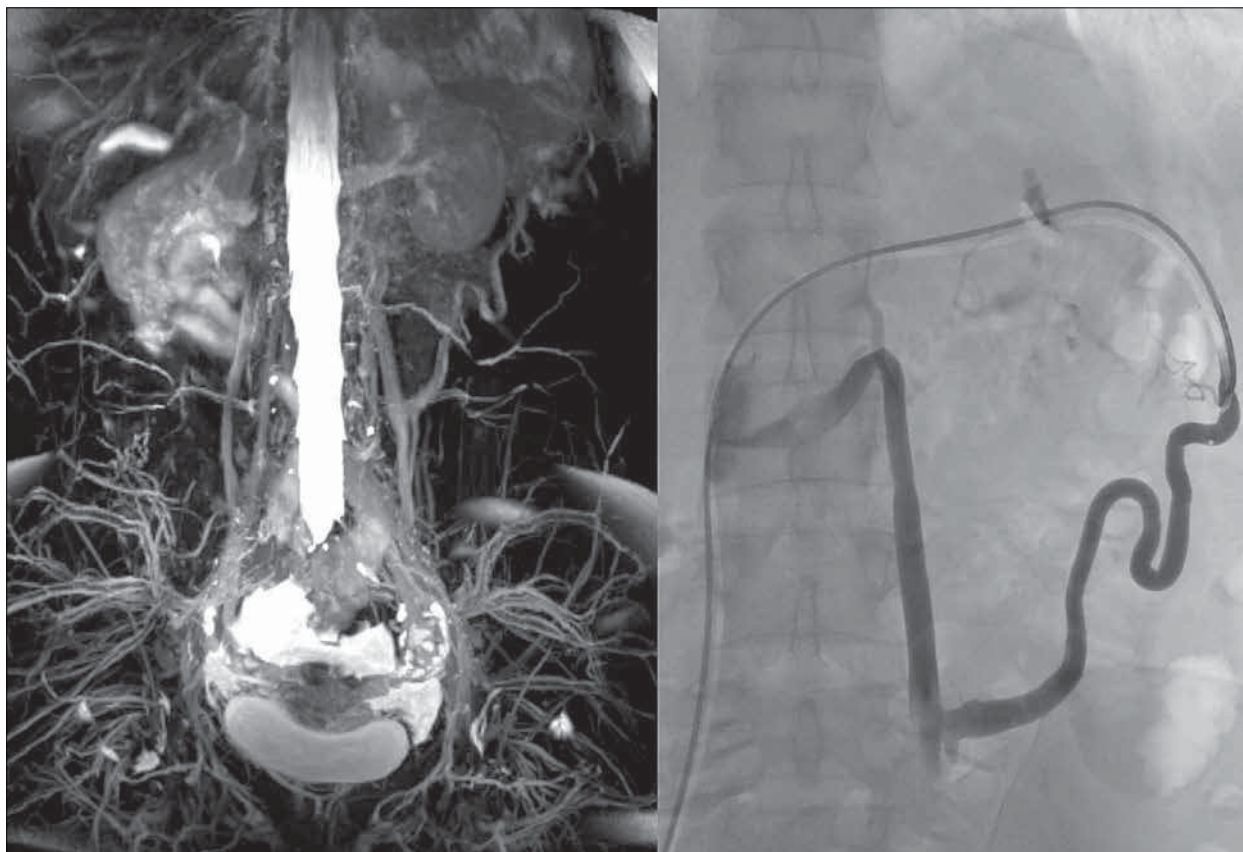


Figure 1. On the left – scan in the frontal plane in the T2 – dependent SPACE sequence (image without a paramagnetic agent) visualizing the dilated left and right ovarian veins. A wide-diameter collateral vessel visible halfway the left ovarian vein. On the right - a catheter placed in collateral ostium to the renal vein. The T2 SPACE sequence combines many assets – non-invasive, of short duration (the sequence last 6 minutes), markedly facilitates diagnosis and helps to plan the procedure.

The suggested criteria for the diagnosis of pelvic varices include at least 4 veins of varying diameters present unilaterally; at least one of them should have the diameter > 4 mm, or the dilated ovarian vein > 8 mm [8]. However, the final radiological assessment should be performed with reference to the clinical symptoms.

The treatment of PCS depends mainly on the severity of pain. Analgesics, i.e. non-steroidal anti-inflammatory drugs are applied, which act symptomatically. In cases of pain associated predominantly with menstruation, contraceptives are used. The prospective studies performed also describe the use of medroxyprogesterone, which alleviates the symptoms in about 40 % of patients. Until the development of interventional radiology, patients were subjected to hysterectomy. Despite its definitive nature, hysterectomy is not as effective as ligation or embolisation of the ovarian vein.

Thanks to dynamic advances in endovascular methods, embolisation has become one of the most common methods currently used; this treatment option is readily chosen due to its low invasiveness and high effectiveness [9].

CT and MRI examinations enable also to evaluate the local anatomy and facilitate differential diagnosis of CPP. Whenever possible, MRI should be performed first as patients are not exposed to X-radiation. The endovascular examination – phlebography enables additionally functional assessment of reflux of blood to varicose plexuses [10].

Aim

The aim of the present study was to assess the effectiveness of endovascular embolisation in decreasing pelvic pain in PCS.

Material and methods

This prospective observational study was performed between January and May 2014. Patients qualified for embolization because of PCS were included. After history taking, each patient underwent physical examination. The next stage was transvaginal Doppler ultrasound examination followed by MRI without paramagnetic contrast. Scan were performed in the transverse, frontal and lateral planes, in T1 and T2-dependent sequences supplemented with SPACE sequences (Figure 1). Once the clinical suspicion of PCS was confirmed with imaging exams, patients were scheduled for phlebography and possible embolization. The procedures were carried out until the tenth day of the cycle after the B-hCG test. Additional examinations included platelet count, aPTT, INR, levels of urea and creatinine. During the procedures, all patients were urinary catheterized and monitored.

All the procedures were performed in the interventional radiology department cathlab using an angiographic system (Artis Zee, Siemens) under local anaesthesia by injecting the right femoral vein via the 5Fr sheath. Phlebographies were performed with the Valsalva manoeuvre from the catheter left in the left renal vein; on the right side, at the ovarian vein ostium. The ovarian veins were catheterised using a 5 Fr Cobra II (Cook Medical) or 5

Krzysztof Pyra, et al. Evaluation of effectiveness of endovascular embolisation for the treatment of pelvic congestion syndrome – preliminary study.

Fr Simmons II (Cook Medical) catheter and a hydrophilic guide-wire (Glidewire, Terumo). The 0.035" detachable coils (MReye, Cook Medical) were applied to close them; in a few cases, an obliterating material (aethoxysclerol) was additionally used. For the right ovarian vein embolisation, microguides (Progreate, Terumo) and microcoils (Concerto, Covidien) were required in the majority of cases (Figure 2). A final phlebography was performed to confirm the safe closure of the vein/veins and no inflow of the contrast medium during the Valsalva test, which was considered a technical success.

The procedure effectiveness was evaluated three months after embolization. The main outcome measure was pelvic pain. The pain intensity was assessed using VAS scores (0-10 where 0- lack of pain and 10- unbearable pain).

The study protocol was accepted by a local bioethics committee, each participant signed an informed consent.

Statistical analysis was performed with Statistica (version 10, StatSoft, Tulsa, OK, USA). Pelvic pain scores were compared with the Wilcoxon Matched Pairs Test. P values below 0.05 were considered significant.

Results

Twenty four patients were qualified for PCS embolization procedures during the study period. The procedure was performed in 23 out of 24 patients (95.8%). In one case, safe and selective vessel catheterisation was not possible due to the anatomical variant of venous flow – this patient was excluded from further analysis. Patient age ranged from 22 to 44 years (31 on average). Two patients were nulliparous, 9 - primiparous, and 12 - multiparous. All patients were of Caucasian racial origin.

Nineteen patients underwent unilateral embolisation of the left ovarian vein. In 18 cases, the 0.035" detachable coils were used, in one case - 0 0.018" microcoils and in 5 cases due to the extensive network of collateral veins obliterating material was additionally used (aethoxysclerol). In the remaining 4 patients, the left and right ovarian veins were embolized: the right ovarian vein was closed using macrocoils (3 cases) and microcoils (one case). In one case, the internal iliac vein was additionally embolized; 3 to 12 coils were implanted (5 on average). In all cases final phlebography confirmed the technical success of the procedure.

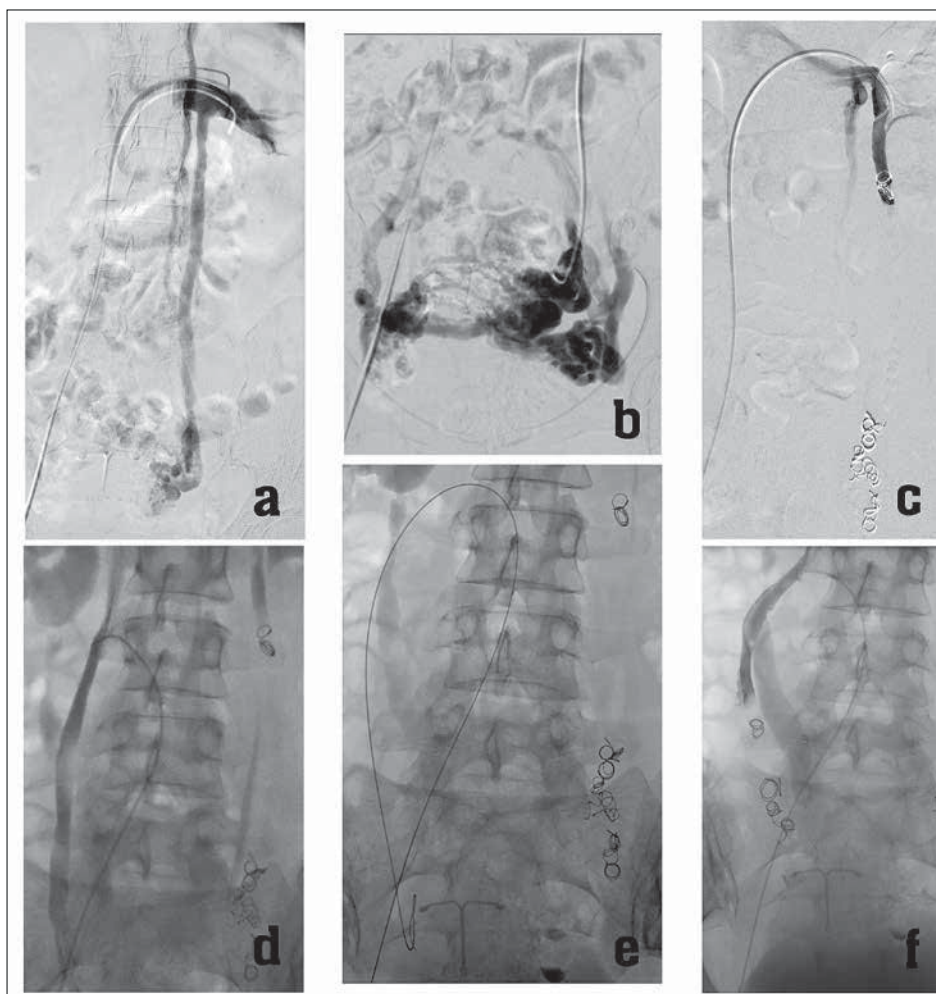


Figure 2. Image a, b and c in digital subtraction angiography (DSA); images d, e and f – without subtraction performed in the same patient
 a) phlebography of the left renal vein, free inflow through incompetent valves of the wide ovarian vein to dilated parametrial plexuses
 b) selective phlebography visualising markedly dilated parametrial plexuses
 c) after embolisation of the left ovarian vein using the 0.035 "detachable coils
 d) phlebography of the right substantially dilated ovarian vein
 e) the selectively inserted Radifocus Standard M Glidewire
 f) after embolisation of the right ovarian vein using the 0.035" detachable coils.

Krzysztof Pyra, et al. Evaluation of effectiveness of endovascular embolisation for the treatment of pelvic congestion syndrome – preliminary study.

Procedures lasted from 23 to 78 minutes (32 minutes on average); an average of 40 ml of contrast (Visipaque 320 mg I/ml) was administered during procedures. The total average radiation dose at the reference site was 389 mGy (from 127 mGy to 1112 mGy).

The median VAS pelvic pain score before the procedure was 8. Three months after the procedure median pelvic pain score decreased to 1, which was statistically significant ($p < 0.001$). Pelvic pain scores before and 3 months after embolization for each patient are shown on Figure 3.

In two cases, the ovarian vein was injured and the contrast medium extravasated, which was not clinically significant immediately after the procedure and during follow-up. In one case, a slight haematoma developed at the injection site of the femoral vein. No other adverse effects were noted.

Discussion

Conservative treatment of PCS is focused on pain alleviation. Non-steroidal anti-inflammatory drugs can be administered for symptomatic treatment. Medroxyprogesterone acetate can reduce pain sensations in 40% of patients. Moreover, psychotherapy has been demonstrated to have substantial pain-relieving effects in another 20% of patients [11]. Surgical treatment involves ligation of the ovarian veins using the laparoscopic method or laparotomy as well as hysterectomy and hormone replacement therapy. This kind of management can be associated with secondary pain symptoms and the risk of recurrence of pelvic varices. The laparoscopic technique requires increased pressure in the peritoneal cavity, which can additionally hinder the identification of varices. A randomized study by Chung and Huh compared surgical treatment and embolisation for the treatment of PCS-associated pain. In the embolisation group of patients, the symptoms decreased from 7.8 to 3.2 points according to VAS. After bilateral ligation of the ovarian vein, pain was observed to decrease to 4.6 and after unilateral procedures to 5.6 [12].

At present, the surgical methods are rarely used as the transdermal endovascular techniques are available, which are characterized by higher technical effectiveness and lower invasiveness.

Transdermal embolization of ovarian veins is currently a standard procedure of PCS therapy. The technical effectiveness of procedures is estimated at 96-100% with the recurrence incidence of 20%. The side effect of embolisation is likely to be slight pain developing during embolization of the ovarian vein (particularly when aetoxycelrol is used), gradually subsiding within several days. The complications are rare and predominantly involve bleeding at the femoral vein injection site. Other complications include ovarian vein perforation during catheterisation and migration of embolisation material, which can potentially result in pulmonary embolism [13].

According to estimates, PCS symptoms decrease or subside in 67% - 89% of patients. However, it is difficult to find the studies demonstrating which complaints subside most commonly. Moreover, the predictive factors have not been studied to date, which would enable to select the patients who could benefit most from endovascular treatment of PCS [13, 14, 15].

Embolisation of the ovarian veins may not be beneficial for all patients with PCS symptoms and pelvic varices confirmed by imaging examinations, which can evidence the multi-factorial nature of CPP-type complaints. Thus, the elimination of reverse

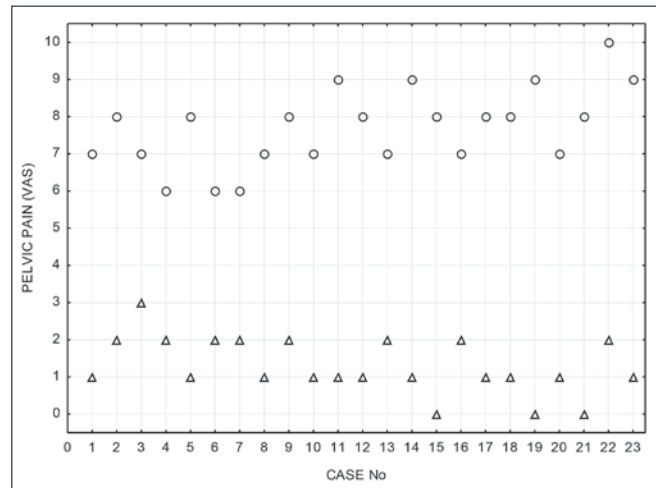


Figure 3. Pelvic pain scores estimated by the Visual Analog Scale (VAS) before (circles) and 3 months after (triangles) embolization procedures for each case separately.

blood flow in incompetent pelvic veins cannot guarantee the subsidence of symptoms. Some authors suggest that pelvic varices in women are found accidentally. According to available results, the varices occur in 38-47% of women without PCS symptoms [16, 17]. Furthermore, about 60% of patients with varicose ovarian veins have been demonstrated to have symptoms of chronic pelvic pain syndrome [18]. The above findings justify the need for carrying further examinations to assess indications for PCS treatment.

In the largest retrospective study performed by Labord et al., the group of 202 patients who underwent embolisation procedures due to PCS was observed. The technical effectiveness of procedures was 100%. In 68.3% of patients, all 4 veins involved were closed using embolisation coils. In 23.8% of patients, it was possible to close 3 veins; in 7.9% of cases only two vein were embolized. The left ovarian vein was closed in all patients whereas the right one in 95.5%. Additionally, the left internal iliac vein was closed in 91.1% of individuals and the right one in 73.8%. The procedure duration was 43.3 ± 6.9 min, on average. The percentage of complications was 11.4% (post-embolisation pain treated with NSAIDs). In one patient, the contrast medium allergic reaction was observed. Haematomas at the injection site developed in 2.9% of patients; however, none of the cases required further repair. Embolisation coils migrated in four cases (1.9%). The coils were successfully removed using endovascular loops in three cases; in one case, the coil migrated to the lungs and the patient refused further treatment. This complication was asymptomatic. No remote embolisation-related complications were observed after five years [19].

The following clinical questions should be considered and answered: should embolisation be performed only in the ovarian veins with reflux or irrespective of reflux, is the closure of internal iliac veins also necessary?

A similar study by Nasser et al. demonstrated a substantial decrease in pain over the period of 12 months (from 7.34 to 0.47 according to VAS), despite rare closures of internal iliac veins, as compared to the study by Labord et al. (LIIV 91% vs 80, RIIV 74% vs 46%). Fifty-three percent of patients reported complete

Krzysztof Pyra, et al. Evaluation of effectiveness of endovascular embolisation for the treatment of pelvic congestion syndrome – preliminary study.

while 47% partial subsidence of pain. Each of the remaining PCS symptoms observed decreased at least partially, especially urgency, whose incidence dropped from 41.6% to 0% after embolisation. Complete subsidence of all PCS symptoms was found in 37% of patients. In the group of 13 patients, four complications in the form of migration of coils, which were removed using endovascular loops, and two slight bleedings at femoral vein injection sites were observed. No fatal procedure-related complications were noted [20].

Conclusions

The pathophysiology of PCS has many aspects and is still poorly known. The cooperation of gynaecologists and interventional radiologists is essential. Despite many positive results of studies, some issues are still open for debate, i.e. which veins should be closed, what kind of the embolisation material should be used, whether there are predisposing factors for good clinical outcome or which indications base on.

Our findings indicate that in cases where one or two ovarian veins are closed and the iliac vessels are not interfered in, the clinical effects are very good; hence, embolisation for PCS treatment can be considered a low-invasive, effective and safe method of therapy. The early results show a promising potential alternative treatment in PCS embolization. Future studies with long-term follow-up, unilateral or bilateral OVE, and different-embolic devices, and a larger study to validate our observations, are required to answer some questions.

Oświadczenie autorów

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