

## SURGERY

### OCCLUSION OF RECTAL ARTERIES IN THE TREATMENT OF RECURRENT HEMORRHOIDAL DISEASE AFTER TRANSANAL SURGICAL INTERVENTIONS

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#### ABSTRACT

*The article presents data on variant X-ray anatomy of the superior rectal artery and types of arterial architectonics of the rectum. The causes of recurrent hemorrhoidal disease after traditional transanal surgical interventions are highlighted. The possibilities of endovascular occlusion of rectal arteries in the treatment of relapses of chronic hemorrhoids are shown. Its technical variants are given depending on the number of hemorrhoidal arteries and types of arterial architectonics of the rectum.*

*Over a 2-year period, clinical results of endovascular occlusion of hemorrhoidal arteries were evaluated in 11 patients with relapse of the disease after various transanal interventions: after latex ligation of internal hemorrhoids – in 5, transanal dearterization of internal hemorrhoids with mucopexia – in 4, hemorrhoidectomy – in 2. The average age of patients was  $44.2 \pm 12.5$  years. Men – 5, women – 6. Superselective occlusion of the target hemorrhoidal branches of the upper rectal artery was performed with EmboGold (Merit Medical) microparticles, 500–700/300–500 mkm in size. Immediate results: cessation of bleeding on the first day – in 4 patients, after 3 days – in 5, after 7 days – in 2. Terms of hospitalization – 1 day, disability –  $4.3 \pm 0.7$  days. Long-term results (from 1 to 2 years) were observed in all 11 patients. The course is relapse-free.*

*As an illustration, a clinical case is presented – successful treatment of a patient with recurrent hemorrhoidal disease by endovascular occlusion of hemorrhoidal arteries after five traditional transanal surgical interventions: sclerosing, ligation, dearterization of internal hemorrhoids, dearterization of internal hemorrhoids with mucopexia, removal of external hemorrhoids. Within 3 months after endovascular occlusion – complete regression of all symptoms of hemorrhoidal disease. According to the questionnaire (after 1 and 2 years) there is no relapse of the disease, the patient is subjectively satisfied with the endovascular treatment.*

**Key words:** hemorrhoidal disease, chronic hemorrhoids, recurrence of hemorrhoidal disease, endovascular treatment of hemorrhoids, occlusion of hemorrhoidal arteries, embolization of the superior rectal artery

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## ОККЛЮЗИЯ РЕКТАЛЬНЫХ АРТЕРИЙ В ЛЕЧЕНИИ РЕЦИДИВОВ ГЕМОРРОИДАЛЬНОЙ БОЛЕЗНИ ПОСЛЕ ТРАНСАНАЛЬНЫХ ХИРУРГИЧЕСКИХ ВМЕШАТЕЛЬСТВ

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### РЕЗЮМЕ

В статье представлены данные о вариантной рентгеноанатомии верхней ректальной артерии и типах артериальной архитектоники прямой кишки. Освещены причины рецидивов геморроидальной болезни после традиционных трансанальных хирургических вмешательств. Показаны возможности эндоваскулярной окклюзии ректальных артерий в лечении рецидивов хронического геморроя. Приведены её технические варианты в зависимости от количества геморроидальных артерий и типов артериальной архитектоники прямой кишки.

За двухлетний период оценены клинические результаты эндоваскулярной окклюзии геморроидальных артерий у 11 пациентов с рецидивом заболевания после различных трансанальных вмешательств: после латексного лигирования внутренних геморроидальных узлов – у 5, трансанальной дезартеризации внутренних геморроидальных узлов с мукопексией – у 4, геморроидэктомии – у 2. Средний возраст пациентов составил  $44,2 \pm 12,5$  года. Мужчин – 5, женщин – 6. Суперселективную окклюзию целевых геморроидальных ветвей верхней ректальной артерии выполняли микрочастицами EmboGold (Merit Medical), размерами 500–700/300–500 мкм. Непосредственные результаты: прекращение кровотечений в первые сутки – у 4 пациентов, через 3 суток – у 5, через 7 суток – у 2. Сроки госпитализации – 1 сутки, нетрудоспособности –  $4,3 \pm 0,7$  дня. Отдалённые результаты (от 1 года до 2 лет) прослежены у всех 11 больных. Течение – безрецидивное.

В качестве иллюстрации приведён клинический случай успешного лечения пациента с рецидивом геморроидальной болезни путём эндоваскулярной окклюзии геморроидальных артерий после пяти традиционных трансанальных оперативных вмешательств: склерозирования, лигирования, дезартеризации внутренних геморроидальных узлов, дезартеризации внутренних геморроидальных узлов с мукопексией, удаления наружных геморроидальных узлов. В течение 3 месяцев после эндоваскулярной окклюзии – полный регресс всех симптомов геморроидальной болезни. По данным анкетирования (через 1 и 2 года) – рецидива заболевания нет, субъективное удовлетворение проведённым эндоваскулярным лечением.

**Ключевые слова:** геморроидальная болезнь, хронический геморрой, рецидив геморроидальной болезни, эндоваскулярное лечение геморроя, окклюзия геморроидальных артерий, эмболизация верхней ректальной артерии

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## INTRODUCTION

The choice of hemorrhoid treatment method depends on the form (acute/chronic), stage of the disease (I–IV) and individual clinical picture. By now, coloproctologists have conservative therapy and various surgical interventions (minimally invasive/hemorrhoidectomy) in their arsenal.

If conservative therapy is ineffective in stage I–III hemorrhoidal disease (HD) without clinically apparent external component, preference is given to minimally invasive surgical treatment methods: sclerotherapy; ligation of internal hemorrhoids with latex rings; transanal disarterization of internal hemorrhoids (IH) under the control of ultrasound navigation  $\pm$  mucopexia; laser vaporization. In stage IV, the gold standard is hemorrhoidectomy [1].

All known minimally invasive treatments for HD can be categorized as symptomatic and pathogenetic. The latter includes Doppler-guided transanal IH disarterization  $\pm$  mucopexia. Another pathogenetically substantiated method is endovascular occlusion of hemorrhoidal arteries (HA), which allows to eliminate arterial-venous imbalance [2–4].

There is no doubt that any surgical method of HD treatment, even pathogenetic, is fraught with recurrences in a certain percentage of cases [1, 4]. This raises a number of questions: 1. What underlies HD recurrences after any surgical interventions? 2. How can the risk of recurrence after transanal minimally invasive interventions and hemorrhoidectomy (where repeated invasions through the anus significantly increase the risk of anal canal stenosis/anorectal incontinence) be leveled? 3. Is it reasonable to use endovascular occlusion of rectal arteries for recurrences as the operation of choice?

To date, there is little evidence in the literature to answer the questions posed above. This prompted us to present a vision of the problem of disease recurrence based on our own scientific and clinical studies [4, 5].

## THE AIM

To determine the role and place of rectal artery occlusion in recurrent hemorrhoidal disease after traditional transanal surgical interventions.

## MATERIALS AND METHODS

In the period from 2020 to 2022, 11 patients with disease recurrence were treated by the method of endovascular occlusion of hemorrhoidal arteries: after latex ligation of internal hemorrhoids – 5, transanal disarterization of hemorrhoidal arteries with mucopexia – 4, hemorrhoidectomy – 2. The recurrences were recorded: within the first year – in 3, from 1 to 2 years – in 8 patients. The patients' mean age was  $44.2 \pm 12.5$  years. Men – 5, women – 6.

Informed consent for this method of hemorrhoidal disease treatment was taken from all patients enrolled in the study.

The technology of endovascular treatment of hemorrhoidal disease was considered and approved by the Ethics Committee of the Prof. V.F. Voino-Yasenetsky Krasnoyarsk State Medical University in 2000 (Minutes No. 7 dated 13.05.2000).

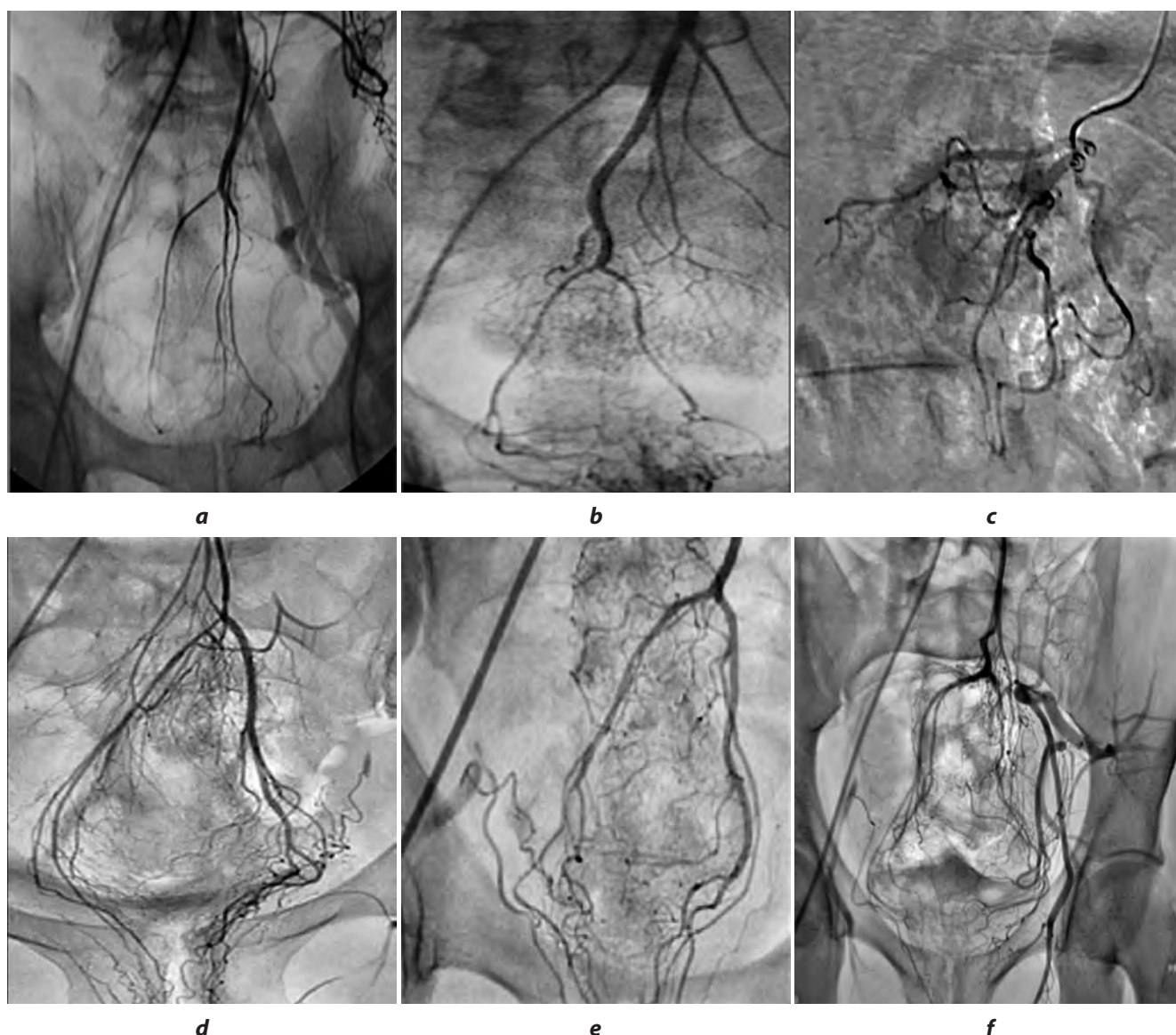
Endovascular intervention was performed through a femoral access on the right by Seldinger. We used: femoral sheath introducer, 5F (Merit Medical, USA), Simmons/Cobra 4, 5F catheters (Boston Scientific, USA), Maestro microcatheter (Merit Medical, USA) – 2.0–2.8F, hydrophilic microwire (Boston Scientific, USA) – 0.035/0.014», contrast – Omnipak. During the diagnostic stage we determined: the number of hemorrhoidal arteries (target vessels), absence/presence of collateral connection of the SRA branches with the middle rectal arteries (MRA). Further, we performed superselective occlusion of all target vessels depending on the X-ray and anatomical variant of SRA division and type of arterial architectonics of the rectum: with EmboGold microparticles, 300–500/500–700  $\mu$ m (Merit Medical, USA). Immediate results were evaluated in all patients at up to 1 year and long-term results at 1 to 2 years.

## RESULTS AND DISCUSSION

The results of our angiographic studies in HD showed that the blood supply of internal hemorrhoids is carried out predominantly by branches of the superior rectal artery (73.1 %). Increased arterial inflow to the hemorrhoids on the background of triggering factors is caused, among other things, by the expansion of the SRA diameter, its distal (hemorrhoidal) branches, predominance of the trifurcation type of branching (69.2 %). A collateral connection of the distal branches of the superior rectal artery (SRA) with the middle rectal arteries (MRA) was detected in 28.3 % of cases [4]. The SRA distal branches were traced in the number of three to the distal rectum (IH localization zone) only in 13.5 % of cases. Four branches were identified in 17.7 % of patients, 5 branches – in 42.2 %, 6 branches – in 16.4 %, and 7 branches – in 10.2 %. Angiographic findings about the variant number of hemorrhoidal arteries are in full agreement with the known anatomical data [1] and ultrasound navigation (Dopplerometry) results [1, 4].

As per angiography data, two variants of SRA branching were found: main type (89.8 % of cases) (Fig. 1a, b) and loose type (10.2 %) (Fig. 1c). Along with that, there was either no collateral connection of distal SRA branches with middle rectal arteries (71.7 %) or its presence: left-sided – in 21.4 % of cases (Fig. 1d), right-sided – in 3.1 % (Fig. 1e), bilateral – in 3.8 % (Fig. 1f).

Based on our identified features of arterial architectonics of the rectum [4] and on our own observations, in 2018, V. Vidal offered a new angiologic classification of arterial architectonics of the rectum, in which two types were distinguished. Type I – absence of collaterals be-



**FIG. 1.**

*Variants of arterial architectonics of the rectum according to angiography. **a, b** – the main type of SRA branching. Absence of collateral connection of hemorrhoidal branches of the SRA with the MRA; **c** – loose type of SRA branching without a collateral connection with MRA; **d** – collateral connection of hemorrhoidal branches of the SRA with the MRA (left); **e** – collateral connection of hemorrhoidal branches of SRA with MRA (right); **f** – collateral connection of hemorrhoidal branches of SRA with MRA (bilateral)*

tween branches of the superior rectal artery and the middle rectal arteries. Type II – presence of collateral connection [5].

As follows from the above, underestimation of the data on the variant number of hemorrhoidal branches of the SRA and collateral blood supply of the internal hemorrhoids through the middle rectal arteries determines the risk of HD recurrence and may worsen the results of both known transanal minimally invasive interventions and hemorrhoidectomy, as well as endovascular treatment.

Based on these features of blood supply to internal hemorrhoids, different variants of hemorrhoidal artery occlusion are currently used clinically using two main types of microemboli: metal spirals and synthetic particles. In type I arterial architectonics of the rectum

only superselective occlusion of hemorrhoidal branches of the SRA with metal spirals is used [6]. In type II, the middle rectal arteries are occluded with metallic spirals simultaneously [6].

Due to the high cost of spirals (in Russia), impossibility of their reinstallation during dislocation, risk of non-target embolization, we use synthetic microemboli EmboGold, 300–500/500–700  $\mu\text{m}$  (Merit Medical, USA), both for primary treatment of bleeding hemorrhoids and in case of disease recurrence after traditional transanal interventions depending on the X-ray and anatomical variant of SRA division and type of arterial architectonics of the rectum.

In case of disease recurrence after traditional transanal interventions and type I architectonics, superselective occlusion of all target hemorrhoidal arteries



in the SRA basin with EmboGold microparticles (500–700  $\mu\text{m}$ ) was performed in 8 patients. In type II – similarly microemboli were used, only of smaller size (300–500  $\mu\text{m}$ ) – in 3 patients. They were also injected superselectively into all hemorrhoidal branches of the SRA, but maximally distally – below the collateral anastomoses with the MRA. This technical solution did not require additional endovascular manipulations in the middle rectal artery basin and technically simplified the endovascular intervention.

The mean intervention time was  $40.2 \pm 9.7$  min. Systemic and local complications have not been reported. Pelvic pain syndrome was absent in 8 patients with type I and in 1 patient with type II, both during and after HA occlusion. No pharmacologic therapy was required. In type II (2 patients), there were registered unexpressed pains (2–3 points as per the VAS) in the anus area for up to 3 days. They were effectively treated with oral analgesics.

Immediate results: cessation of bleeding on the first day – in 4 patients, after 3 days – in 5, after 7 days – in 2. Terms of hospitalization – 1 day, disability –  $4.3 \pm 0.7$  days. Long-term results (from 1 to 2 years) were observed in all 11 patients. The course is relapse-free [7].

As an illustration, we present a clinical case of a patient with HD recurrence after repeated transanal surgical interventions.

Patient S., 35 years old. He came to our clinic in August 2020 with complaints of fullness sensation, foreign body sensation in the anus, enlargement of residual hemorrhoids in the upright position, systematic moderate pain in the anus, occasional traces of scarlet blood on toilet paper.

The duration of hemorrhoidal disease is ~10 years. The patient underwent 5 surgical interventions (between 2012–2017) (all by transanal access): 1 – sclerosing, 2 – ligation, 3 – disarterization (HAL), 4 – disarterization with mucopexy of internal hemorrhoidal nodes (HAL-RAR), 5 – removal of external hemorrhoids. Persistent therapeutic effect was not achieved – clinical relapse of the disease. Inability to lead an active lifestyle, predominantly bed rest, job loss, depression. Medical report of the coloproctologist at the place of residence – the whole range of surgical methods of HD treatment is exhausted, conservative therapy is indicated (Detralex 1000 mg 1 time/day, 2-month courses, with intervals of half a year). Conservative therapy is ineffective.

At the time of hospitalization – the condition is satisfactory. General physical status – no abnormalities. Locally (Fig. 2a, b): on examination of the anus area – post-operative deformation of the anal canal, external hemorrhoids are not defined, there are hypertrophied residual internal hemorrhoids with dimensions of  $0.6 \times 0.9$  cm (at 7, 9 and 10 o'clock). At 3 o'clock, the dimensions are  $1.2 \times 1.5$  cm.

Endoscopy (anal canal, rectum, up to 18 cm) showed no organic changes in the rectum mucosa. Dilated hemorrhoidal arteries (up to 0.15–0.2 cm) at 3, 7, 9 and 10 o'clock (4 hemorrhoidal collectors) are visualized in the submucosal

layer of the inferior ampullary rectum, and residual hemorrhoidal tissue is visualized accordingly.

DS: Hemorrhoidal disease. Recurrent chronic internal hemorrhoids, stage I–II. Condition after surgical treatment (5 transanal interventions, 2012–2017). Hypertrophied residual internal hemorrhoids (at 3, 7, 9 and 10 o'clock).

The decision of a consilium consisting of a coloproctologist and an endovascular surgeon: endovascular treatment of disease recurrence is indicated.

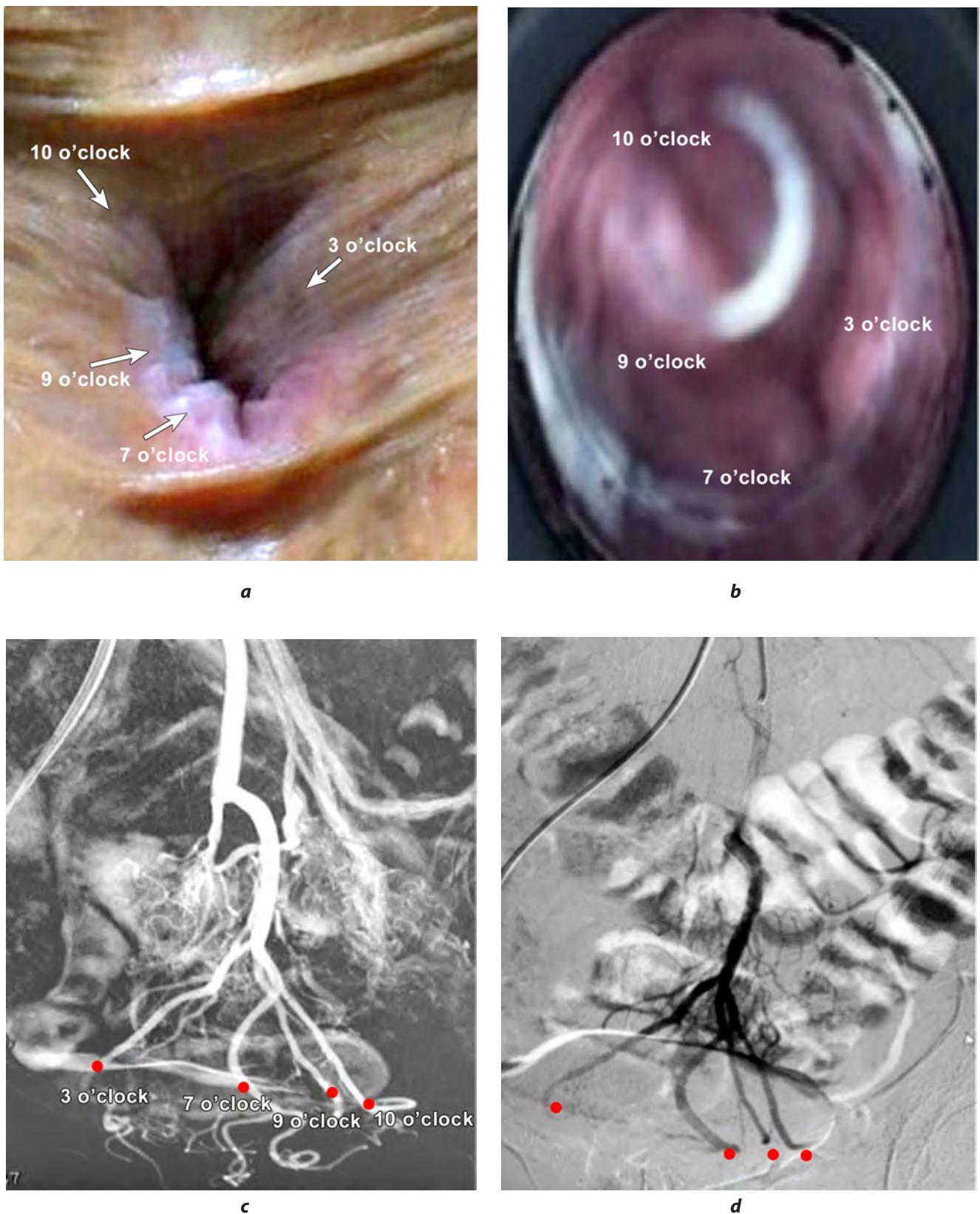
Surgery (27.08.2020): endovascular occlusion of hemorrhoidal arteries in the SRA basin with EmboGold microparticles (500–700  $\mu\text{m}$ ). Without colon preparation, under local anesthesia (Lidocaine, 2 ml) by transfemoral Seldinger access on the right side, using a 5F femoral sheath introducer (Merit Medical, USA), a Simmons 4F catheter (Boston Scientific, USA), a 0.014" hydrophilic microwire (Boston Scientific, USA), a Maestro 2.0F microcatheter (Merit Medical, USA), contrast (Omnipak), the diagnostic angiographic stage of the intervention was performed (Fig. 2c). The main type of SRA branching, significant expansion of its diameter, absence of collateral connection with middle rectal arteries (type I of angioarchitectonics of the rectum), 4 hemorrhoidal arteries (also significantly increased in diameter), contrasting of residual IH at 3, 7, 9 and 10 o'clock were established. Complete concordance of clinical data with angiographic findings was confirmed.

Next, superselective occlusion of all (4) hemorrhoidal arteries with EmboGold microparticles, 500–700  $\mu\text{m}$  (Merit Medical, USA) was performed sequentially. The intervention was completed in the absence of contrast of the distal segments of hemorrhoidal arteries and IH (Fig. 2d). The intervention time – 35 min. The patient's well-being during the intervention – satisfactory. No systemic vascular reactions, pelvic and anal pain syndrome, local complications (at the site of femoral artery puncture) were registered. No pharmacologic therapy was required after the intervention. The patient was discharged the next day under the supervision of a coloproctologist at the place of residence. On the 3rd day – 5-hour flight to the place of residence, tolerated well. During the next 3 months – complete regression of all symptoms of hemorrhoidal disease. The patient returned to an active lifestyle and work life. According to the questionnaire (after 1 and 2 years) there is no relapse of the disease, the patient is subjectively satisfied with the endovascular treatment.

## CONCLUSION

In recurrences of hemorrhoidal disease after transanal minimally invasive interventions (sclerotherapy, latex ligation, transanal disarterization) and hemorrhoidectomy (when repeated invasions through the anus significantly increase the risk of late complications), it is reasonable to use endovascular occlusion of hemorrhoidal arteries as the operation of choice.

Underestimation of data on the number of hemorrhoidal arteries and the presence of collateral blood supply of in-



**FIG. 2.**

Patient S., 35 years. Recurrent chronic hemorrhoids, stages I–II (after 5 transanal minimally invasive interventions). **a** – angiography (diagnostic stage). The main branch type is a SRA. Absence of collateral connection with MRA. Four hemorrhoidal arteries. IH contrast at 3, 7, 9 and 10 o'clock; **b** – external visual inspection of the anus. Postoperative deformity of the anal canal. Hypertrophied IH at 3, 7, 9 and 10 o'clock; **c** – anoscopy. Hypertrophied IH at 3, 7, 9 and 10 o'clock; **d** – angiography (therapeutic stage). The immediate result of occlusion of hemorrhoidal arteries (lack of contrast of the IH)

ternal hemorrhoids through the middle rectal arteries can worsen long-term results (cause recurrences of the disease), both after traditional transanal interventions and after endovascular treatment.

### Conflict of interest

The authors of this article declare the absence of a conflict of interest.

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