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Results Following Stent-Graft Coverage of the Hypogastric Artery in the Management of Aortoiliac Aneurysms in Endovascular Aneurysm Repair

Dissertation for the degree of Doctor of Medical and Health Sciences

in the Discipline of Medical Sciences

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List of publications constituting a doctoral dissertation

Publication	**Type of Work**	**IF**	**MNiSW**
Armatowicz P, Szostek M, Jakuczun W, Osęka M, Skórski M. Extra-anatomical bypass operation in patients with unilateral graft limb occlusion after endovascular aneurysm repair for abdominal aortic aneurysm. Kardiol Pol. 2023 Aug 4. doi: 10.33963/KP.a2023.0166.	Short Communication	3.300	100
Armatowicz P, Szostek M, Jakuczun W, Skórski M. Results Following Stent-Graft Coverage of the Hypogastric Artery in the Management of Aortoiliac Aneurysms in Endovascular Aneurysm Repair. Pol Przegl Chir. 2023 Jun 13;95(5):72-75. doi: 10.5604/01.3001.0053.6870.	Original	0.600	100
Trejnowska E, Fiszer R, **Armatowicz P**, Tarczyńska-Słomian M, Wiklińska A, Kurdyś P, Ślusarz K, Kocaj K, Knapik P. Lifesaving Stenting of Pulmonary Arteries Critically Narrowed by Mediastinal Lymphoma. Am J Respir Crit Care Med. 2019 Jul 1;200(1):e1-e3. doi: 10.1164/rccm.201807-1366IM.	Case Report	17.452	200
	Total Score	**21.352**	**400**

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I. List of Abbreviations

AAA - abdominal aortic aneurysm

EVAR - endovascular aneurysm repair

ASA - American Society of Anaesthesiologists

CIA - common iliac artery

EIA - external iliac artery

HA - hypogastric artery

PA - pulmonary artery

AE - adverse events

II. Abstract

Title: **Results Following Stent-Graft Coverage of the Hypogastric Artery in the Management of Aortoiliac Aneurysms in Endovascular Aneurysm Repair**

Aims

The aim of the series of publications is: 1) to assess the outcomes of stent-graft coverage of the HA in the management of aortoiliac aneurysms with EVAR. 2) to determine the durability of an extra-anatomical procedure in the form of a femorofemoral crossover bypass in patients with AAA who had a unilateral graft limb occlusion following EVAR.

Materials and Methods

In the original article, a total of 93 patients with aortoiliac aneurysms were treated with EVAR, which required occlusion of one or both of the hypogastric arteries. The short communication article included 33 high-risk patients (2.05%), ASA class III and IV who required an extra-anatomical procedure in the form of a femorofemoral crossover bypass due to unilateral graft limb occlusion of the bifurcated stent-graft. Patients were re-examined at one month, six months, and one year, and then every year afterward, with clinical examination and a computed tomography scan.

Results

In the original article, a total of 93 patients with aortoiliac aneurysms required a unilateral or bilateral procedure. Six patients were excluded from our study because they did not appear at their follow-up appointments. The study included 87 patients (80 men; mean age 71.9 (7.9) years, range 54–88), of which 30 had a unilateral procedure and 57 had a bilateral procedure. In 8 procedures (5.55%, n = 7) there was a type II endoleak that resolved during follow-up and required no surgical intervention. In 10 procedures (6.94%, n = 10) there was a type IB endoleak, with 8 procedures requiring surgical re-intervention in the form of an extension. In 12 procedures (8.33%, n = 9), the hypogastric artery thrombosed.

The short communication article included 33 high-risk patients (2.05%), ASA class III & IV, (30 men; mean (SD) age 70 (7.7) years, range 48-90) who required an extra-anatomical

procedure. Seven patients had a failed femorofemoral crossover bypass which occluded during the follow-up period. Five patients had a thrombectomy, one patient had an above-the-knee amputation, and one patient was treated conservatively. However, four patients experienced femorofemoral crossover bypass re-occlusion. Two patients required another re-intervention and the remaining two patients were treated conservatively.

The case report describes a lifesaving procedure where percutaneous intervention of the PAs critically narrowed by a mediastinal lymphoma was performed. To the best of our knowledge, this is the first case describing an intervention in a critically ill patient with PA stenosis without any AEs.

Conclusion

Coverage of the hypogastric artery by stent-graft has been proven to be a safe procedure, but there is still a risk of type II endoleak. The femorofemoral crossover bypass as an extra-anatomical procedure following unilateral graft limb occlusion should be considered for high-risk patients who are not a candidate for major surgery.

III. Introduction

AAA is an abnormal dilatation of the abdominal aortic diameter by more than 50% which is irreversible and permanent [1,2]. EVAR has become the preferred treatment for AAAs since the early 1990s, when Parodi et al. described minimally invasive endovascular techniques [3–6]. It has become an alternative to open surgical repair for AAAs [7, 8]. EVAR shortens the patient's hospital stay and decreases post-operative morbidity and mortality rates [8]. Unilateral or bilateral iliac artery aneurysms or ectasias are found in up to 40% of patients with AAAs [4, 9–14]. There is an increased risk of mortality, morbidity, and endoleak in patients with concomitant abdominal aortic and iliac artery aneurysm following EVAR [9].

During EVAR, the stent-graft requires a proximal and distal landing zone in order to adequately seal the aneurysm. This usually requires a minimum length of 10–15 mm in the CIA. If this is not attainable, the stent-graft is extended into the EIA to obtain an adequate seal. As a result, the HA is covered and occluded by the stent-graft. Coverage of the HA has been proven to be a safe procedure, but there is still a risk of type II endoleak [6, 11].

Following EVAR for AAA, graft limb occlusion is a serious and severe complication [15]. The management options for symptomatic patients with graft limb occlusion are endovascular or surgical. The endovascular options include thrombolytic therapy, angioplasty with or without stenting, and rheolytic therapy. Whereas, surgical treatment includes thrombectomy or extra-anatomical bypass in the form of femorofemoral crossover bypass. Each treatment option has its drawbacks and should be tailored to the individual patient.

Thrombolysis therapy can be complicated by hemorrhages, new endoleak due to thrombus lysis in the aneurysm sack, and leg embolism. It is also time-consuming. Whereas, surgical thrombectomy has disadvantages such as thrombus migration in the contralateral limb and hypogastric artery, component separation in modular devices, and stent-graft dislodgement [16].

Femorofemoral crossover bypass is performed in high-risk patients who are not a candidate for invasive open surgery due to comorbid conditions that exclude them from the procedure and in patients with critical limb ischemia or intermittent claudication where anatomic constraints exclude them from endovascular procedures in re-establishing in-line flow [17].

The series presents the results of one short communication, one original work and one case report:

- Extra-anatomical bypass operation in patients with unilateral graft limb occlusion after endovascular aneurysm repair for abdominal aortic aneurysm (18)

- Results Following Stent-Graft Coverage of the Hypogastric Artery in the Management of Aortoiliac Aneurysms in Endovascular Aneurysm Repair (19)

- Lifesaving Stenting of Pulmonary Arteries Critically Narrowed by Mediastinal Lymphoma (20)

The first article “Extra-anatomical bypass operation in patients with unilateral graft limb occlusion after endovascular aneurysm repair for abdominal aortic aneurysm” addresses the durability of an extra-anatomical femorofemoral crossover bypass procedure in patients with unilateral graft limb occlusion after EVAR for AAA. The second article analyzes the morbidity of HA occlusion in patients treated for aortoiliac aneurysms with EVAR, specifically the rate of endoleaks. We believe that by occluding the HA without embolization, we can successfully treat aortoiliac aneurysms with minimal procedure-related morbidity. The third article describes a lifesaving procedure where percutaneous intervention of the PAs critically narrowed by a mediastinal lymphoma was performed. To the best of our knowledge, this is the first case describing an intervention in a critically ill patient with PA stenosis without any AEs.

IV. Aims and Objectives

The aim of the series of publications is: 1) to assess the outcomes of stent-graft coverage of the HA in the management of aortoiliac aneurysms with EVAR. 2) to determine the durability of an extra-anatomical procedure in the form of a femorofemoral crossover bypass in patients with AAA who had a unilateral graft limb occlusion following EVAR.

V. Discussion

The short communication article included 33 high-risk patients (2.05%), ASA class III & IV, (30 men; mean (SD) age 70 (7.7) years, range 48-90) who required an extra-anatomical procedure. In seven patients, femorofemoral crossover bypass failed due to occlusion during the follow-up period. Five patients had thrombectomy, one patient required an above-the-knee amputation of the right leg due to critical limb ischemia after a failed femorofemoral crossover bypass due to unsuccessful attempts at restoring patency, and one patient was treated conservatively. However, four patients experienced femorofemoral crossover bypass re-occlusion. Two patients required another re-intervention, and the remaining two patients were treated conservatively. One patient had a re-intervention which consisted of an axillobifemoral bypass, and the other patient had a successful thrombectomy. In total, three patients were asymptomatic after the occluded femorofemoral crossover bypass was incidentally found on follow-up computed tomography angiography and were treated conservatively.

Four patients died during the follow-up period, all due to cardiac-related causes. There were no infections reported during the follow-up period.

Late occlusion (>1 month) occurred in seven patients, whereas early occlusion (<1 month) did not occur in any patient. Primary patency was 78.8% while secondary patency was 90.9%. Kaplan-Meier curves were used to show the percentage of patients free from secondary intervention and the percentage of patients with patent grafts including secondary interventions.

In the original article, a total of 93 patients with aortoiliac aneurysms required a unilateral or bilateral procedure. Six patients were excluded from our study because they did not appear at

their follow-up appointments. The study included 87 patients (80 men; mean age 71.9 (7.9) years, range 54–88), of which 30 had a unilateral procedure and 57 had a bilateral procedure. Bilateral procedures were counted as 2 separate procedures, giving a total of 144 procedures. All patients had successful insertion and deployment of the stent-graft and none required surgical conversion. In 8 procedures (5.55%, n = 7) there was a type II endoleak that resolved during follow-up and required no surgical intervention since no aneurysm growth was observed. There was a type IB endoleak in 10 procedures (6.94%, n = 10), with 8 procedures requiring surgical re-intervention in the form of an extension. In 12 procedures (8.33%, n = 9), the HA thrombosed and did not require any surgical intervention.

Twenty-six patients (29.9%) developed buttock claudication. In 19 patients (21.8%), the buttock claudication resolved within 6 months, whereas the remaining 7 patients (8%) had persistent buttock claudication. The total incidence of impotence was 14.9% (13 out of 87 patients). There was no incidence of gluteal necrosis, spinal cord ischemia, or ischemic colitis. No aneurysm-related deaths or aneurysm ruptures were noted in the patients throughout the follow-up period.

The case report describes a 23-year-old woman without a prior medical history who presented with malaise, dyspnea, and massive edema of the lower limbs. Chest X-ray revealed a mediastinal tumor. The patient’s condition deteriorated drastically, with cardiogenic shock, hypoxia requiring mechanical ventilation, severe hepatic insufficiency (international normalized ratio, 6.8), and anuria. Pulmonary angiogram showed a 102 x 107 x 75 mm mass obstructing both PAs. As a lifesaving procedure, percutaneous intervention of PAs was performed. The left PA was expanded only with balloon angioplasty due to technical difficulties. The right PA was widened with implantation of two stents. Improvement of blood flow was achieved and the patient’s parameters gradually improved and symptoms resolved. Biopsy showed diffuse large B-cell lymphoma. After chemotherapy, complete remission was achieved and autogenous bone marrow transplant was performed. To the best of our knowledge, this is the first case describing an intervention in a critically ill patient with PA stenosis without any AEs.

VI. Summary and conclusions

Coverage of the hypogastric artery by stent-graft has been proven to be a safe procedure, but there is still a risk of type II endoleak. The femorofemoral crossover bypass as an extra-anatomical procedure following unilateral graft limb occlusion should be considered for high-risk patients who are not a candidate for major surgery.

VII. List of tables

Table 1: Patient demographics (n=87)

	n	%
Median age, year (range)		
71.9 (54-88)		
Males	80	92
Hypertension	55	63
Ischemic heart disease	56	64
Arrythmia	15	17
Chronic obstructive pulmonary disease	30	34.5
Diabetes mellitus	10	11.5
Hyperlipidemia	45	52
Atherosclerosis	16	18
Renal impairment	15	17
Cancer	6	7
Cerebrovascular accident	5	6
Tobacco use	52	60
ASA		
II	12	14
III	49	56
IV	26	30

ASA, American Society of Anesthesiologists

VIII. Copies of published articles

Extra-anatomical bypass operation in patients with unilateral graft limb occlusion after endovascular aneurysm repair for abdominal aortic aneurysm

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INTRODUCTION

Femorofemoral crossover bypass is performed in high-risk patients who are not candidates for invasive open surgery due to comorbidities that exclude them from the procedure and in patients with critical limb ischemia or intermittent claudication where anatomic constraints exclude them from endovascular procedures to re-establish in-line flow [1].

An abdominal aortic aneurysm (AAA) is an abnormal dilatation of the abdominal aortic diameter by more than 50%, which is irreversible and permanent [2, 3]. Following endovascular aneurysm repair (EVAR) for AAA, graft limb occlusion is a serious and severe complication [4].

The management options for symptomatic patients with graft limb occlusion are endovascular or surgical. The endovascular options include thrombolytic therapy, angioplasty with or without stenting, and rheolytic therapy, whereas surgical treatment includes thrombectomy or extra-anatomical bypass in the form of femorofemoral crossover bypass. Each treatment option has its drawbacks and should be tailored to each patient.

Thrombolysis therapy can be complicated by hemorrhages, a new endoleak due to thrombus lysis in the aneurysm sack, and leg embolism. It is also time-consuming. On the other hand, surgical thrombectomy has disadvantages such as thrombus migration in the contralateral limb and hypogastric artery, component separation in modular devices, and stent-graft dislodgement [5].

The main objective of our study was to determine the durability of an extra-anatomical femorofemoral crossover bypass procedure in patients with unilateral graft limb occlusion after EVAR for AAA over a 20-year period.

METHODS

From January 2001 to March 2021, 1611 AAA patients were treated with EVAR using a bifurcated stent graft at the Department of General, Endocrine and Vascular Surgery at the Independent Public Central Clinical Hospital in Warsaw, Poland. A total of 33 high-risk patients (American Society of Anesthesiologists [ASA] class III and IV) required an extra-anatomical procedure in the form of femorofemoral crossover bypass due to occlusion of one of the limb branches of the bifurcated stent graft. Patients were included in the study continously and all primary procedures carried out were elective. Patients were re-examined at one month, 6 months, and one year, and then every year afterward, with clinical examination and a computed tomography scan. Four patients died during the follow-up period; all deaths were cardiac-related.

Commercially available devices that were used included Zenith (Cook Medical, Bloomington, Ind), Endurant (Medtronic, Minneapolis, MN, US), and Excluder (W. L. Gore & Associates, Newark, DE, US). Of the 33 patients that had a graft limb occlusion; one patient had an Endurant stent graft and the remaining patients had Zenith stent grafts. The choice of stent graft type was based on institutional practice and vascular surgeons' preference and depended on the technical aspects of the procedure.

The AAA diameter range was from 48 mm to 75 mm. The aortic bifurcation diameter range was from 21 mm to 40 mm. The right

and left iliac diameter range was from 10 mm to 46 mm and from 10 mm to 87 mm, respectively. Six mm, 7 mm, and 8 mm prostheses were used.

Computed tomography angiography was used to determine the occurrence of an occlusion. Patient operative details, immediate and long-term clinical outcomes, aneurysm characteristics, perioperative arteriograms, and computed tomography scans were stored prospectively in a dedicated database and analyzed retrospectively. An extra-anatomical procedure was performed when the patient was symptomatic. Patients were found to have an occluded graft limb when they presented with claudication or acute limb ischemia to the accident and emergency department or during their follow-up appointment.

Ethics

The study was conducted according to the guidelines of the Declaration of Helsinki and was approved by the Bioethics Committee at the Medical University of Warsaw (AKBE/108/2022) in Warsaw, Poland. The need for informed consent was waived owing to the retrospective study design.

Statistical analysis

Statistical analysis was performed using STATISTICA for Windows software (StatSoft, Inc.). Patients were considered the unit of analysis for clinical data analysis. The Kaplan-Meier method was used to show the percentage of patients free from secondary intervention and the percentage of patients with patent grafts including secondary interventions.

RESULTS AND DISCUSSION

A total of 1611 AAA patients were treated with EVAR using a bifurcated stent graft. This study included 33 high-risk patients (2.05%), ASA class III and IV (30 men; mean [SD] age 70 [7.7] years, range 48–90) who required an extra-anatomical procedure in the form of a femorofemoral crossover bypass due to unilateral graft limb occlusion of the bifurcated stent- graft.

In seven patients, femorofemoral crossover bypass failed due to occlusion during the follow-up period. Five patients had thrombectomy, one patient required an above-the-knee amputation of the right leg due to critical limb ischemia after a failed femorofemoral crossover bypass due to unsuccessful attempts at restoring patency, and one patient was treated conservatively. However, four patients experienced femorofemoral crossover bypass re-occlusion. Two patients required another re-intervention, and the remaining two patients were treated conservatively. One patient had a re-intervention which consisted of an axillo-bifemoral bypass, and the other patient had a successful thrombectomy. In total, three patients were asymptomatic after the occluded femorofemoral crossover bypass was incidentally found on follow-up computed tomography angiography and were treated conservatively.

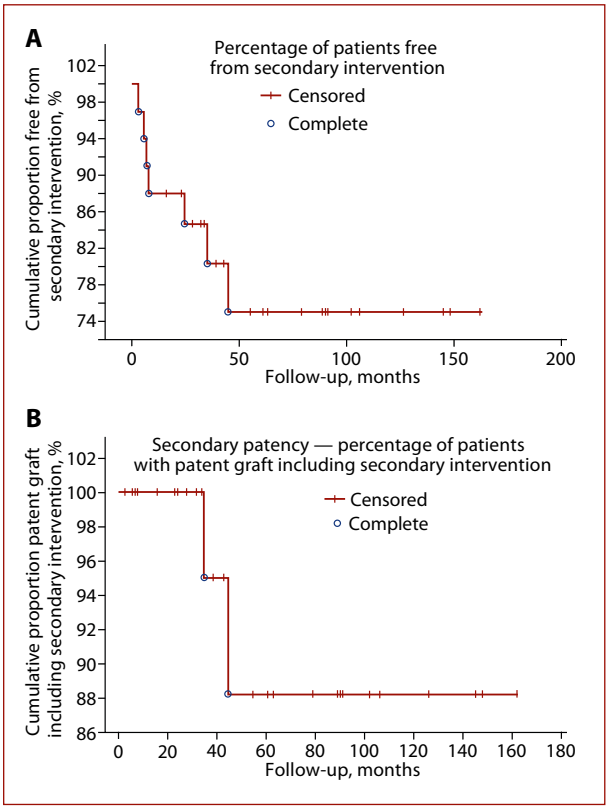

Figure 1. A. Percentage of patients free from secondary intervention. **B.** Percentage of patients with patent graft including secondary interventions

Four patients died during the follow-up period, all due to cardiac-related causes. There were no infections reported during the follow-up period.

Late occlusion (>1 month) occurred in seven patients, whereas early occlusion (<1 month) did not occur in any patient. Primary patency was 78.8% while secondary patency was 90.9%. Kaplan-Meier curves were used to show the percentage of patients free from secondary intervention (Figure 1A) and the percentage of patients with patent grafts including secondary interventions (Figure 1B).

Although EVAR is becoming the preferred treatment for AAA due to its clinical benefits and minimal invasiveness, there is an increase in the number of re-interventions and graft-related complications. Graft limb occlusion presents with severe acute rest pain in the lower extremity which is a significant complication following EVAR [6]. It is one of the top three reasons for readmission to the hospital [7, 8].

Our study shows good primary and secondary patency rates which is consistent with other femorofemoral crossover bypass studies [9, 10]. Our primary and secondary patency rates were 78.8% and 90.9%, respectively. Park et al. [9] showed similar primary and secondary patency rates at 5 years of 70% and 85%, respectively. In a study by Park et al., 32 patients (24%) showed graft occlusion due to thrombosis compared to our study, in which there were as few as 7 such patients (21%). However, our study involved

only 33 patients, whereas Park et al. reported a total of 133 patients, which could account for the difference.

In a study by Ricco et al. [10], primary and secondary patency rates were 71.8% and 89.8%, respectively. Thirty patients (40%) had crossover bypass graft failure; 14 had graft occlusion, 12 had stenosis of the donor iliac artery, and 4 had femoral anastomotic stenosis. However, if we are comparing graft occlusion, Ricco et al. reported 14 graft occlusions (18.9%), which is similar to our study (21%).

In our study, all 33 patients were high-risk patients (ASA class III and IV) with unilateral graft limb occlusion, who presented with either leg claudication or acute limb ischemia. It is our experience, similar to Parent et al. [11], that femorofemoral bypass grafting is frequently required when there is endograft limb occlusion. Femorofemoral crossover bypass is a minor procedure that can be performed under local anesthesia, making it particularly beneficial for patients who are high-risk, are not suitable for major surgery, or have contraindications. In addition, little or no preoperative preparation is required for this procedure to be carried out. All our patients were treated urgently right after unilateral graft limb occlusion, which resulted in continued patency of the limb vessels. However, larger prospective studies are required to validate this hypothesis.

Limitations

This study had several limitations. First, this was a retrospective study, limited by factors inherent in retrospective data analysis and interpretation. Second, the study was based on the experience of one institution with a moderate number of patients.

CONCLUSION

Femorofemoral crossover bypass as an extra-anatomical procedure following unilateral graft limb occlusion should be considered for high-risk patients who are not candidates for major surgery. It is a minor procedure, performed under local anesthesia, with good patency in the long-term and low operative mortality and morbidity.

Article information

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REFERENCES

1. Yuksel A, Cayir MC, Kumtepe G, et al. An overview and update of femorofemoral crossover bypass surgery as an extra-anatomic bypass procedure. Thorac Cardiovasc Surg. 2018; 66(3): 266–272, doi: 10.1055/s-0037-1613715, indexed in Pubmed: 29290082.
2. Janho KE, Rashaideh MA, Shishani J, et al. Outcomes of elective endovascular aneurysmal repair for abdominal aortic aneurysms in Jordan. Vasc Specialist Int. 2019; 35(4): 202–208, doi: 10.5758/vsi.2019.35.4.202, indexed in Pubmed: 31915664.
3. Kim HO, Yim NY, Kim JK, et al. Endovascular aneurysm repair for abdominal aortic aneurysm: a comprehensive review. Korean J Radiol. 2019; 20(8): 1247–1265, doi: 10.3348/kjr.2018.0927, indexed in Pubmed: 31339013.
4. Solonynko B, Gałązka Z, Jakimowicz T, et al. Influence of atheromatous lesions in the ilio-femoral segment on the occurrence of stentgraft thrombosis after endovascular treatment of an abdominal aortic aneurysm. Pol Przegl Chir. 2012; 84(11): 551–559, doi: 10.2478/v10035-012-0092-2, indexed in Pubmed: 23399618.
5. Cochennec F, Becquemin JP, Desgranges P, et al. Limb graft occlusion following EVAR: clinical pattern, outcomes and predictive factors of occurrence. Eur J Vasc Endovasc Surg. 2007; 34(1): 59–65, doi: 10.1016/j.ejvs.2007.01.009, indexed in Pubmed: 17400004.
6. Erzurum VZ, Sampram ESK, Sarac TP, et al. Initial management and outcome of aortic endograft limb occlusion. J Vasc Surg. 2004; 40(3): 419–423, doi: 10.1016/j.jvs.2004.06.028, indexed in Pubmed: 15337867.
7. Woody JD, Makaroun MS. Endovascular graft limb occlusion. Semin Vasc Surg. 2004; 17(4): 262–267, doi: 10.1053/j.semvascsurg.2004.09.002, indexed in Pubmed: 15614749.
8. Carpenter JP, Baum RA, Barker CF, et al. Durability of benefits of endovascular versus conventional abdominal aortic aneurysm repair. J Vasc Surg. 2002; 35(2): 222–228, doi: 10.1067/mva.2002.120034, indexed in Pubmed: 11854718.
9. Park KM, Park YJ, Kim YW, et al. Long Term Outcomes of Femorofemoral Crossover Bypass Grafts. Vasc Specialist Int. 2017; 33(2): 55–58, doi: 10.5758/vsi.2017.33.2.55, indexed in Pubmed: 28690996.
10. Ricco JB, Probst H, et al. Long-term results of a multicenter randomized study on direct versus crossover bypass for unilateral iliac artery occlusive disease. J Vasc Surg. 2008; 47(1): 45–53; discussion 53, doi: 10.1016/j.jvs.2007.08.050, indexed in Pubmed: 17997269.
11. Parent FN, Godziachvili V, Meier GH, et al. Endograft limb occlusion and stenosis after ANCURE endovascular abdominal aneurysm repair. J Vasc Surg. 2002; 35(4): 686–690, doi: 10.1067/mva.2002.118595, indexed in Pubmed: 11932663.

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Results Following Stent-Graft Coverage of the Hypogastric Artery in the Management of Aortoiliac Aneurysms in Endovascular Aneurysm Repair

Authors' Contribution:
A – Study Design
B – Data Collection
C – Statistical Analysis
D – Data Interpretation
E – Manuscript Preparation
F – Literature Search
G – Funds Collection

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ABSTRACT:

Aim: The aim of our study was to assess the outcomes of stent-graft coverage of the hypogastric artery in the management of aortoiliac aneurysms with endovascular aneurysm repair (EVAR).

Material and methods: From January 2013 to March 2017, a total of 93 patients with aortoiliac aneurysms were treated with EVAR, which required occlusion of one or both of the hypogastric arteries. The patients of the Department of General, Vascular, Endocrine and Transplant Surgery were included in the study continuously and all procedures were elective.

Results: A total of 93 patients with aortoiliac aneurysms required a unilateral or bilateral procedure. Six patients were excluded from our study because they did not appear at their follow-up appointments. The study included 87 patients (80 men; mean age 71.9 (7.9) years, range 54–88), of which 30 had a unilateral procedure and 57 had a bilateral procedure. In 8 procedures (5.55%, n = 7) there was a type II endoleak that resolved during follow-up and required no surgical intervention. In 10 procedures (6.94%, n = 10) there was a type IB endoleak, with 8 procedures requiring surgical re-intervention in the form of an extension. In 12 procedures (8.33%, n = 9), the hypogastric artery thrombosed.

Conclusion: Coverage of the hypogastric artery by stent-graft has been proven to be a safe procedure, but there is still a risk of type II endoleak. Although 5.55% (n = 7) of the procedures in our study had a type II endoleak, none required surgical intervention.

KEYWORDS: aortoiliac aneurysm, endovascular aneurysm repair, hypogastric artery, stent-graft

ABBREVIATIONS

AAAs – abdominal aortic aneurysms
CIA – common iliac artery
EIA – external iliac artery
EVAR – endovascular aneurysm repair
HA – hypogastric artery

INTRODUCTION

Endovascular aneurysm repair (EVAR) has become the preferred treatment for abdominal aortic aneurysms (AAAs) since the early 1990s, when Parodi et al. described minimally invasive endovascular techniques [1–4]. It has become an alternative to open surgical repair for AAAs [5, 6]. EVAR shortens the patient's hospital stay and decreases post-operative morbidity and mortality rates [6]. Unilateral or bilateral iliac artery aneurysms or ectasias are found in up to 40% of patients with AAAs [2, 7–12]. There is an increased risk of mortality, morbidity, and endoleak in patients with concomitant abdominal aortic and iliac artery aneurysm following EVAR [7].

During EVAR, the stent-graft requires a proximal and distal landing zone in order to adequately seal the aneurysm. This usually requires a minimum length of 10–15 mm in the common iliac artery (CIA). If this is not attainable, the stent-graft is extended into the external iliac artery (EIA) to obtain an adequate seal. As a result, the hypogastric artery (HA) is covered and occluded by the stent-graft. Coverage of the HA has been proven to be a safe procedure, but there is still a risk of type II endoleak [2, 7].

The primary aim of this study was to analyze retrospectively the morbidity of HA occlusion in a consecutive series of patients treated for aortoiliac aneurysms with EVAR, specifically the rate of endoleaks. We believe that by occluding the HA without embolization, we can successfully treat aortoiliac aneurysms with minimal procedure-related morbidity.

METHODS

From January 2013 to March 2017, a total of 93 aortoiliac aneurysm patients in the Department of General, Vascular, Endocrine and Transplant Surgery were treated with EVAR, which required occlusion of one or both of the HAs. The patients were included in the study continuously and all the procedures were elective. The patients were followed up with a clinical exam at one month, six months, and one year – and every year thereafter. Computed tomography angiography was used to determine the occurrence of endoleaks from the HA. The patients' operative details, immediate and long-term clinical outcomes, aneurysm characteristics, perioperative arteriograms, and computed tomography scans were stored prospectively in a specific database and were analyzed retrospectively.

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Tab. I. Patient demographics (N = 87).

	N	%
Age, years, median (range) 71.9 (54–88)		
Males	80	92
Hypertension	55	63
Ischemic heart disease	56	64
Arrythmia	15	17
Chronic obstructive pulmonary disease	30	34.5
Diabetes mellitus	10	11.5
Hyperlipidemia	45	52
Atherosclerosis	16	18
Renal impairment	15	17
Cancer	6	7
Cerebrovascular accident	5	6
Tobacco use	52	60
ASA		
II	12	14
III	49	56
IV	26	30

ASA – American Society of Anesthesiologists

The commercially available stent-grafts included the Zenith (Cook Medical, Bloomington, IN), Endurant (Medtronic, Minneapolis, MN), and Excluder (W. L. Gore & Associates, Newark, DE). The choice of stent-graft was based on institutional practice, the vascular surgeon's preference, and the technical aspects of the procedure. The HA was covered when the CIA distal landing zone was too short to obtain an adequate seal – due to the aneurysm being too close or involving the iliac bifurcation – or when the CIA was too large for the available stent-grafts. All HAs were patent prior to the procedure.

Exclusion criteria

Patients were excluded from our study if A) the primary procedure was not carried out in our institution, B) secondary intervention was needed but the primary procedure was carried out in a different hospital, C) the HA was not covered by the stent-graft during EVAR, D) the patients had the primary procedure at our hospital but were followed-up in a different institution, or E) there was any emergency procedure/rupture.

RESULTS

A total of 93 patients with aortoiliac aneurysms required a unilateral or bilateral procedure. Six patients were excluded from our study because they did not attend their follow-up appointments. The study included 87 patients (80 men; mean age 71.9 (7.9) years, range 54–88), of which 30 had a unilateral procedure and 57 had a bilateral procedure. Bilateral procedures were counted as 2 separate procedures, giving a total of 144 procedures. All patients had successful insertion and deployment of the stent-graft and none required surgical conversion. The patients' demographics are listed in Tab. I.

In 8 procedures (5.55%, n = 7) there was a type II endoleak that resolved during follow-up and required no surgical intervention, since no aneurysm growth was observed. There was a type IB endoleak in 10 procedures (6.94%, n = 10), with 8 procedures requiring surgical re-intervention in the form of an extension. In 12 procedures (8.33%, n = 9), the HA thrombosed and did not require any surgical intervention.

Twenty-six patients (29.9%) developed buttock claudication. In 19 patients (21.8%), the buttock claudication resolved within 6 months, whereas the remaining 7 patients (8%) had persistent buttock claudication. The total incidence of impotence was 14.9% (13 out of 87 patients). There was no incidence of gluteal necrosis, spinal cord ischemia, or ischemic colitis. No aneurysm-related deaths or aneurysm ruptures were noted in the patients throughout the follow-up period.

DISCUSSION

The HA, also known as the internal iliac artery, is one of the two branches of the CIA – the other being the EIA. The former supplies the walls and viscera of the pelvis, buttock, perineum, reproductive organs, and medial compartment of the thigh [13, 14].

Patients with aortoiliac aneurysms represent a challenging dilemma. In order to completely seal off the aneurysm, the HA is usually sacrificed during EVAR. The main objective of occluding the HA by the limb of the graft during EVAR is to prevent a potential type II endoleak from the HA and to achieve an adequate distal landing zone in the non-aneurysmal EIA.

In our institution, routine HA embolization is not performed for aortoiliac aneurysms requiring EVAR. We believe that by occluding the HA without embolization, we can successfully treat aortoiliac aneurysms with minimal procedure-related morbidity.

There are several studies suggesting that coil embolization of the HA may not be required [15–18]. In a series by Wyers et al. [15], 22 patients had stent-graft coverage of the HA without coil embolization. None of the patients had type II endoleak related to HA. Six of the 22 patients (27%) had buttock claudication. In addition, in a series by Mell et al. [16], 21 patients had unilateral HA coverage without coil embolization. No type II endoleaks related to HA were found. Two of the 21 patients (9.5%) had buttock claudication, which resolved within 4 months.

However, in our study, 26 of the 87 patients (29.9%) had buttock claudication. In 19 patients (21.8%), the buttock claudication resolved within 6 months, whereas the remaining 7 patients (8%) had persistent buttock claudication. In addition, type II endoleaks occurred in 7 patients (8%) as well as type IB endoleaks in 10 (11.49%).

From the available data in the literature, coverage of the HA without embolization during EVAR for AAA results in fewer major ischemic complications than coil embolization. However, the incidence rates of reinterventions and endoleaks are similar [17].

In a study by Papazoglou et al. [18], the total incidence of HA-associated type II endoleak in the group without coil embolization was 6.2% (7 out of 112 patients). In 3 of the patients, an HA-associated type II endoleak was detected at the end of the procedure; they were managed conservatively. The remaining 4 patients had

an HA-associated type II endoleak during the follow-up period, managed conservatively because none had aneurysm expansion. In a study by Farahmand et al. [6], the total incidence of HA-associated type II endoleak was 4% (1 patient out of 25).

In our study, the total incidence of HA-associated type II endoleak was 8% (7 out of 87 patients). All of the HA-associated type II endoleaks were detected during the follow-up period and were managed conservatively because no aneurysm expansion was observed.

This study had several limitations. Firstly, as a retrospective study, it was limited by factors inherent in retrospective data analysis and interpretation. Secondly, the study was based on the experience of one institution with a moderate number of patients.

CONCLUSION

Coverage of the HA by a stent-graft has been proven to be a safe procedure, but there is still a risk of type II endoleak. Although 5.55% (n = 7) of the procedures in our study had a type II endoleak, none required surgical intervention.

ETHICS

The study protocol was approved by the Bioethics Committee at the Medical University of Warsaw (AKBE/83/2022) in Warsaw, Poland. The need for informed consent was waived owing to the retrospective study design.

REFERENCES

1. Parodi J.C., Palmaz J.C., Barone H.D.: Transfemoral Intraluminal Graft Implantation for Abdominal Aortic Aneurysms. Annals of Vascular Surgery, 2012; 26(7): 898–905.
2. Stokmans R.A., Broos P.P.H.L., van Sambeek M.R.H.M., Teijink J.A.W., Cuypers P.W.M.: Overstenting the hypogastric artery during endovascular aneurysm repair with and without prior coil embolization: A comparative analysis from the ENGAGE Registry. J Vasc Surg., 2018; 67(1): 134–141.
3. Rayt H.S., Bown M.J., Lambert K.V. et al.: Buttock claudication and erectile dysfunction after internal iliac artery embolization in patients prior to endovascular aortic aneurysm repair. Cardiovasc Intervent Radiol., 2008; 31(4): 728–734.
4. Yano O.J., Morrissey N., Eisen L. et al.: Intentional internal iliac artery occlusion to facilitate endovascular repair of aortoiliac aneurysms. J Vasc Surg., 2001; 34(2): 204–211.
5. Parodi J.C.: Endovascular repair of abdominal aortic-aneurysms and other arterial lesions. J Vasc Surg., 1995; 21(4): 549–557.
6. Farahmand P., Becquemin J.P., Desgranges P. et al.: Is hypogastric artery embolization during endovascular aortoiliac aneurysm repair (EVAR) innocuous and useful? Eur J Vasc Endovasc Surg., 2008; 35(4): 429–435.
7. Ghosh, J., Murray D., Paravastu S. et al.: Contemporary Management of Aorto-iliac Aneurysms in the Endovascular Era. Eur J Vasc Endovasc Surg., 2009; 37(2): 182–188.
8. Kouvelos G.N., Katsargyris A., Antoniou G.A. et al.: Outcome after Interruption or Preservation of Internal Iliac Artery Flow During Endovascular Repair of Abdominal Aorto-iliac Aneurysms. Eur J Vasc Endovasc Surg., 2016; 52(5): 621–634.
9. Torsello G., Schönefeld E., Osada N. et al.: Endovascular Treatment of Common Iliac Artery Aneurysms Using the Bell-Bottom Technique: Long-term Results J Endovasc Ther., 2010; 17(4): 504–509.
10. Lee W.A., Nelson P.R., Berceli S.A. et al.: Outcome after hypogastric artery bypass and embolization during endovascular aneurysm repair. J Vasc Surg., 2006; 44(6): 1162–1168.
11. Karthikesalingam A., Hinchliffe R.J., Holt P.J.E. et al.: Endovascular Aneurysm Repair with Preservation of the Internal Iliac Artery Using the Iliac Branch Graft Device. Eur J Vasc Endovasc Surg., 2010; 39(3): 285–294.
12. Hobo R., Sybrandy J.E.M., Harris P.L. et al.: Endovascular repair of abdominal aortic aneurysms with concomitant common iliac artery aneurysm: Outcome analysis of the EUROSTAR experience. J Endovasc Ther., 2008; 15(1): 12–22.
13. Chitragari G., Schlosser F.J., Ochoa Chaar C.I., Sumpio B.E. et al.: Consequences of hypogastric artery ligation, embolization, or coverage. J Vasc Surg., 2015; 62(5): 1340–1347.
14. Siegel P., W.F.: Mengert, Internal iliac artery ligation in obstetrics and gynecology. JAMA., 1961; 178(11): 1059–1062.
15. Wyers M.C., Schermerhorn M.L., Fillinger M.F. et al.: Internal iliac occlusion without coil embolization during endovascular abdominal aortic aneurysm repair. J Vasc Surg., 2002; 36(6): 1138–1144.
16. Mell M., Tefera G., Schwarze M. et al.: Absence of buttock claudication following stent-graft coverage of the hypogastric artery without coil embolization in endovascular aneurysm repair. J Endovasc Ther., 2006; 13(3): 415–419.
17. Kontopodis N., Tavlas E., Papadopoulos G. et al.: Embolization or Simple Coverage to Exclude the Internal Iliac Artery During Endovascular Repair of Aortoiliac Aneurysms? Systematic Review and Meta-analysis of Comparative Studies. J Endovasc Ther., 2017; 24(1): 47–56.
18. Papazoglou K.O., Sfyroeras G.S., Zambas N. et al.: Outcomes of endovascular aneurysm repair with selective internal iliac artery coverage without coil embolization. J Vasc Surg., 2012; 56(2): 298–303.

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Competing interests: The authors declare that they have no competing interests.

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Lifesaving Stenting of Pulmonary Arteries Critically Narrowed by Mediastinal Lymphoma

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Figure 1. Chest X-ray showing a 102 × 107 × 75-mm tumor in the mediastinum.

Figure 2. Contrast-enhanced chest computed tomography axial plane showing left pulmonary artery (PA) stenosis (2.5 mm in 34 mm) and right PA stenosis (5 mm in 40 mm).

A 23-year-old woman without a prior medical history presented with malaise, dyspnea, and massive edema of the lower limbs. Chest X-ray revealed a mediastinal tumor (Figure 1). The patient's condition deteriorated drastically, with cardiogenic shock, hypoxia requiring mechanical ventilation, severe hepatic insufficiency (international normalized ratio, 6.8), and anuria. Pulmonary angiogram showed a 102 × 107 × 75 mm mass obstructing both pulmonary arteries (PAs; Figure 2). The patient's pulmonary hemodynamic measurements were: right ventricular 50/6/18 mm Hg (systolic pressure/diastolic pressure/mean), PA 48/18/27, and right atrium 25/20/18, respectively. As a lifesaving procedure, percutaneous intervention of PAs was performed (Video 1). Because of technical difficulties, left PA was expanded only with balloon angioplasty (Figures 3A and 3B). Right PA was widened with implantation of two stents (Video 2). Improvement of blood flow was achieved (Video 3). Parameters gradually improved and symptoms resolved. Biopsy showed diffuse large B-cell lymphoma. After chemotherapy, complete remission was achieved and autogenous bone marrow transplant was performed.

Stenosis within the pulmonary arterial tree is mostly caused by congenital heart disease (1–4). Adverse events (AEs) during treatment of congenital heart disease were documented in 22% of patients, with a high-severity AE in 10% of cases. The most common AEs were vascular/cardiac trauma (19%), technical (15%), and arrhythmias (15%). AEs were classified as not preventable in 50%, possibly preventable in 41%, and preventable in 9% (2). The interventional cardiologist had >10 years of experience, which reduced the risk for AEs. According to our best knowledge, this is the first case describing an intervention in a critically ill patient with PA stenosis without any AEs. ■

Author disclosures are available with the text of this article at www.atsjournals.org.

Author Contributions: E.T. is the treating physician and wrote the draft of the article; R.F. and A.W. are the treating physicians; P.A. and M.T.-S. assisted in writing the draft; P. Kurdyś, K.Ś., K.K., and P. Knapik critically revised the manuscript; and all authors read and approved the final manuscript.

The uncompressed videos are accessible from this article's supplementary material page.

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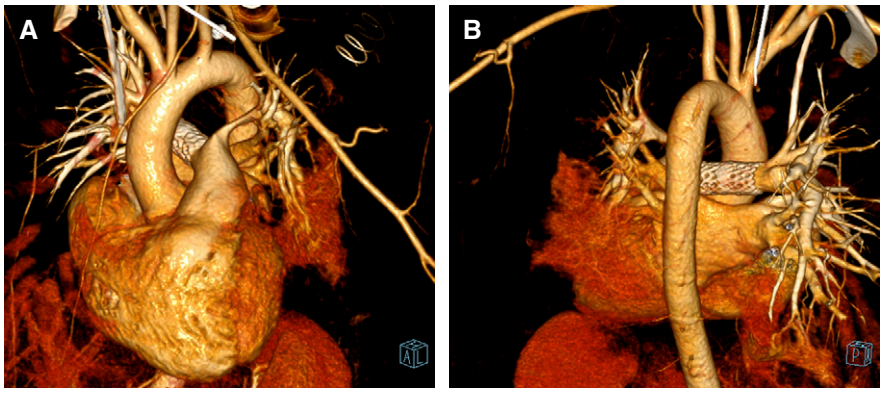
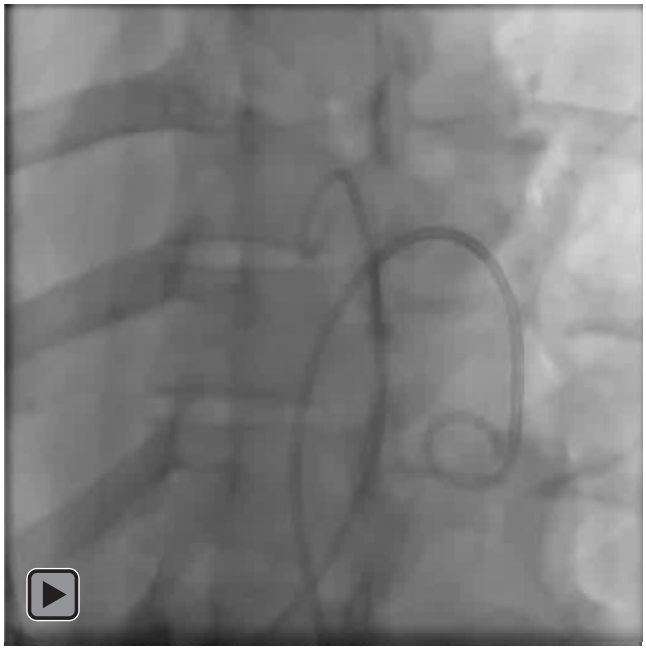


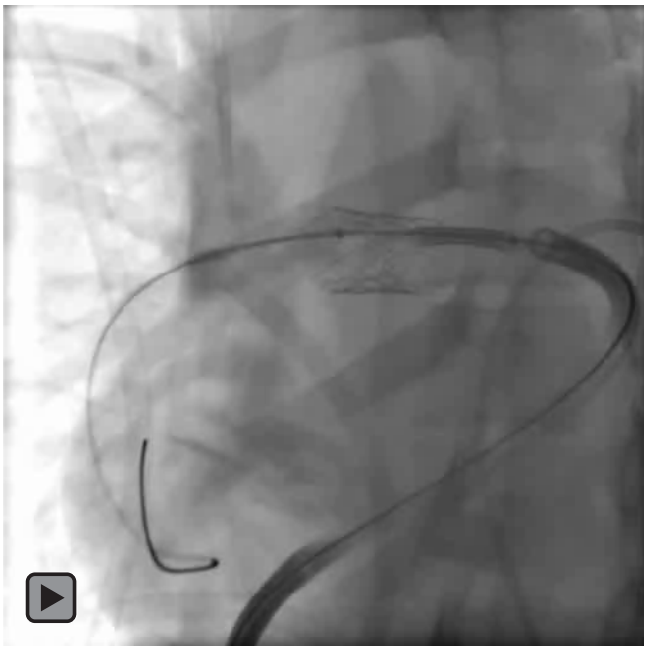
Figure 3. Contrast-enhanced chest computed tomography (CT). (*A*) CT axial plane showing an implanted stent in right pulmonary artery (PA) and residual stenosis in left PA. (*B*) Three-dimensional reconstruction of contrast-enhanced CT.



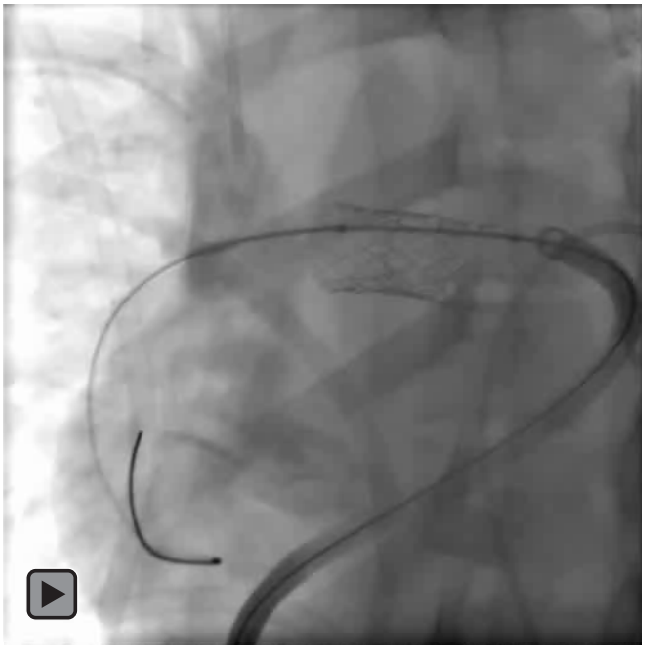
Video 1. Pulmonary angiography. Critical narrowing in the proximal segment of the right and left pulmonary arteries. A pigtail catheter was introduced into the peripheral branch of the left pulmonary artery. The sheath was unable to be passed through the narrowing. Balloon dilatation was attempted several times but was unsuccessful. An attempt to implant a stent using the front-loading technique was ineffective. The procedure was abandoned.

References

1. Mercieca V, Grech V, Degiovanni J. Use of stents for correction of pulmonary artery branch stenosis. *Images Paediatr Cardiol* 2004;6:1–10.
2. Holzer RJ, Gauvreau K, Kreutzer J, Leahy R, Murphy J, Lock JE, *et al*. Balloon angioplasty and stenting of branch pulmonary arteries: adverse events and procedural characteristics: results of a multi-institutional registry. *Circ Cardiovasc Interv* 2011;4:287–296.
3. Kapoor R, Gowda S, Ross R, Saydain G. Asymmetric pulmonary artery occlusion pressure opens window to pulmonary venous stenosis. *Am J Respir Crit Care Med* 2013;188:621.
4. Doyle TP, Loyd JE, Robbins IM. Percutaneous pulmonary artery and vein stenting: a novel treatment for mediastinal fibrosis. *Am J Respir Crit Care Med* 2001;164:657–660.



Video 2. Implantation of two stents on a balloon catheter in the right pulmonary artery. The long sheath curvature was impossible to cross with a long stent because of the size of the tumor. As a result, it was decided to implant 2 shorter stents.



Video 3. Pulmonary angiography in the anterior–posterior view. Dilatation of the right pulmonary artery after implantation of two stents with good perfusion of the right lung. The left pulmonary artery remains narrowed after several unsuccessful attempts at balloon dilatation.

IX. References

1. Janho KE, Rashaideh MA, Shishani J, et al. Outcomes of elective endovascular aneurysmal repair for abdominal aortic aneurysms in Jordan. Vasc Specialist Int. 2019; 35(4): 202–208.
2. Kim HO, Yim NY, Kim JK, et al. Endovascular aneurysm repair for abdominal aortic aneurysm: a comprehensive review. Korean J Radiol. 2019; 20(8): 1247–1265.
3. Parodi J.C., Palmaz J.C., Barone H.D.: Transfemoral Intraluminal Graft Implantation for Abdominal Aortic Aneurysms. Annals of Vascular Surgery, 2012; 26(7): 898–905.
4. Stokmans R.A., Broos P.P.H.L., van Sambeek M.R.H.M., Teijink J.A.W., Cuypers P.W.M.: Overstenting the hypogastric artery during endovascular aneurysm repair with and without prior coil embolization: A comparative analysis from the ENGAGE Registry. J Vasc Surg., 2018; 67(1): 134–141.
5. Rayt H.S., Bown M.J., Lambert K.V. et al.: Buttock claudication and erectile dysfunction after internal iliac artery embolization in patients prior to endovascular aortic aneurysm repair. Cardiovasc Intervent Radiol., 2008; 31(4): 728–734.
6. Yano O.J., Morrissey N., Eisen L. et al.: Intentional internal iliac artery occlusion to facilitate endovascular repair of aortoiliac aneurysms. J Vasc Surg., 2001; 34(2): 204–211.
7. Parodi J.C.: Endovascular repair of abdominal aortic-aneurysms and other arterial lesions. J Vasc Surg., 1995; 21(4): 549–557.
8. Farahmand P., Becquemin J.P., Desgranges P. et al.: Is hypogastric artery embolization during endovascular aortoiliac aneurysm repair (EVAR) innocuous and useful? Eur J Vasc Endovasc Surg., 2008; 35(4): 429–435.
9. Ghosh, J., Murray D., Paravastu S. et al.: Contemporary Management of Aorto-iliac Aneurysms in the Endovascular Era. Eur J Vasc Endovasc Surg., 2009; 37(2): 182–188.
10. Kouvelos G.N., Katsargyris A., Antoniou G.A. et al.: Outcome after Interruption or Preservation of Internal Iliac Artery Flow During Endovascular Repair of Abdominal Aorto-iliac Aneurysms. Eur J Vasc Endovasc Surg., 2016; 52(5): 621–634.
11. Torsello G., Schönefeld E., Osada N. et al.: Endovascular Treatment of Common Iliac Artery Aneurysms Using the Bell-Bottom Technique: Long-term Results J Endovasc Ther., 2010; 17(4): 504–509.
12. Lee W.A., Nelson P.R., Berceli S.A. et al.: Outcome after hypogastric artery bypass and embolization during endovascular aneurysm repair. J Vasc Surg., 2006; 44(6): 1162–1168.
13. Karthikesalingam A., Hinchliffe R.J., Holt P.J.E. et al.: Endovascular Aneurysm Repair with Preservation of the Internal Iliac Artery Using the Iliac Branch Graft Device. Eur J Vasc Endovasc Surg., 2010; 39(3): 285–294.
14. Hobo R., Sybrandy J.E.M., Harris P.L. et al.: Endovascular repair of abdominal aortic aneurysms with concomitant common iliac artery aneurysm: Outcome analysis of the EUROSTAR experience. J Endovasc Ther., 2008; 15(1): 12–22.
15. Solonynko B, Gałązka Z, Jakimowicz T, et al. Influence of atheromatous lesions in the ilio-femoral segment on the occurrence of stentgraft thrombosis after endovascular treatment of an abdominal aortic aneurysm.Pol Przegl Chir. 2012; 84(11): 551–559.
16. Cochennec F, Becquemin JP, Desgranges P, etal. Limb graft occlusion followingEVAR: clinical pattern,outcomes and predictive factors of occurrence.Eur JVascEndovasc Surg. 2007; 34(1): 59–65.

17. Yuksel A, Cayir MC, Kumtepe G, et al. An overview and update of femorofemoral crossover bypass surgery as an extra-anatomic bypass procedure. Thorac Cardiovasc Surg. 2018; 66(3): 266–272.
18. Armatowicz P, Szostek M, Jakuczun W, Osęka M, Skórski M. Extra-anatomical bypass operation in patients with unilateral graft limb occlusion after endovascular aneurysm repair for abdominal aortic aneurysm. Kardiol Pol. 2023 Aug 4.
19. Armatowicz P, Szostek M, Jakuczun W, Skórski M. Results Following Stent-Graft Coverage of the Hypogastric Artery in the Management of Aortoiliac Aneurysms in Endovascular Aneurysm Repair. Pol Przegl Chir. 2023 Jun 13;95(5):72-75.
20. Trejnowska E, Fiszer R, Armatowicz P, Tarczyńska-Słomian M, Wiklińska A, Kurdyś P, Ślusarz K, Kocaj K, Knapik P. Lifesaving Stenting of Pulmonary Arteries Critically Narrowed by Mediastinal Lymphoma. Am J Respir Crit Care Med. 2019 Jul 1;200(1):e1-e3.

X. Opinion of the Bioethics Committee

Komisja Bioetyczna
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AKBE/ 83 / 2022

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OŚWIADCZENIE

Niniejszym oświadczam, że Komisja Bioetyczna przy Warszawskim Uniwersytecie Medycznym w dniu 21 lutego 2022r. przyjęła do wiadomości informację na temat badania pt. „Rezultaty pokrycia tarczycy podbrzusznej stentgraftem w leczeniu tętniaków aortalno-biodrowych w naprawie tętniaka wewnątrznaczyniowego." (ang. Results Following Stent-Graft Coverage of the Hypogastric Artery in the Management of Aortoiliac Aneurysms in Endovasculalar Aneurysm Repair." Przedstawione badanie nie stanowi eksperymentu medycznego w rozumieniu art. 21 ust. 1 ustawy z dnia 5 grudnia 1996 r. o zawodach lekarza i lekarza dentysty(Dz.U.z 2018 r. poz. 617) i nie wymaga uzyskania opinii Komisji Bioetycznej przy Warszawskim Uniwersytecie Medycznym, o której mowa w art. 29 ust.1 ww. ustawy.

Przewodnicząca Komisji Bioetycznej

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OŚWIADCZENIE

Niniejszym oświadczam, że Komisja Bioetyczna przy Warszawskim Uniwersytecie Medycznym w dniu 11 kwietnia 2022r. przyjęła do wiadomości informację na temat badania pt „Przeszczep pozaanatomiczny z jednostronną niedrożnością odnogi stentgraftu po wewnątrznaczyniowej operacji tętniaka aorty brzusznej : 20 letnia obserwacja." Przedstawione badanie nie stanowi eksperymentu medycznego w rozumieniu art. 21 ust. 1 ustawy z dnia 5 grudnia 1996 r. o zawodach lekarza i lekarza dentysty(Dz.U. z 2018 r. poz. 617) i nie wymaga uzyskania opinii Komisji Bioetycznej przy Warszawskim Uniwersytecie Medycznym, o której mowa w art. 29 ust.1 ww. ustawy.

Przewodnicząca Komisji Bioetycznej

Prof. dr hab. n. med. Magdalena Kuźma –Kozakiewicz

XI. Statements of co-authors of the publications

Warsaw, 20.10.2023
(place, date)

Paul Armatowicz
.....
(first and last name)

STATEMENT

As co-author of the work entitled "**Extra-anatomical bypass operation in patients with unilateral graft limb occlusion after endovascular aneurysm repair for abdominal aortic aneurysm"** published in Kardiologia Polska.

I declare that my own substantive contribution to the preparation, conduct and development of the research and the presentation of the work in the form of a publication consists of: participation in the creation of the research project, conducting a literature review, collecting materials, clinical examination of the patient, preparing the first version of the manuscript, final assessment of the article before submitting it for review.

I define my percentage share in the preparation of the publication as 80%.

Paul Armatowicz
.....
(signature)

Warsaw, 20.10.2023
(place, date)

Małgorzata M. Sosnes-Suberi
(first and last name)

STATEMENT

As co-author of the work entitled **"Extra-anatomical bypass operation in patients with unilateral graft limb occlusion after endovascular aneurysm repair for abdominal aortic aneurysm"** published in Kardiologia Polska.

I declare that my own substantive contribution to the preparation, conduct and development of the research and the presentation of the work in the form of a publication consists of: participation in the creation of the research project, substantive supervision during the research, assessment of the article before submitting it for review.

I define my percentage share in the preparation of the publication as 5%.

At the same time, I consent to the use of the above-mentioned work as part of Dr. Paul Armatowicz doctoral dissertation, whose percentage share is 80%.

.....
(signature)

Warsaw, 20.10.2023
(place, date)

Wawrzyniec Jakuczun
.....
(first and last name)

STATEMENT

As co-author of the work entitled "**Extra-anatomical bypass operation in patients with unilateral graft limb occlusion after endovascular aneurysm repair for abdominal aortic aneurysm"** published in Kardiologia Polska.

I declare that my own substantive contribution to the preparation, conduct and development of the research and the presentation of the work in the form of a publication consists of: participation in the creation of the research project, substantive supervision during the research, assessment of the article before submitting it for review.

I define my percentage share in the preparation of the publication as 5%.

At the same time, I consent to the use of the above-mentioned work as part of Dr. Paul Armatowicz doctoral dissertation, whose percentage share is 80%.

Podpisano przez/ Signed by:
WAWRZYNIEC
JAKUCZUN
Data/ Date: 24.10.2023 21:22
mSzafir

.....
(signature)

Warsaw, 20.10.2023
(place, date)

Marcin Osęka
.....
(first and last name)

STATEMENT

As co-author of the work entitled "**Extra-anatomical bypass operation in patients with unilateral graft limb occlusion after endovascular aneurysm repair for abdominal aortic aneurysm"** published in Kardiologia Polska.

I declare that my own substantive contribution to the preparation, conduct and development of the research and the presentation of the work in the form of a publication consists of: participation in the creation of the research project, substantive supervision during the research, assessment of the article before submitting it for review.

I define my percentage share in the preparation of the publication as 5%.

At the same time, I consent to the use of the above-mentioned work as part of Dr. Paul Armatowicz doctoral dissertation, whose percentage share is 80%.


.....
(signature)

Warsaw, 20.10.2023
(place, date)

....Maciej Skórski.....
(first and last name)

STATEMENT

As co-author of the work entitled "**Extra-anatomical bypass operation in patients with unilateral graft limb occlusion after endovascular aneurysm repair for abdominal aortic aneurysm**" published in Kardiologia Polska.

I declare that my own substantive contribution to the preparation, conduct and development of the research and the presentation of the work in the form of a publication consists of: participation in the creation of the research project, substantive supervision during the research, assessment of the article before submitting it for review.

I define my percentage share in the preparation of the publication as 5%.

At the same time, I consent to the use of the above-mentioned work as part of Dr. Paul Armatowicz doctoral dissertation, whose percentage share is 80%.

.....
(signature)

Warsaw, 20.10.2023
(place, date)

Paul Armatowicz
.....
(first and last name)

STATEMENT

As co-author of the work entitled "**Results Following Stent-Graft Coverage of the Hypogastric Artery in the Management of Aortoiliac Aneurysms in Endovascular Aneurysm Repair"** published in Polish Journal of Surgery.

I declare that my own substantive contribution to the preparation, conduct and development of the research and the presentation of the work in the form of a publication consists of: participation in the creation of the research project, conducting a literature review, collecting materials, clinical examination of the patient, preparing the first version of the manuscript, final assessment of the article before submitting it for review.

I define my percentage share in the preparation of the publication as 82%.

Paul Armatowicz
.....
(signature)

Warsaw, 20.10.2023
(place, date)

Małgorzata A. Szostek-Jurek
(first and last name)

STATEMENT

As co-author of the work entitled **"Results Following Stent-Graft Coverage of the Hypogastric Artery in the Management of Aortoiliac Aneurysms in Endovascular Aneurysm Repair"** published in Polish Journal of Surgery.

I declare that my own substantive contribution to the preparation, conduct and development of the research and the presentation of the work in the form of a publication consists of: participation in the creation of the research project, substantive supervision during the research, assessment of the article before submitting it for review.

I define my percentage share in the preparation of the publication as 6%.

At the same time, I consent to the use of the above-mentioned work as part of Dr. Paul Armatowicz doctoral dissertation, whose percentage share is 82%.

(signature)

Warsaw, 20.10.2023
(place, date)

Wawrzyniec Jakuczun

.....
(first and last name)

STATEMENT

As co-author of the work entitled "**Results Following Stent-Graft Coverage of the Hypogastric Artery in the Management of Aortoiliac Aneurysms in Endovascular Aneurysm Repair"** published in Polish Journal of Surgery.

I declare that my own substantive contribution to the preparation, conduct and development of the research and the presentation of the work in the form of a publication consists of: participation in the creation of the research project, substantive supervision during the research, assessment of the article before submitting it for review.

I define my percentage share in the preparation of the publication as 6%.

At the same time, I consent to the use of the above-mentioned work as part of Dr. Paul Armatowicz doctoral dissertation, whose percentage share is 82%.

Podpisano przez/ Signed by:
WAWRZYNIEC
JAKUCZUN
Data/ Date: 24.10.2023 21:22
mSzafir

.....
(signature)

Warsaw, 20.10.2023
(place, date)

...Maciej Skórski.....
(first and last name)

STATEMENT

As co-author of the work entitled "**Results Following Stent-Graft Coverage of the Hypogastric Artery in the Management of Aortoiliac Aneurysms in Endovascular Aneurysm Repair**" published in Polish Journal of Surgery.

I declare that my own substantive contribution to the preparation, conduct and development of the research and the presentation of the work in the form of a publication consists of: participation in the creation of the research project, substantive supervision during the research, assessment of the article before submitting it for review.

I define my percentage share in the preparation of the publication as 6%.

At the same time, I consent to the use of the above-mentioned work as part of Dr. Paul Armatowicz doctoral dissertation, whose percentage share is 82%.

.....
(signature)

Warsaw, 29.11.2023
(place, date)

Paul Armatowicz
.....
(first and last name)

STATEMENT

As co-author of the work entitled "**Lifesaving Stenting of Pulmonary Arteries Critically Narrowed by Mediastinal Lymphoma"** published in American Journal of Respiratory and Critical Care Medicine.

I declare that my own substantive contribution to the preparation, conduct and development of the research and the presentation of the work in the form of a publication consists of: participation in the creation of the research project, preparing the first version of the manuscript, final assessment of the article before submitting it for review.

I define my percentage share in the preparation of the publication as 10%.

Paul Armatowicz
.....
(signature)

Warsaw, 29.11.2023
(place, date)

Ewa Trejnowska
.....
(first and last name)

STATEMENT

As co-author of the work entitled "**Lifesaving Stenting of Pulmonary Arteries Critically Narrowed by Mediastinal Lymphoma**" published in American Journal of Respiratory and Critical Care Medicine.

I declare that my own substantive contribution to the preparation, conduct and development of the research and the presentation of the work in the form of a publication consists of: participation in the creation of the research project, substantive supervision during the research, clinical examination of the patient, evaluation of the article before submitting it for review.

I define my percentage share in the preparation of the publication as 40%.

At the same time, I consent to the use of the above-mentioned work as part of Dr. Paul Armatowicz doctoral dissertation, whose percentage share is 10%.

.....
(signature)

Zabrze, 22.01.2024
(place, date)

Roland Fisher
(first and last name)

STATEMENT

As co-author of the work entitled "**Lifesaving Stenting of Pulmonary Arteries Critically Narrowed by Mediastinal Lymphoma"** published in American Journal of Respiratory and Critical Care Medicine.

I declare that my own substantive contribution to the preparation, conduct and development of the research and the presentation of the work in the form of a publication consists of: participation in the creation of the research project, substantive supervision during the research, clinical examination of the patient, evaluation of the article before submitting it for review.

I define my percentage share in the preparation of the publication as 30%.

At the same time, I consent to the use of the above-mentioned work as part of Dr. Paul Armatowicz doctoral dissertation, whose percentage share is 10%.

(signature)