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Case Reports

Tentos 4F
sinus-Obliquus
sinus-Venous

Revision-No. 03-2024

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Tentos 4F

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6 quick questions to:

DR. HEIKO WENDORFF
Vascular surgeon
Managing Senior Physician
Clinic and Polyclinic for Vascular & Endovascular Surgery
Klinikum r. d. Isar der TU München

1. EXPERIENCE STENTING BTK/SFA IN GENERAL AND WITH TENTOS 4F

"I am working for 17 years in the interventional vascular surgery, and we are doing a lot of vessel Stenting in the aortic/iliac/SFA/Poplitea and the lower leg. We are implanting more than 300 stents each year in the legs."

2. COMPARED TO YOUR CURRENT STENTS – WHAT MAKES TENTOS 4F SPECIAL?

"Currently we are using EverFlex Nitinol stents. The Tentos 4F stent is extremely low profile with 4F and has nearly the same power like the other stents. The top of the introducing system is conic, and the stent uses a 0.018" guide wire. So, it is predestined for using in the SFA and the lower leg, when you already are using a 0.018" guide wire."

3. WHAT TYPES OF PATIENTS ARE MOST SUITABLE FOR THIS STENT, AND WHY?

"Especially very small vessels are suitable for this stent, and its ideal for the radial access with 160 cm long introducing devices. And also, if there are already one or more stents in the leg it's easier to pass with this stent system."

4. HOW DOES THE STENT FIT INTO THE OVERALL TREATMENT LANDSCAPE FOR THE CONDITION IT IS INTENDED TO TREAT?

"It is a missing part between the special lower leg stents and the regular thigh stents on the 0.035" guide wires. You need only one wire (0.018") for the case."

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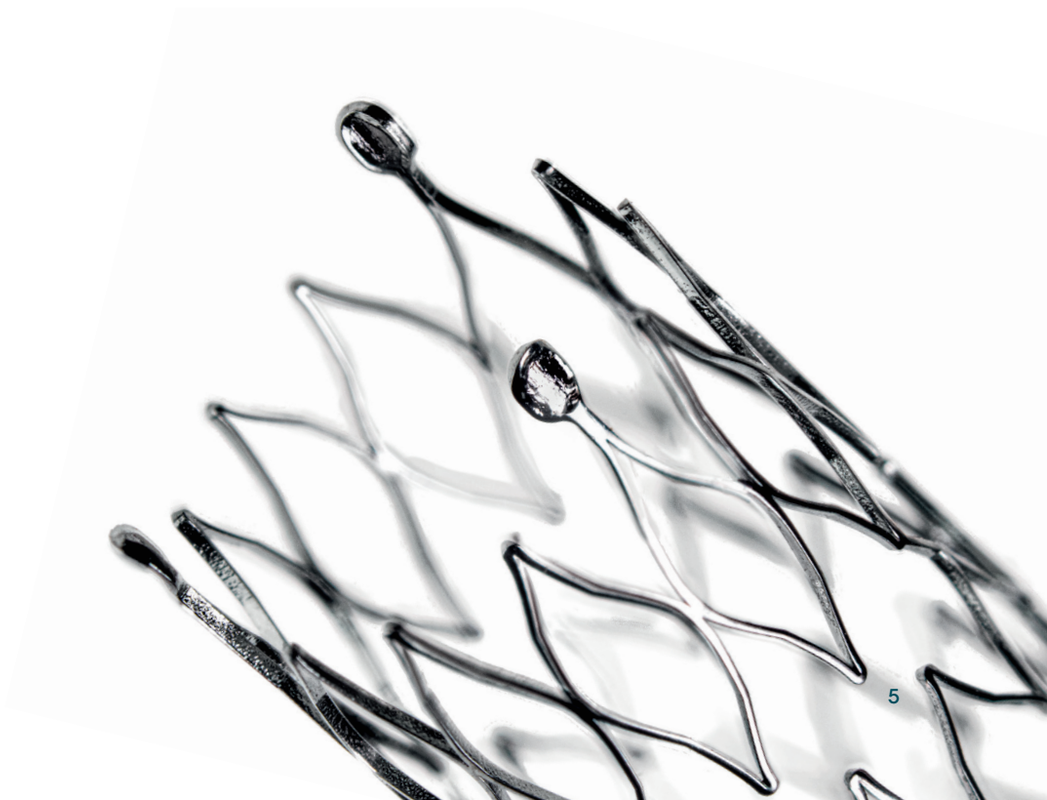
Tentos 4F

5. WHAT IMPACT HAS THE STENT HAD ON PATIENT OUTCOMES, BOTH IN THE SHORT-TERM AND LONG-TERM? - AS FAR AS YOU CAN DETERMINE

"The stent helps in situations where other stents cannot be implanted. In our short view (1 year) over 90% of the implanted Tentos 4F stents were still open. Long term results are pending."

6. HOW EASY IS THE STENT TO USE FOR YOU?

"The stent is as easy as every pull-back system, it is well visible und I like the low profile system without corners and edges."



Acute ischemia (TASC I)

DR. HEIKO WENDORFF
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CASE SUMMARY

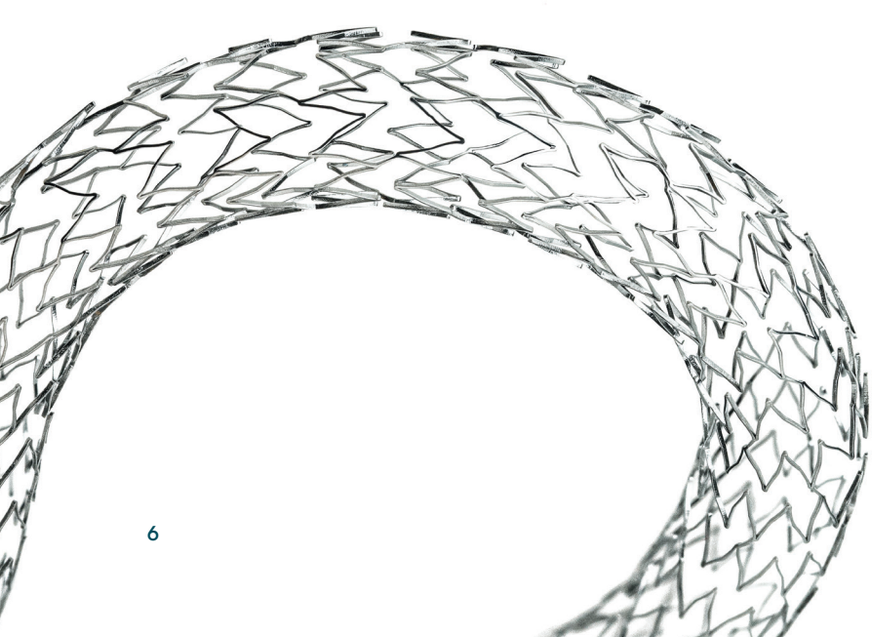
A 55-year-old male patient was admitted to our hospital with subacute pain in the right leg after multiple Bypass-Surgery in another hospital. The medication of Aspirin and Eliquis was stopped 4 days ago. The ultrasound examination shows that the vein-bypass (distal-origin femoro-crural (tibial posterior, fibular artery) implanted three years earlier is occluded as well as the femoral artery.

THERAPY

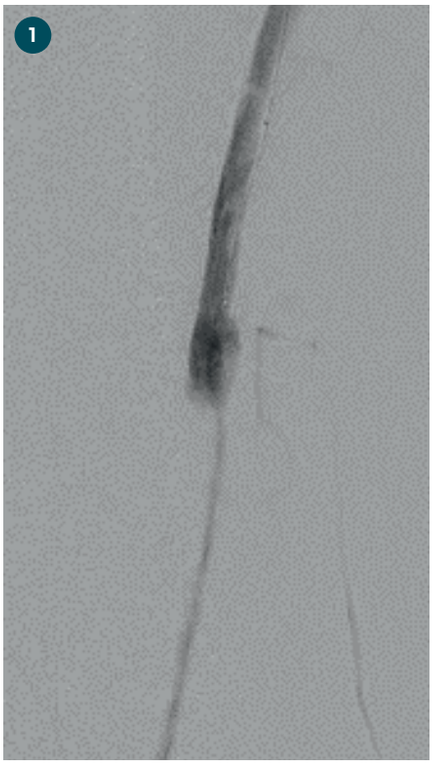
We immediately started with a catheter lysis therapy. A Cross-Over maneuver was done and a 45 cm Terumo Sheath 5F was introduced. In the angiography, the entire superficial femoral artery was occluded, while the fibular artery was fed by collaterals. After positioning the Cragg-McNamara Valved Infusion Catheter (ev3, Medtronic), catheter lysis with Actilyse-tissue-type plasminogen activator was started at a rate of 1 mg/h.
24 hours later, the occlusion in the superficial femoral artery and bypass was completely restored. However, there was some thrombotic material left in the bypass and bypass-anastomosis, causing a stenosis.
After balloon angioplasty we implanted stents in the superficial femoral artery (6x170 mm Tentos 4F, optimed) and in the proximal Bypass-Anastomosis (5x40 mm Tentos 4F, optimed) due to the small lumen of the old vein-bypass.
In the Bypass itself we implanted a Supera stent (4.5x60 mm, Abbott) (due to its position in the popliteal region) with a good result. After post-dilatation with a long 4 mm balloon, the entire vessel axis was reopened, except for the distal fibular artery. The remaining occlusion was removed by aspiration. At the level of the ankle, there were collaterals to the anterior and posterior tibial artery.

FOLLOW-UP

After 3 days, the patient was painless. We discharged him with an ABI of 0.9 and a recommendation of Aspirin (ASS) 100 mg and Clopidogrel (Plavix) 75 mg.



Tentos 4F



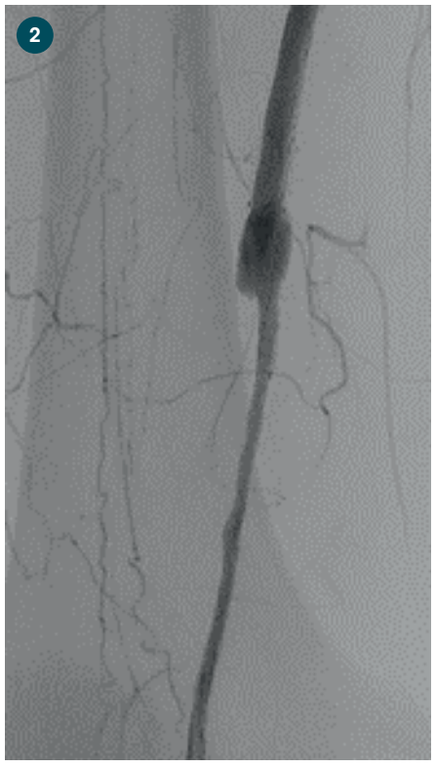


Figure 1: Dist-origin – fibular Bypass · **Figure 2:** After 5 x 40 mm Tentos 4F · **Figure 3:** Final Angiography

TASC IIb ischemia

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CASE SUMMARY

A 67-year-old woman presented to our policlinic via the rescue service with TASC IIb ischemia of the right leg. There was an acute occlusion of the complete femoral artery, profundal artery, and a bypass (femoro-popliteal P1 PTFE) implanted in 2018 due to an embolic event. The patient had known cardiovascular risk factors, including arterial hypertension and a history of smoking (50 pack years). In order to salvage the lower leg, we made the decision to perform an open revascularization procedure from the right groin.

THERAPY

The typical approach to access the right femoral arteries involved an open thrombectomy of the femoral artery, deep femoral artery, and the alloplastic femoro-crural PTFE bypass using different Fogarty catheters. After embolectomy and atherectomy of the femoral arteries and achieving a good inflow and slow backflow out of the bypass, the vessel was closed by adding a pericardial patch. In the follow-up angiography, the femoral arteries were open without stenosis, but the distal outflow of the bypass was still restricted due to embolic remnants. Consequently, we performed an open access to the lower leg. Thrombectomy was carried out to remove fresh and older thrombi/emboli, followed by open atherectomy, and the vessel was closed by adding a vein patch. In the subsequent angiography, the anterior tibial artery was identified as the primary vessel in the lower leg, while the other vessels were not viable

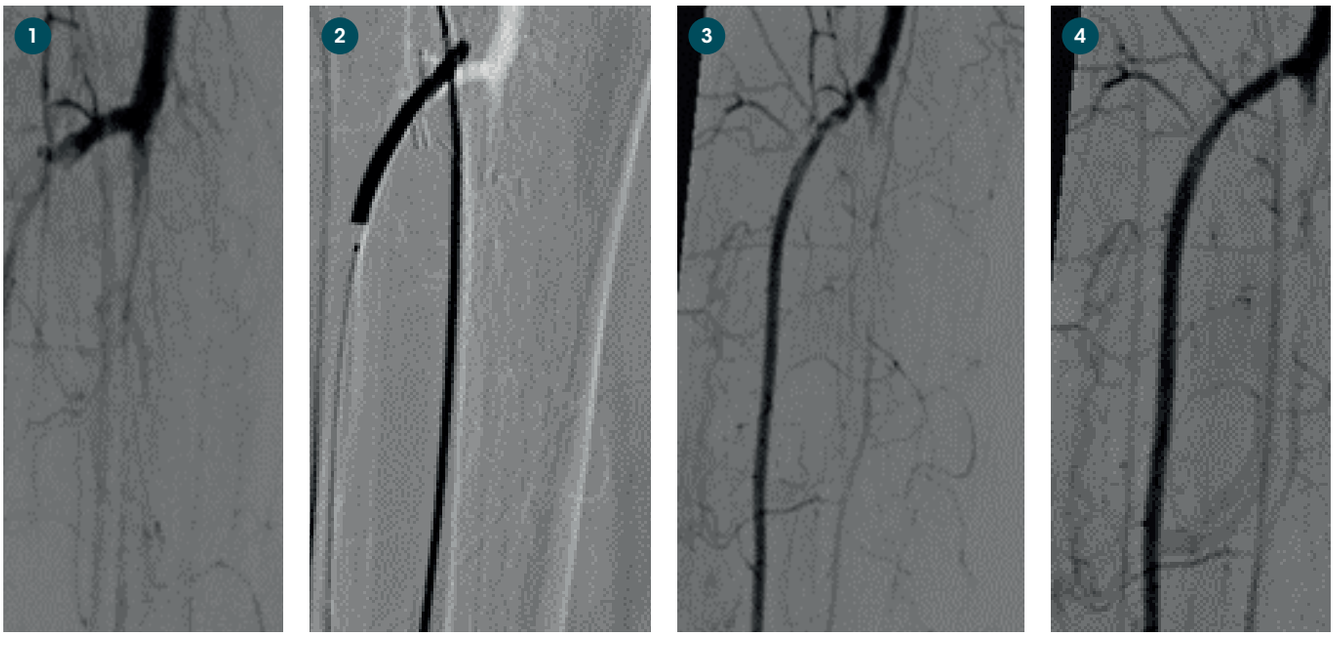


Figure 1: After open Thrombectomy · **Figure 2:** PTA ATA (3 x 40 mm Sterling) · **Figure 3:** After PTA before Stent Tentos 4F 4 x 40 mm
Figure 4: Final angiography

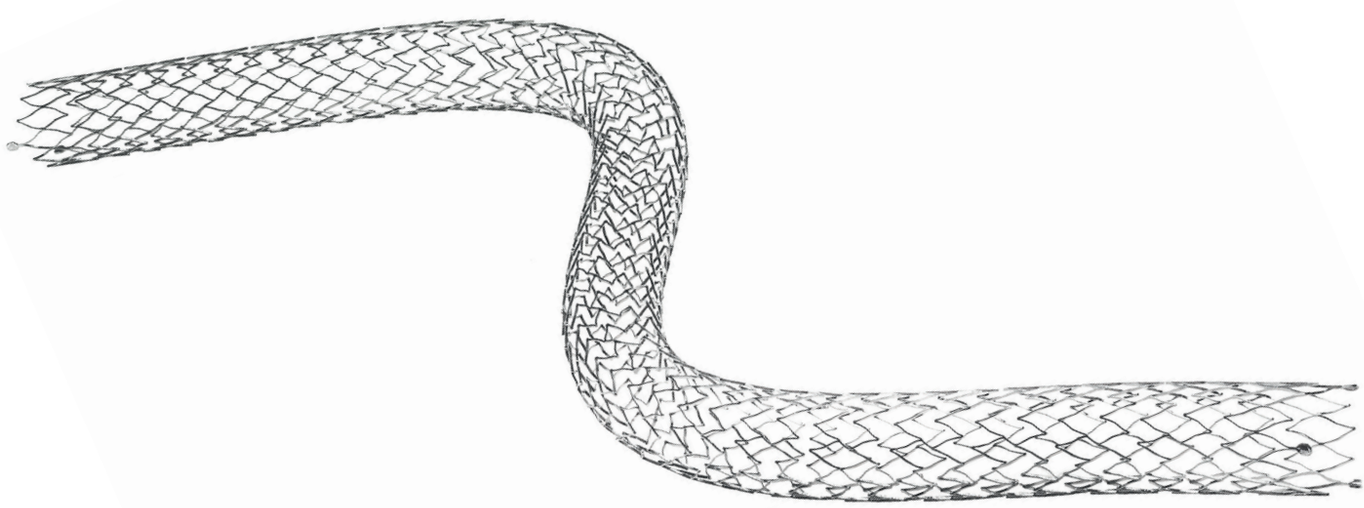
Tentos 4F

for revascularization. We transitioned to an endovascular approach and introduced a 5F sheath through the femoral arteries. During the angiography, it was observed that the proximal part of the anterior tibial artery was nearly occluded. We successfully passed through with a Hi-Torque Command 0.018" guidewire (Abbott) and a 0.018" Trailblazer support catheter (Medtronic). After confirming the intraluminal position, we dilated this area with a 3x40 mm Sterling balloon (Boston Scientific). Due to restenosis and a single vessel outflow, we decided to implant a 4x40 mm Tentos 4F stent (optimed), which yielded positive results.

To prevent compartment syndrome, a complete fasciotomy of the lower leg was performed, and the skin incision was closed with artificial skin. Due to extreme muscle swelling, the incision was closed with a mesh graft transplantation a few days later.

FOLLOW-UP

Two months after discharge, a planned follow-up examination was conducted. The patient reported no pain, and her walking distance was only limited by an old peroneal lesion. The foot pulse was palpable.



PAD Rutherford Stage 4 (Fontaine IV)

DR. ANTON ORLOV
Vascular surgeon, Shalimov's National Institute of Surgery and Transplantation · Kyiv, Ukraine

CASE SUMMARY

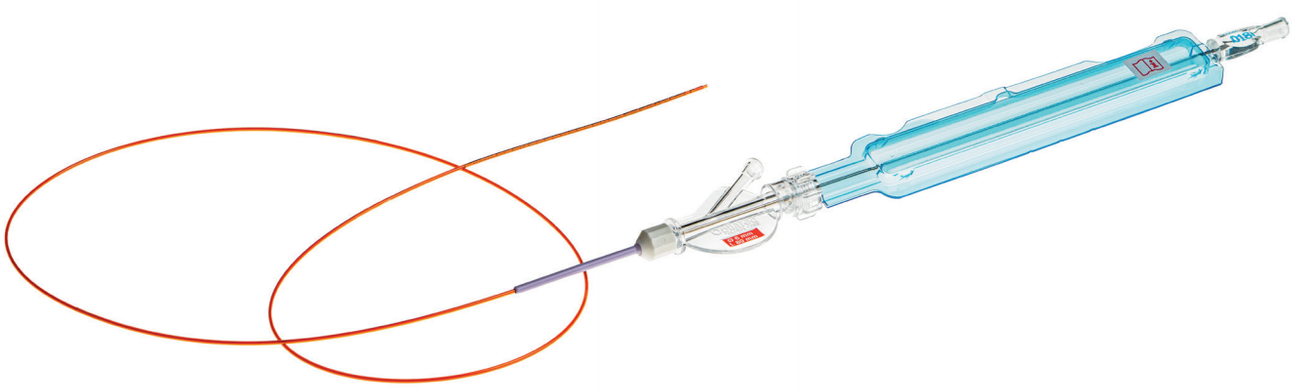
A 73-year-old woman presented with a painless ulcer on her first toe. The ulcer started as a blister 1 week earlier. She also suffered from a slight limp. She suffered from type 2 diabetes for 12 years. Other risk factors included hypertension and hyperlipidemia. 3 weeks ago, amputation of 1 toe was performed. The wound did not heal. Medicines: bisoprolol, metformin, rosuvastatin and aspirin. Physical examination revealed a cold, pale foot with dry, scaly skin and an indolent ulcer in the area of the first toe surrounded by erythema. Arterial pulsation of the ankle joint was not palpable. Skin sensitivity is reduced due to diabetic neuropathy. In addition, he had a long history of ischemic diseases, including carotid artery stenting and compensated heart failure. The patient's general condition was poor. Given the severity of the condition, we decided to immediately perform a CT scan on the patient in preparation for the intervention.

THERAPY

Via antegrade puncture, common femoral artery access was obtained. Pre-interventional DSA images were obtained, demonstrating femoral artery occlusion. To address the femoral occlusion, we navigated through it using an Hi-Torque Command 0.018" guidewire (Abbott) and a 0.018" Trailblazer support catheter (Medtronic). During the subsequent balloon angioplasty with a 5x150 mm VIAR (AR Baltic Medical), there was an immediate recoil. To stabilize the situation, we successfully resolved the problem by using a Tentos 4F stent (optimed) with a low-profile introducer system. Ultimately, a 6x150 mm Tentos 4F stent was successfully implanted.

FOLLOW-UP

After 7 days, the first toe was reamputated. The wound has healed per prima. A routine follow-up examination was carried out 3 months after discharge. The patient did not report pain, the walking distance was not limited, and the pulse in the foot was palpable.



Tentos 4F

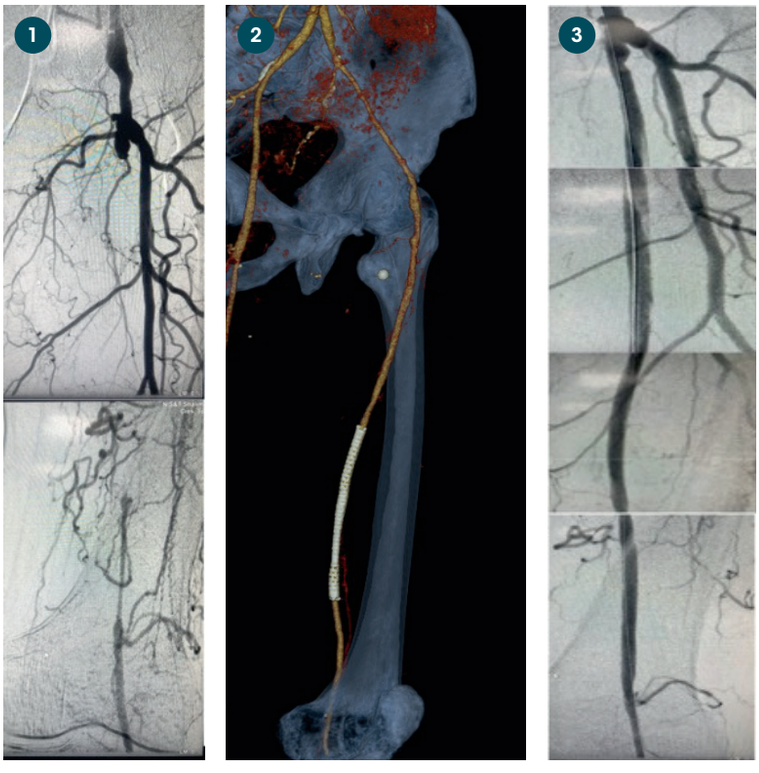


Figure 1: Occluded femoral artery
Figure 2: Tentos 4F 6x150 mm – in 3 months
Figure 3: Tentos 4F 6x150 mm – final angiography

PAD Rutherford Stage 5 (Fontaine IV)

DR. ANTON ORLOV
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CASE SUMMARY

A 69-year-old man suffered from a painless ulcer on the fifth toe. The ulcer had started as a blister 3 weeks earlier. He also suffered from mild claudication. He had type II diabetes for 9 years and had been insulin dependent for 2 years. Other risk factors present were hypertension and hyperlipidaemia. Medication: Atenolol, Nifedipine, Rosuvastatine and Aspirin. Physical examination showed a warm, reddish foot with a dry, peeling skin and an indolent, probably pressure-induced ulcer on the lateral side of the fifth toe, surrounded by erythema. No arterial ankle pulsations were palpable. Skin sensibility was reduced due to diabetic neuropathy. Additionally, he had a long history of coronary diseases, including cardiac stenting, decompensated heart failure and AV-block. The patient was in a very poor overall condition. Given the severity of the condition, we made the decision to treat the patient immediately with angiography, prepared for intervention.

THERAPY

Via antegrade puncture, common femoral artery access was obtained. Pre-interventional DSA images were obtained, demonstrating femoral artery occlusion and a subtotal stenosis in the distal fibular artery. To address the femoral occlusion, we navigated through it using an Hi-Torque Command 0.018" guidewire (Abbott) and a 0.018" Trailblazer support catheter (Medtronic). During the subsequent balloon angioplasty with a 6x150 mm VIAR (AR Baltic Medical), there was an immediate recoil. To stabilize the situation, we successfully resolved the problem by using a Tentos 4F stent (optimed) with a low-profile introducer system. Ultimately, a 6x150 mm Tentos 4F stent was successfully implanted. The fibular artery was successfully treated with percutaneous transluminal angioplasty.

The final angiography demonstrated complete recanalization of the lower leg vessels with normal distal flow. Improved inflow and perfusion are seen on original, microcirculation and macrocirculation 2DPA images and TDCs. All parameters are improved in the original, microcirculation and macrocirculation TDCs.

CONCLUSION

One month after discharge, a planned follow-up examination was conducted. The patient reported no pain, and his walking distance was not limited, the toe wound healed in two weeks. The foot pulse was palpable.

Tentos 4F

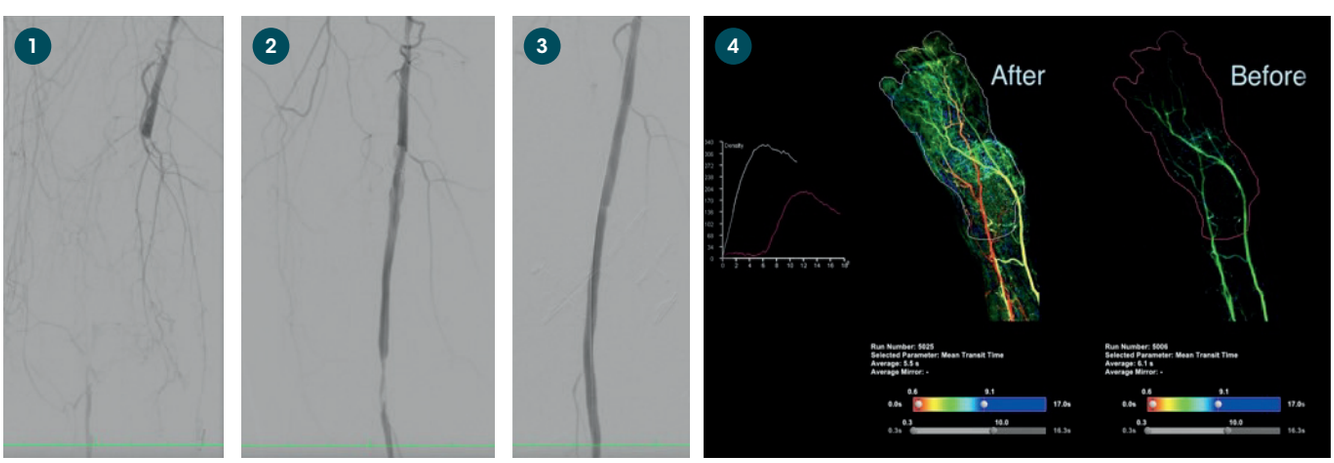
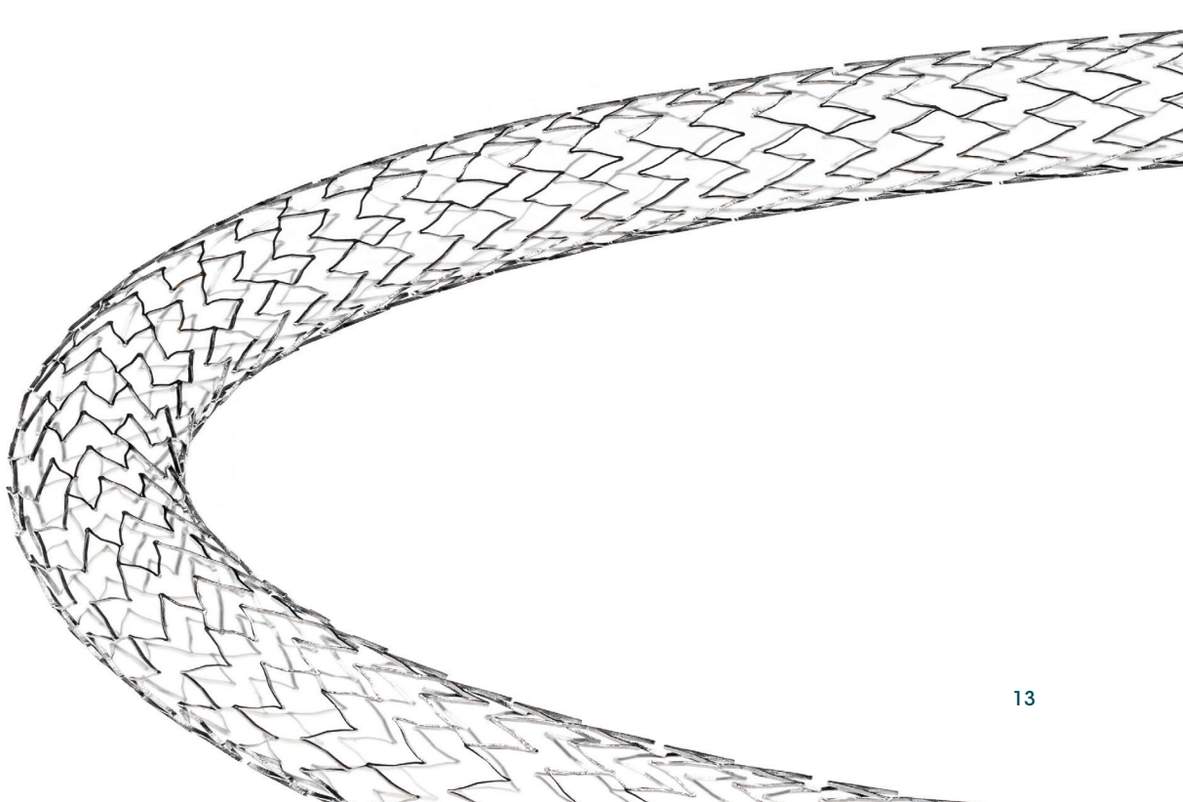


Figure 1: Occluded femoral artery · **Figure 2:** After PTA 6x150mm VIAR · **Figure 3:** Tentos 4F – 6x150 mm · **Figure 4:** Final angiography



PAD Rutherford Stage 5 (Fontaine IV)

DR. HEIKO WENDORFF
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CASE SUMMARY

An 80-year-old man came to the emergency room with acute worsening of Rutherford 5 Peripheral Arterial Disease (PAD). Both legs were affected, and there was a risk of amputation in the feet. The patient had multiple cardiovascular risk factors, including diabetes, hypertension, and hypercholesterolemia.

Additionally, he had a long history of coronary diseases, including ACVB, cardiac stenting, decompensated heart failure, AV-block, and atrial fibrillation. The patient was in a very poor overall condition. Given the severity of the condition, we made the decision to treat the patient immediately with bilateral angiography, prepared for intervention.

THERAPY

Under duplex-ultrasound guidance, we performed an antegrade puncture of the right femoral artery and cannulated the superficial femoral artery using a 5F sheath. The angiography revealed no stenosis or occlusion in the groin and thigh. However, the popliteal artery below-the-knee was completely occluded, with collateral circulation supplying the distal end of the popliteal artery. The anterior tibial artery, which was the main vessel in the lower leg, showed some distal stenoses, while the fibular artery appeared small and continuous, and the posterior tibial artery was occluded distally.

To address the popliteal occlusion, we navigated through it using an Hi-Torque Command 0.018" guidewire (Abbott) and a 0.018" Trailblazer support catheter (Medtronic). During the subsequent balloon angioplasty with a 3 x 120 mm Sterling (Boston Scientific), there was an immediate recoil. After pre-dilatation, we attempted to implant a Supera stent (Abbott) but encountered difficulties advancing the stent-introducing system. To stabilize the situation, we successfully resolved the problem by using a Tentos 4F stent (optimed) with a low-profile introducer system. Ultimately, a 5 x 80 mm Tentos 4F stent was successfully implanted. The final angiography demonstrated complete recanalization of the lower leg vessels with normal distal flow.

CONCLUSION

Unfortunately, the tissue loss in the toes had already advanced too far to salvage the forefoot. As a result, we had to perform a forefoot amputation several days later. However, the wound healing in the following weeks was good.

optimed

Tentos 4F

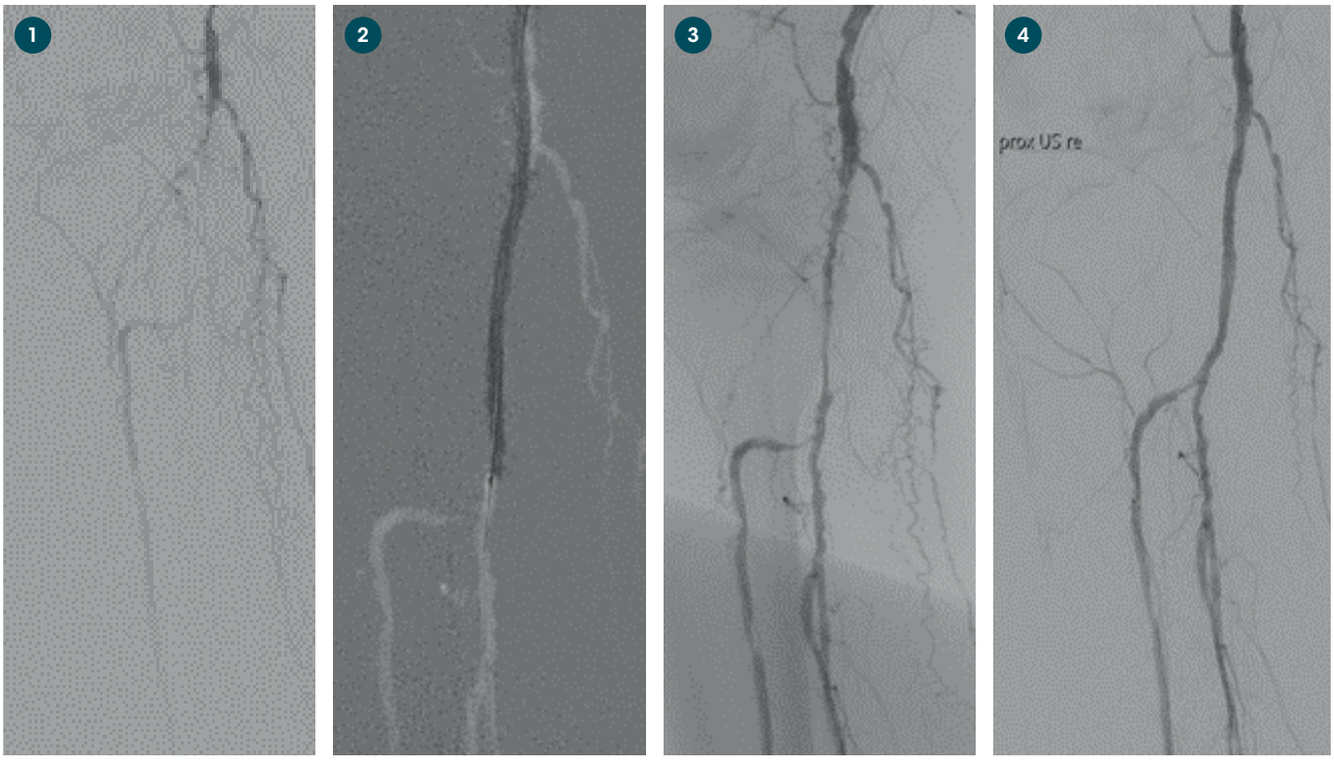


Figure 1: Occluded poplitea right · **Figure 2:** PTA 3x120 mm Sterling
Figure 3: Before Stenting · **Figure 4:** Tentos 4F- 5x80 mm, final Angiography

CLI – stenting of the Anterior Tibial Artery and Peroneal Artery

DR. AYMAN AHMED
Consultant Vascular Surgeon

CASE SUMMARY

A 60-year-old female presented with severe rest pain, multiple gangrenous patches over the heel, big toe, and an unhealed ulcer at the base of the second toe.

DIAGNOSIS

Initial visit on 31/July/2023 revealed flow reconstitution for the right anterior tibial artery with diffuse attenuation. Significant atherosclerotic changes observed in various arteries of both lower limbs.

Second visit on 10/August/2023 showed patent right common femoral artery with moderate atherosclerotic changes. Luminal narrowing and occlusions present in the right SFA, popliteal artery, posterior tibial artery, and peroneal artery. Similar findings in the left lower limb with the presence of a stent in the left SFA.

Clinical Indication: Critical limb ischemia in the right lower limb.

THERAPY (PROCEDURE)

Angioplasty with recanalization of the popliteal artery with stenting, infra-popliteal angioplasty with recanalization of the ATA, and peroneal artery with stenting.

TECHNIQUE

US-guided puncture of the right CFA. Insertion of a 6F sheath. Angiogram showed patent SFA stent with total occlusion of the popliteal artery, necessitating angioplasty with a Tentos 4F stent. Subsequent angioplasties were performed on the ATA and peroneal artery, with stenting in the popliteal and peroneal arteries to address complications. Post-intervention, palpable DPA was noted.

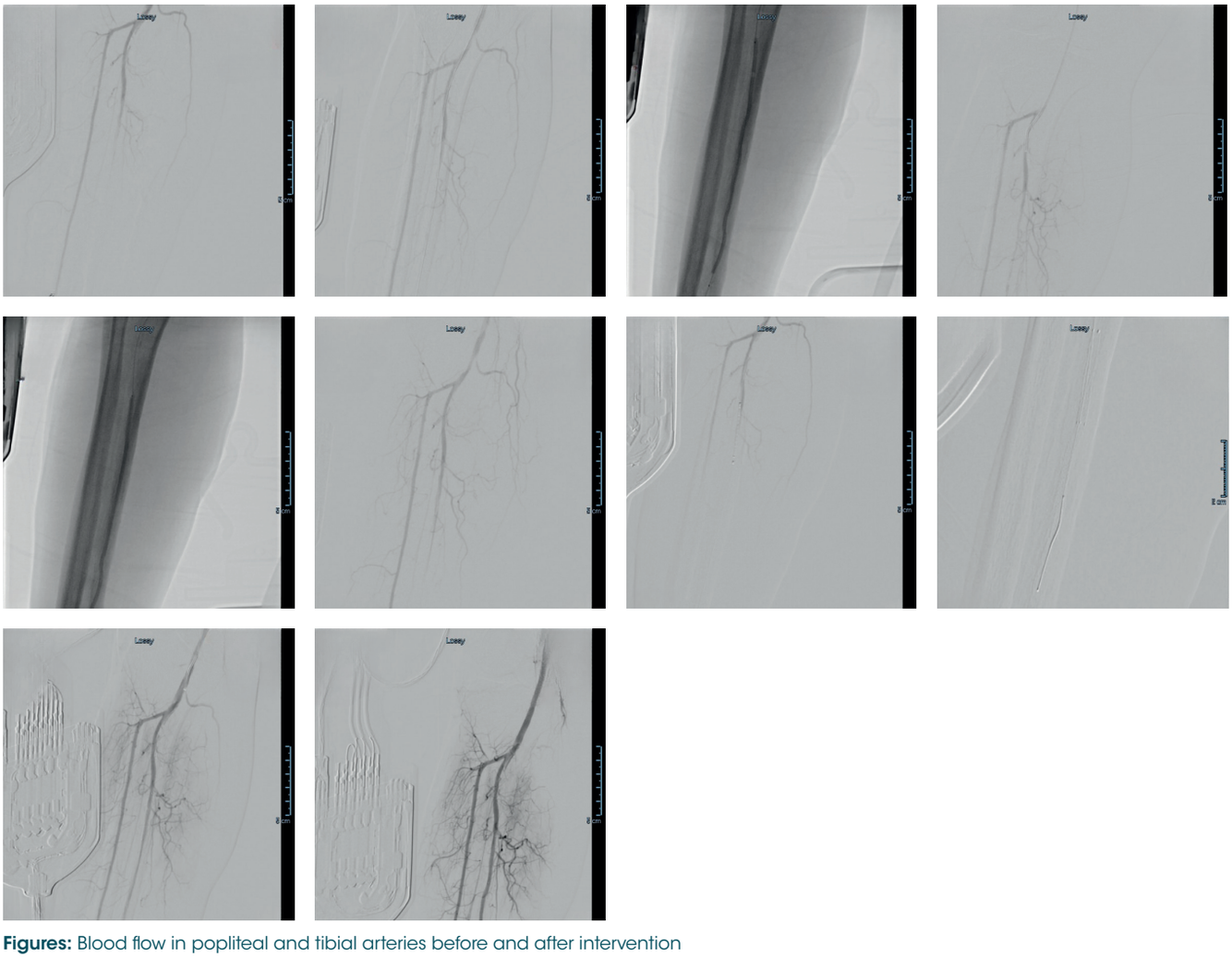
FOLLOW-UP

The patient exhibited improvement in warmth and complete resolution of pain during follow-up. At 2, 4, and 6 weeks, ulcers healed, and the gangrenous patch over the big toe sloughed. DPA pulse remained intact with improved collateral flow to PTA. The patient continued dual antiplatelets.

CONCLUSION

The stenting procedure on the popliteal artery demonstrated excellent outcomes with no residual stenosis or dissection. This successful intervention highlights effective management of the vascular condition, emphasizing the positive impact of the Tentos 4F stent in treating similar vascular disorders.

Tentos 4F



Figures: Blood flow in popliteal and tibial arteries before and after intervention

CLI with significant stenosis in ATA junction

DR. AHMED SAKR
Consultant Vascular Surgeon

PATIENT HISTORY AND SYMPTOMS

A 65-year-old male with a history of Diabetes mellitus (DM), cardiac issues, and a previous percutaneous coronary intervention (PCI) without stents four years ago, currently managed medically. The patient presents with severe polyneuropathy in both lower limbs, post-angioplasty of the right lower limb, lateral 4 toes amputation in the left lower limb, and ischemic wound edges with a small ulcer on the right big and second toe. Dressing done, and the patient scheduled for follow-up in 5 days. Urgent Doppler ultrasound ordered due to critical limb ischemia with gangrene in the right foot 2nd toe.

EXAMINATION: DOPPLER FOR THE PERIPHERAL PART – RIGHT LOWER LIMB ARTERIAL DOPPLER U/S REPORT:

- Mild atherosclerosis with no hemodynamically significant stenosis or vascular occlusion.
- Triphasic waveform observed in CFA, SFA and POP A.
- ATA displays a low monophasic waveform and DPA shows a dampened (venous) waveform.
- PTA exhibits a biphasic waveform.
- Further CT angiography is recommended for detailed assessment.

EXAMINATION: DOPPLER FOR PERIPHERAL ARTERIAL (BOTH LOWER LIMBS): RAD REPORT

- Diffuse atherosclerotic wall disease with multiple calcified plaques and stenotic segments.
- Significant stenosis in the Right ATA Junction, RT DPA, distal lower third Left ATA, and Left Profunda femoris artery junction.
- Increased peak systolic velocity and prolonged end-diastolic blood flow noted.
- LT DPA shows atherosclerotic Intimal Heterogenous calcified plaques with 44% stenosis.

MAIN DIAGNOSIS

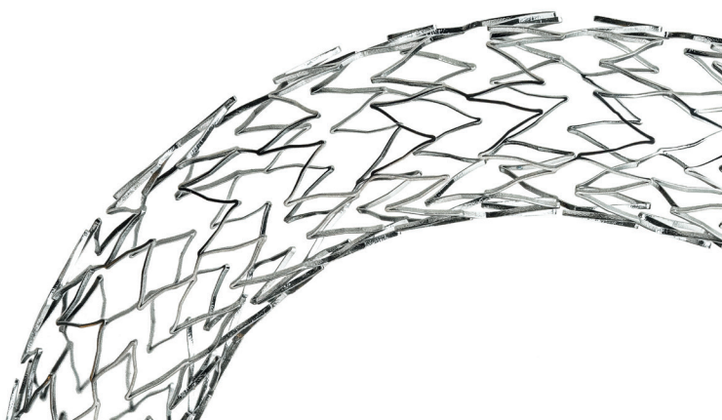
Hemodynamically significant stenosis in the Right ATA Junction caused by calcified plaques, exhibiting Damped Biphasic waveform, PSV = 82 cm/sec.

THERAPY (PROCEDURE)

The right Common Femoral Artery (CFA) was punctured, and a 6F sheath was inserted. Initial angiogram showed normal findings in the Superficial Femoral Artery (SFA) and popliteal artery. A 4F long 45 sheath was inserted up to P2 for a direct angiogram of the Tibioperoneal Trunk (TBT) and Anterior Tibial Artery (ATA). Stenosis and total occlusion were found in ATA and PTA. Antegrade drilling, balloon angioplasty, and Tentos 4F stents deployment (size 3x30 mm for PTA and size 4x40 mm for ATA) were performed, resulting in satisfactory outcomes.

FOLLOW-UP

- Post-procedure duplex scan confirmed stent patency and healthy flow runoff.
- One-week follow-up showed improved Ankle-Brachial Index (ABI) and demarcation of foot gangrene.
- One-month Doppler ultrasound displayed ongoing positive outcomes with patent stent lumen and unimpeded runoff to the foot arch.



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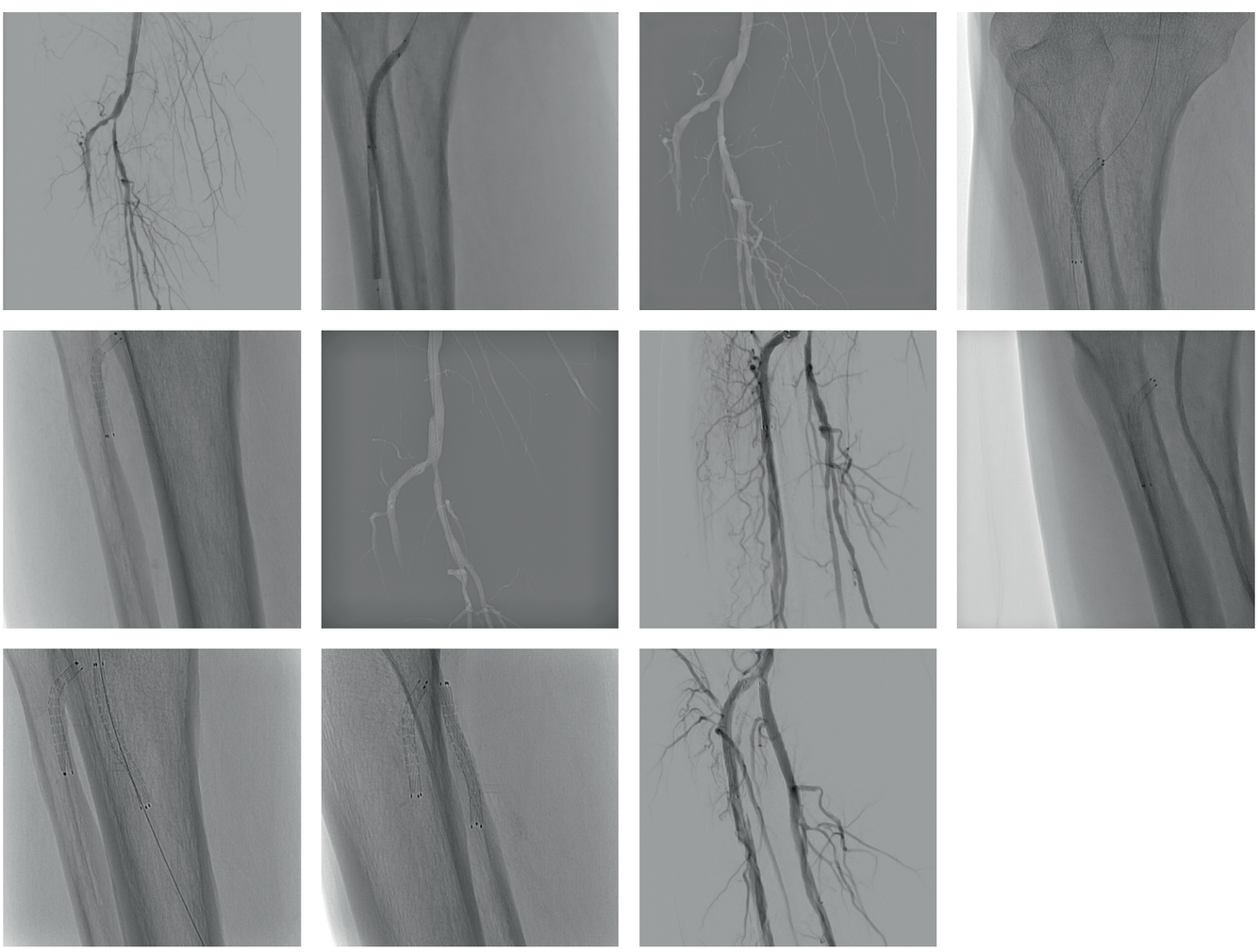
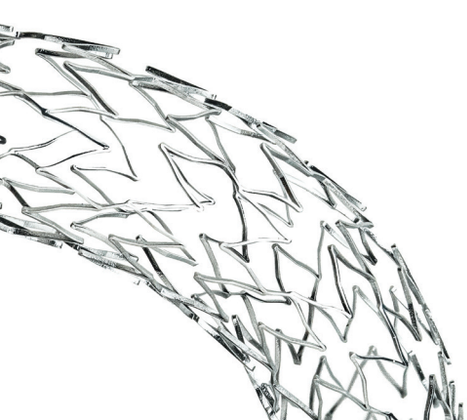
Tentos 4F



Figures: Blood flow before and after treatment with the Tentos 4F in the tibial arteries & tibioperoneal trunk



DVT Management in Young Patient with Targeted Thrombolysis and Stenting

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Consultant Vascular and Endovascular Surgeon
DR. HOUMAN JALAIE
Head of the European Venous Center Aachen-Maastricht

CASE SUMMARY

A 37-year-old female patient presented with a multi-level acute deep vein thrombosis (DVT) of the left lower extremity, reaching up to the inferior vena cava (IVC). The onset of symptoms commenced three days prior to admission. The thrombosis was most likely secondary to May-Thurner Syndrome – an anatomical variant where the left common iliac vein (CIV) is compressed by the right common iliac artery, predisposing the individual to venous thrombosis on the left side (Fig. 1).

The patient's medical history is significant for a missed abortion followed by curettage, noted as occurring two years before her current presentation. Additionally, she has a history of previous venous thrombotic events, including DVT in the lower legs. These prior events point towards a chronic predisposition to thrombosis, which may have been compounded by unrecognized or inadequately managed May-Thurner Syndrome.

Given the patient's history and the acute presentation, an aggressive and targeted therapeutic management plan was initiated, which included EKOS-Lyse therapy and stent placement to address both the immediate thrombotic concerns and the underlying anatomical predisposition contributing to her recurrent thrombotic risk.

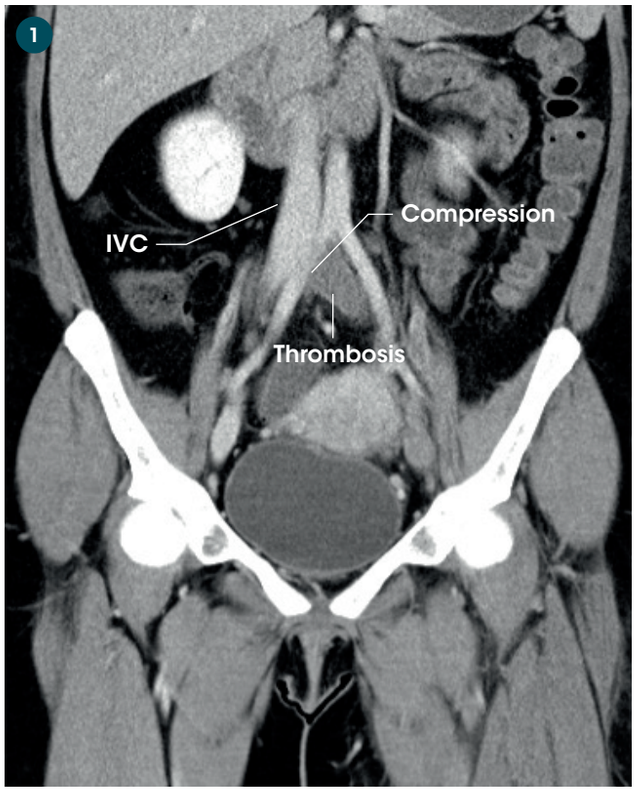

Figure 1: Preoperative CTV showing DVT of left CIV distal to point of maximal compression (May-Thurner point) with patent inferior vena cava (IVC).

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sinus-Obliquus

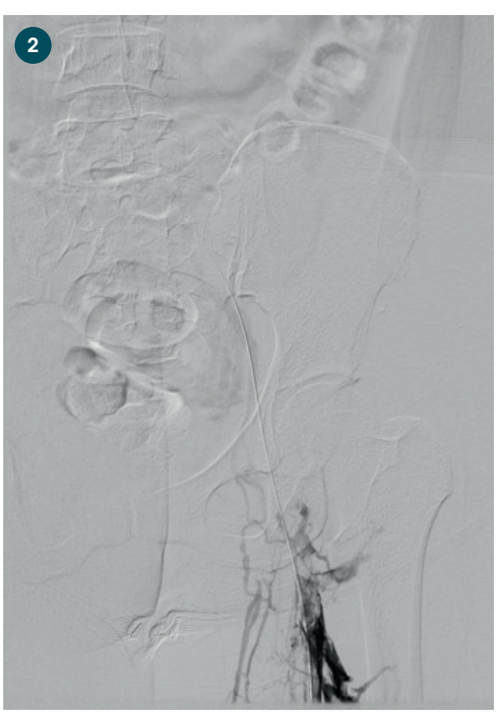
THERAPEUTIC INTERVENTION

Day 0: Initial Procedure

The intervention began with strict adherence to sterile procedures. After administering local anesthesia, an ultrasound-guided antegrade puncture of the left popliteal vein was performed. The thrombosis was navigated using the wire and a 4F Glide catheter. Contrast revealed extensive thrombosis in the femoral and iliac veins (Fig. 2). An EKOS-Lyse catheter was placed from the IVC to the left femoral vein (FV). The thrombolytic therapy initiated according to the institutional protocol, with a follow-up examination scheduled for the next day.

Day 1: Follow-Up and Assessment

Comparative analysis with the previous day's examination showed a completely resolved thrombus in the FV. There was partial resolution of the thrombus in the distal external iliac vein (EIV), but significant residual thrombi remained in the CIV and in the EIV, with notable collateral formation. The recommendation was to continue thrombolytic therapy unchanged, with another control check planned for the next day.



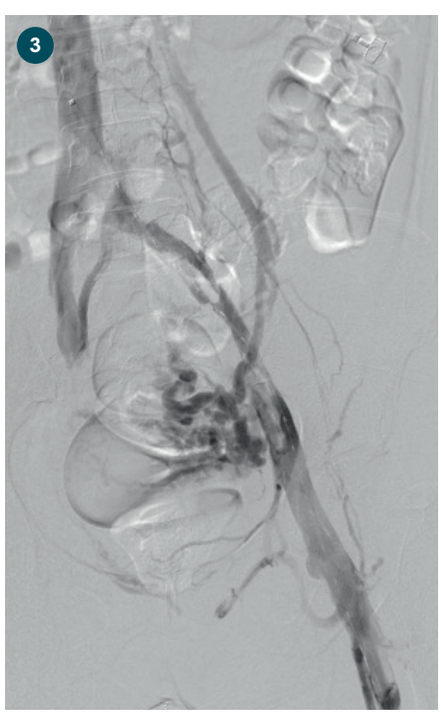


Figure 2: The initial phlebography showing occlusion of left femoroiliac veins
Figure 3: Phlebography after one day showing the reduction of the thrombus burden with significant rest thrombosis in the common iliac vein

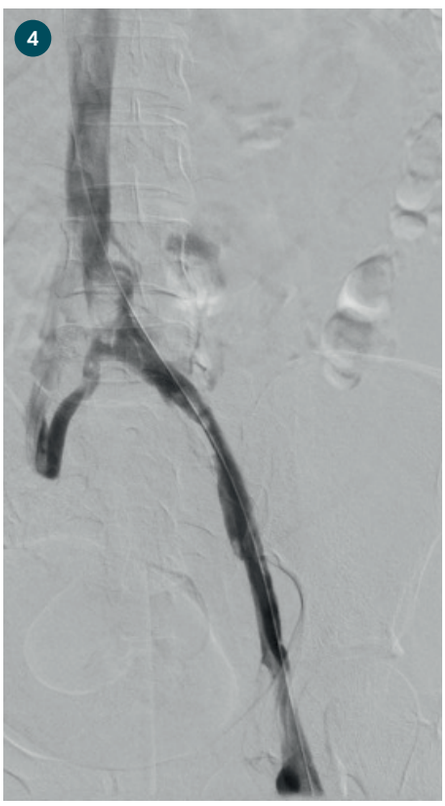
DVT Management in Young Patient with Targeted Thrombolysis and Stenting

DR. MOHAMMAD E. BARBATI
Consultant Vascular and Endovascular Surgeon
DR. HOUMAN JALAIE
Head of the European Venous Center Aachen-Maastricht

Day 2: Secondary Intervention

A follow-up phlebography was performed which demonstrated further regression in thrombus burden but residual adherent thrombi in the CIV, causing moderate to high-grade stenosis, particularly affecting the outflow into the IVC (Fig. 4). The decision was made to proceed with percutaneous transluminal angioplasty (PTA) and stent implantation. After predilation, the stent (sinus-Obliquus 16x100 mm) was implanted in CIV, followed by postdilation of the stent. The final control phlebography showed a good outcome with unrestricted contrast flow centrally (Fig. 5).

It was recommended to initiate overlapping anticoagulation with Clexane twice daily and to transition to Marcumar aiming for a target INR of 2.5 to 3.5.



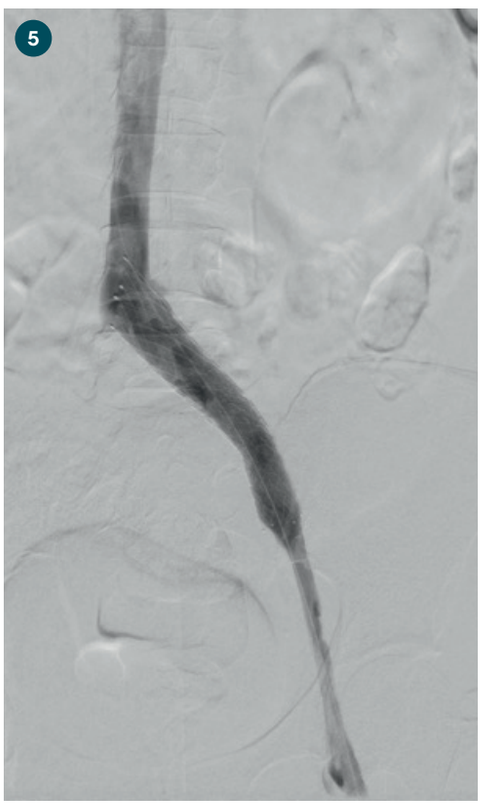


Figure 4: Phlebography after two days showing residual adherent thrombi in the CIV
Figure 5: Final phlebography after stent implantation shows a sufficient restoration of outflow into the IVC

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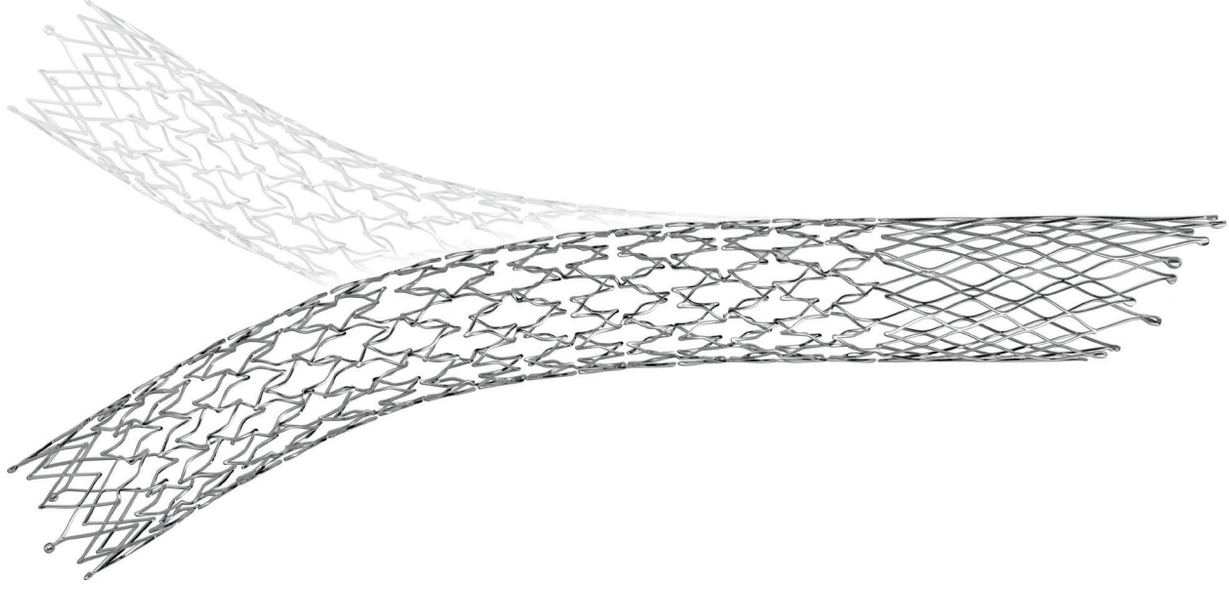
sinus-Obliquus

CONCLUSION

DVT represents a significant risk, particularly in young female patients with predisposing conditions such as May-Thurner Syndrome. In this case, the use of thrombolytic therapy, specifically catheter-directed thrombolysis using an EKOS-Lyse system, was critical in dissolving extensive thrombosis and restoring venous patency. This minimally invasive approach demonstrates the importance of targeted interventions in complex venous disorders.

The persistence of residual stenosis after thrombolysis is not uncommon in severe cases of DVT and can lead to re-thrombosis and chronic venous obstruction if not addressed. Stent implantation following thrombolysis was essential to maintain vessel patency, particularly in areas of intrinsic venous compression, and to prevent re-thrombosis.

This case exemplifies the evolving landscape of DVT management, where a combination of advanced thrombolytic agents and endovascular techniques such as stenting can dramatically improve outcomes for young patients, reducing the long-term complications of post-thrombotic syndrome and improving quality of life.



Chronic iliac thrombosis

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SUMMARY

Female, 22 years old. Left common iliac thrombosis 6 years ago, which he chose to treat clinically due to the patients age, 16 years old at the time. Pain and edema refractory to the use of elastic compression and venotonic drugs. CEAP: 4. Villalta-Score:15
US doppler – Left common iliac vein not visualized with presence of dilated varicose veins in the pelvic region. angioCT (Fig. 1). Left common iliac vein not visualized with presence of intense collateral circulation in the pubic region.

THERAPY

Patient underwent angiography with bilateral common femoral vein access.
We identified an extensive occlusion of the external common iliac vein to the Vena Cava (Fig. 2).
After total recanalization of the iliac vein, angioplasty was performed with a 14x40 mm high-pressure balloon with sinus-Obliquus stent implantation 16x150 mm and 14x100 mm followed by post-ballooning. Final angiography with good result (Fig. 3 and 4).

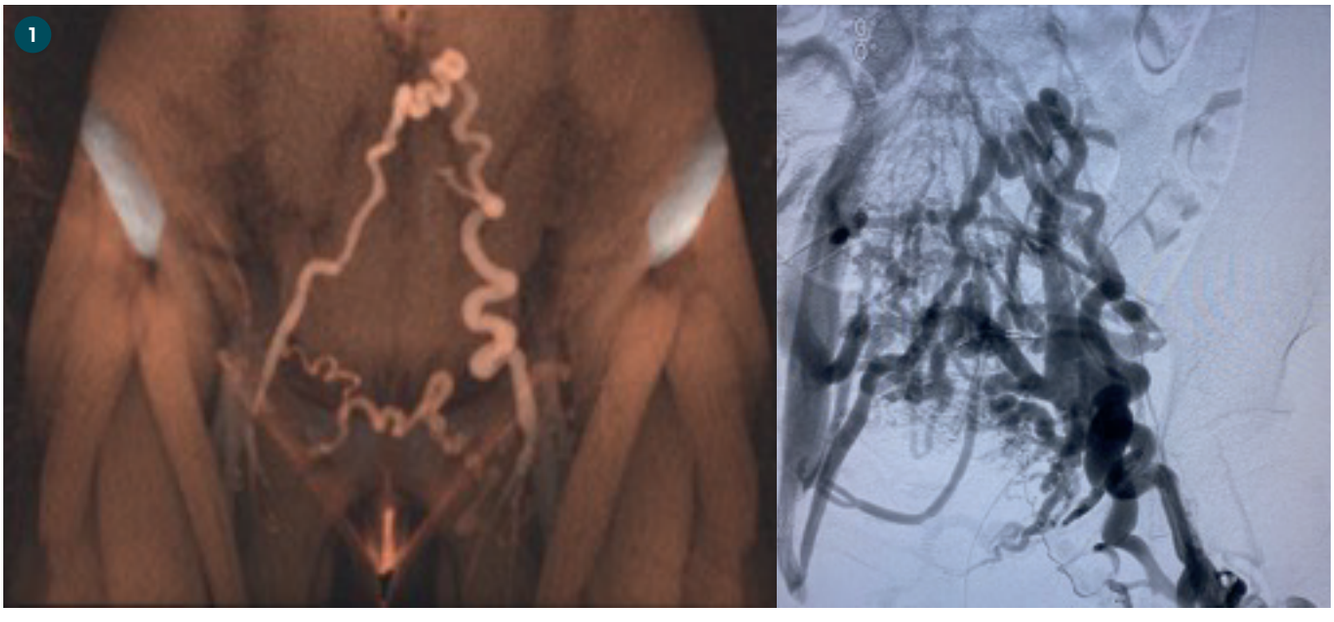

Figure 1: Tomographic reconstruction compared with diagnostic angiography in the presence of atypical varices

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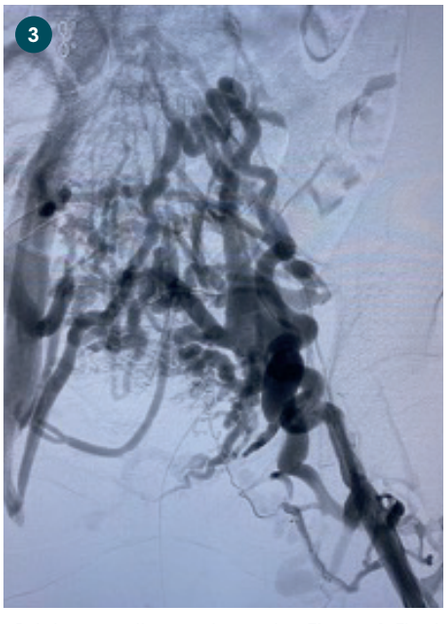
CONCLUSION

The patient was anticoagulated with enoxaparin 1 mg / kg every 12 hours, + clopidogrel 75 mg once a day, and was discharged after 24 hours with rivaroxaban 20 mg and clopidogrel 1 x day. Significant improvement in edema and pain in the lower limbs with disappearance of varicose veins in the pubic region.
After 6 months: Villalta-Score: 6.



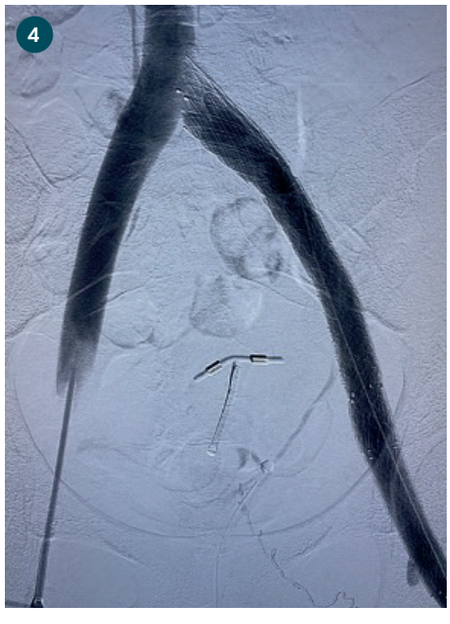


Figure 2: Tomographic reconstruction · **Figure 3:** Intraoperative angiography ·**Figure 4:** Final result with stent implantantion

Thrombosis in acute femoral-iliaca-cava veins

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SUMMARY

Woman, 37 years old. Clinical picture with deep vein thrombosis of the left lower limb and Vena Cava. She maintained refractory pain and edema after using heparin for 24 hours.

Doppler: Deep vein thrombosis of the superficial femoral vein and left common femoral vein.

CT Angio – Deep vein thrombosis in the acute left iliac vein extending to the vena cava (Fig. 1).

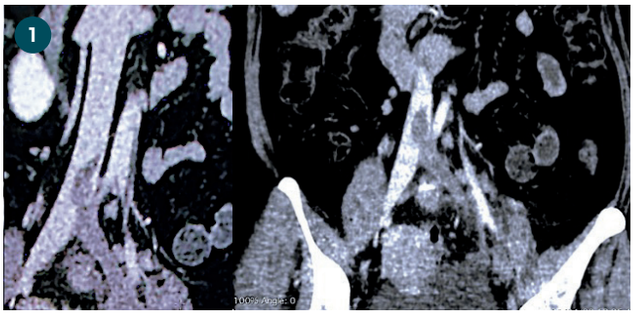


Figure 1: Computed tomography with image of the thrombus in the left common iliac vein and vena cava

THERAPY

The patient underwent angiography with filter implantation in the vena cava with jugular access, placement of an acoustic-chemical thrombolysis catheter maintained for 24 hours in the region of the thrombus in the femoral iliac and cava veins (Fig. 2 and 3).

A new angiography was performed with patency in the femoral iliac-cava vein system and implantation of the 16x100 mm sinus-Obliquus stent on the left followed by ballooning (Fig. 4 – 7).

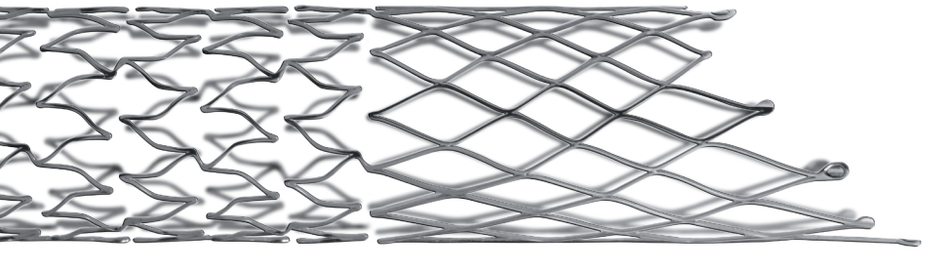
Control angiography with thrombus in the Vena Cava filter with the decision to maintain anticoagulation and follow-up (Fig. 8).

CONCLUSION

The patient was anticoagulated with enoxaparin 1 mg/kg every 12 hours, + clopidogrel 75 mg once a day, and was discharged from hospital on the two days, using rivaroxaban 20 mg and clopidogrel 1 x day.

Significant improvement in edema and pain in the lower limbs.

The Vena Cava filter was rescued after 90 uneventful days.



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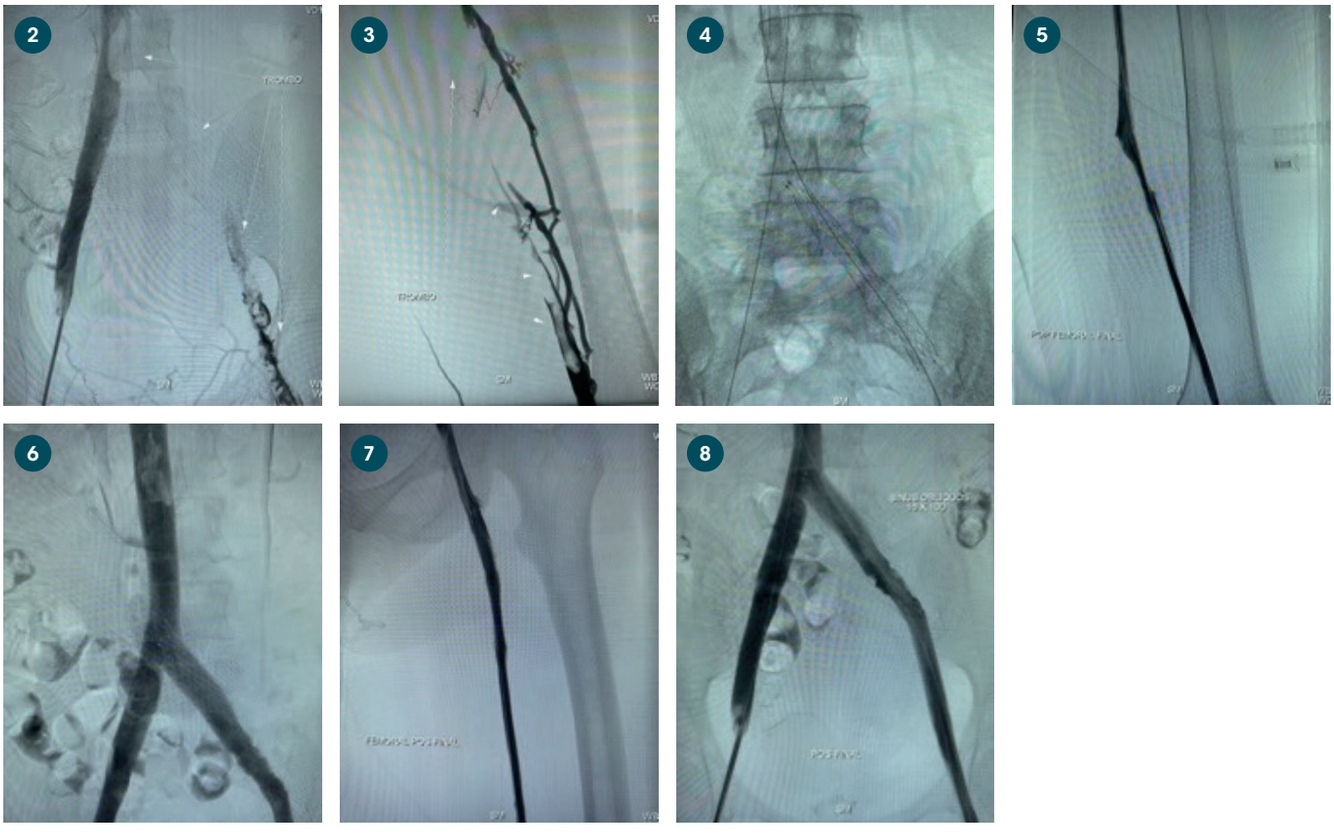

Figure 2: Iliac thrombosis · **Figure 3:** Femoral thrombosis · **Figure 4:** sinus-Obliquus stent implantation · **Figure 5:** Superficial femoral vein after thrombolysis · **Figure 6:** Iliac vein after thrombolysis · **Figure 7:** Post-ballooning stent · **Figure 8:** Thrombus adhered to the filter

Pelvic venous disorder

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CASE SUMMARY

A 43-year-old female presented with a two-year history of severe pelvic pain (VAS 10/10), dyspareunia (VAS 9/10), left lower limb edema, and exacerbated symptoms with orthostasis and physical activity.

Pelvic ultrasound revealed the presence of pelvic varicose veins, along with gonadal and left internal iliac reflux. A subsequent venous NMR angiography confirmed left common iliac vein stenosis, gonadal reflux, and left internal iliac vein reflux (Fig. 1 and 2).

DIAGNOSIS

Symptomatic Pelvic Venous Disorder – Classified as S2, V2, LOVR, LCIVO-NT.

THERAPY

The patient underwent angiography with access through the right common femoral vein (6F x 11cm introducer) and the left with a 10F x 11cm introducer. Utilizing a 0.035" hydrophilic guidewire and Cobra 1 catheter, the left renal and gonadal veins were successfully catheterized.

Angiography, in conjunction with intravascular ultrasound (IVUS) using a Volcano 0.035" catheter, revealed reflux through the left internal iliac vein, compression of the left common iliac vein (70% stenosis), and left gonadal vein reflux with a pelvic reservoir draining through the contralateral common iliac vein (Fig. 3 – 6). Angioplasty was performed using a sinus-Obliquus stent (optimed), 16x100 mm, and an Atlas balloon (BARD) 16x40 mm, resulting in a favorable outcome (Fig. 7).

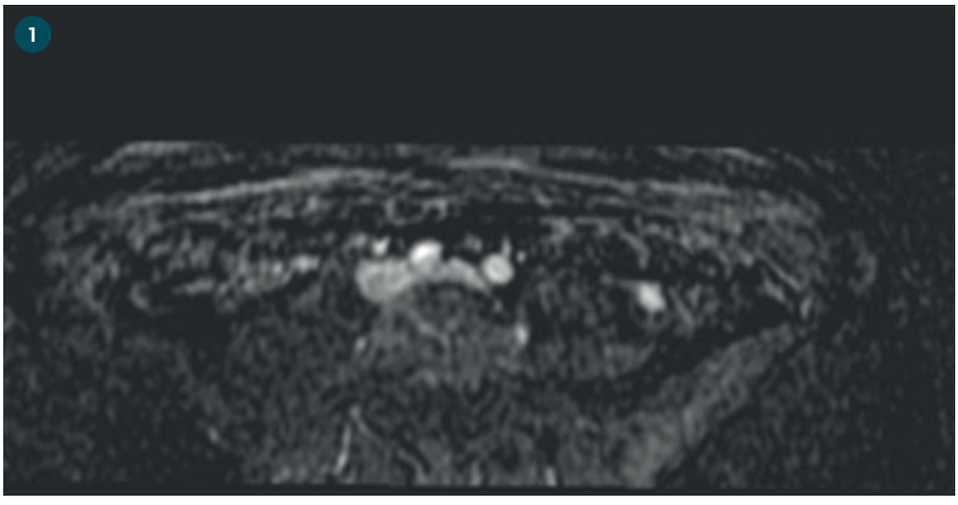

Figure 1: Iliac vein stenosis · **Figure 2:** Left gonadal vein reflux

sinus-Obliquus

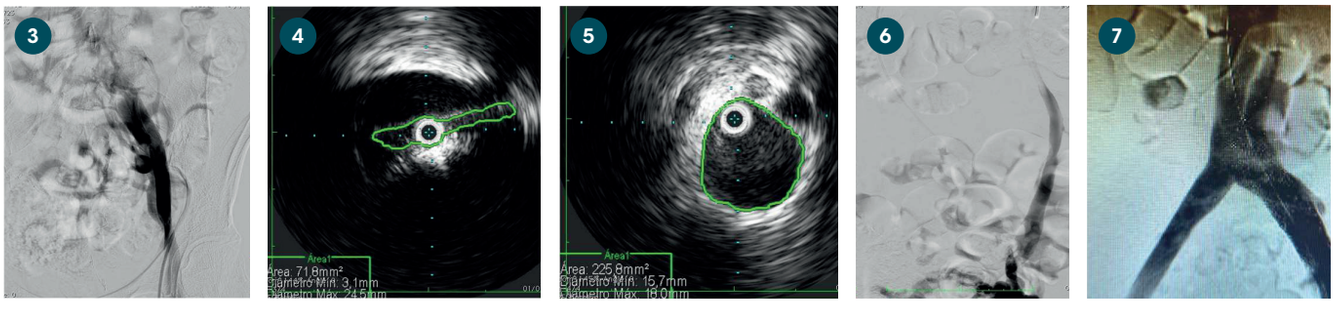

Figure 3: Common iliac vein compression, internal iliac vein reflux · **Figure 4:** IVUS comum iliac vein compression area 71,8 mm² · **Figure 5:** Distal common iliac vein area -225,8 mm² · **Figure 6:** Left gonadal vein reflux · **Figure 7:** Angiography after 16x100 mm sinus-Obliquus stent placement; good apposition, avoiding right iliac vein "entrapment"

FOLLOW-UP

The patient was discharged on the same day as the procedure, prescribed rivaroxaban 20 mg and clopidogrel 75 mg for 30 days. After 30 days, rivaroxaban was discontinued, and 100 mg aspirin was initiated.

At the 3-month follow-up, the patient remained completely asymptomatic. A subsequent two-year follow-up demonstrated continued absence of symptoms, with patent stent confirmed by imaging (Fig. 8 and 9).

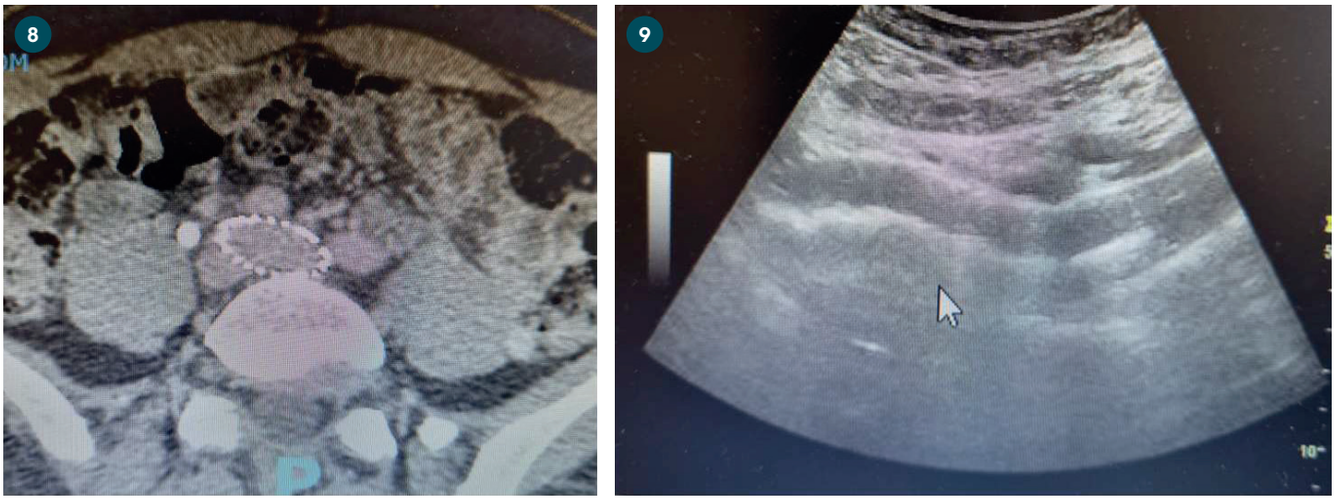

Figure 8: angioCT stent patency and stenosis resolution · **Figure 9:** US: good stent apposition and flexibility

Iliofemoral DVT

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CASE SUMMARY

Patient with a 2-day history of edema and pain in the left lower limb starting from the thigh.
US doppler showed femoral and popliteal vein thrombosis. Patient was admitted and started on anticoagulation with enoxaparin 1mg / kg every 12 hours and rest. We performed abdomen and pelvis angioCT, showing extensive iliac femoral venous thrombosis. Even with anticoagulation and rest, the patient did not show any improvement in symptoms. we recommend pharmacomechanical thrombectomy.

THERAPY

Procedure initiated by implantation of an inferior vena cava filter via right femoral access. By accessing the left popliteal vein, we performed pharmacomechanical thrombectomy with angiojet 6F, first intrathrombo pulse spray with 20 mg of actilyse for 30 minutes followed by mechanical thrombectomy 150 pulses (Fig 2, 3).
After recanalization, we treated the stenosis with angioplasty with a 16x150 mm sinus-Obliquus stent. With great end result.

CONCLUSION

Patient being discharged from hospital on the third day after surgery, with clopidogrel 75 mg and rivaroxaban 20 mg 1 xd. Improvement of pain and edema. 3 years follow up. Stent patent and asymptomatic (Fig 6).

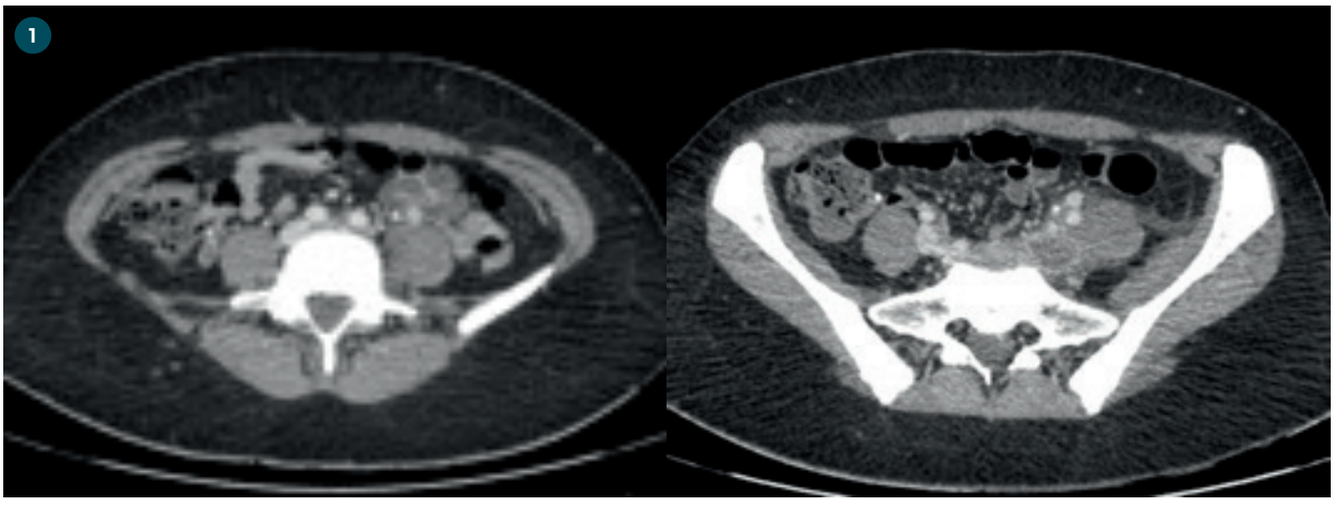

Figure 1: AngioCT showing a severe left iliac vein compression and extensive DVT

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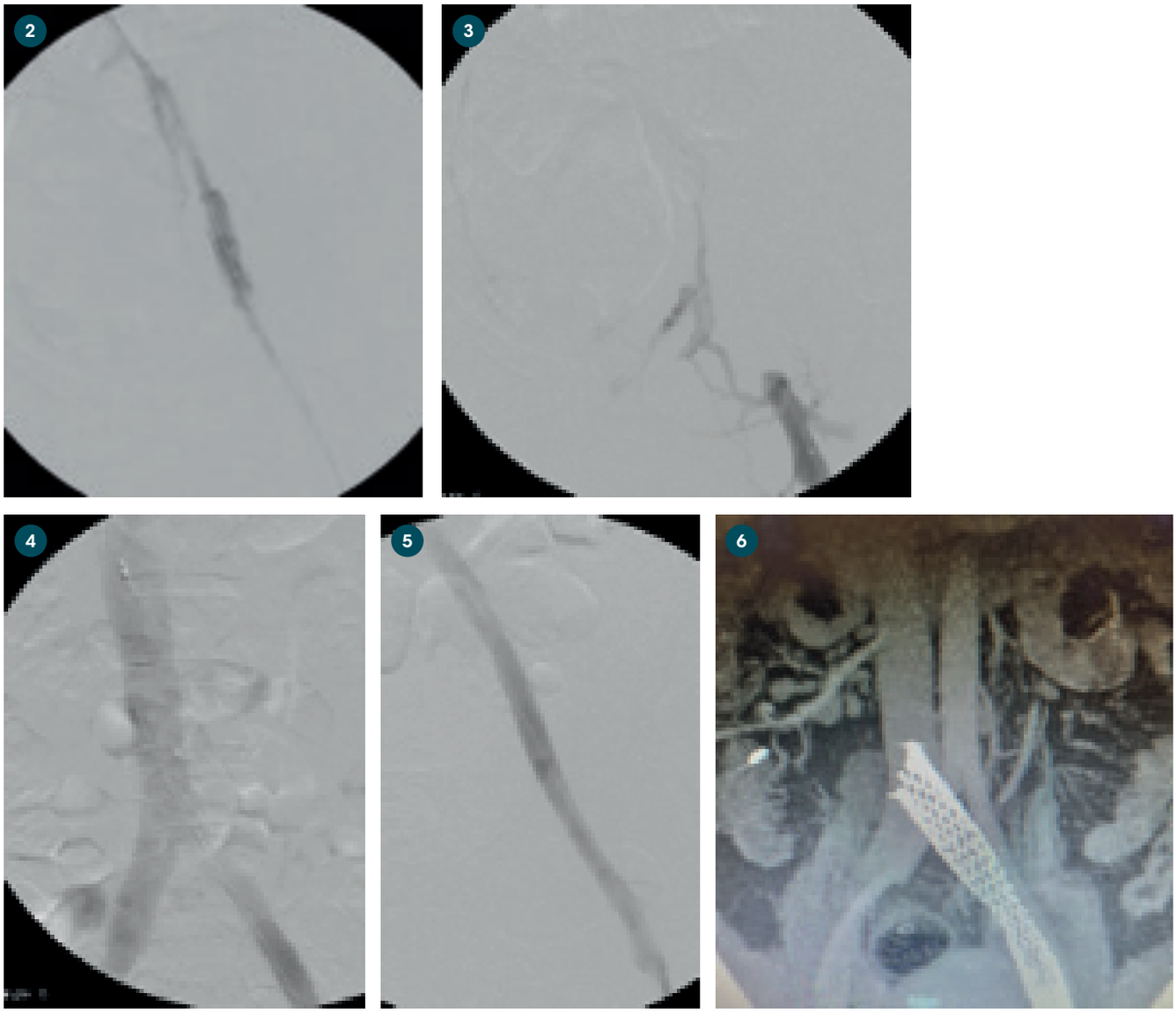

Figure 2: Extensive iliofemoral DVT · **Figure 3:** Performing pharmacomechanic thombectomy
Figure 4 & 5: Final results · **Figure 6:** Control angioCT.

Postthrombotic Syndrome with Chronic Ilio-femoral Venous Obstruction

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DR. HOUMAN JALAIE
Head of the European Venous Center Aachen-Maastricht

CASE SUMMARY

A 25-year-old woman with a medical history of deep vein thrombosis (DVT) presented to our clinic reporting persistent left leg swelling and venous claudication two years post-initial DVT event. She has been under conservative treatment since the occurrence of DVT; however, this has not alleviated her symptoms. Given the patient's ongoing symptoms conservative management alone proved insufficient. The decision was made to consider venous recanalization and stent implantation.

DIAGNOSTIC ASSESSMENT

Vascular imaging studies revealed patency in the femoral vein (FV) and the deep femoral vein (DFV) but identified a chronic occlusion of the left common femoral vein (CFV) (Fig. 1) and iliac veins, which is responsible for the patient's symptoms due to the disruption of normal venous return from the lower extremity.

THERAPEUTIC INTERVENTION

The procedure was performed under general anesthesia and throughout the surgery, anticoagulation was maintained with heparin to keep the activated clotting time (ACT) over 200 seconds. Initially, a sonographically-guided puncture was made into the FV in the distal part of the left thigh. Following this, a phlebography was conducted, revealing the occlusion of the entire left iliac veins as well as parts of the CFV (Fig. 2). Subsequently, the femoro-iliac revascularization was performed. This involved a pre-dilatation followed by the implantation of a total of three stents. A 16x100 mm sinus-Obliquus stent was placed in the common iliac vein (CIV), extending through the May-Thurner point into the external iliac vein (EIV) (Fig. 3a). The stent was then extended by implanting two additional sinus-Venous stents (14x80 mm and 14x120 mm) (Fig. 3b and 3c), ensuring that the distal stent was positioned at the confluence of the femoral vein (Fig. 3). After the stents were in place, they underwent post-dilatation to ensure they were fully expanded and in the correct position. Control phlebography (Fig. 4) and intravascular ultrasound (IVUS) were performed, confirming a proper and prompt flow of contrast me-

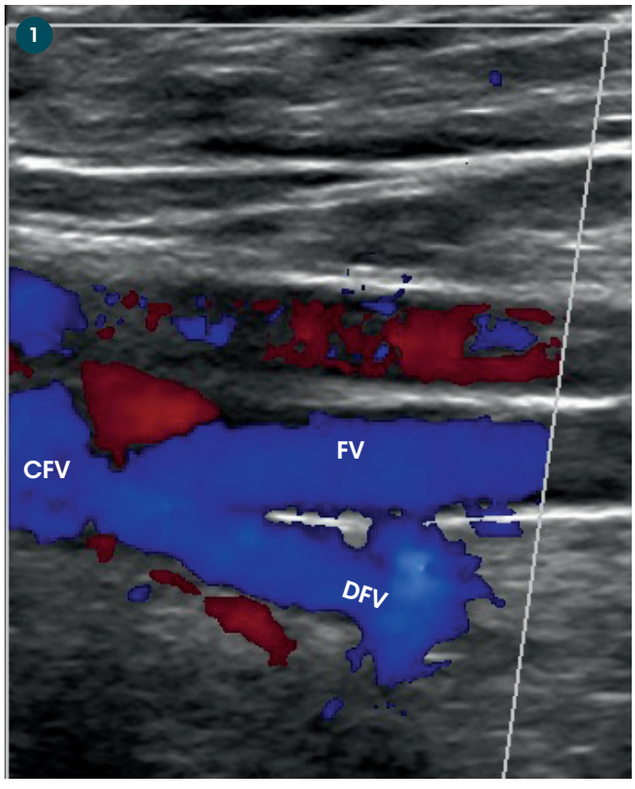

Figure 1: Preoperative duplex-ultrasound showing good inflow over patent femoral vein (FV) and deep femoral vein (DFV) draining into postthrombotic common femoral vein (CFV).

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sinus-Obliquus sinus-Venous

dia without any significant residual stenosis or collateral veins. After the procedure, the endovascular tools were removed, and pressure was applied to the puncture site to prevent bleeding. A compression bandage was then applied. The operation was concluded successfully.

POSTOPERATIVE MANAGEMENT

The patient will require close follow-up (before discharge, after 2 weeks, 3 months, 6 months and yearly thereafter) to monitor the outcomes of stenting and to check the geometry of the stent in long term (Fig. 5). Compression therapy and therapeutic anticoagulation management remain a cornerstone of treatment to prevent further thrombotic events and to reduce the risk of stent occlusion.

CONCLUSION

The careful placement of a series of stents from healthy-to-healthy segment, specifically addressing the May-Thurner point, has resulted in the successful recanalization of the occluded veins. The observed reduction of collateral veins post-intervention is a significant indicator of the restored venous flow and proper functioning of the stents.

The strategic intervention not only alleviated the patient's debilitating symptoms but also sets a foundation for a sustained improvement in her quality of life. Ongoing follow-up and management with compression therapy and anticoagulation treatment are crucial to ensuring the long-term patency of the stents and preventing future thrombotic events.

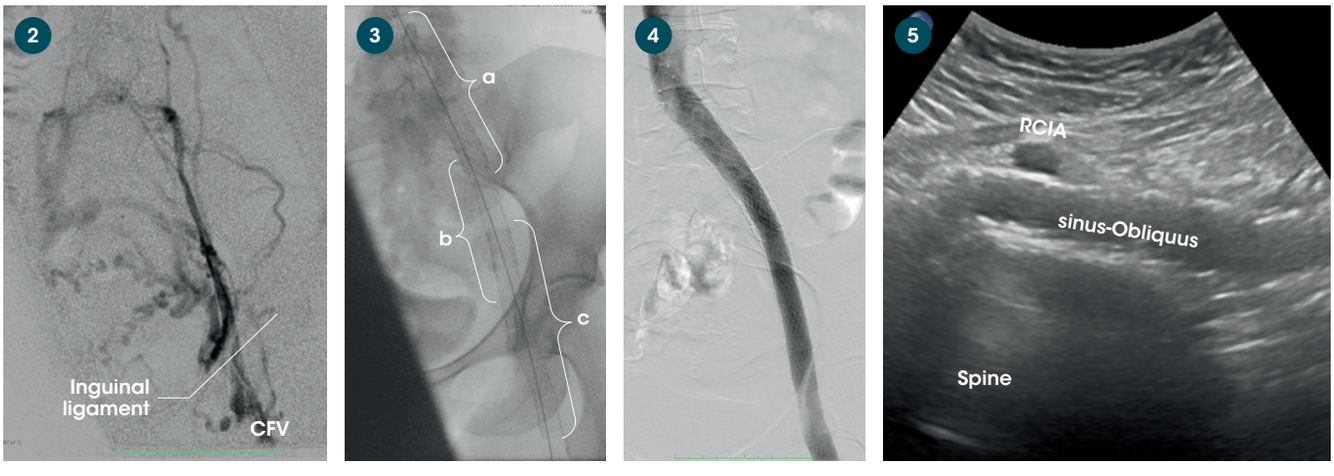

Figure 2: Intraoperative phlebography showing occluded common femoral vein (CFV) and left iliac veins with extensive collateral pelvic veins **Figure 3:** Fluoroscopy after stent implantation showing the position of stents (a: 16x100 mm sinus-Obliquus stent, b: 14x80 mm sinus-Venous stent and c: 14x120 mm sinus-Venous stent) · **Figure 4:** Final phlebography shows the prompt flow of the contrast medium over stents without any visible pelvic collateral veins · **Figure 5:** Duplex-Ultrasound before discharge shows the correct position of the sinus-Obliquus stent keeping the left common iliac vein open at May-Thurner point between right common iliac artery (RCIA) and spine

PRECISION IN INTERVENTIONAL TREATMENT OF PTS:

The Role of Preoperative Imaging and Intraoperative Verification

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CASE SUMMARY

A 57-year-old patient presented with a severe case of post-thrombotic syndrome (PTS) in the left leg secondary to a previous femoroiliacal deep vein thrombosis (DVT) from 2013. The patient had no family history of thrombophilia and was on oral anticoagulation therapy. Additional medical history included arterial hypertension and macular degeneration.

During the outpatient assessment for secondary varicosity and PTS of the left leg, the clinical examination revealed a C4 situation with venous claudication and a Villalta scale score of 18. Despite the use of class II compression stockings and oral anticoagulation, the patient experienced significant mobility impairment due to leg swelling and heaviness.

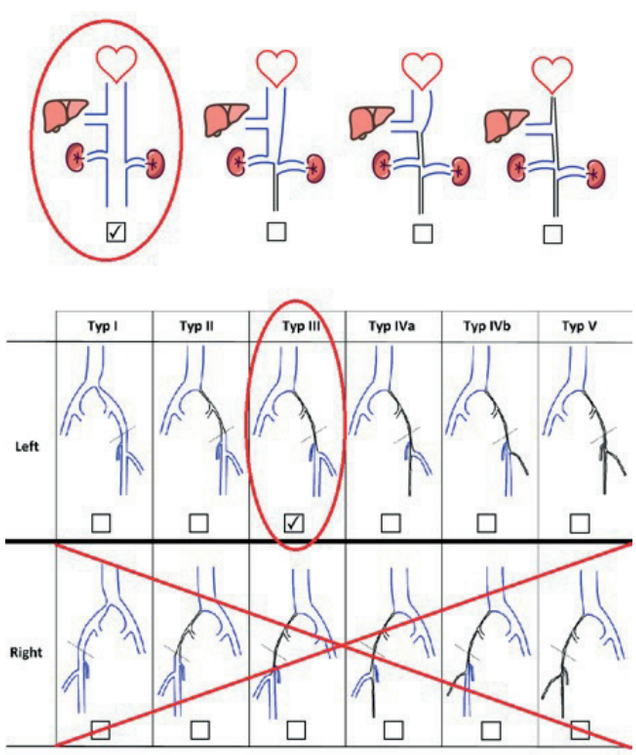

Figure 1: Preoperative venous map of the patient based on duplex-ultrasound and MRV

Duplex ultrasonography and MRV showed a patent and well-perfused inferior vena cava (IVC). However, the left common and external iliac veins were completely occluded and post-thrombotically scarred. The left common femoral vein (CFV) was partially occluded, being up to 30% patent. The left femoral vein (FV) and profunda femoris vein (PFV) were open and compressible (Fig. 1)

After thorough discussion with the patient, the indication for interventional therapy in the form of venous recanalization and stent implantation was given.

OPERATIVE PROCEDURE

The operation performed under general anesthesia and began with a duplex ultrasonography-guided puncture of the left middle FV. A bolus of 5,000 IU of Heparin was administered intravenously, and activated clotting time (ACT) over 200 was maintained throughout the procedure.

Phlebography confirmed post-thrombotic obstructions in the femoroiliac veins (Fig. 2). After successful antegrade recanalization, the iliac veins and proximal CFV were dilated to 16 mm (iliac) and 14 mm (femoroiliac) using high-pressure balloons. Phlebography (Fig. 3) and intravascular ultrasound (IVUS) were utilized to mark the iliocaval junction, followed by stent implantation into the common iliac and external iliac veins using a sinus-Obliquus 16x150 mm stent. After post-dilation, a sinus-Venous 14x150 mm stent was then placed, with its distal end positioned just above the femoral confluence. The final angiography demonstrated adequate

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sinus-Obliquus sinus-Venous

stenting from healthy to healthy segment and vanishing the collaterals (Fig. 4). Additional fluoroscopy in anteroposterior (AP) and lateral view confirmed the proper geometry of stents without deformity or fracture (Fig. 5). The procedure concluded with the application of sterile plasters and class II compression stockings.

CONCLUSION

The successful interventional management of PTS in this 57-year-old patient underscores the critical role of preoperative evaluation and precise intraoperative imaging techniques. The preoperative duplex ultrasonography and MRV played a pivotal role in mapping the venous inflow, confirming the patency of the IVC, and revealing the extent of occlusion and scarring in the CFV. This comprehensive venous mapping was instrumental in planning the strategic approach for the venous recanalization and stent placement.

Intraoperatively, the utilization of phlebography and intravascular ultrasound (IVUS) were invaluable for real-time visualization of the vascular anatomy and for guiding the accurate placement of stents at the iliocaval junction. The use of these imaging modalities ensured that stent placement was precise, optimizing the chances for restoring adequate venous return and avoiding the jailing of right CIV.

The final checks of the stents' geometry with both IVUS and additional fluoroscopic images in AP and lateral views were crucial steps to confirm the absence of stent deformity or fracture. This verification process helps in predicting the long-term patency of the stents and reduces the likelihood of postoperative complications, such as stent thrombosis.

This case demonstrates the importance of these practices and supports their continued use as standard procedures in the interventional treatment of PTS.

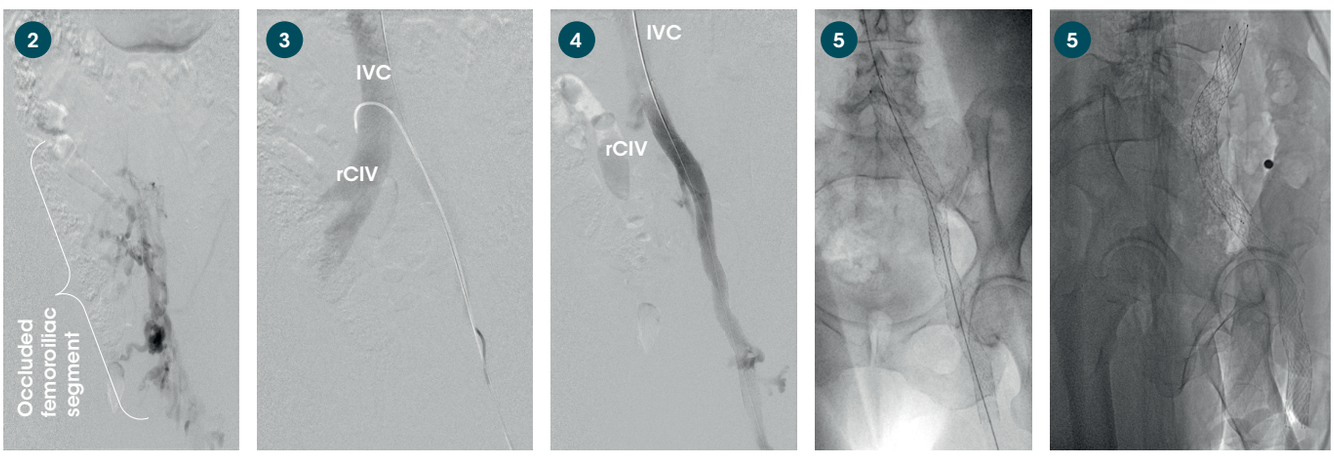

Figure 2: Intraoperative phlebography showing occluded common femoral vein (CFV) and left iliac veins with extensive collateral pelvic veins · **Figure 3:** A cross-over phlebography starting from the right common iliac vein (rCIV) showing inferior vena cava (IVC) and iliocaval confluence · **Figure 4:** Final phlebography shows the prompt flow of the contrast medium over stents without any visible pelvic collateral veins or jailing the right common iliac vein (rCIV) · **Figure 5:** Final geometry check of the stents via anteroposterior (left image) and lateral view (right image) showing proper shape of the implanted stents

External iliac vein stenosis

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SUMMARY

Patient underwent Vena Cava and iliac angioplasty 8 years ago due to post-thrombotic occlusion and chronic venous insufficiency of the lower limbs CEAP 6 (Fig. 1). Currently with a healed ulcer.
Patient progressed with worsening pain and edema of the right lower limb. Doppler US identified significant stenosis in the external iliac/common femoral vein. We opted for angiography.

THERAPY

Angiography of the femoral, iliac and cava veins, we identified severe stenosis of 90% of the right external iliac/femoral vein (Fig. 2 and 3).
We performed angioplasty with a 14x80 mm sinus-Venous stent, crossing the inguinal ligament and 14x40 mm high pressure balloon, with good final results (Fig. 4 and 5).

CONCLUSION

Patient was discharged from hospital on the second day, receiving rivaroxaban and clopidogrel.
Improvement of symptoms. 6 months of follow-up with patent stent and no fracture.

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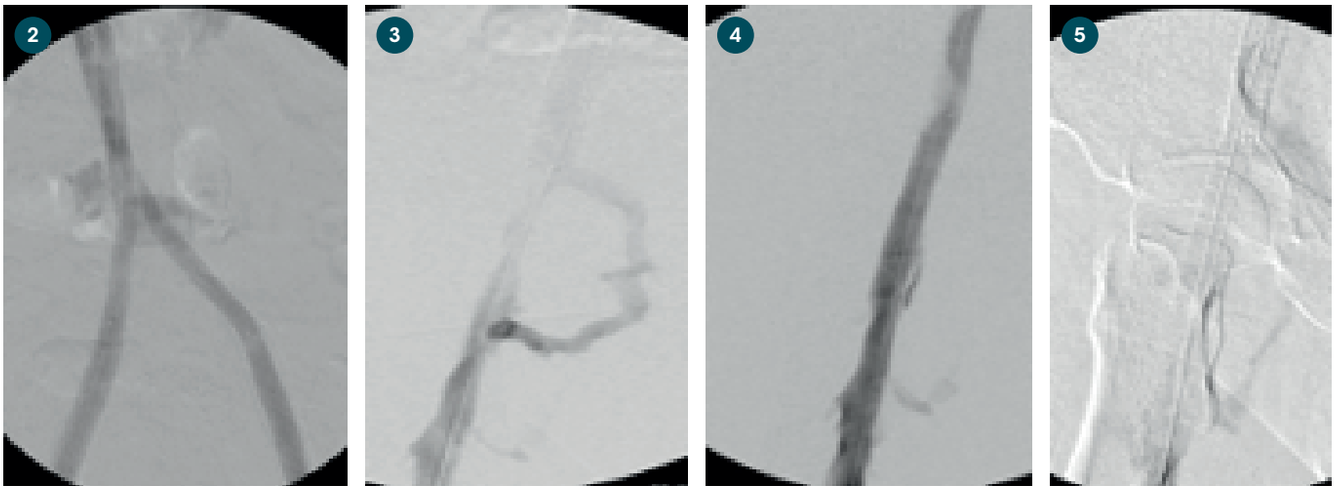
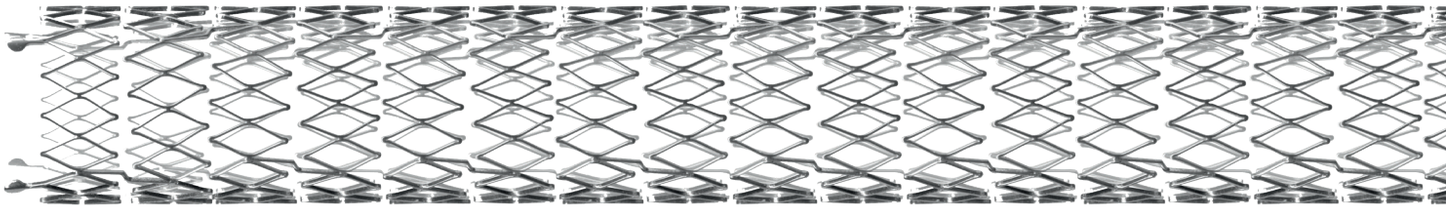


Figure 2: iliocaval angiography · **Figure 3:** external iliac vein stenosis, just below the stent
Figure 4 & 5: final result. Stent crossing the inguinal ligament



Extensive iliocaval occlusion

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SUMMARY

Male, 40 years old. Multiple episodes of deep venous thrombosis of the lower limbs. Pain and edema. refractory to the use of elastic compression and venotonic drugs.
-CEAP 4B. Villalta-Score:16
US doppler – cava and common iliac veins not visualized.
angioCT – extensive iliocaval occlusion (Fig. 1) .

THERAPY

He underwent angiography. Accesses: right jugular and bilateral common femoral vein.
We identified an extensive occlusion of the common iliac and cava up to the retrohepatic segment (Fig. 2). After caval and iliac recanalization, we performed angioplasty with a 20x40 mm and 14x40 mm (iliac veins) high pressure balloon with implantation of sinus-Venous stent in the Vena Cava and kissing sinus-Venous stent 14x120 mm on the right and 14x150 mm on the left (Fig. 3 and 4). Final angiography with good result (Fig. 5).

CONCLUSION

Patient progresses with improvement in upper limb edema and no changes during hemodialysis, 2-year follow-up with Doppler US without changes.

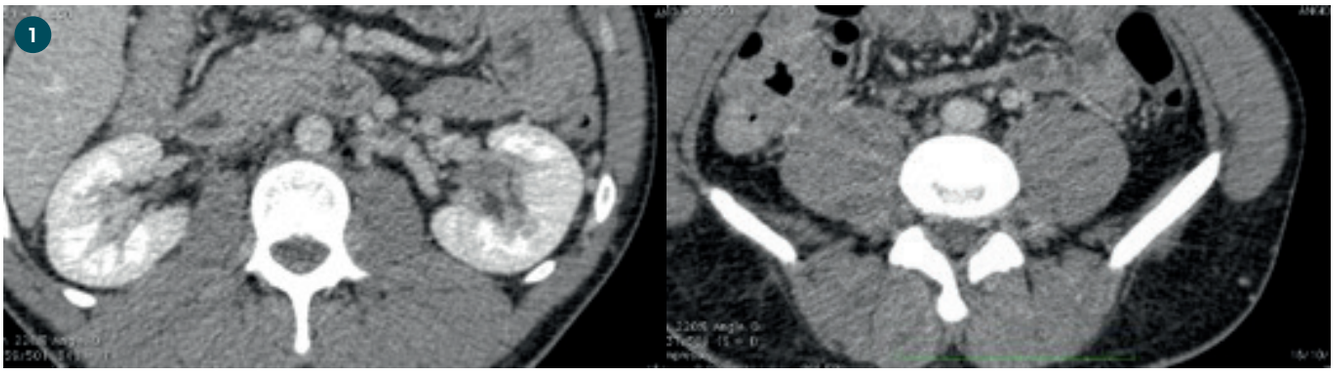

Figure 1: extensive chronic iliocaval occlusion

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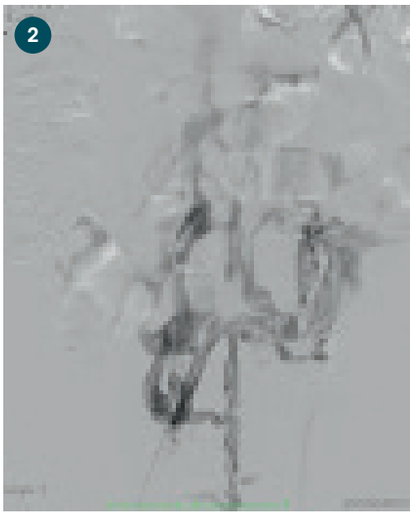
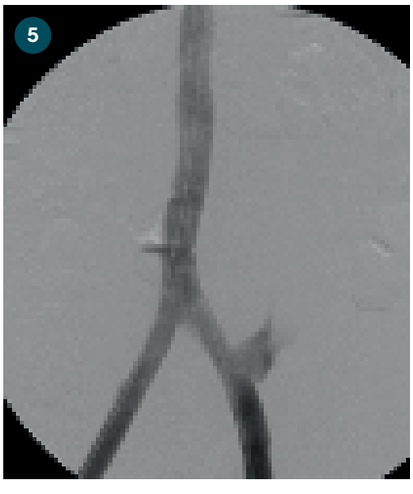
sinus-Venous





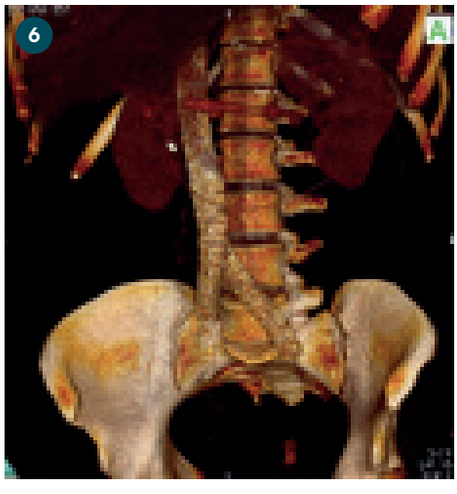


Figure 2: Extensive cava occlusion · **Figure 3:** Recanalization and balloon angioplasty **Figure 4:** Cava stent (sinus-Venous), plus kissing stents (sinus-Venous 14x120 mm / 14x150 mm) · **Figure 5:** Final result · **Figure 6:** AngioCT – 3D reconstruction showing stents layout

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