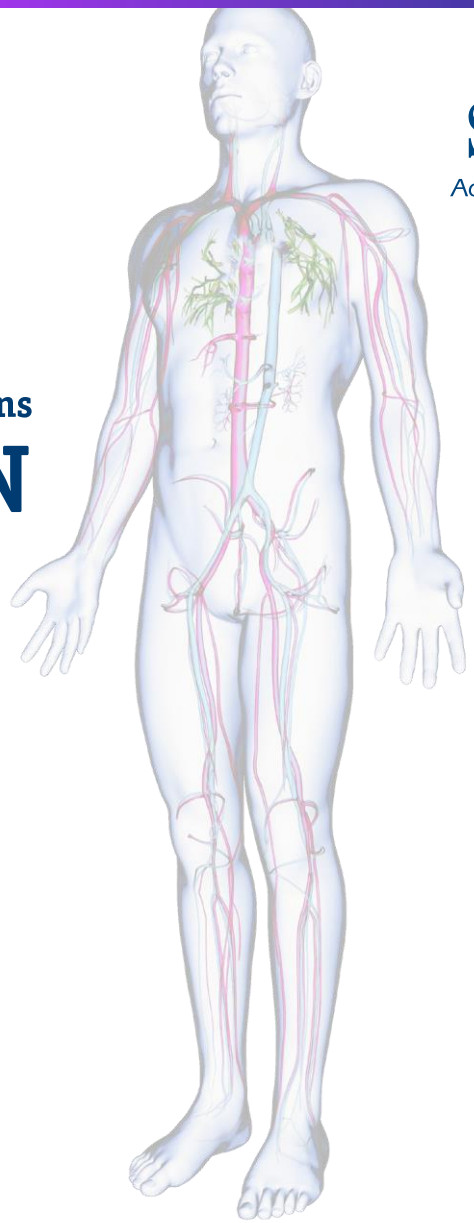
OPTICROSS™ 18 & 35
Peripheral Imaging Catheters

Boston Scientific
Advancing science for life™

Advanced IVUS Peripheral Imaging Solutions

CASE COLLECTION



- A NEW depth of **insight**
- A NEW range of **flexibility**
- A NEW level of **clarity**

DISCOVER A New Depth of **Insight**. A New Level of **Clarity**.

Advanced IVUS Peripheral Imaging Solutions | Case Collection

Mr Taha Khan
Consultant Vascular Surgeon,
Guy's and St Thomas' NHS
Foundation Trust, London, UK

Dr Arun Kumarasamy
Interventional Radiologist,
Krankenhaus Sachsenhausen,
Frankfurt, Germany

Dr Rutger Brans
Interventional Radiologist,
Maastricht University Medical Center,
Maastricht, The Netherlands

Results from case studies are not necessarily predictive of results in other cases. Results in other cases may vary.

A New Depth of **Insight.** A New Level of **Clarity.**

ATA: Anterior tibial artery
Afib: Atrial fibrillation
ATP: Arteria tibialis posterior
CVD: Chronic venous disease

IVUS: Intra-vascular Ultrasound
PAD: Peripheral arterial disease
SFA: Superficial femoral artery

Acute left subclavian arterial occlusion – thoracic outlet syndrome

Mr Taha Khan, Consultant Vascular & Endovascular Surgeon, Guy's and St Thomas' NHS Foundation Trust, London, UK

PRESENTATION VIEW IMAGING >

- 52-year-old male right-handed baker
- No previous illness and no regular medication
- Five-day history of left upper-limb forearm discomfort and fatigue
- On examination:
  - Absence of left upper-limb pulses
  - Pallor
  - Sensation intact (power 4/5)

TREATMENT

- The morning after admission, operative intervention involving:
  - Left 1st rib resection
  - Left brachial embolectomy
  - Left subclavian and upper-limb angiogram
  - Left subclavian and upper-limb IVUS
  - Left subclavian artery stenting and angioplasty
- IVUS enabled:
  - Recognition of residual subclavian artery stenosis and thrombus
  - Identification of the segment of the subclavian artery requiring treatment with a stent

OUTCOME VIEW IMAGING >

- Left upper-limb pulse palpable immediately after the procedure

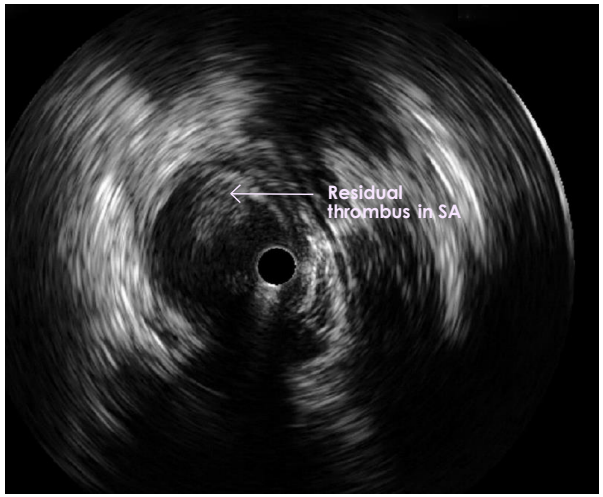
CONCLUSION

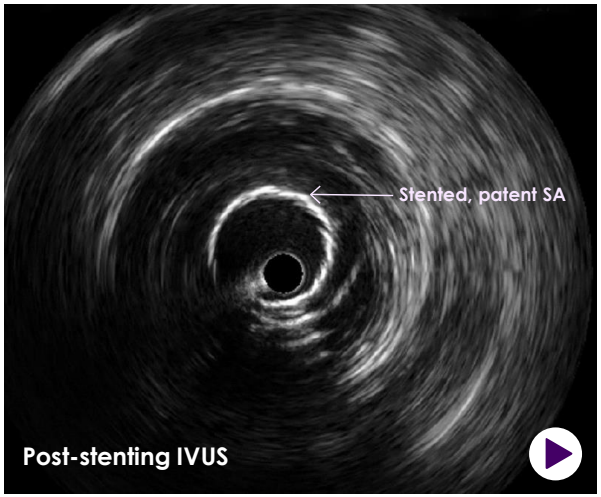
- IVUS enabled early identification of residual intraarterial disease which may have been ambiguous on DSA alone

RATIONALE FOR IVUS

- IVUS in combination with angiography has greater sensitivity for **identifying residual disease**
- In this case, IVUS demonstrated residual stenosis and thrombosis despite surgical intervention and therefore **supported the need for subclavian artery stenting**

ENLARGE IVUS IMAGES >



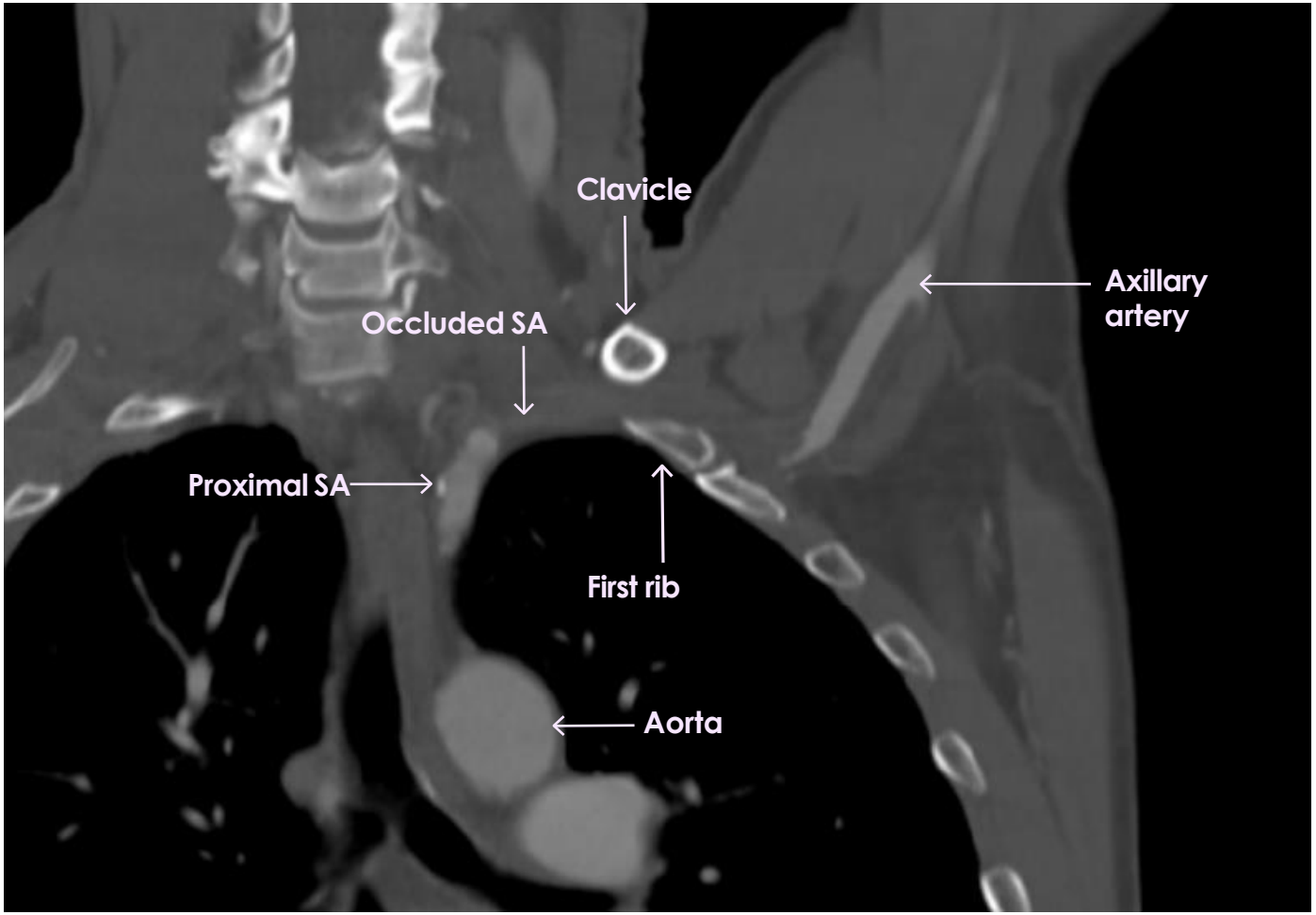


DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
SA: Subclavian artery

Acute left subclavian arterial occlusion – thoracic outlet syndrome

Mr Taha Khan, Consultant Vascular & Endovascular Surgeon, Guy's and St Thomas' NHS Foundation Trust, London, UK

PRESENTATION



DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
SA: Subclavian artery

Acute left subclavian arterial occlusion – thoracic outlet syndrome

Mr Taha Khan, Consultant Vascular & Endovascular Surgeon, Guy's and St Thomas' NHS Foundation Trust, London, UK

OUTCOME

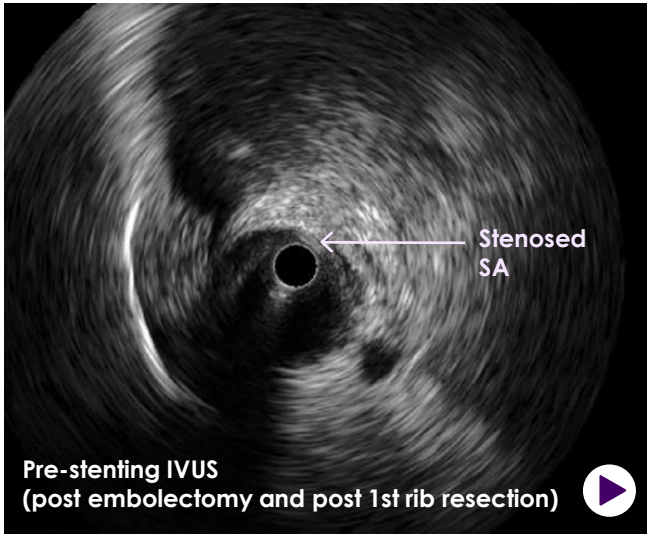
Post balloon-expandable endoprosthesis stent 8mm x 5mm

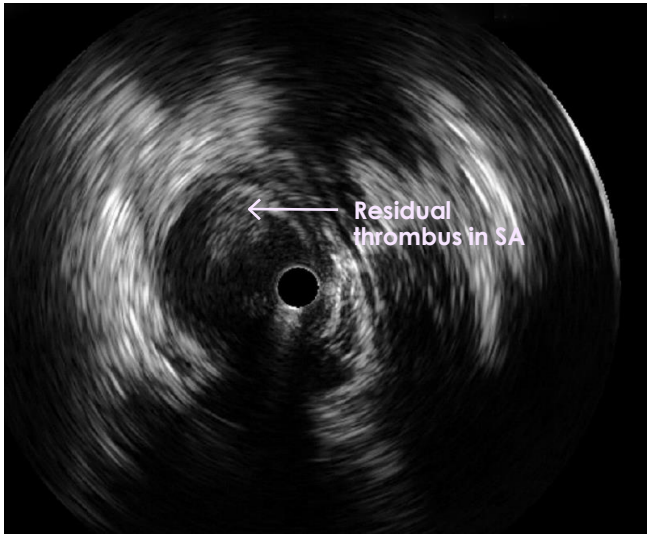
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
SA: Subclavian artery

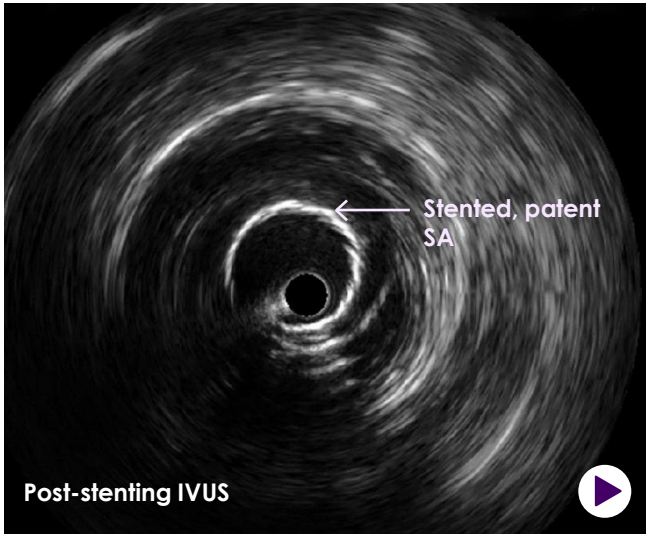
Acute left subclavian arterial occlusion – thoracic outlet syndrome

Mr Taha Khan, Consultant Vascular & Endovascular Surgeon, Guy's and St Thomas' NHS Foundation Trust, London, UK

IVUS IMAGES







DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
SA: Subclavian artery

Lower-limb claudication due to iliac atherosclerosis

Mr Taha Khan, Consultant Vascular & Endovascular Surgeon, Guy's and St Thomas' NHS Foundation Trust, London, UK

PRESENTATION

VIEW IMAGING >

- 80-year-old male
- Bilateral lower-limb claudication (left worse than right)
- **Medical history:**
  - Current smoker
  - Coronary artery bypass 2016
  - Right external iliac and superficial femoral artery angioplasty 2011
  - Known 5.1cm asymptomatic abdominal aortic aneurysm (AAA)
- **Drug history:**
  - Aspirin
  - Atorvastatin
  - Ramipril
  - Lansoprazole
  - Bisoprolol

TREATMENT

Therapeutic dilemma:

- **Option 1:** Treat peripheral arterial disease (PAD) alone (left CFA endarterectomy and left Iliac stenting)
- **Option 2:** Treat PAD and aortic aneurysm (endovascular repair)
- **Treatment of choice:** Left CFA endarterectomy and left iliac stenting, chosen for two reasons:
  1. AAA was sub-threshold
  2. Patient had significant comorbidities as a result of PAD

OUTCOME

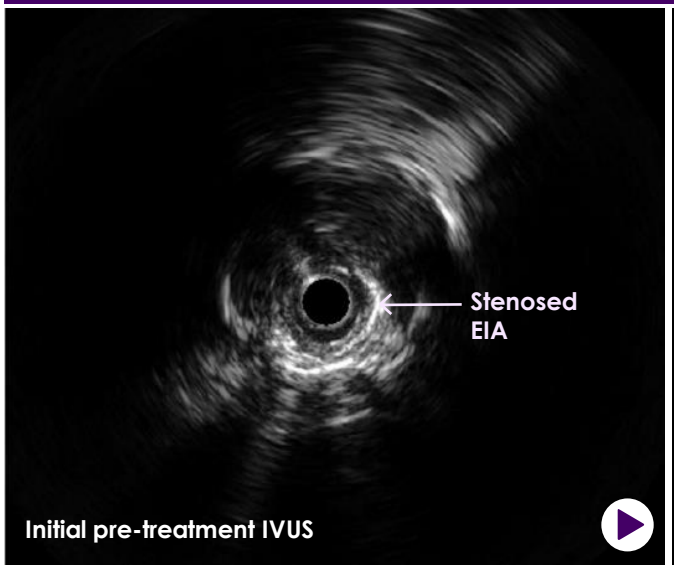
VIEW IMAGING >

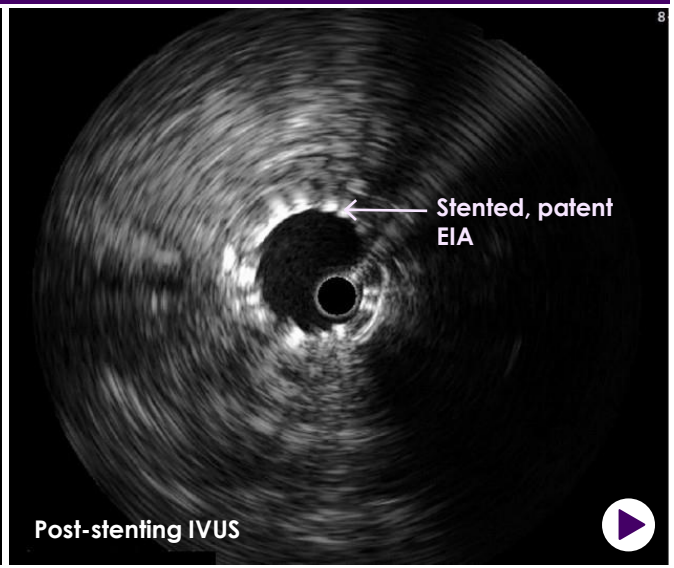
- Palpable left pedal pulses
- Claudication resolved
- Patient is now able to walk for 0.5 mile (0.8 km) before his mobility is restricted by fatigue
- Atorvastatin continued
- Secondary prevention with dual antiplatelet therapy for six weeks and then Clopidogrel 75mg once a day

CONCLUSION

- IVUS enabled accurate recognition of the diseased left iliac segments despite challenges with DSA

ENLARGE IVUS IMAGES >





RATIONALE FOR IVUS

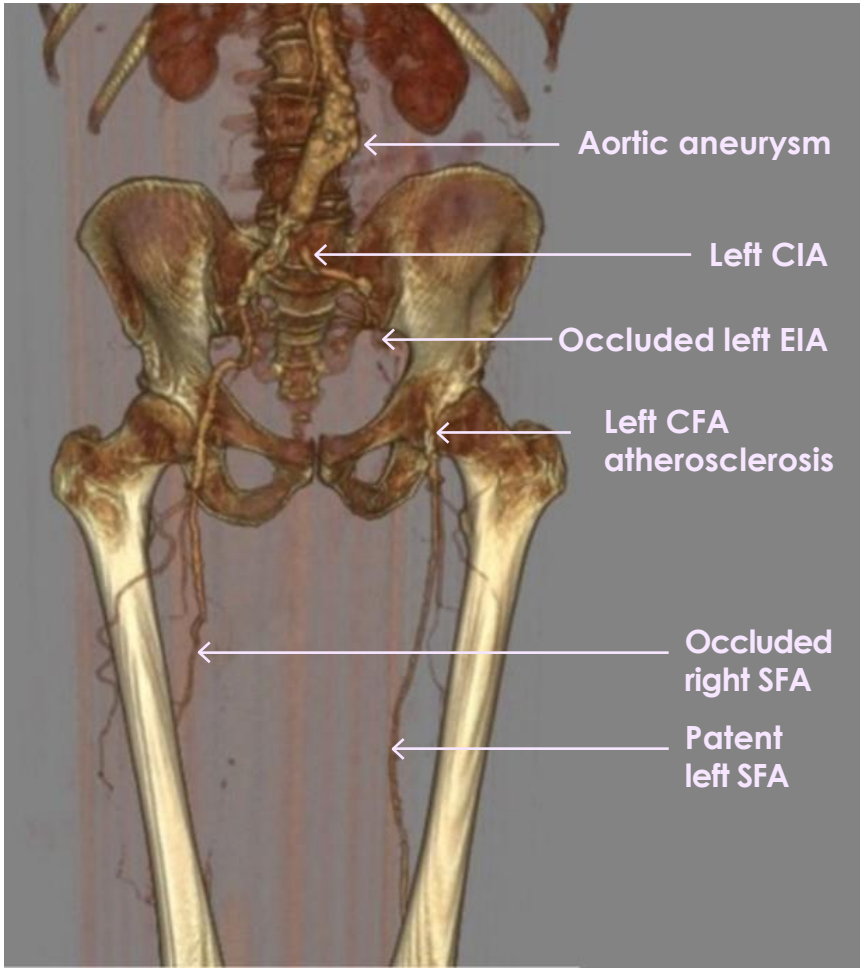
- Recognition of residual stenosis or thrombosis with greater sensitivity when used in conjunction with DSA angiography
- Accurate identification of the diseased arterial segments, even in the absence of flow
- Assessment of individual vessels without the need for changing orientation of the image intensifier

AAA: Abdominal aortic aneurysm
CIA: Common iliac artery
CFA: Common femoral artery
EIA: External iliac artery
DSA: Digital Subtraction Angiography
IVUS: Intravascular ultrasound
SFA: Superficial femoral artery

Lower-limb claudication due to iliac atherosclerosis

Mr Taha Khan, Consultant Vascular & Endovascular Surgeon, Guy's and St Thomas' NHS Foundation Trust, London, UK

PRESENTATION

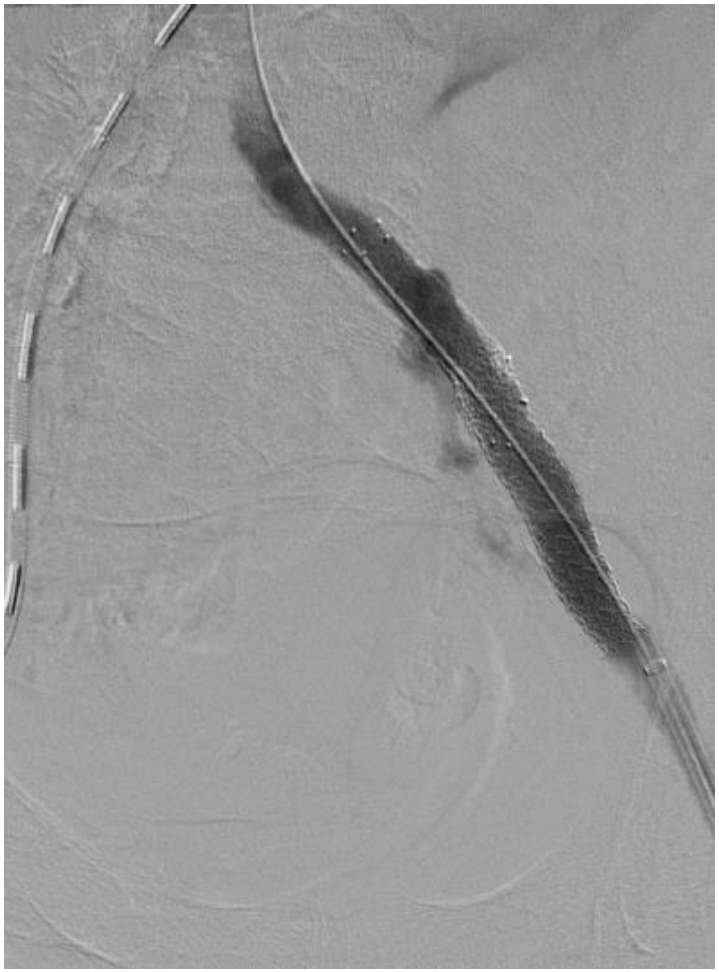


AAA: Abdominal aortic aneurysm
CIA: Common iliac artery
CFA: Common femoral artery
EIA: External iliac artery
DSA: Digital Subtraction Angiography
IVUS: Intravascular ultrasound
SFA: Superficial femoral artery

Lower-limb claudication due to iliac atherosclerosis

Mr Taha Khan, Consultant Vascular & Endovascular Surgeon, Guy's and St Thomas' NHS Foundation Trust, London, UK

OUTCOME



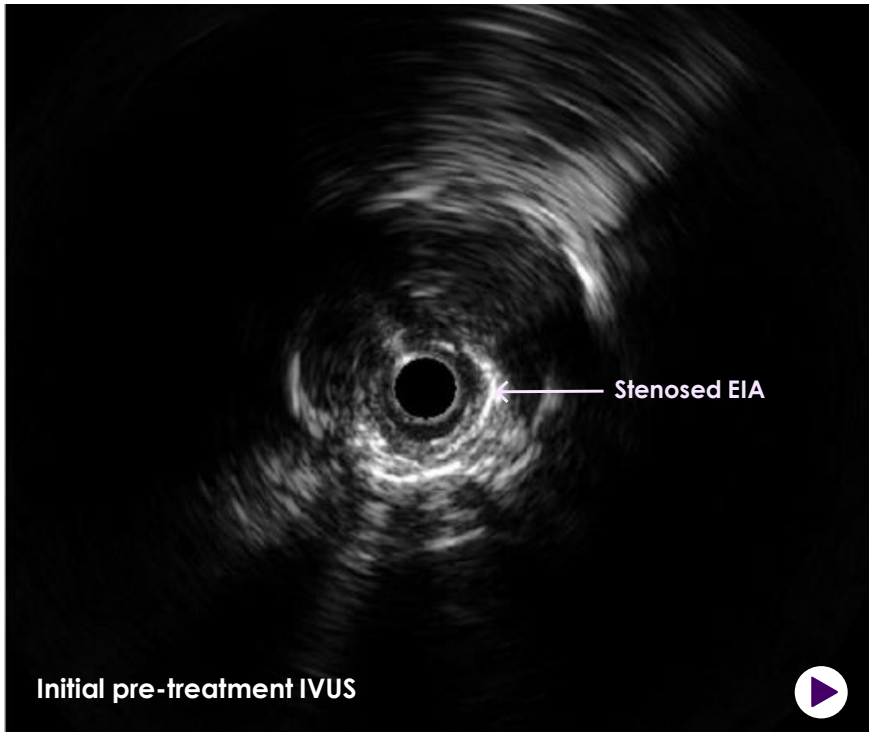
Stent graft 8mm x 57mm

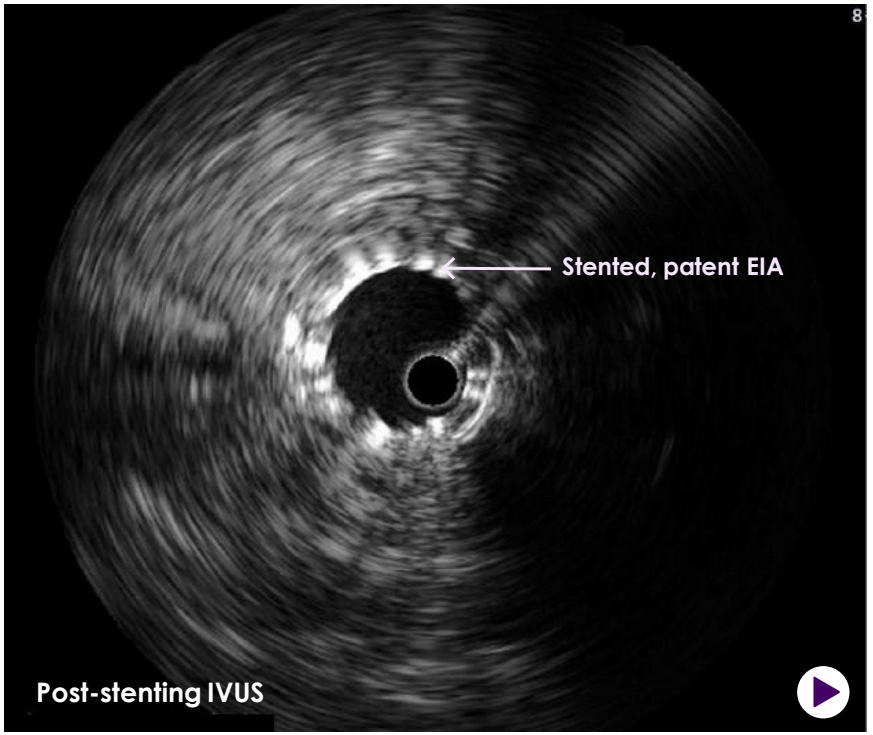
AAA: Abdominal aortic aneurysm
CIA: Common iliac artery
CFA: Common femoral artery
EIA: External iliac artery
DSA: Digital Subtraction Angiography
IVUS: Intravascular ultrasound
SFA: Superficial femoral artery

Lower-limb claudication due to iliac atherosclerosis

Mr Taha Khan, Consultant Vascular & Endovascular Surgeon, Guy's and St Thomas' NHS Foundation Trust, London, UK

IVUS IMAGES





AAA: Abdominal aortic aneurysm
CIA: Common iliac artery
CFA: Common femoral artery
EIA: External iliac artery
DSA: Digital Subtraction Angiography
IVUS: Intravascular ultrasound
SFA: Superficial femoral artery

Lower-limb claudication due to aorto-iliac disease

Mr Taha Khan, Consultant Vascular & Endovascular Surgeon, Guy's and St Thomas' NHS Foundation Trust, London, UK

PRESENTATION VIEW IMAGING >

- 57-year-old lady who works as a cleaner
- Bilateral lower-limb claudication (distance: 10m)
- **Medical history:**
  - Current smoker
  - Hypertension
  - Diabetes
- **Drug history:**
  - Atorvastatin
- No infra-inguinal pulses were palpable
- CTA showed severe stenosis of the aortic bifurcation with severe right CIA stenosis and left CIA occlusion. No further run-off disease

TREATMENT

- Medical management: Aspirin commenced at 75mg once a day
- Suitable surgical/endovascular options:
  - Aorto bi-iliac bypass
  - CERAB
- Risks vs benefit discussion with the patient led to the decision to proceed with CERAB

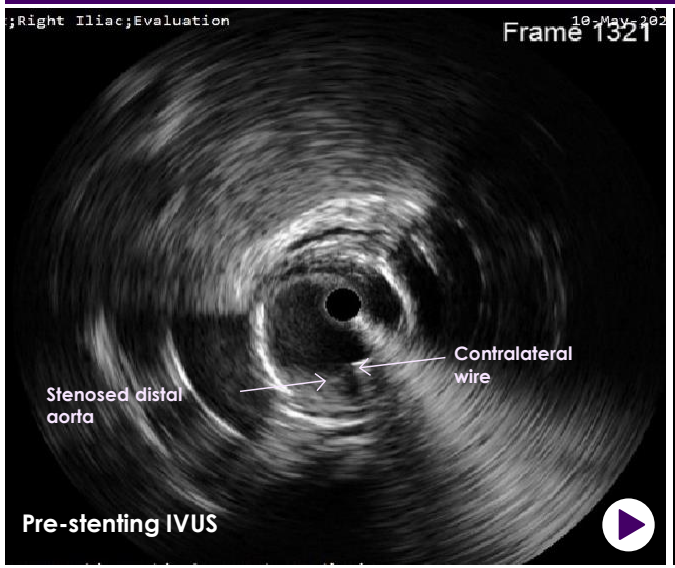
OUTCOME VIEW IMAGING >

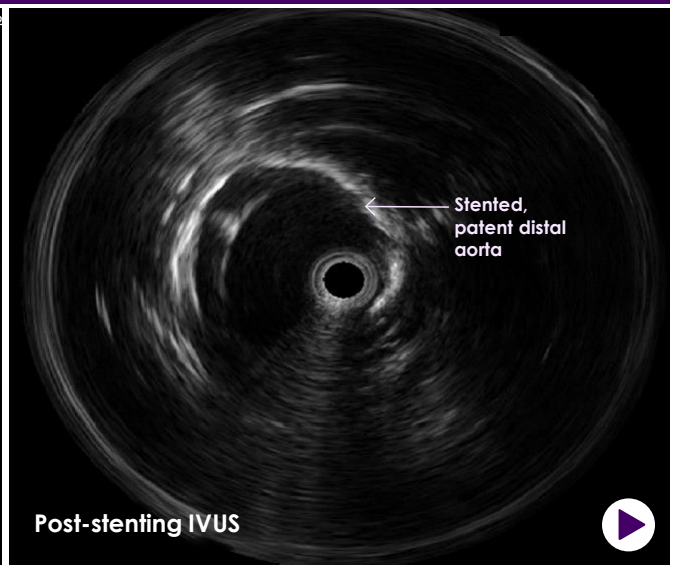
- Palpable bilateral pedal pulses
- Claudication resolved
- No significant limitation in mobility and patient returned to full-time work
- Atorvastatin continued
- Secondary prevention with dual antiplatelet therapy for six weeks and then Clopidogrel 75mg once a day

CONCLUSION

- IVUS enabled accurate recognition of the diseased arterial segments despite challenges with DSA
- Furthermore, IVUS demonstrated a residual dissection flap not seen on DSA

ENLARGE IVUS IMAGES >





RATIONALE FOR IVUS

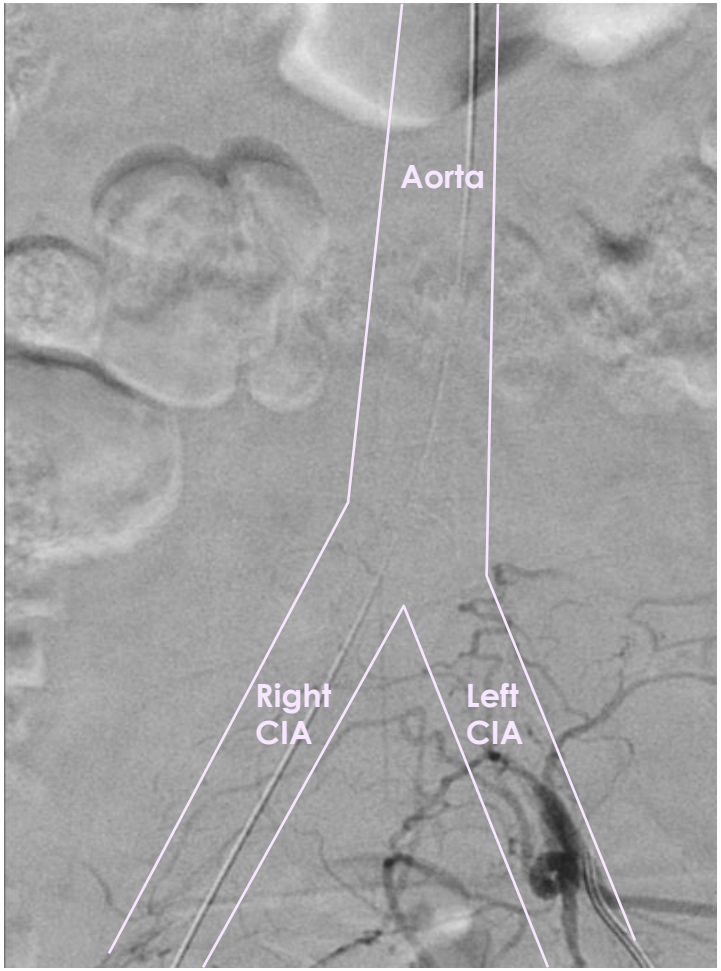
- Greater sensitivity for identifying residual arterial disease when used in conjunction with DSA
- Accurate identification of the diseased arterial segments, even in the absence of flow
- Precise assessment of potential in-stent disease or external sent compression

CERAB: Covered endovascular reconstruction of the aortic bifurcation
CIA: Common iliac artery
CTA: Computed tomography angiogram
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound

Lower-limb claudication due to aorto-iliac disease

Mr Taha Khan, Consultant Vascular & Endovascular Surgeon, Guy's and St Thomas' NHS Foundation Trust, London, UK

PRESENTATION



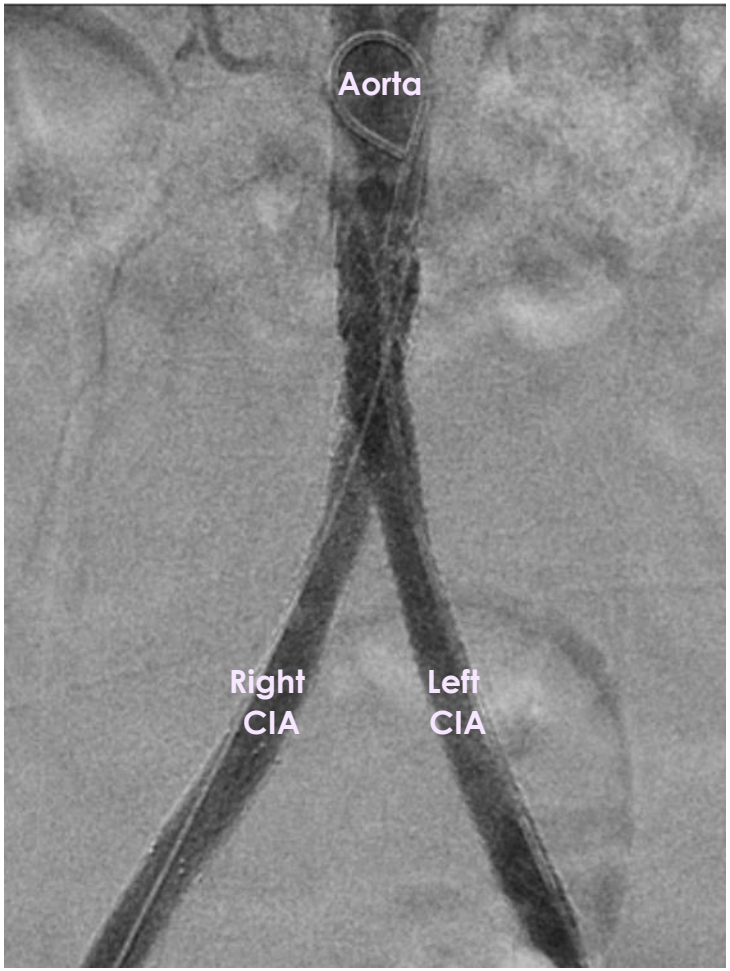
Lines indicate expected location of vessels

CERAB: Covered endovascular reconstruction of the aortic bifurcation
CIA: Common iliac artery
CTA: Computed tomography angiogram
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound

Lower-limb claudication due to aorto-iliac disease

Mr Taha Khan, Consultant Vascular & Endovascular Surgeon, Guy's and St Thomas' NHS Foundation Trust, London, UK

OUTCOME

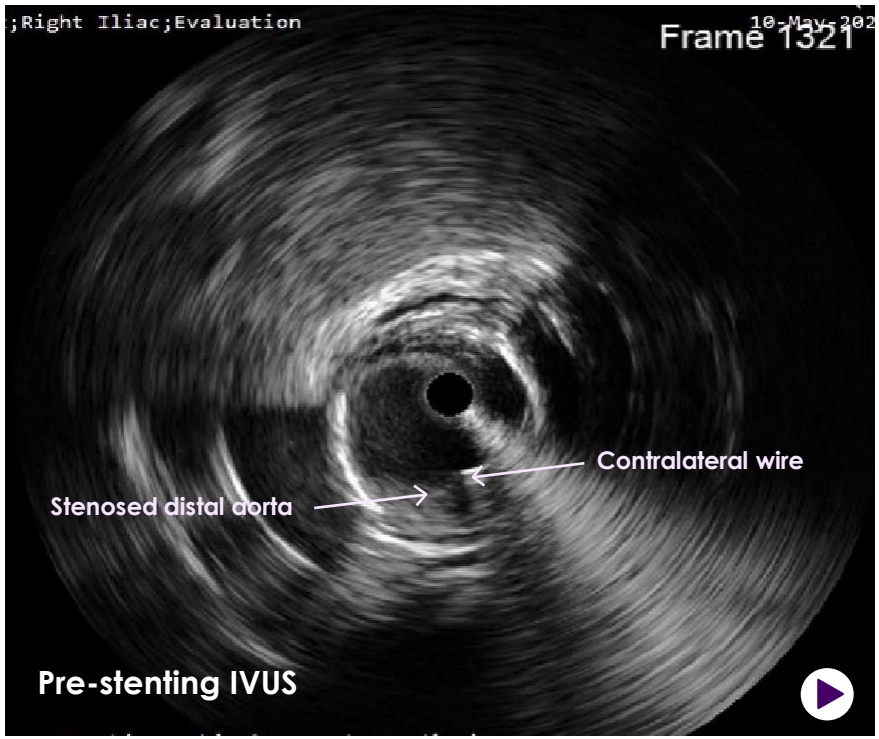


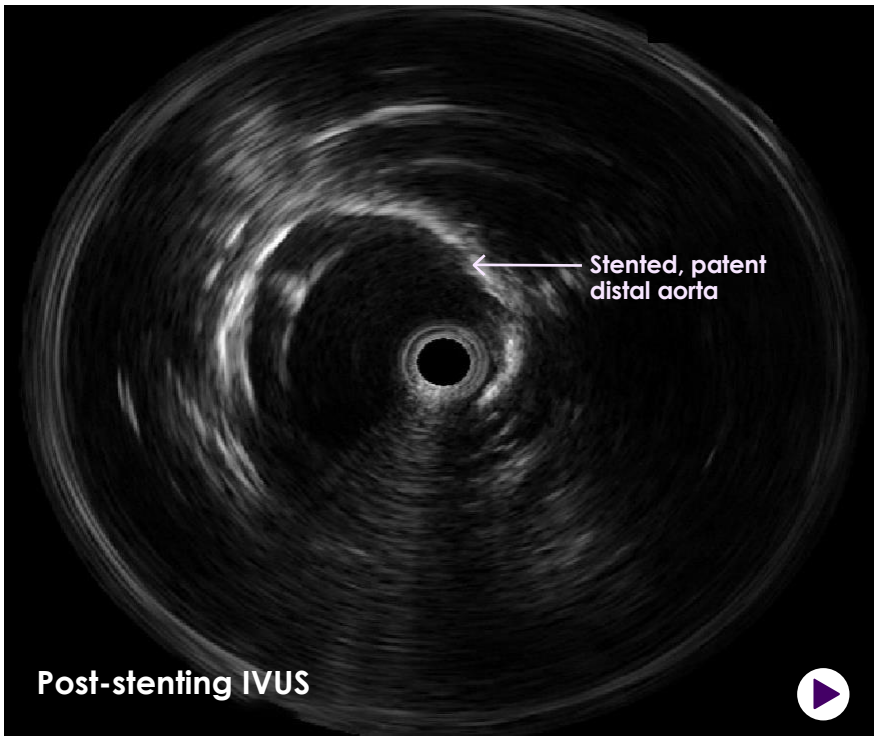
CERAB: Covered endovascular reconstruction of the aortic bifurcation
CIA: Common iliac artery
CTA: Computed tomography angiogram
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound

Lower-limb claudication due to aorto-iliac disease

Mr Taha Khan, Consultant Vascular & Endovascular Surgeon, Guy's and St Thomas' NHS Foundation Trust, London, UK

IVUS IMAGES





CERAB: Covered endovascular reconstruction of the aortic bifurcation
CIA: Common iliac artery
CTA: Computed tomography angiogram
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound

Rutherford IV left, SFA occlusion, recanalisation

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

PRESENTATION VIEW IMAGING >

- 55-year-old male, left SFA Occlusion
- Rutherford IV (ischaemic rest pain) left
- Medical history:
  - Diabetes
  - Arterial hypertension
  - Hypercholesterolemia
  - Adipositas
- **Drug history:**
  - Aspirin 100mg 1-0-0
  - Clopidogrel 75mg 1-0-0
  - Atorvastatin 40mg 0-0-1
  - Enalpril 10mg 1-0-0
  - Pantozol 40mg 1-0-0

TREATMENT VIEW IMAGING >

- SFA recanalisation and atherectomy with JetStream™ 2.4mm/3.4mm
- SFA treatment with:
  - 4mm x 80mm DEB
  - 5mm x 80mm DEB
  - 4mm x 200mm POBA
- IVUS revealed no dissection

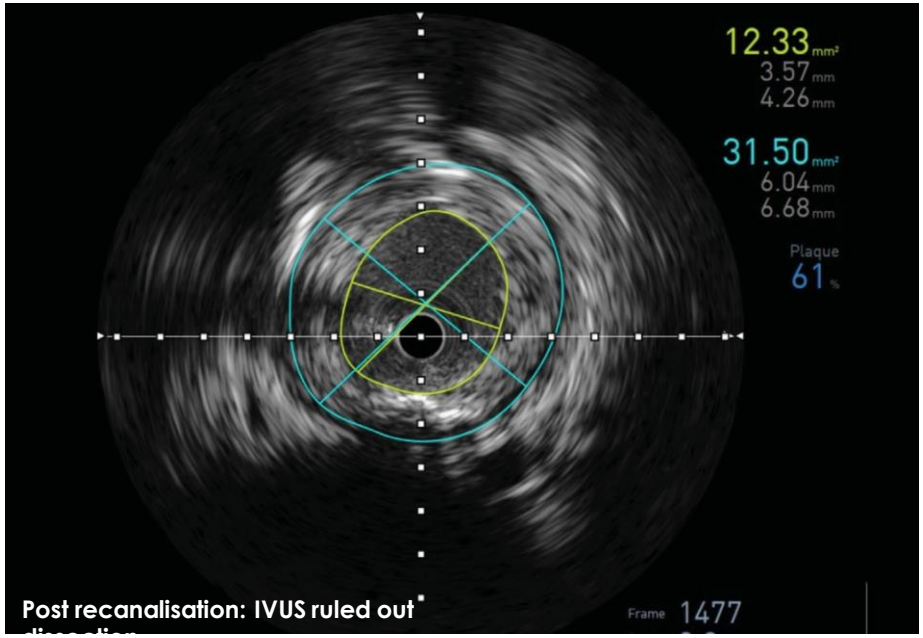
OUTCOME VIEW IMAGING >

- SFA recanalisation with patent flow
- IVUS detected no residual stenosis, no dissection, no stent placement needed
- Improved Rutherford Category (IV → II)

CONCLUSION

- IVUS ruled out dissection, no stent needed

ENLARGE IVUS IMAGE >



Post recanalisation: IVUS ruled out

RATIONALE FOR IVUS

- Greater sensitivity in terms of identifying residual stenosis when used in conjunction with DSA
- Accurate vessel sizing
- Accurate identification of dissections
- Assessment of individual vessels without the need for changing orientation of the image intensifier

DEB: Drug-eluting balloon
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
POBA: Plain old balloon angioplasty
SFA: Superficial femoral artery

Rutherford IV left, SFA occlusion, recanalisation

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

PRESENTATION

DEB: Drug-eluting balloon
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
POBA: Plain old balloon angioplasty
SFA: Superficial femoral artery

Rutherford IV left, SFA occlusion, recanalisation

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

DIAGNOSIS / TREATMENT

DEB: Drug-eluting balloon
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
POBA: Plain old balloon angioplasty
SFA: Superficial femoral artery

Rutherford IV left, SFA occlusion, recanalisation

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

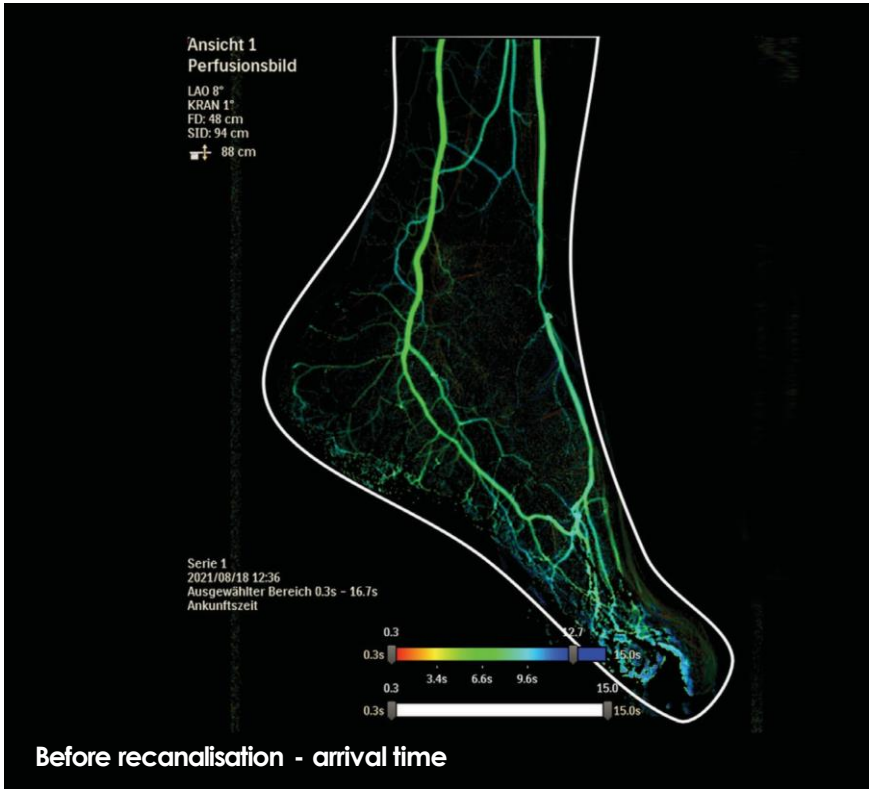
OUTCOME 1 2

DEB: Drug-eluting balloon
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
POBA: Plain old balloon angioplasty
SFA: Superficial femoral artery

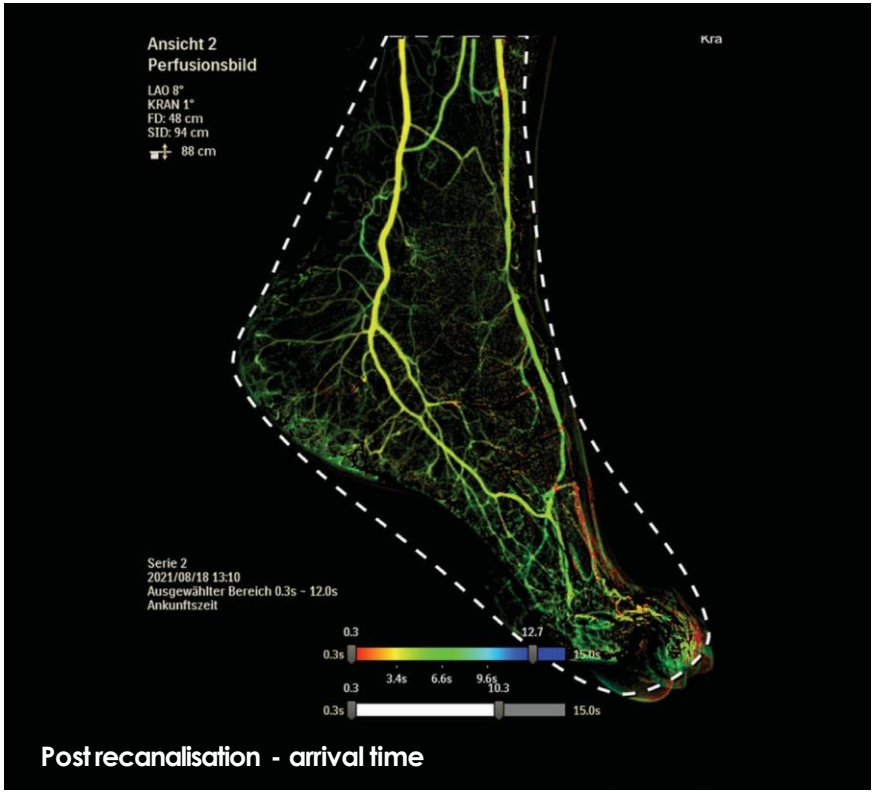
Rutherford IV left, SFA occlusion, recanalisation

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

OUTCOME 1 **2** **SMART PERFUSION**



Before recanalisation - arrival time



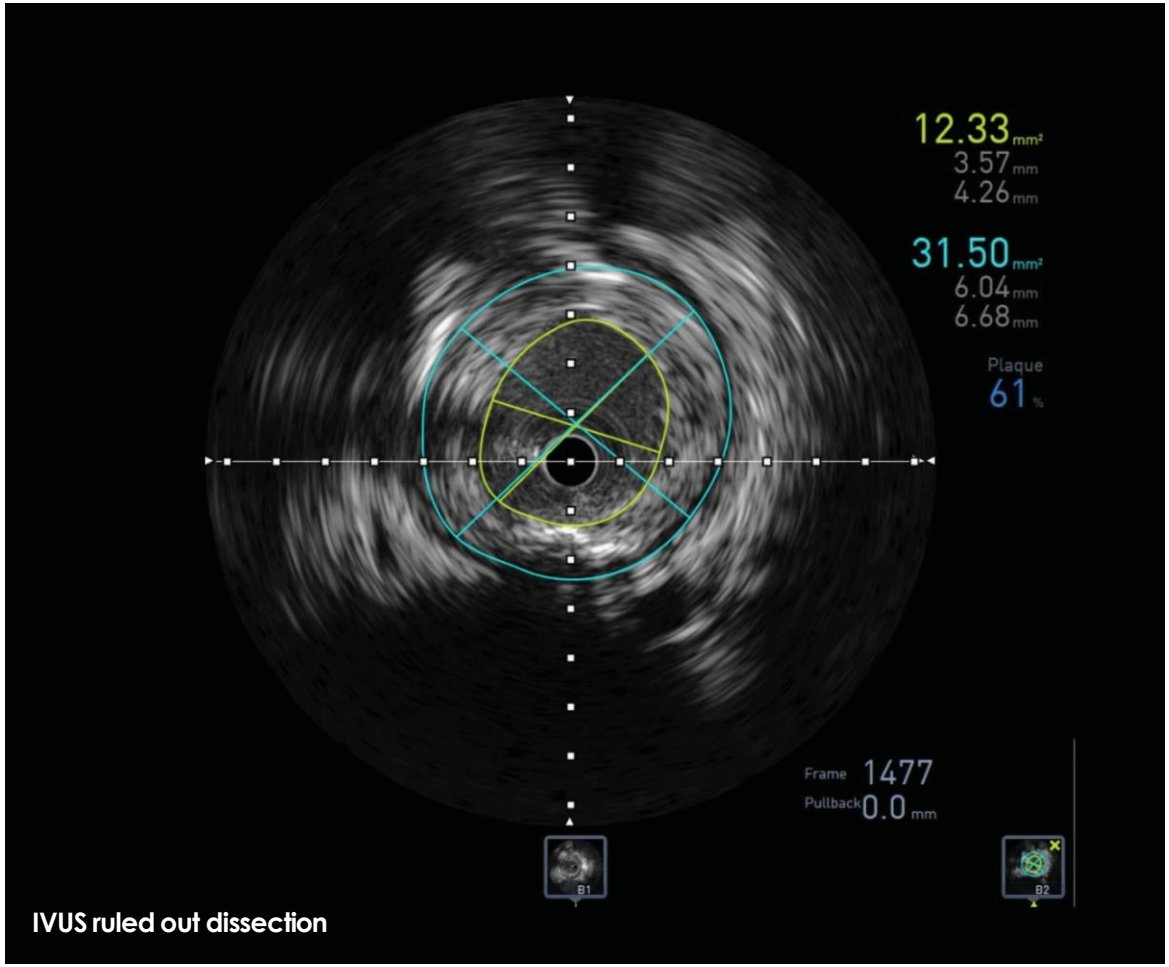
Post recanalisation - arrival time

DEB: Drug-eluting balloon
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
POBA: Plain old balloon angioplasty
SFA: Superficial femoral artery

Rutherford IV left, SFA occlusion, recanalisation

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

IVUS IMAGE POST RECANALISATION



DEB: Drug-eluting balloon
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
POBA: Plain old balloon angioplasty
SFA: Superficial femoral artery

Rutherford II left, long ATA, Afib, ATP occlusions, JetStream™ 1.6mm

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

PRESENTATION VIEW IMAGING >

- 47-year-old male, left AFS
- Rutherford II (moderate claudication)
- **Medical history:**
  - Arterial hypertension
  - Hypercholesterolemia
- **Drug history:**
  - Aspirin 100mg 1-0-0
  - Clopidogrel 75mg 1-0-0
  - Atorvastatin 40mg 0-0-1

TREATMENT VIEW IMAGING >

- ATA recanalisation and atherectomy with JetStream™ 1.6mm
- ATA PTA with:
  - 2.5mm x 150mm balloon
  - 3.0mm x 150mm balloon
- IVUS revealed no dissection

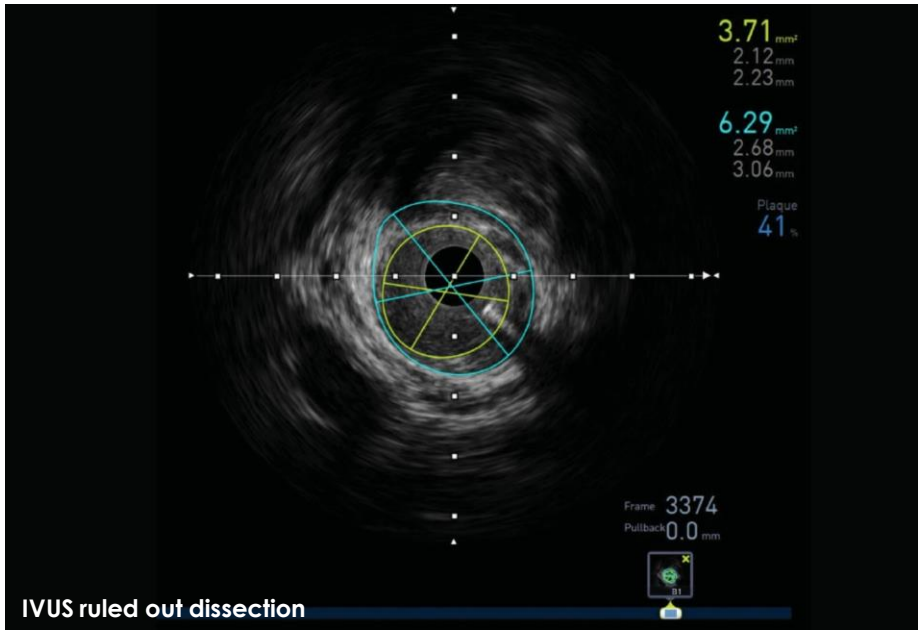
OUTCOME VIEW IMAGING >

- ATA recanalisation with patent flow
- IVUS detected no residual stenosis, no dissection
- Improved Rutherford Category (II → I)

CONCLUSION

- IVUS ruled out dissection and residual stenosis/embolus

ENLARGE IVUS IMAGE >



IVUS ruled out dissection

RATIONALE FOR IVUS

- Greater sensitivity in terms of identifying residual stenosis when used in conjunction with DSA
- Accurate vessel sizing
- Accurate identification of dissections
- Assessment of individual vessels without the need for changing the orientation of the image intensifier

Afib: Atrial fibrillation
AFS: Arterial fermoral stenosis
ATA: Anterior tibial artery
ATP: Arteria tibialis posterior
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
PTA: Percutaneous transluminal angioplasty
SFA: Superficial femoral artery

Rutherford II left, long ATA, Afib, ATP occlusions, JetStream™ 1.6mm

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

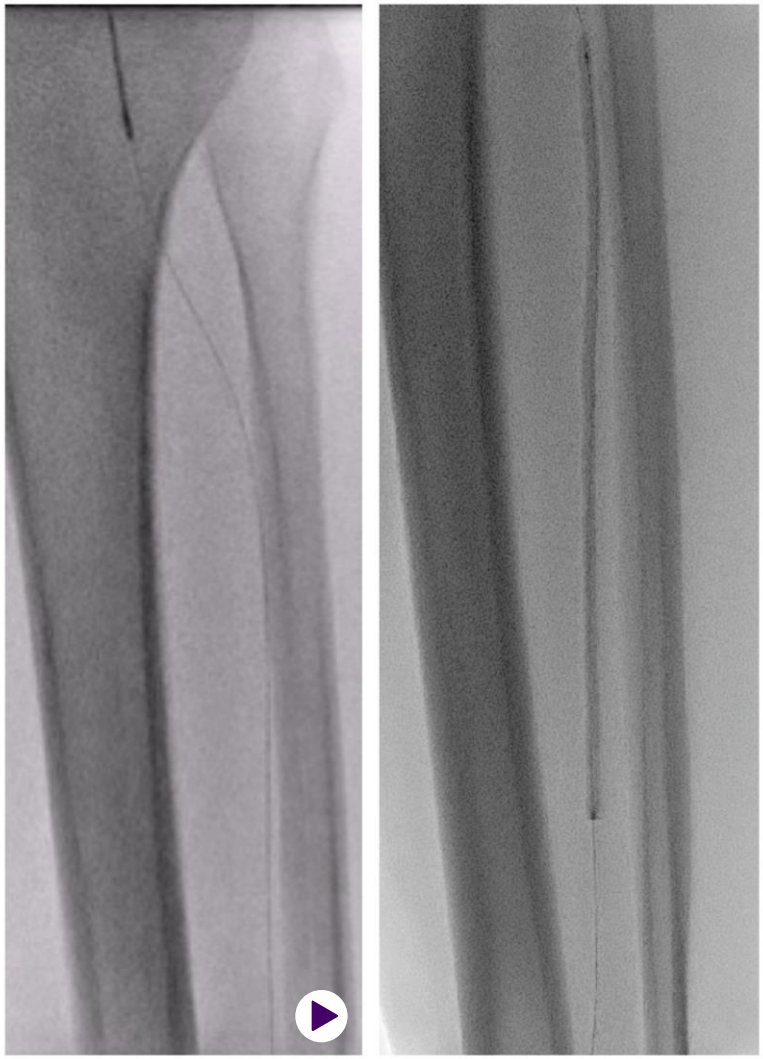
PRESENTATION

Afib: Atrial fibrillation
AFS: Arterial fermoral stenosis
ATA: Anterior tibial artery
ATP: Arteria tibialis posterior
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
PTA: Percutaneous transluminal angioplasty
SFA: Superficial femoral artery

Rutherford II left, long ATA, Afib, ATP occlusions, JetStream™ 1.6mm

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

DIAGNOSIS / TREATMENT

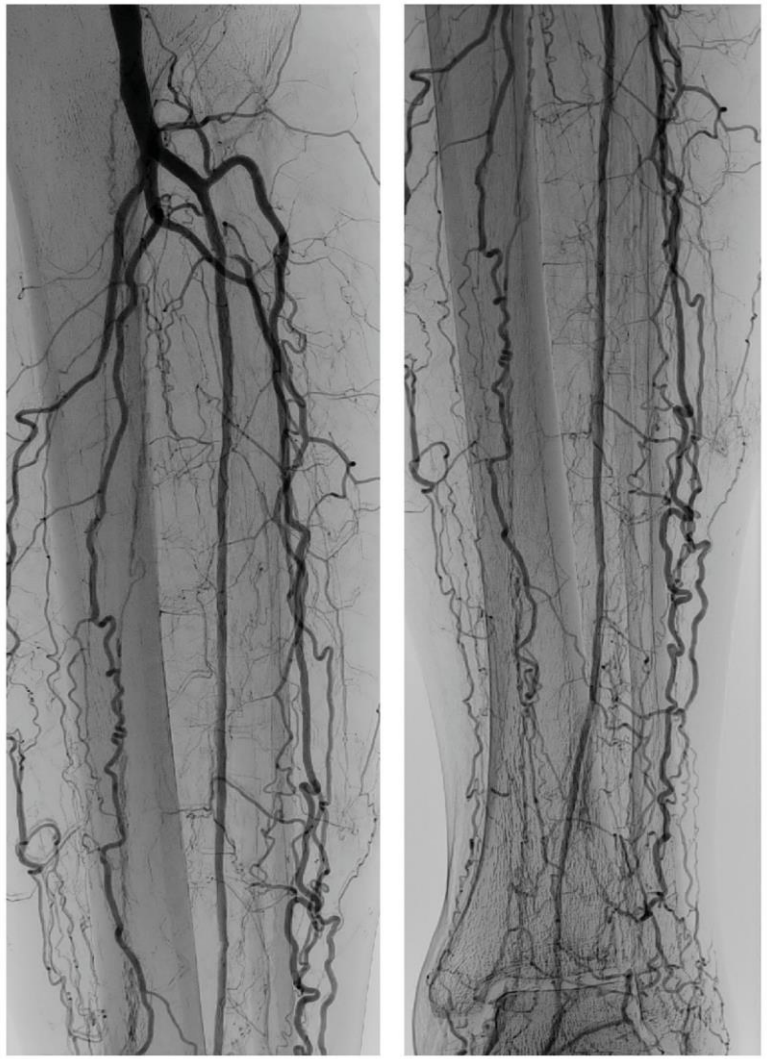


Afib: Atrial fibrillation
AFS: Arterial fermoral stenosis
ATA: Anterior tibial artery
ATP: Arteria tibialis posterior
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
PTA: Percutaneous transluminal angioplasty
SFA: Superficial femoral artery

Rutherford II left, long ATA, Afib, ATP occlusions, JetStream™ 1.6mm

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

OUTCOME 1 2

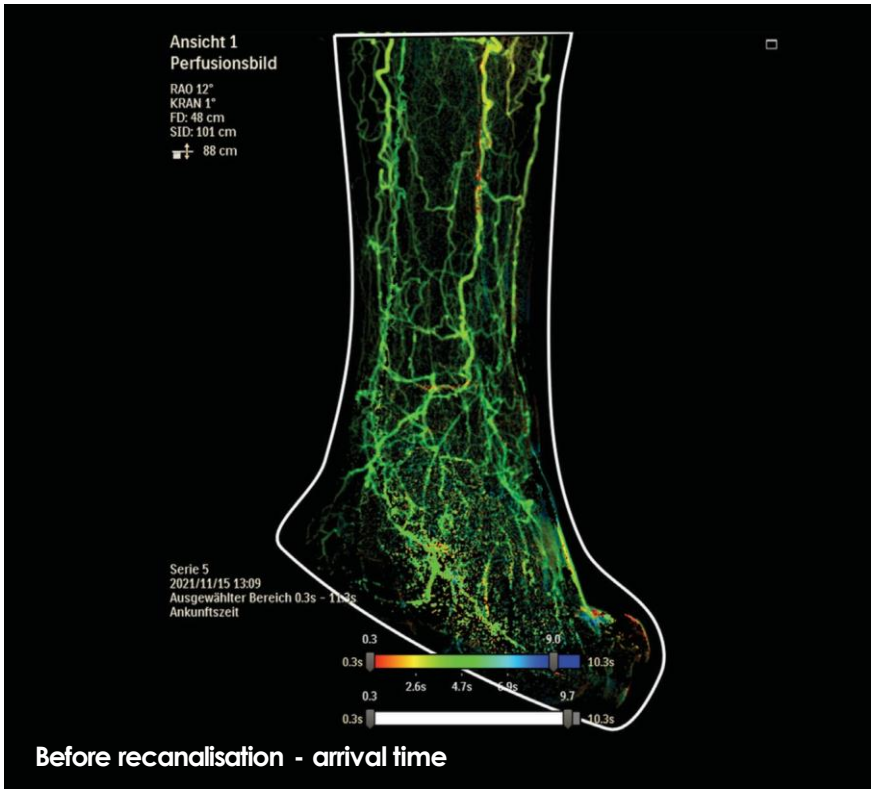


Afib: Atrial fibrillation
AFS: Arterial femoral stenosis
ATA: Anterior tibial artery
ATP: Arteria tibialis posterior
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
PTA: Percutaneous transluminal angioplasty
SFA: Superficial femoral artery

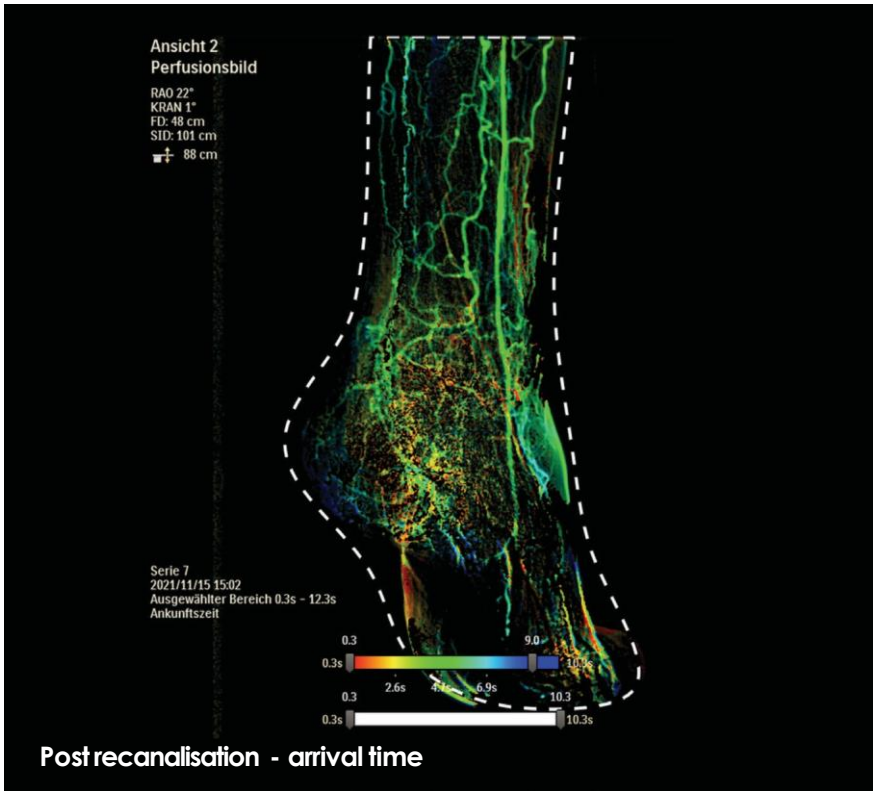
Rutherford II left, long ATA, Afib, ATP occlusions, JetStream™ 1.6mm

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

OUTCOME 1 **2** **SMART PERFUSION**



Before recanalisation - arrival time



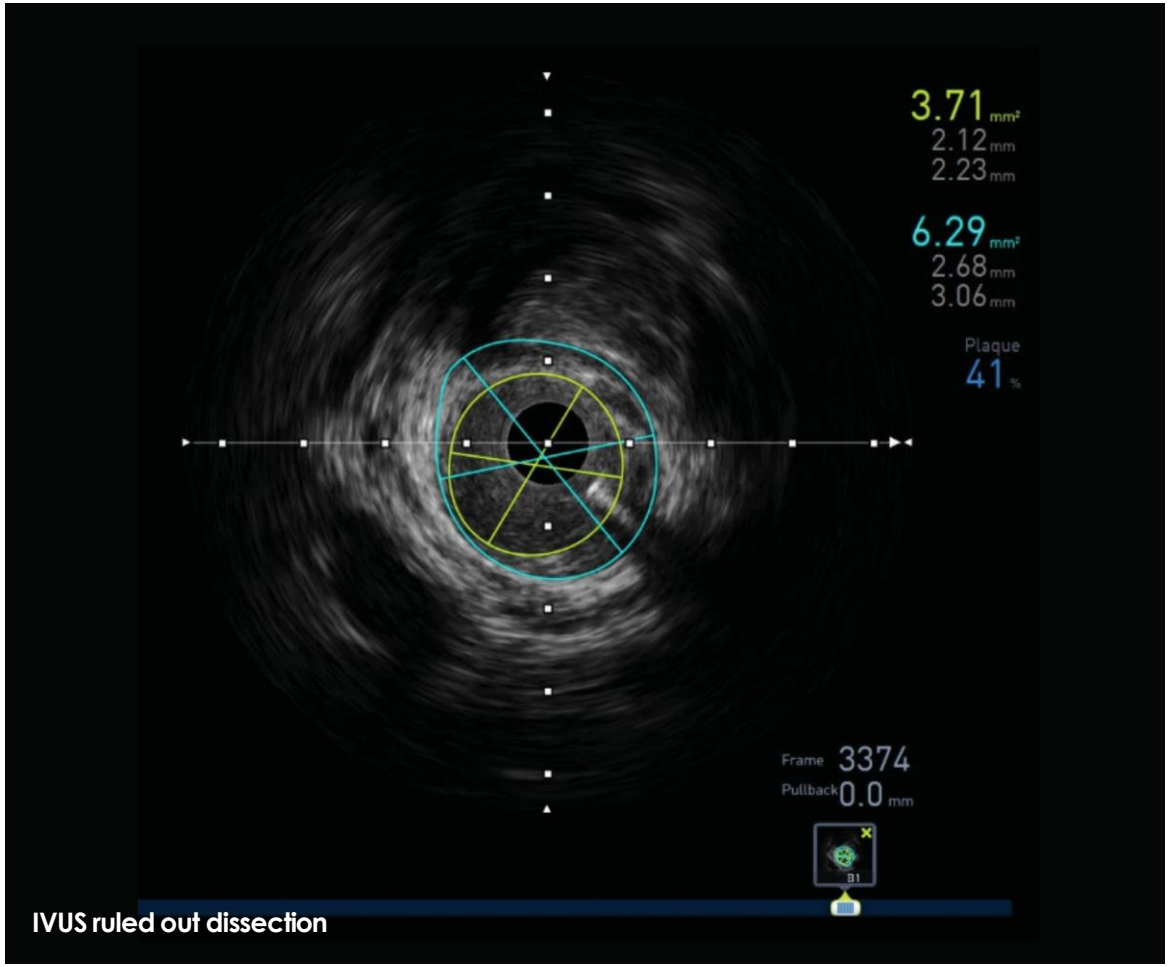
Post recanalisation - arrival time

Afib: Atrial fibrillation
AFS: Arterial fermoral stenosis
ATA: Anterior tibial artery
ATP: Arteria tibialis posterior
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
PTA: Percutaneous transluminal angioplasty
SFA: Superficial femoral artery

Rutherford II left, long ATA, Afib, ATP occlusions, JetStream™ 1.6mm

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

IVUS IMAGE POST RECANALISATION



Afib: Atrial fibrillation
AFS: Arterial fermoral stenosis
ATA: Anterior tibial artery
ATP: Arteria tibialis posterior
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
PTA: Percutaneous transluminal angioplasty
SFA: Superficial femoral artery

Rutherford IV both legs, left tibiofibular tract stenosis

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

PRESENTATION

VIEW IMAGING >

- 80-year-old male, ischaemic multiple prior interventions
- Rutherford IV (ischaemic rest pain) on both sides
- **Medical history:**
  - Diabetes
  - Arterial hypertension
  - Rheumatoid arthrosis
- **Drug history:**
  - Aspirin 100mg
  - Eliquis 5mg
  - Metformin 1000mg
  - Atorvastatin 80mg
  - Lercanidipin 20mg
  - Ramipril HCT 5/25mg
  - Bisoprolol 2.5mg
  - Torasemid 10mg

TREATMENT

VIEW IMAGING >

- Femoropopliteal treatment with:
  - 6mm x 80mm DEB
  - 6mm x 80mm DEB
  - 5mm x 80mm DEB
  - 4mm x 80mm DEB
- Artherectomy of the tibiofibular tract with JetStream™ 2.1mm/3.1mm
- PTA of tibiofibular tract using 2 balloons:
  - 3.0mm x 150mm
  - 3.5mm x 80mm
- On the basis of vessel sizing of the tibiofibular tract with IVUS, we performed a further dilatation using a 3.5mm x 150mm balloon

OUTCOME

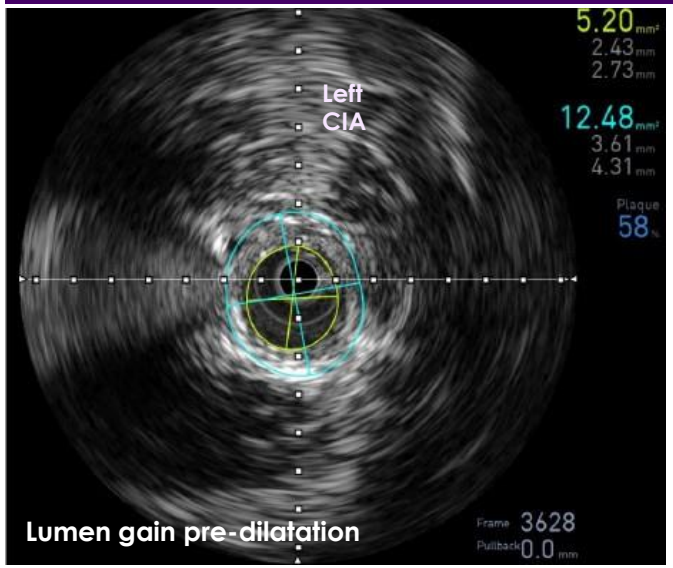
VIEW IMAGING >

- Improved outflow through tibiofibular tract and fibular artery
- Improved Rutherford Category (IV → II)

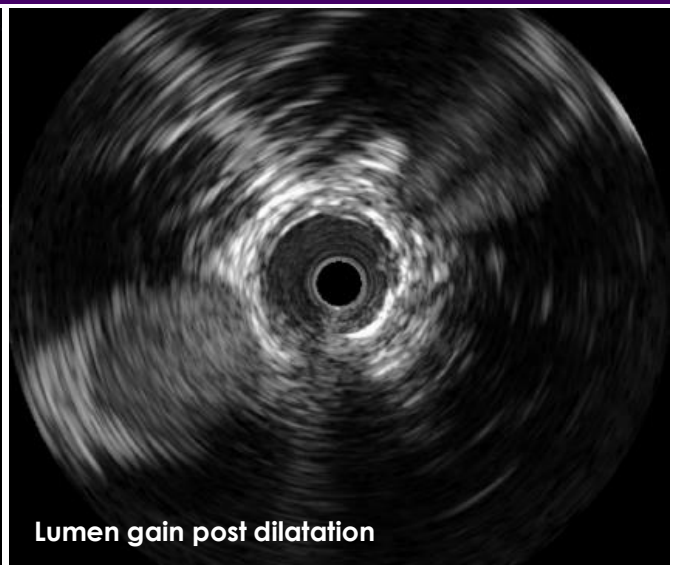
CONCLUSION

- IVUS delivered accurate vessel sizing and ruled out dissection

ENLARGE IVUS IMAGES >



Lumen gain pre-dilatation



Lumen gain post dilatation

RATIONALE FOR IVUS

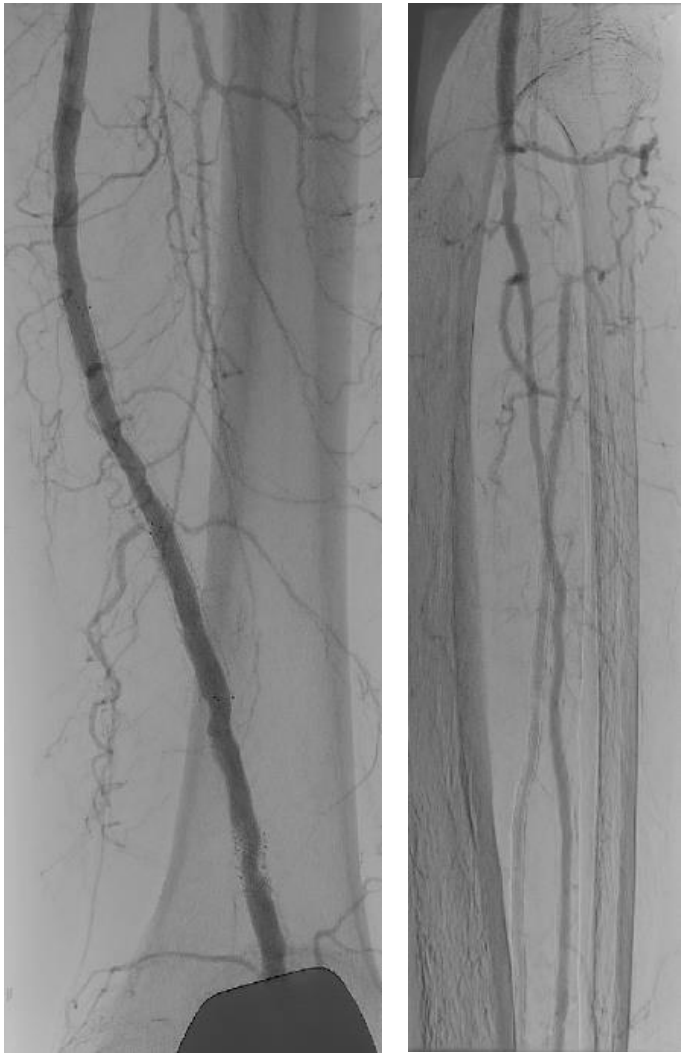
- Recognition of residual stenosis with greater sensitivity when used in conjunction with DSA angiography
- Accurate vessel sizing
- Accurate identification of dissections
- Assessment of individual vessels without the need for changing orientation of the image intensifier

ATA: Anterior tibial artery
DEB: Drug-eluting balloon
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
PTA: Percutaneous transluminal angioplasty

Rutherford IV both legs, left tibiofibular tract stenosis

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

PRESENTATION

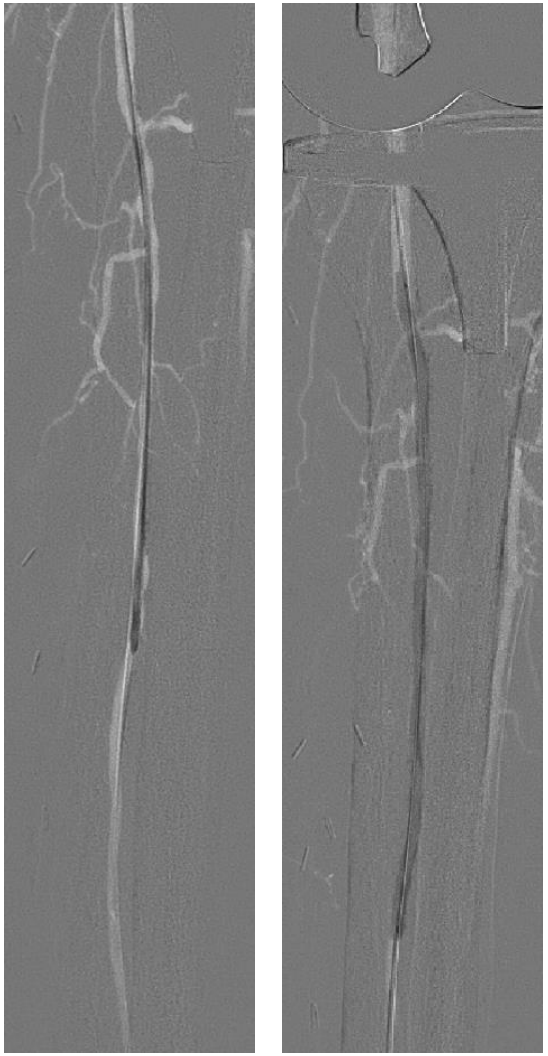


ATA: Anterior tibial artery
DEB: Drug-eluting balloon
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
PTA: Percutaneous transluminal angioplasty

Rutherford IV both legs, left tibiofibular tract stenosis

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

DIAGNOSIS / TREATMENT

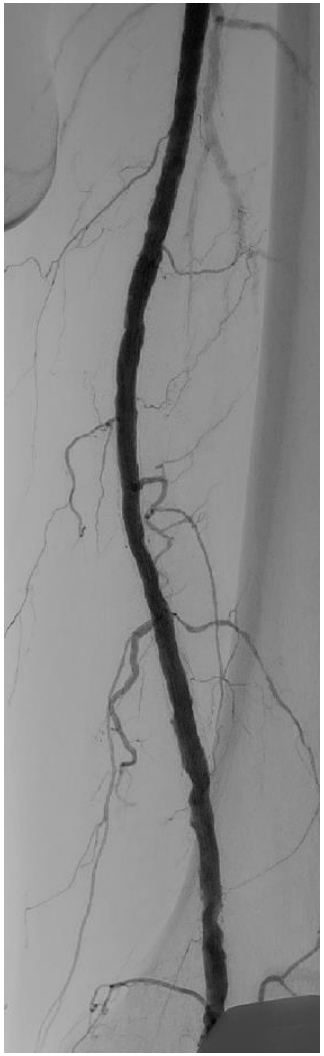


ATA: Anterior tibial artery
DEB: Drug-eluting balloon
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
PTA: Percutaneous transluminal angioplasty

Rutherford IV both legs, left tibiofibular tract stenosis

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

OUTCOME 1 2

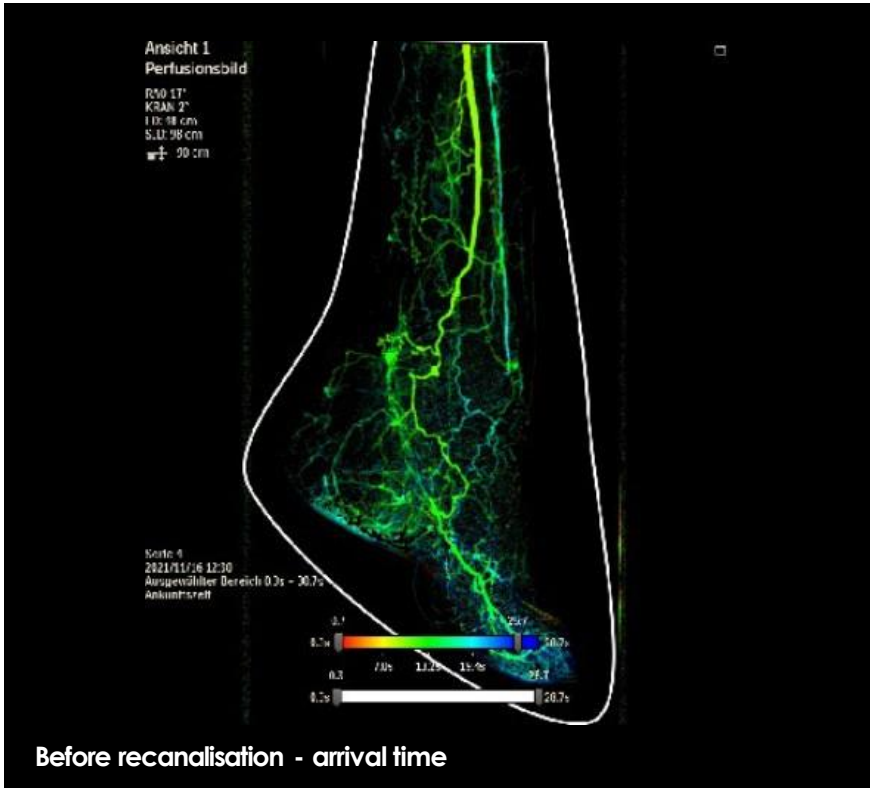


ATA: Anterior tibial artery
DEB: Drug-eluting balloon
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
PTA: Percutaneous transluminal angioplasty

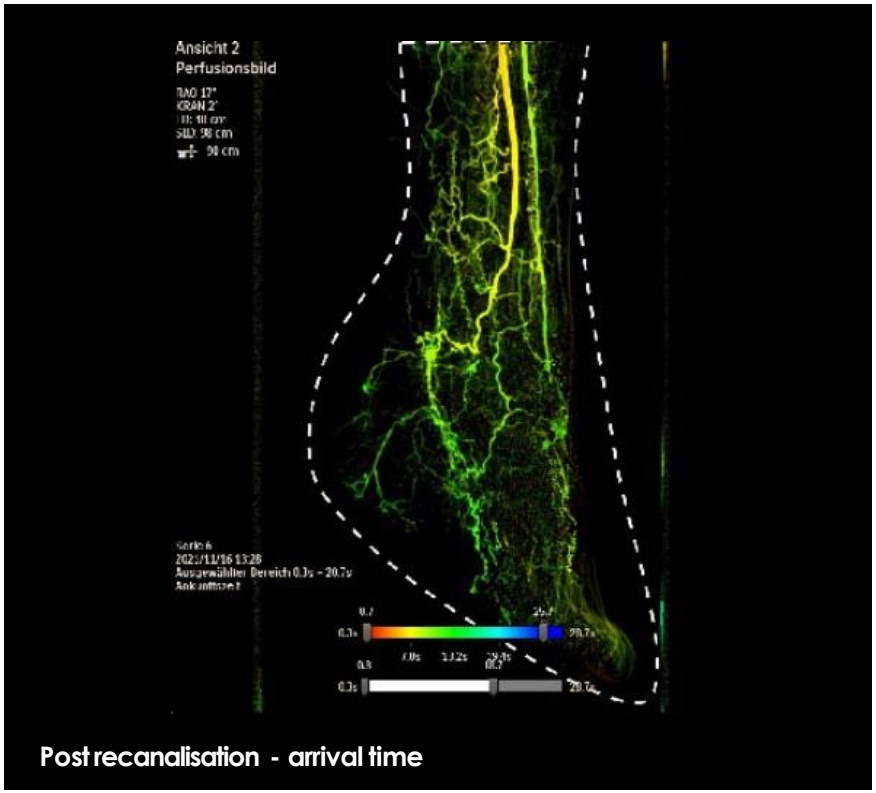
Rutherford IV both legs, left tibiofibular tract stenosis

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

OUTCOME 1 **2** **SMART PERFUSION**



Before recanalisation - arrival time



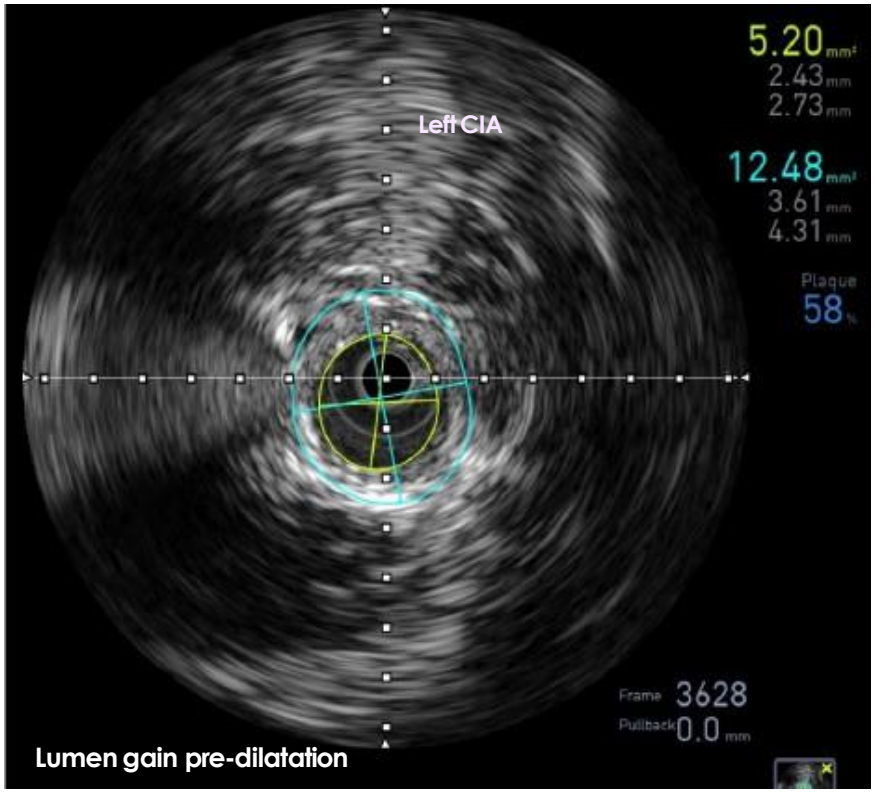
Post recanalisation - arrival time

ATA: Anterior tibial artery
DEB: Drug-eluting balloon
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
PTA: Percutaneous transluminal angioplasty

Rutherford IV both legs, left tibiofibular tract stenosis

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

IVUS IMAGES



Lumen gain pre-dilatation

Lumen gain post dilatation

ATA: Anterior tibial artery
DEB: Drug-eluting balloon
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
PTA: Percutaneous transluminal angioplasty

Rutherford IV, long SFA occlusion (left)

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

PRESENTATION VIEW IMAGING >

- 73-year-old male
- Rutherford IV (ischaemic rest pain) on both sides
- **Medical history:**
  - Current smoker
  - Hypertension
  - COPD
  - Coronary artery disease
- **Drug history:**
  - Aspirin
  - Atorvastatin
  - Ramipril
  - Bisoprolol

TREATMENT VIEW IMAGING >

Long SFA Occlusion

- Recanalisation SFA, JetStream™ 2.4mm/3.4mm, treatment:
  - 6mm x 80mm DEB
  - 5mm x 80mm DEB
  - 5mm x 80mm DEB
  - 4mm x 80mm DEB

Therapeutic dilemma:

- **Option 1:** Stent
- **Option 2:** No stent
- **Decision:** Stent placement due to high-grade dissection detected on IVUS:
  - 8mm x 100mm
  - 8mm x 10mm

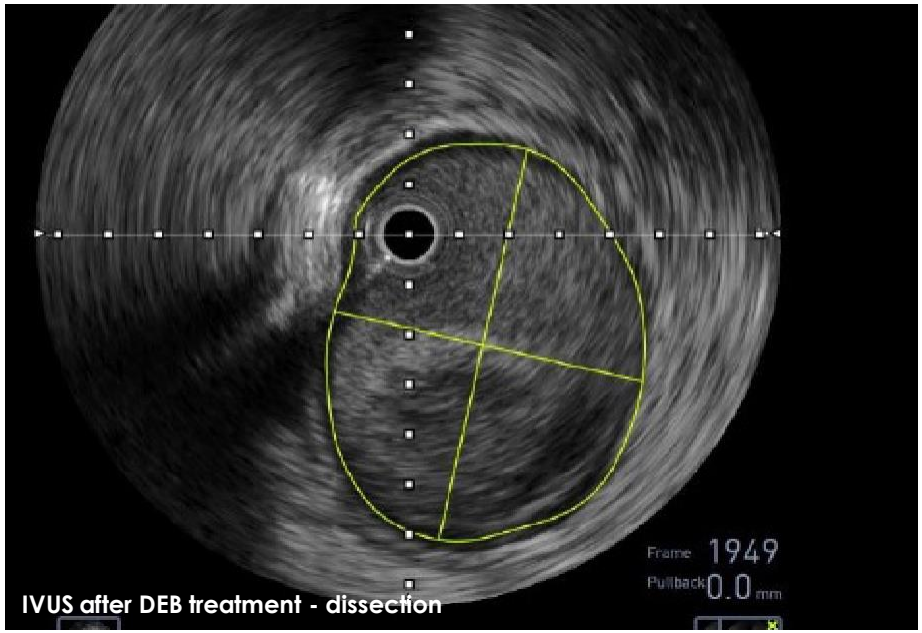
OUTCOME VIEW IMAGING >

- Palpable left pedal pulses
- Ischaemic rest pain resolved
- Improved walking distance
- Aspirin 100mg once a day continued
- Secondary prevention with Clopidogrel 75mg once a day for 6 weeks
- Improved Rutherford Category (IV → II)

CONCLUSION

- IVUS enabled accurate identification of high-grade dissection

ENLARGE IVUS IMAGE >



IVUS after DEB treatment - dissection

RATIONALE FOR IVUS

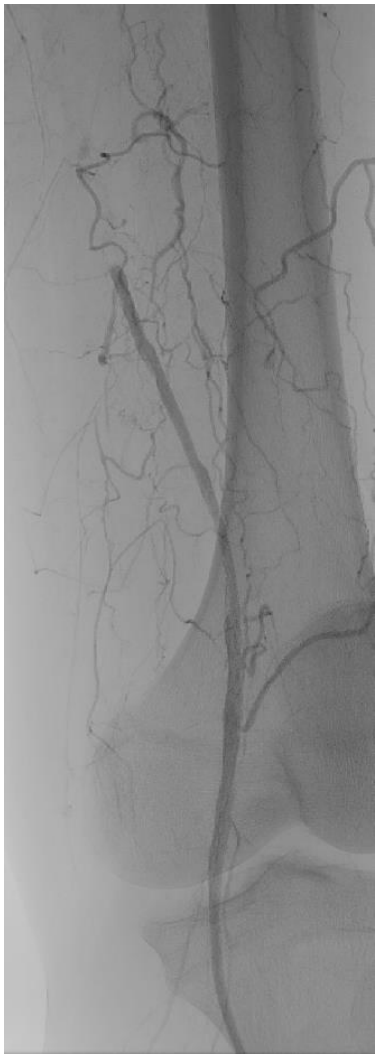
- Greater sensitivity in terms of identifying residual stenosis when used in conjunction with DSA
- Accurate vessel sizing
- Accurate identification of dissections
- Assessment of individual vessels without the need for changing orientation of the image intensifier

COPD: Chronic occlusive pulmonary disease
DEB: Drug-eluting balloon
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
SFA: Superficial femoral artery

Rutherford IV, long SFA occlusion (left)

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

PRESENTATION



COPD: Chronic occlusive pulmonary disease
DEB: Drug-eluting balloon
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
SFA: Superficial femoral artery

Rutherford IV, long SFA occlusion (left)

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

DIAGNOSIS

Angiography after DEB treatment

COPD: Chronic occlusive pulmonary disease
DEB: Drug-eluting balloon
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
SFA: Superficial femoral artery

Rutherford IV, long SFA occlusion (left)

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

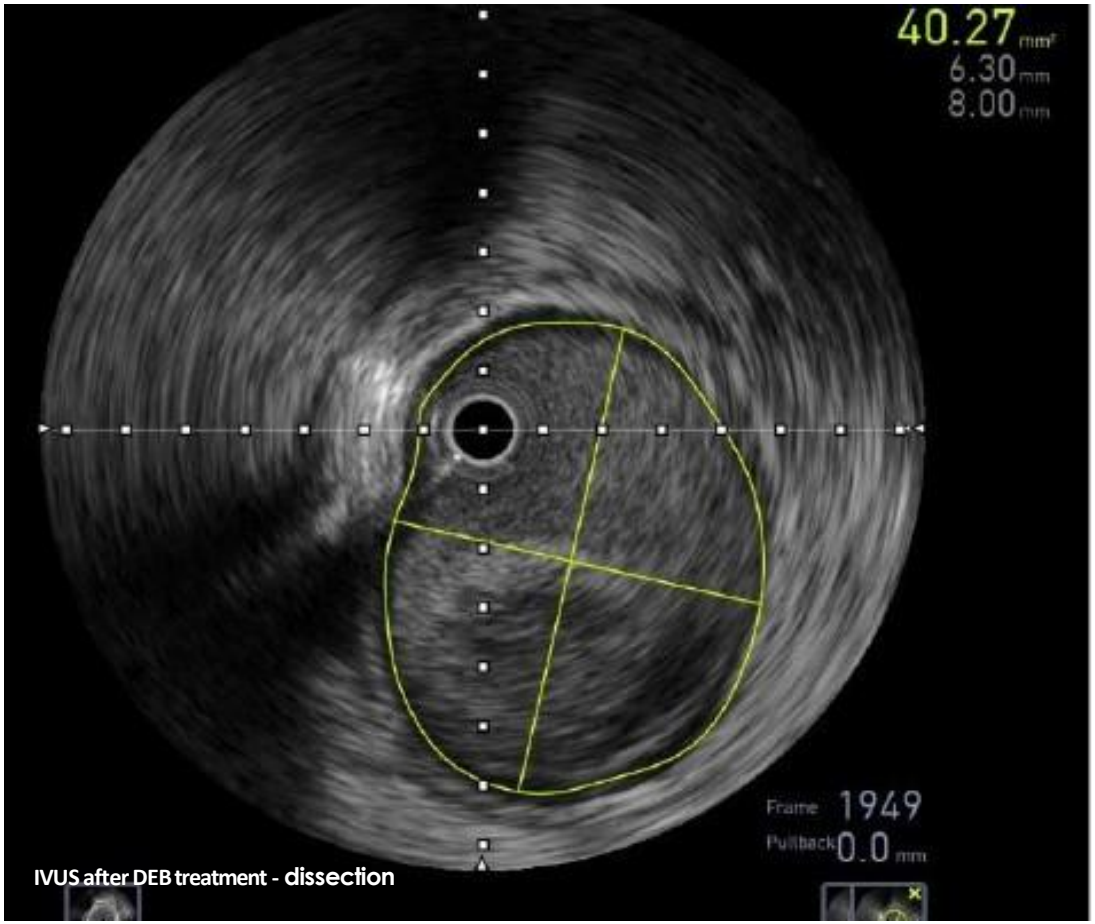
OUTCOME

COPD: Chronic occlusive pulmonary disease
DEB: Drug-eluting balloon
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
SFA: Superficial femoral artery

Rutherford IV, long SFA occlusion (left)

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

IVUS IMAGE



COPD: Chronic occlusive pulmonary disease
DEB: Drug-eluting balloon
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound
SFA: Superficial femoral artery

Rutherford IV ruled out dissection or restenosis after recanalisation

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

PRESENTATION

VIEW IMAGING >

- 79-year-old female, popliteal occlusion (acute onset)
- Rutherford V left, interdigital ulcera D2/D3
- **Medical history:**
  - Diabetes
  - Arterial hypertension
  - Arterial fibrillation
  - CVI
- **Drug history:**
  - Xarelto 20mg 1-0-0
  - Bisoprolol 5mg 1-0-1
  - Ramipril 2.5mg ½-0-0

TREATMENT

VIEW IMAGING >

- Recanalisation of the popliteal artery and Artherectomy with JetStream™2.4mm/3.4mm
- Treatment with 5mm x 80mm DEB
- IVUS revealed no dissection, no restenosis, no embolus – patent flow

OUTCOME

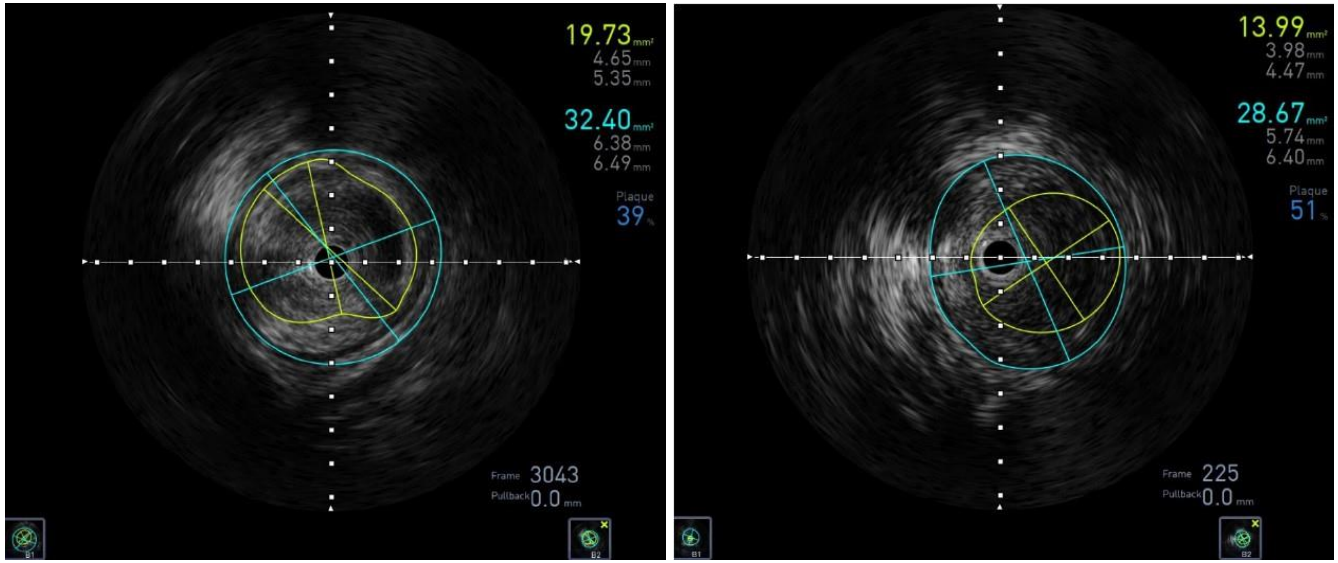
VIEW IMAGING >

- Rutherford II after a couple of weeks, healed ulcera
- Patient is pain free
- Improved ABI

CONCLUSION

- IVUS delivered accurate vessel sizing and ruled out dissection and showed patent flow

ENLARGE IVUS IMAGES >



RATIONALE FOR IVUS

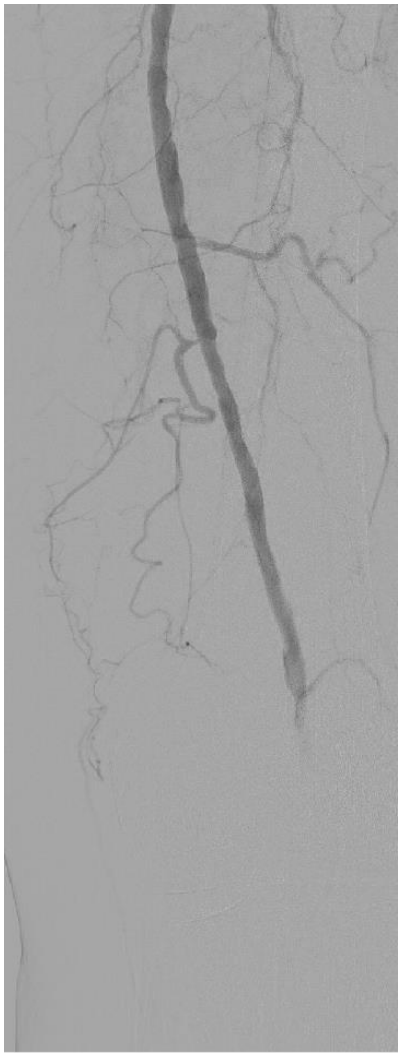
- Greater sensitivity in terms of identifying residual stenosis when used in conjunction with DSA
- Accurate vessel sizing
- Accurate identification of dissections
- Assessment of individual vessels without the need for changing orientation of the image intensifier

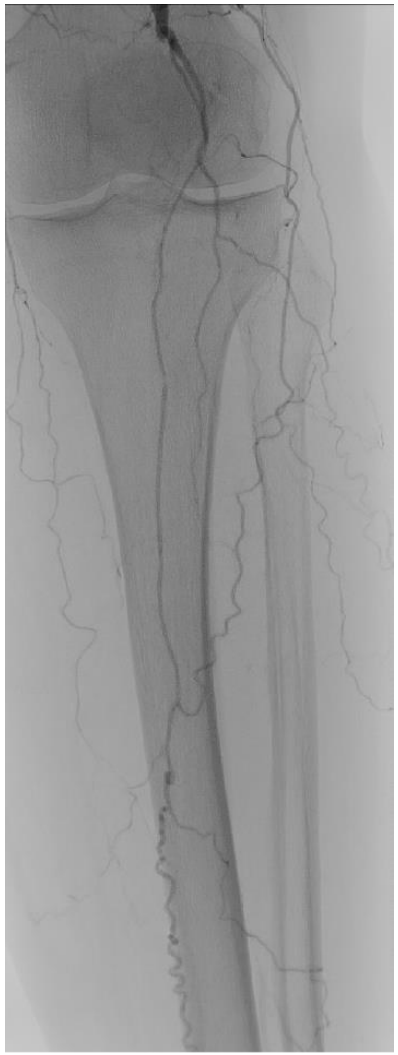
ABI: Ankle brachial index
CVI: Chronic venous insufficiency
DEB: Drug-eluting balloon
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound

Rutherford IV ruled out dissection or restenosis after recanalisation

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

PRESENTATION



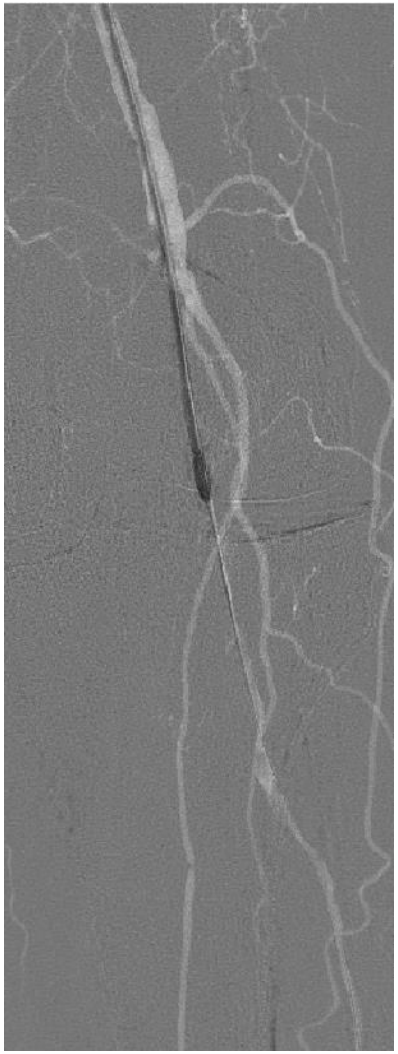


ABI: Ankle brachial index
CVI: Chronic venous insufficiency
DEB: Drug-eluting balloon
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound

Rutherford IV ruled out dissection or restenosis after recanalisation

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

DIAGNOSIS / TREATMENT

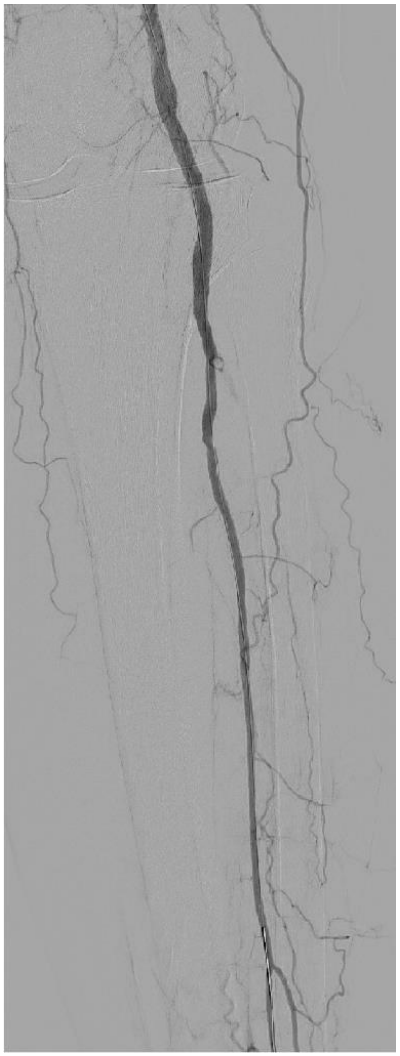


ABI: Ankle brachial index
CVI: Chronic venous insufficiency
DEB: Drug-eluting balloon
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound

Rutherford IV ruled out dissection or restenosis after recanalisation

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

OUTCOME

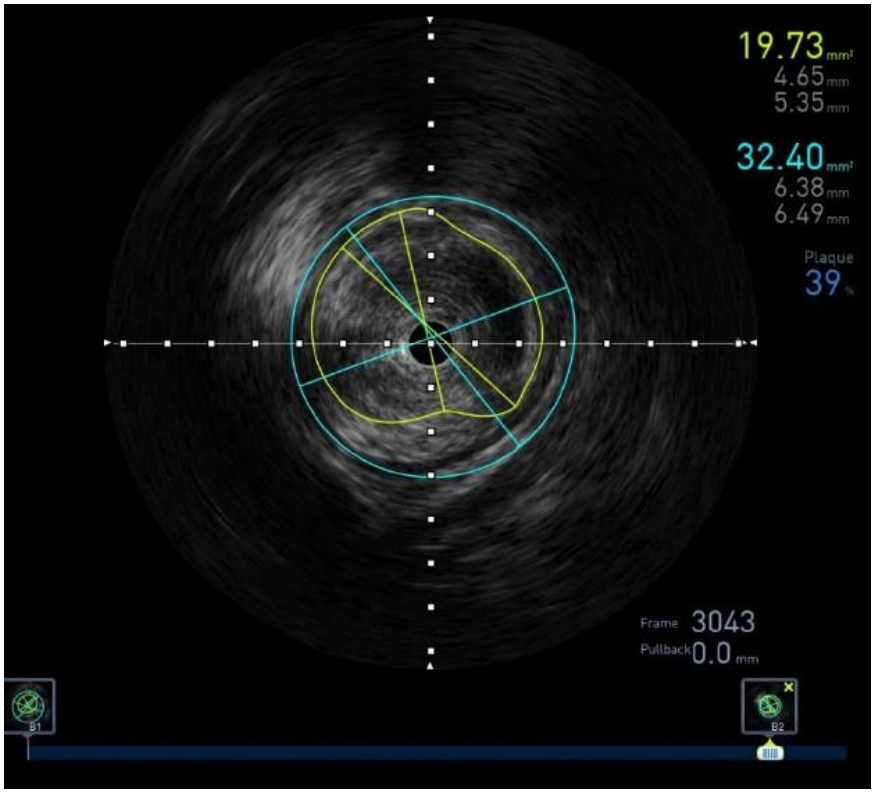


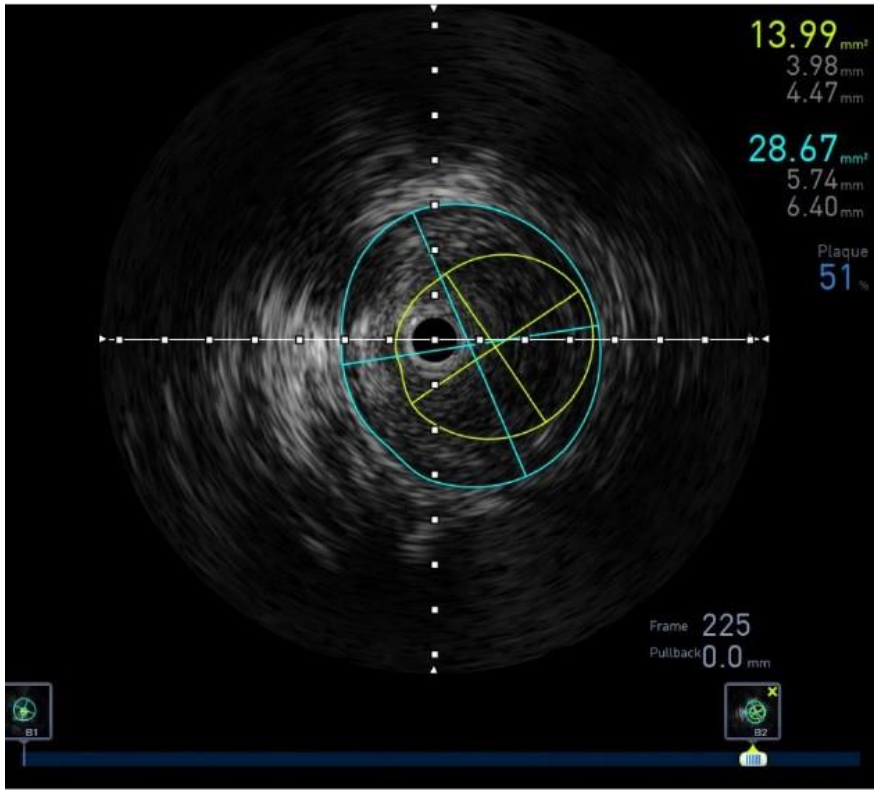
ABI: Ankle brachial index
CVI: Chronic venous insufficiency
DEB: Drug-eluting balloon
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound

Rutherford IV ruled out dissection or restenosis after recanalisation

Arun Kumarasamy, Interventional Radiologist, Krankenhaus Sachsenhausen, Frankfurt, Germany

IVUS IMAGES





ABI: Ankle brachial index
CVI: Chronic venous insufficiency
DEB: Drug-eluting balloon
DSA: Digital subtraction angiography
IVUS: Intravascular ultrasound

Post-thrombotic syndrome resulting in tissue loss

Mr Taha Khan, Consultant Vascular & Endovascular Surgeon, Guy's and St Thomas' NHS Foundation Trust, London, UK

PRESENTATION

VIEW IMAGING >

- 48-year-old soldier who suffered a left lower-limb gunshot wound in the Iraq war of 2003, resulting left iliofemoral DVT in 2003
- Presented in 2020 with left lower-limb post-thrombotic syndrome (PTS): Tissue loss, haemosiderosis and lower-limb swelling
- **Drug history:**
  - Rivaroxaban
  - Omeprazole
  - Pregabalin (for lower limb pain)
- **Venous duplex:**
  - Incomplete visualisation of CIV
  - Patent but incompetent LSV, CFV, PFV, FV
  - EIV occluded distally
- **Magnetic resonance venogram:**
  - May-Thurner Syndrome, chronic CIV disease
  - Severe stenosis of the EIV
  - Extensive superficial venous collaterals

TREATMENT

- Medical management with anticoagulation and compression therapy had failed to resolve persistent symptoms and ulceration
- **Surgical option:** Left iliofemoral deep venous stenting with RFA of the long saphenous vein

OUTCOME

VIEW IMAGING >

- Improvement in left lower-limb swelling over the next week
- Lower-limb discomfort improved over a period of 2-3 weeks
- Ulceration healed after five weeks

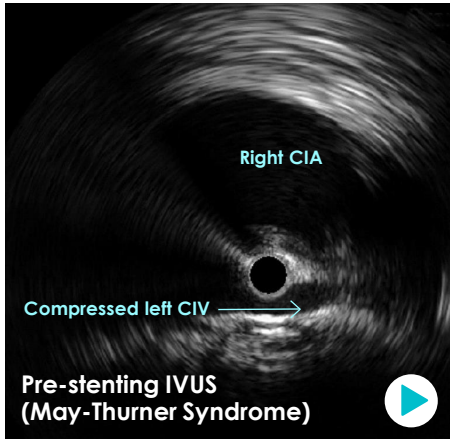
CONCLUSION

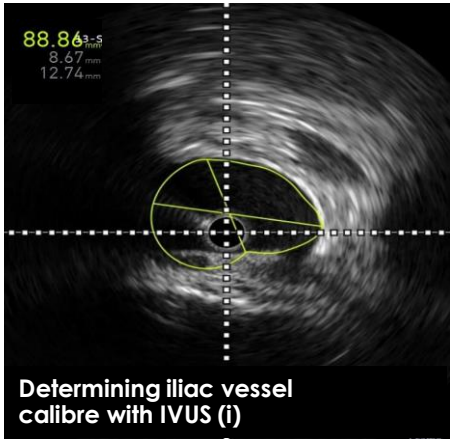
- Medical management provides symptom control but does not cure PTS
- IVUS enabled accurate recognition of the diseased left iliac segments despite challenges with DSV
- IVUS allowed precise assessment of both disease length and vessel calibre, thereby facilitating appropriate stent choice

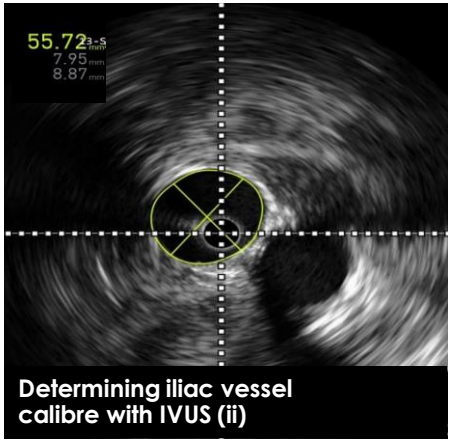
RATIONALE FOR IVUS

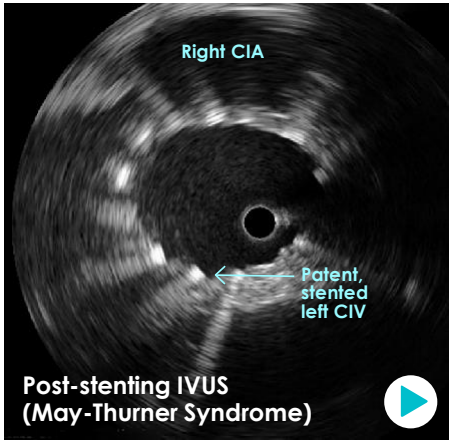
- Accurate identification of the diseased venous segments, even in the absence of flow
- Exact measurement of vessel calibre to guide stent choice
- Precise assessment of the length of deep venous disease
- Clear-cut demonstration of healthy deep veins and the location of the PFV

ENLARGE IVUS IMAGES >







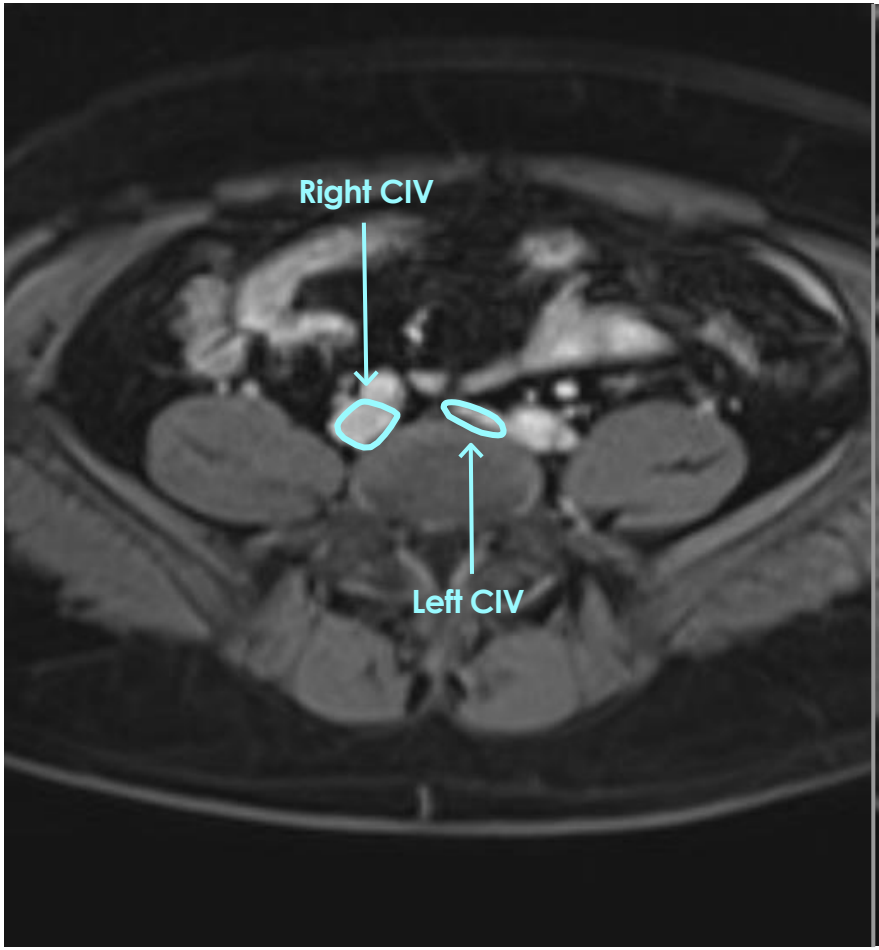


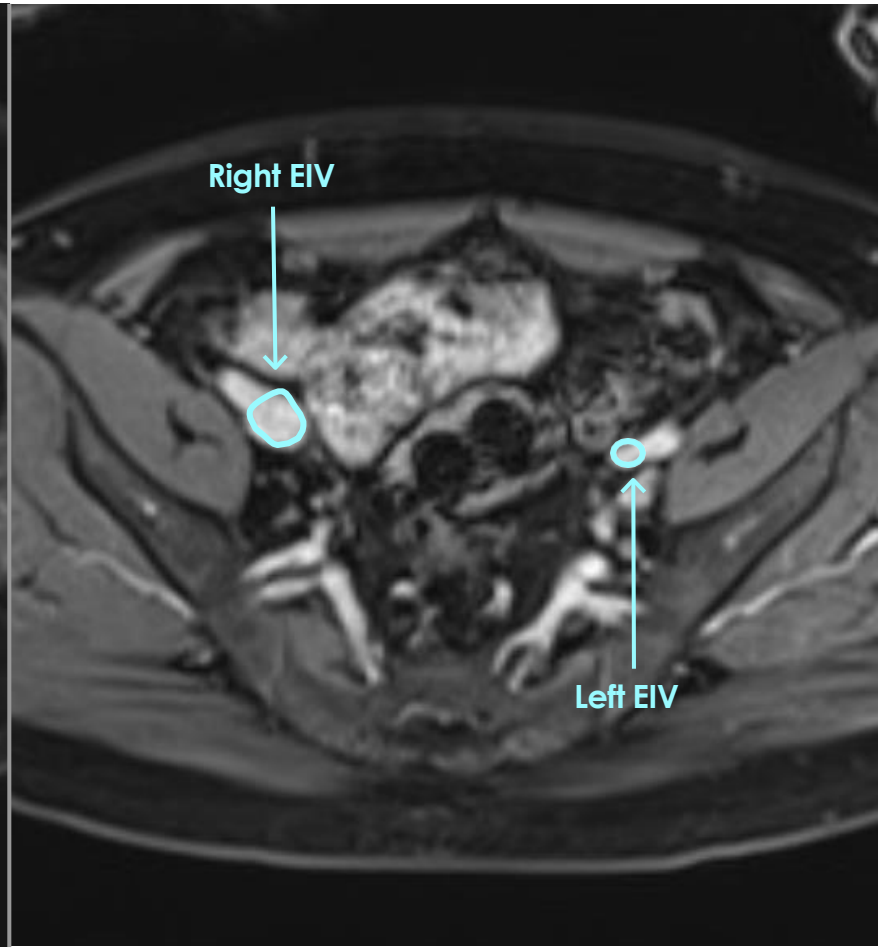
CFV: Common femoral vein
CIV: Common iliac vein
DSV: Digital subtraction venography
DVT: Deep vein thrombosis
EIV: External iliac vein
FV: Femoral vein
IVUS: Intravascular ultrasound
LSV: Long saphenous vein
PFV: Profunda femoris vein
PTS: Post-thrombotic syndrome
RFA: Radiofrequency ablation

Post-thrombotic syndrome resulting in tissue loss

Mr Taha Khan, Consultant Vascular & Endovascular Surgeon, Guy's and St Thomas' NHS Foundation Trust, London, UK

PRESENTATION





CFV: Common femoral vein
CIV: Common iliac vein
DSV: Digital subtraction venography
DVT: Deep vein thrombosis
EIV: External iliac vein
FV: Femoral vein
IVUS: Intravascular ultrasound
LSV: Long saphenous vein
PFV: Profunda femoris vein
PTS: Post-thrombotic syndrome
RFA: Radiofrequency ablation

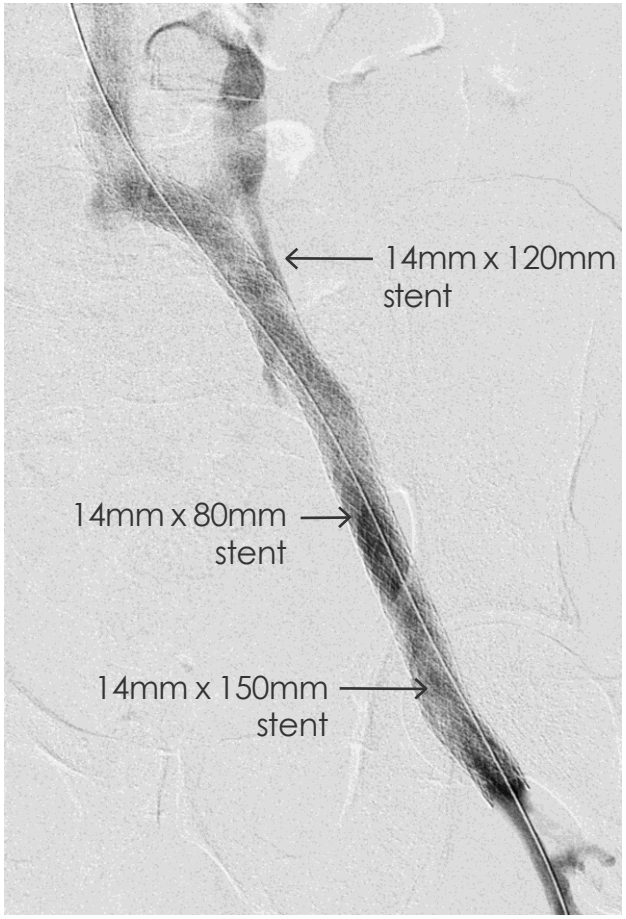
Post-thrombotic syndrome resulting in tissue loss

Mr Taha Khan, Consultant Vascular & Endovascular Surgeon, Guy's and St Thomas' NHS Foundation Trust, London, UK

OUTCOME

Pre-stenting venography

Post-stenting venography

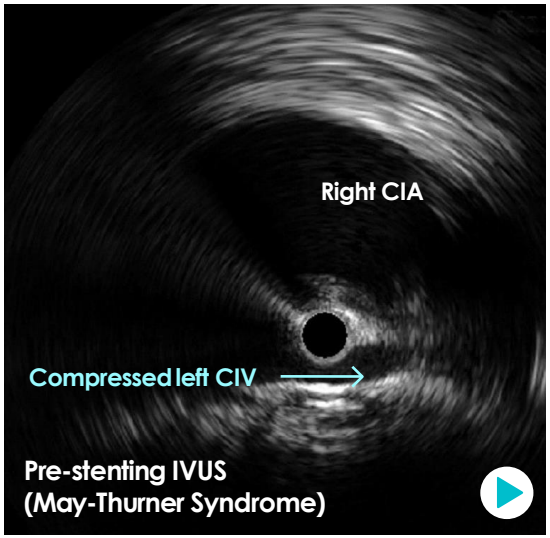


CFV: Common femoral vein
CIV: Common iliac vein
DSV: Digital subtraction venography
DVT: Deep vein thrombosis
EIV: External iliac vein
FV: Femoral vein
IVUS: Intravascular ultrasound
LSV: Long saphenous vein
PFV: Profunda femoris vein
PTS: Post-thrombotic syndrome
RFA: Radiofrequency ablation

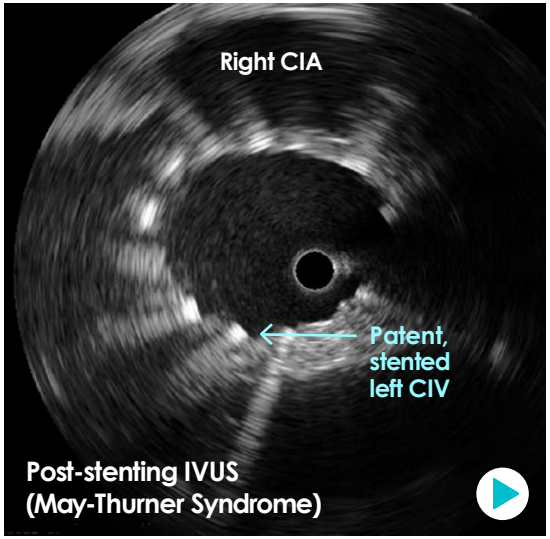
Post-thrombotic syndrome resulting in tissue loss

Mr Taha Khan, Consultant Vascular & Endovascular Surgeon, Guy's and St Thomas' NHS Foundation Trust, London, UK

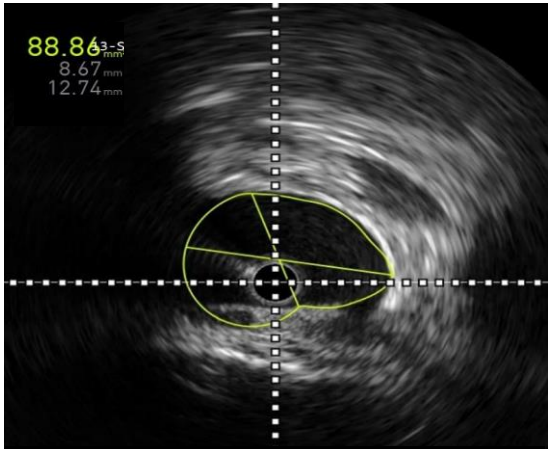
IVUS IMAGES



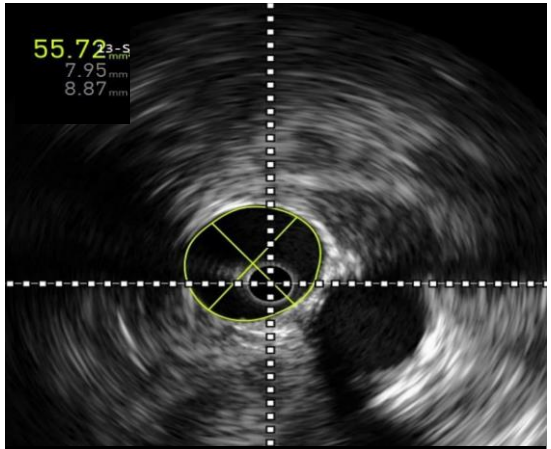
Pre-stenting IVUS (May-Thurner Syndrome)



Post-stenting IVUS (May-Thurner Syndrome)



Determining iliac vessel calibre with IVUS (i)



Determining iliac vessel calibre with IVUS (ii)

CFV: Common femoral vein
CIV: Common iliac vein
DSV: Digital subtraction venography
DVT: Deep vein thrombosis
EIV: External iliac vein
FV: Femoral vein
IVUS: Intravascular ultrasound
LSV: Long saphenous vein
PFV: Profunda femoris vein
PTS: Post-thrombotic syndrome
RFA: Radiofrequency ablation

Acute right iliofemoral deep vein thrombosis

Mr Taha Khan, Consultant Vascular & Endovascular Surgeon, Guy's and St Thomas' NHS Foundation Trust, London, UK

PRESENTATION

VIEW IMAGING >

- 26-year-old female, five weeks post partum
- Three-day history of right lower-limb swelling with discomfort
- Right lower-limb venous congestion to the calf and swelling to the groin
- **Medical history:**
  - Smoker
  - No history of thrombophilia or previous miscarriage
  - No regular medication
- **Venous duplex:**
  - Right iliofemoral DVT with thrombus extending into FV and popliteal vein
  - Patent PFV
- **Computed Tomography Venogram (CTV)**
  - Right iliofemoral DVT
  - No compression of the deep veins or features of malignancy

TREATMENT

- **Medical option:** Anticoagulation and compression
- **Surgical/endovenous option:** thrombolysis with pharmacomechanical therapy (AngioJet™in this case) with venoplasty and deep venous stenting if required
- Risks vs benefit discussion with the patient led to the decision to proceed with endovenous intervention

OUTCOME

VIEW IMAGING >

- Early resolution of venous congestion
- Improvement in swelling over 2-3 days
- Lower limb discomfort improved
- Patient was able to make a prompt return to enjoying time with her new-born infant

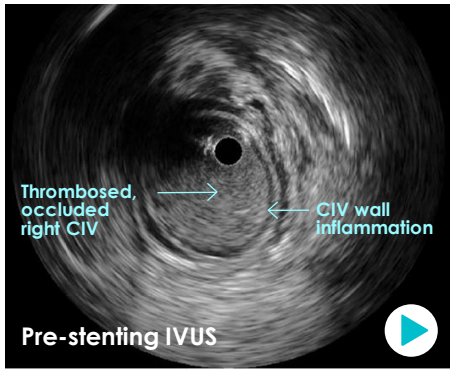
CONCLUSION

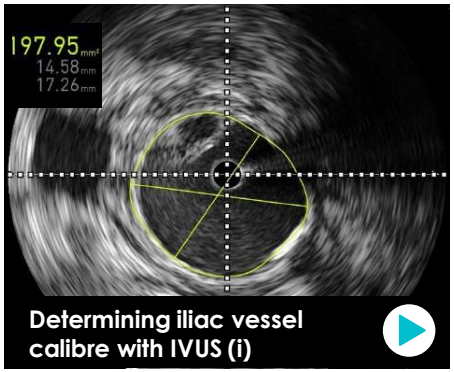
- Intervention for early thrombus resolution can reduce risk of future PTS
- IVUS enabled accurate identification of disease morphology
- IVUS allowed focussed delivery of thrombolytic agents, thereby reducing drug dose and improving thrombus resolution

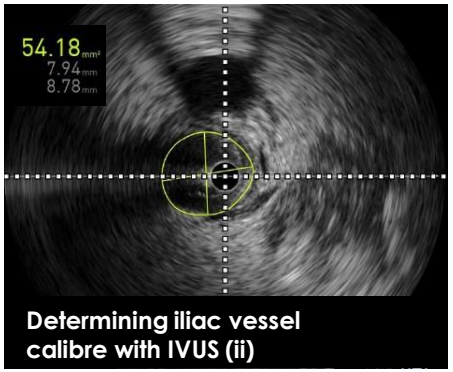
RATIONALE FOR IVUS

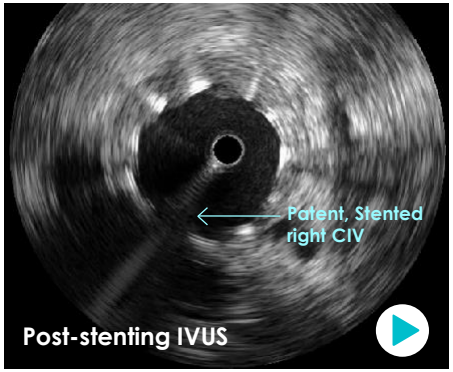
- Accurate identification of the disease morphology enables differentiation between acute thrombus and chronic disease
- Precise measurement of vessel calibre to guide stent choice
- Assessment of which specific deep veins are involved
- Exact demonstration of degree of thrombus resolution which facilitates targeted delivery of further thrombolysis if required

ENLARGE IVUS IMAGES >







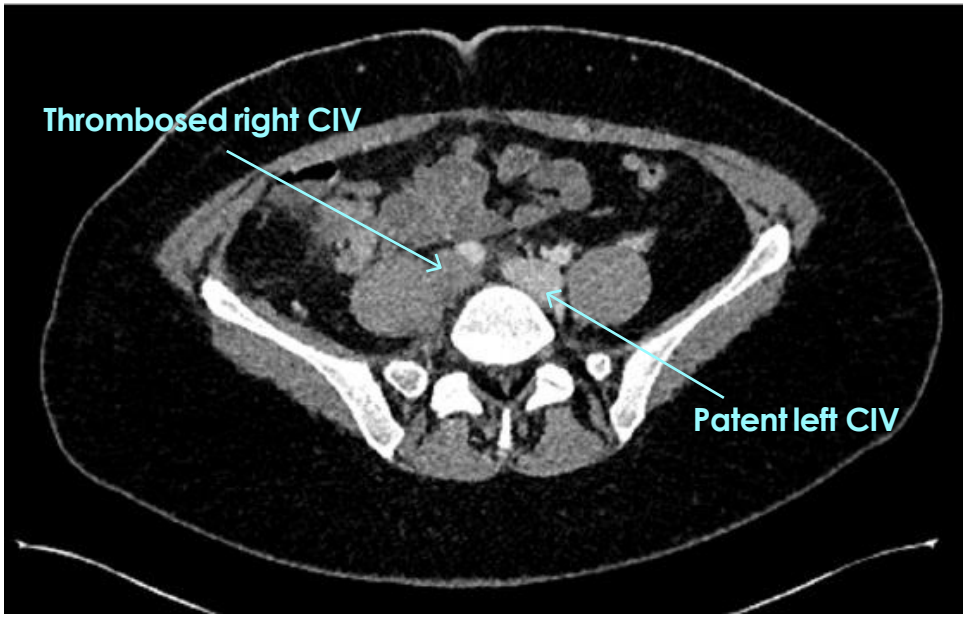


CTA: Computed tomography angiogram
DVT: Deep vein thrombosis
FV: Femoral vein
IVUS: Intravascular ultrasound
PFV: Profunda femoris vein
PTS: Post-thrombotic syndrome

Acute right iliofemoral deep vein thrombosis

Mr Taha Khan, Consultant Vascular & Endovascular Surgeon, Guy's and St Thomas' NHS Foundation Trust, London, UK

PRESENTATION



Pre stenting (patient lying prone)

CTA: Computed tomography angiogram
DVT: Deep vein thrombosis
FV: Femoral vein
IVUS: Intravascular ultrasound
PFV: Profunda femoris vein
PTS: Post-thrombotic syndrome

Acute right iliofemoral deep vein thrombosis

Mr Taha Khan, Consultant Vascular & Endovascular Surgeon, Guy's and St Thomas' NHS Foundation Trust, London, UK

OUTCOME

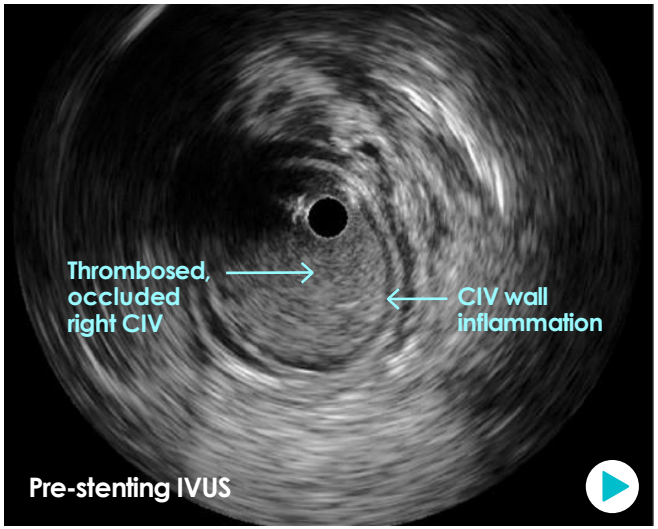
Post stenting (patient lying prone)

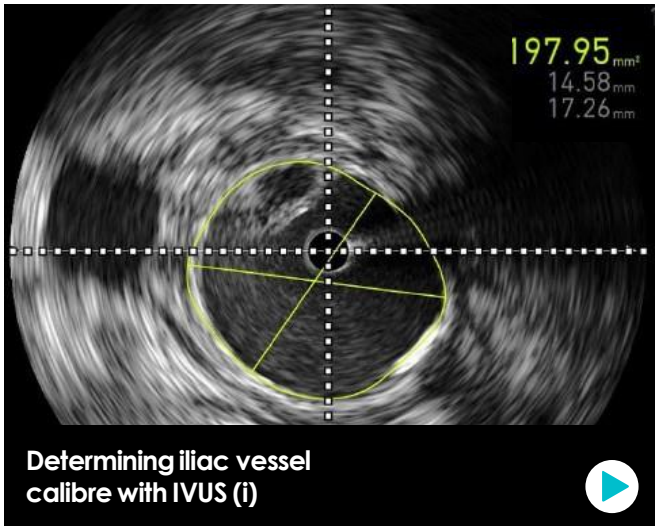
CTA: Computed tomography angiogram
DVT: Deep vein thrombosis
FV: Femoral vein
IVUS: Intravascular ultrasound
PFV: Profunda femoris vein
PTS: Post-thrombotic syndrome

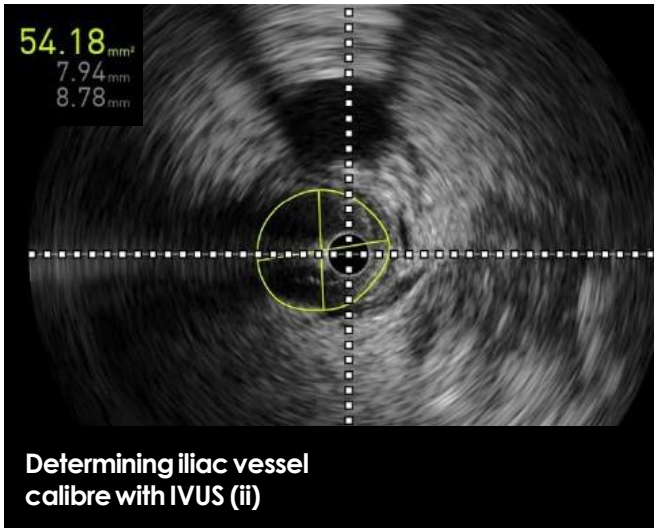
Acute right iliofemoral deep vein thrombosis

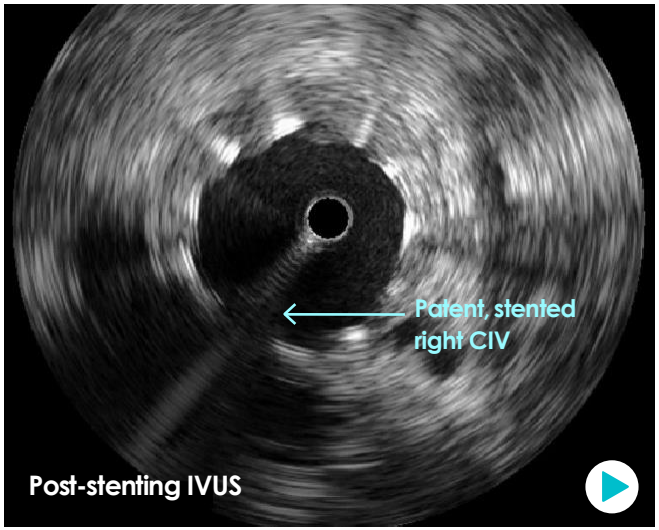
Mr Taha Khan, Consultant Vascular & Endovascular Surgeon, Guy's and St Thomas' NHS Foundation Trust, London, UK

IVUS IMAGES









CTA: Computed tomography angiogram
DVT: Deep vein thrombosis
FV: Femoral vein
IVUS: Intravascular ultrasound
PFV: Profunda femoris vein
PTS: Post-thrombotic syndrome

Bilateral lower-limb post-thrombotic syndrome due to iliocaval disease

Mr Taha Khan, Consultant Vascular & Endovascular Surgeon, Guy's and St Thomas' NHS Foundation Trust, London, UK

PRESENTATION

VIEW IMAGING >

- 47-year-old female
- Four-year history of bilateral lower-limb swelling and pain
- Deterioration 4 months before presentation
- Bilateral lower-limb venous claudication
- **Medical history:**
  - Type 1 diabetes – patient has an insulin pump
  - Multiple episodes of DVTs over the past 11 years
  - No history of thrombophilia
- **Drug history:**
  - Apixaban
- **Venous duplex:**
  - No flow in the infrarenal IVC or the bilateral iliofemoral systems
  - Patent profunda femoris veins but stenotic femoral veins
- **Computed tomography venogram (CTV)**
  - Hypoplastic infrarenal IVC and chronic occlusive disease of the bilateral iliofemoral venous systems

TREATMENT

- **Medical option:** Anticoagulation and compression (but patient has already tried this with very limited benefit)
- **Surgical/endovenous option:** IVC reconstruction and bilateral iliofemoral deep venous stenting
- Patient decided to proceed with endovenous intervention

OUTCOME

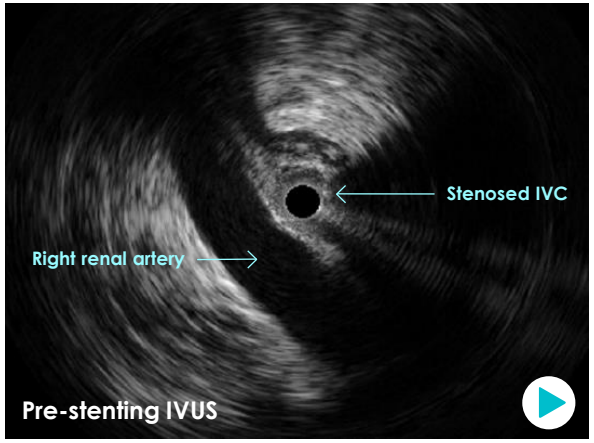
VIEW IMAGING >

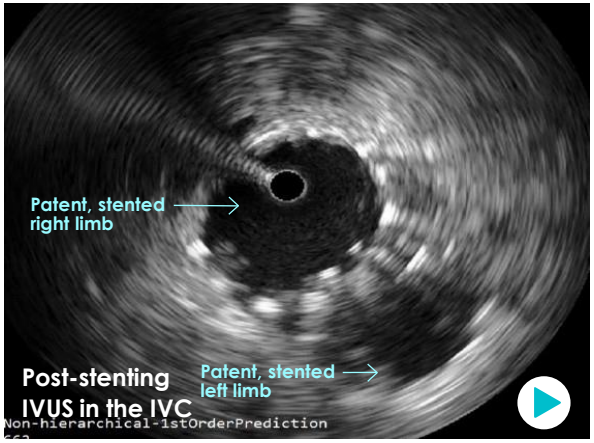
- Improvement in swelling over the next 2-3 weeks
- Lower-limb discomfort improved
- Bilateral lower-limb venous claudication also resolved over the next month

CONCLUSION

- Medical management provides symptom control but does not cure PTS
- IVUS enabled accurate identification of the disease segments
- Clear demonstration of PFV to ensure accurate stenting to preserve inflow

ENLARGE IVUS IMAGES >





RATIONALE FOR IVUS

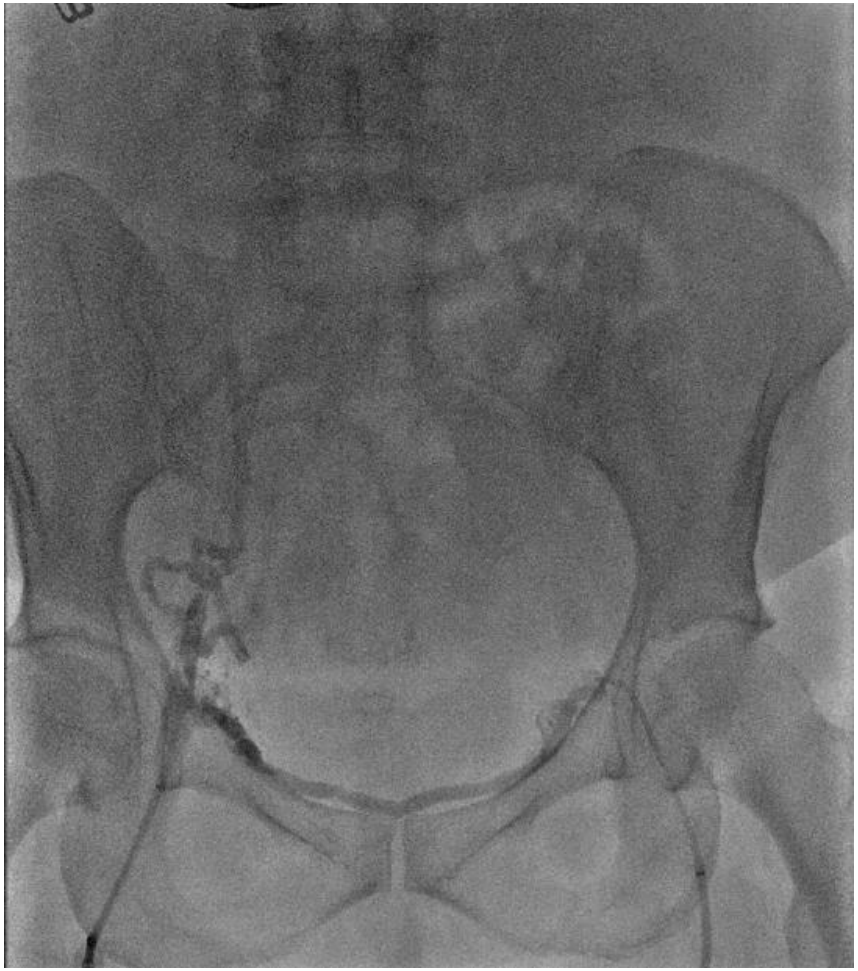
- Accurate identification of the diseased venous segments, even in the absence of flow
- Clear demonstration of the corresponding artery to ensure the correct anatomical path was followed
- Exact identification of the contralateral wire to confirm both the ipsilateral and contralateral wires are in the same fibrotic channel
- Precise measurement of vessel calibre and disease length to guide stent choice

CTA: Computed tomography angiogram
DVT: Deep vein thrombosis
FV: Femoral vein
IVUS: Intravascular ultrasound
PFV: Profunda femoris vein
PTS: Post-thrombotic syndrome

Bilateral lower-limb post-thrombotic syndrome due to iliocaval disease

Mr Taha Khan, Consultant Vascular & Endovascular Surgeon, Guy's and St Thomas' NHS Foundation Trust, London, UK

PRESENTATION



CTA: Computed tomography angiogram
DVT: Deep vein thrombosis
FV: Femoral vein
IVUS: Intravascular ultrasound
PFV: Profunda femoris vein
PTS: Post-thrombotic syndrome

Bilateral lower-limb post-thrombotic syndrome due to iliocaval disease

Mr Taha Khan, Consultant Vascular & Endovascular Surgeon, Guy's and St Thomas' NHS Foundation Trust, London, UK

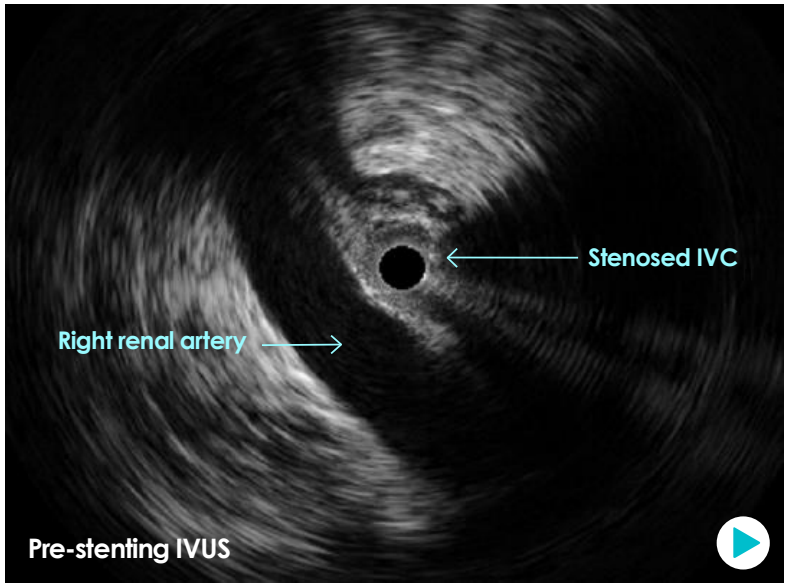
OUTCOME

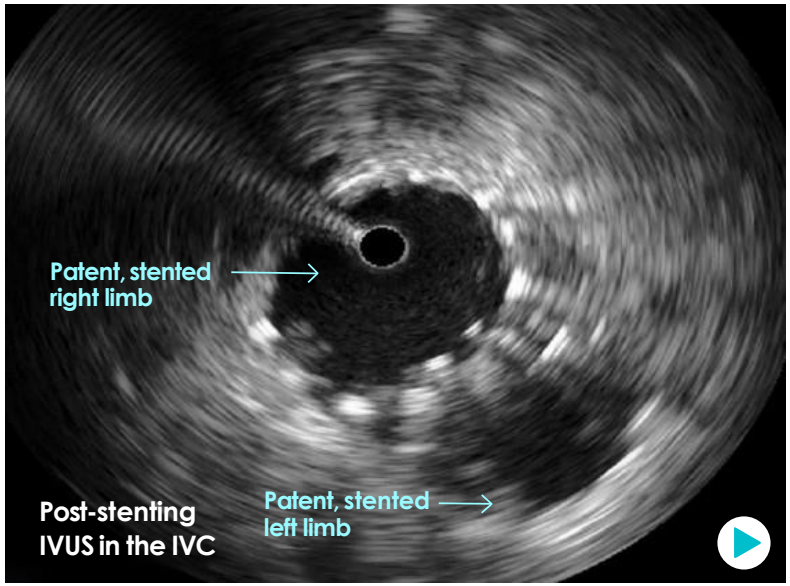
CTA: Computed tomography angiogram
DVT: Deep vein thrombosis
FV: Femoral vein
IVUS: Intravascular ultrasound
PFV: Profunda femoris vein
PTS: Post-thrombotic syndrome

Bilateral lower-limb post-thrombotic syndrome due to iliocaval disease

Mr Taha Khan, Consultant Vascular & Endovascular Surgeon, Guy's and St Thomas' NHS Foundation Trust, London, UK

IVUS IMAGES





CTA: Computed tomography angiogram
DVT: Deep vein thrombosis
FV: Femoral vein
IVUS: Intravascular ultrasound
PFV: Profunda femoris vein
PTS: Post-thrombotic syndrome

Nutcracker Syndrome

Dr Rutger Brans, Interventional Radiologist, Maastricht University Medical Center, Maastricht, The Netherlands

PRESENTATION

VIEW IMAGING >

- 45-year-old female
- Long-lasting left-sided flank pain, dull abdominal pain and bilateral leg pain
- Microscopic haematuria and pubic varicosities
- **Imaging findings (confirmed with phlebography)**:
  - Significant compression of the left renal vein between the aorta and superior mesenteric artery
  - Dilated incompetent left ovarian vein
- **Other phlebography findings:**
  - Left-sided paralumbar dilated collaterals
  - Retrograde filling of the ovarian vein

TREATMENT

VIEW IMAGING >

- Ultrasound-guided antegrade placement of a 6F sheath (15cm) into the right common femoral vein under local anaesthesia
- Fluoroscopy-guided 5F catheter placement into the left renal vein
- Phlebography to confirm nutcracker compression. Sheath in right groin exchanged over a stiff 260cm guidewire for a 55cm long 12F sheath. Latter placed into left renal vein
- Intravascular ultrasound (IVUS) to visualise exact compression point, measure stent size/length and landing zone
- Pre-dilatation with 14mm balloon and a 14/60mm self- expanding stent into the left renal vein. Post-dilatation with a 14mm balloon
- Completion phlebography and IVUS showed good result with smooth flow through the stent into the inferior vena cava
- No significant retrograde filling of the left ovarian vein and paralumbar collateral veins
- Sheath removal and five minutes' manual compression to achieve haemostasis in the groin
- One single dose of 5000 IU intravenous infusion given during the procedure

OUTCOME

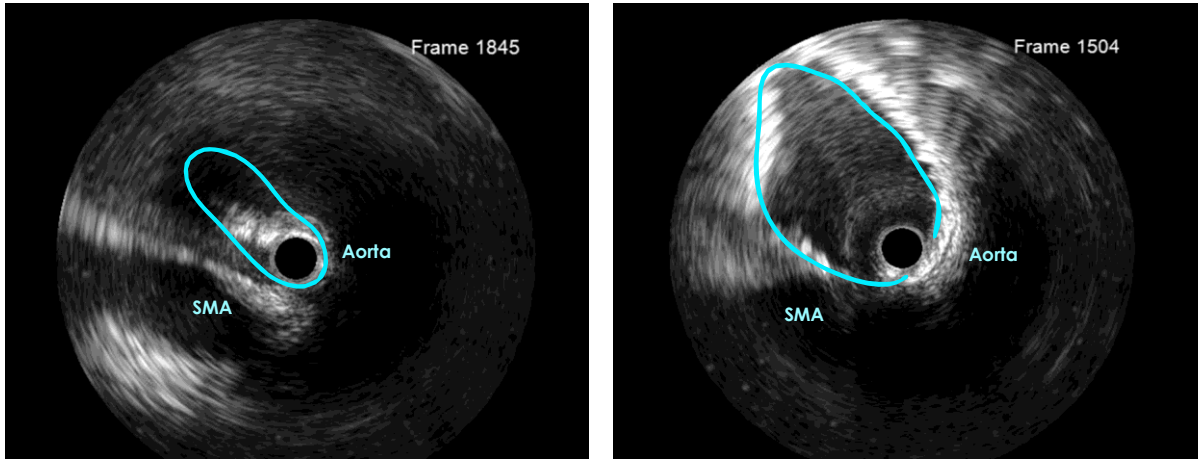
VIEW IMAGING >

- After stent treatment, the patient was very well with no complaints or other symptoms
- Patient developed mild complaints in the left leg after a few weeks, which could not directly related to the nutcracker syndrome
- Pain in left flank and abdominal area was resolved, as was the haematuria
- Control ultrasound duplex at two weeks and six months showed a patent stent with 0% lumen reduction

CONCLUSION

- IVUS imaging provided additional information that was necessary to enable a successful procedure to be performed

ENLARGE IVUS IMAGES >



RATIONALE FOR IVUS

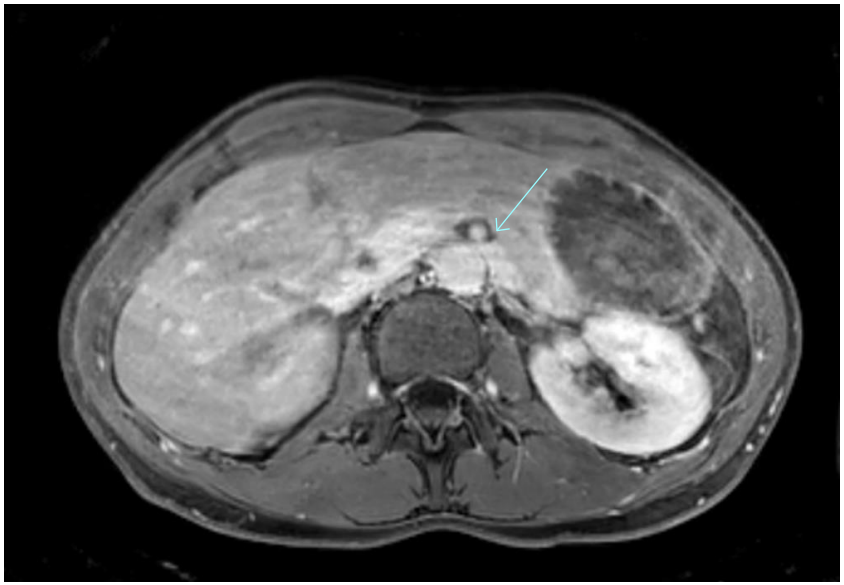
- It was not clear from phlebology if length of left renal vein would allow a 6cm-long stent
- IVUS allowed us to:
  - Determine renal vein length and diameter and patency of lumen
  - Identify exact location of compression/stenosis
  - Provide information about the existence of webbing and prothrombotic trabeculation
- IVUS was used at the end of the endovascular treatment to check if there were any stent- related complications, such as early in-stent thrombosis, which could be missed on phlebography

IU: International unit
IVUS: Intravascular ultrasound
SMA: Superior mesenteric artery

Nutcracker Syndrome

Dr Rutger Brans, Interventional Radiologist, Maastricht University Medical Center, Maastricht, The Netherlands

PRESENTATION



MRV (csTHRIVE sequence) shows compression (arrow) of the left renal vein between aorta on the dorsal side and SMA anteriorly.

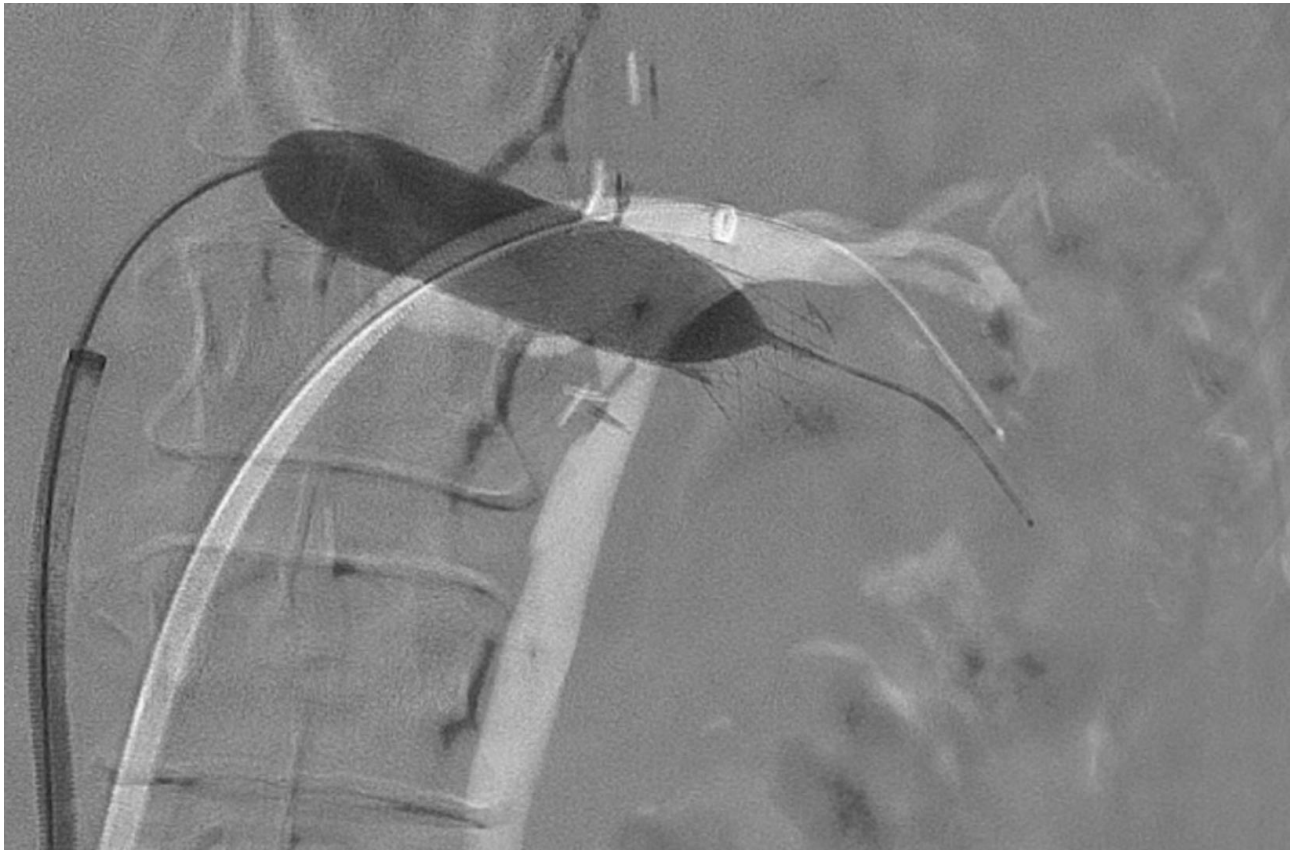
Phlebography shows compression of the left renal vein (top arrow) with retrograde contrast filling of a dilated left ovarian vein (bottom arrow).

IU: International unit
IVUS: Intravascular ultrasound
SMA: Superior mesenteric artery

Nutcracker Syndrome

Dr Rutger Brans, Interventional Radiologist, Maastricht University Medical Center, Maastricht, The Netherlands

TREATMENT



**Roadmap image of phlebography with angioplasty post stenting.
No indention of the balloon is seen at 6 atmospheric pressure.**

IU: International unit
IVUS: Intravascular ultrasound
SMA: Superior mesenteric artery

Nutcracker Syndrome

Dr Rutger Brans, Interventional Radiologist, Maastricht University Medical Center, Maastricht, The Netherlands

OUTCOME

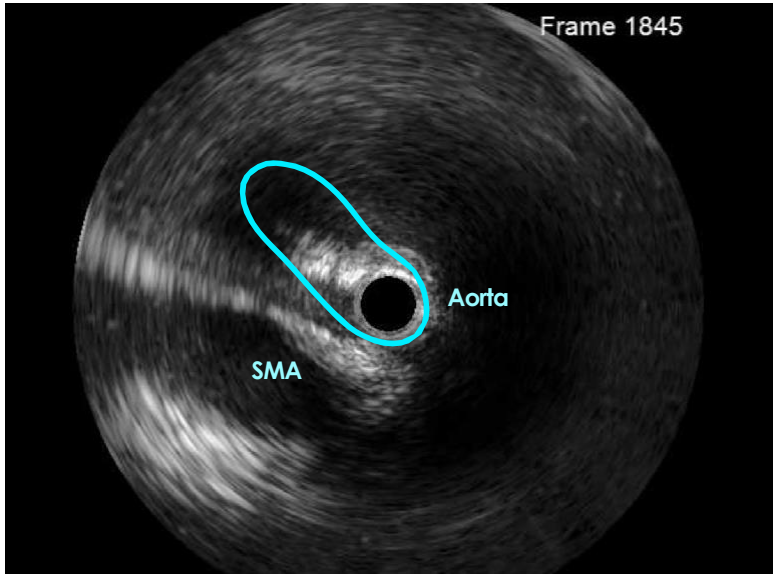
Completion phlebography shows nice stent position with good flow.
There are no paralumbar collaterals or retrograde filling of ovarian vein.

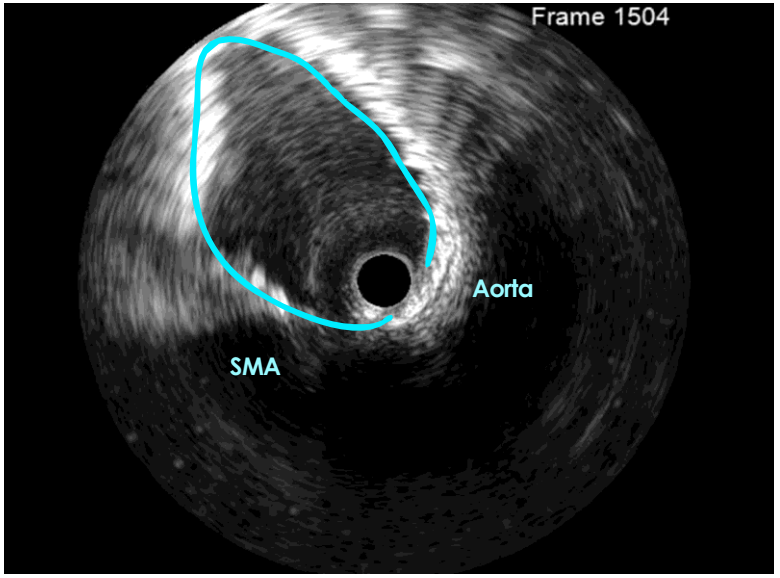
IU: International unit
IVUS: Intravascular ultrasound
SMA: Superior mesenteric artery

Nutcracker Syndrome

Dr Rutger Brans, Interventional Radiologist, Maastricht University Medical Center, Maastricht, The Netherlands

IVUS IMAGES





IVUS images at presentation and after stent placement in left renal vein (LRV), outlined in blue. Pre treatment the LRV is flattened due compression between aorta and superior mesenteric artery (SMA). After stent placement de LRV is fully opened with good stent apposition and no intraluminal thrombus is seen.

IU: International unit
IVUS: Intravascular ultrasound
SMA: Superior mesenteric artery

Boston Scientific
Advancing science for life™

Results from case studies are not necessarily predictive of results in other cases. Results in other cases may vary.

All cited trademarks are the property of their respective owners. CAUTION: The law restricts these devices to sale by or on the order of a physician. Indications, contraindications, warnings, and instructions for use can be found in the product labelling supplied with each device or at www.IFU-BSCI.com. Products shown for INFORMATION purposes only and may not be approved or for sale in certain countries. This material not intended for use in France.

PI-1268203-AB.

www.bostonscientific.eu