Convegno accessi vascolari per emodialisi: Approccio integrato e strategie operative

Tromboaspirazione

D.Leni
Radiologia interventistica
IRCCS San Gerardo, Monza

Mechanism of thrombosis

Thrombosis often presents as the final complication after a period of AVF dysfunction.

Causes:

- progressive stenosis in the AVF or in the outflow
- hypotension

Treatment needs to be started as soon as possible to prevent organisation of the thrombus and endothelial damage in the vein.

Early thrombus removal allows immediate use without the need for a CVC

Vascular Access: 2018 Clinical Practice Guidelines of the European Society for Vascular Surgery (ESVS)

Treatment options

Recommendation 64	Class	Level	Refs.
Surgery or endovascular methods should be considered for treatment of late thrombosis of vascular accesses depending on the centre's expertise.	IIa	B	270,271
Recommendation 65			
Treatment of vascular access thrombosis should include peri-operative diagnosis and treatment of any associated stenosis.	I	C	548,552,553

Table 2. Grades of strength of recommendations according to the ESC grading system.[7]

Classes of Recommendations	Definition
Class I	Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective.
Class II	Conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of the given treatment or procedure.
Class IIa	*Weight of evidence/opinion is in favour of usefulness/efficacy.*
Class IIb	*Usefulness/efficacy is less well established by evidence/opinion.*
Class III	Evidence or general agreement that the given treatment or procedure is not useful/effective, and in some cases may be harmful.

Table 1. Levels of evidence.[7]

Level of Evidence A	*Data derived from multiple randomised clinical trials or meta-analyses.*
Level of Evidence B	*Data derived from a single randomised clinical trial or large non-randomised studies*
Level of Evidence C	*Consensus of opinion of the experts and/or small studies, retrospective studies, registries.*

Vascular Access: 2018 Clinical Practice Guidelines of the European Society for Vascular Surgery (ESVS)

Treatment options

KDOQI

KIDNEY DISEASE OUTCOMES QUALITY INITIATIVE

National Kidney Foundation

KDOQI CLINICAL PRACTICE GUIDELINE FOR VASCULAR ACCESS: 2019 UPDATE

Charmaine E. Lok, Thomas S. Huber, Timmy Lee, Surendra Shenoy, Alexander S. Yevzlin, Kenneth Abreo, Michael Allon, Arif Asif, Brad C. Astor, Marc H. Glickman, Janet Graham, Louise M. Moist, Dheeraj K. Rajan, Cynthia Roberts, Tushar J. Vachharajani, and Rudolph P. Valentini

Abstract

The National Kidney Foundation's Kidney Disease Outcomes Quality Initiative (KDOQI) has provided evidence-based guidelines for hemodialysis vascular access since 1996. Since the last update in 2006, there has been a great accumulation of new evidence and sophistication in the guidelines process. The 2019 update to the KDOQI Clinical Practice Guideline for Vascular Access is a comprehensive document intended to assist multidisciplinary practitioners care for chronic kidney disease patients and their vascular access. New topics include the end-stage kidney disease "Life-Plan" and related concepts, guidance on vascular access choice, new targets for arteriovenous access (fistulas and grafts) and central venous catheters, management of specific complications, and renewed approaches to some older topics. Appraisal of the quality of the evidence was independently conducted by using a Grading of Recommendations Assessment, Development, and Evaluation (GRADE) approach, and interpretation and application followed the GRADE Evidence to Decision frameworks. As applicable, each guideline statement is accompanied by rationale/background information, a detailed justification, monitoring and evaluation guidance, implementation considerations, special discussions, and recommendations for future research.

In citing this document, the following format should be used: Lok CE, Huber TS, Lee T, et al; KDOQI Vascular Access Guideline Work Group. KDOQI clinical practice guideline for vascular access: 2019 update. *Am J Kidney Dis.* 2020;75(4)(suppl 2):S1-S164.

As they are designed to reflect the views and recommendations of the responsible KDOQI Work Group, based on data from an independent evidence review team, and because they undergo both internal and public review, KDOQI guidelines are not peer reviewed by *AJKD*.

Treatment options

Statement: General Treatment of Clinically Significant Stenosis or Thrombosed AV Access

15.4 **KDOQI considers it reasonable to use a careful individualized approach to the treatment of failing or thrombosed AVF and AVG (surgical or endovascular), based on the operators best clinical judgment and expertise considering the patient's ESKD Life-Plan. (Expert Opinion)**

Note: Consider both the patient's individual circumstances and the operator's clinical experience and expertise (ie, reasonable capabilities and limitations); preferably discussed and agreed on by the team managing the patient's vascular access, including but not limited to the patient and one or more of the following: nephrologist, interventionalist, surgeon, vascular access coordinator, cannulators (nurse or technician).

Statements: Treatment of Clinically Significant AV Access Stenosis

Angioplasty

15.5 **KDOQI considers it reasonable to use balloon angioplasty (with high pressure as needed) as primary treatment of AVF and AVG stenotic lesions that are both clinically and angiographically significant. (Expert Opinion)**

Note: Angiographically present stenosis without accompanying clinical signs and symptoms is inadequate to treat/intervene upon.

15.6 **There is inadequate evidence for KDOQI to make a recommendation regarding the use of specialized balloons (drug-coated or cutting) versus standard high-pressure balloons in the primary treatment of AVF and AVG stenosis.**

15.7 **There is inadequate evidence for KDOQI to make a recommendation regarding the optimal duration of balloon inflation time during angioplasty to improve intervention primary patency in the treatment of AVF or AVG stenosis.**

15.8 **KDOQI considers it reasonable that a careful patient-individualized approach to the choice of balloon type for angioplasty of clinically significant AVF and AVG stenosis be based on the operator's best clinical judgment and expertise. (Expert Opinion)**

Stents

15.9 **KDOQI suggests the appropriate use of self-expanding stent-grafts in preference to angioplasty alone to treat clinically significant graft-vein anastomotic stenosis in AVG when the goal is overall better 6-month postintervention outcomes after carefully considering the patient's ESKD Life-Plan. (Conditional Recommendation, Moderate Quality of Evidence)**

Note: Appropriate use avoids cannulation segments.

Note: Overall better 6-month outcomes refer to reduced recurrent AVG restenosis ± improved patency.

15.10 **KDOQI considers it reasonable to first consider the consequences of placement of a stent-graft on future AV access options according to the patient's ESKD Life-Plan, with consultation with the vascular access team if necessary, prior to its placement. (Expert Opinion)**

15.11 **KDOQI suggests that the use of an appropriately placed stent-graft is preferred to angioplasty alone for the treatment of in-stent restenosis in AVG and AVF for overall better 6-month postintervention outcomes. (Conditional Recommendation, Moderate Quality of Evidence)**

Note: Appropriate use avoids cannulation segments.

Note: Overall better 6-month outcomes refer to reduced recurrent AVG and AVF restenosis ± improved patency.

15.12 **KDOQI considers it reasonable to avoid the use of bare metal stents for the treatment of clinically and/or angiographically significant AVG and AVF stenotic lesions. (Expert Opinion)**

Rationale/Background

Maintaining effective functioning AV access (AVF and AVG) is an ongoing challenge that frequently requires remedial treatment for problematic AV accesses (see Table 13.2, Clinical Indicators (Signs and Symptoms) Suggesting Underlying Clinically Significant Lesions During Access Monitoring), especially if AV access thrombosis occurs as a terminal event. Several of these conditions are addressed in separate sections of the Guidelines (Guidelines 16-19). The generic approach to these various failure modes includes appropriate monitoring and imaging to identify the underlying cause and then definitive treatment of the clinically significant culprit lesion. Various endovascular approaches have largely replaced the open, surgical approach and should be used as the first line of treatment, with the surgical approach reserved for endovascular failures, lesions not amenable to endovascular treatment, and those select lesions in which the surgical approach is deemed far more durable.

Stenosis is the most common complication after AV access creation.[393] Venous stenosis is often the result of neointimal hyperplasia[394] and leads to several serious sequelae in both AVF and AVG. Stenosis causes AVF nonmaturation with the attendant reliance on CVCs. AVF maturation failure has been reported in observational studies to range from 20% to 60%.[77,233,234] Furthermore,

Future Research

- Study the patient and AV access outcomes and impact of (1) ultrasound-guided angioplasty and (2) intravascular ultrasound-guided angioplasty, to limit contrast exposure in CKD/ESKD patients with residual kidney function and urine output
- Stent-grafts versus bare-metal stents for treatment of central vein stenosis requires more RCT evaluation, with larger numbers, rigorous conduct, and analysis.
- More RCT evaluation of stent-grafts for vascular access management (primary or secondary) with clinical-based (rather than angiogram) outcomes are urgently required.
- Study is needed in AVFs for multiple modalities of treatment (eg, stent-grafts, drug-eluting balloons, etc).
- Comparative methods of AV access thrombolysis (eg, surgical vs endovascular) with a variety of short- and longer-term AVF and AVG outcomes
- Increasing evidence in the following areas:
  - The use of specialized balloons (drug-coated or cutting) versus standard high-pressure balloons in the primary treatment of AVF and AVG stenosis
  - The optimal duration of balloon inflation time during angioplasty to improve intervention primary patency in the treatment of AVF or AVG stenosis
  - The secondary use of drug-coated balloons after successful angioplasty with high-pressure balloons for treatment of stenosis in AVF and AVG
- Impact of timing of recurrence of stenosis on choice of treatment modality
- Use of stent grafts in locations other than graft-vein anastomosis or cephalic arch in brachiocephalic AVFs
- Optimal treatment of in-stent stenosis that occurs in stent-grafts
- Study outcomes with surgically corrected occluded AV accesses that are followed by a completion angiogram/imaging ± further corrective procedure. How does this strategy compare with historical surgical correction without completion imaging or with endovascular management?
- The optimal timing of angioplasty/thrombolysis or thrombectomy in thrombosed AVF and AVG
- Studies to determine the best measurement that defines a successful procedure outcome: for example, should it be a percent relative improvement in lumen size or an absolute lumen diameter or other measurement? When should it be measured after the treatment (eg, PTA) (during the procedure or after?)

Statements: Treatment of Thrombosed AV Access

15.13 **KDOQI considers it reasonable that management of each episode of AV access thrombosis is at the operator's/clinician's best judgement and discretion, and involves the consideration of the patient's dialysis access Succession Plan that is consistent with the ESKD Life-Plan, given the compromised AV access patency after either endovascular or surgical treatment. (Expert Opinion)**

Note: Operators/clinician's discretion carefully considers both the patient's individual circumstances and the operator's/clinician's own clinical experience and expertise (ie, reasonable capabilities and limitations). The Succession Plan is a critical component of the P-L-A-N (see Monitoring and Evaluation discussion in Guideline 1).

15.14 **KDOQI considers it reasonable to surgically treat a failing AV access in the following circumstances: (1) endovascular treatment failures, (2) clinically significant lesions not amenable to endovascular treatment, and (3) situations in which the surgical outcomes are deemed markedly better. (Expert Opinion)**

Note: Situations when surgical outcomes are anticipated to be better than alternative options should be first discussed and agreed upon by the team managing the patient's vascular access, including but not limited to the patient and one or more of the following: nephrologist, interventionalist, surgeon, vascular access coordinator, and cannulation expert, if possible.

Rationale/Background

Fully occlusive thrombosis represents the terminal event for the failing AV access and accounts for 65% to 85% of all AV access abandonments.[438] Although the contributory cause of the terminal thrombotic event is usually obvious (eg, low flow related to venous outflow stenosis in AVG), patients can present with de novo thrombosis without any clear failure mechanism.[439] The clinical priorities include providing necessary effective dialysis, clearing the intraluminal thrombus, and definitively treating the underlying cause of the failure.

The diagnosis of a thrombosed AV access is often obvious on physical examination but can be confirmed with duplex ultrasound. Patients with an emergent need for dialysis (eg, volume overload, hyperkalemia) should be dialyzed through a temporary nontunneled CVC prior to definitive treatment of their AV access thrombosis.

Detailed Justification

Both endovascular and open surgical approaches for treating thrombosed AVGs are acceptable, with the choice determined by the local practice and expertise, underlying condition, and patient preference. Although earlier reports suggested superior outcomes with the surgical approach, more recent reports have suggested that both approaches for AVGs are comparable, likely reflecting the overall evolution in the endovascular therapies.[431,440,441] Furthermore, there are a number of different endovascular approaches, although none has proven superior.[438] Importantly, open surgical and endovascular approaches should not be viewed as competing but rather complementary, because there are a variety of hybrid approaches

BACKGROUND

Review > Cochrane Database Syst Rev. 2024 Feb 14;2(2):CD013293.
doi: 10.1002/14651858.CD013293.pub2.

Interventions for thrombosed haemodialysis arteriovenous fistulas and grafts

Andre V Fonseca [1], Marcos G Toledo Barros [1], Jose Cc Baptista-Silva [2], Jorge E Amorim [1], Vladimir Vasconcelos [1]

Background: Patients who present with problems with definitive dialysis access (arteriovenous fistula (AVF) or arteriovenous graft (AVG)) become catheter dependent (temporary access), a condition that often carries a higher risk of infections, central venous occlusions and recurrent hospitalisations. For AVG, primary patency rates are reported to be 30% to 90% in patients undergoing thrombectomy or thrombolysis. According to the National Kidney Foundation-Kidney Disease Outcomes Quality Initiative (NKF-KDOQI) guidelines, surgery is preferred when the cause of the thrombosis is a stenosis at the site of the anastomosis in thrombosed AVF. The European Best Practice Guidelines (EBPG) reported that thrombosed AVF may be preferably treated with endovascular techniques, but when the cause of thrombosis is in the anastomosis, surgery provides better results with re-anastomosis. Therefore, there is a need to carry out a systematic review to determine the effectiveness and safety of the intervention for thrombosed fistulae.

Objectives: This review aims to establish the efficacy and safety of interventions for failed AVF and AVG in patients receiving haemodialysis (HD).

Search methods: We searched the Cochrane Kidney and Transplant Register of Studies up to 28 January 2024 through contact with the Information Specialist using search terms relevant to this review. Studies in the Register are identified through searches of CENTRAL, MEDLINE, EMBASE, conference proceedings, the International Clinical Trials Registry Portal (ICTRP) Search Portal and ClinicalTrials.gov.

Selection criteria: The review included randomised controlled trials (RCTs) and quasi-RCTs in people undergoing HD treatment using AVF or AVG presenting with clinical or haemodynamic evidence of thrombosis. Patients had to have used an AVF or AVG at least once.

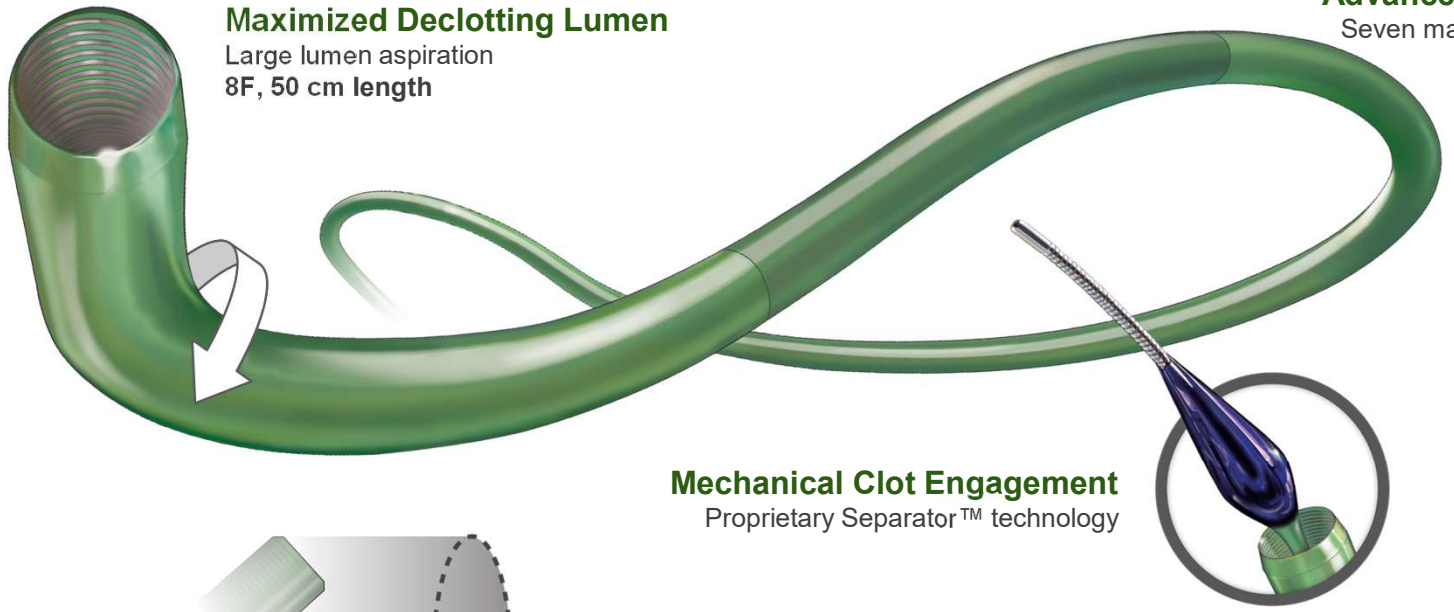
Data collection and analysis: Summary estimates of effect were obtained using a random-effects model, and results were expressed as risk ratios (RR) and their 95% confidence intervals (CI) for dichotomous outcomes. Confidence in the evidence was assessed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach.

Main results: Our search strategy identified 14 eligible studies (1176 randomised participants) for inclusion in this review. We included three types of interventions for the treatment of thrombosed AVF and AVG: (1) types of thrombectomy, (2) types of thrombolysis and (3) surgical procedures. Most of the included studies had a high risk of bias due to a poor study design, a low number of patients and industry involvement. Overall, there was insufficient evidence to suggest that a specific intervention was better than another for the outcomes of failure, primary patency at 30 days, technical success and adverse events (both major and minor). Primary patency at 30 days may improve with surgical compared to mechanical thrombectomy (3 studies, 404 participants: RR 1.36, 95% CI 1.07 to 1.67); however, the evidence is very uncertain. Death, access dysfunction, successful dialysis, and SONG (Standards Outcomes in Nephrology) outcomes were rarely reported. The current review is limited by the small number of available studies with a limited number of patients enrolled. Most of the studies included in this review have a high risk of bias and a low or very low certainty of evidence. Further research is required to define the most effective and clinically appropriate technique for access dysfunction.

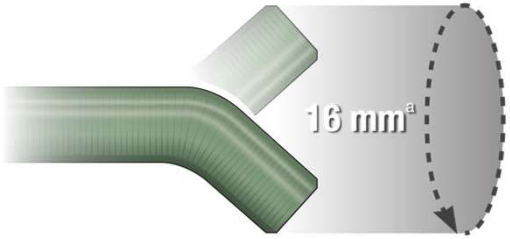
Authors' conclusions: It remains unclear whether any intervention therapy affects the patency at 30 days or failure in any thrombosed HD AV access (very low certainty of evidence). Future research will very likely change the evidence base. Based on the importance of HD access to these patients, future studies of these interventions among people receiving HD should be a priority.

Maximized Declotting Lumen
Large lumen aspiration
8F, 50 cm length

Advanced Trackability
Seven material transitions



Mechanical Clot Engagement
Proprietary Separator™ technology



Circumferential Aspiration
Tip directionality designed to enable aspiration in aneurysmal segments

One Touch for Maximum Aspiration
Powerful, Deep Vacuum

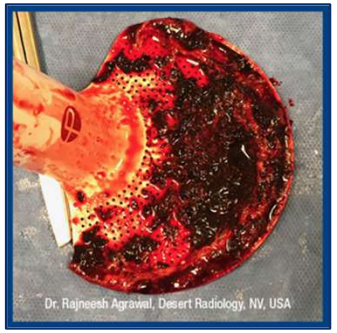
-29 inHg[a]

Easy Setup
Sleek, Simple Design

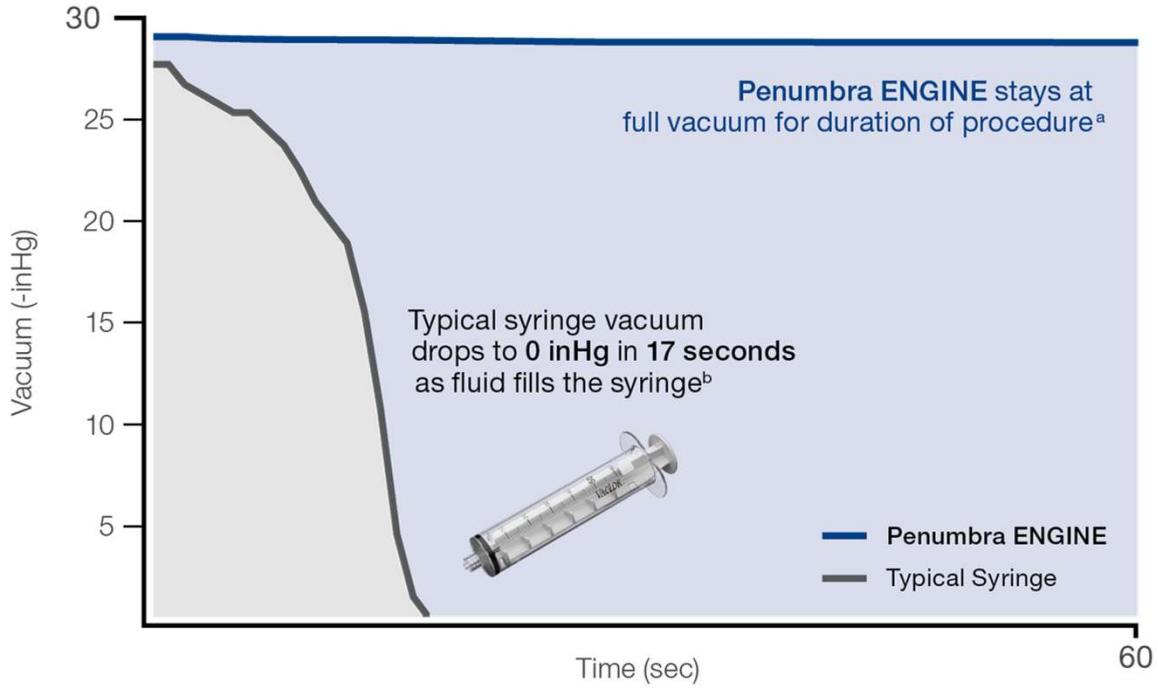


Live Feedback During Procedure
Integrated Clot Catcher





Mechanical Power Aspiration





LIGHTNING BOLT



2013

Pump MAX™



2014

CAT™**5** & CAT**3**



2015

CAT**8** & CAT**6**

2018

CAT**D**



2020

Penumbra ENGINE™



2022

Lightning 12
Lightning 7 CAT7D



2024

NOW!!!
Bolt & FLASH





Indigo System · *CAVT*
Computer Assisted Vacuum Thrombectomy

Product availability varies by country. Caution: Federal (USA) law restricts these devices to sale by or on the order of a physician. Prior to use, please refer to the Instructions for Use (IFU) for complete product indications, contraindications, warnings, precautions, potential adverse events, and detailed instructions for use. Please contact your local Penumbra representative for more information.

Copyright ©2023–2024 Penumbra, Inc. All rights reserved. The Penumbra P logos, Lightning Bolt, Indigo, CAVT, Lightning, and Lightning Flash are registered trademarks or trademarks of Penumbra, Inc. in the USA and other countries. All other trademarks are the property of their respective owners. 26047, Rev. B 09/24 UNI

WHICH AND WHEN?

Factors influencing choice of catheter:

- vessels tortuosity
- length of thrombosis
- multiple stenosis
- extimated blood loss
- extimated long procedure
- central vessels involvement
- transfemoral/multiple approach

CLINICAL PRACTICE

Factors influencing success

- aneurism
- length of obstruction
- age of thrombus
- dimension of device used
- thrombosis of the artery
- phlebitis

Clinical case

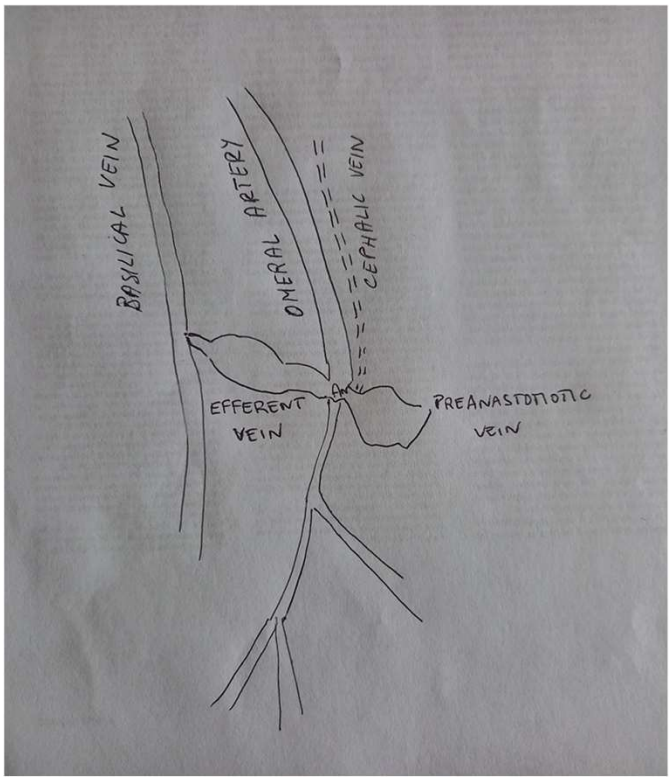
Patient, age 59. Severe obesity.

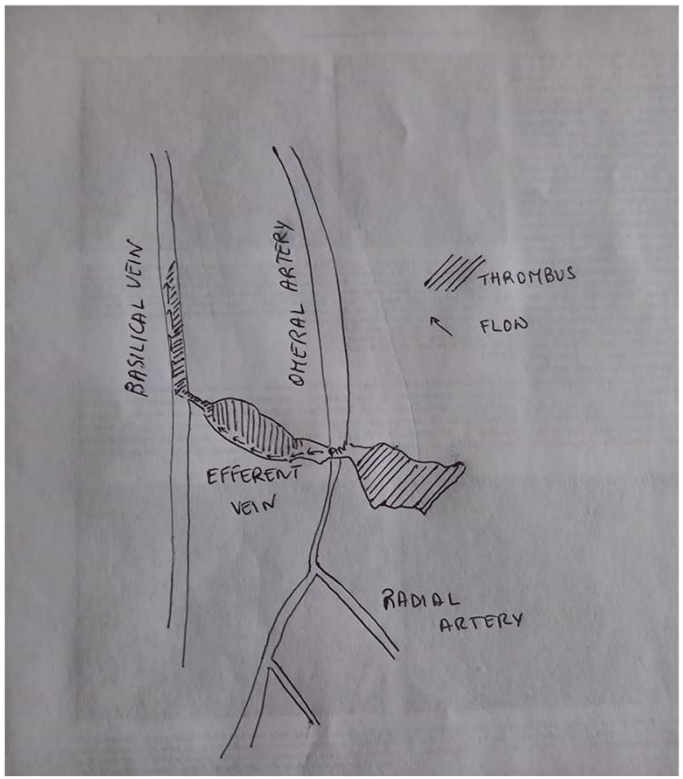
- Left brachiobasilic AVF with superficialization of basilic vein.
- Occlusion of cephalic vein
- Aneurism of median vein
- Outflow through basilic vein

Referred to IR due to

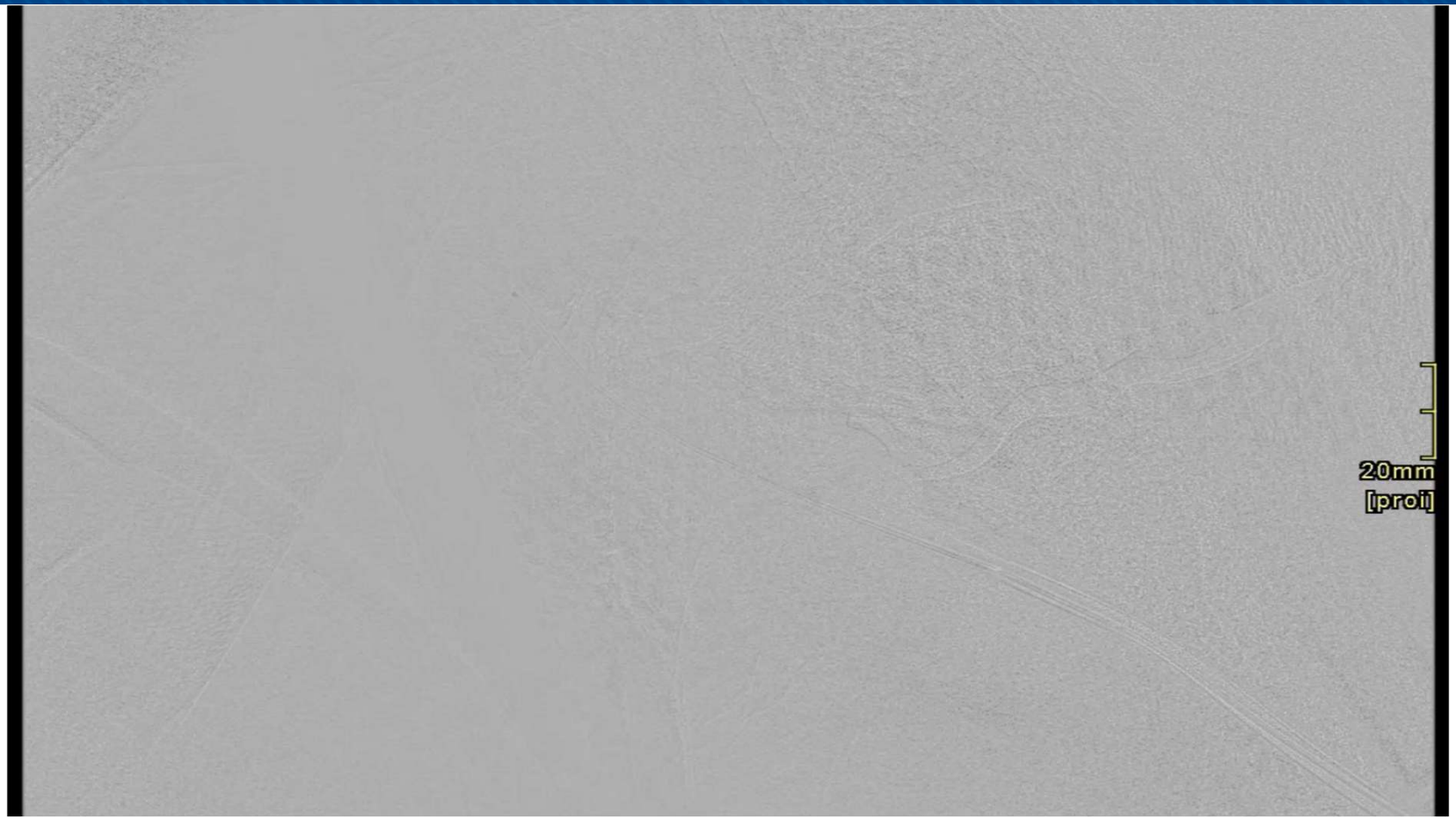
- VA malfunctioning
- Thrombosis of median vein
- Thrombosis of basilic vein at the confluence of median vein

Clinical Case

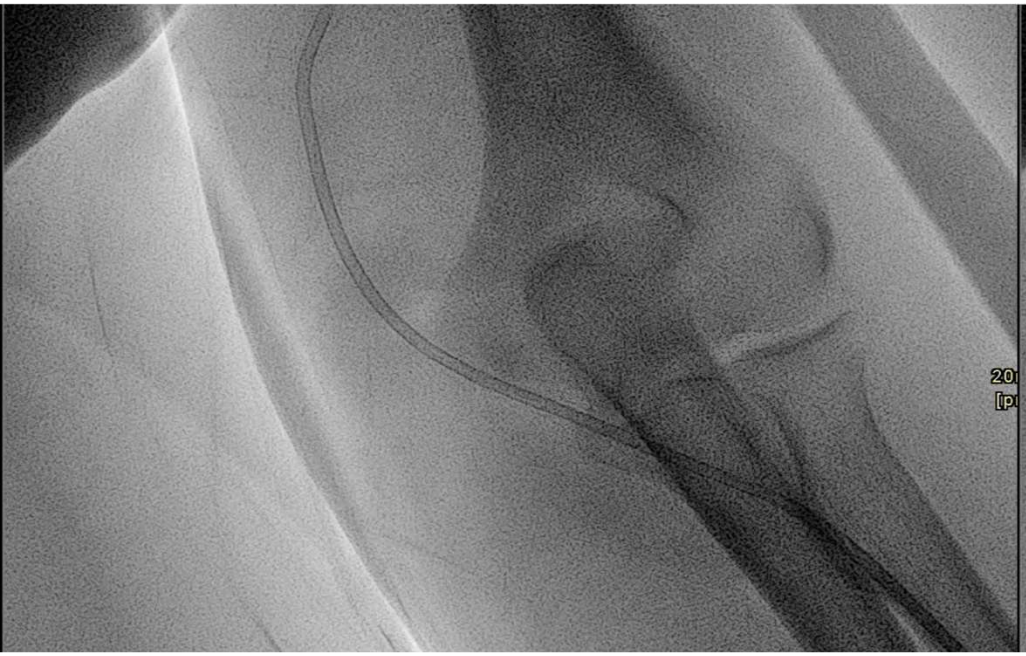


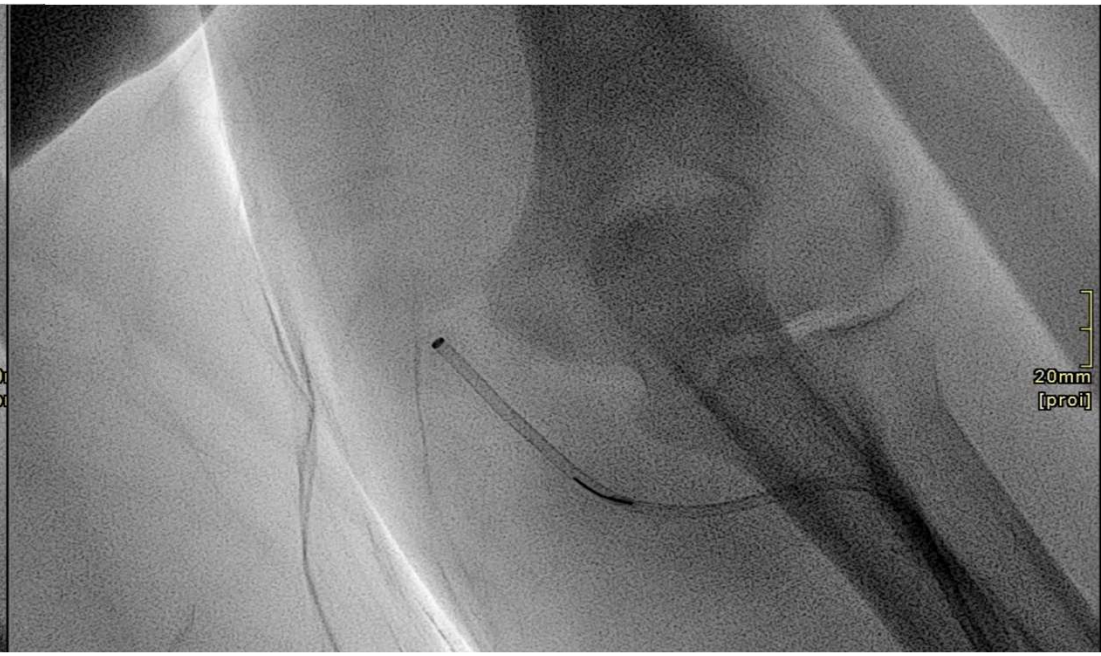


Clinical Case



Clinical Case





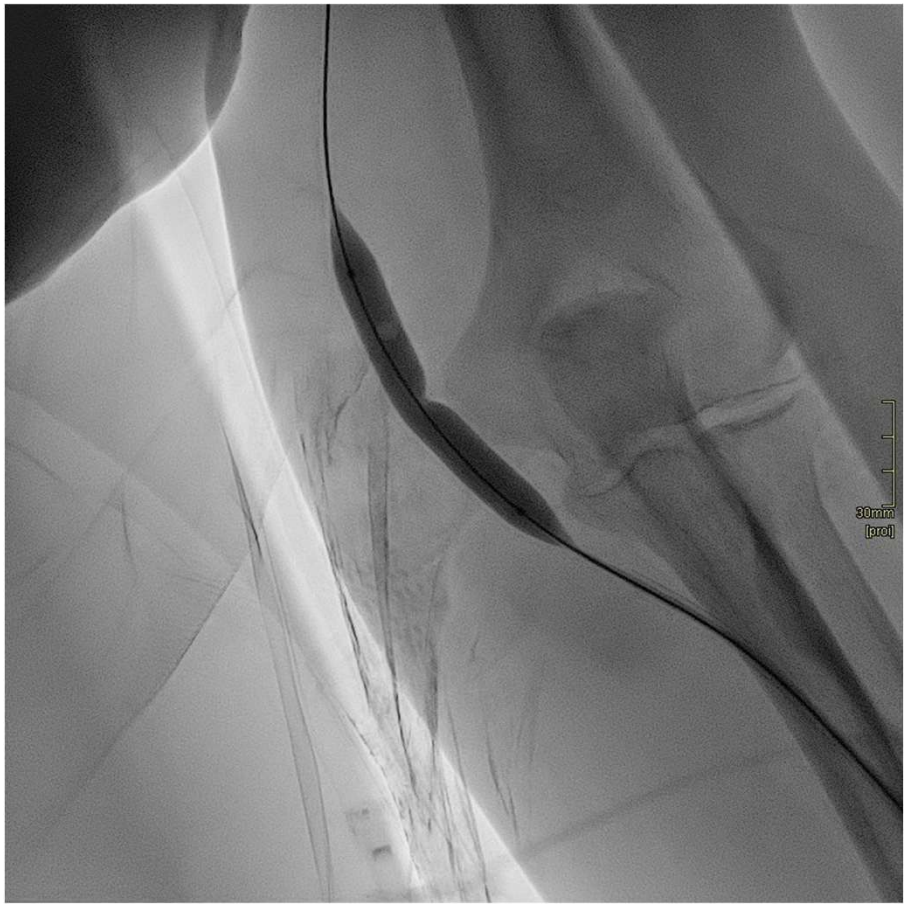
THROMBECTOMY and US

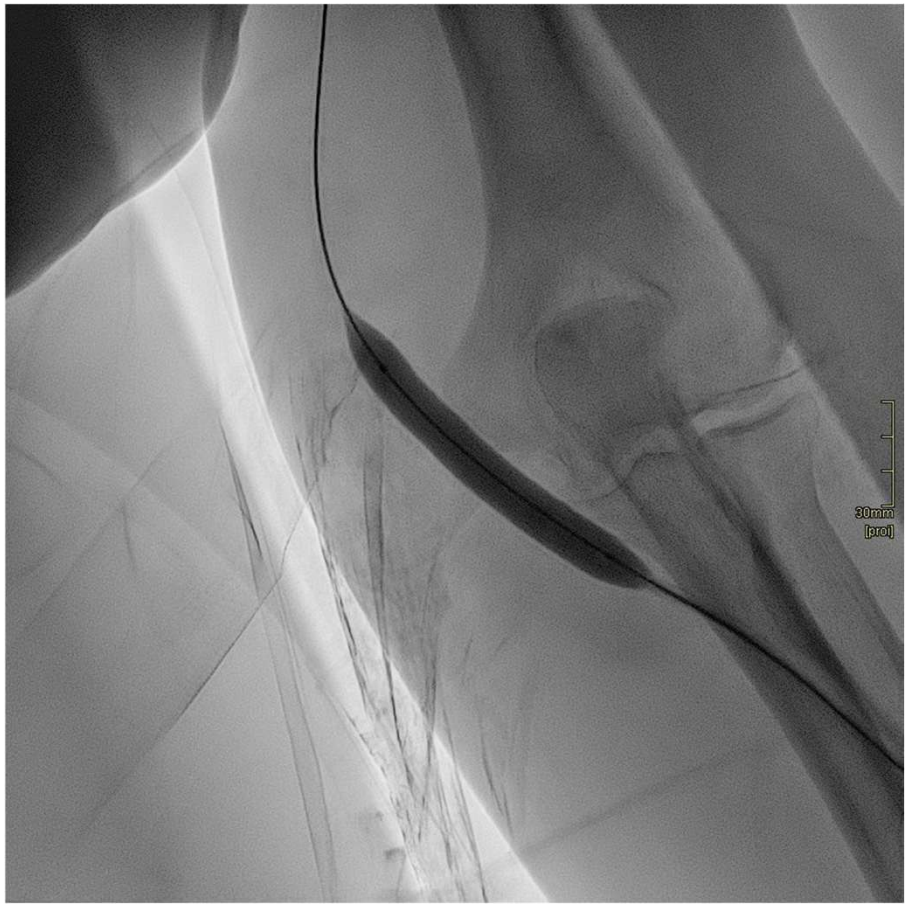


THROMBECTOMY and US

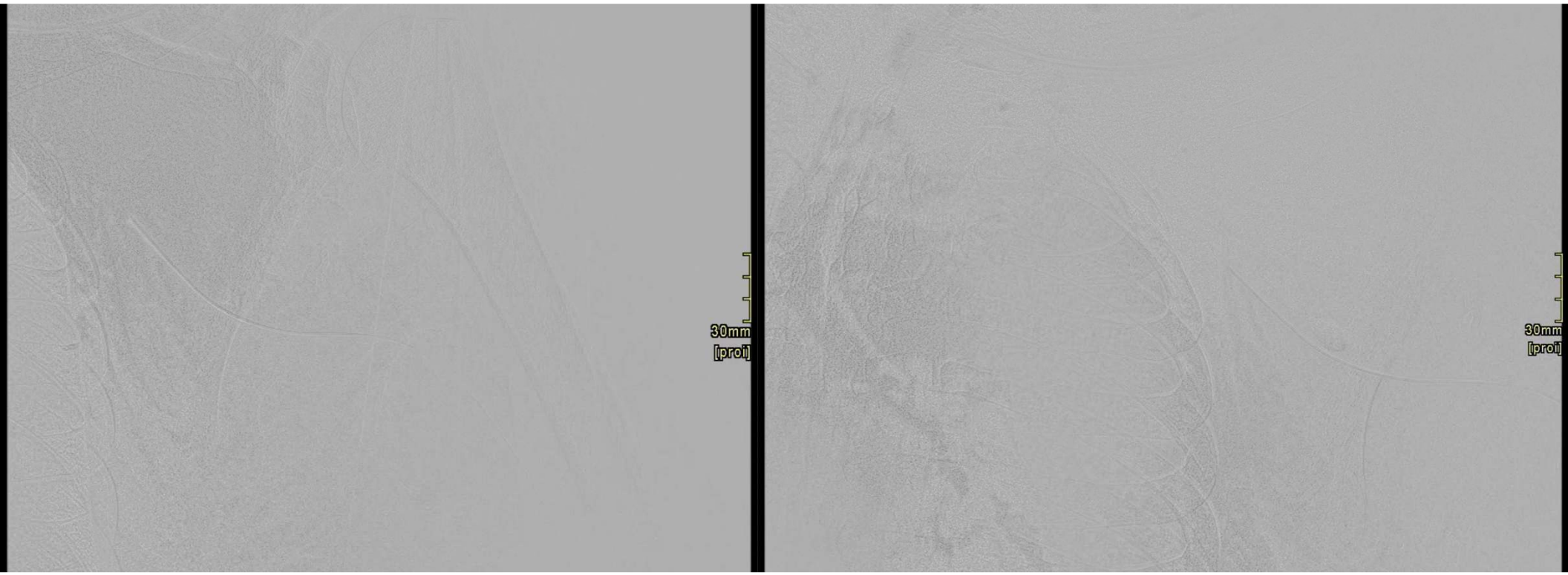


Clinical Case

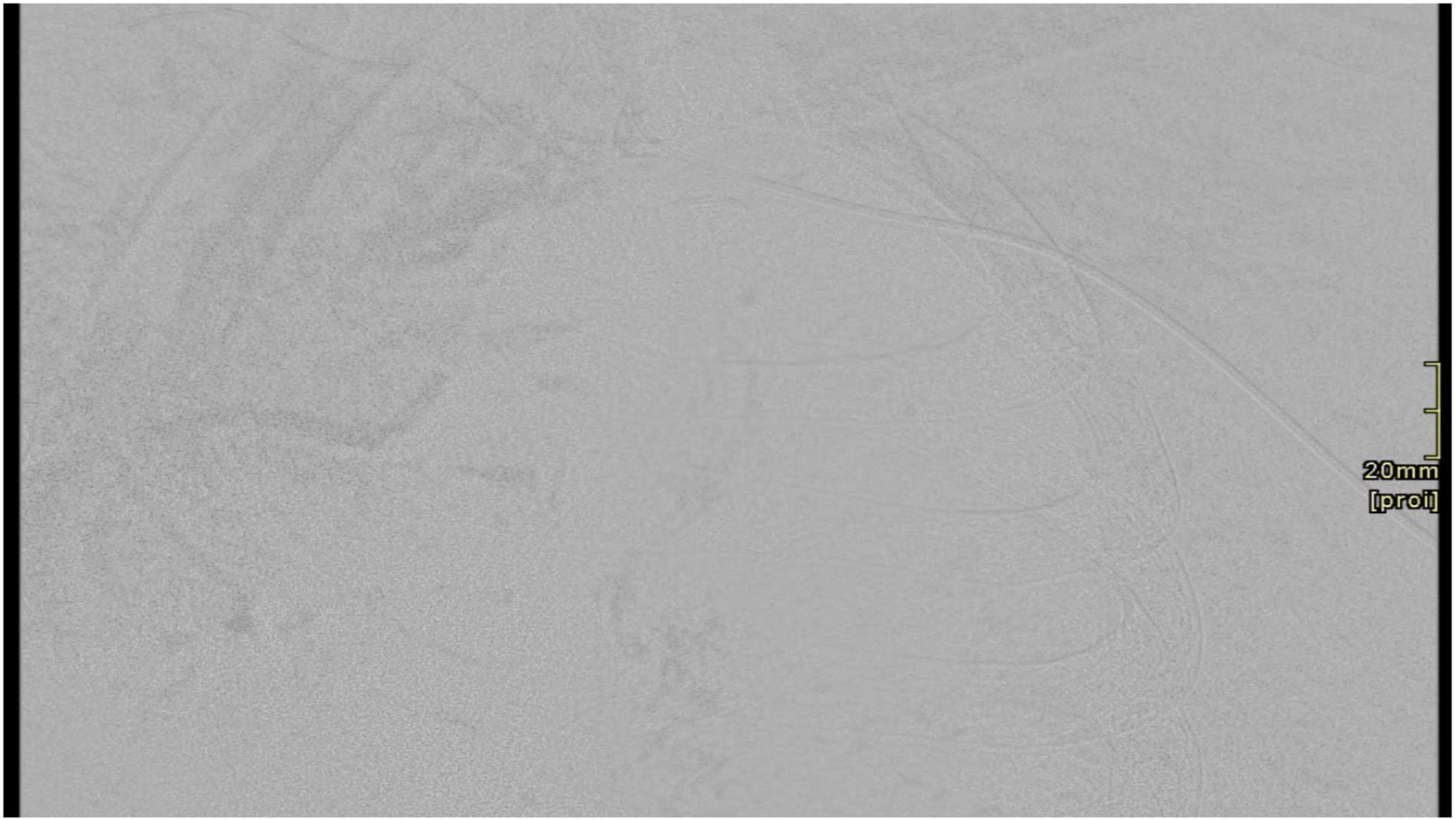




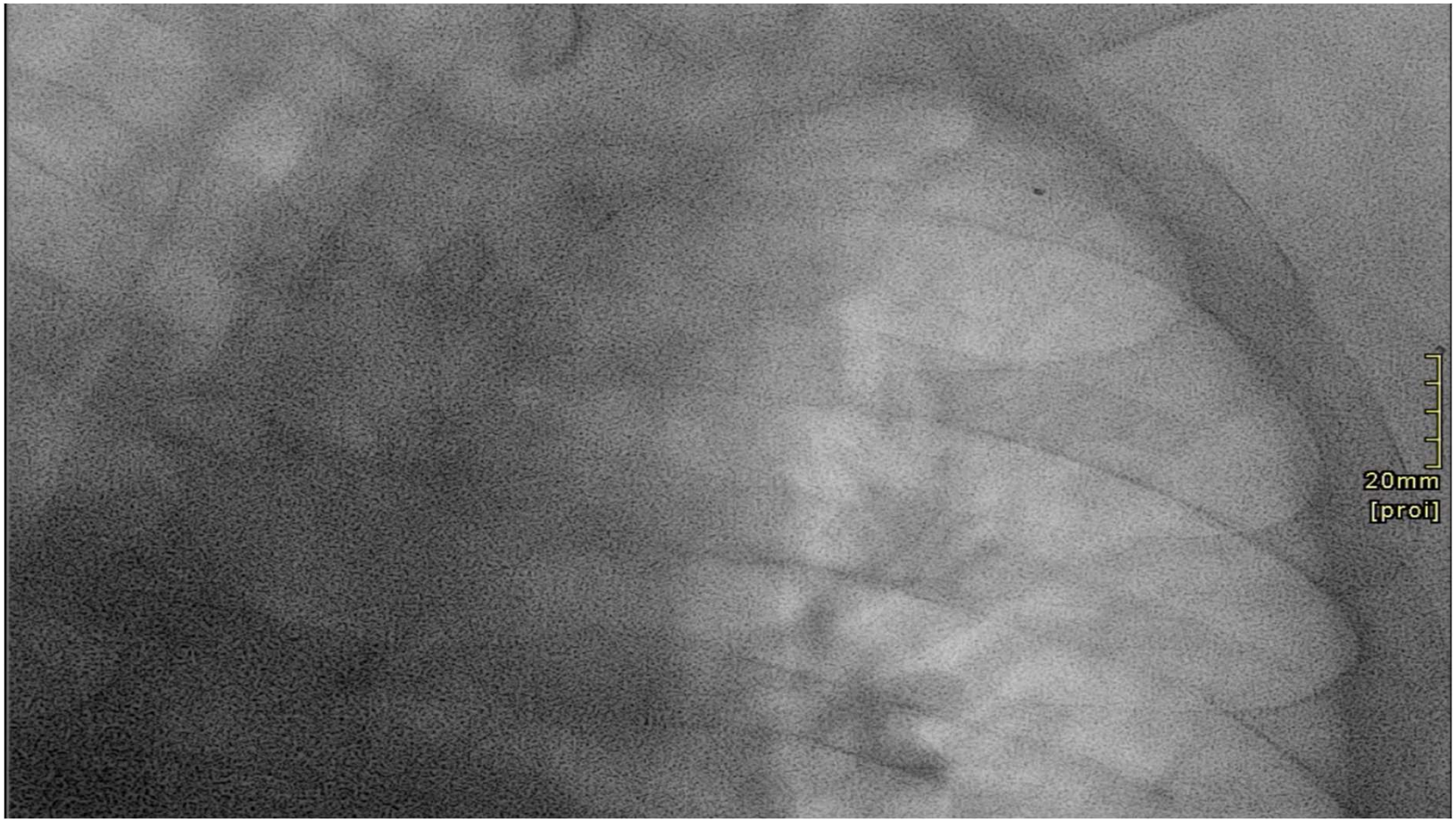
Clinical Case



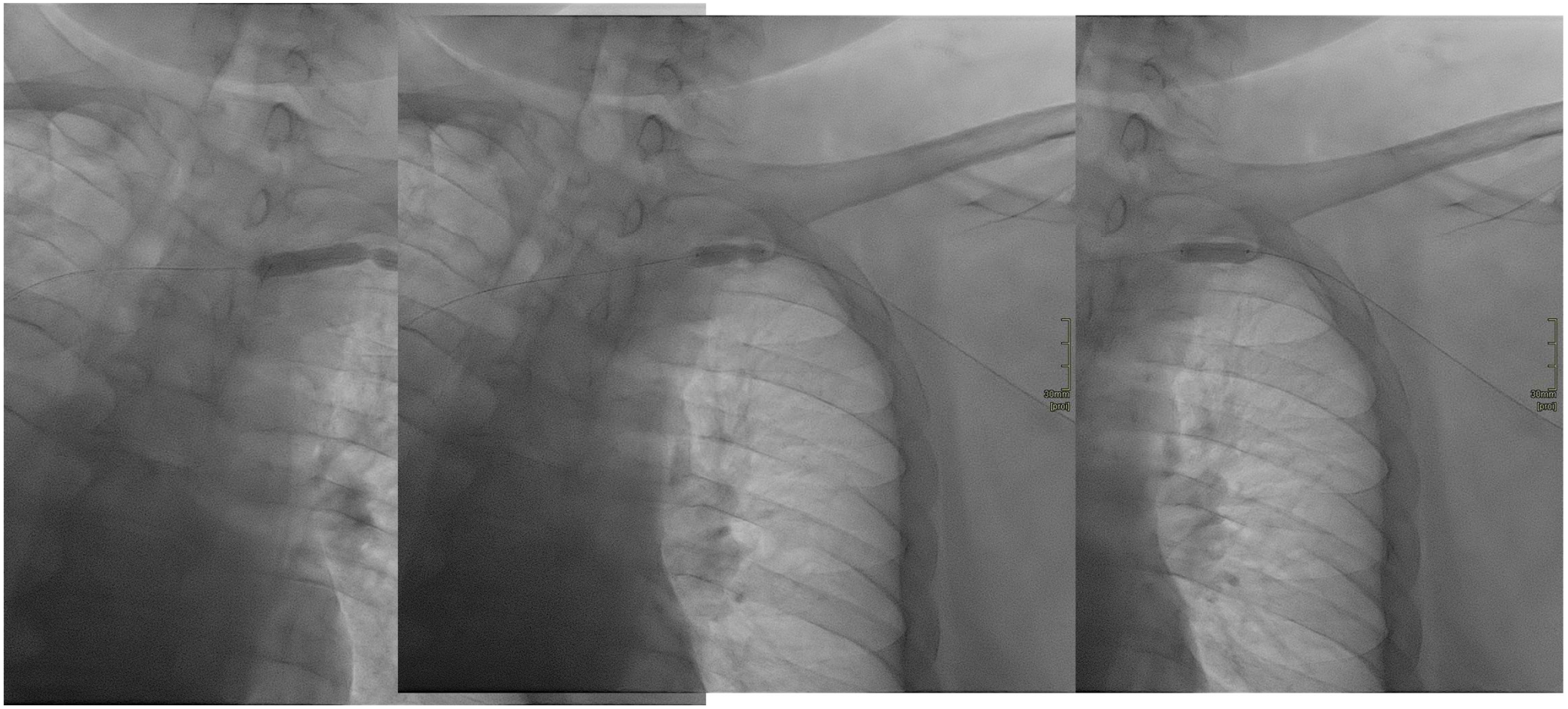
Clinical Case



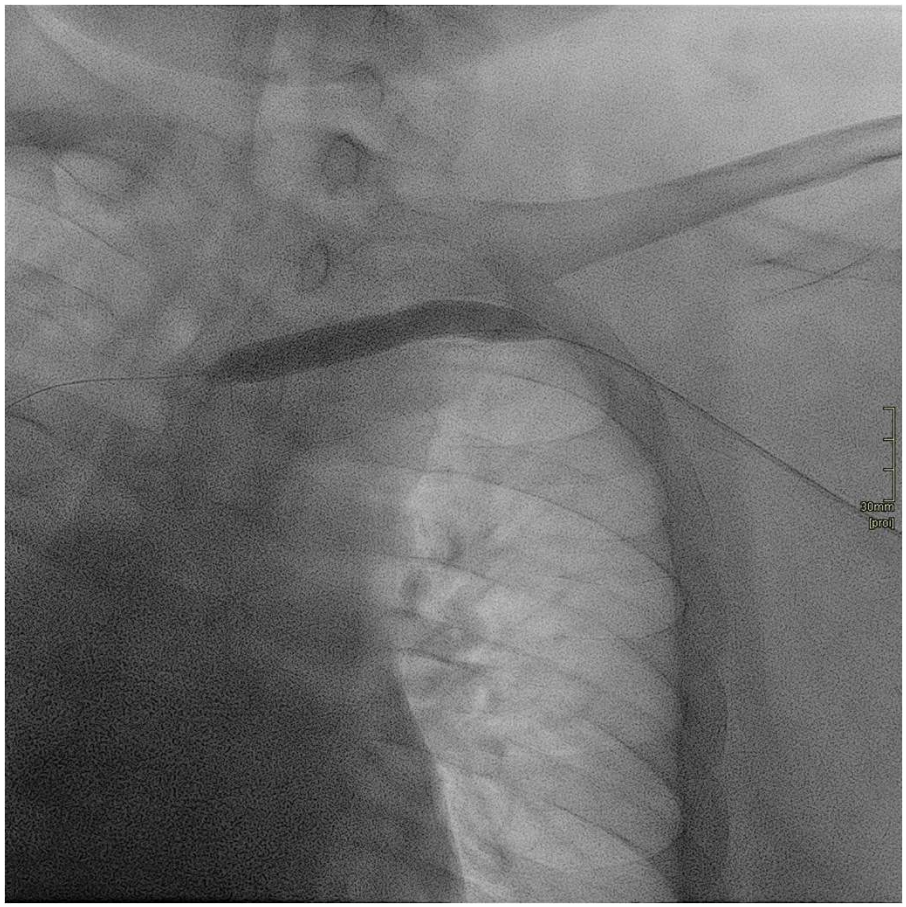
Clinical Case

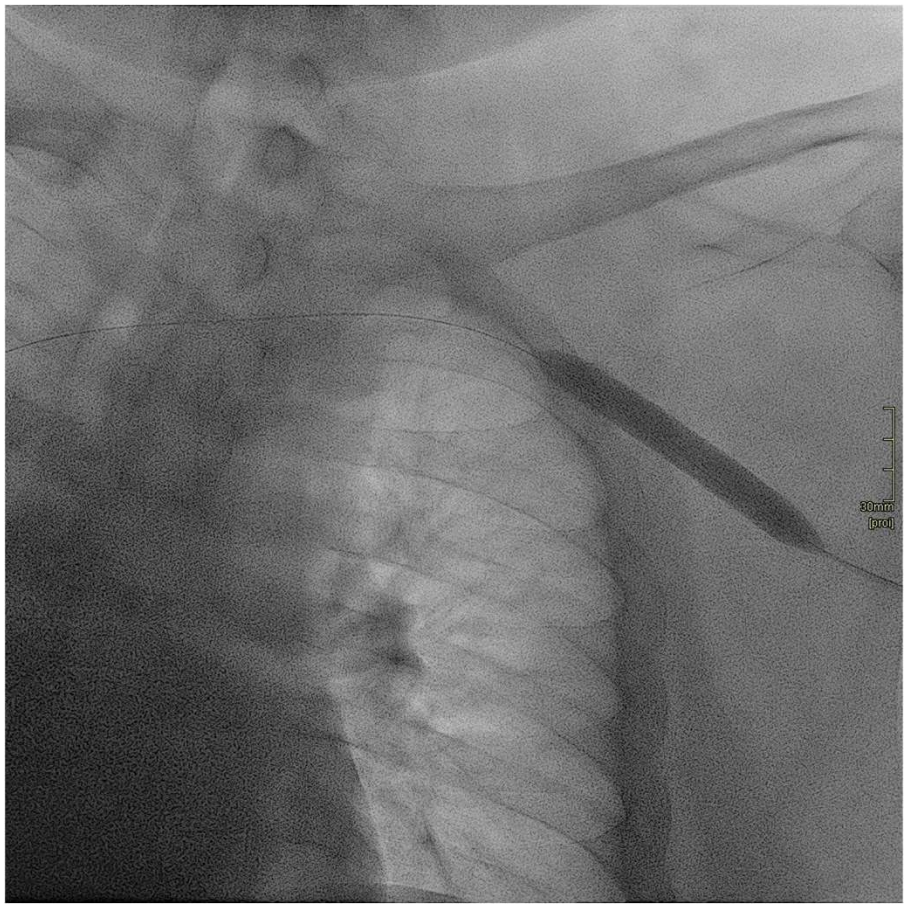


Clinical Case

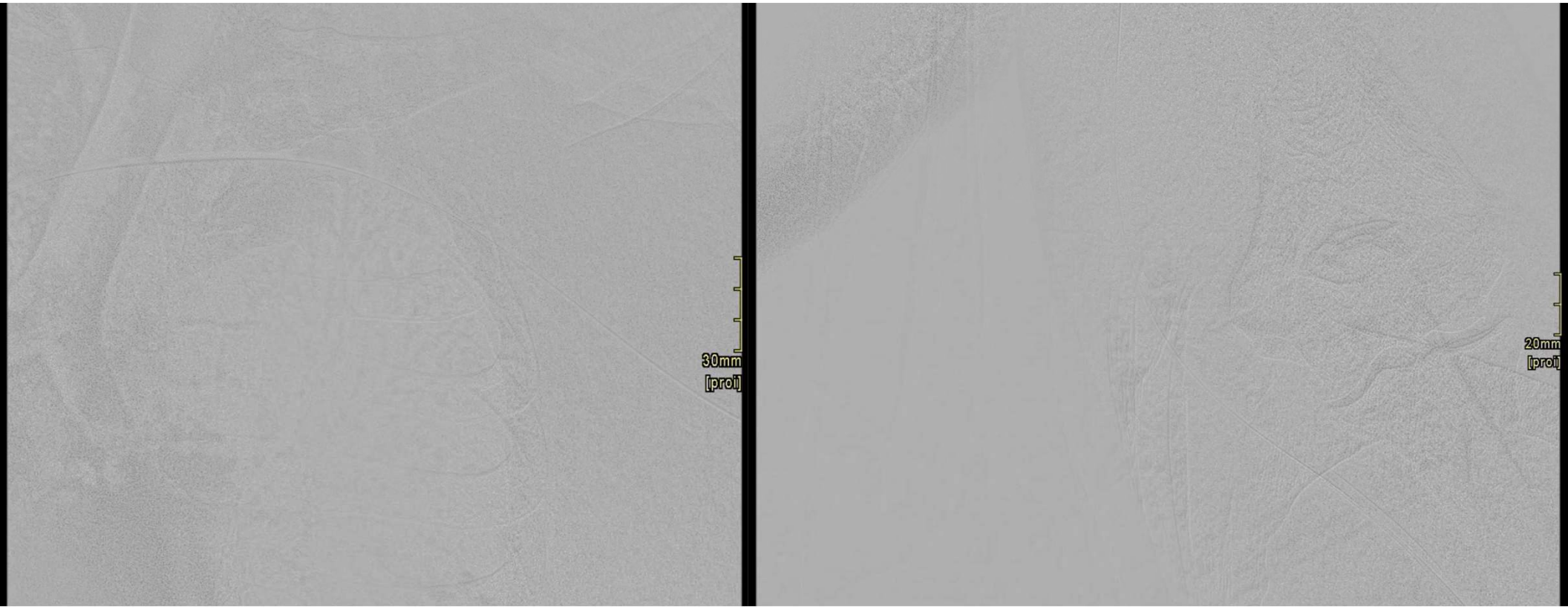


Clinical Case





Clinical Case

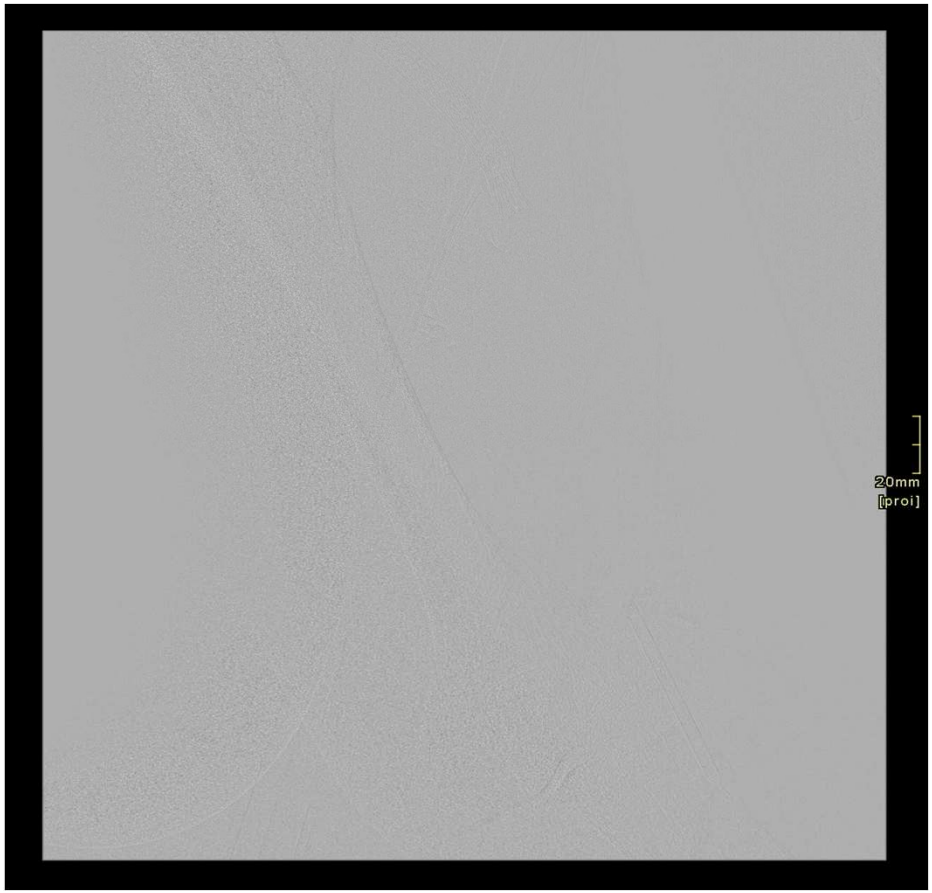


Clinical Case

- Patient with arterial hypertension, end-stage chronic kidney disease (on hemodialysis without preserved urine output; 3 sessions/week at Desio), chronic anemia (on EPO therapy), bronchial asthma, and cognitive decline.
- History of breast cancer treated with quadrantectomy in April 2021 (documentation missing).
- Left proximal arteriovenous fistula (AVF) draining exclusively into the cephalic vein. Covered stents have previously been placed in the upper and middle thirds of the cephalic vein due to access malfunction.
- Complete thrombosis of the cephalic vein extending to its junction with the subclavian vein

Clinical case

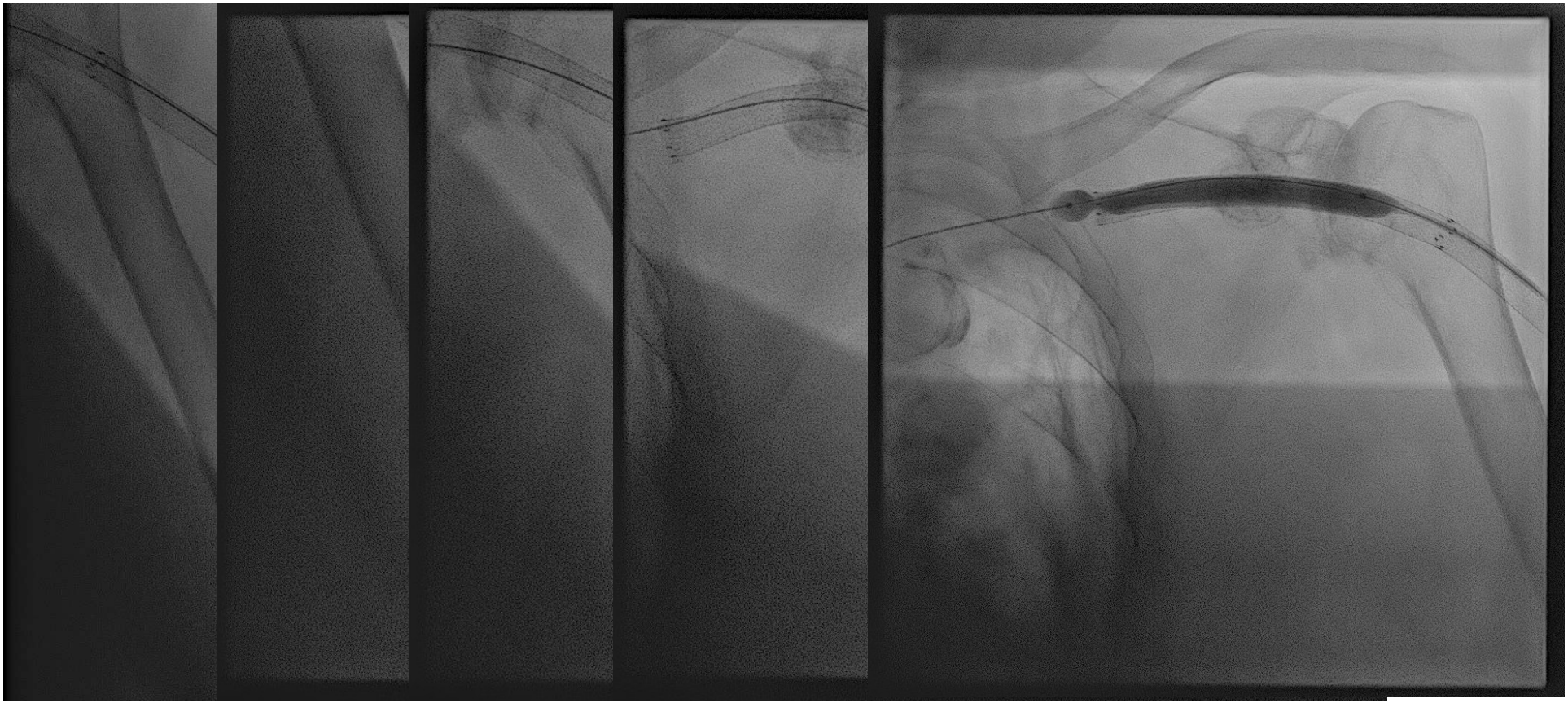




Clinical Case



Clinical case



Clinical case





Clinical case

Patient, female age 60. Severe obesity. Multiple orthopedic interventions

- Left proximal dialytic access thrombosed after multiple treatment (2021/2022)
- Left tunnelled catheter
- Right brachiobasilic AVF with superficialization of basilic vein (2022)
- Outflow only through basilic vein due to occlusion of cephalic vein

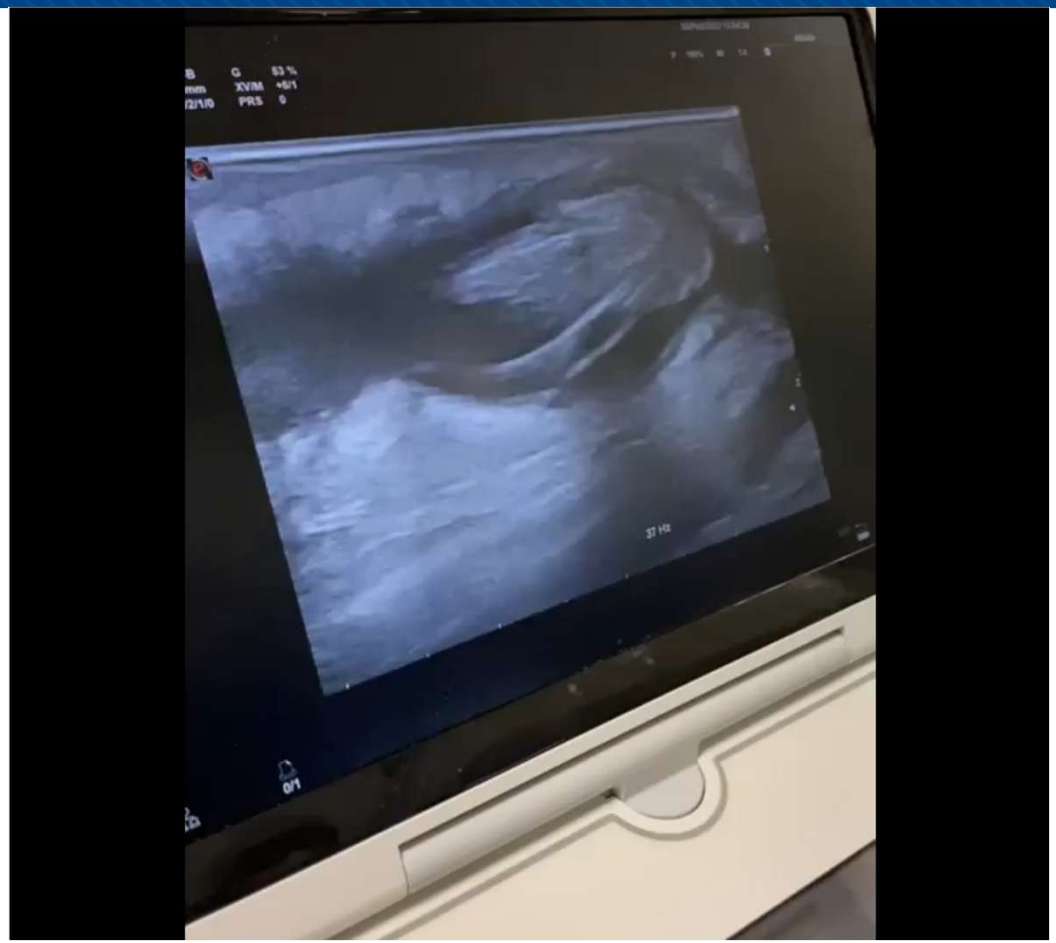
Referred to IR 2/2023 due to

- Complete thrombosis of right dialytic access up to axillary vein

Clinical Case



Clinical Case

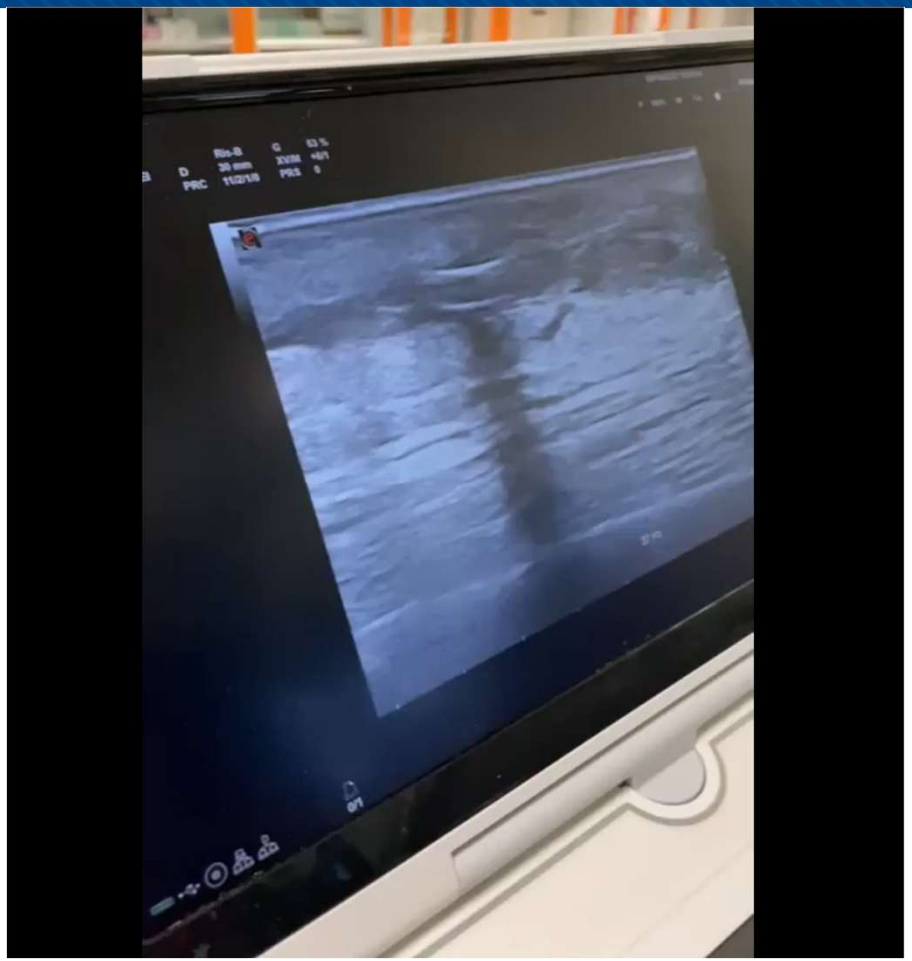


Clinical Case

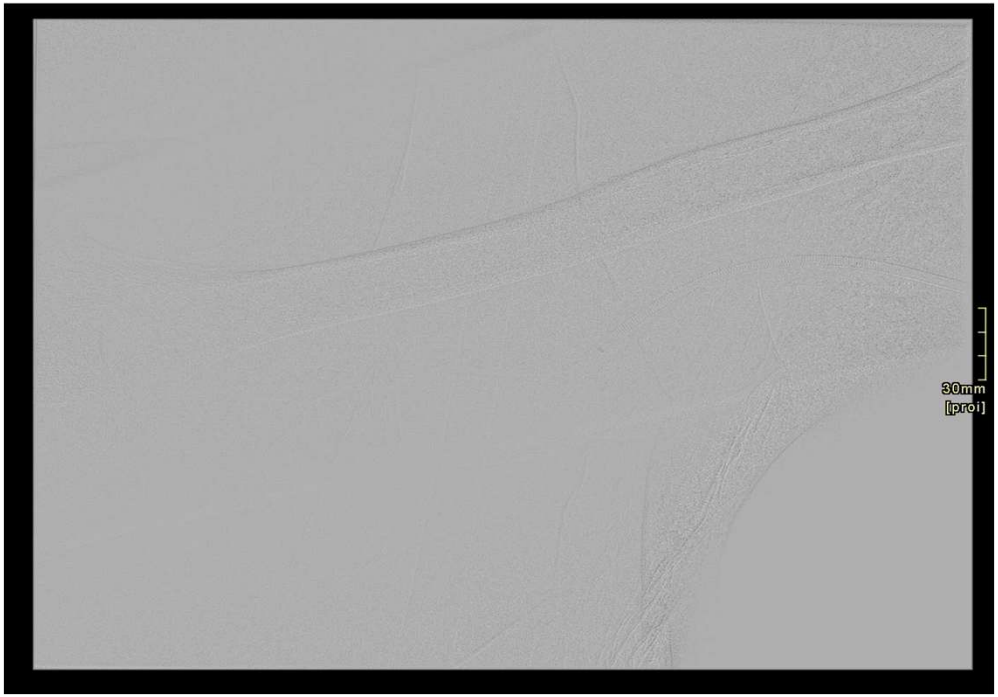


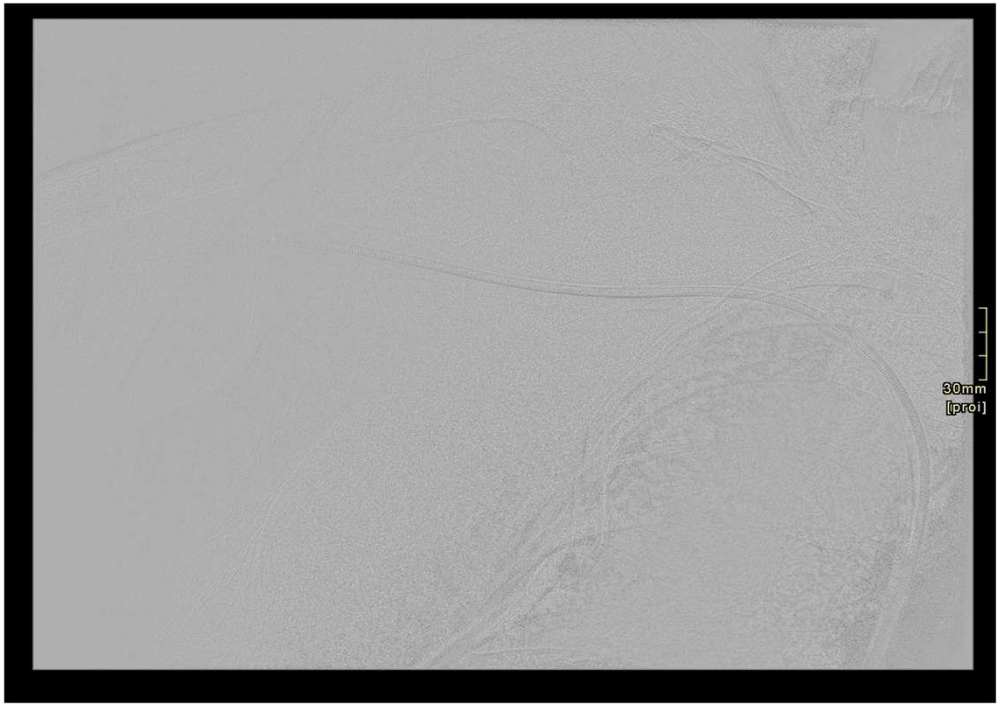


Clinical Case

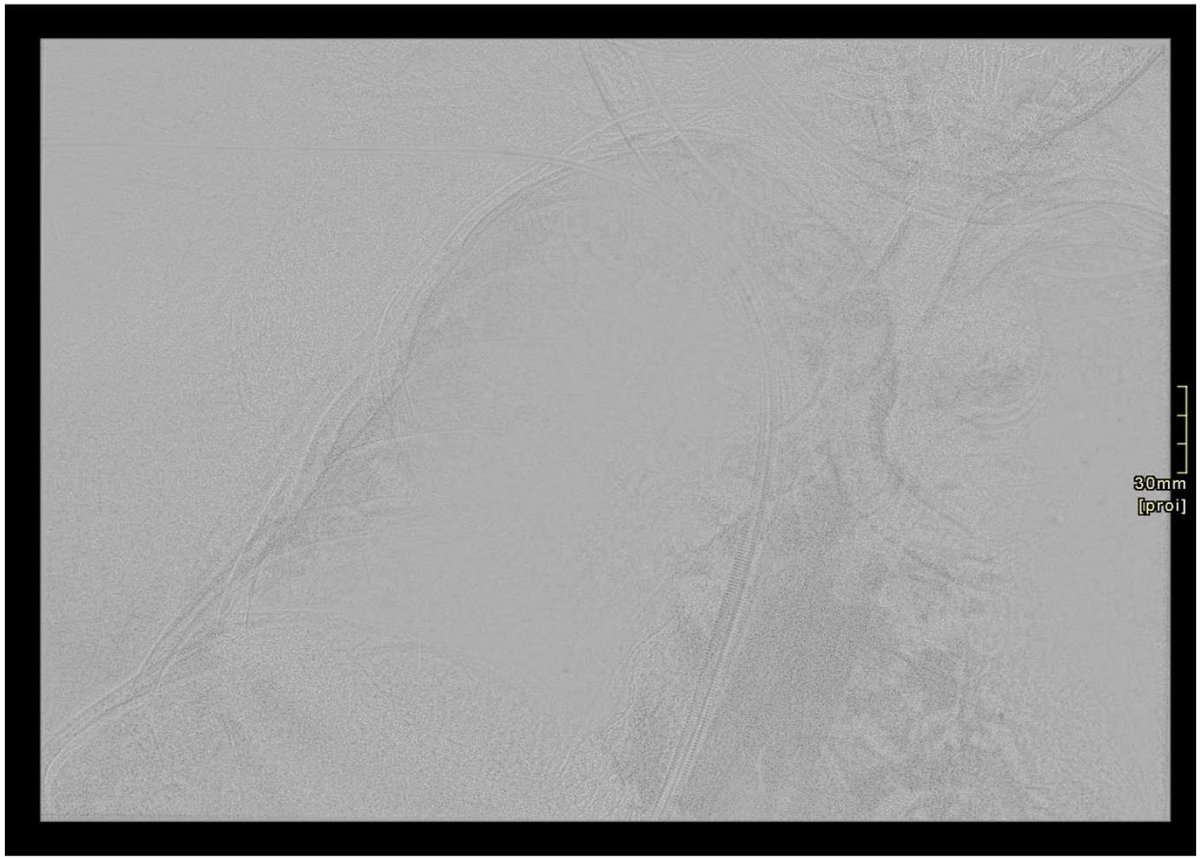


Clinical Case

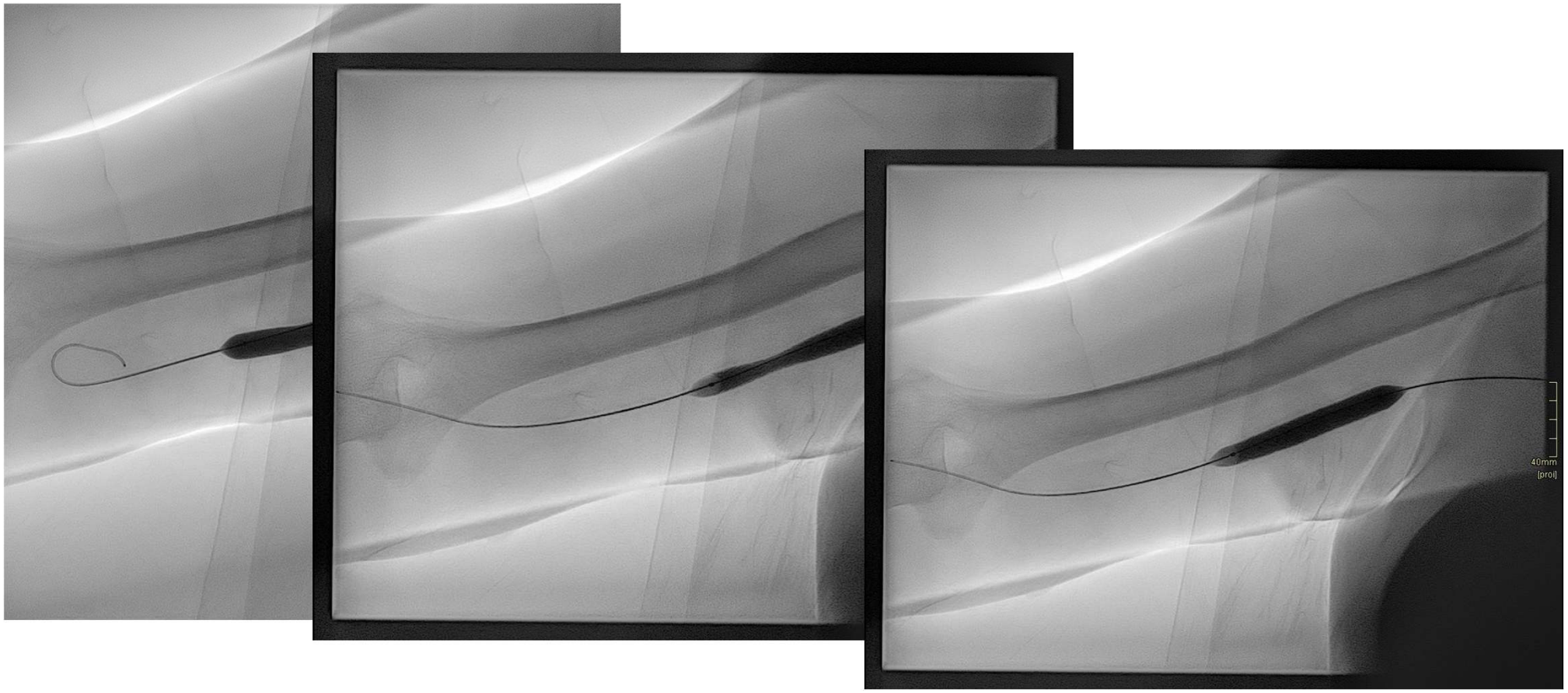




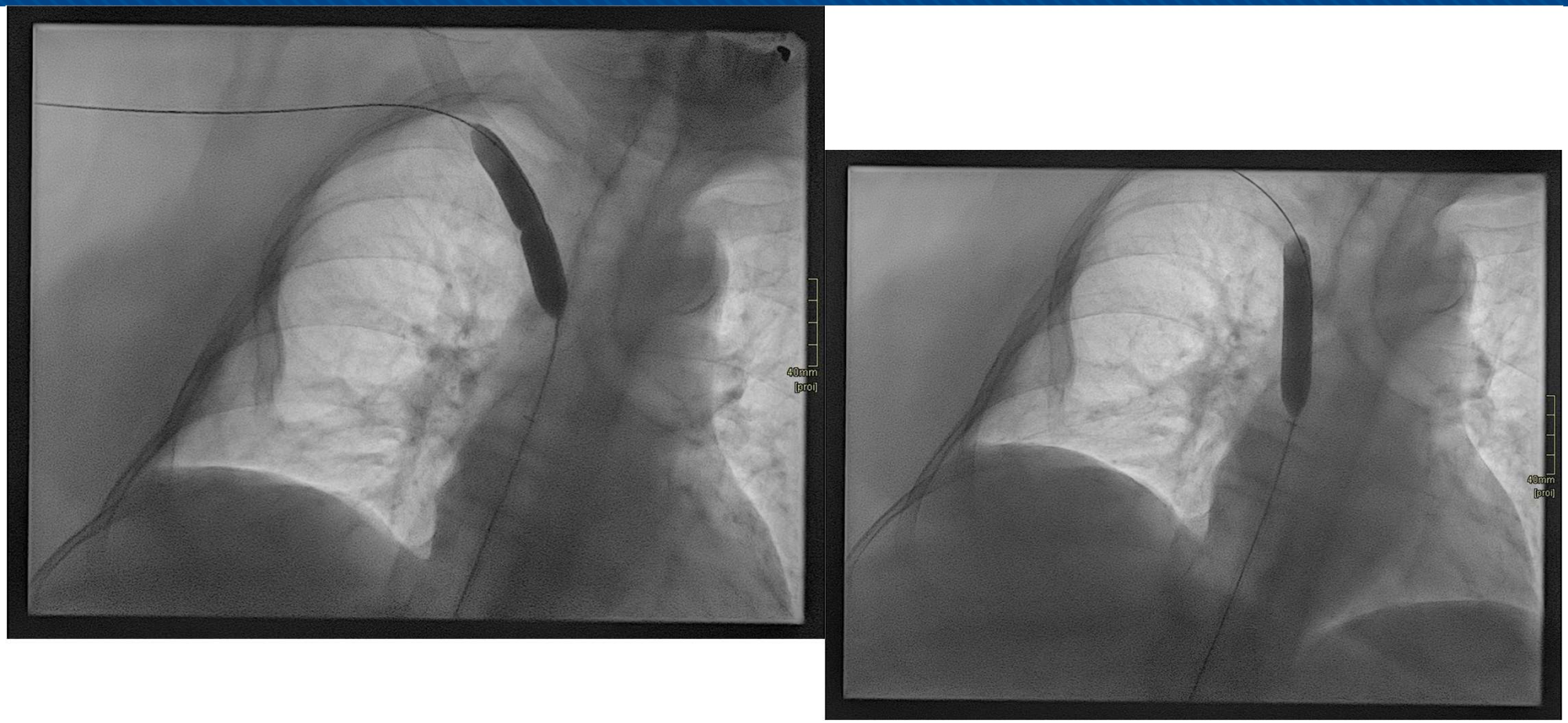
Clinical Case



Clinical Case



Clinical Case



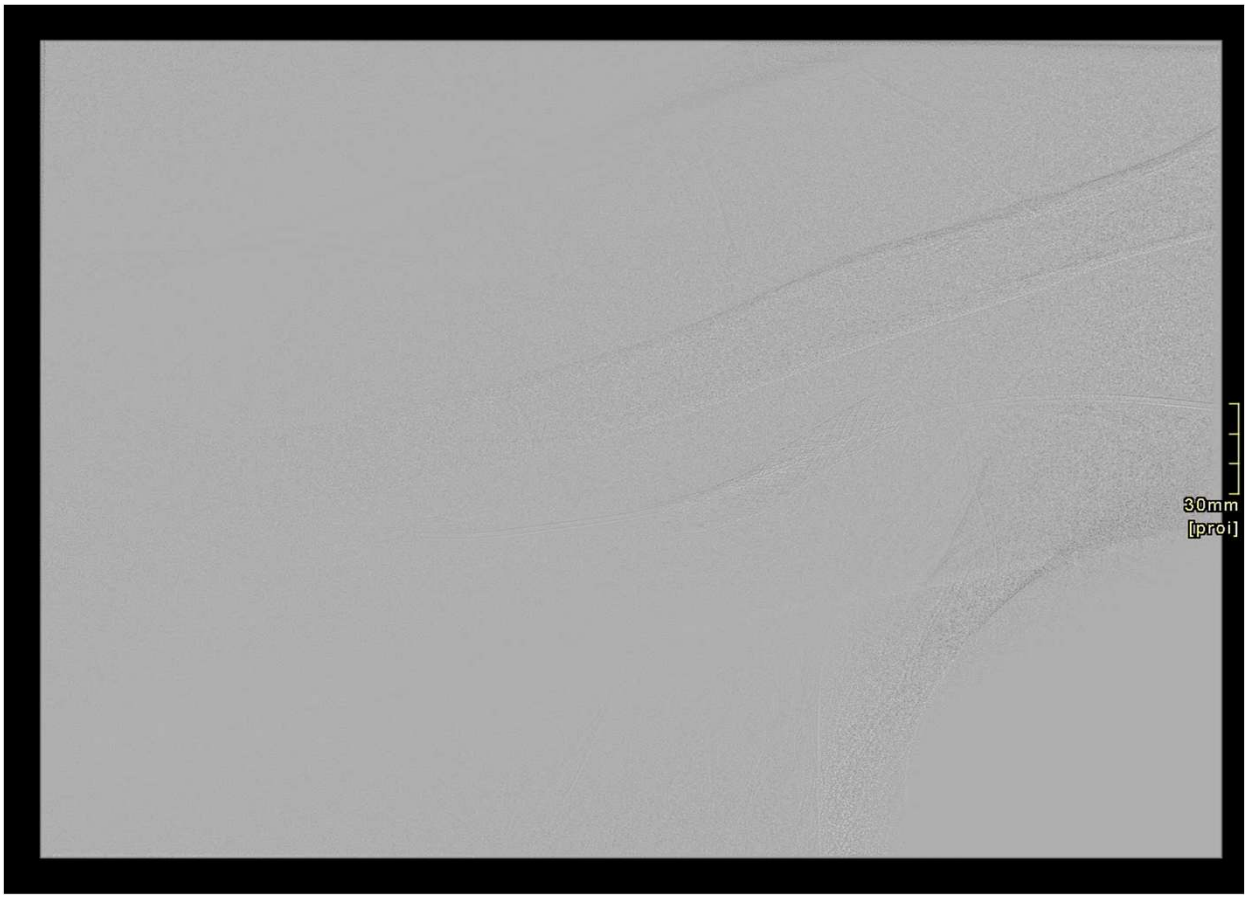
Clinical Case



Clinical Case



Clinical Case



WHY?

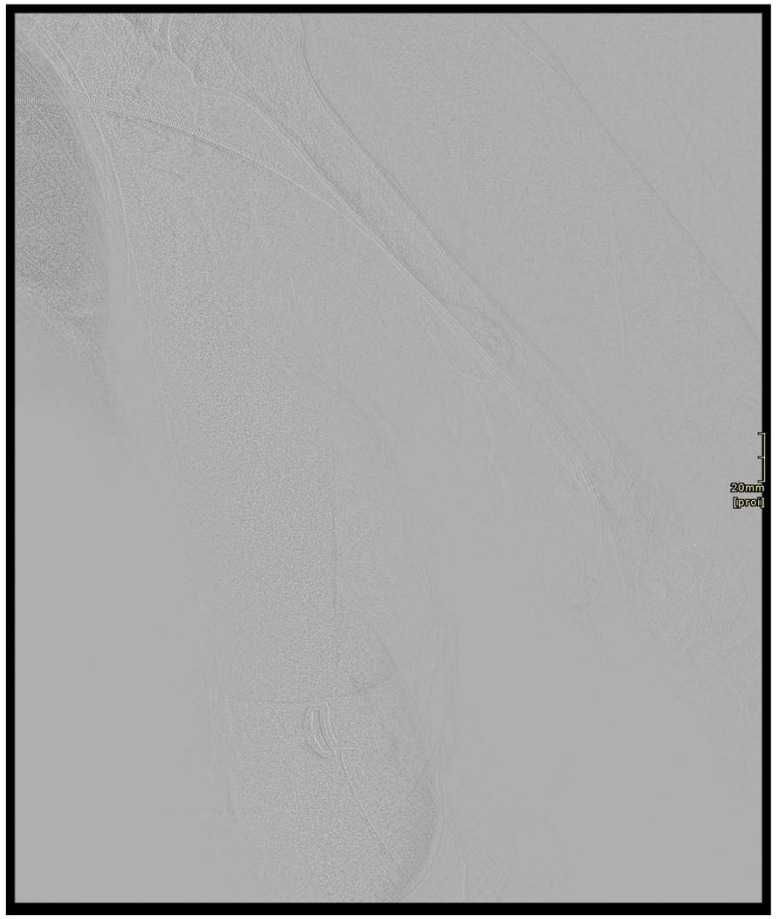


- Associazione Rx+Eco (portatile)
- Riduzione dose
- Valutazione sino al tratto extratoracico della vena succlavia
- Controllo real time
    - Caratteristiche trombo
    - Capacita' del catetere di frammentare il trombo e catturarlo
    - Trombo residuo
    - Flusso nell'accesso
    - Stenosi residue
    - Ematomi extravascolari

Clinical case

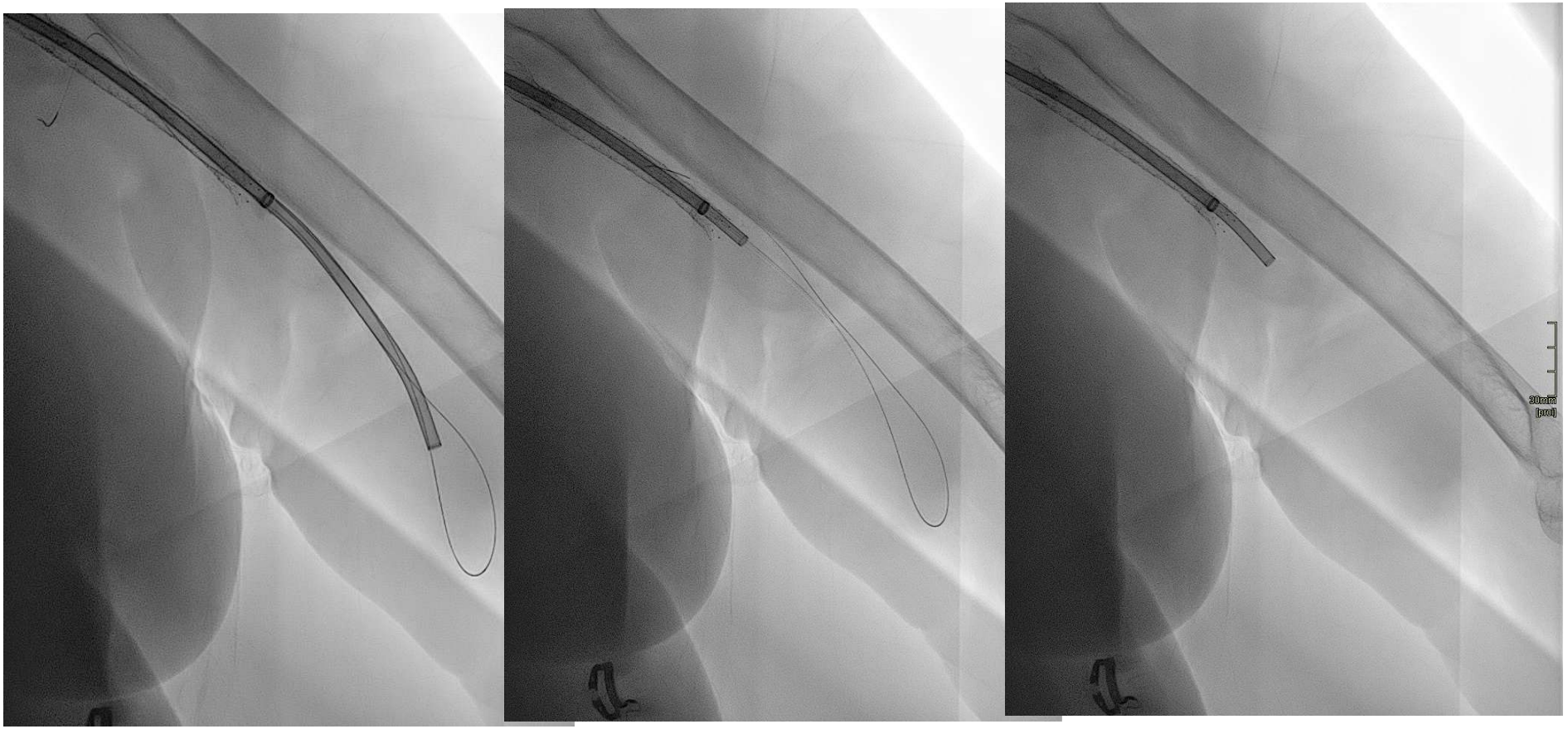
- 2002: Cerebral stroke resulting in dysarthria and left hemiparesis
- Jan 2020: Acute renal failure; dialysis initiated
- Creation of proximal arteriovenous fistula (AVF) with superficialization of the cephalic vein in the left arm
- Repeated angioplasty and access recanalization procedures over the last 6 years
- Sept 2026: Complete access thrombosis following a hypotensive episode

Clinical case

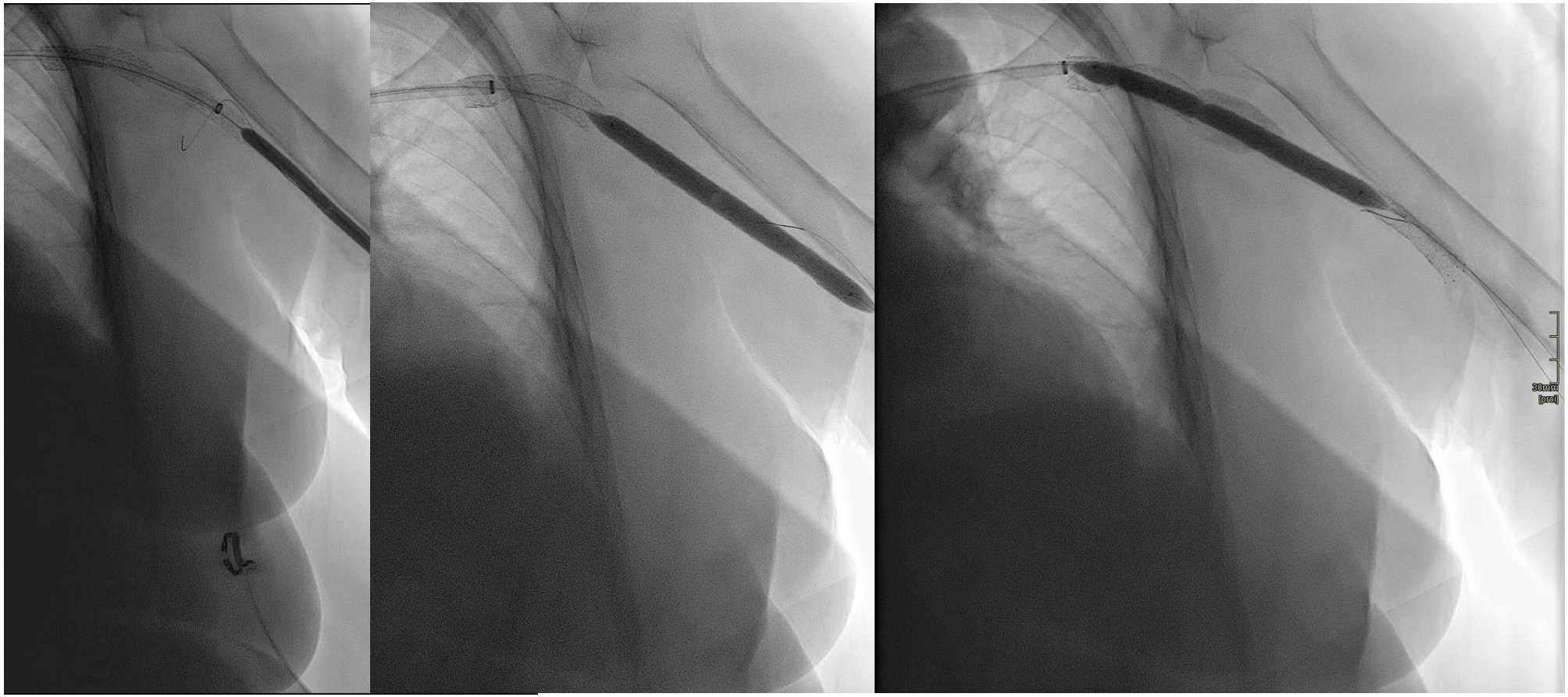




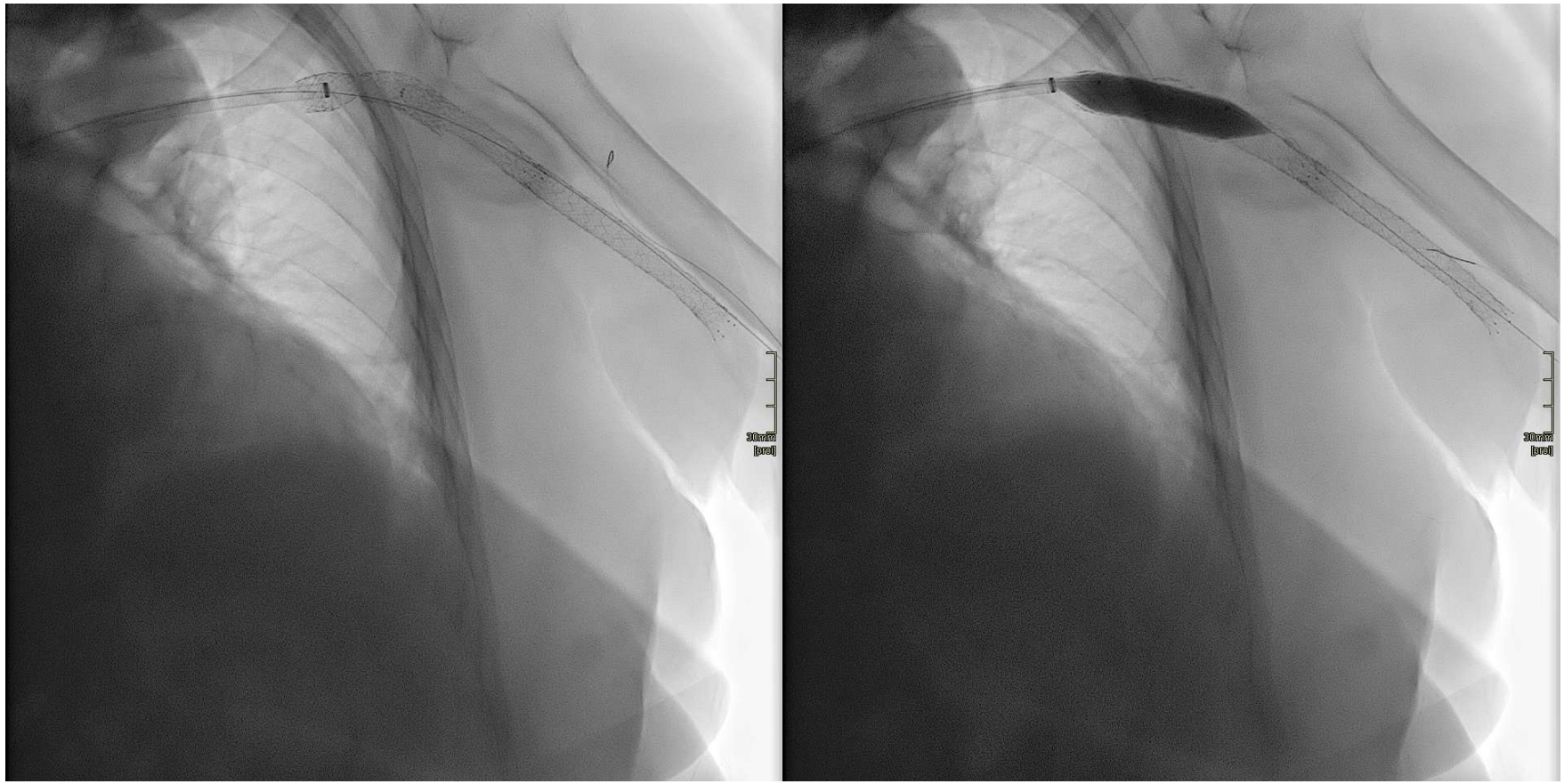
Clinical case



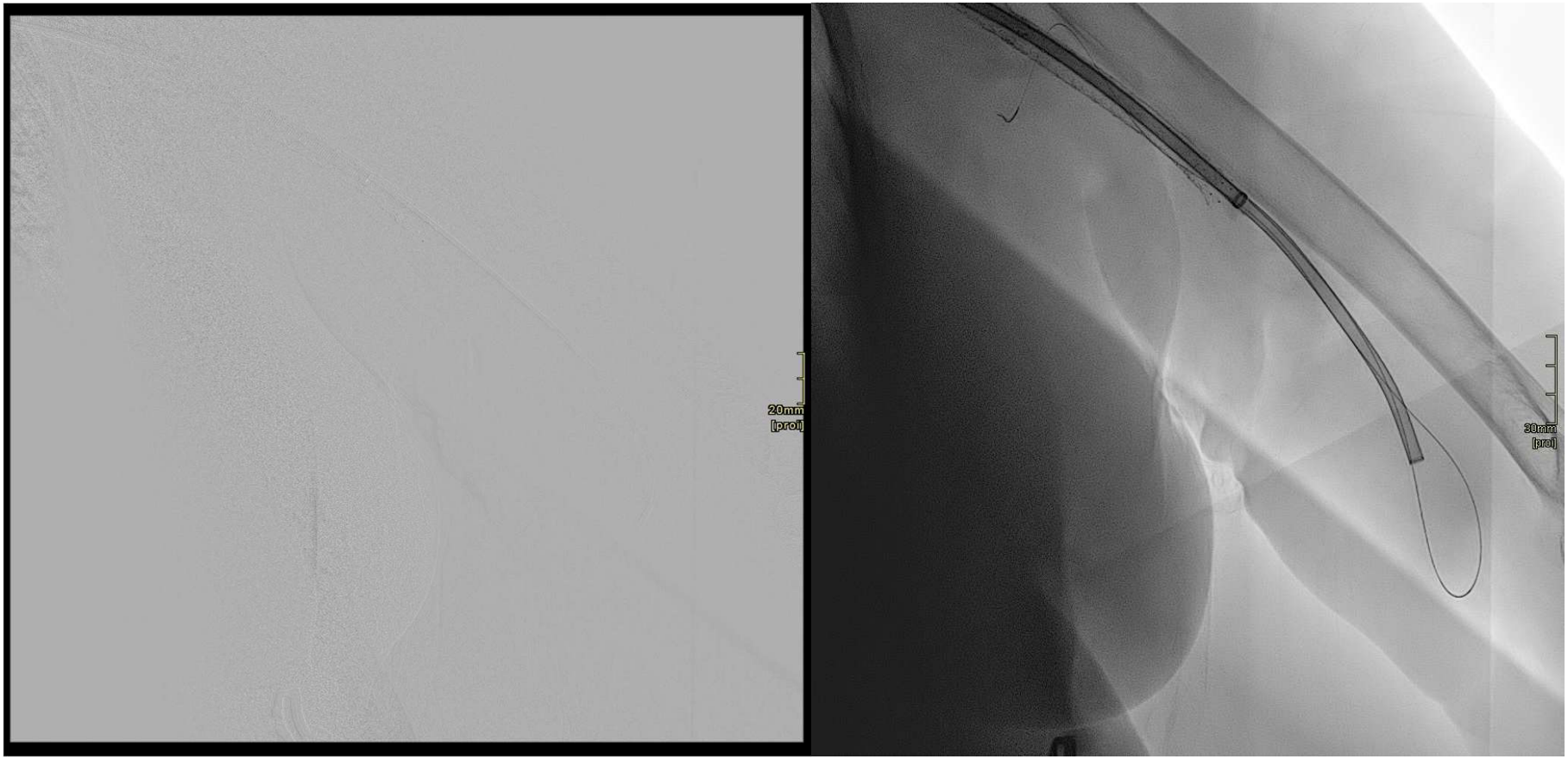
Clinical case



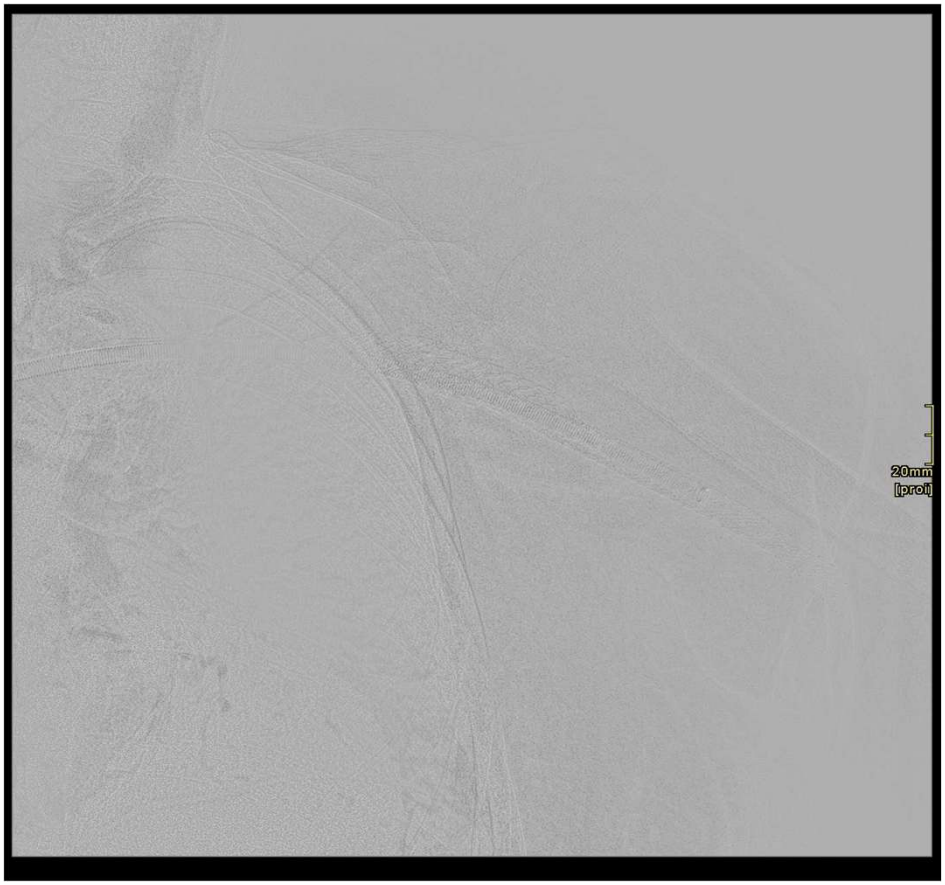
Clinical case

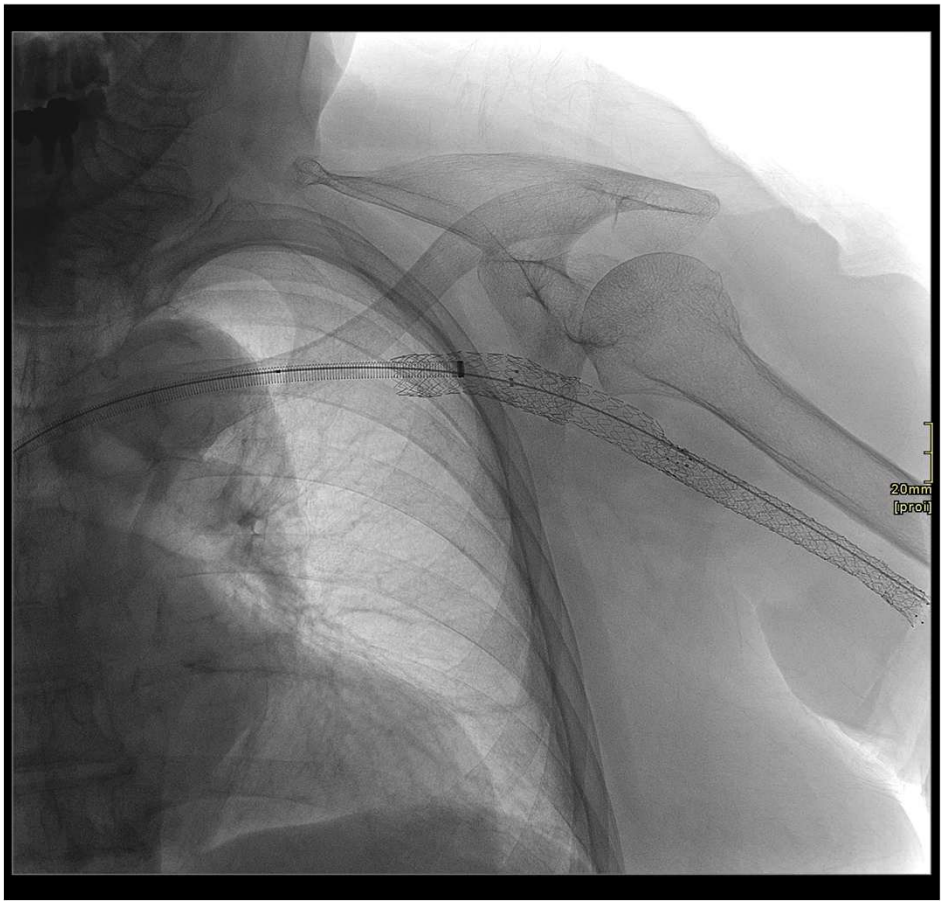


Clinical case

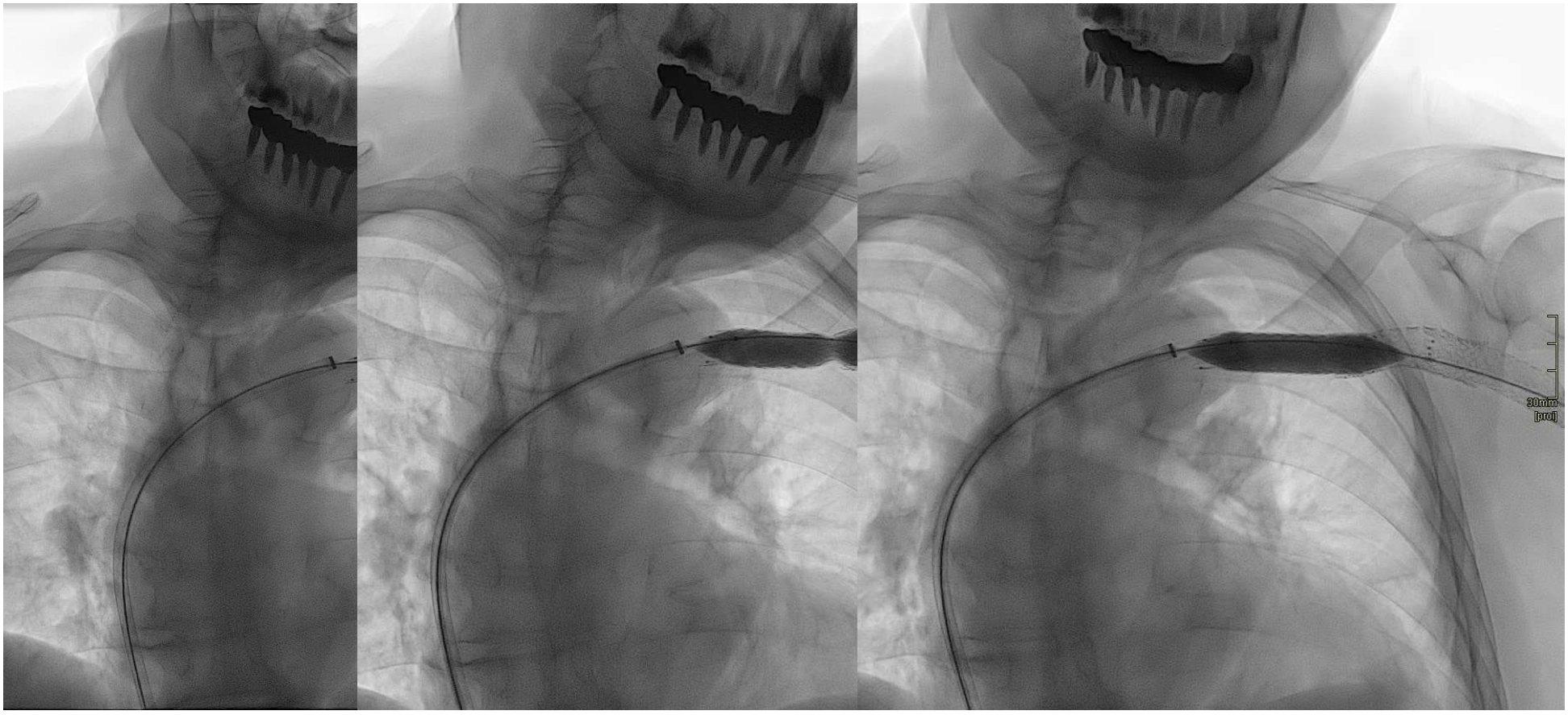


Clinical case

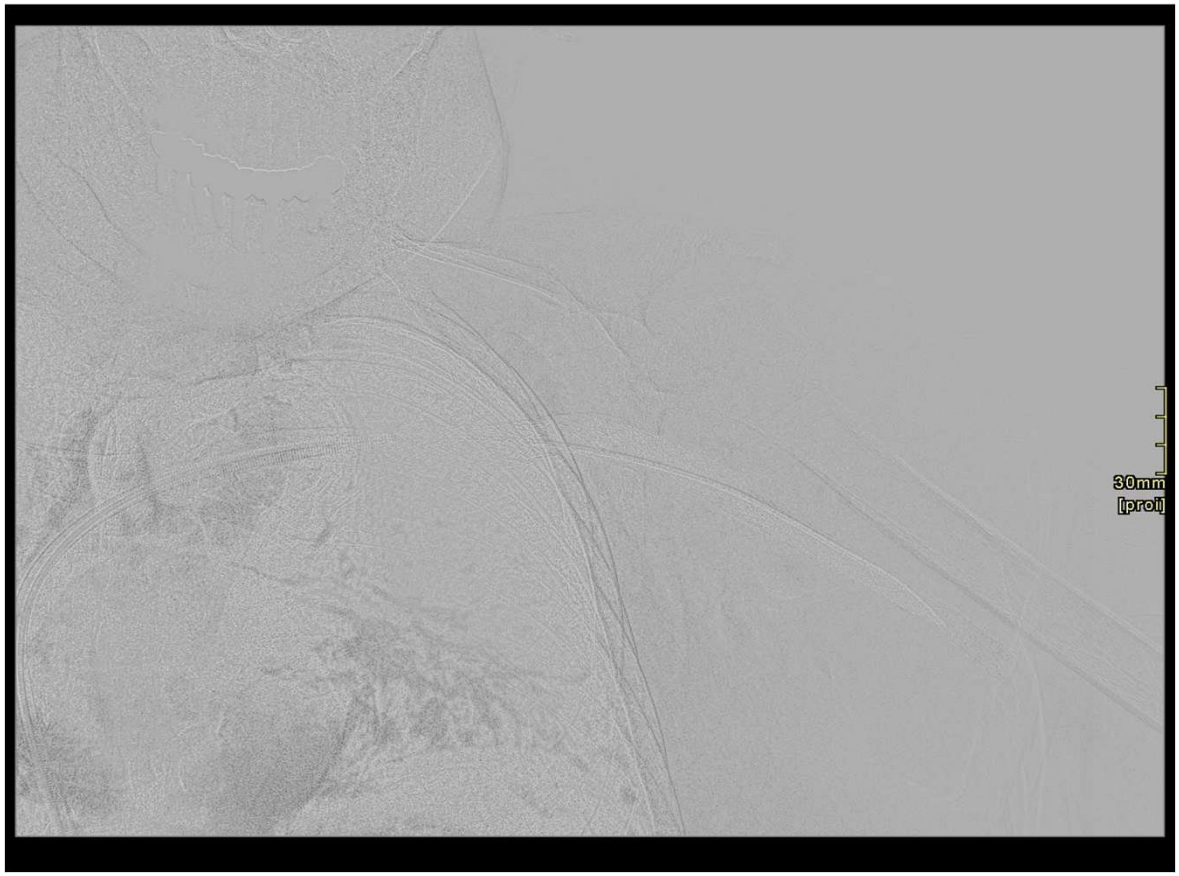




Clinical case



Clinical case




GRAZIE PER L’ATTENZIONE
Ascensori

Diapositiva 53

1 dav.leni76@gmail.com; 01/11/2024