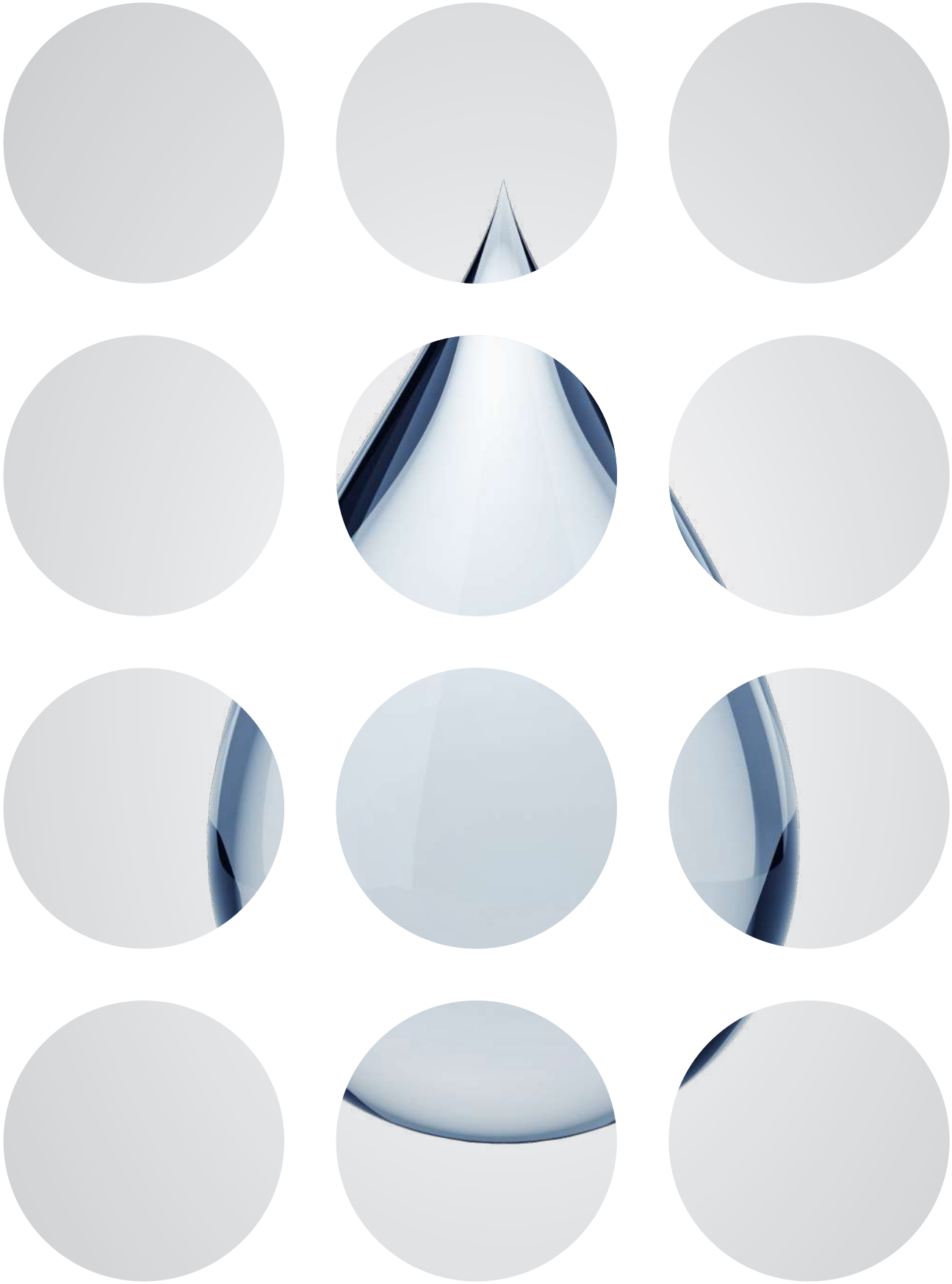

12 clinical cases of Effective Embolization

GLUBRAN®2

ENDOVASCULAR

GLUBRAN®2

ENDOVASCULAR

12 clinical cases of Effective Embolization

GENERAL INTRODUCTION

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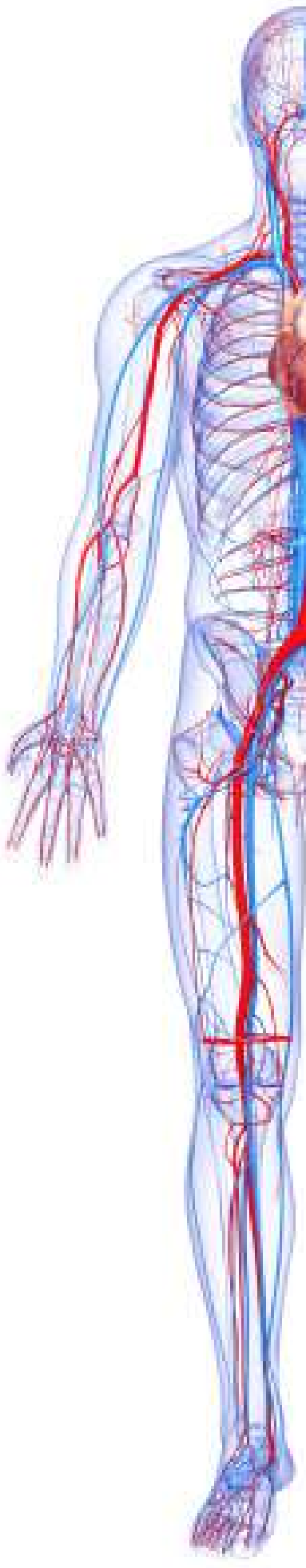
Endovascular embolization is one of the major applications of interventional radiology. From the first procedure in 1972 by Charles Dotter, steps forward have been made and now interventional radiologists can choose from a wide range of embolizing agents.

Embolization is now used to treat many onditions, from acute bleeding to embolization and oncological chemoembolization, occlusions of aneurysms and vascular malformations, treatment and prevention of endoleaks, or even on the venous side. Among liquid embolic agents, cyanoacrylates play a key role. Their intrinsic property of rapidly polymerizing in an ionic environment makes them versatile and able to provide rapid and effective embolization, allowing for different dilutions with Lipiodol, at low overall costs.

In this collection, I /we show the use of the Glubran®2 medical device, which has been used for many years as an embolic agent, for the resolution of various types of cases.

GLUBRAN®2
NOT A SIMPLE CYANOACRYLATE.



Great penetration capacity also in, capillary districts

Effective and fast

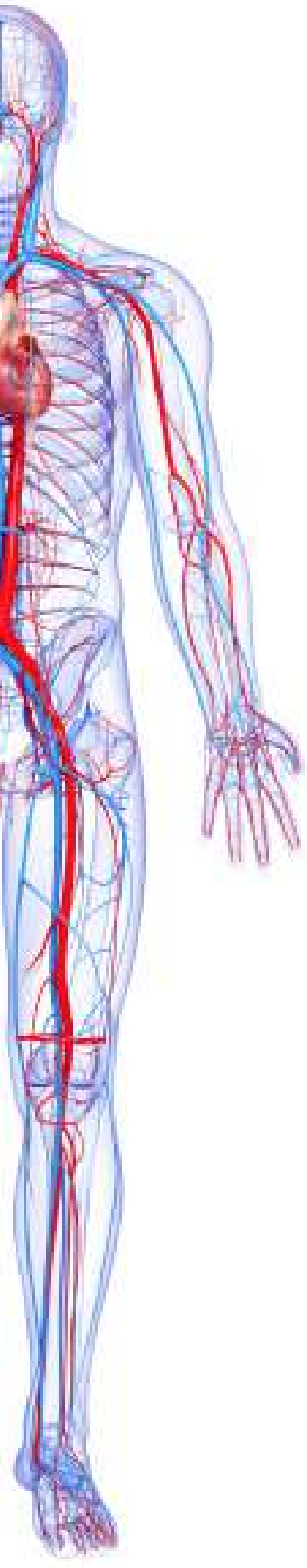
Easy to prepare

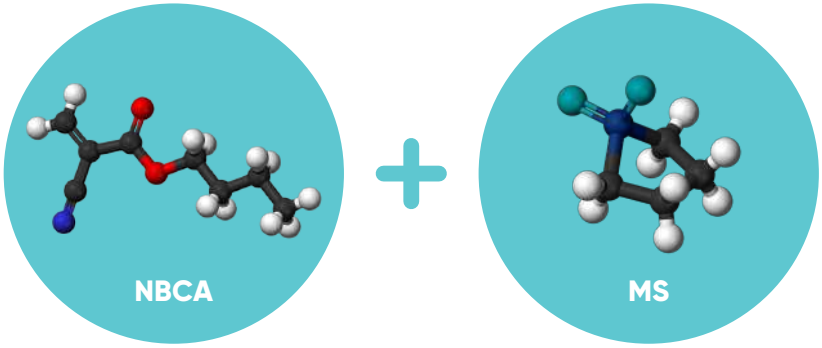
Suitable for emergencies

High haemostatic power

Applicable with standard 4F catheters

In addition to producing mechanical embolization, it also acts as a sclerosing agent





Does not cause pain

Does not contain toxic solvents

Can be used in combination with other embolization agents (coils and microspheres)

Reduced costs: “This treatment is safe, effective and “low cost”, with a high success rate”

Also effective in patients who are uncoagulated or with hereditary coagulation disorders

Generates a permanent occlusion

CE approved for endovascular use

pseudo
aneury
sms

Pseudoaneurysms

Pseudoaneurysms are pathological dilatations of the arteries contained solely by the tunica adventitia, unlike aneurysms, which are contained by all three normal layers of the arterial wall.

Iatrogenic causes are recognized (arterial accesses or anastomosis failure), as well as non-iatrogenic causes (trauma or infections).

Most pseudoaneurysms manifest at the time of rupture, with variable symptoms depending on the site.

Given the wall fragility, the risk of rupture is much higher than in aneurysms.

CASE 01

AGE/GENDER: 70 YEARS, WOMAN

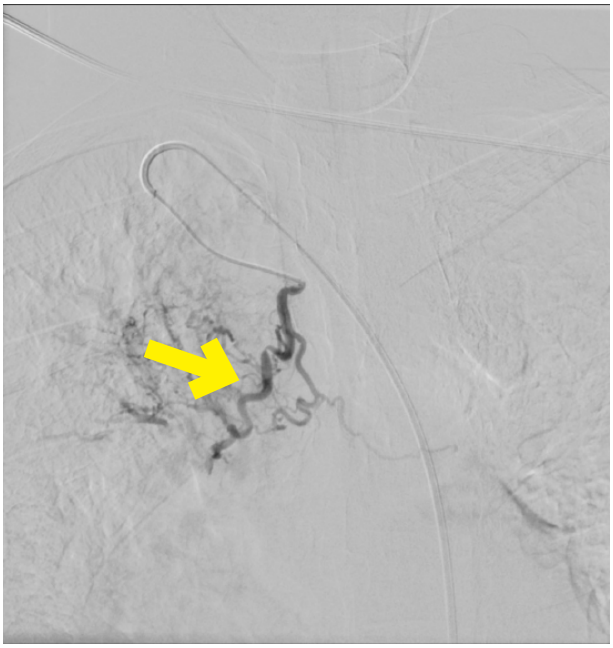
Pseudoaneurysms in left hypogastric artery

SYMPTOMATOLOGY

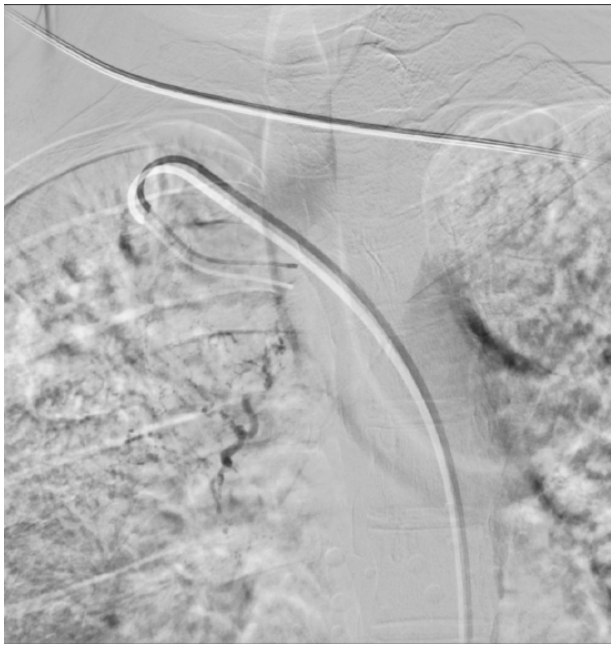
Abdominal pain and anemization.

DIAGNOSIS

CT with contrast agent had already been performed at the hospital of origin. We proceed to the selective catheterization of the left hypogastric artery via right femoral access and cross-over technique (4F diagnostic, Cobra, Terumo Glidecath -65 cm). Pseudoaneurysmal formation is evident, with extraluminal spread of contrast agent at left bladder wall branch.



Left hypogastric a. arteriography. Evidence of pseudoaneurysmal formation with contrast agent overflow of lateral sacral artery branch (arrow).



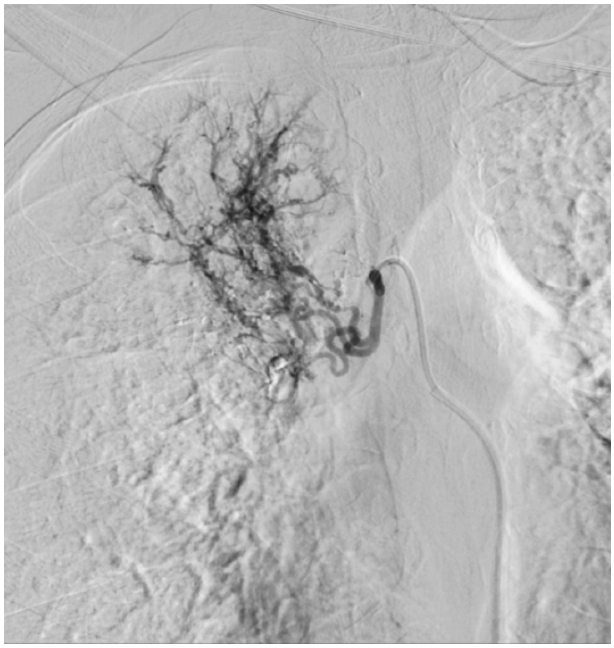
After a selective catheterization of the artery with a microcatheter (Progreat 2.7), we proceed with an ultrasound-guided injection of Glubran2-Lipiodol (1:1) mixture.

TREATMENT

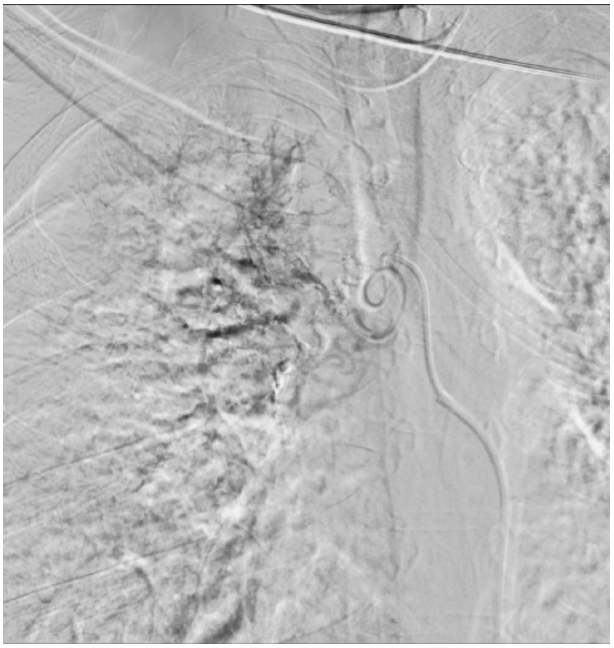
Progreat 2.7F microcatheter (Terumo) is used to reach the site of bleeding and the aneurysmal sac and all the pathological territory is embolized with approximately 1 ml of Glubran®2-Lipiodol mixture (1:1 dilution).

OUTCOME

At the final follow-up, the successful outcome of the procedure is confirmed in the absence of extraluminal residues of contrast agent.



Glubran®2-Lipiodol cast.



The angiography follow-up at end of the procedure provides evidence of bleeding resolution with embolization of the pseudoaneurysm and sparing of the vessels in the region.

CASE 02

AGE/GENDER: 52 YEARS, MAN

Pseudoaneurysm in superior mesenteric artery

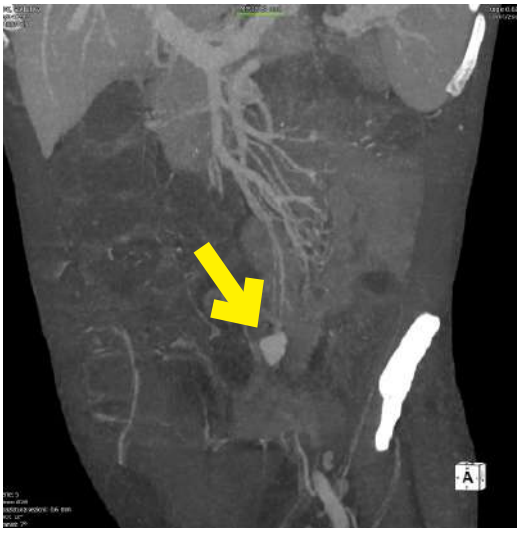
SYMPTOMATOLOGY

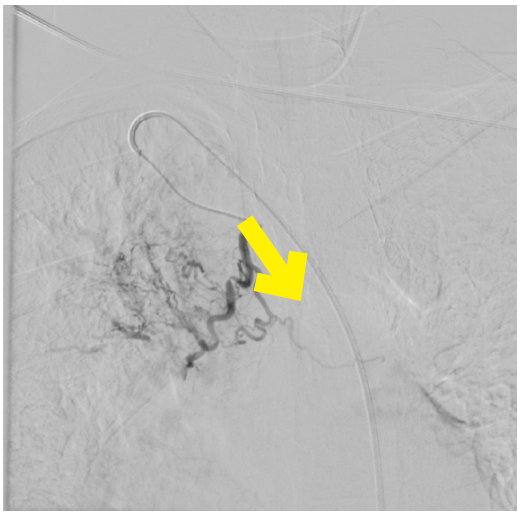
Abdominal pain and anemization.

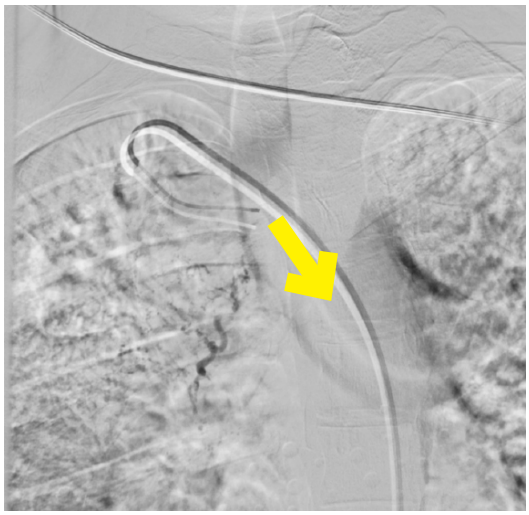
DIAGNOSIS

An abdominal CT scan with and without contrast agent is performed. Findings of known pseudoaneurysmal dilatation (approximately 16x15x18 mm), in mesohypogastric, which is dysmorphic and originating from the peripheral branch of the superior mesenteric artery.

With Simmons 1 - 100 carrier catheter (Terumo) and Progreat 2.7F microcatheter (Terumo), a selective catheterization of the inferior and superior mesenteric artery is performed, as well as a superselective catheterization of some peripheral branches of the latter.





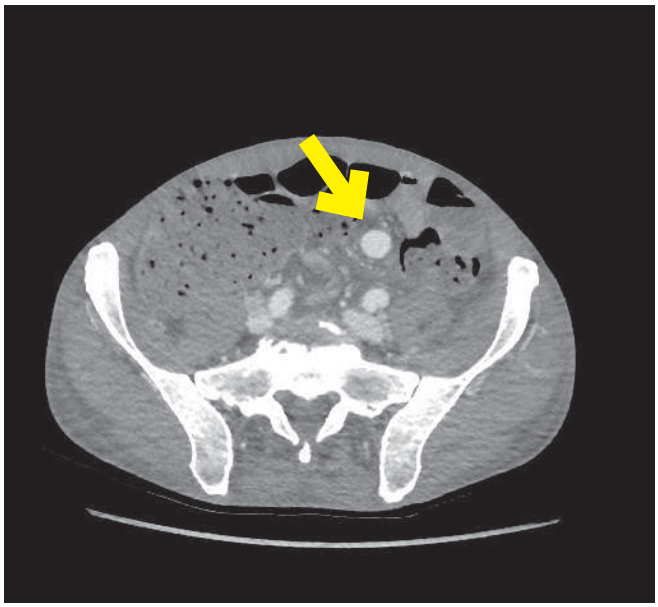


ACT angiography (at the top) and DSA image of voluminous pseudoaneurysm (arrows) of the ileal branch of the superior mesenteric artery.

TREATMENT

The preliminary diagnostic examination demonstrates the presence of pseudoaneurysmal dilatation, involving the distal ileocolic branch of the superior mesenteric artery. Through a superselective catheterization of this branch, we reach the sac and embolize the pseudoaneurysm and the afferent branch backward flow, with about 1 ml of Glubran®2-Lipiodol (1:1 dilution) mixture.

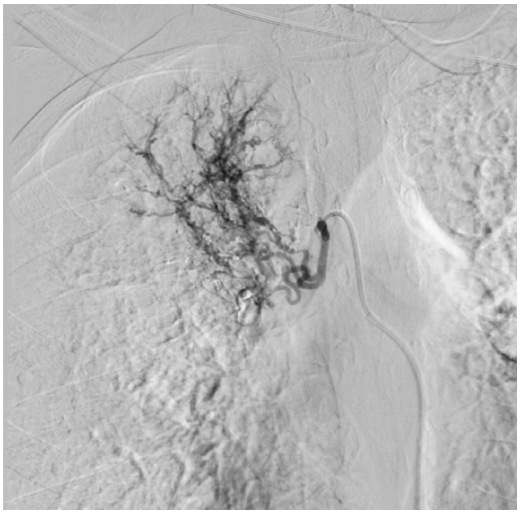
Right side: ultraselective catheterization with microcatheter (Progreat 2.7) of the branch afferent to the pseudoaneurysm and ultrasound-guided injection of Glubran®2 - Lipiodol mixture (1:1).

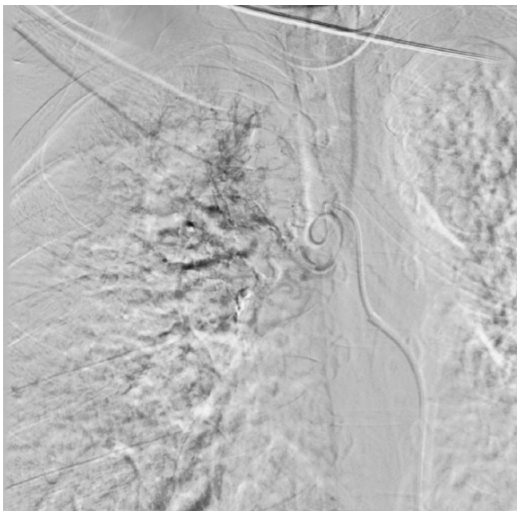


Pseudoaneurysm (arrow) of the ileal branch of the superior mesenteric a. in axial CT angiography image.

OUTCOME

At the final follow-up, complete embolization of the pseudoaneurysmal sac and regular opacification of the mesenteric vessels with normal circulating times were confirmed.





Postembolization follow-up with exclusion of pseudoaneurysm and sparing of vessels in the region.

CASE 03

Cerebral pseudoaneurysm

AGE/GENDER: 50 YEARS, MAN

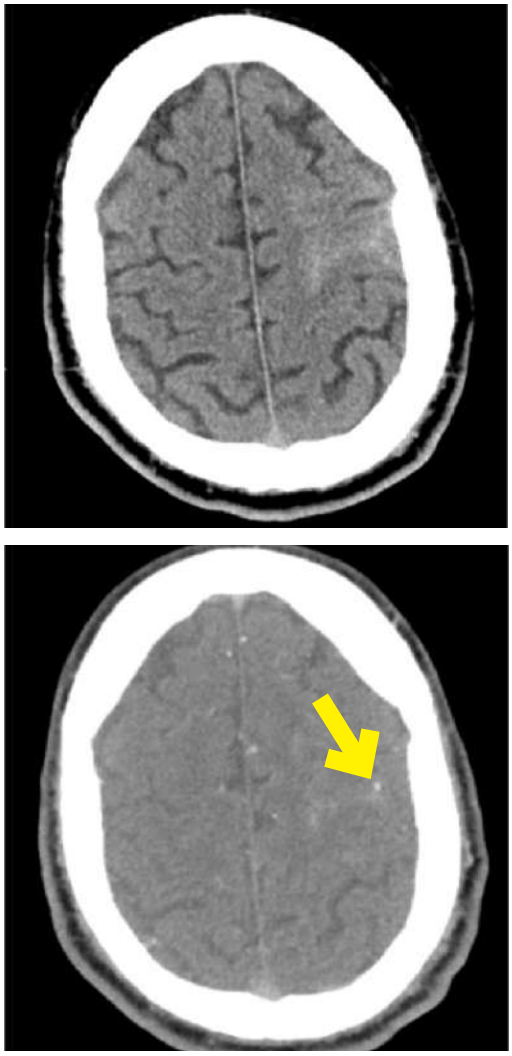
SYMPTOMATOLOGY

Transient upper and lower right limb strength deficit

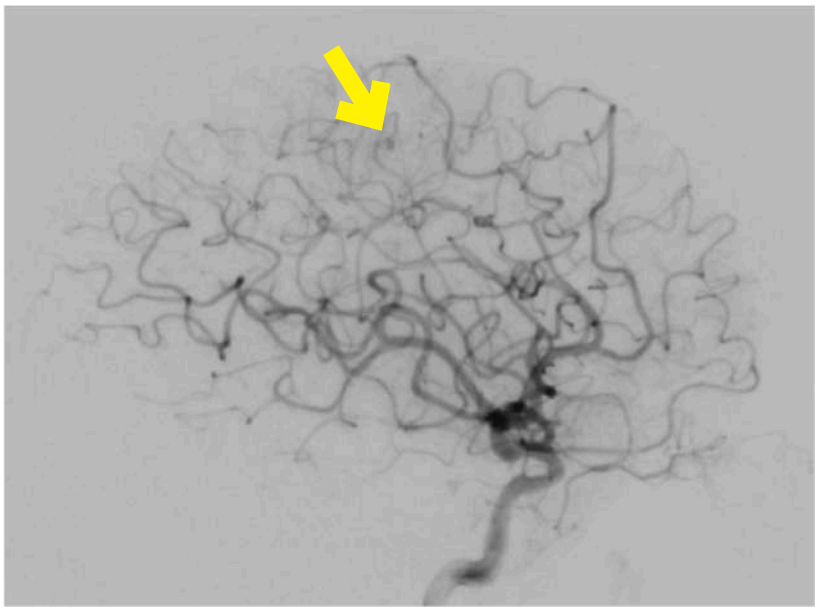
DIAGNOSIS

The skull CT scan performed at ER access shows subarachnoid haemorrhage in the left precentral sulcus. On CT angiography examination, evidence of a minute pseudoaneurysm in the distal frontal branch of the ipsilateral Sylvian artery circulation.

This data is confirmed by the angiography.



Hexa in precentral sulcus (above).
Distal pseudoaneurysm (below).



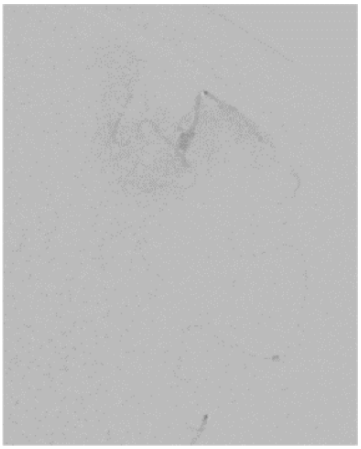
Angiography with injection from the left internal carotid. We confirm the presence of a small pseudoaneurysm (arrow) distal to the frontal region of maximum 2 mm, site of bleeding.

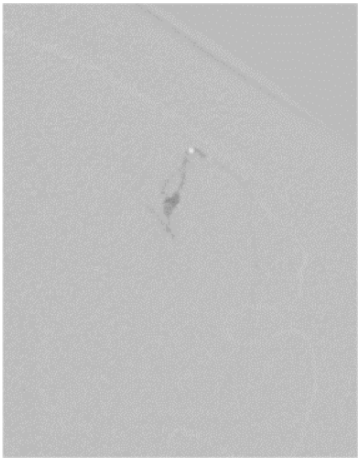
TREATMENT

After placement of triaxial system (NeuronMax 90 guiding catheter - Sofia 5 intermediate, 125 cm), with flow-dependent Magic 1.2F microcatheter, the afferent branch of the aneurysm is reached and the aneurysm is embolized by injection of Glubran®2-Lipiodol (1:2 dilution) mixture.

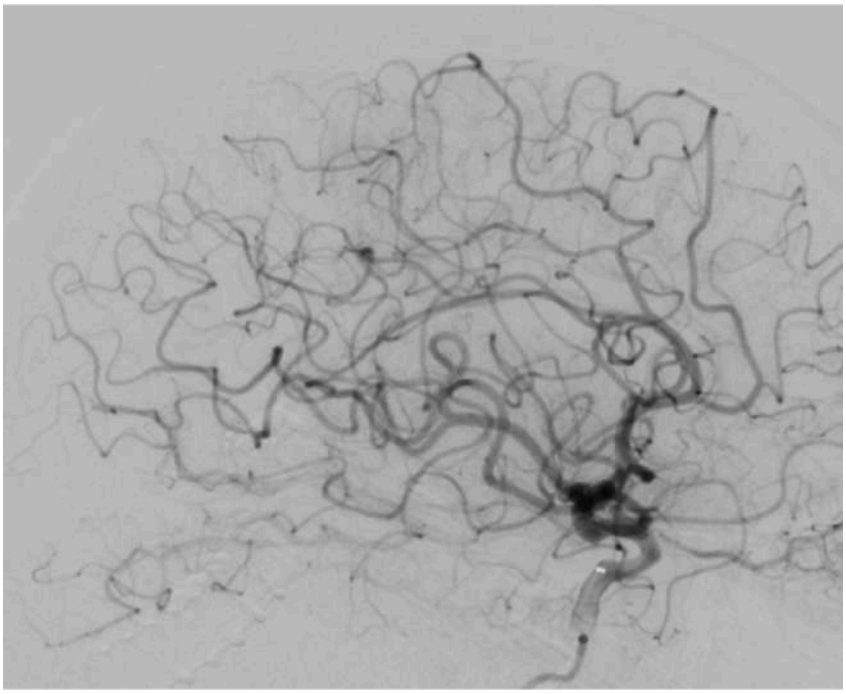
OUTCOME

The final follow-up shows the exclusion of the pseudoaneurysm, with vessels in the region and preserved parenchymal sonography. No neurological deficits at discharge.





Above: ultraselective catheterization of the afferent branch to the pse doaneurysm. Below: injection of Glubran®2- Lipiodol mixture (1:2).



The final follow-up shows the exclusion of the pseudoaneurysm from the circulation with preserved vessels in the region and parenchymal sonography.

type
ll

endole
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Type II endoleaks

By endoleak, we mean the persistence of flow within an aneurysmal sac after placement of an endoprosthesis.
They are classified into 4 types

I leaks from proximal or distal portion of the prosthesis

II recanalizations of the sac from collateral circles

III disconnections or ruptures of the components of the prosthesis

IV increased “porosity” of the prosthetic framework

Although type II endoleaks are low-pressure and therefore considered benign, treatment is indicated if there are sac increments higher than 5 mm at the follow-ups.

CASE 04

Type II Endoleak Inf. Mesenteric Artery

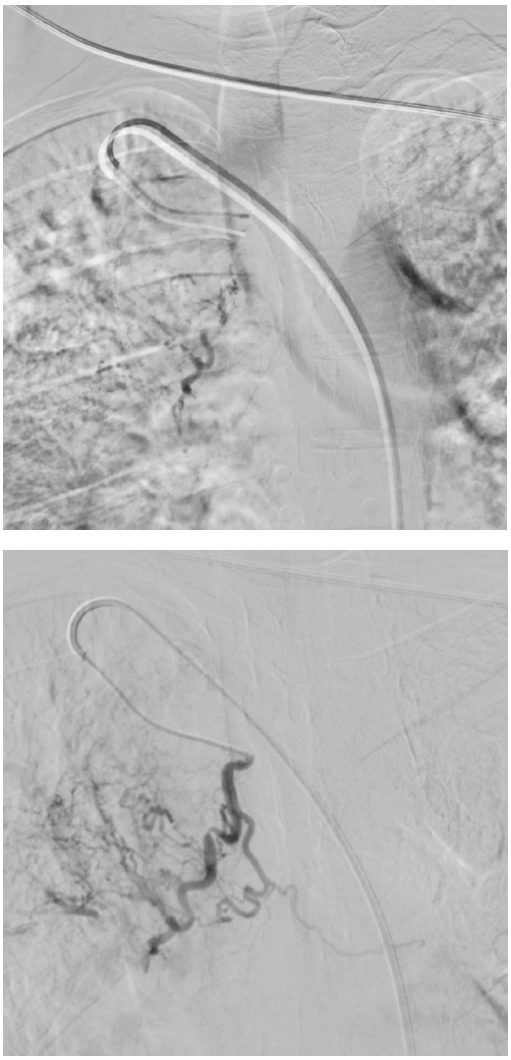
AGE/GENDER: 70 YEARS, MAN

SYMPTOMATOLOGY

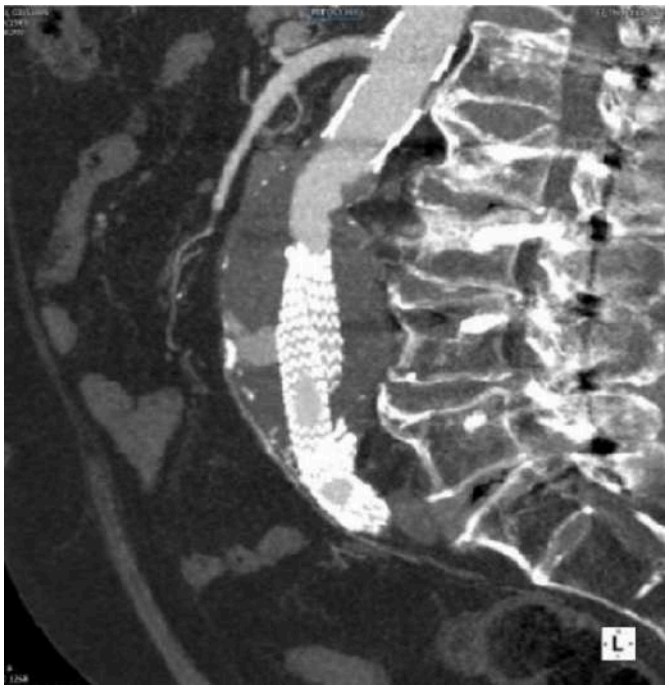
In 2016, the patient was treated for abdominal aortic aneurysm with endoprosthesis.

DIAGNOSIS

At CT follow-up (every six months), type II endoleak from inferior mesenteric artery is evident, with the lumbar artery as efferent branch. An increase in residual aneurysmal sac of 7 mm was noted in the last year.



Angiography of the Arc of Riolan by AMS in right oblique (above) and AP (below) projection. Type II endoleaks are observed anterior to the EVAR.

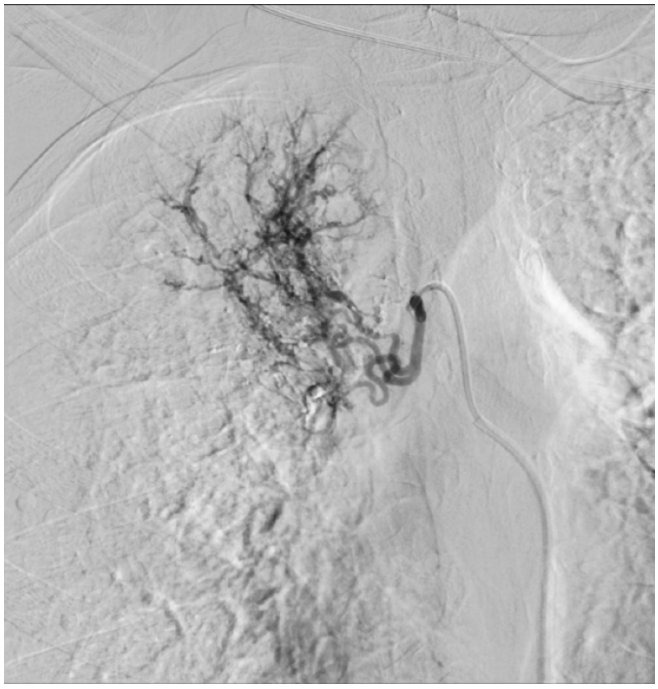


Sagittal MPR CT angiography: evidence of type II endoleak anterior to the EVAR originating from the inferior mesenteric artery

TREATMENT

Under local anaesthesia and with double arch, catheterization is performed from the superior mesenteric artery, along the Arc of Riolan (5F introducer, Simmons 1 carrier catheter, Progre-at -Terumo microcatheter).

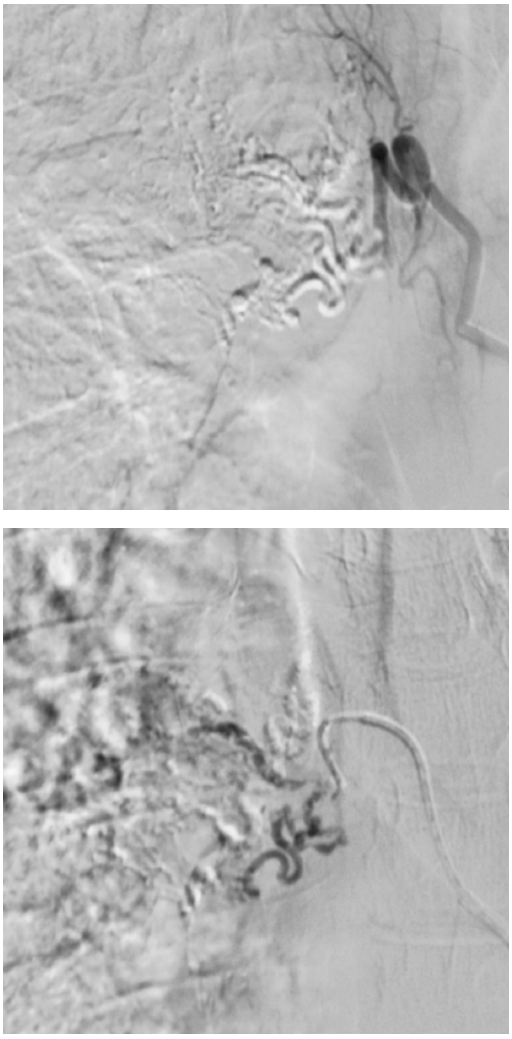
We then embolize with 1 ml of Glubran®2- Lipiodol (1:1 dilution) mixture.



2.7F microcatheter in the distal portion of the Arc of Riolan; injection confirms sac opacification.

OUTCOME

During embolization, reflux of the mixture occurs on the mesenteric branch all through the bifurcation, which, however, did not result in ischemia.



Above: injection of Glubran®2- Lipiodol mixture with embolization of the proximal IMA tract
Below: follow-up at end of the procedure with endoleak exclusion.

CASE 05

Type II Endoleak Lumbar Artery

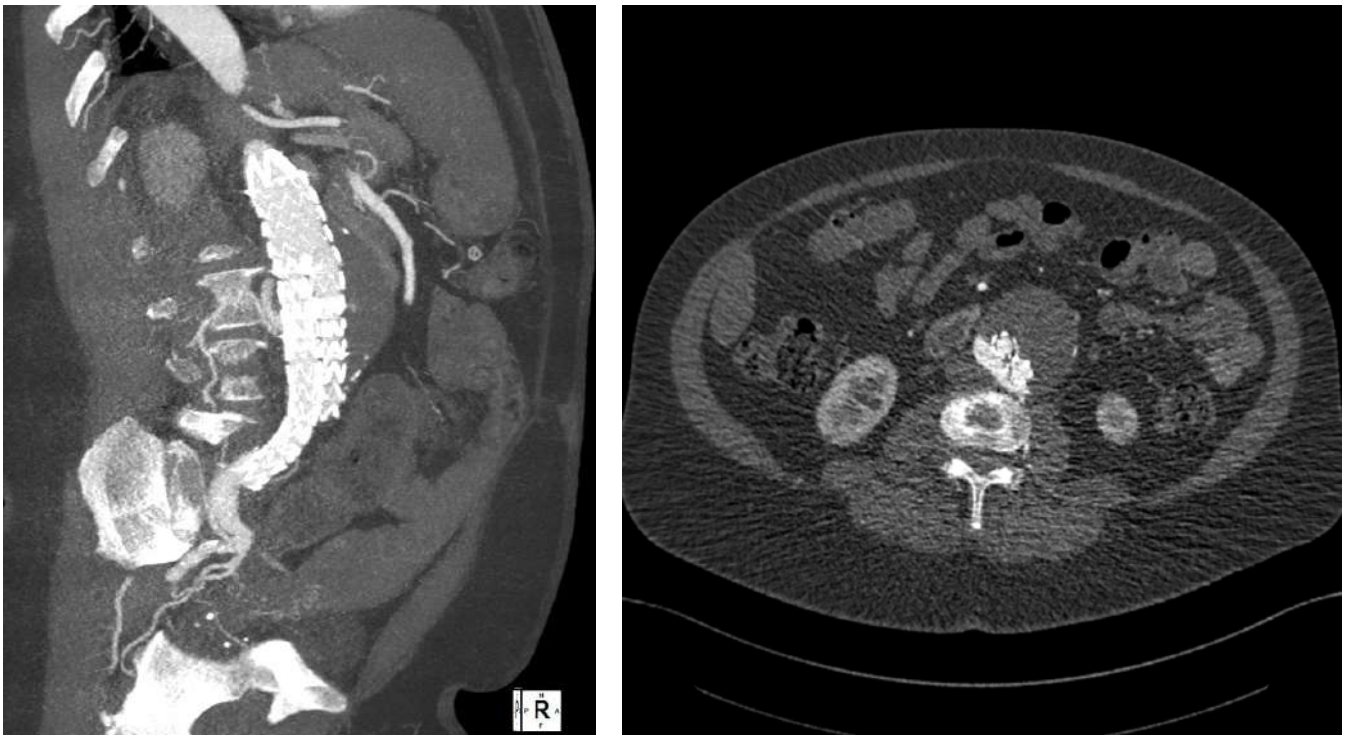
AGE/GENDER: 70 YEARS, WOMAN

SYMPTOMATOLOGY

Abdominal aortic aneurysm treated with EVAR in 2016. The patient arrived at our unit with abdominal pain and anemisation.

DIAGNOSIS

At the CT follow-up (annually), there is evidence of type II endoleak from the left L3 lumbar artery, with an increase of the aneurysmal sac of 6 mm in the last year.



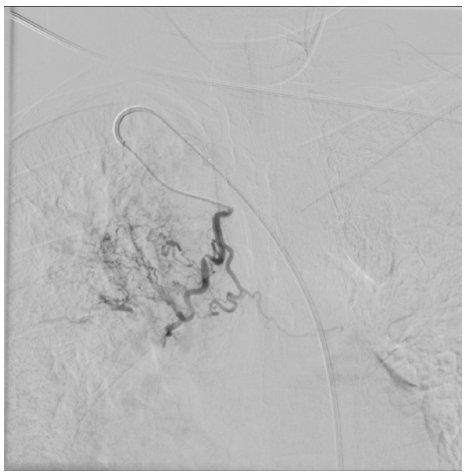
CT ANGIOGRAPHY with MIP reconstructions and axial scanning. There is evidence of type II endoleak posterior to the EVAR at the L3 level.

TREATMENT

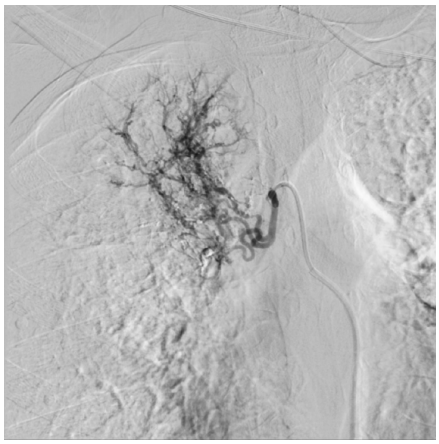
A superselective catheterization of the left hypertrophied iliolumbar branch is performed, originating from the ipsilateral hypogastric artery. Anastomosis is performed on that same branch with the L3 lumbar branch supplying the endoleak. Embolization of this branch is performed with Glubran®2- Lipiodol mixture (1:6 dilution).

OUTCOME

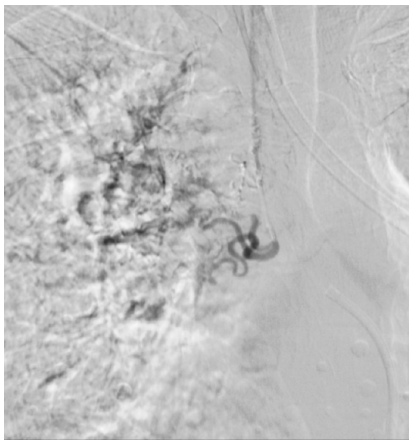
The final follow-up shows the exclusion of the treated branch from the circulation, with residual small type II endoleak from another non-navigable iliolumbar branch. At CT follow up at 6 months, sac stability is noted.



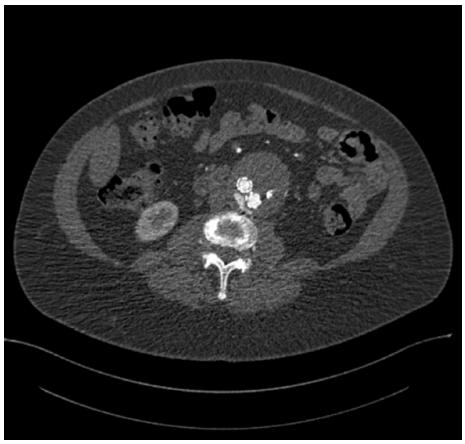
DSA with injection from 2.7F microcatheter positioned in the iliolumbar branch, demonstrating sac opacification.



Glubran®2-Lipiodol mixture cast (1:6) with intrasaccular deposition and on the L3 lumbar branch responsible for the leak.



Post-embolization angiography follow-up demonstrating the exclusion of leak from L3 lumbar.



Follow-up CT at 6 months: minimal residual leak from L2 branch with evidence of sac stability.

arterio-venous malfor-mations

Arteriovenous malformations

Arteriovenous malformations (AVMs) are a type of vascular malformation due to development defects

They grow by hypertrophy and show a progressive vascular ectasia. They are fairly rare entities, affecting less than 1% of the population, but they can be a cause of significant morbidity over the lifetime of the individual.

AVMs can affect any organ; however, there is a higher prevalence of intracranial AVMs than peripheral districts AVMs.

Their treatment may require an initial endovascular approach of nidus embolization and a subsequent surgical resection time.

CASE 06

Mediastinal AVM

AGE/GENDER: 93 YEARS, WOMAN

SYMPTOMATOLOGY

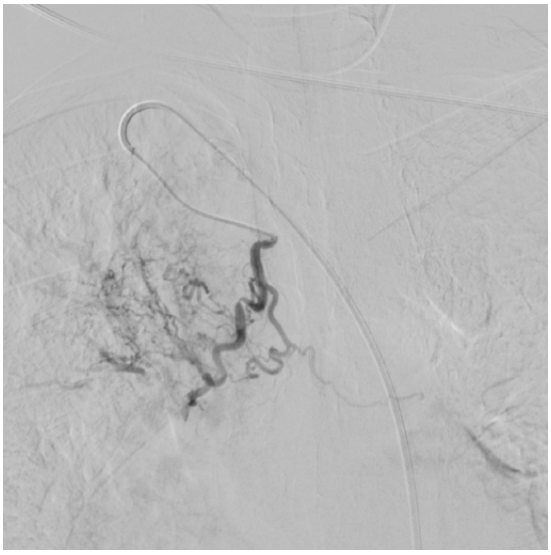
Patient with chronic obstructive pulmonary disease (COPD).

Symptomatology: haemoptysis.

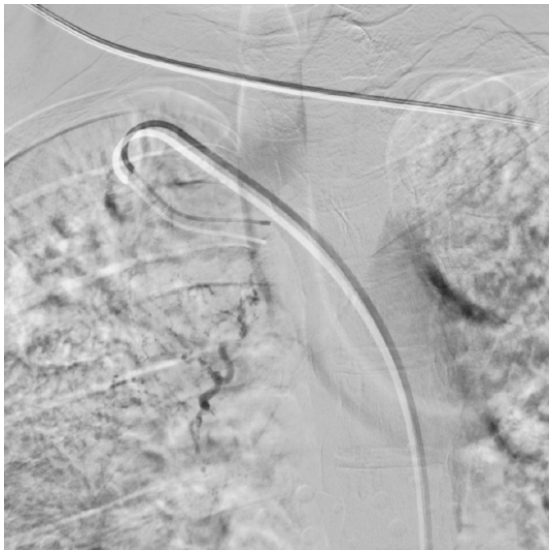
DIAGNOSIS

In narcosis, bilateral femoral access is performed; the left femoral access is used for blood pressure monitoring.

On the basis of the CT angiography examination, a selective catheterization of the left subclavian artery is performed (Vertebral carrier catheter), which gives rise to a proximal hypertrophied bronchial aberrant branch, the site of proximal aneurysmal dilatation. This branch divides early and feeds a coarse median mediastinal paratracheal AVM, resulting in the late parenchymal opacification of a portion of the lower lobe and, subsequently, of the ipsilateral pulmonary venous branch.



Selective catheterization of the aberrant hypertrophic branch originating from the left subclavian artery.



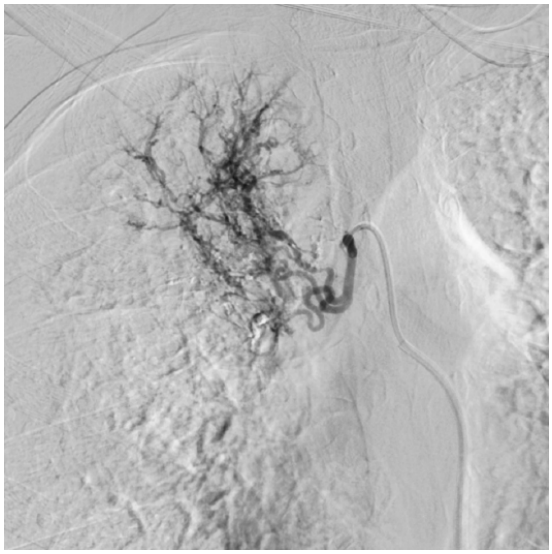
The angiography, with injection from the aberrant branch, shows left paramediastinal arteriovenous vascular malformation.

TREATMENT

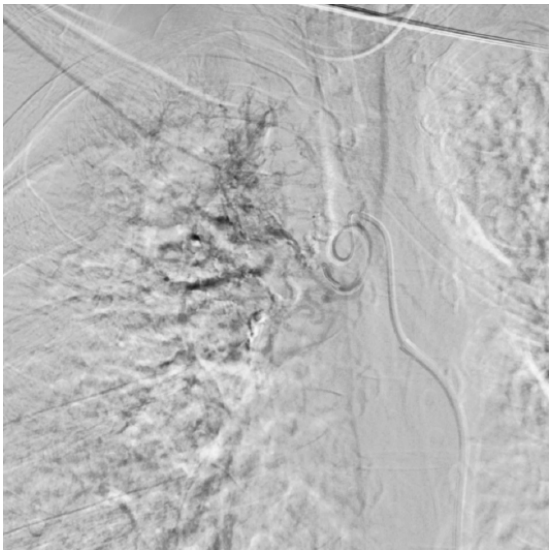
By means of a superselective microcatheterization (Progreat 2.7F microcatheter, Terumo) of the bronchial branch described herein, the aneurysmal dilatation pertaining to the malformation is reached and embolization is performed with approximately 0.8 ml of Glubran®2-Lipiodol mixture(1:1 dilution).

OUTCOME

The angiographic follow-ups at the end of the procedure show its good outcome, with the complete occlusion of the malformative bronchial branch and of the proximal aneurysm, with no residual opacification of the pathological shunt.



Glubran®2-Lipiodol mixture cast (1:1) into the proximal portion of the malformation.



Post-embolization follow-up with devascularization of the malformative region.

CASE 07

Abdominal AVM

AGE/GENDER: 70 YEARS, MAN

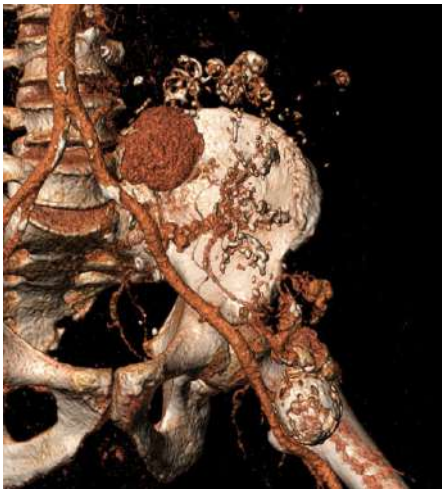
SYMPTOMATOLOGY

Abdominal pain and anemisation. Patient's history of arteriovenous malformation of the left iliopsoas, already treated in another medical centre with endovascular embolisation

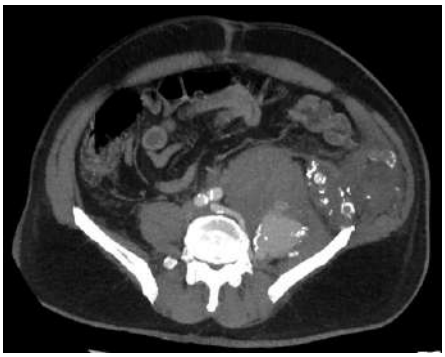
DIAGNOSIS

The CT examination and the CT angiography show a large retroperitoneal hematoma involving the left iliopsoas muscle extended from the subdiaphragmatic region to the root of the thigh, caused by rupture of a coarse aneurysmal formation, located at L4-L5.

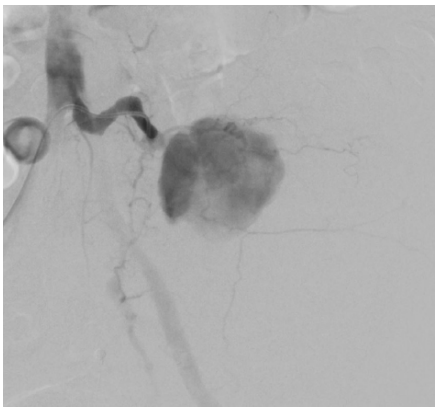
In the left retroperitoneal area up to the root of the thigh, there are also multiple coarse ectatic vascular structures with calcified walls, which are part of the still patent portion of the AVM.



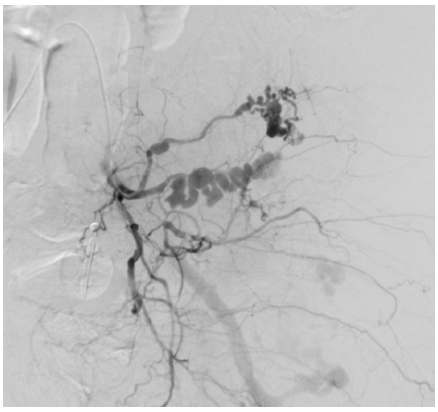
Angio TC - ricostruzione VR: voluminoso aneurisma paralombare sinistro, con presenza di esteso territorio malformativo vascolare in regione iliaca e paracetabolare omolaterale.



CT angiography: contrast agent overflow at the left paralumbar aneurysmal dilatation, site of bleeding.



Angiography with injection from the left lumbar V branch, afferent to the voluminous aneurysmal dilatation.



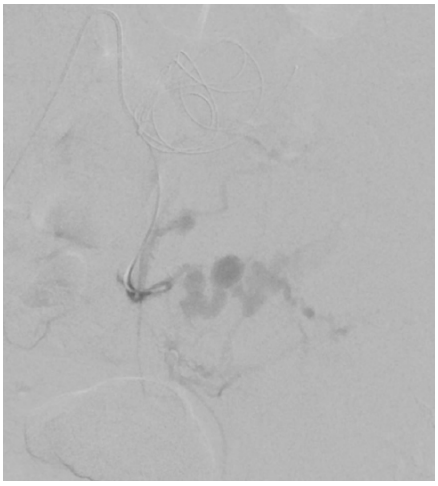
Angiography with injection from the left hypogastric artery with evidence of extensive arterial malformative branches afferent to the AVM.

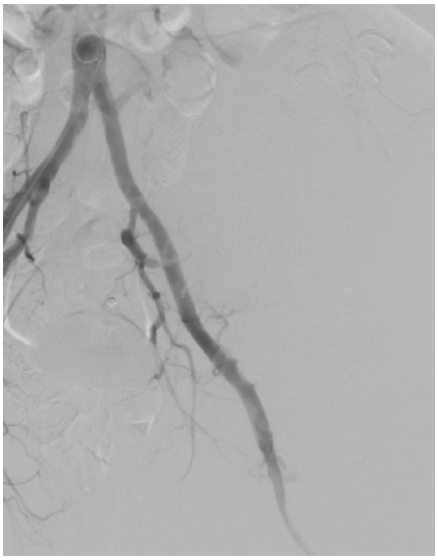
TREATMENT

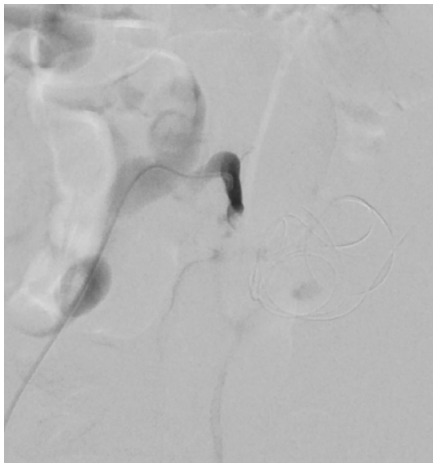
Using a Progreat 2.7 microcatheter, catheterization of the branches of the left lumbar V artery, of the arterial branches of the hypogastric artery and of the circumflex artery, afferent to the AVM is performed. Subsequent embolization of these branches with Glubran®2-Lipiodol mixture at variable dilutions (from 1:2 to 1:6)

OUTCOME

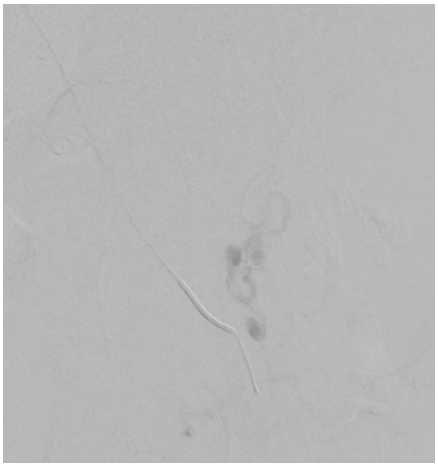
At the final follow-up, it is confirmed that the aneurysm responsible for the bleeding and for the 90% of the arteriovenous malformation is excluded from the circulation. malformation is excluded from the circulation. malformazione artero-venosa.



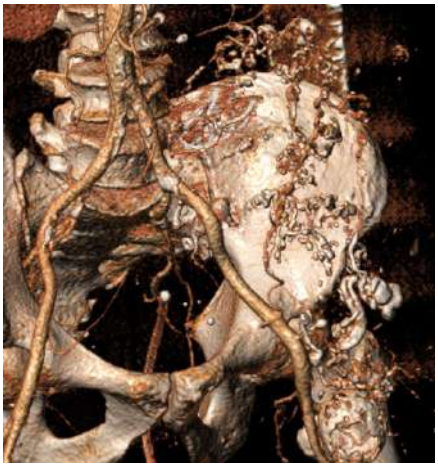




Glubran®2-Lipiodol mixture injection (1:2) into the branch afferent to the aneurysm



Injection of Glubran2- Lipiodol mixture (1:4 and 1:6) into the two afferent branches of the AVM.



Follow-up aortography (above): exclusion of the branches originating from the aorta and from the hypogastric artery.
CT angiography - VR control: only slender residuals branches to LFA.

treat-
ment of
blee-
ding

Treatment of bleeding

Acute bleeding can affect almost all body districts. Different causes can be recognized, from trauma to pontaneous bleeding, to the rupture of vessels in newly formed tissue. Depending on the site, they can manifest with different symptoms, with a constant element provided by anemization and, in case of major bleeding, by hemodynamic instability.

Arterial bleeding can be addressed with minimally invasive endovascular approaches in order to close the vascular territory responsible for the bleeding.

CASE 08

Bleeding

AGE/GENDER: 25 YEARS, MAN

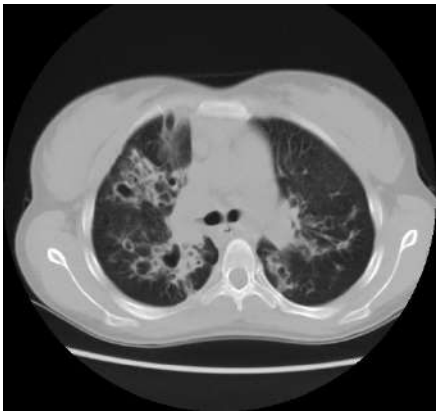
SYMPTOMATOLOGY

Roadside polytrauma.

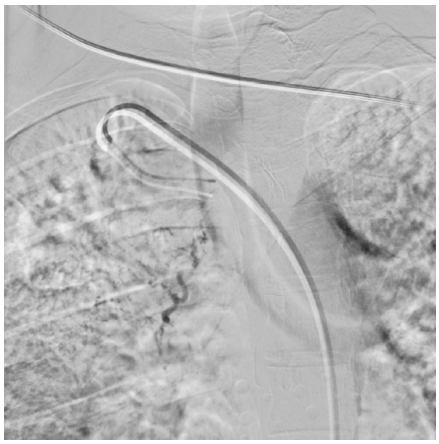
DIAGNOSIS

A CT scan is performed by which bleeding in the penile and perineal area is diagnosed.

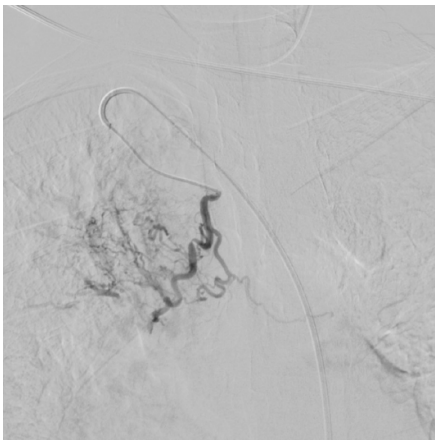
Under local anaesthesia, right femoral access is performed with selective catheterization of both hypogastric arteries. Active extravascular spread of contrast agent from internal pudendal and perineal branches of the right hypogastric artery is shown.



The CT angiography shows extraluminal blush of contrast agent in the right penile region.



Selective catheterization of internal pudendal branch with 2.7 F microcatheter.



The angiography confirms the spread of contrast agent in the penile/perineal region.

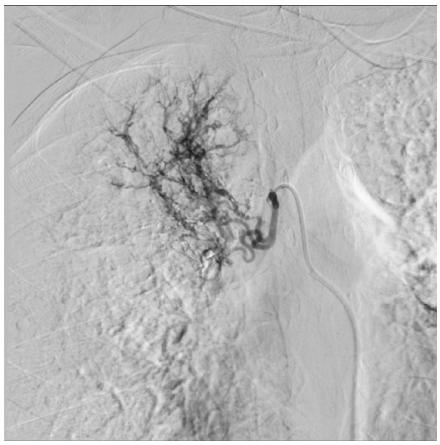
TREATMENT

By superselective microcatheterization of these branches (Cobra Glide 4F carrier catheter, Progreat 2.7F - Terumo microcatheter), embolization is performed with resorbable particulate material (Cutanplast-Spongostan). When the procedure was still in progress, artery rupture occurs, perhaps caused by the heaviness of the embolization material itself, which under pressure can break the vessel in the fragile area.

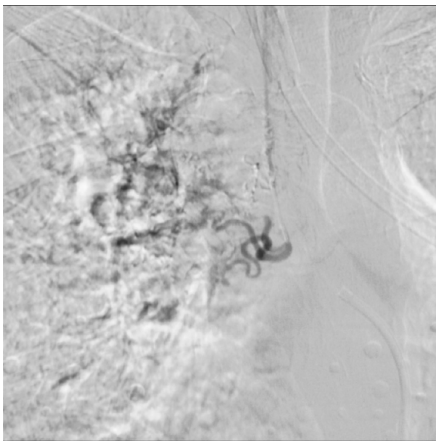
Further embolization is then performed with approximately 1 ml of Glubran®2-Lipiodol mixture (1:1 dilution), filling the dead volume of the catheter with the embolization mixture and injecting boluses of it while pushing with glucose solution.

OUTCOME

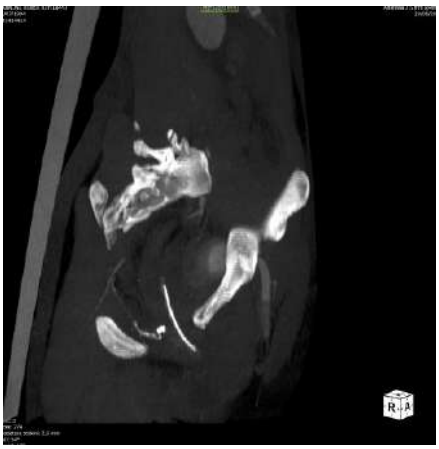
At the final follow-up angiography, complete occlusion of the treated branches is confirmed, with no further active spread of the contrast agent..



Glubran®2-Lipiodol mixture cast (1:1) at site of bleeding.



Post-embolization angiography follow-up: exclusion of the branch afferent to the bleeding and sparing of the vessels in the region.



CT angiography follow-up after 24h with evidence of Glubran®2-Lipiodol cast and absence of bleeding.

CASE 09

Sanguinamento

AGE/GENDER: 20 YEARS, WOMAN

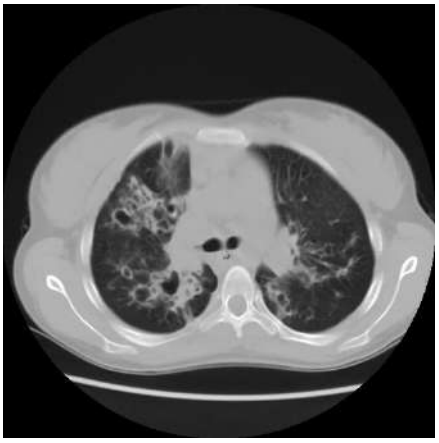
SYMPTOMATOLOGY

Haemoptysis.

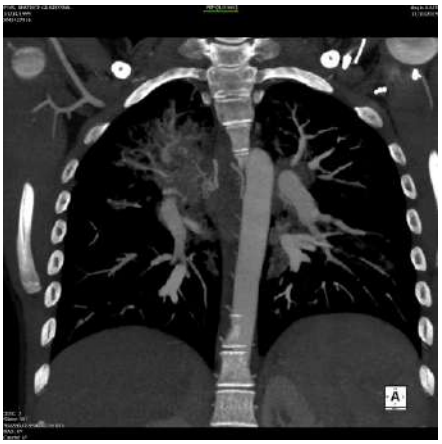
DIAGNOSIS

Patient with cystic fibrosis.

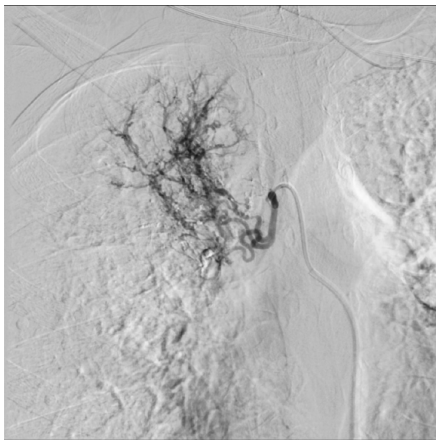
In the last month, the patient accessed the ER several times for haemoptysis, which were spontaneously resolved each time.

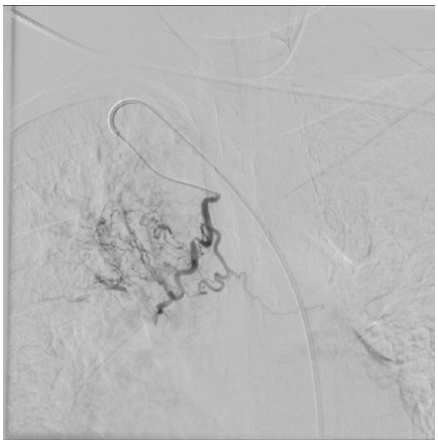


TC polmonare: quadro tipico di fibrosi cistica con bronchiectasie ed ispessimento dell'interstizio peribronchiale.



Coronal MIP CT angiography: presence of bronchial artery hypertrophied branches in the right upper lung lobe.





Angiographic examination, from the right bronchial artery and from the ipsilateral internal mammary artery, confirms CT angiographic finding of malformative vascular territories in the right upper pulmonary lobe, site of bleeding.

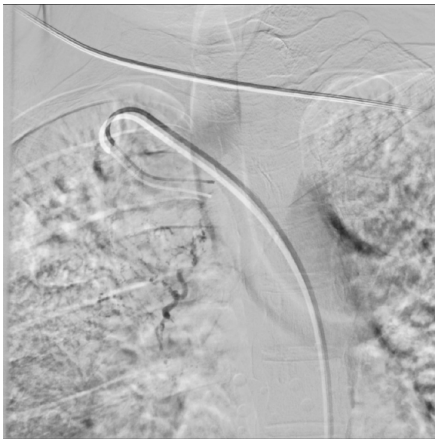
TREATMENT

By superselective microcatheterization from the right bronchial artery and from the ipsilateral internal mammary artery (Progreat 2.7F, Terumo microcatheter), embolization is performed with about 0.8 ml of Glubran®2-Lipiodol mixture (dilution 1:4).

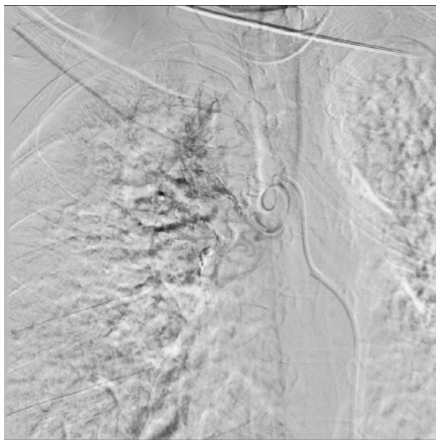
OUTCOME

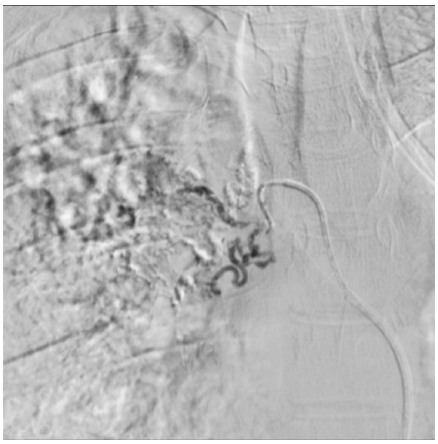
A complete devascularization of the treated area is achieved, as well as no further evidence of bronchial pathological circulations.

There is a post-procedural complication of simple resolution: a small iatrogenic pseudoaneurysm at the femoral access, ultrasound evidenced and treated with compression bandage.

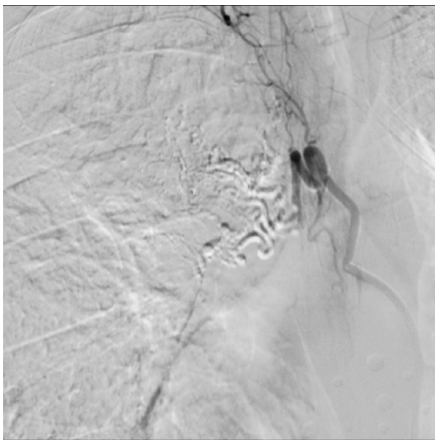


Embolization with Glubran2-Lipiodol mixture from the bronchial branch originating from the right internal mammary artery; 1:4 dilution allows to reach distal portions of the malformative territory.





Embolization with Glubran2-Lipiodol mixture through 2.7 F microcatheter placed in the afferent branches to the upper lung lobe originating from the right bronchial a.



Follow up angiography demonstrates the complete exclusion of the malformed circle

AVF
and
DAVE

AVF and DAVF

Arterio-Venous Fistulae (AVF) and Dural Arterio-Venous Fistulae (DAVF) are abnormal communications between artery and vein without interposition of the capillary bed.

Dural involvement accounts for 10-15% of all vascular brain malformations of adult patients. The classification of dural fistulas according to Cognard has 5 classes depending on the type of drainage (on sinus or on cortical vein) and venous reflux (present or not), with a progressive risk of bleeding as the class increases. Classes from IIb to V have an annual bleeding risk of approximately 8%.

Treatment options include endovascular embolization.

CASE 10

Iatrogenic AVF

AGE/GENDER: 36 YEARS, WOMAN

SYMPTOMATOLOGY

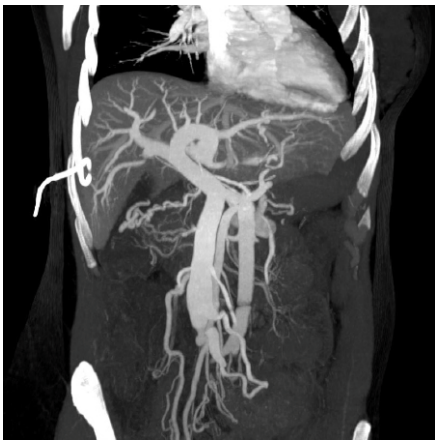
The patient accesses the ER with nausea and abdominal pain, which she has been experiencing for the past 3 months. During hospitalization, onset of enteric bleeding from oesophageal varices, despite absence of portal hypertension.

DIAGNOSIS

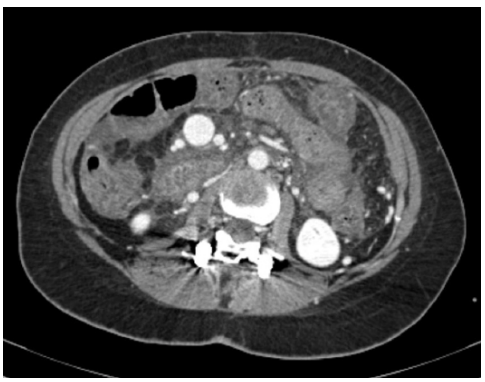
Gastroscopy and CT angiography were performed, diagnosing dilatation of the superior mesenteric artery and the presence of iatrogenic fistula between the superior mesenteric artery and the superior mesenteric vein (SMV), as a result of intestinal resection for endometriosis, performed in the last year.

These types of fistulas are very rare, and are usually treated with a coated stent, coils, or vascular plug, but migration can become a complication.

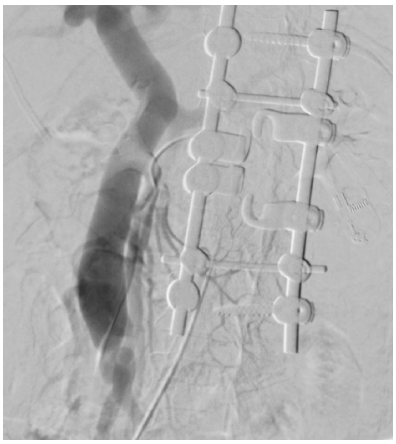
A decision is made for treatment with coils and concurrent embolization with Glubran®2 to avoid possible migration of the coils, which is one of the complications of this procedure.



CT angiography with early opacification of the portal circulation for AV fistula with AMS.



The CT examination shows damage of the intestinal loops caused by the steal exerted by the fistula.



The angiography performed by AMS confirms the pathological communication with the portal system, which appears markedly dilated.

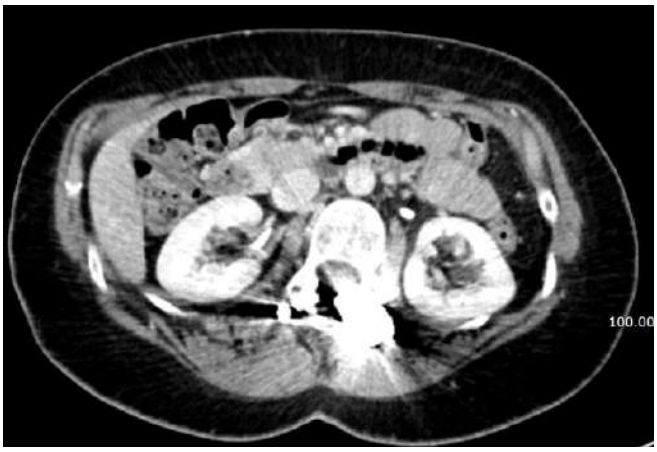
TREATMENT

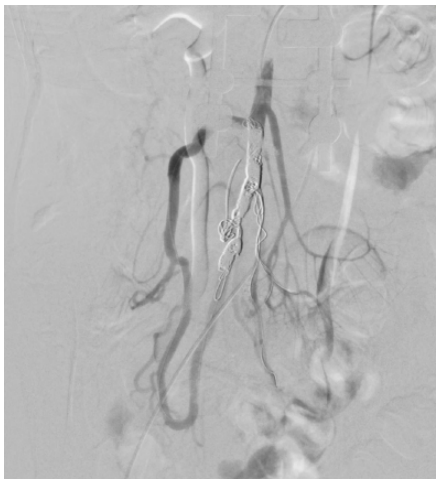
Under local anaesthesia, catheterization of the mesenteric artery is performed with Simmons 1.5F, and microcatheterization of the actual fistula with Progreat 2.7F, since this type of complex fistulas require the occlusion of the effluent vessels as well. 9 controlled-release coils are placed, with which a good reduction of the flow is obtained, and embolization is completed with Glubran®2-Lipiodol mixture (1:1 dilution).

A partial thrombosis of the superior mesenteric vein occurs during the procedure, but without complications.

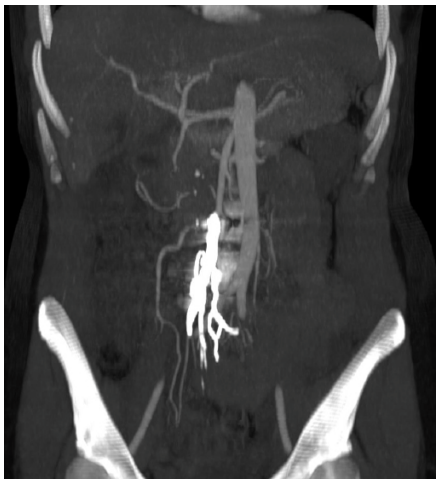
OUTCOME

The good procedural success is also evidenced by the disappearance of abdominal pain.

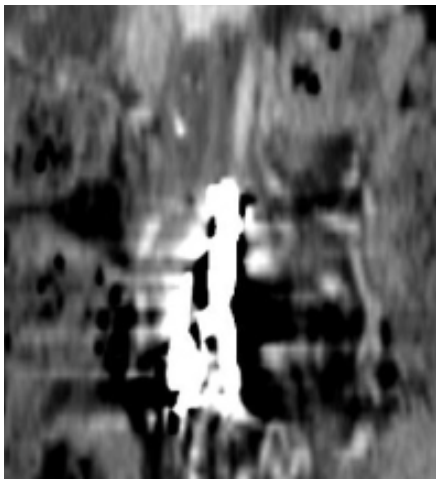




Embolization of the arterial tract affected by AVF with coils and Glubran®2-Lipiodol mixture (1:1), sparing the vessels in the region.



CT angiography follow-up at 7 days: no evidence of early opacification of the portal system.



Recovery of intestinal perfusion (at the top).
Thrombosis of the superior mesenteric vein.

CASE 11

Spinal DAVF

AGE/GENDER: 77 YEARS, WOMAN

SYMPTOMATOLOGY

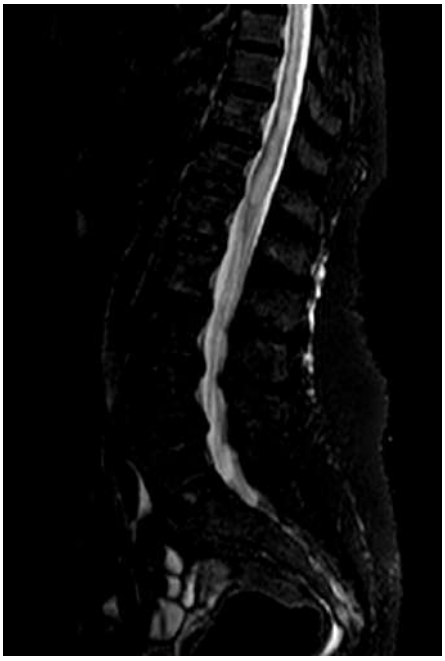
Subacute onset of paraparesis since approximately one month.

DIAGNOSIS

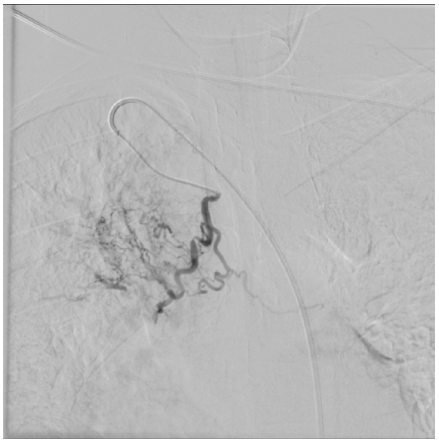
CT angiography, MRI angiography, and dual diagnostic angiography had been performed at another hospital, which show the presence of a spinal dural arteriovenous fistula (DAVF), which appears to be fed predominantly by right D7 intercostal branches, and a diffuse "vein foot" over micro-fistulous territory with subsequent retrograde discharge over dural veins.

Under narcosis, right femoral access is performed, as well as a selective catheterization of the intercostal arteries bilaterally (Simmons1 - Terumo carrier catheter).

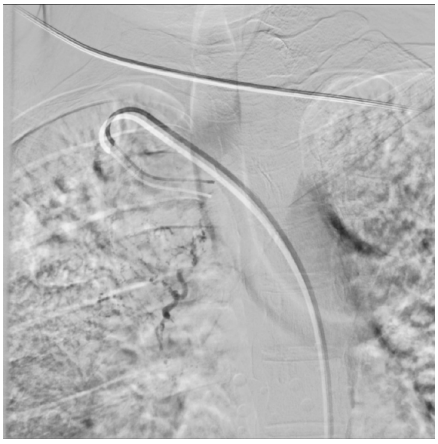
On preliminary diagnostic examination, the presence of dorsal spinal DAVF is confirmed, with afferents from dural branches originating from the radicular artery of the right intercostal artery at the level of D8.



Altered spinal cord signal, with swelling of the cord, in the D4-D12 segment due to subacute myelitis secondary to venous hypertension.



Ultraselective catheterization angiography of D8 intercostal branch showing microfistulous territory with retrogressive discharge on two dural veins.



Injection of Glubran®2-Lipiodol mixture (1:2) from Echelon 10 microcatheter with saturation of the fistulous territory.

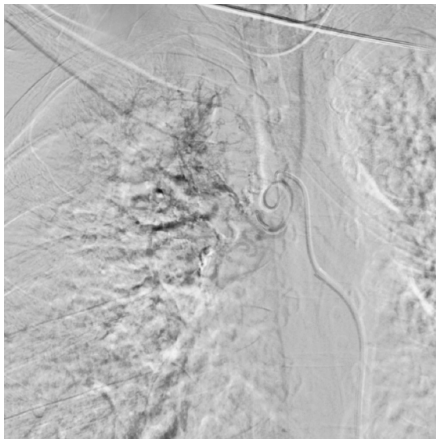
TREATMENT

In the absence of surgical indications for treatment, a decision is made to perform embolization, despite the fact that this procedure has a high recurrence rate for these diseases (over 30%).

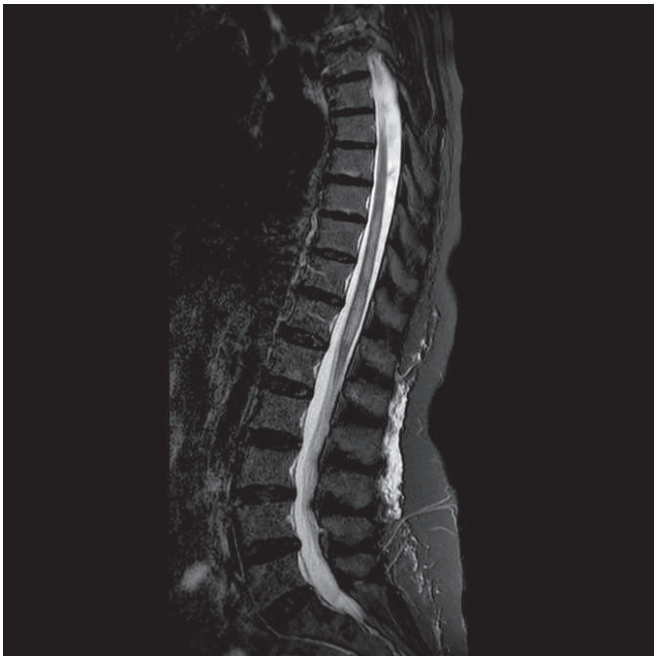
Using superselective microcatheterization (Echelon 10 microcatheter) of the pathological branch, embolization is performed with a mixture of Glubran®2-Lipiodol (1:2 dilution).

OUTCOME

The final check-up shows the complete exclusion of the dorsal DAVF vascular malformation from the flow.



Follow-up angiography with devascularization of the pathological territory.



Follow-up MRI at 6 months: reduction in the extent of signal alteration of the medullary cord (D9-D12), with reduced swollen appearance of the cord.

CASE 12

Cerebral DAVF

AGE/GENDER: 63 YEARS, MAN

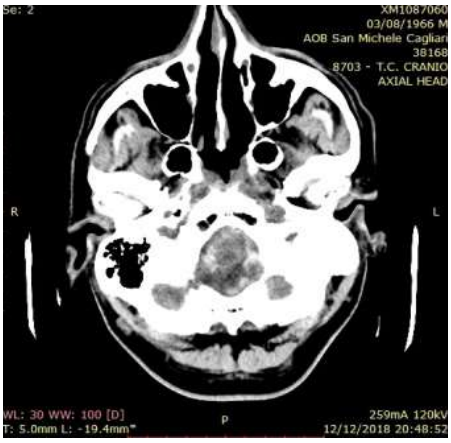
SYMPTOMATOLOGY

Headache. A CT scan is performed, showing a subarachnoid haemorrhage in the basal and perimesencephalic cisterns. The CT angiography also shows a blurred contrast build-up in the right tentorial hemisection, near the torcular region.

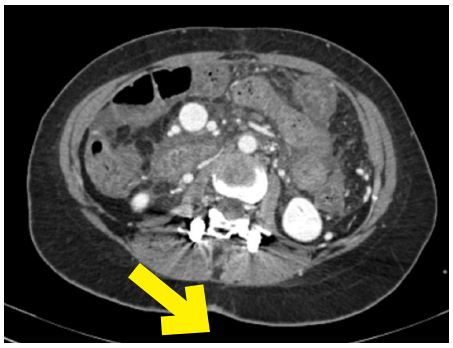
DIAGNOSIS

Under general anaesthesia, a right femoral access is performed (6F vascular introducer), as well as a selective catheterization of the right vertebral artery (Destination 45 to 6F carrier catheter left in the aorta, intermediate Vertebral Terumo 100 cm 5F).

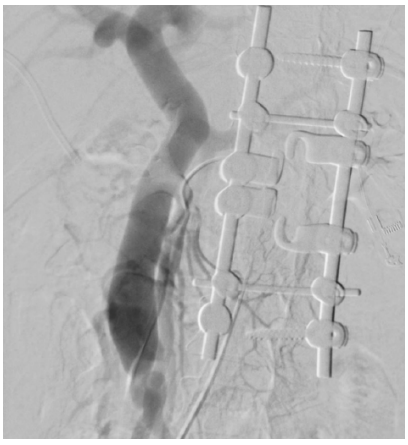
The diagnostic angiography confirms the presence of a dural arteriovenous fistula (DAVF) fed by an occipital meningeal branch originating from the V3 segment of the right vertebral artery.



Brain CT on admission: ESA in perimesencephalic location and in the cisterns of the basicranium.



CT angiography: in the angiographic phase, early blurring and contrast uptake is observed at the level of the torcular sinus.



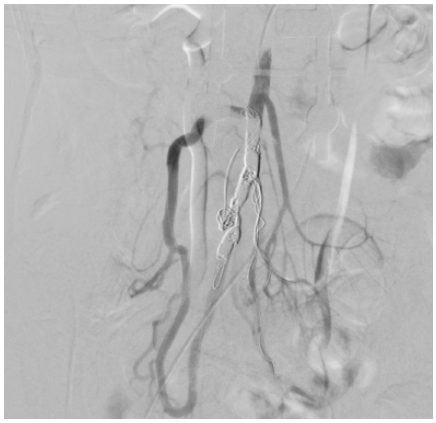
Angiography from right vertebral a.: presence of fistulous territory in the occipital site, fed by an occipital meningeal branch originating from V4 segment, with drainage on the cortical vein.

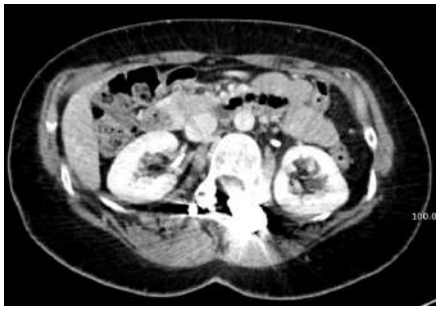
TREATMENT

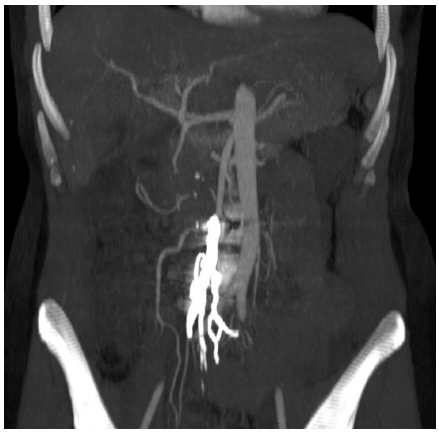
After systemic heparinization (2500 IU), we proceed to the superselective microcatheterization of the above-mentioned branch afferent to the DAVF (Echelon 10 microcatheter), and we perform an embolization of the fistulous passage and of the vein foot by a Glubran®2: Lipiodol mixture (1:5 dilution).

OUTCOME

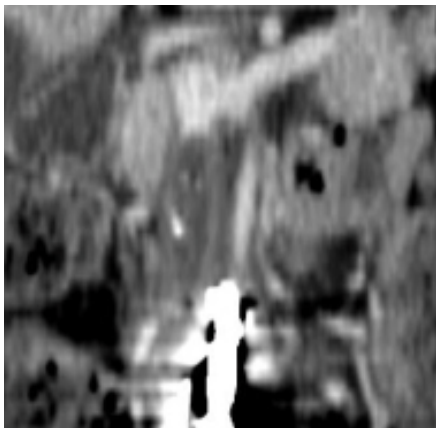
The final angiography follow-up shows the complete occlusion of the DAVF, as well as the absence of further residual arteriovenous shunts, preserved patency of the right vertebral artery and of all the remaining vertebrobasilar circulation. Arteriovenous circulation times are also preserved.



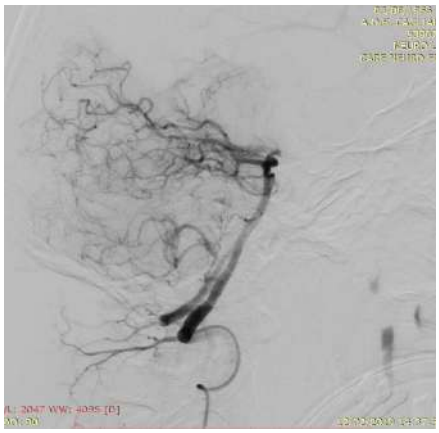




Placement of a triaxial system (guiding catheter - intermediate catheter - microcatheter) in the right vertebral a.



Injection from the occipital meningeal branch confirming malformative territory (above). Afferent artery distal saturation with Glubran®2- Lipiodol injection (1:5).



Post-embolization control injection: complete saturation of the fistulous territory with regular arteriovenous circulation times.

USER GUIDE GLUBRAN®2

1. Accurate preliminary angiographic study

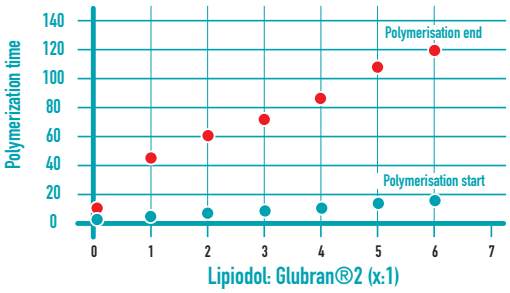
Identification of afferent, collateral, and possible AV fistulae, with oblique and cranio-caudal projections

2. Selective and superselective catheterization of the area to be embolized

3. Careful hemodynamic assessment

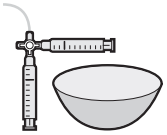
4. Dilute with Lipiodol:

a) to delay the polymerization of Glubran® 2
b) to make it radiopaque



5. Mix the two compounds well

just before injection (with resistant plastic tap/in a steel basin)



6. Flush the catheter with a glucose solution

7. Inject slowly

- Microbeads of 0.1-0.3 ml of mixture > push with glucose solution ("sandwich" technique)
- Single continuous injection

8. Remove the microcatheter

(quickly and immediately after injection if you have not done the "sandwich" technique with glucose solution)

9. Possible control with contrast agent after at least 2 minutes

WARNING: DO NOT USE GLUBRAN 2 WITH POLYCARBONATE OR SILICONE MATERIALS

Advised products & materials

Glubran® 2/Lipiodol® Ultra-Fluid - Guerbet

5%-33% glucose or dextrose

3x1 mL or 3x5 mL polyethylene (PE) or polypropylene (PP) syringes with luer lock

18 G needles

3-way-stopcocks or a steel bowl

One coaxial microcatheter

Glubran® 2/Lipiodol® dilution ratios[84]

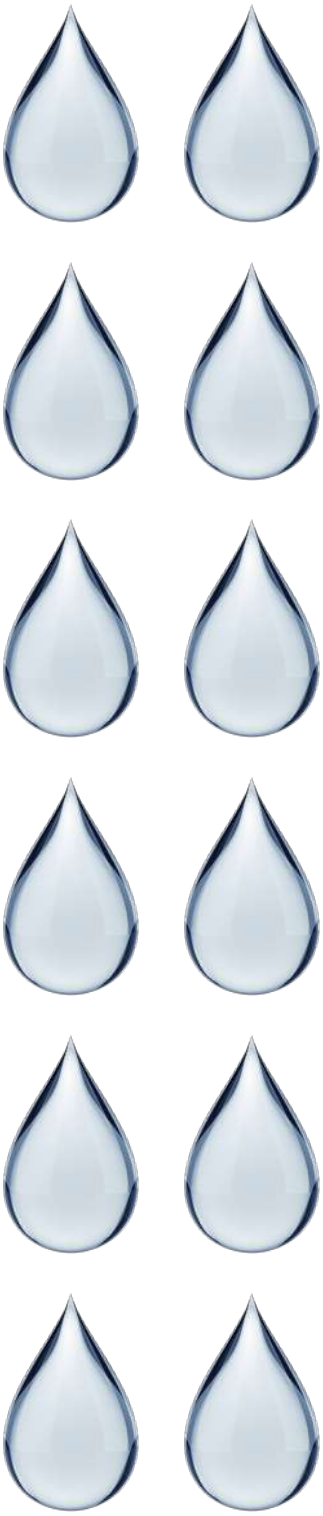
	MICROCATHETER POSITION	CATHETER TIP	INJECTION OF THE MIXTURE	FLOW SPEED	OCCLUSION	EXAMPLES OF APPLICATIONS
GLUBRAN® 2/LIPIODOL® Dilution ratio 1:1 to 1:3[1-9]	Close to lesion	Wedged	Continuous	High	Proximal	Varicocele, Hypervascularized tumors,Gastro-intestinal bleedings, Peripheral bleedings, Pseudoaneurysms, High-flow AVM
GLUBRAN® 2/LIPIODOL® Dilution ratio 1:4 to 1:9[10-14]	Far from lesion	Free	Drop by drop	Low	Distal	Organ-end artery, Portal vein embolization, Low-flow AVM, Tumor devascularization, Venous malformations, Lymphatic leakage

GLUBRAN®2

ENDOVASCULAR

SOLVES.

Building the perfect Embolization



GEM SOLUTION COMES FROM EVOLUTION.

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