

## Case 10238

### Endovascular management of non maturing dialysis vascular access

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**Section:** Interventional Radiology

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**Patient:** 66 year(s), female

#### Authors' Institution

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#### Clinical History

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A 66-year-old woman with pre-dialysis chronic renal insufficiency was unsuccessfully submitted to surgical ligation of multiple collateral veins identified as the cause of a non-maturing native arteriovenous fistula, created 3 months before. 2 months after surgery, physical examination revealed a whistling high-frequency bruit and a weak continuous thrill.

#### Imaging Findings

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The initial fistula was unable to be cannulated and judged as non-maturing. Doppler examination before surgical ligation revealed good blood flow (1, 290 ml/min) but small calibre (4.9mm) (figure 1) and deep collateral veins were identified by fistulography. Two months latter, the fistula still failed to mature and developed a whistling high-frequency bruit and a weak continuous thrill. A second fistulography showed persistence of collateral veins and a stenosis at the origin of one of

them (figure 2a). Central stenosis were excluded (figure 2b). Coil embolisation was successful on the two most proximal accessory veins using 5x50mm nitinol coils (figure 2d). After failed attempts to negotiate the collateral vein with the stenosis at the origin, it was no longer visualised probably due to thrombosis (figure 2e). The overall blood flow was directed to the main venous pathway. Post-embolisation Doppler sonography showed no flow in the manipulated collaterals (figure 3).

## Discussion

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A haemodialysis vascular access needs to be matured to allow its safe cannulation and failure to mature should prompt an evaluation 6 weeks after access construction [1].

Doppler sonography can reveal potential causes for non-maturation [2], such as stenotic lesions, thrombosis or collateral veins and determine blood flow rates and venous diameter [1, 2].

An access salvage strategy usually entails endovascular management of stenotic lesions, either by balloon angioplasty, surgical ligation or endovascular embolisation of collateral veins and eventual thrombectomy [1-3].

Opened collateral veins diverge the blood flow from the main venous pathway preventing the fistula's maturation. These are usually associated with a stenosis of the venous outflow and its dilation will relieve the collateral veins [2, 4]. Coil embolization of collateral veins is controversial because it treats the consequence and not the cause of the problem (i.e. the stenosis) [4, 5]. Some authors advocate that a stenosis is always present on the main venous outflow [6], however, some patients, like the one presented, will have no evidence of a significant stenotic lesion using currently accepted criteria. In these cases, collateral ligation or embolization are a viable alternative.

Suture ligation is preferred for superficial collaterals because coils can induce skin irritation and even erosion [2]. Coil embolisation of deep collaterals is preferred because deep cutdown ligation has an increased risk of nerve, muscle and tendon injury [2, 3, 5]. Hematoma and inflammation are frequent complications of coil embolization. Coil migration, a more serious complication is minimized through proper technique and potentially retrievable.

Our patient was first proposed for surgical ligation but the procedure proved difficult due to the depth of the collaterals. The access developed a high-frequency whistling bruit that raised the clinical suspicion of a stenosis but a stenotic lesion would be associated with a strong discontinuous pulse [1]. Subsequent fistulography revealed a stenosis at the origin of a collateral vein, probably due to incomplete suture ligation and the persistence of several other collateral veins. After discussing the case with the surgical team, we attempted coil embolisation of the collateral veins. The collateral vein with the stenotic lesion was unable to be negotiated due to a steep angle and after a couple of failed attempts it was no longer visible by fistulography, possibly suffering thrombosis, with significant reduction of overall collateral flow. Following the procedure the access showed significant inflammatory signs, but was conservatively managed and successfully cannulated after two weeks.

## Final Diagnosis

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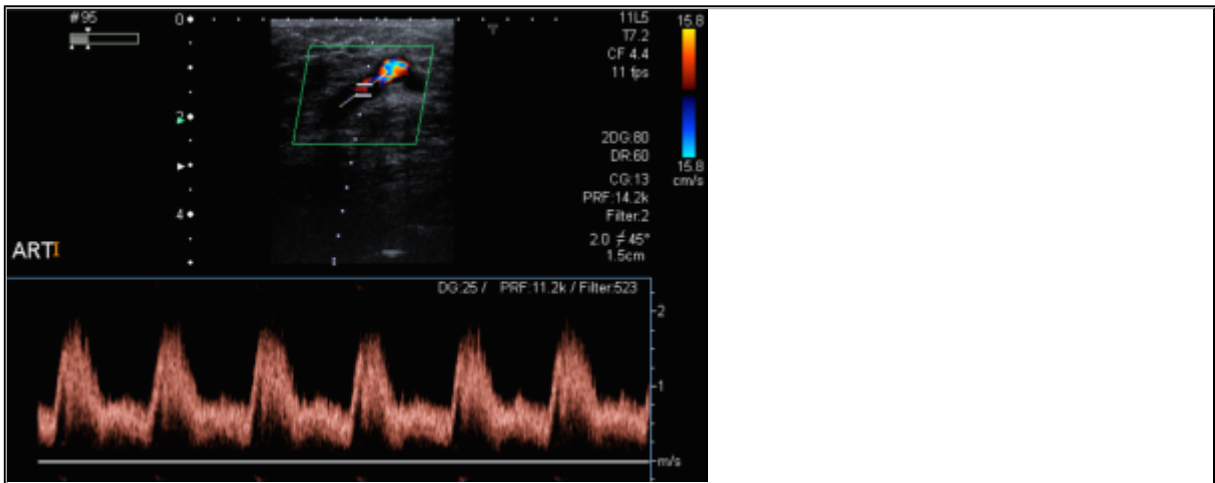
Non-maturing haemodialysis arteriovenous fistula due to collateral veins

## Differential Diagnosis List

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## Figures

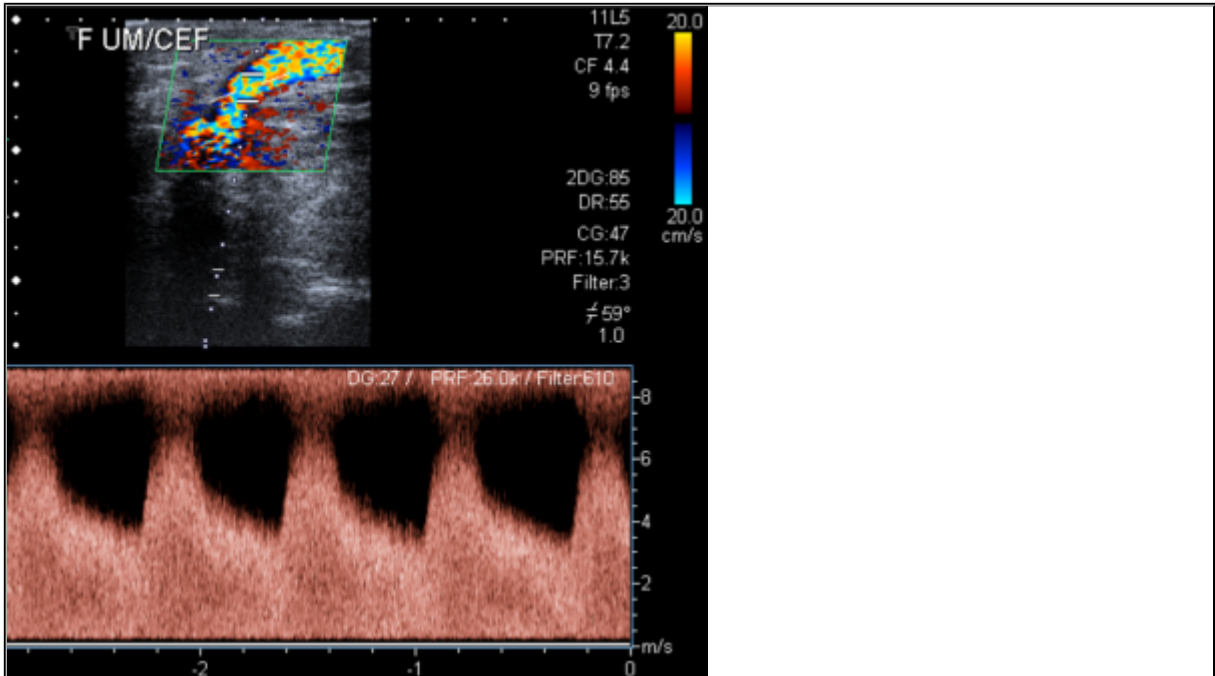
**Figure 1 Doppler ultrasound 1**



Pre-anastomosis arterial flow (radial artery)

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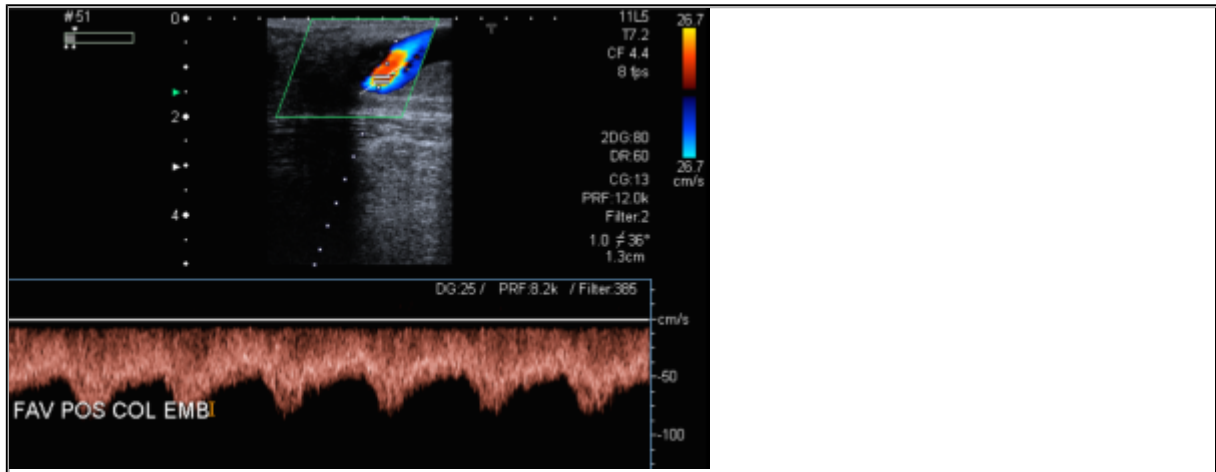
Area of Interest: Vascular;  
Imaging Technique: Ultrasound-Colour Doppler;  
Procedure: Diagnostic procedure;  
Special Focus: Haemodynamics / Flow dynamics;



Arteriovenous anastomosis

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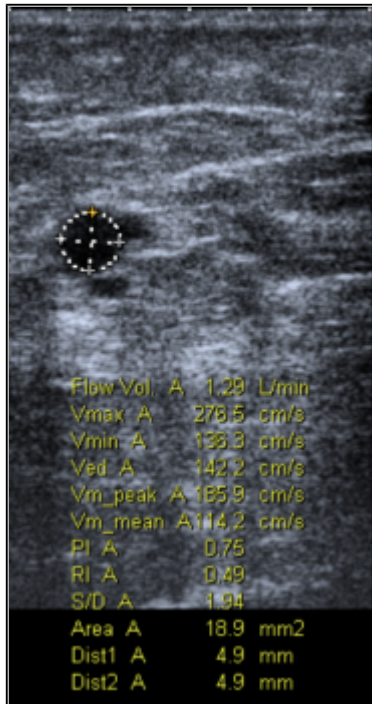
Area of Interest: Vascular;  
Imaging Technique: Ultrasound-Colour Doppler;  
Procedure: Diagnostic procedure;  
Special Focus: Haemodynamics / Flow dynamics;



Venous outflow distal to the embolised collateral veins

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Area of Interest: Vascular;  
 Imaging Technique: Ultrasound-Colour Doppler;  
 Procedure: Diagnostic procedure;  
 Special Focus: Haemodynamics / Flow dynamics;

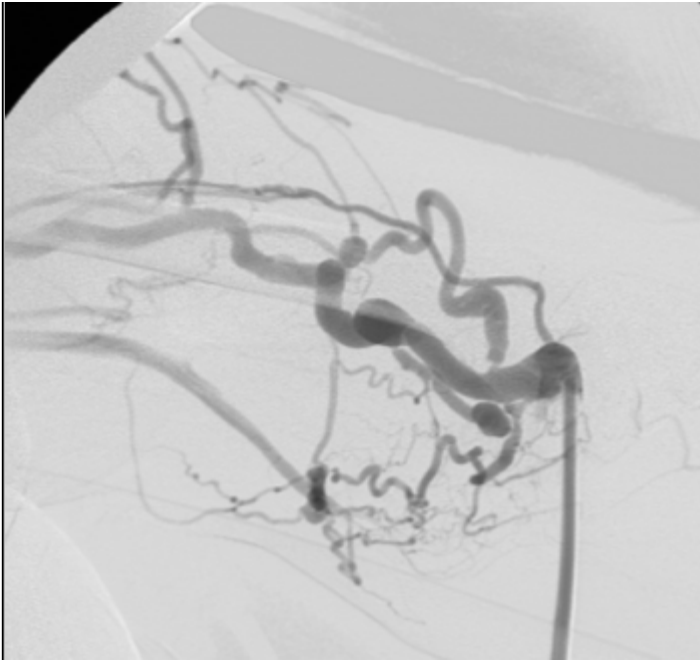


Flow measurement across the AVF. Flow rate = 1290 l/min RI = 0.49 Venous caliber = 4.9 mm

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Area of Interest: Vascular;  
 Imaging Technique: Ultrasound;  
 Procedure: Diagnostic procedure;  
 Special Focus: Haemodynamics / Flow dynamics;

**Figure 2 Coil embolisation after**



Multiple collateral veins diverging the blood flow from the main venous pathway. Notice the stenosis at the origin of the third collateral vein with post-stenosis dilation.

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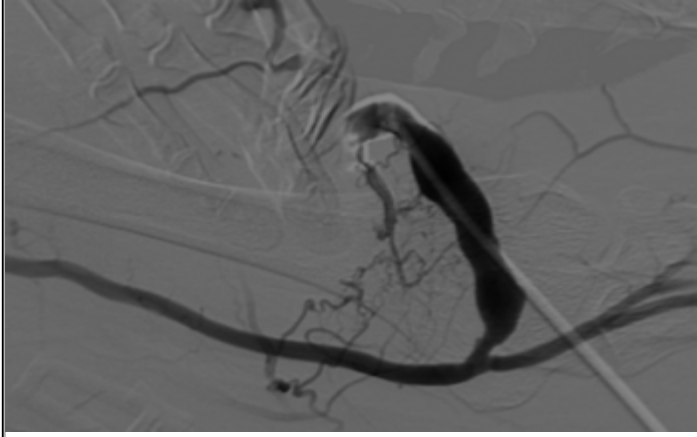
Area of Interest: Vascular;  
Imaging Technique: Catheter venography;  
Procedure: Embolisation;  
Special Focus: Fistula;



No significant central stenosis was identified.

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Area of Interest: Vascular;  
Imaging Technique: Catheter venography;  
Procedure: Embolisation;  
Special Focus: Fistula;



Retrograde opacification of the anastomosis and the arterial inflow. The anastomosis evidences a good caliber with no sign of stenosis.

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Area of Interest: Vascular;  
Imaging Technique: Catheter venography;  
Procedure: Embolisation;  
Special Focus: Fistula;



Coil embolisation of the two most proximal collateral veins with endovascular coils.

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Area of Interest: Vascular;  
Imaging Technique: Catheter venography;  
Procedure: Embolisation;  
Special Focus: Fistula;

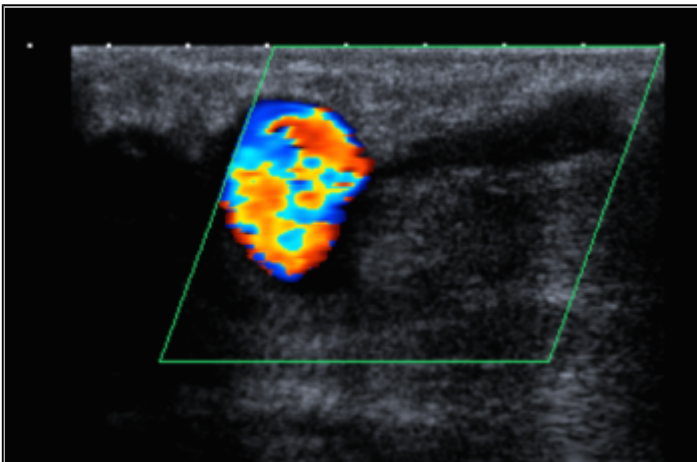


After a couple of failed attempts to negotiate the third collateral vein, the one with the stenosis, the vein was no longer visualised on subsequent runs, possibly due to thrombosis from manipulation.

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Area of Interest: Vascular;  
Imaging Technique: Catheter venography;  
Procedure: Embolisation;  
Special Focus: Fistula;

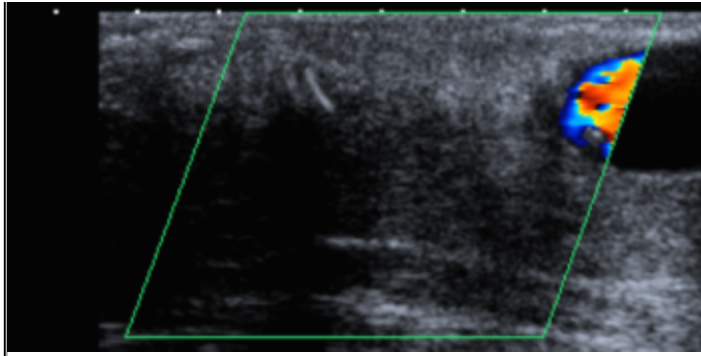
**Figure 3 Doppler ultrasound 2**



Thrombosed previously embolised collateral vein

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Area of Interest: Vascular;  
Imaging Technique: Ultrasound-Colour Doppler;  
Procedure: Diagnostic procedure;  
Special Focus: Haemodynamics / Flow dynamics;



Thrombosed previously embolised collateral vein. The endovascular coil is clearly visualised.

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Area of Interest: Vascular;  
Imaging Technique: Ultrasound-Colour Doppler;  
Procedure: Diagnostic procedure;  
Special Focus: Haemodynamics / Flow dynamics;

## MeSH

### **Catheterization** [E02.148]

Use or insertion of a tubular device into a duct, blood vessel, hollow organ, or body cavity for injecting or withdrawing fluids for diagnostic or therapeutic purposes. It differs from INTUBATION in that the tube here is used to restore or maintain patency in obstructions.

### **Angioplasty, Balloon** [E04.100.814.050.060]

Use of a balloon catheter for dilatation of an occluded artery. It is used in treatment of arterial occlusive diseases, including renal artery stenosis and arterial occlusions in the leg. For the specific technique of balloon dilatation in coronary arteries, ANGIOPLASTY, TRANSLUMINAL, PERCUTANEOUS CORONARY is available.

### **Embolization, Therapeutic** [E02.520.360]

A method of hemostasis utilizing various agents such as Gelfoam, silastic, metal, glass, or plastic pellets, autologous clot, fat, and muscle as emboli. It has been used in the treatment of spinal cord and INTRACRANIAL ARTERIOVENOUS MALFORMATIONS, renal arteriovenous fistulas, gastrointestinal bleeding, epistaxis, hypersplenism, certain highly vascular tumors, traumatic rupture of blood vessels, and control of operative hemorrhage.

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## Citation

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