Fusion imaging: what are the benefits for peripheral procedures?

LOUIS Nicolas, Vascular Surgeon
Hôpital Privé les Franciscaines, Nîmes
France

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JUNE 2018

Image Fusion

Image Fusion

Hybrid Room ***F-EVAR*** **Ch-EVAR**

Impact of Hybrid Rooms with Image Fusion on Radiation Exposure during Endovascular Aortic Repair

A. Hertault [a], B. Maurel [a], J. Sobocinski [a], T. Martin Gonzalez [a], M. Le Roux [a], R. Azzaoui [a], M. Midulla [b], S. Haulon [a,*]

[a] Vascular Surgery, Hôpital Cardiologique, CHRU de Lille, INSERM U1008, Université Lille Nord de France, 59037 Lille Cedex, France
[b] Radiology, Hôpital Cardiologique, CHRU Lille, INSERM U1008, Université Lille Nord de France, 59037 Lille Cedex, France

WHAT THIS PAPER ADDS

Experience has shown that the routine use of fusion during endovascular aneurysm repair has significantly reduced the exposure of patients and operators to X-rays and contrast volume injection during complex repairs, without jeopardising the overall procedure workflow.

Objective: To evaluate exposure to radiation during endovascular aneurysm repair (EVAR) performed with intraoperative guidance by preoperative computed tomographic angiogram fusion.

Methods: All consecutive patients who underwent standard bifurcated (BIF) or thoracic (THO), and complex fenestrated (FEN) or branched (BR) EVAR were prospectively enrolled. Indirect dose—area product (DAP), fluoroscopy time (FT), and contrast medium volume were recorded. These data were compared with a previously published prospective EVAR cohort of 301 patients and to other literature. Direct DAP and peak skin dose were measured with radiochromic films. Results are expressed as median (interquartile range).

Results: From December 2012 to July 2013, 102 patients underwent standard (56.8%) or complex (43.2%) EVAR. The indirect DAP ($Gy.cm^2$) was as follows: BIF 12.2 (8.7—19.9); THO 26.0 (11.9—34.9); FEN 43.7 (24.7—57.5); and BR 47.4 (37.2—108.2). The FT (min) was as follows: BIF 10.6 (9.1—14.7); THO 8.9 (6.0—10.5); FEN 30.7 (20.2—40.5); and BR 39.5 (34.8—51.6). The contrast medium volume (mL) was as follows: BIF 59.0 (50.0—75.0); THO 80.0 (50.0—100.0); FEN 105.0 (70.0—136.0); and BR 120.0 (100.0—170.0). When compared with a previous cohort, there was a significant reduction in DAP during BIF, FEN, and BR procedures, and a significant reduction of iodinated contrast volume during FEN and BR procedures. There was also a significant reduction in DAP during BIF procedures when compared with the literature ($p < .01$). DAP measurement on radiochromic films was strongly correlated with indirect DAP values ($r^2 = .93$).

Conclusion: The exposure of patients and operators to radiation is significantly reduced by routine use of image fusion during standard and complex EVAR.

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Keywords: Aorta, Endovascular procedures, Fusion imaging, Hybrid room, Radiation, Radiation protection

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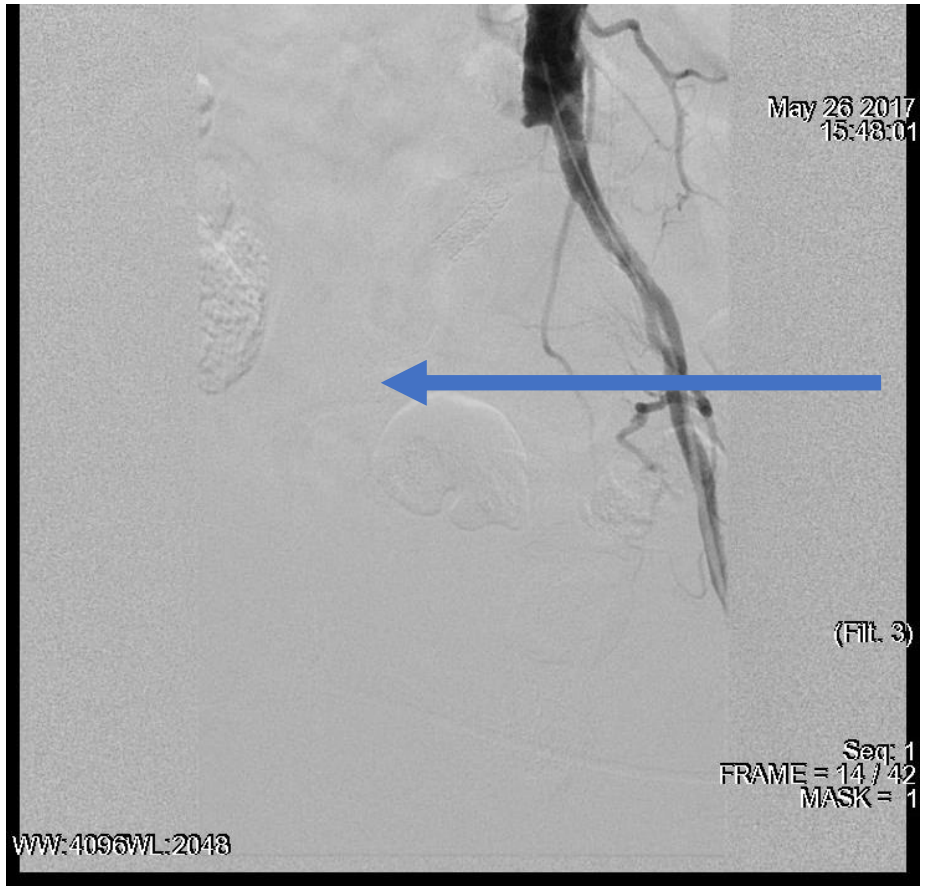
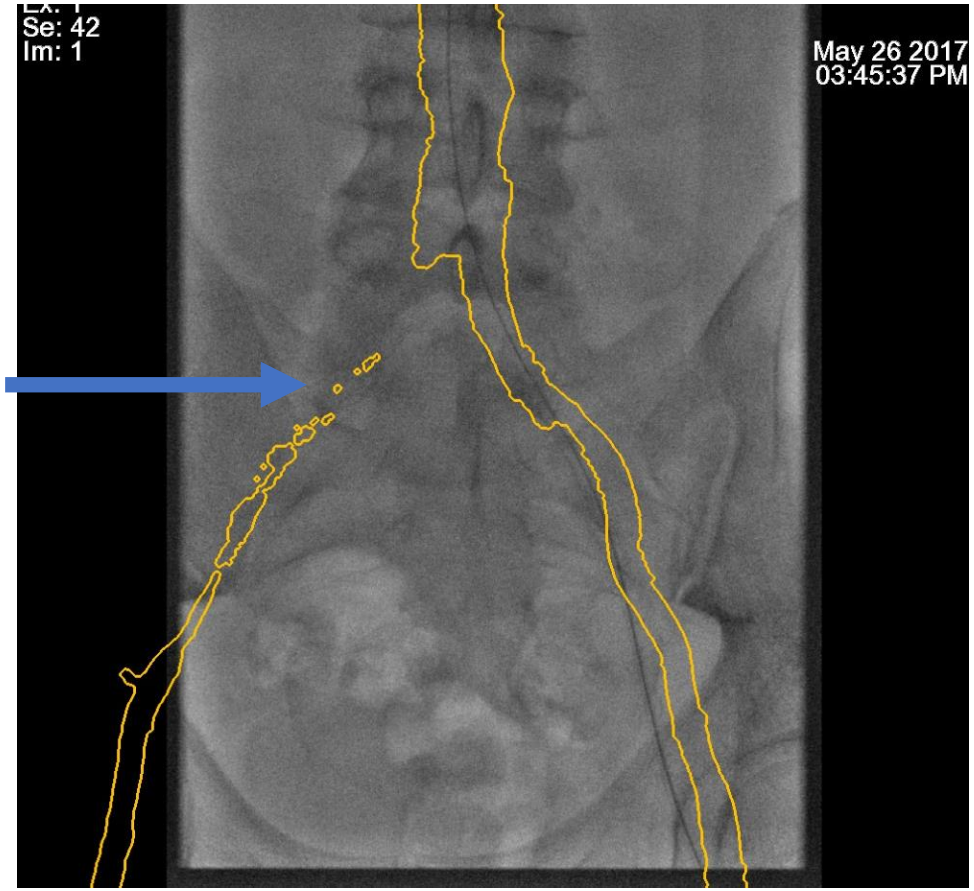
Occluded arteries and Image Fusion?

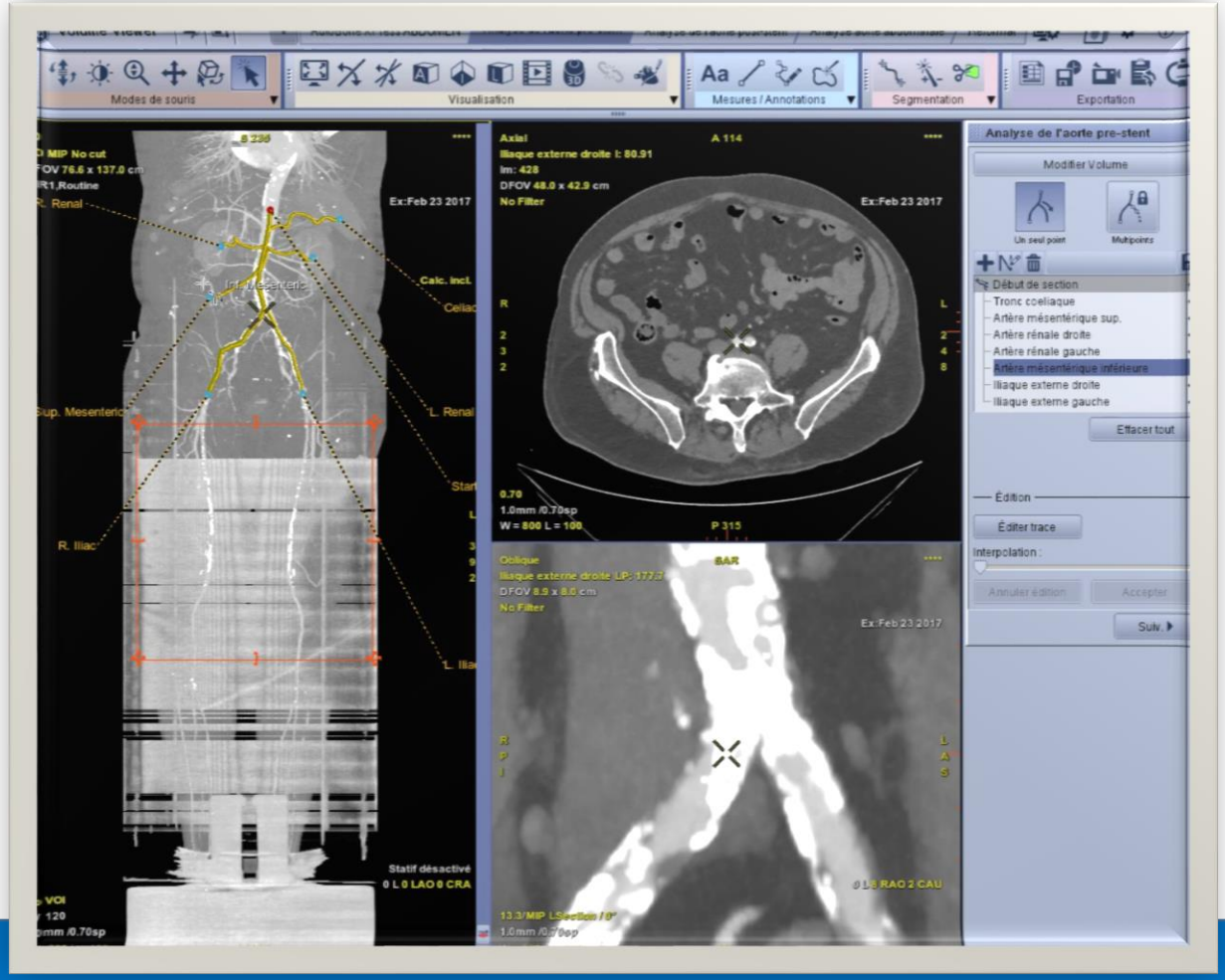


Void Area



Occluded arteries and Image Fusion?

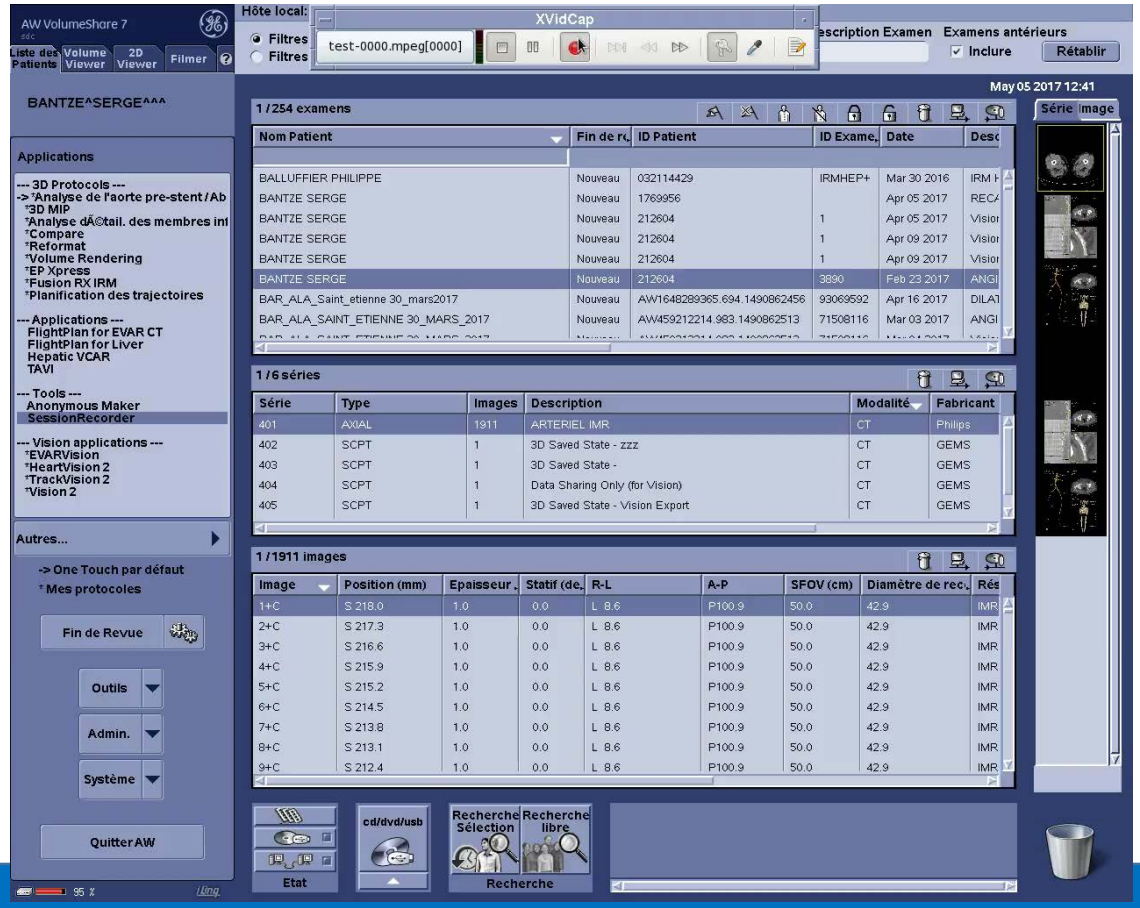
- ***Workstation ADW 4.7 from GE®***
- ***To create a bridge between two non occluded area***
- ***Line up the centerline inside the lumen artery***



Occluded Arteries and Image Fusion?

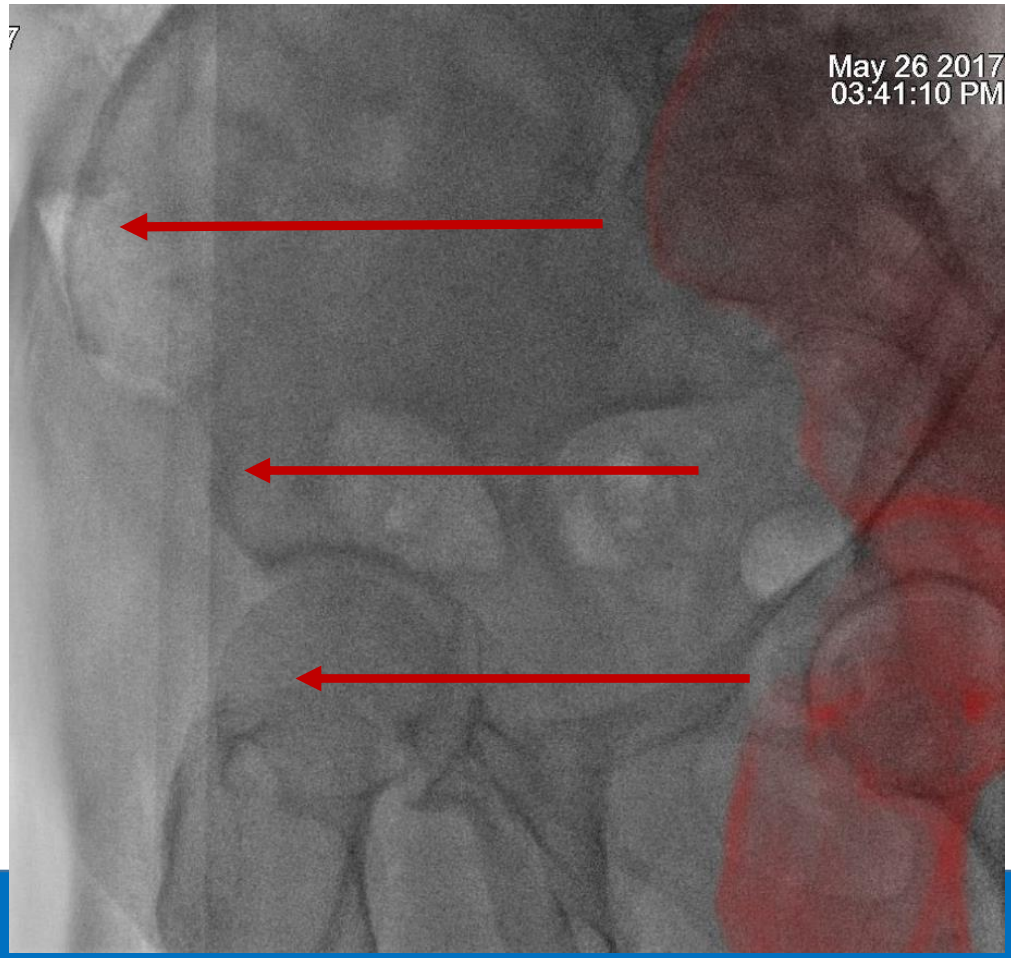
- Workstation ADW 4.7 from GE®
- **Create a bridge between two non occluded area**
- Line up the centerline inside the lumen artery

. DRAW PLANING CERCLES INSIDE THE CALCIFICATION



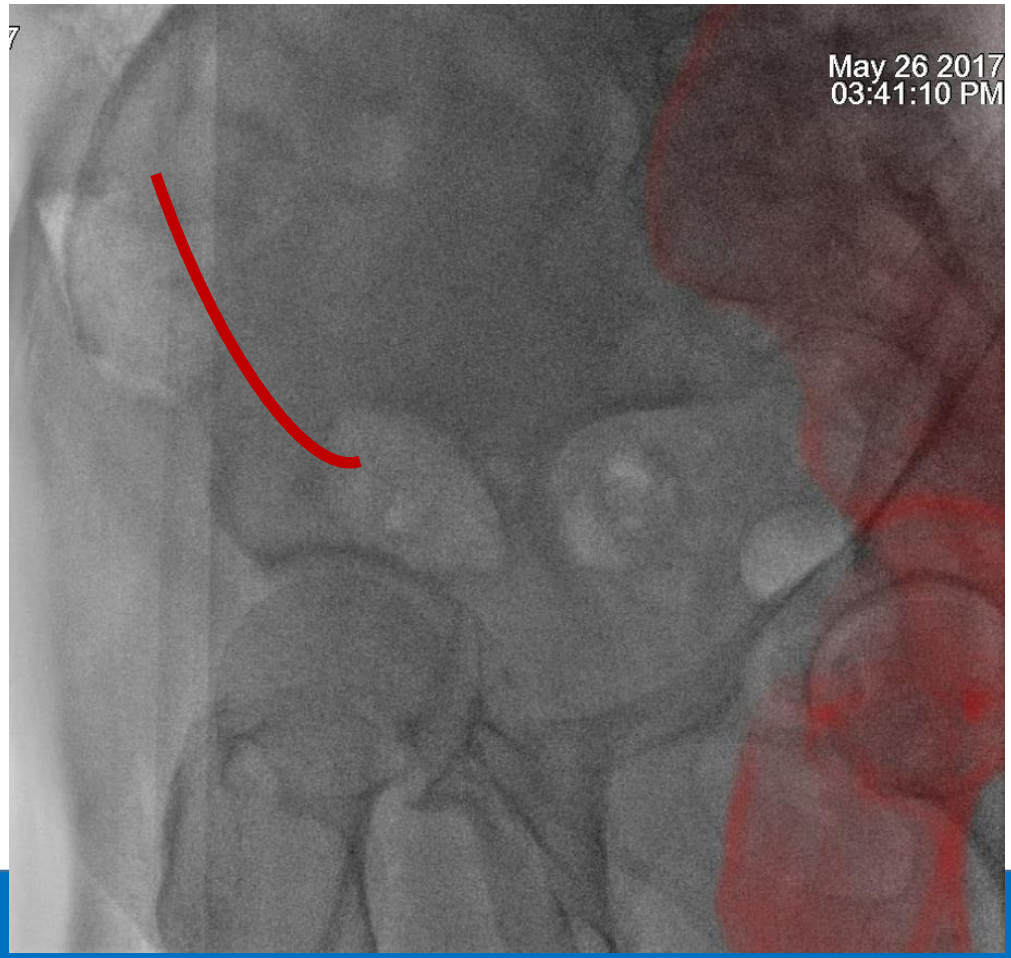
*Registration : **Translation (first incidence)***

2 D Fluoroscopy
Bone Retiming



*Registration : **Rotation (first incidence)***

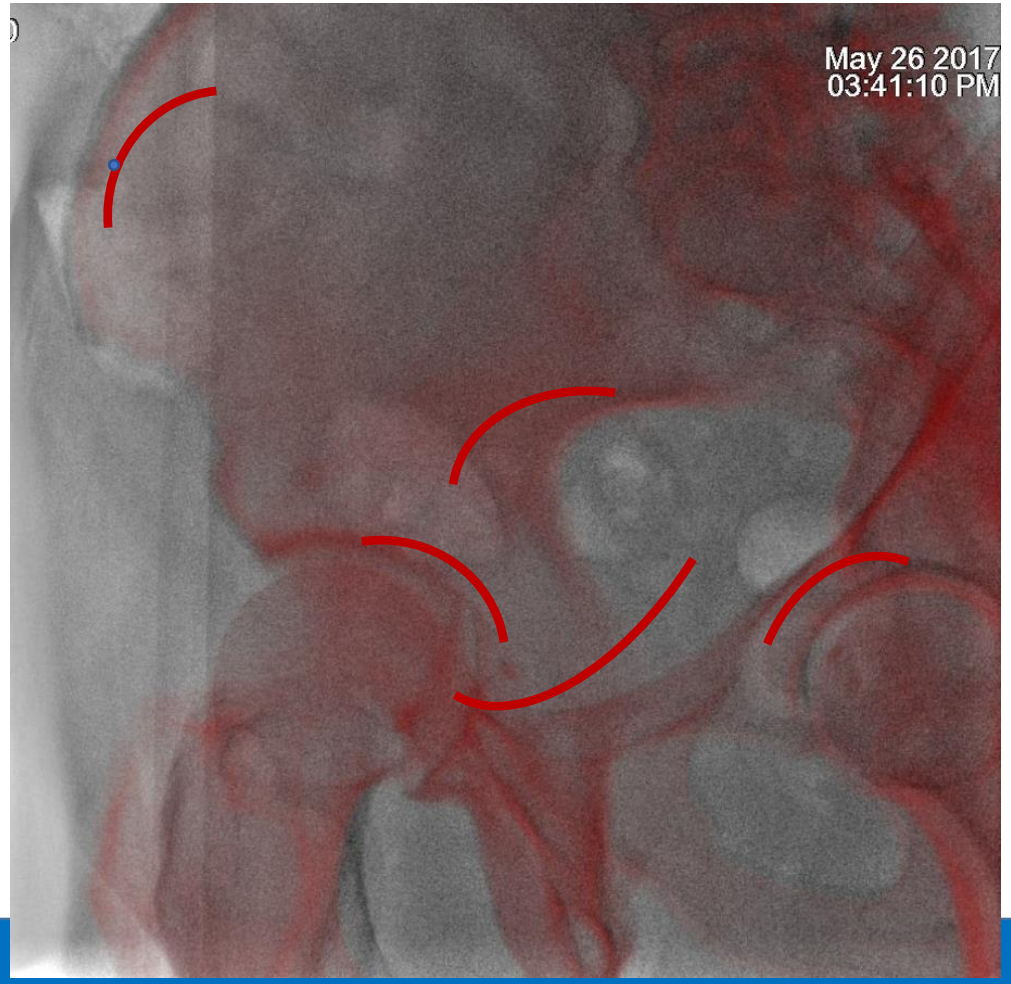
2 D Fluoroscopy
Bone Retiming



*Registration : **Rotation in the axis of the vessel (first incidence)***

2 D Fluoroscopy

Bone Retiming



*Registration : **Profile (second incidence)***

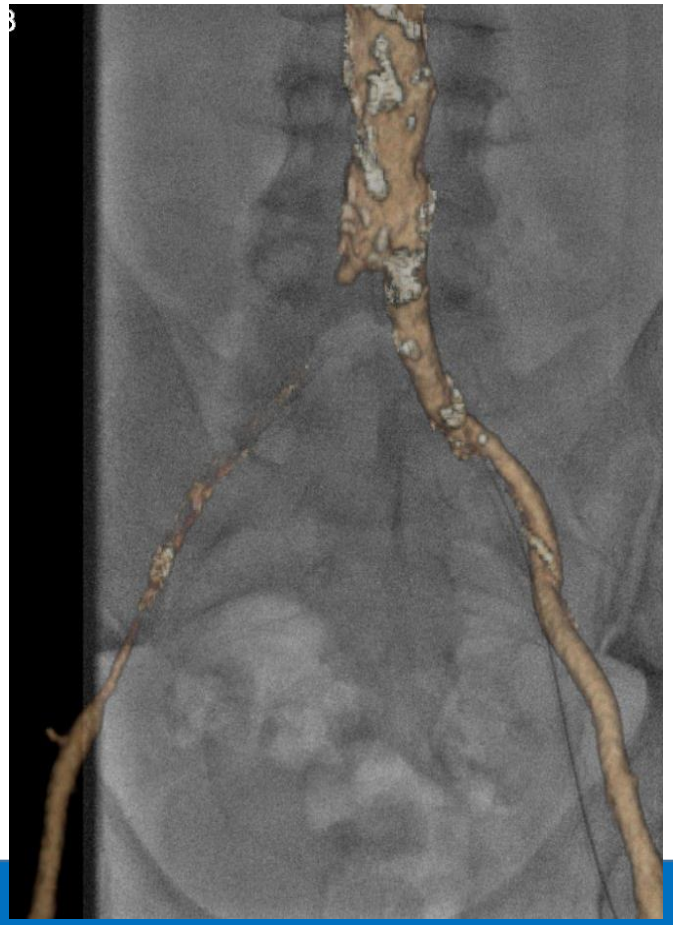
2 D Fluoroscopy
Bone Retiming

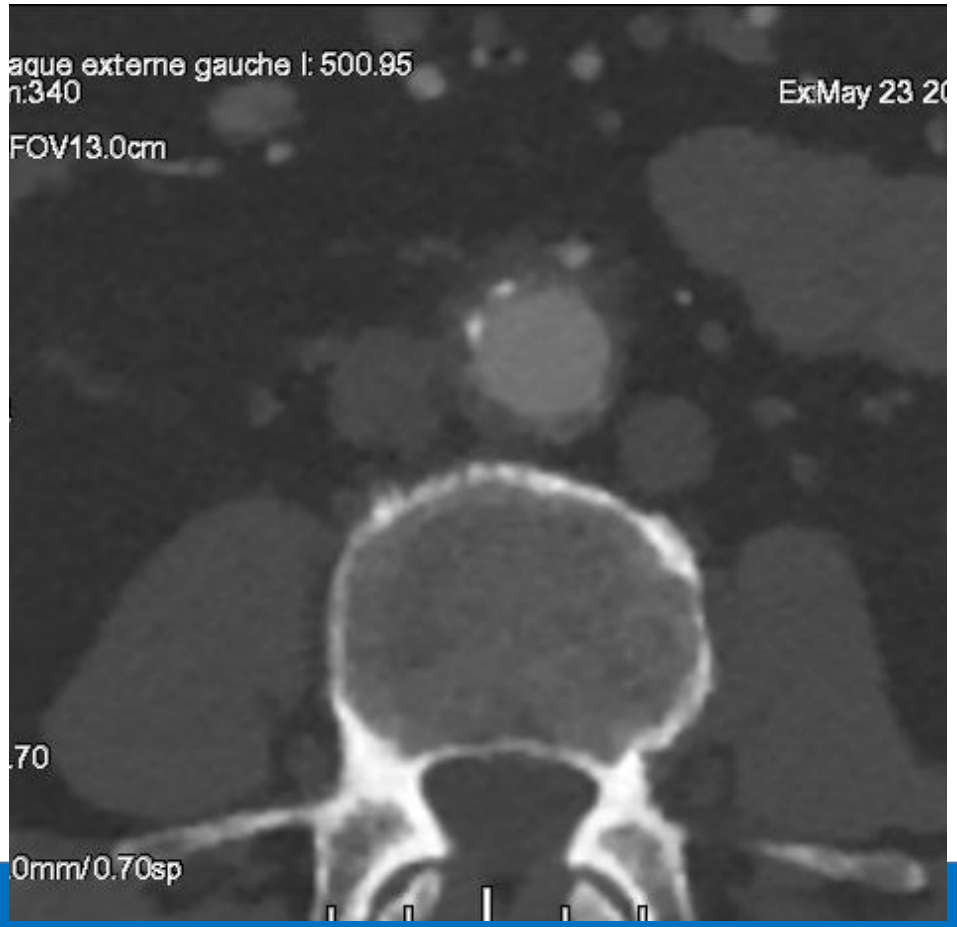
*RETIMING: : **PROFILE (second incidence)***

2 D Fluoroscopy
Bone Retiming

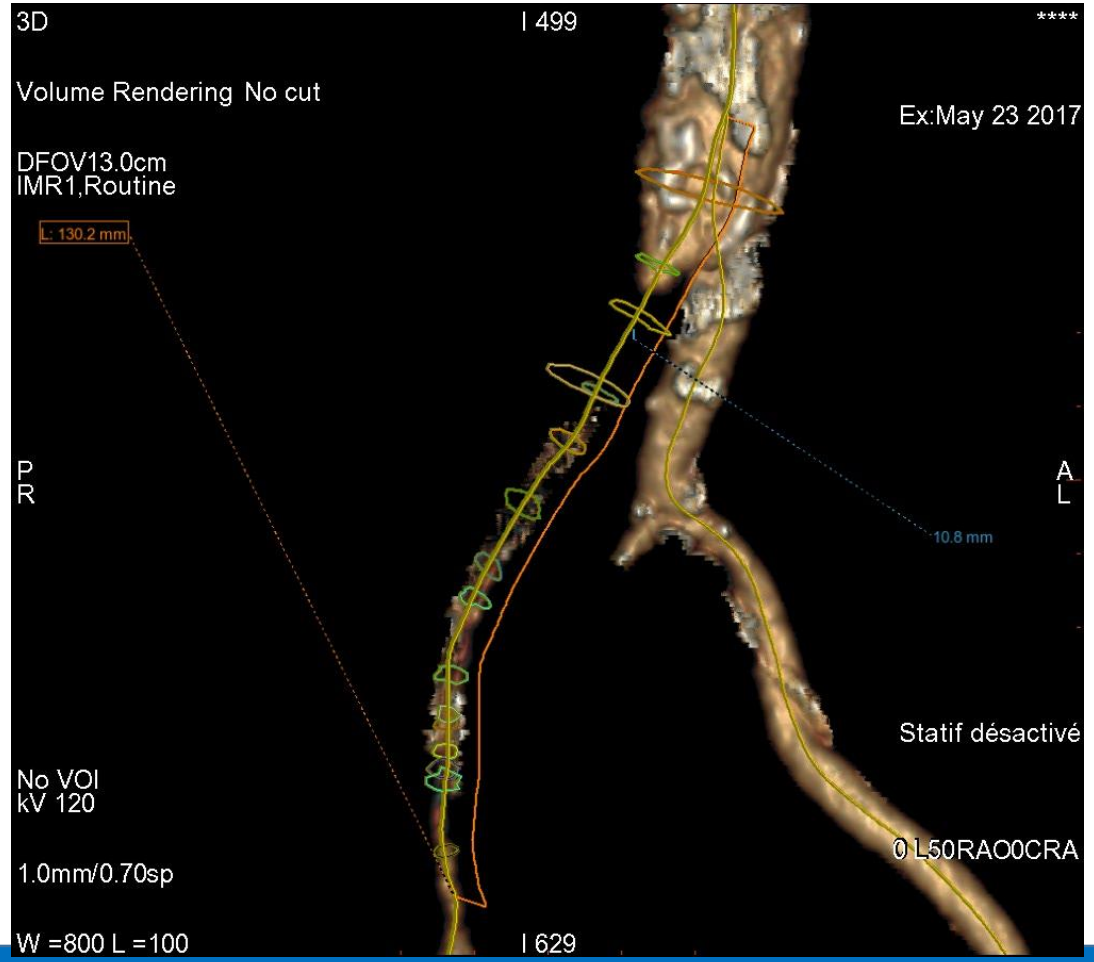
Accuracy Score

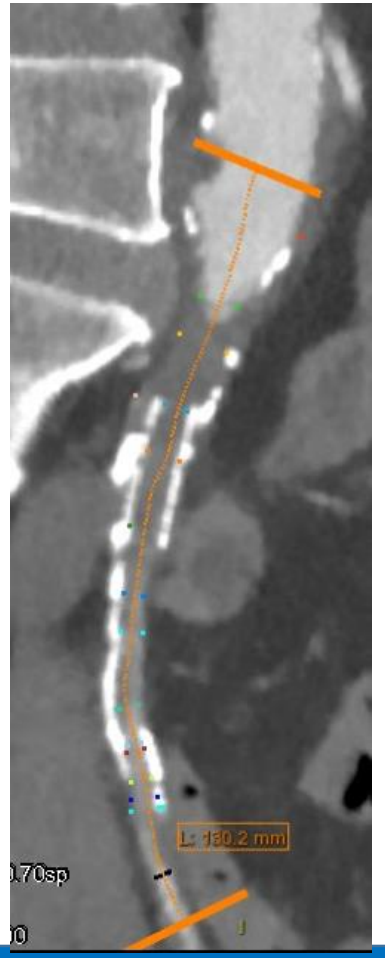
Occluded right illiac artery





Planning Circles Technique





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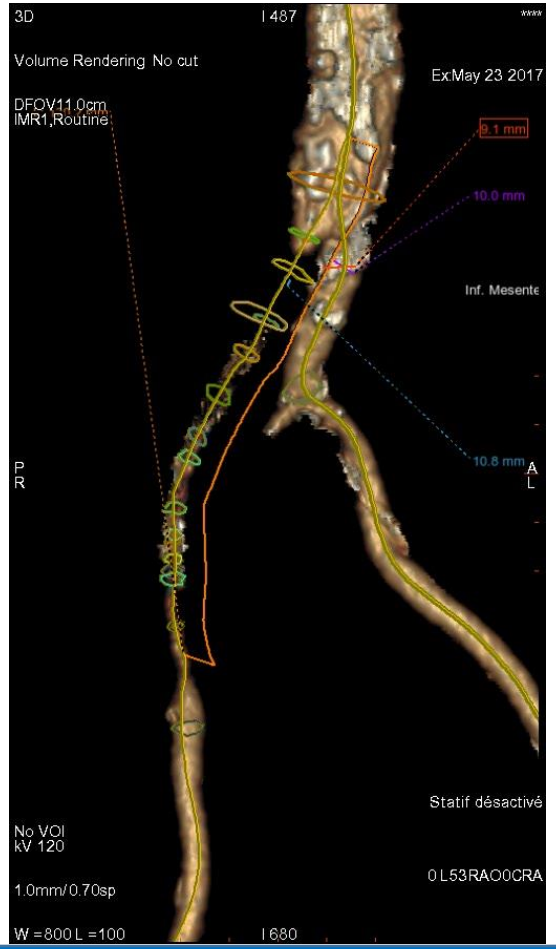
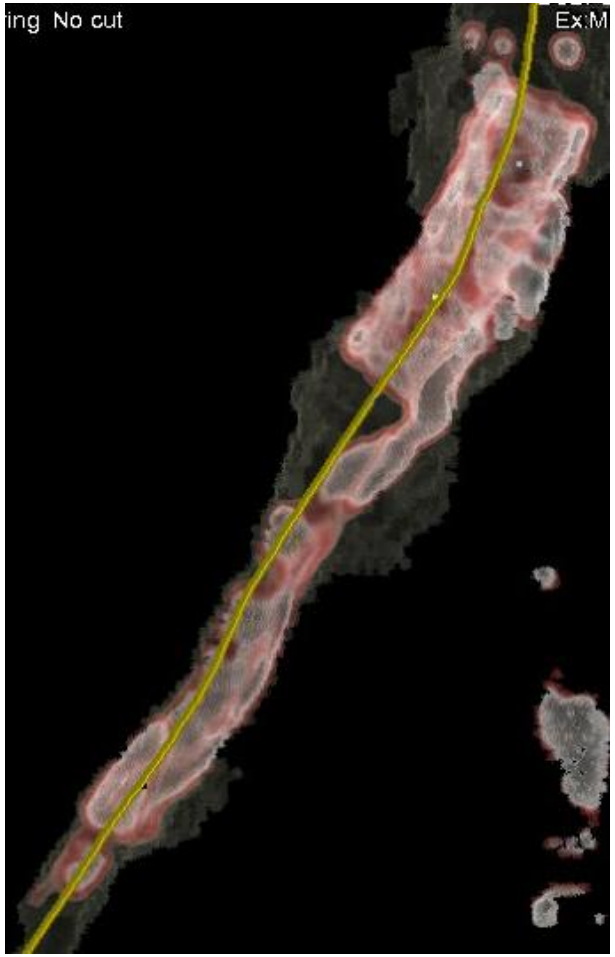
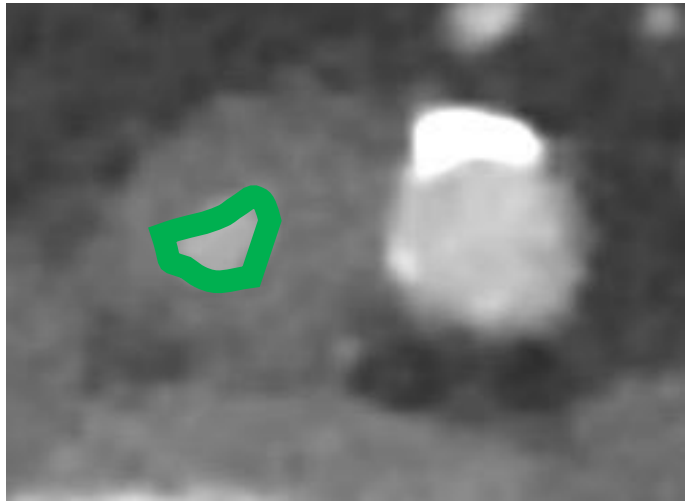
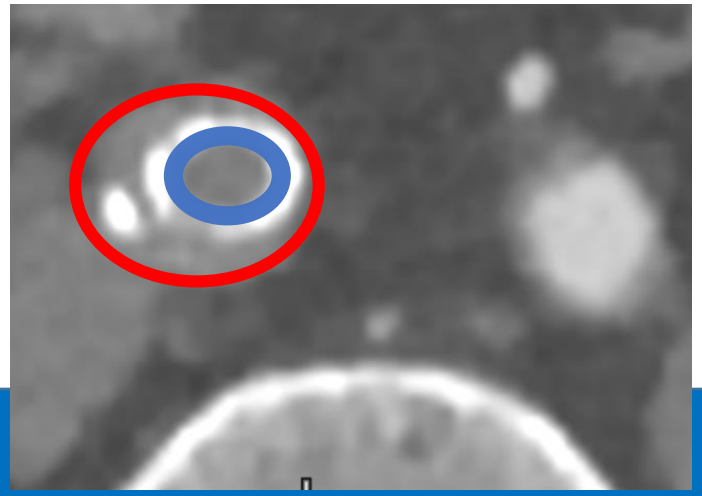


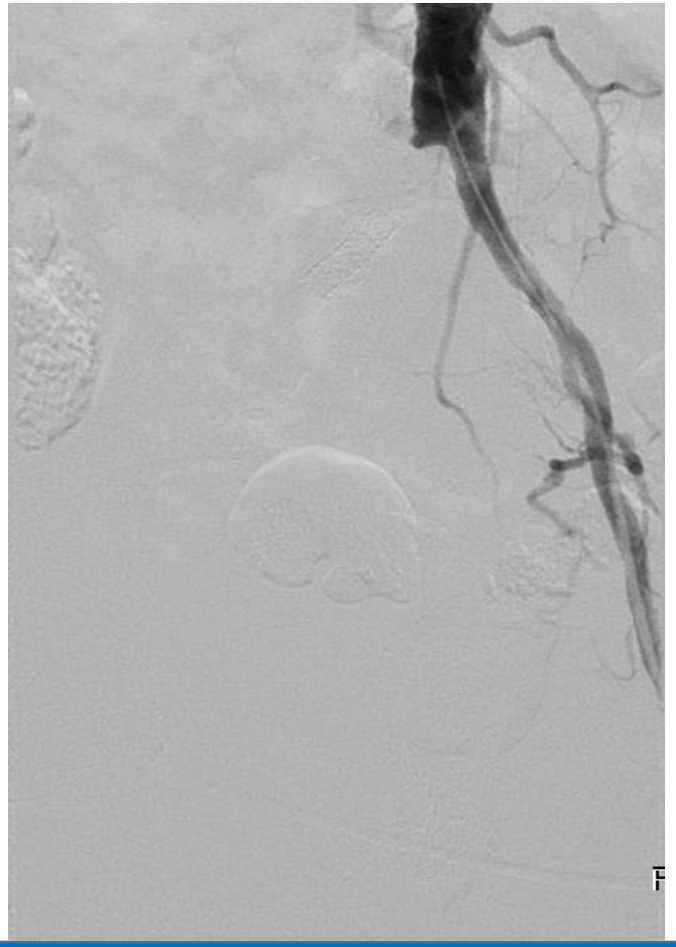




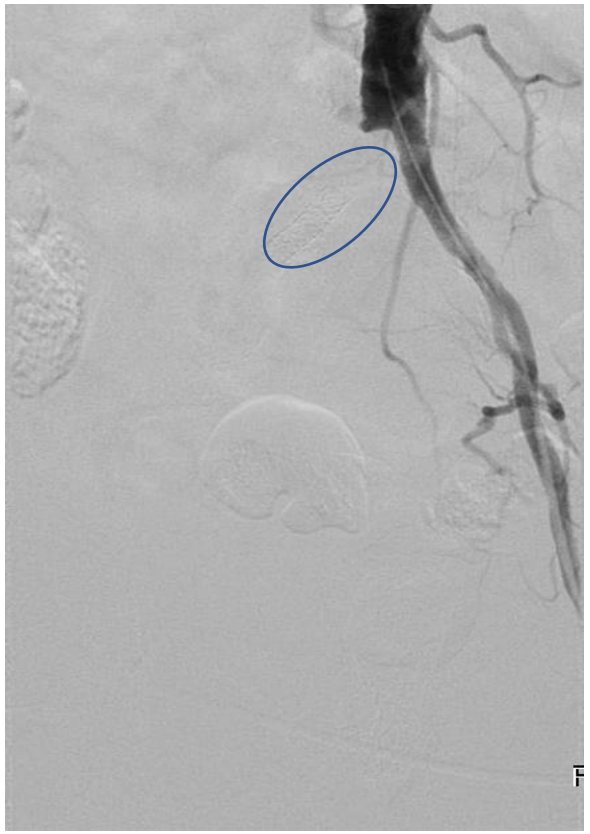


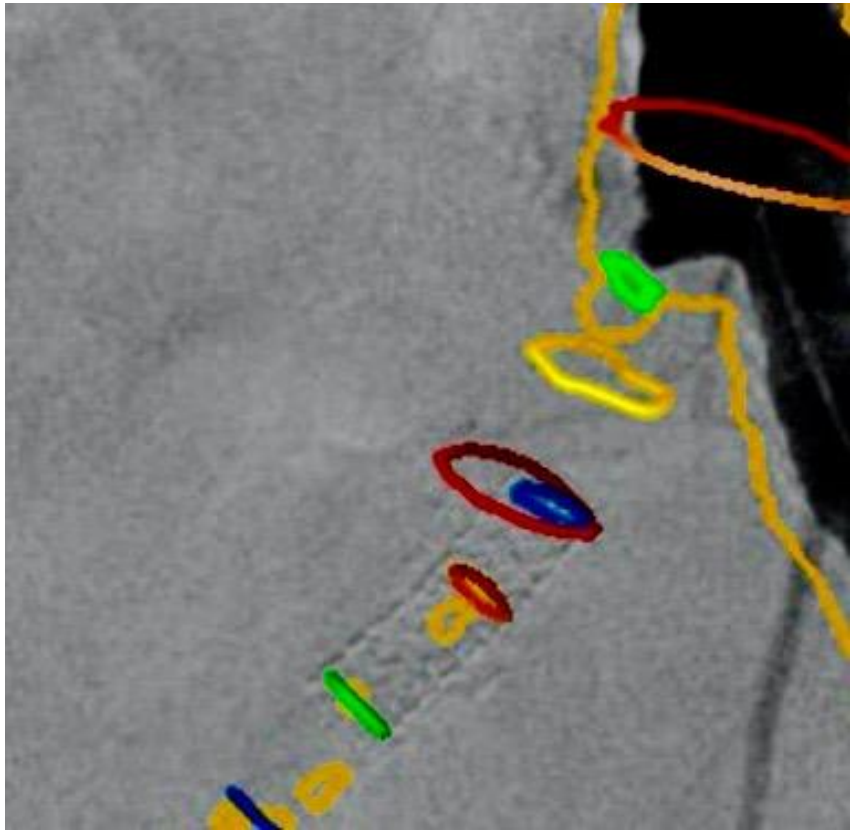
Angiography

Planning Circles Technique

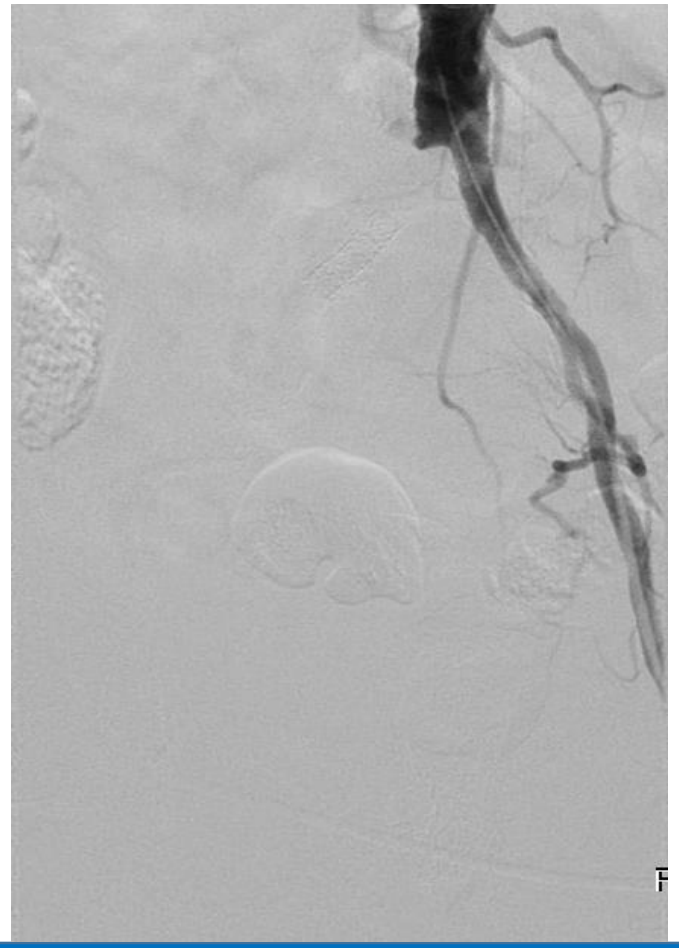


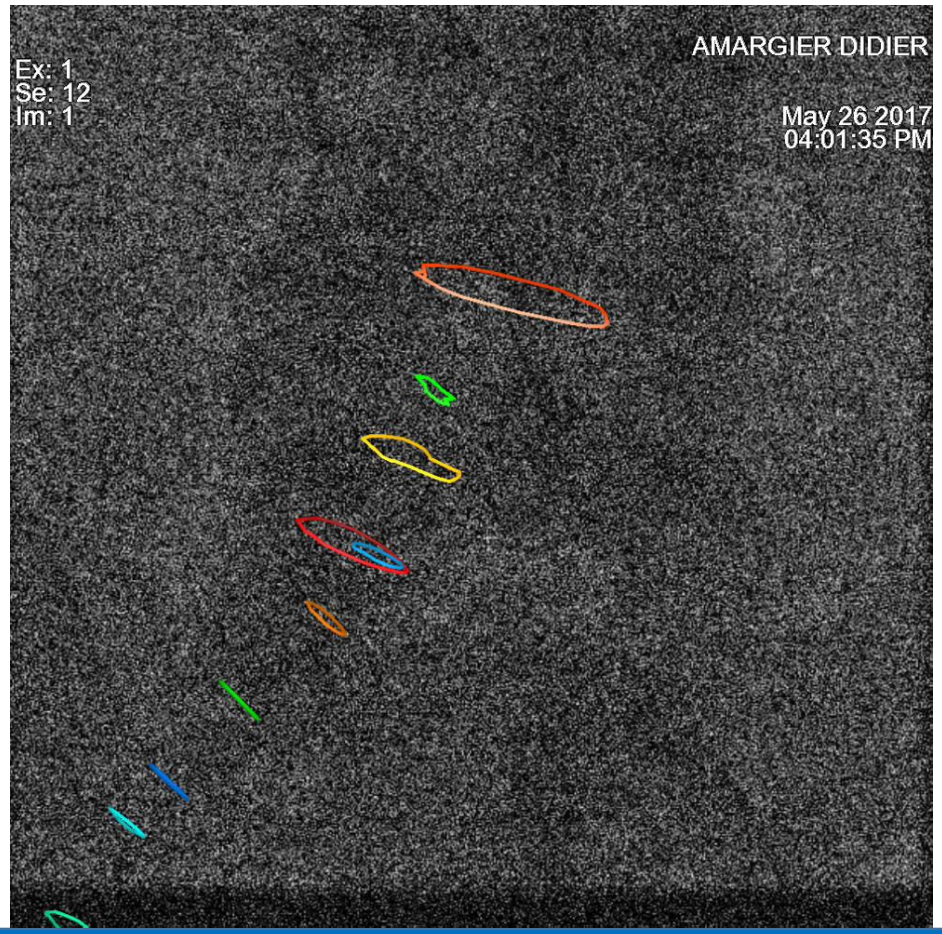
Planning Circles Technique



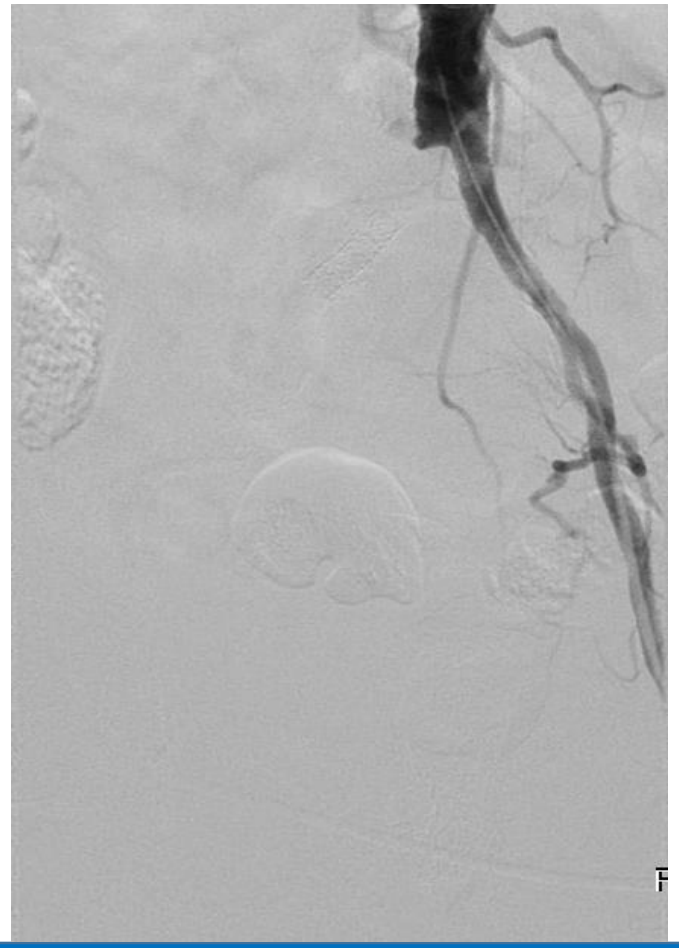


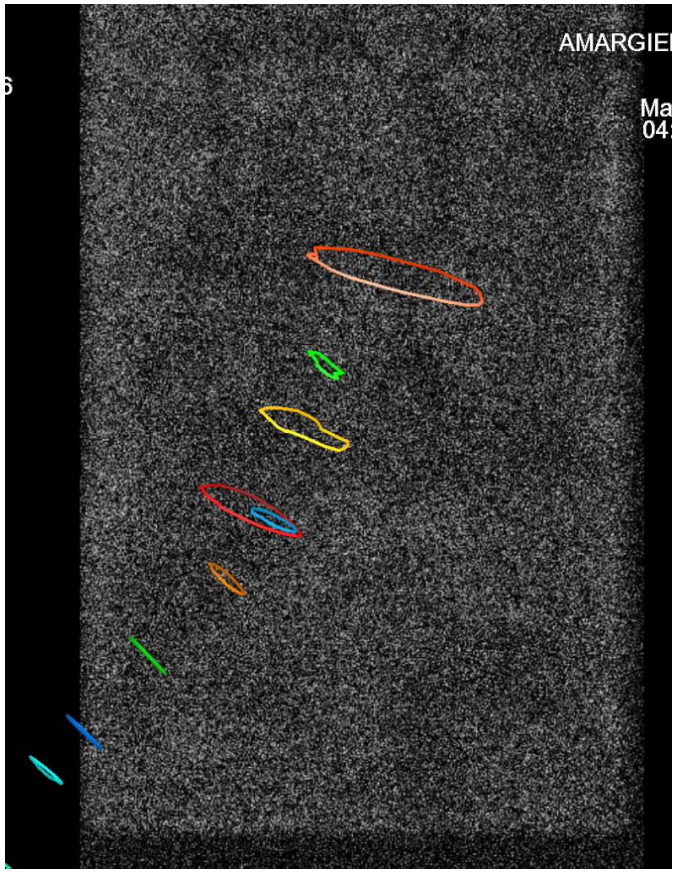
Sub Intimal Progression



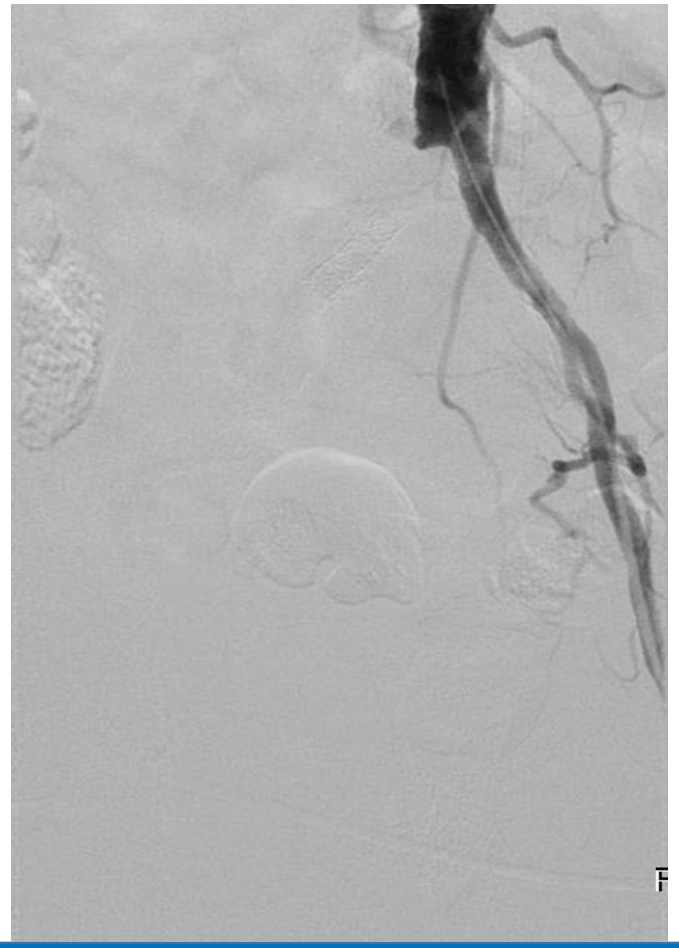


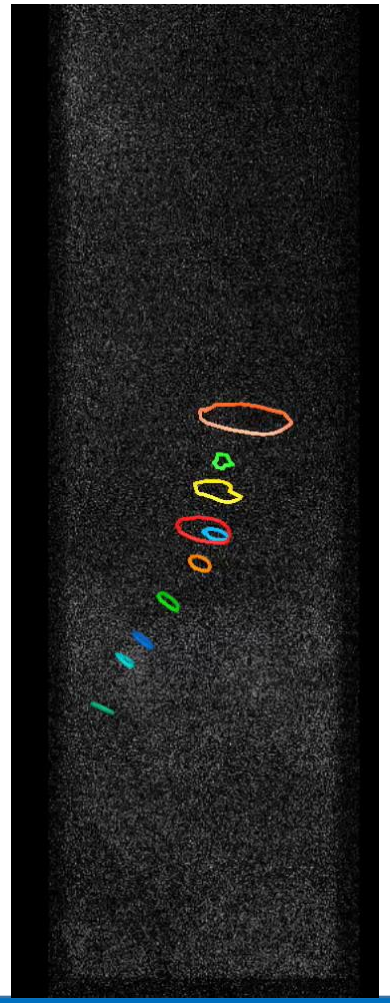
Repositioning with a coronary Guide-Wire



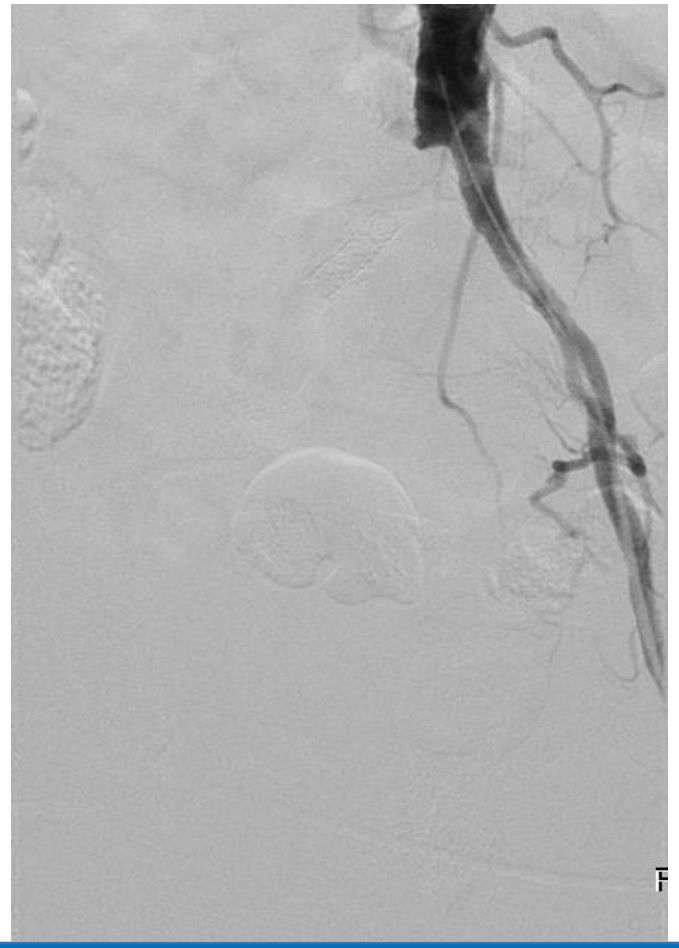


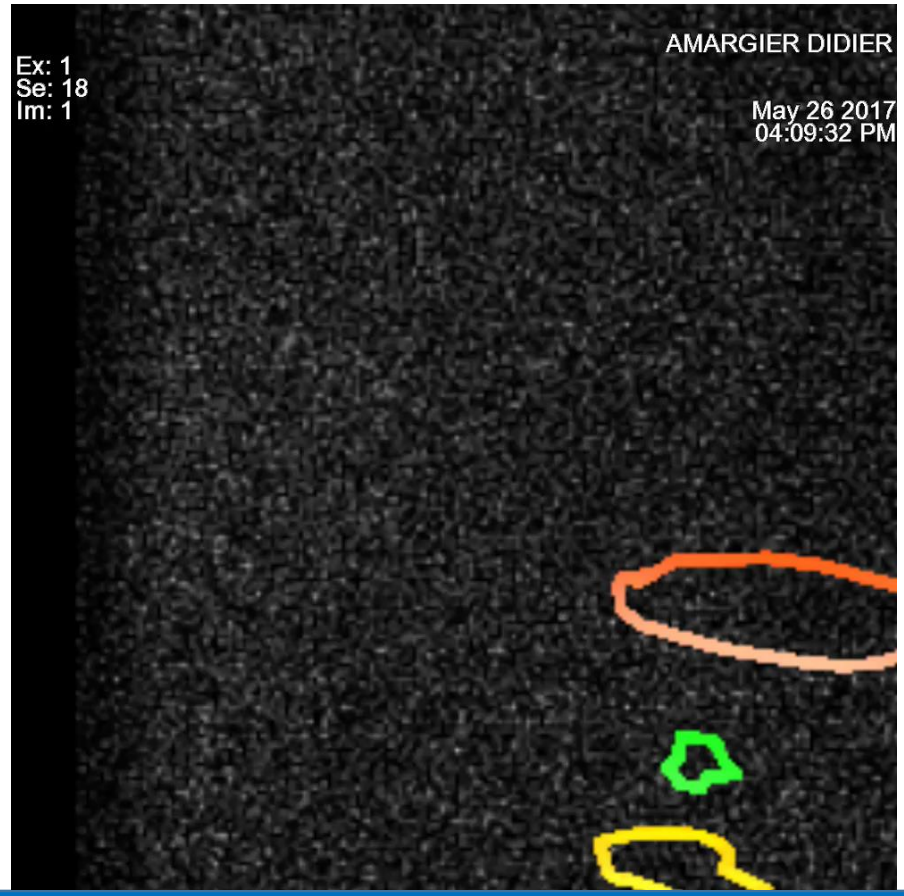
*Progression with **ANOTHER INCIDENCE***





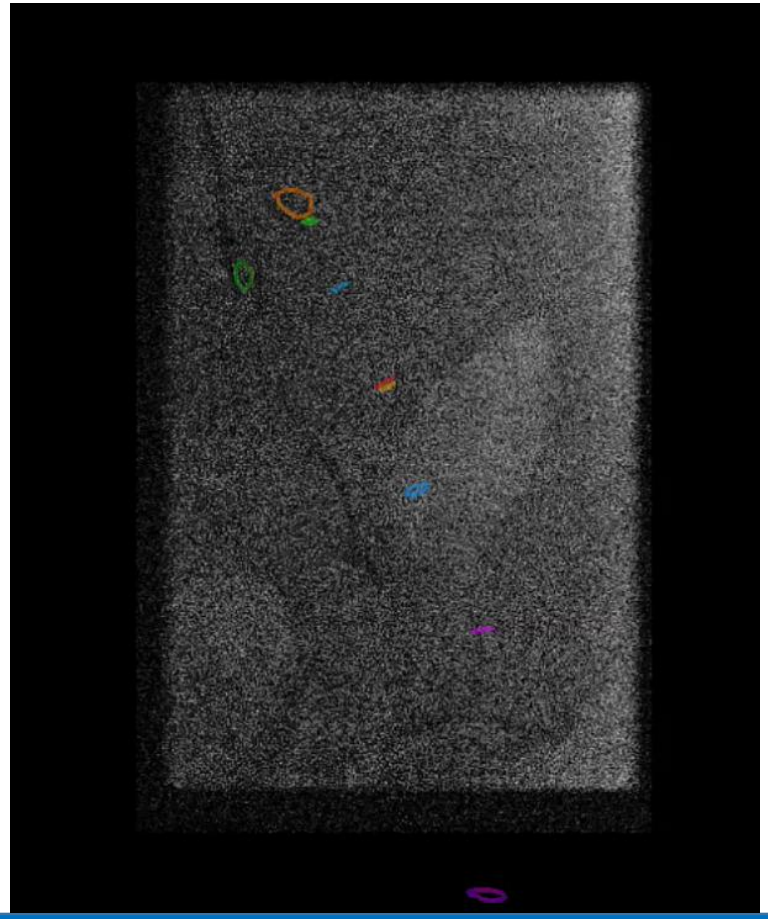
Digital Zoom (without increasing radiation)





Final result

Planning Circles Technique



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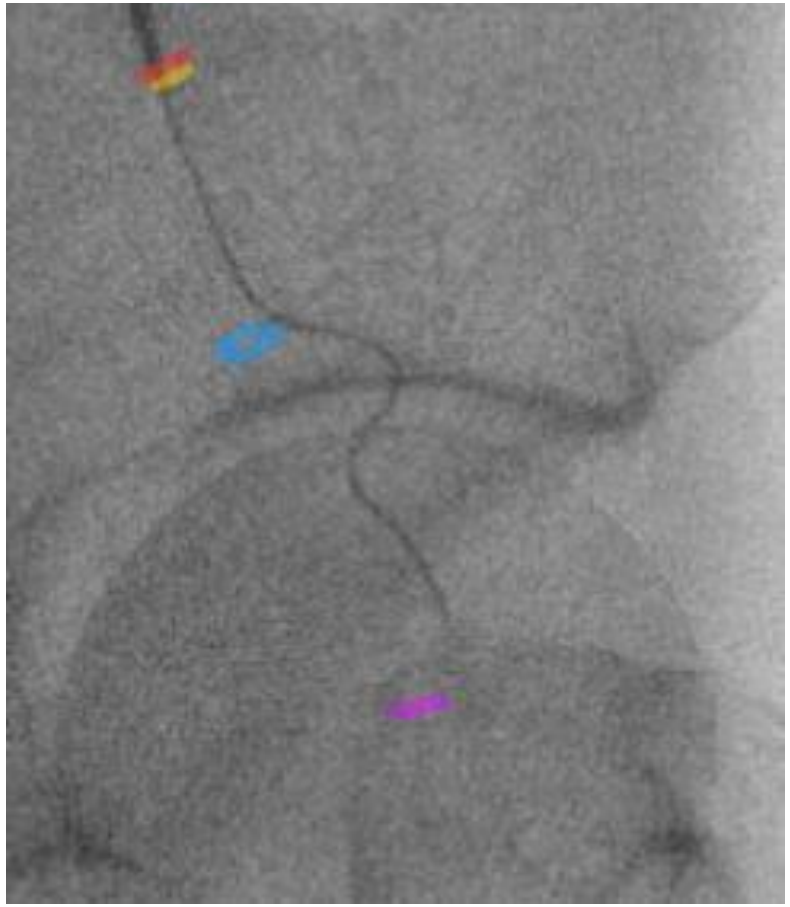

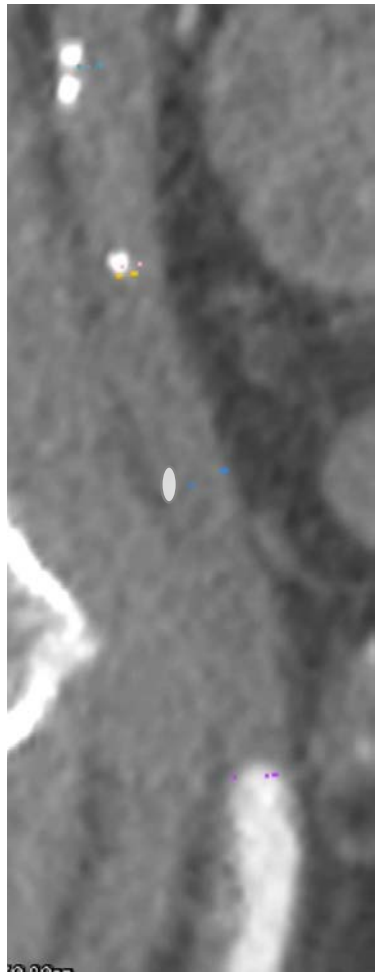

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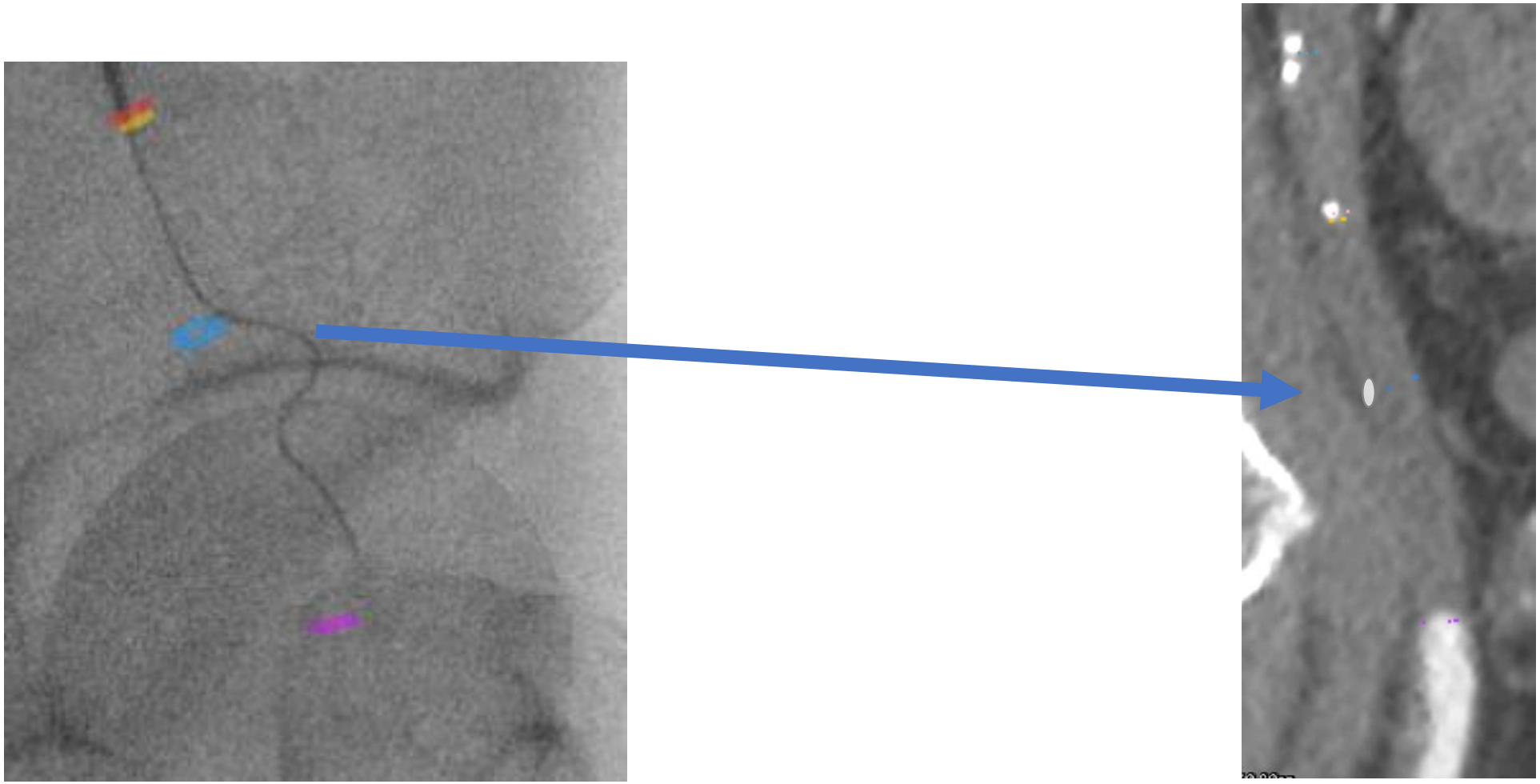

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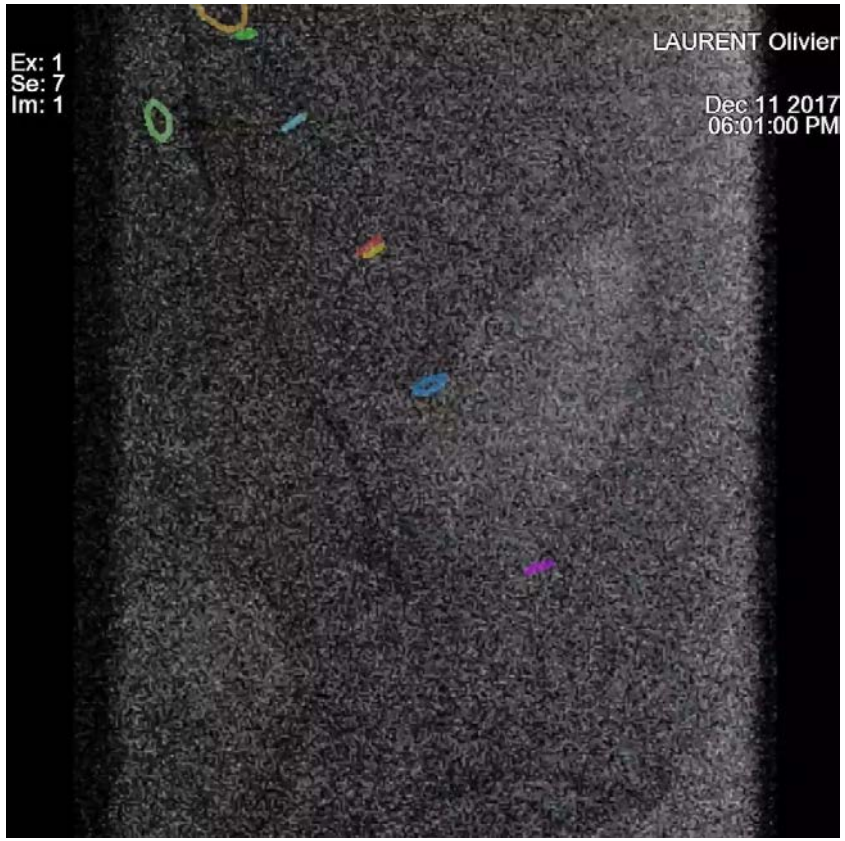

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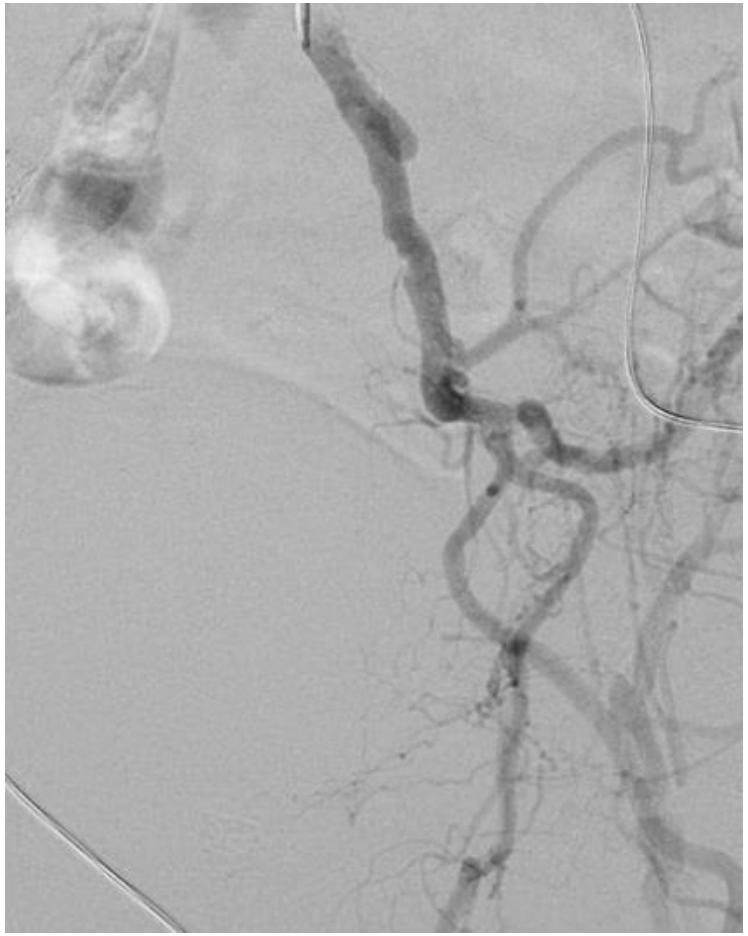

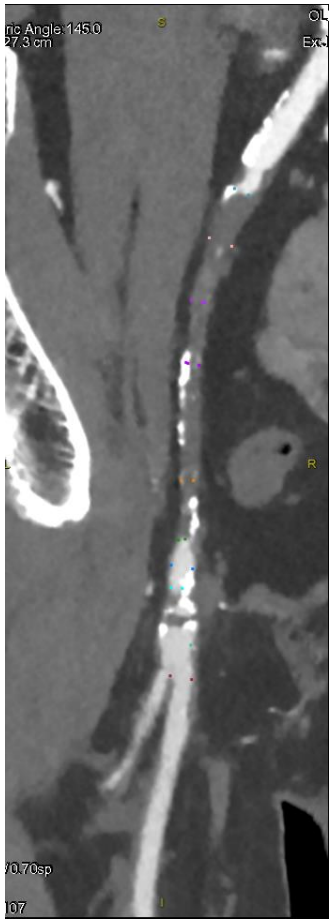

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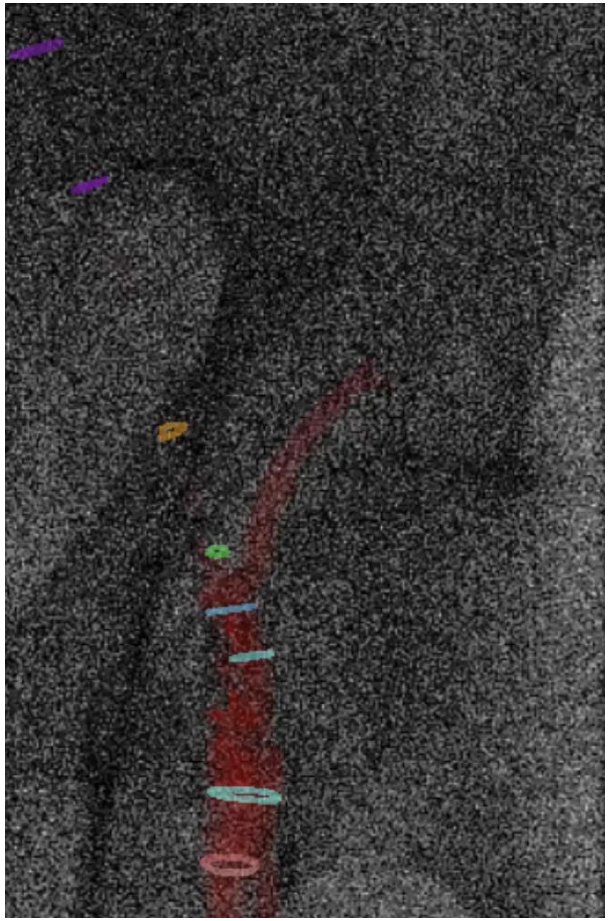

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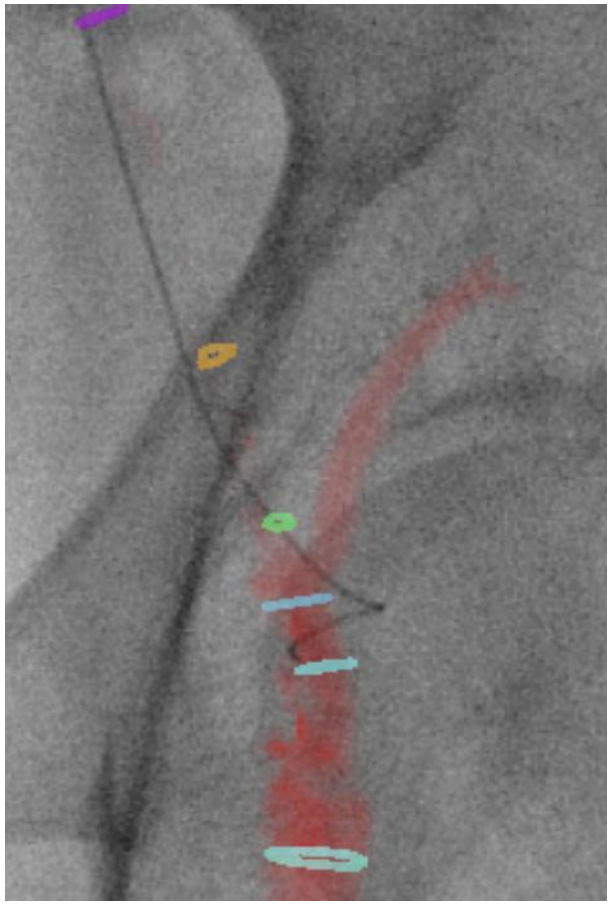
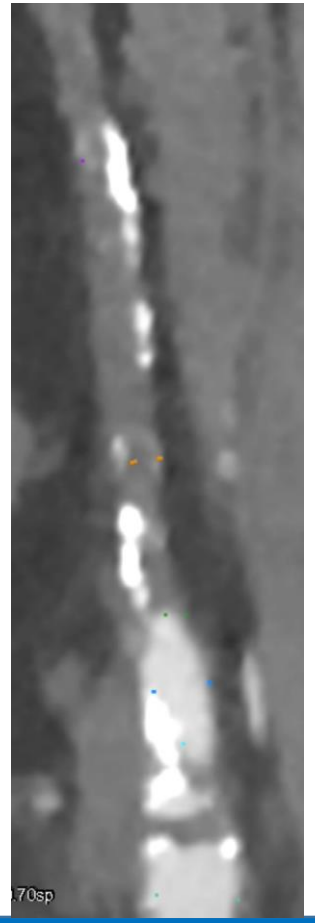
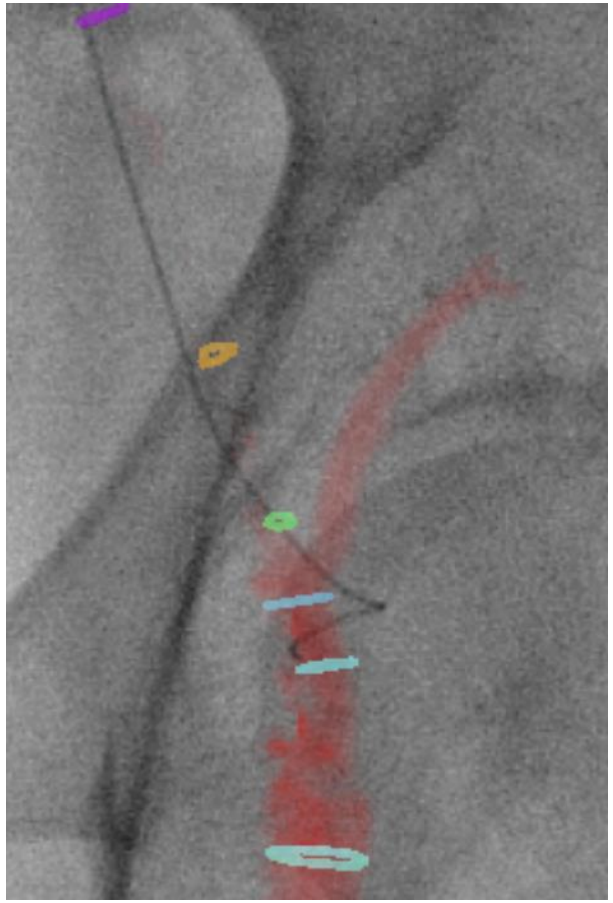
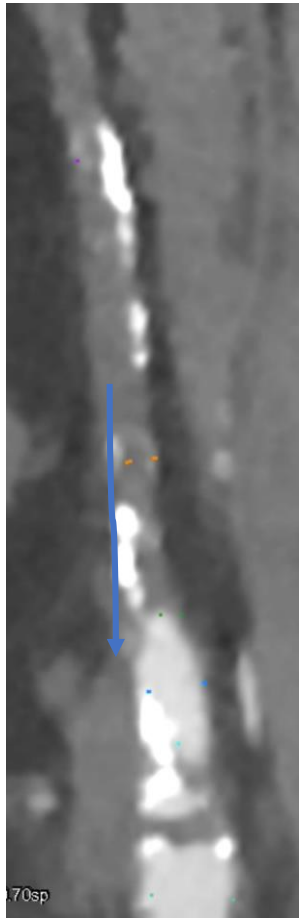




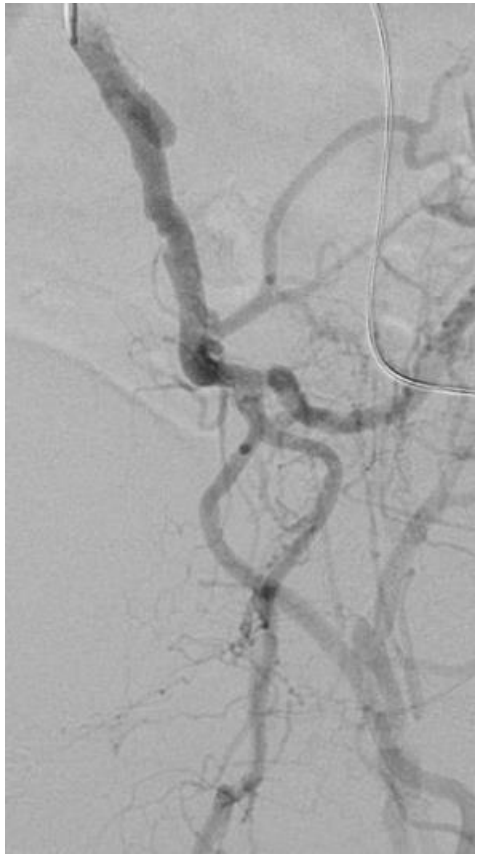
Planification Circles Technique

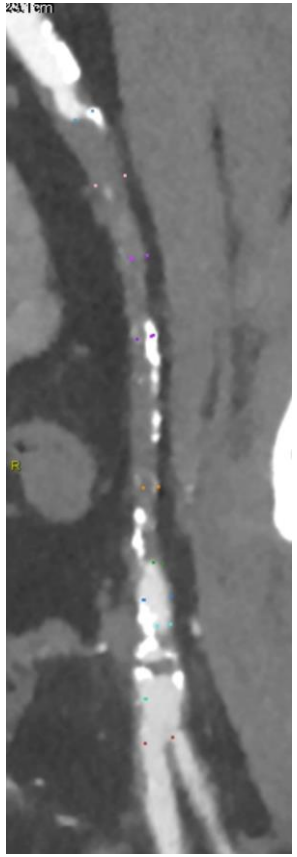




Planning Circles Technique

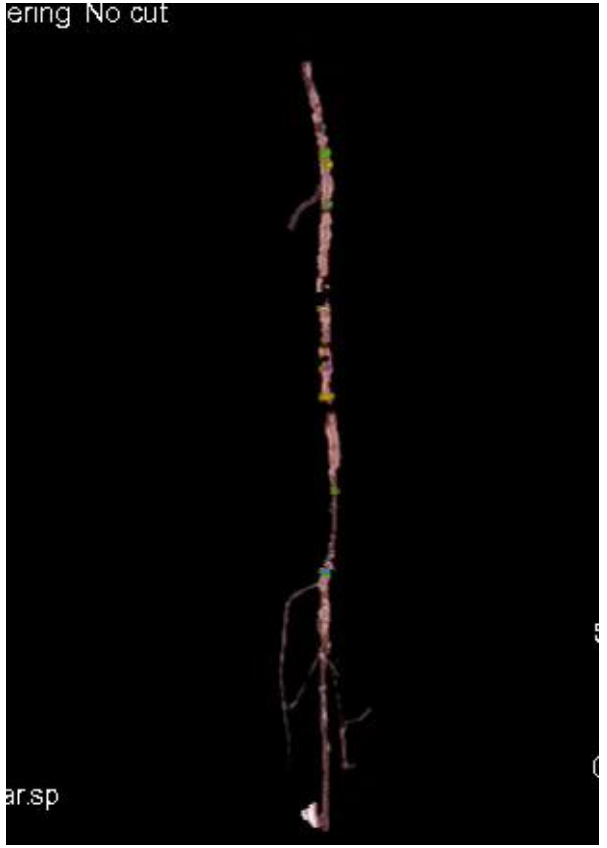
Final result



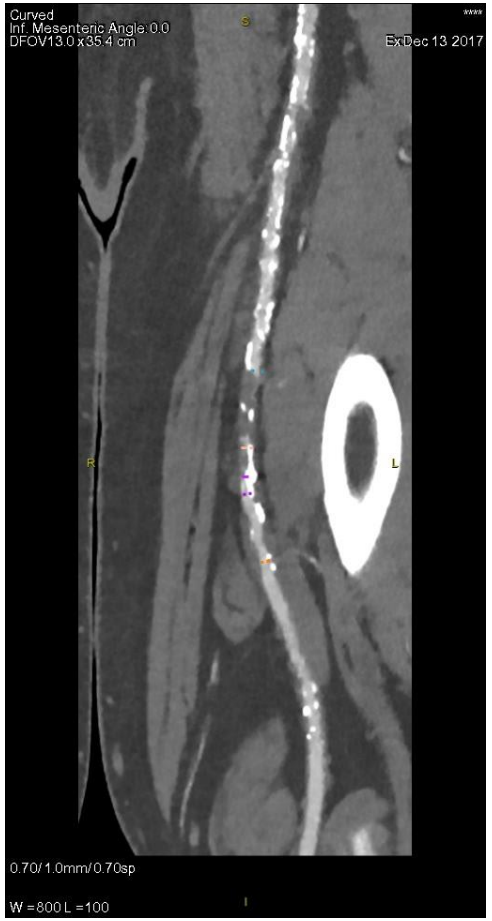


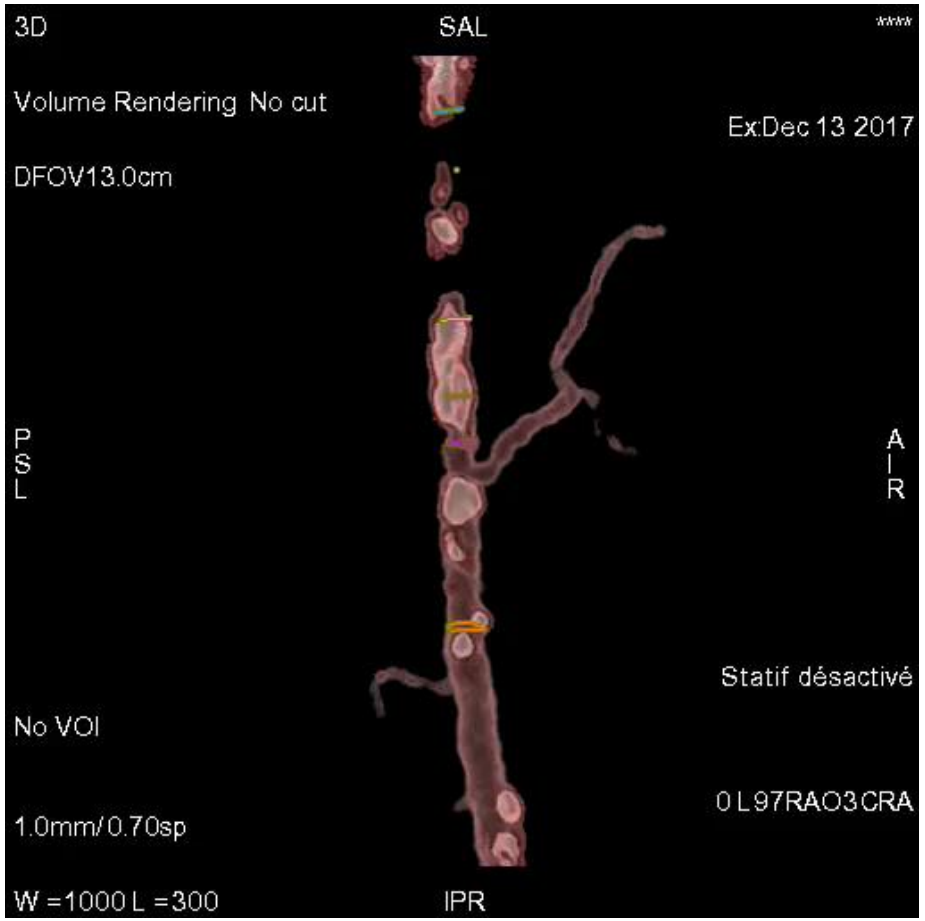
Fusion Imaging with third Volume

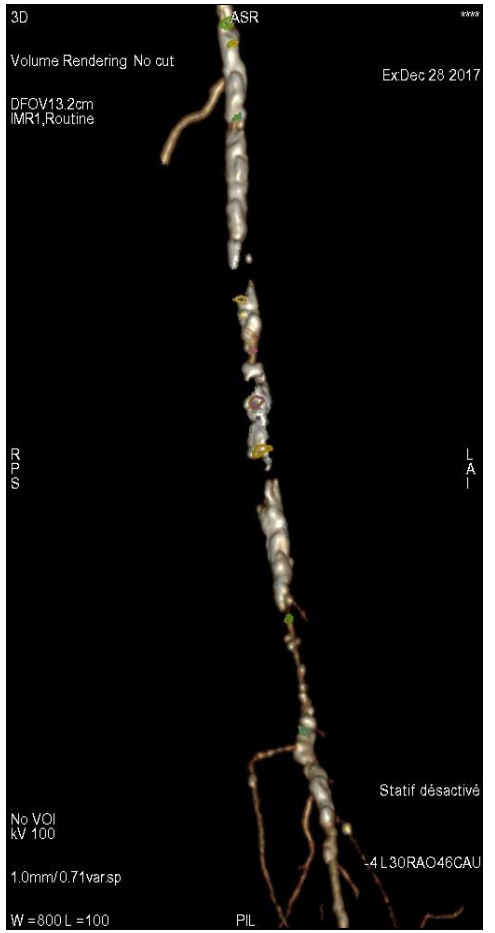
- ***3D Modelisation of the calcification***



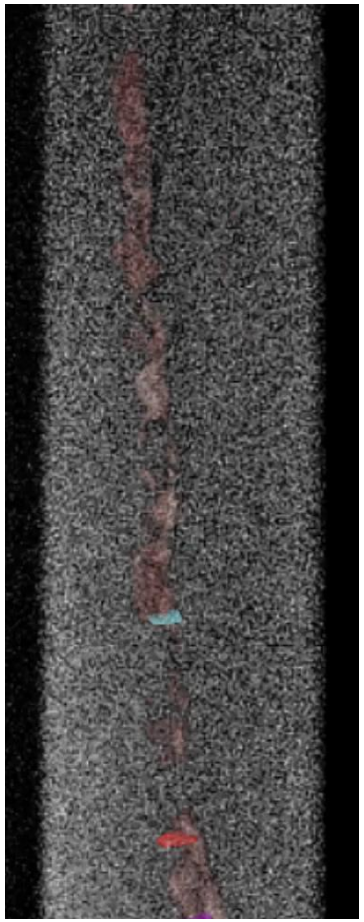
Planning circles and modelling calcification volume

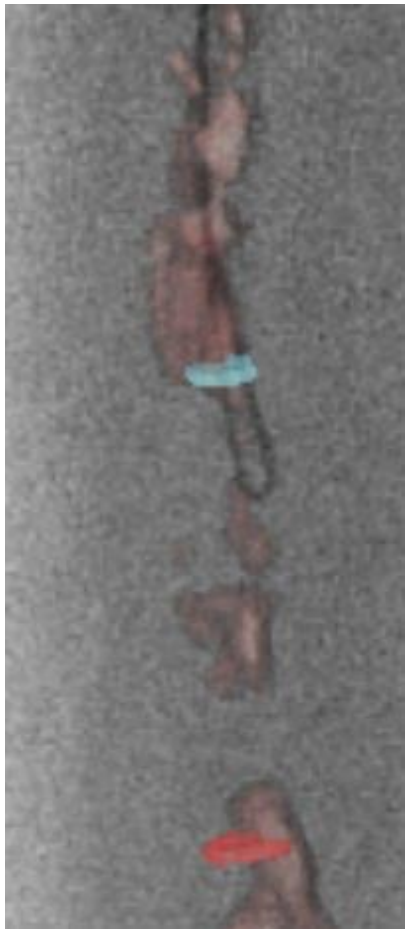


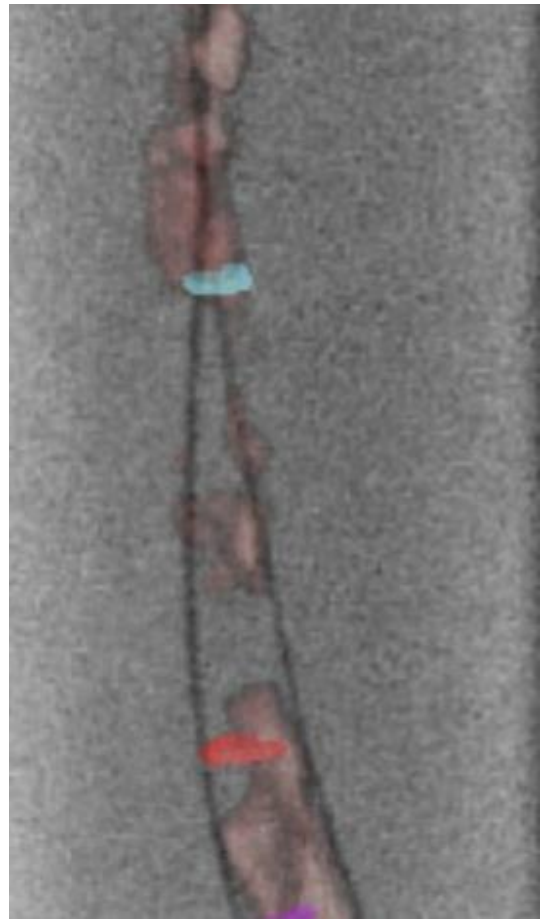




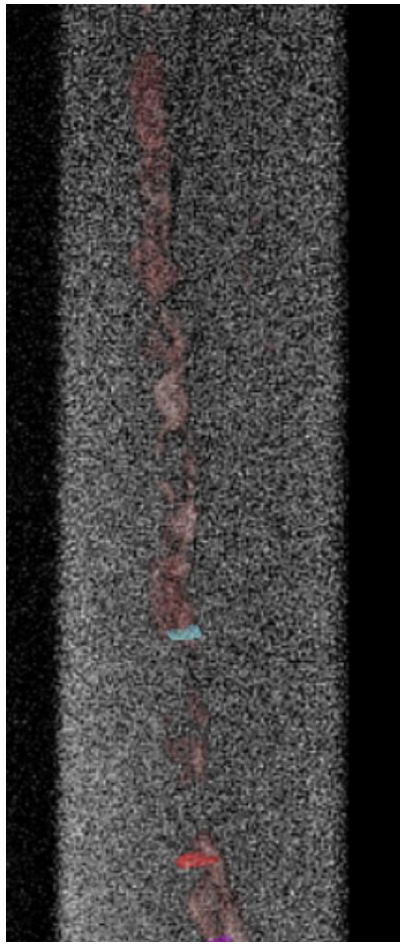
Planning circles and modelling calcification volume

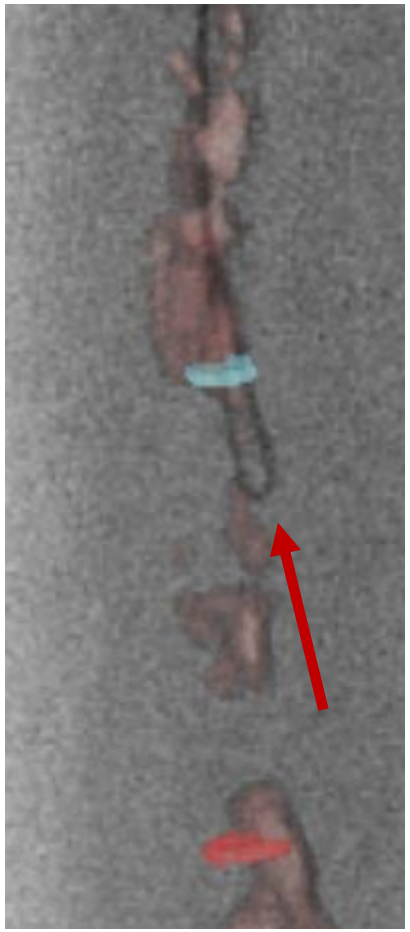


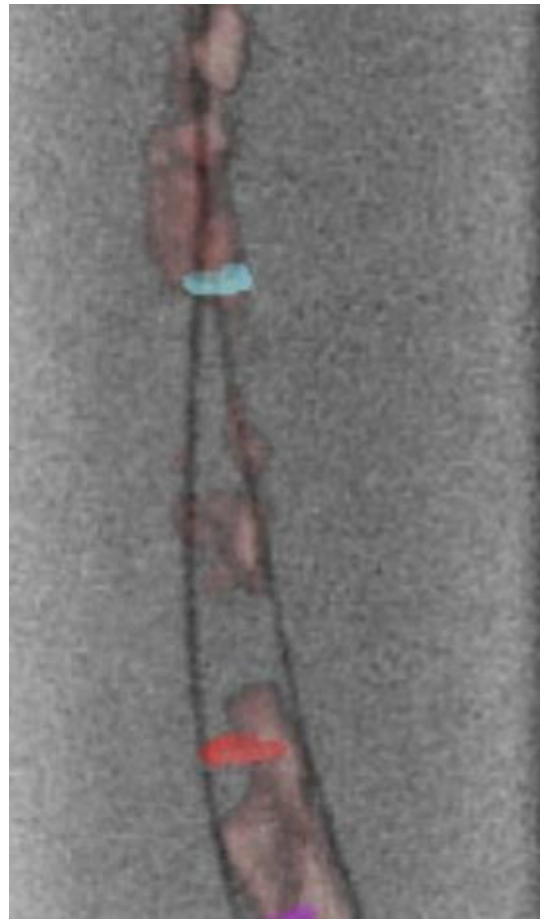




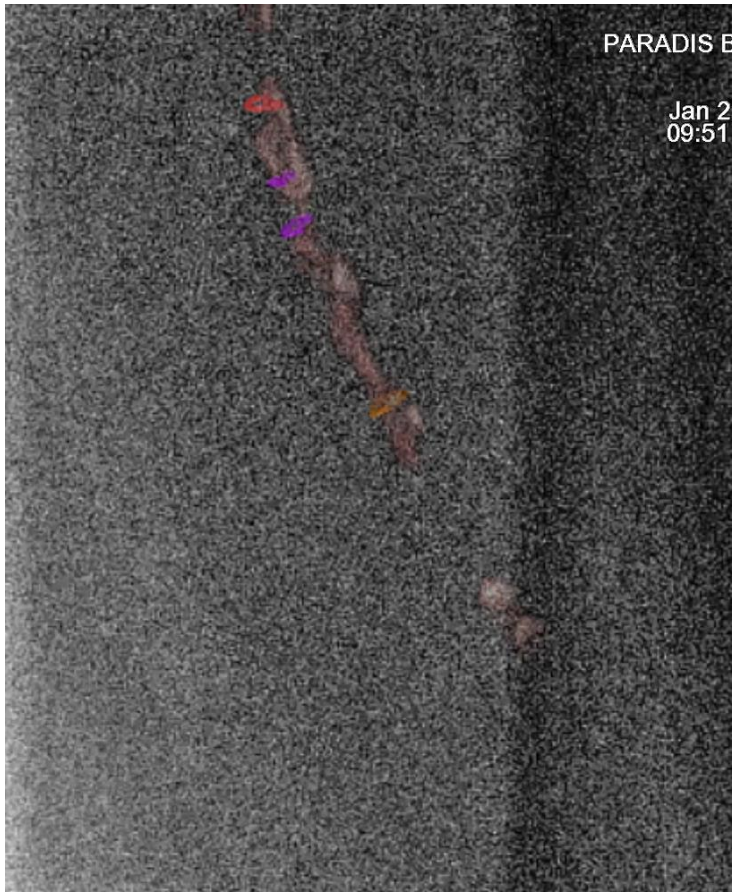
Planning circles and modelling calcification volume

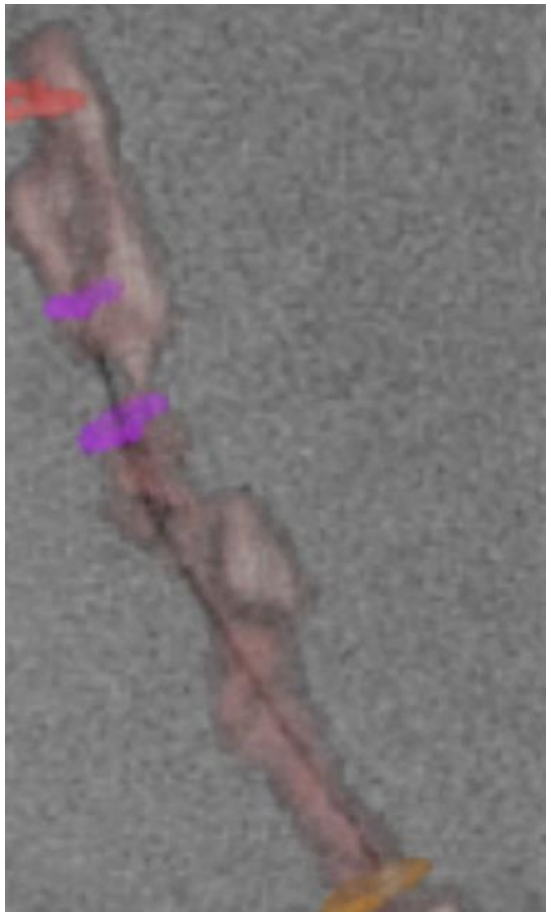


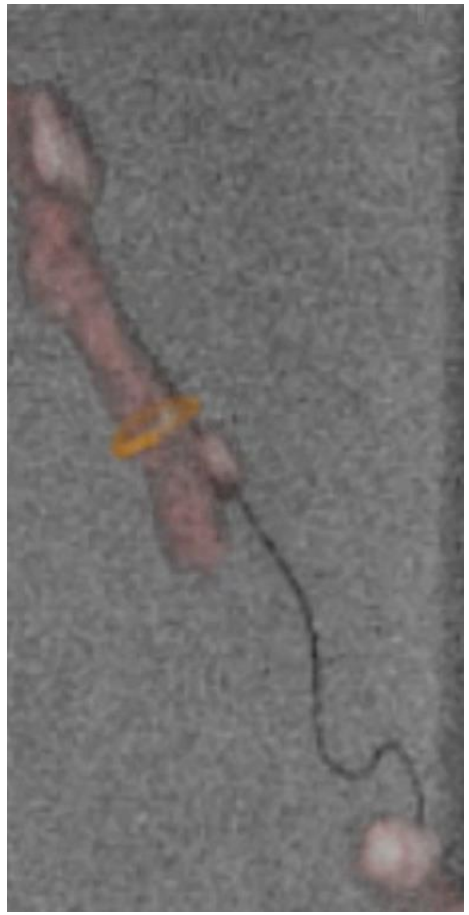




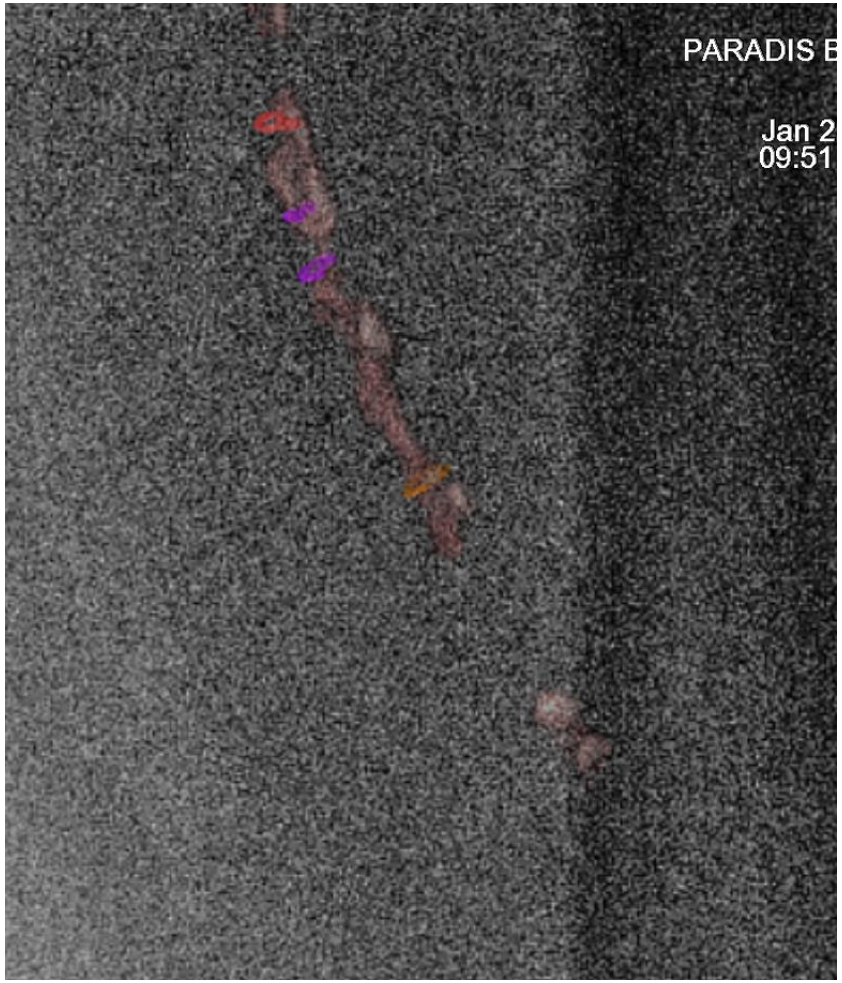
Planning circles and modelling calcification volume

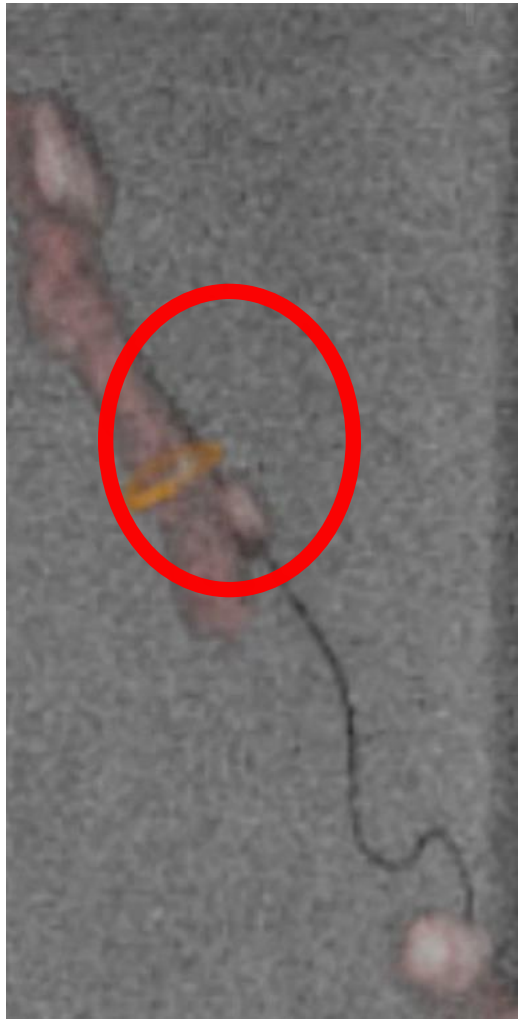


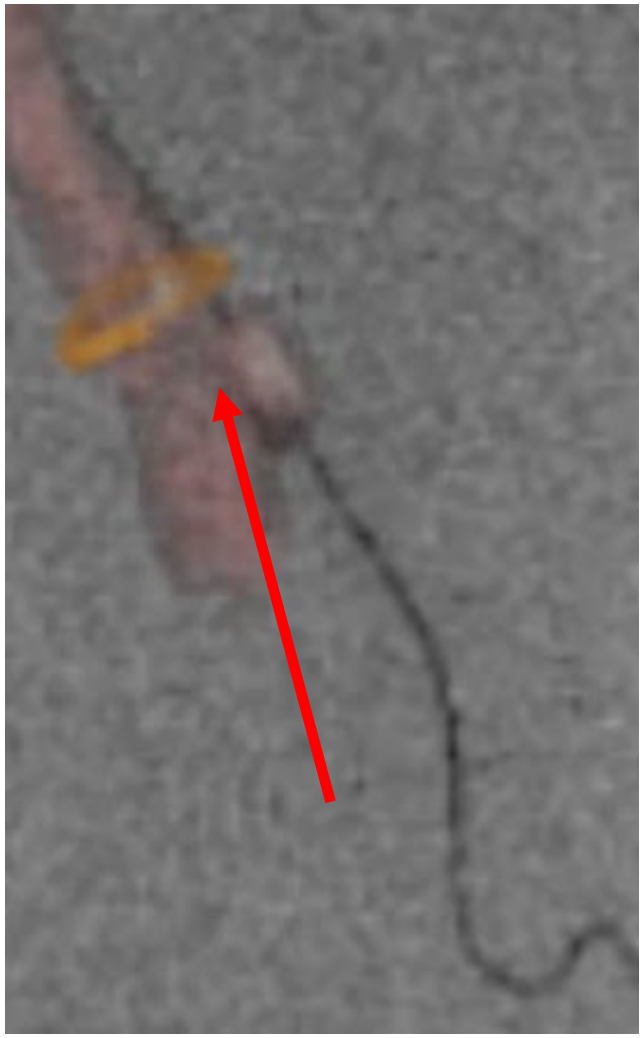




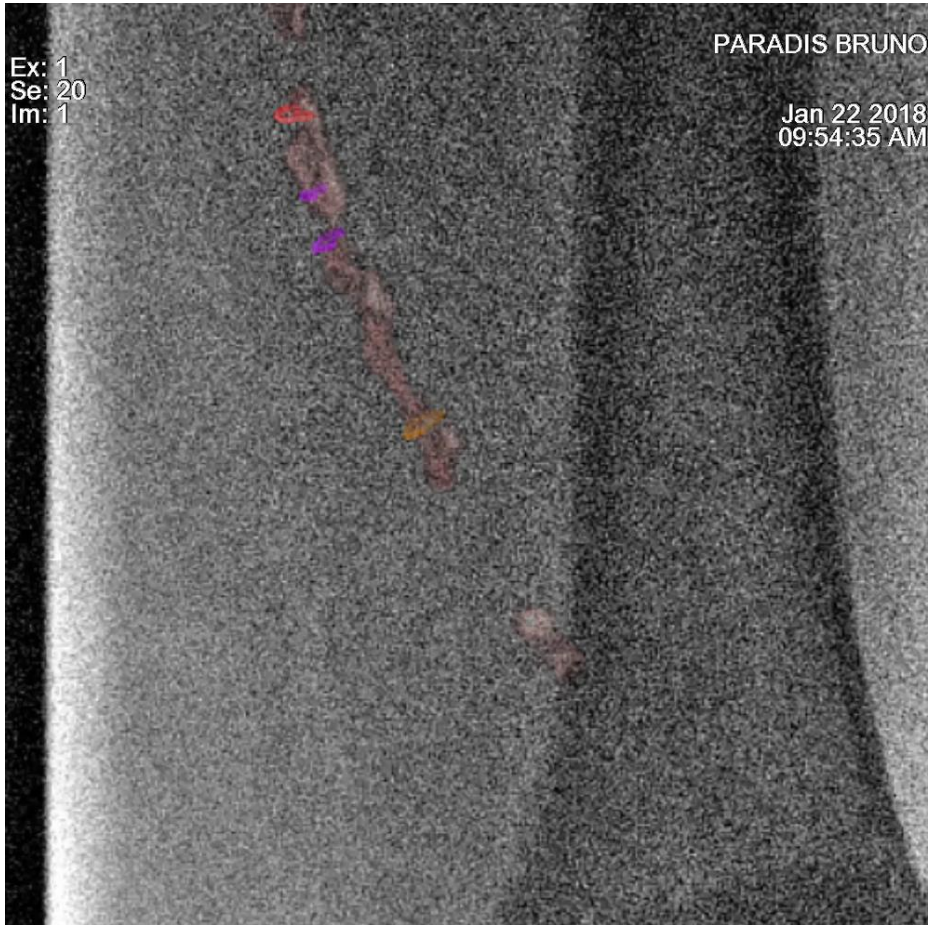
Planning circles and modelling calcification volume

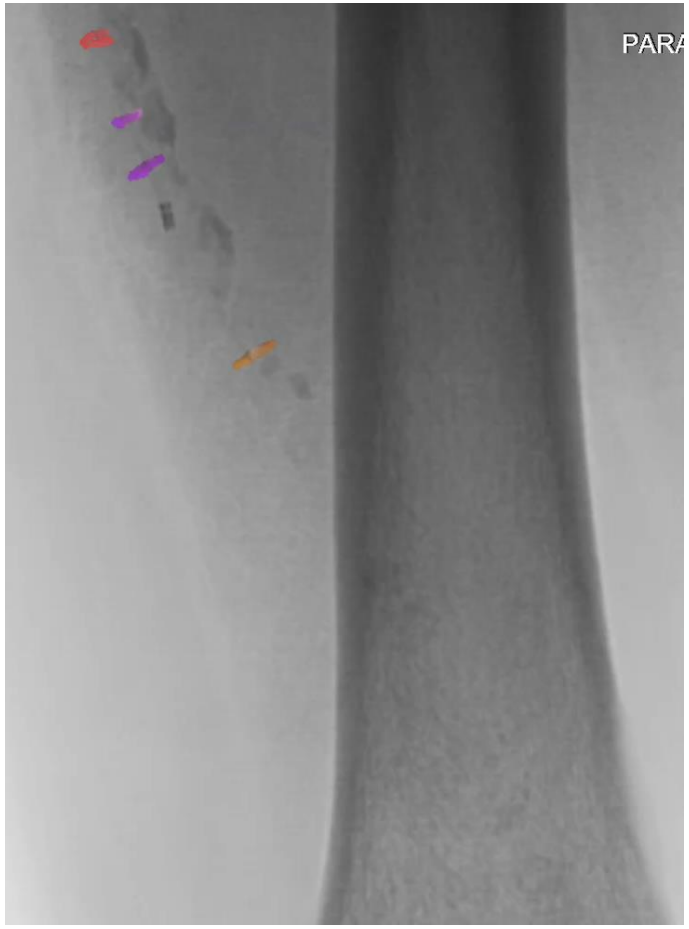




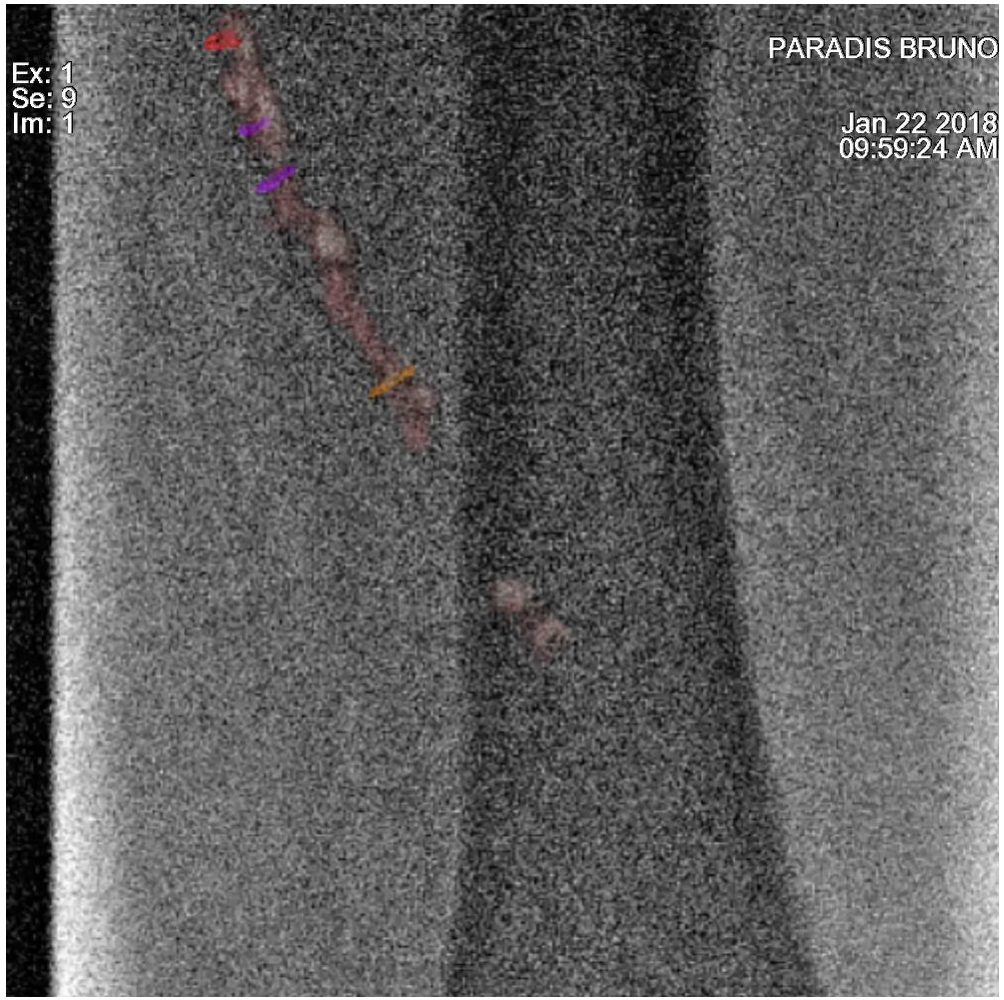


Planning circles and modelling calcification volume



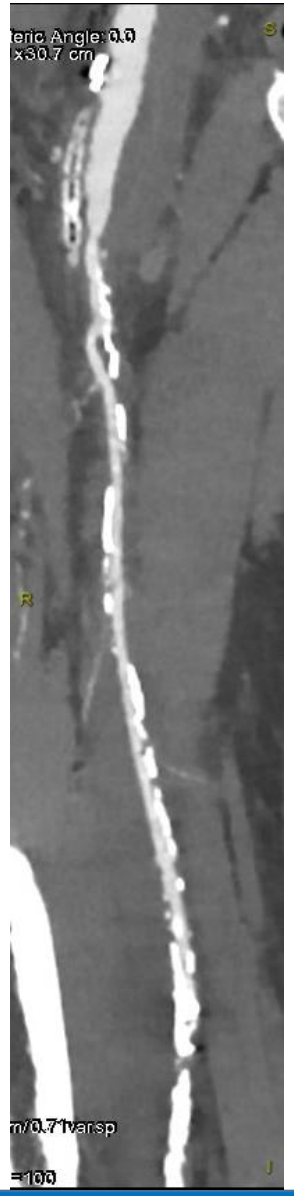


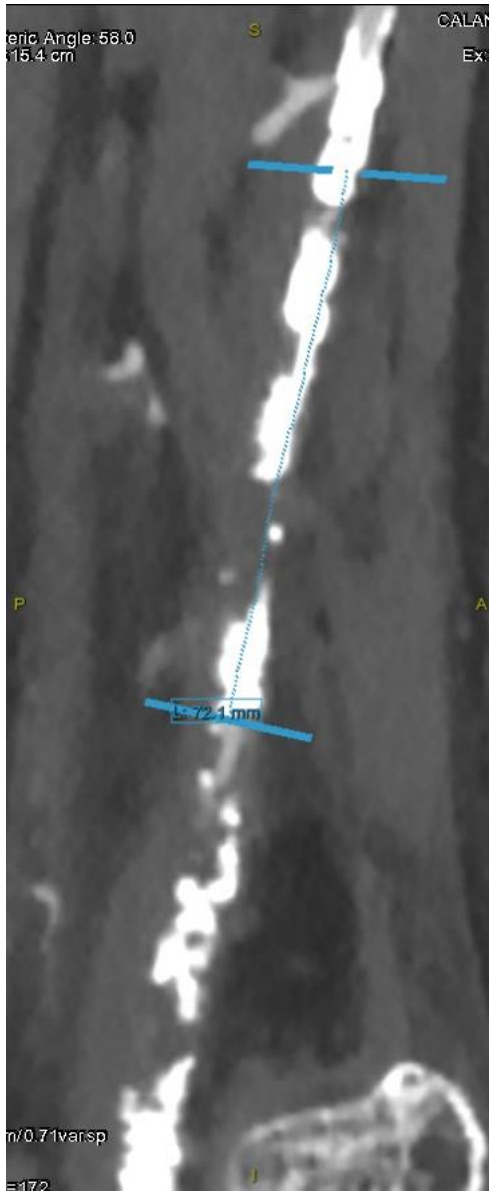
Planning circles and modelling calcification volume



Limb Salvage

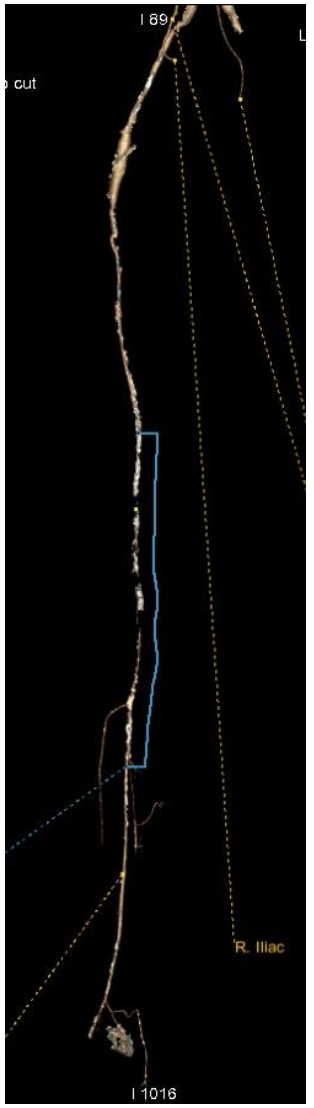
Procedure Evaluation





Procedure Evaluation

- *CT-scan:*
- *LONG OCCLUSION of distal part of the SFA and popliteal artery* ***280mm***
- *VERY CALCIFIED LESIONS*
- *1 vessel run off to the foot (peroneal artery)*



Procedure Evaluation

- *CT-scan:*
- *LONG OCCLUSION of distal part of the SFA and popliteal artery*
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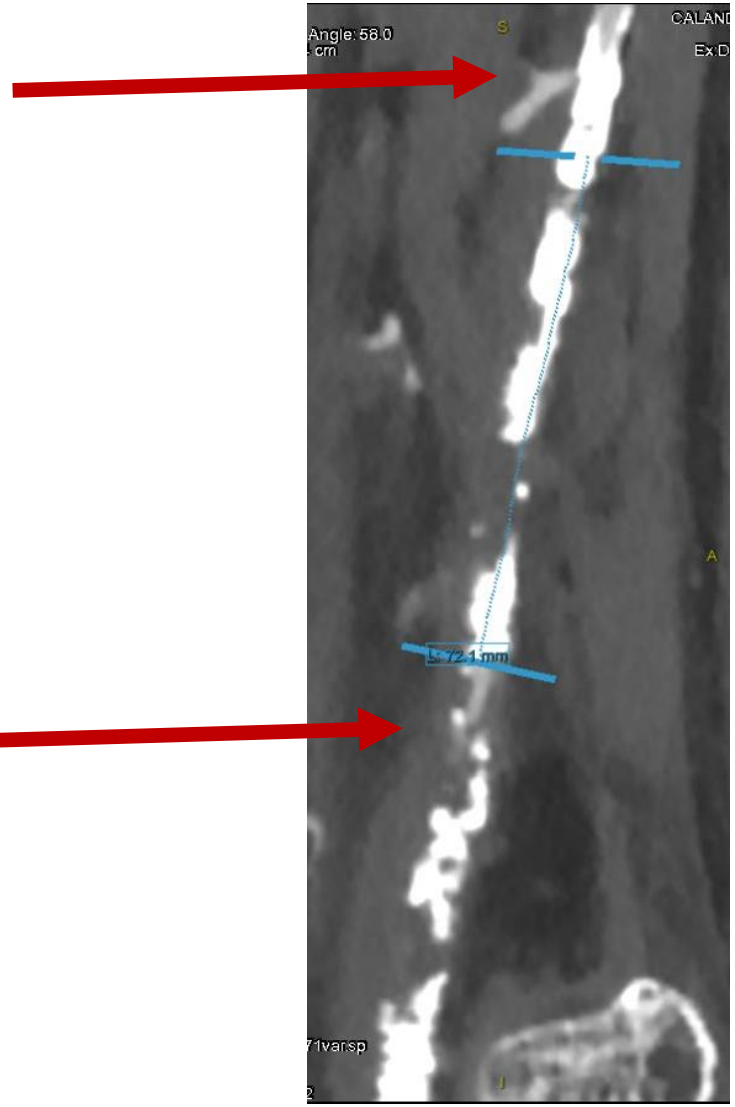
- *1 vessel run off to the foot (Peroneal artery)*

- *SHORT SUSPENDED POPLITEAL ARTERY*
- *PROXIMAL COLLATERAL*
- *: **STRATEGIC KEYS***



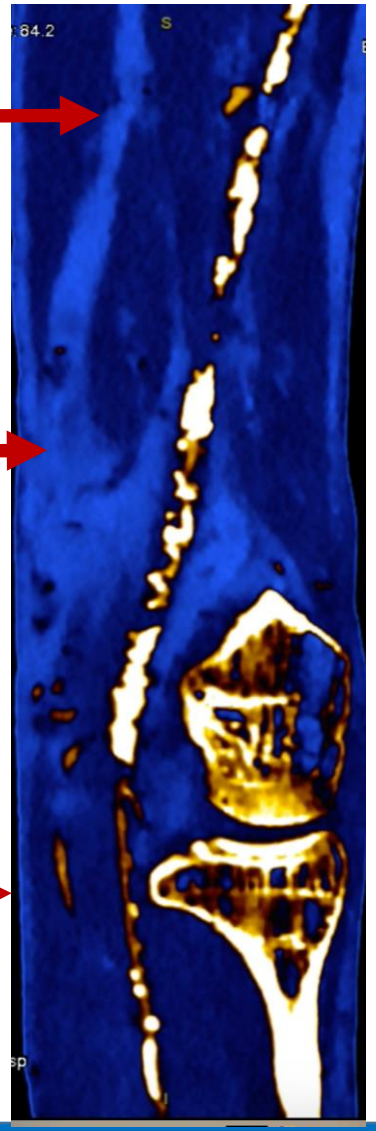
Procedure Evaluation

- *SHORT SUSPENDED POPLITEAL ARTERY*
- *PROXIMAL COLLATERAL: STRATEGIC KEYS*
- *STUDY THE CT- SCAN IN PERFUSION MODE*

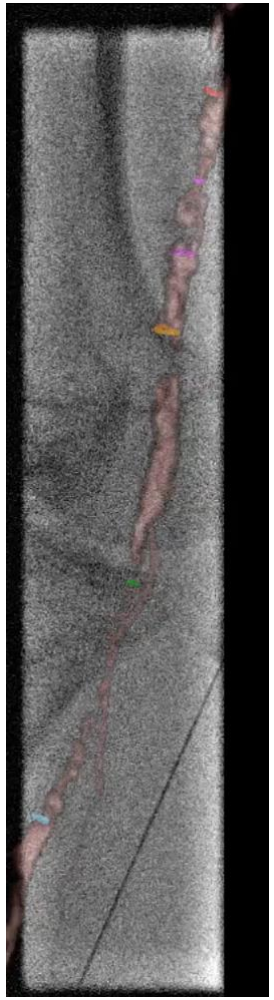
CTO CATHETER ANGULATED with PUSH guide wire 0.035

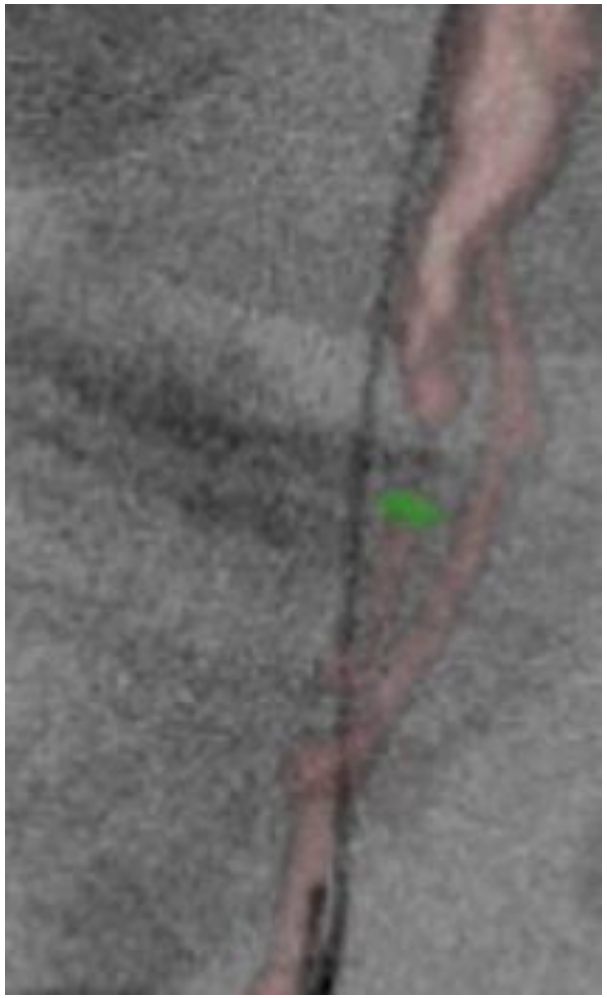
MICRO CATHETER 0.018 or 0.014 Guide wire navigation and CTI

Navigation guide wire 0.014 with coronary balloons

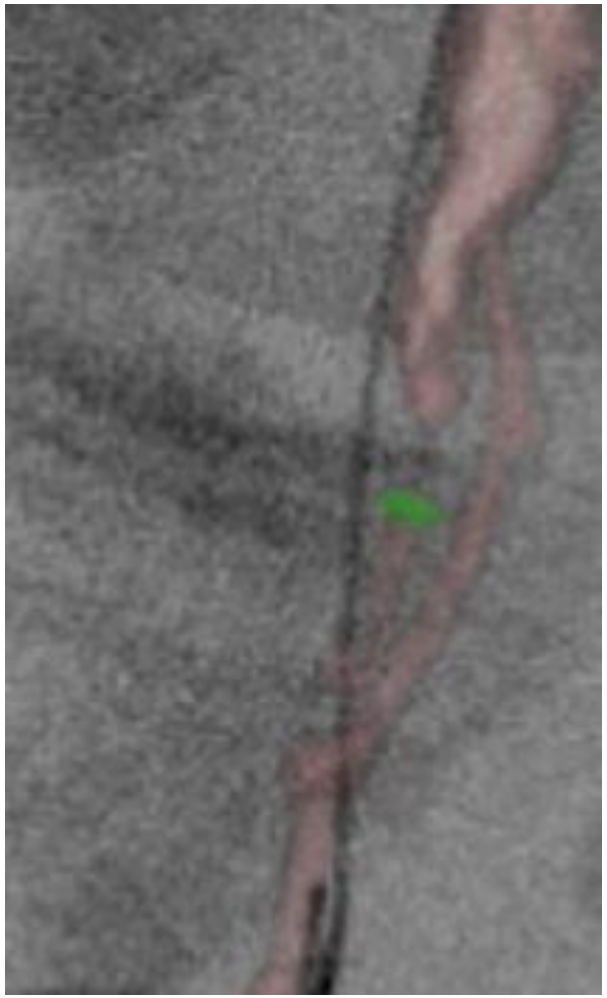


Planning circles and modelling calcification volume





Planning circles and modelling calcification volume



Planning circles and modelling calcification volume

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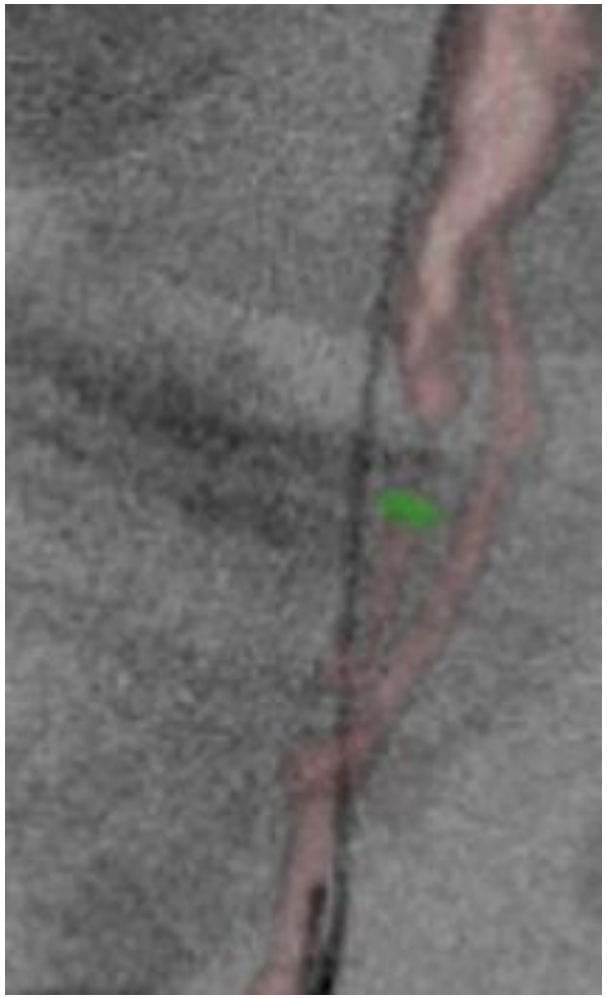

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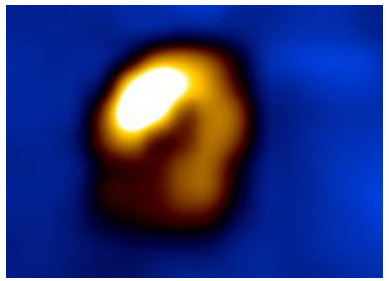
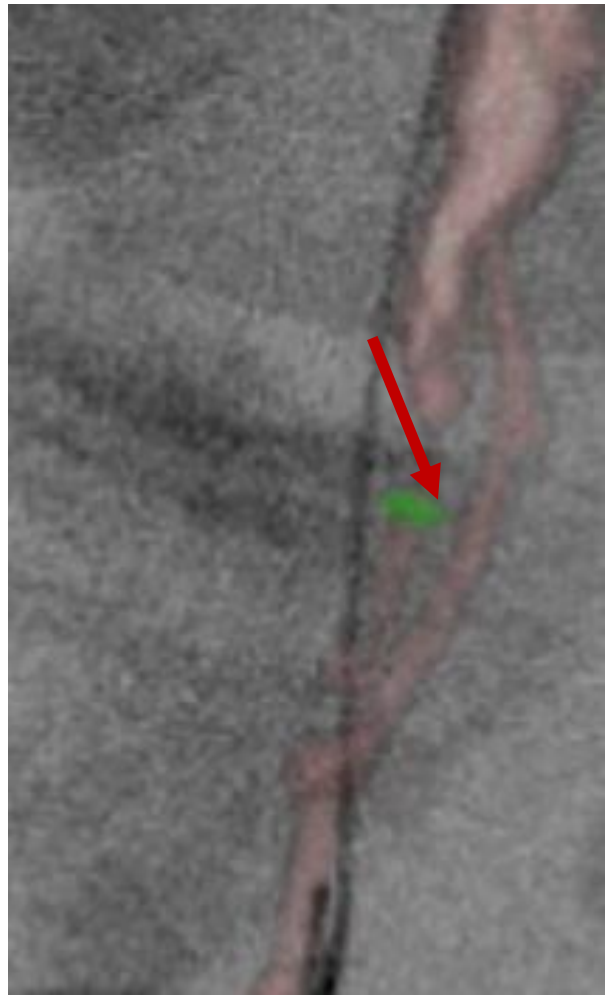
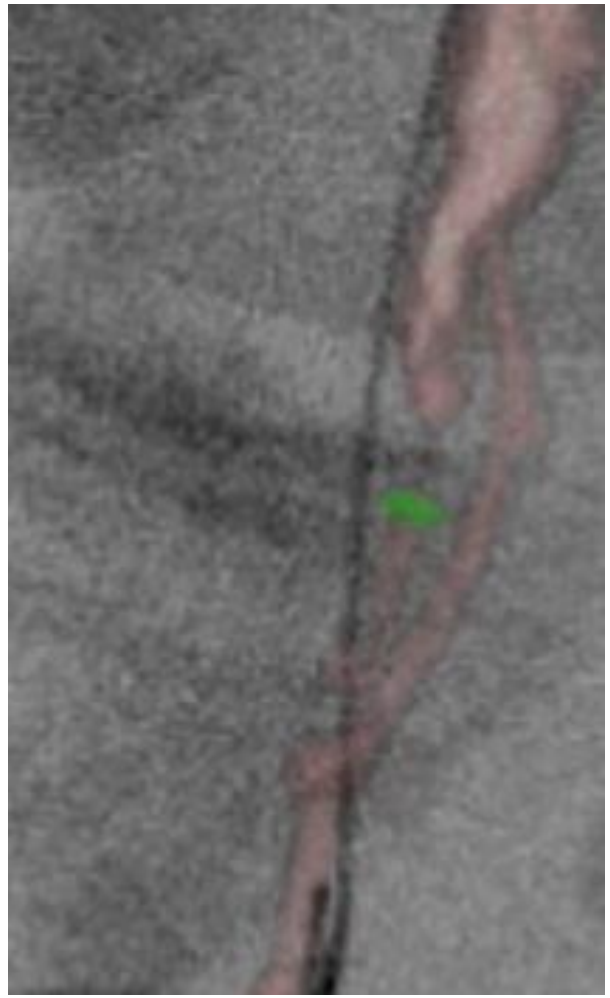




Planning circles and modelling calcification volume

- *Left groin approach,*
- *6fr long Inroducer 65cm*
- *Vertebral catheter 0.035 angulated wire*
- *CX 0.035, 260 cm stiff guide Wire*

- ***MICRO 0.018, GAIA 0.018 INSIDE THE CXI***



Planning circles and modelling calcification volume

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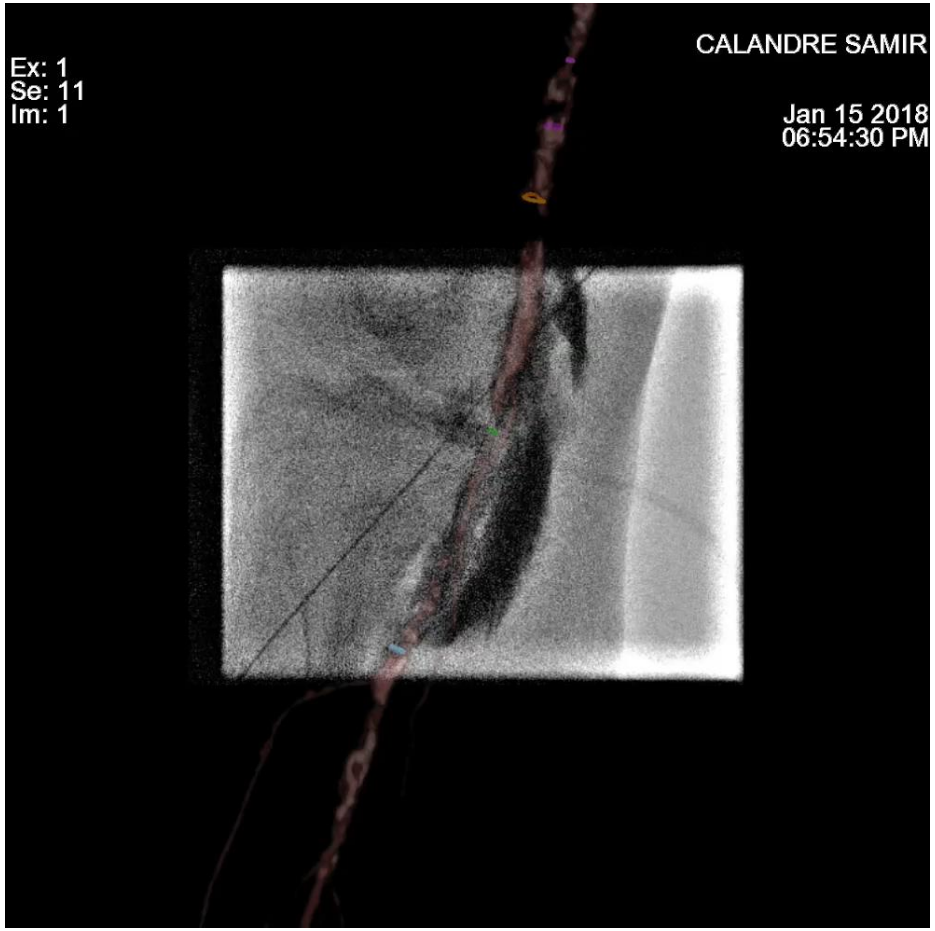
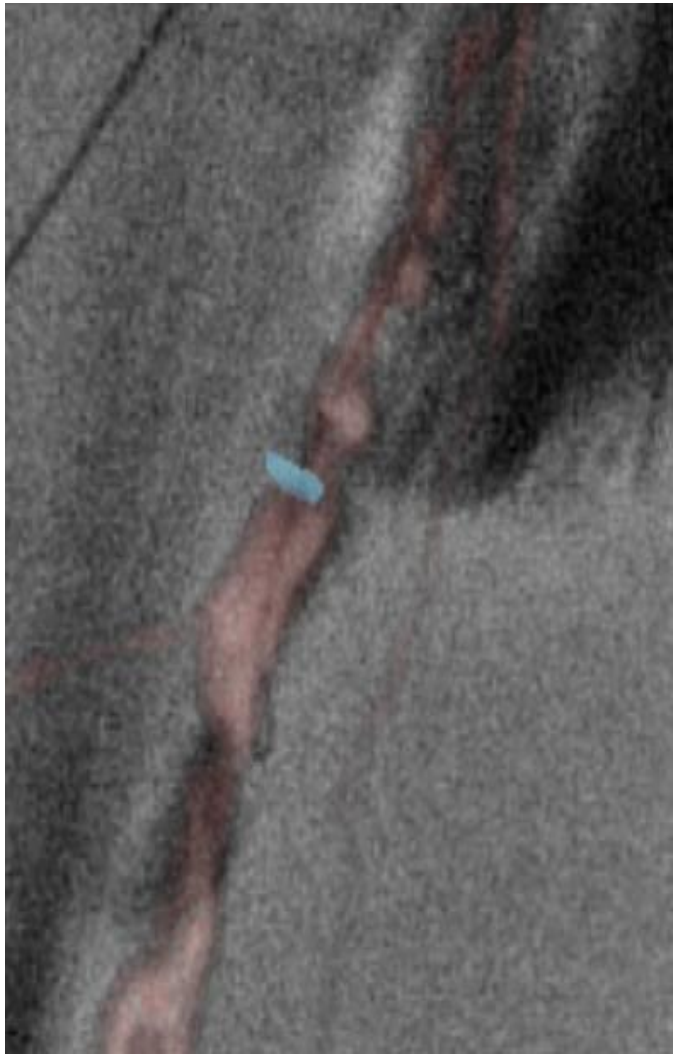


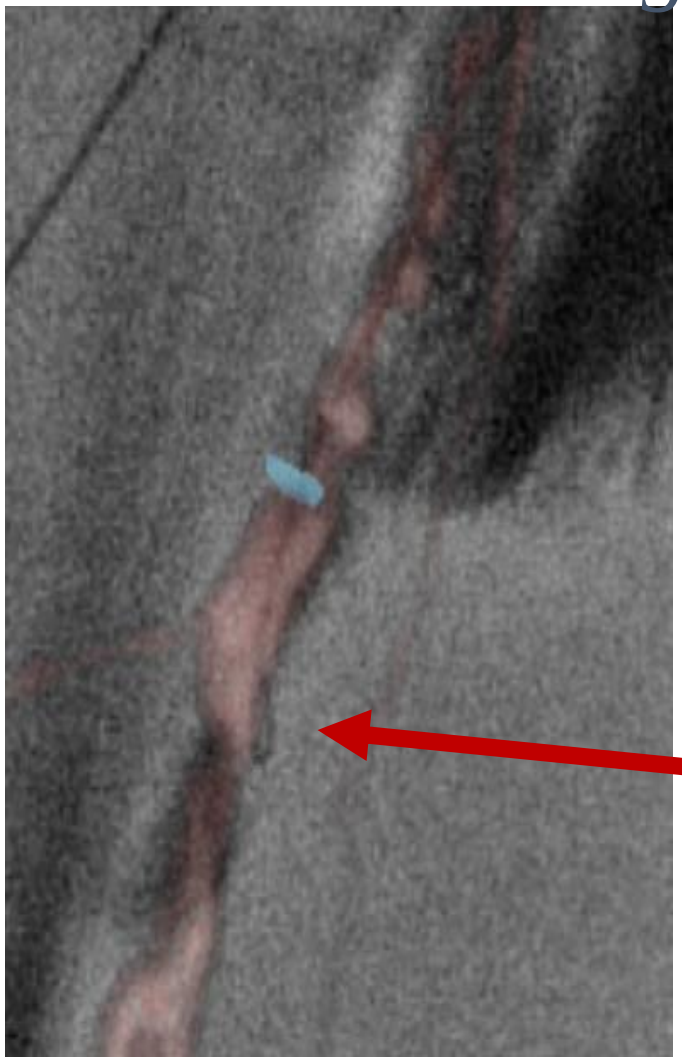
Planning circles and modelling calcification volume

Modelling guide wire along the calcification

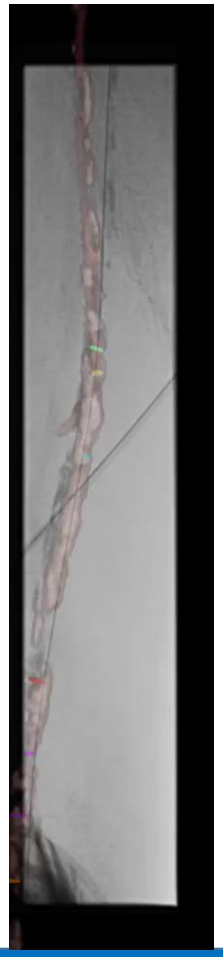


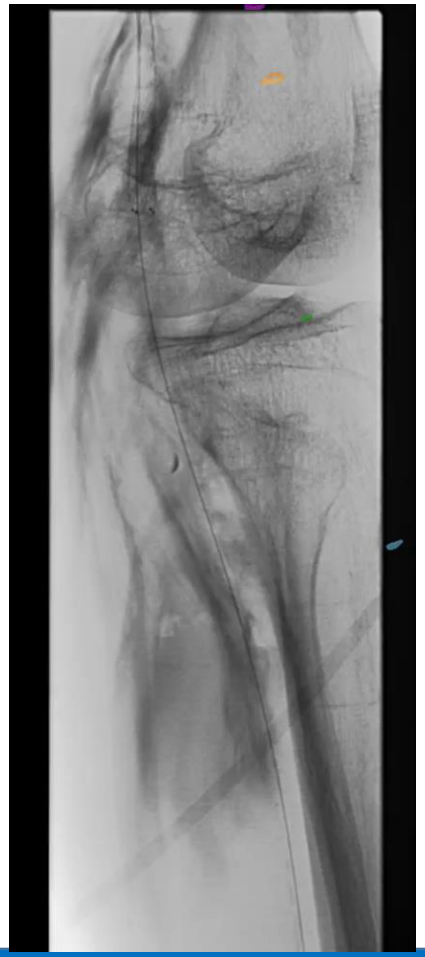
Planning circles and modelling calcification volume

Modelling guide wire along the calcification



Planning circles and modelling calcification volume





Planning circles and modelling calcification volume

1. Change for 0.014

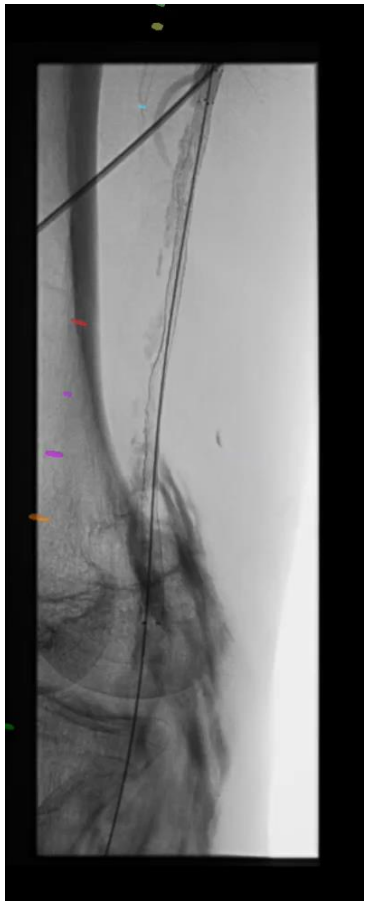
2. Coronary Ballon 1.5-30 inside the CXI Catheter

3. **Invatec Amphirion Deep 2.0 -120**

4. **Invatec Amphirion Deep 4.0 -120**

5. **DEB 4.120 (popliteal artery) AVOID STETINTING IN THIS AREA**

1. **2 X Absolute 5X 100 Abbott**



Planning circles and modelling calcification volume

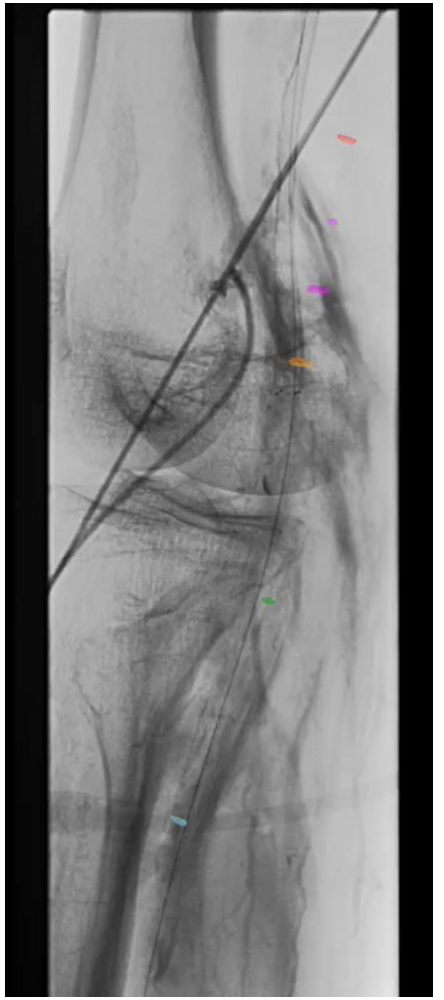
1. *Change for 0.014*

2. *Coronary ballon 1.5-30 inside the CXI catheter*

1. ***IN.PACT ADMIRAL 4.120 (popliteal artery)***

2. ***2X Absolute 5X 80***

3. ***DES Xience Prime BTK* Abbott *in poplipeal trunk***

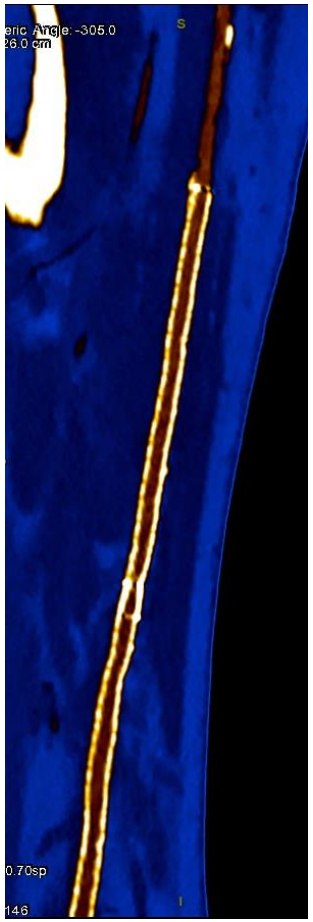


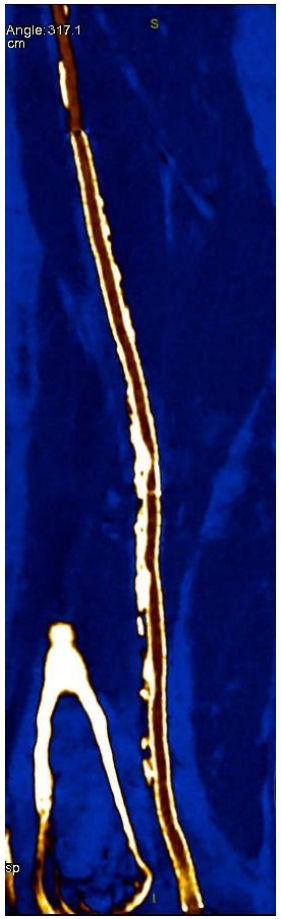
WOUND HEALING

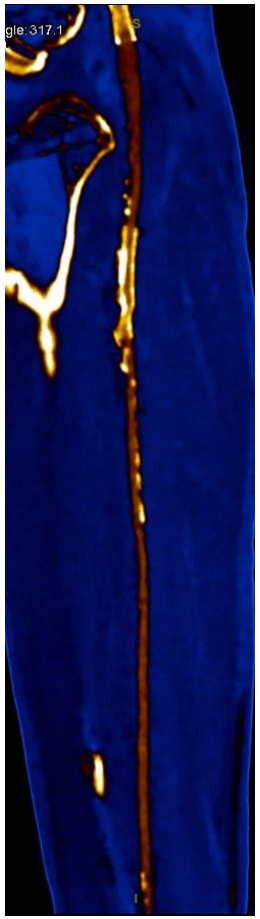
WOUND HEALING

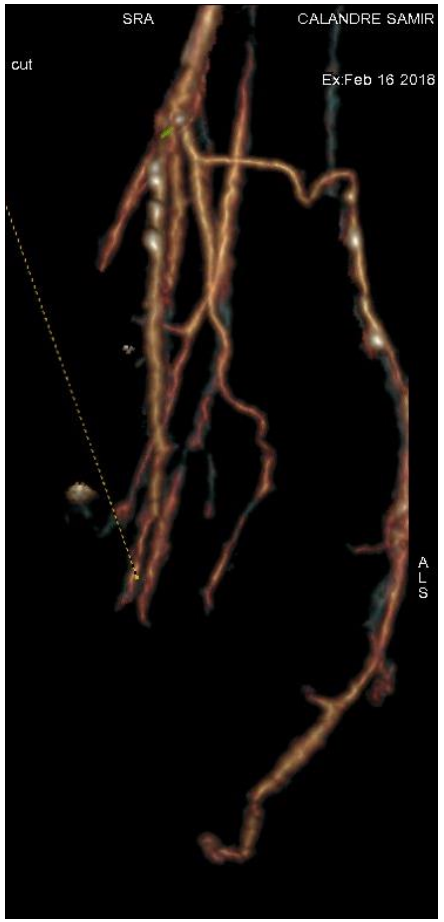
One month

POST OPERATIVE CT SCAN







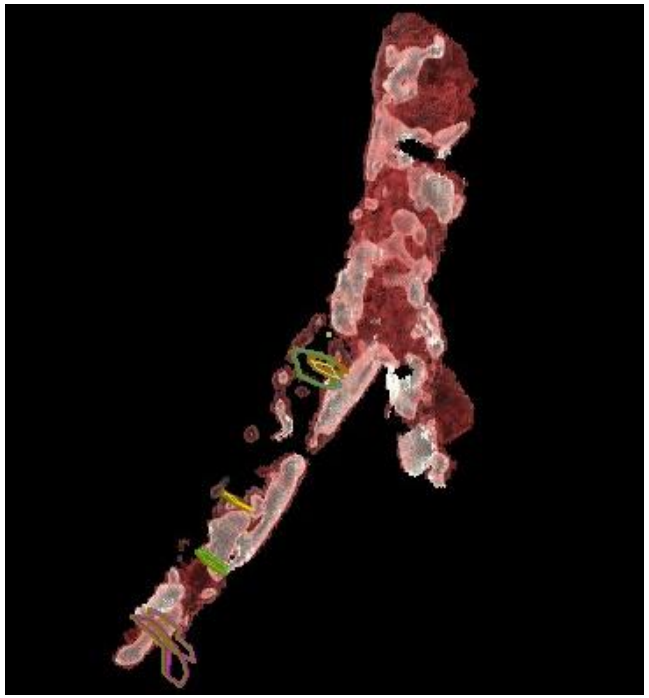


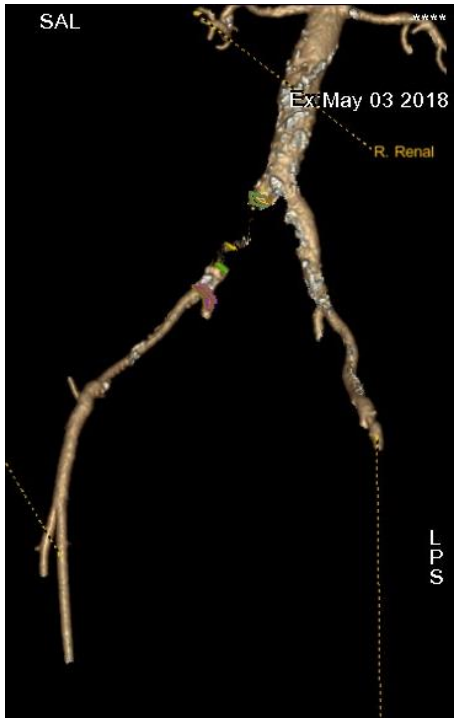
WOUND HEALING

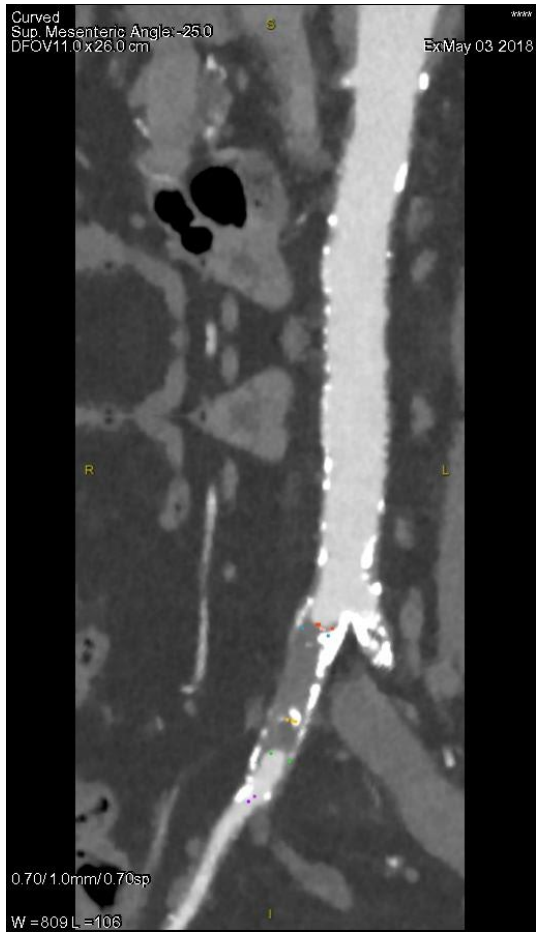
Two months

Planning Circles and Modelling calcification Volume

- Right Common Iliac Artery Occluded

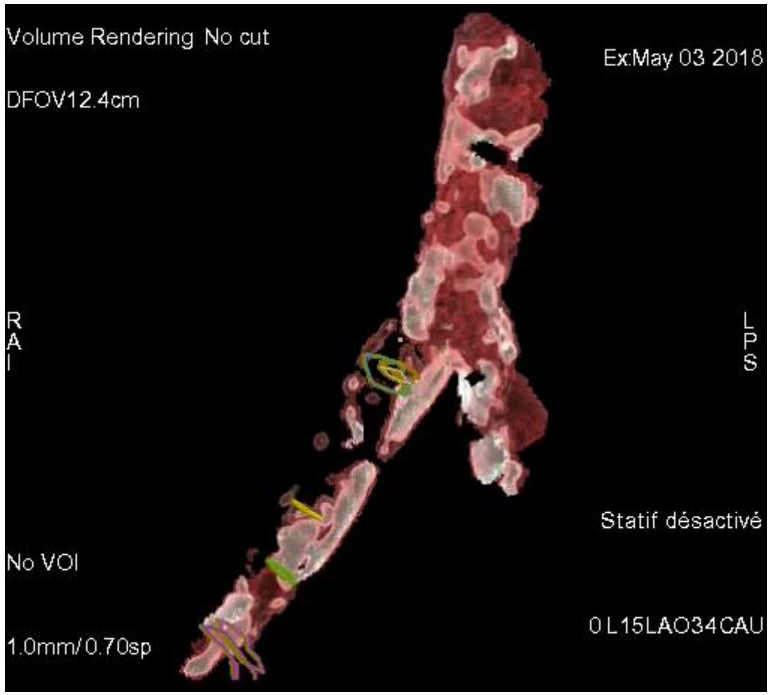


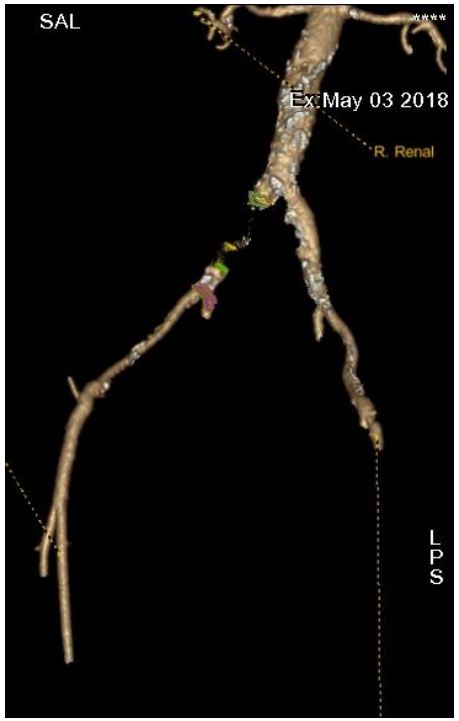


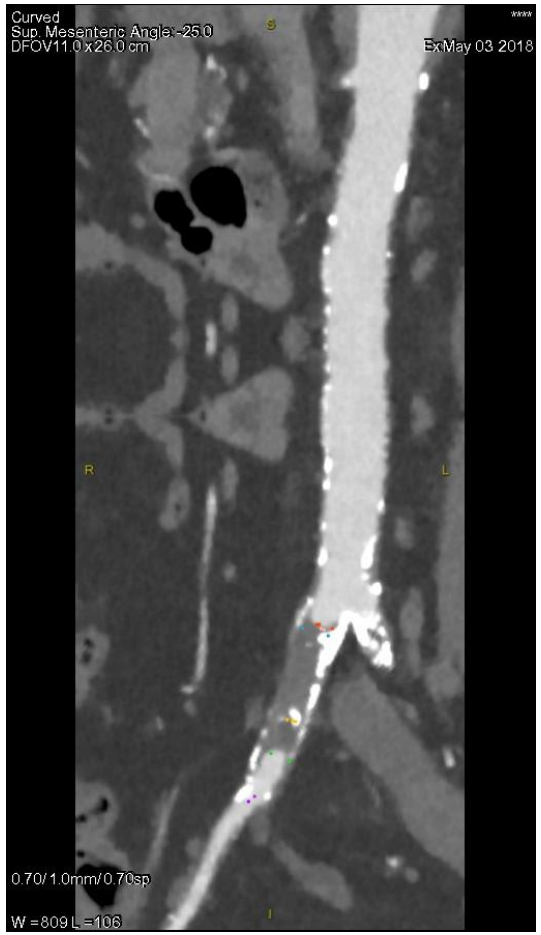


Planning Circles and Modelling calcification Volume

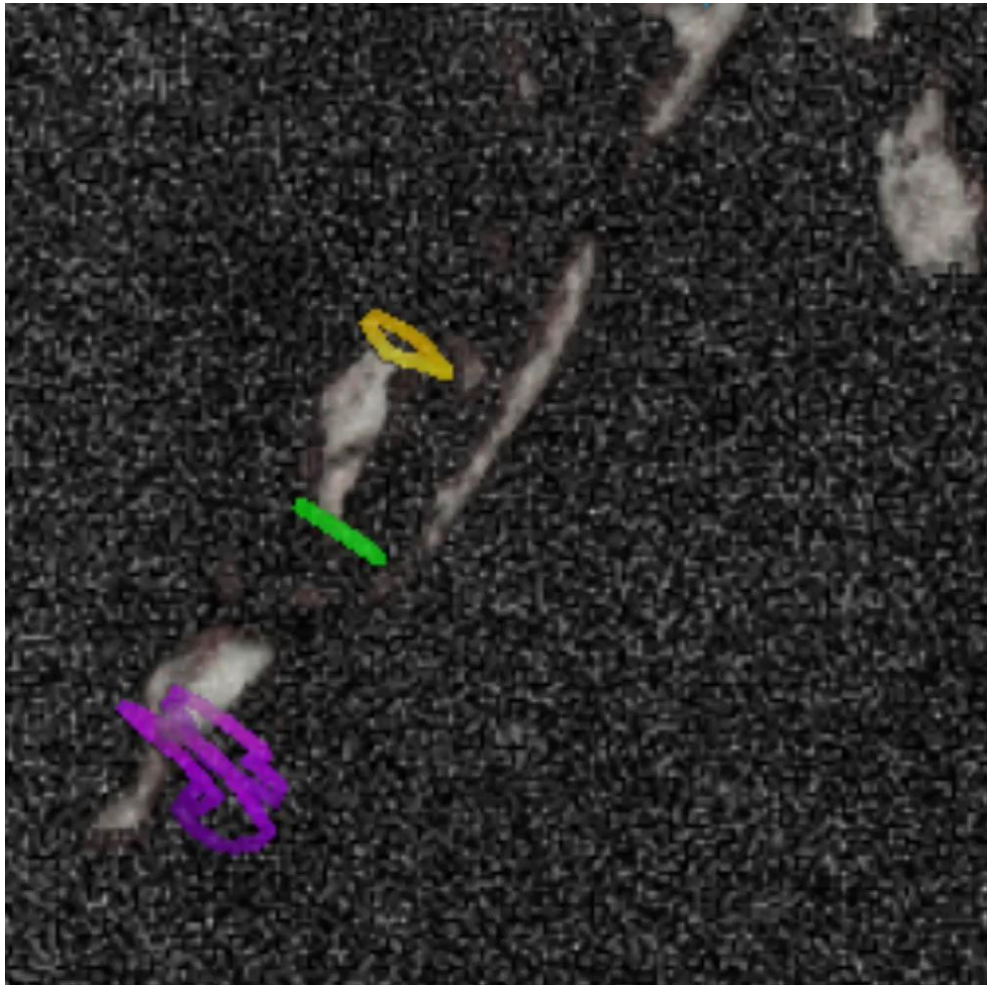
- Right Common Iliac Artery Occluded





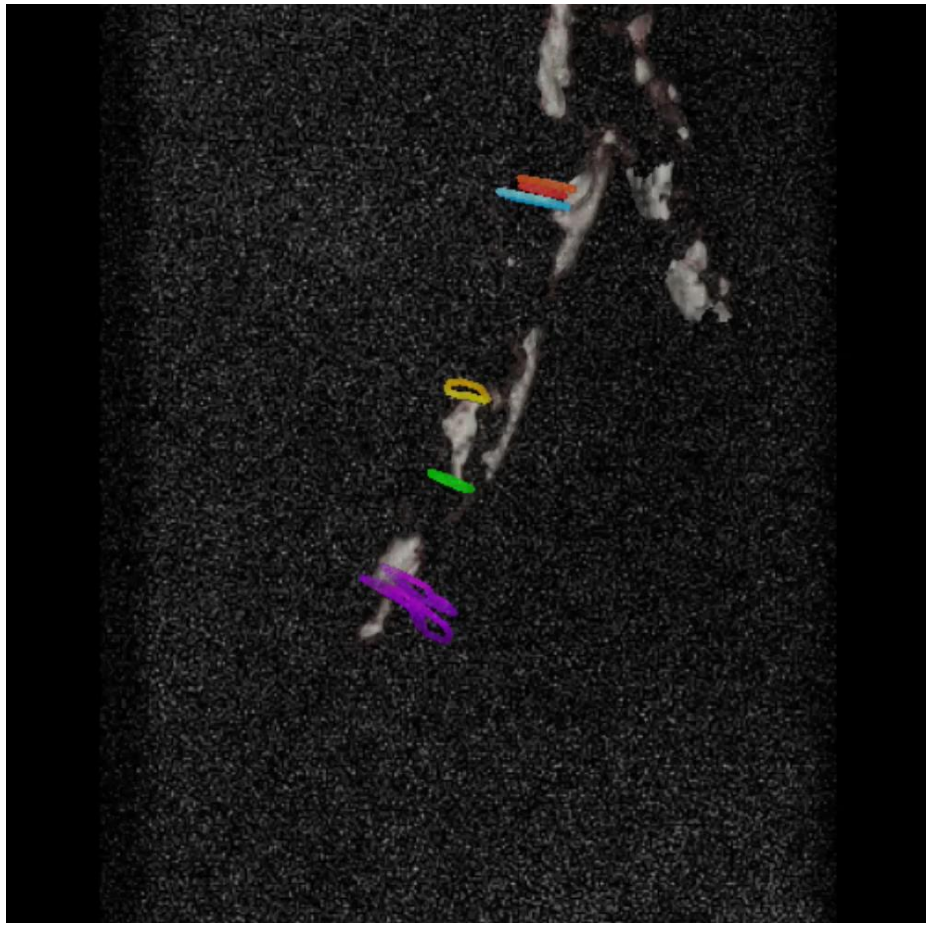


Planning circles and modelling calcification volume



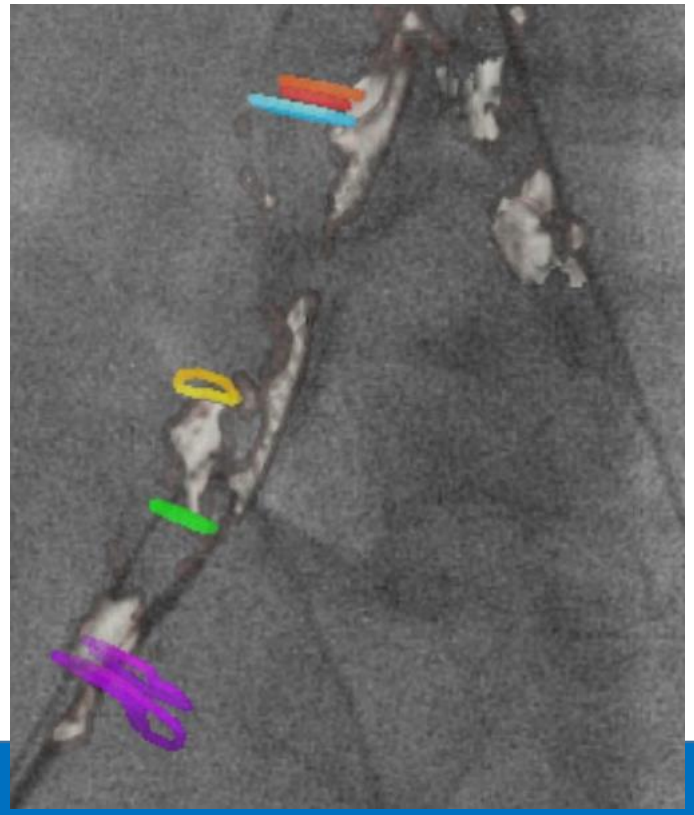
Planning circles and modelling calcification volume

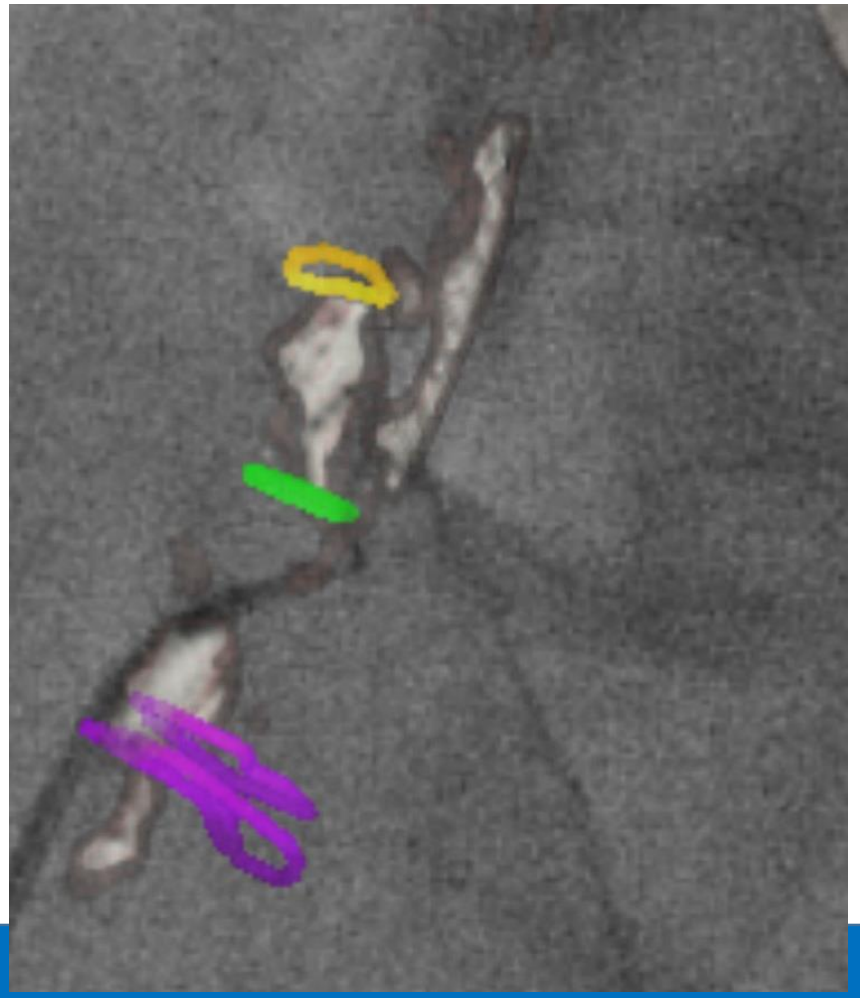
New incidence

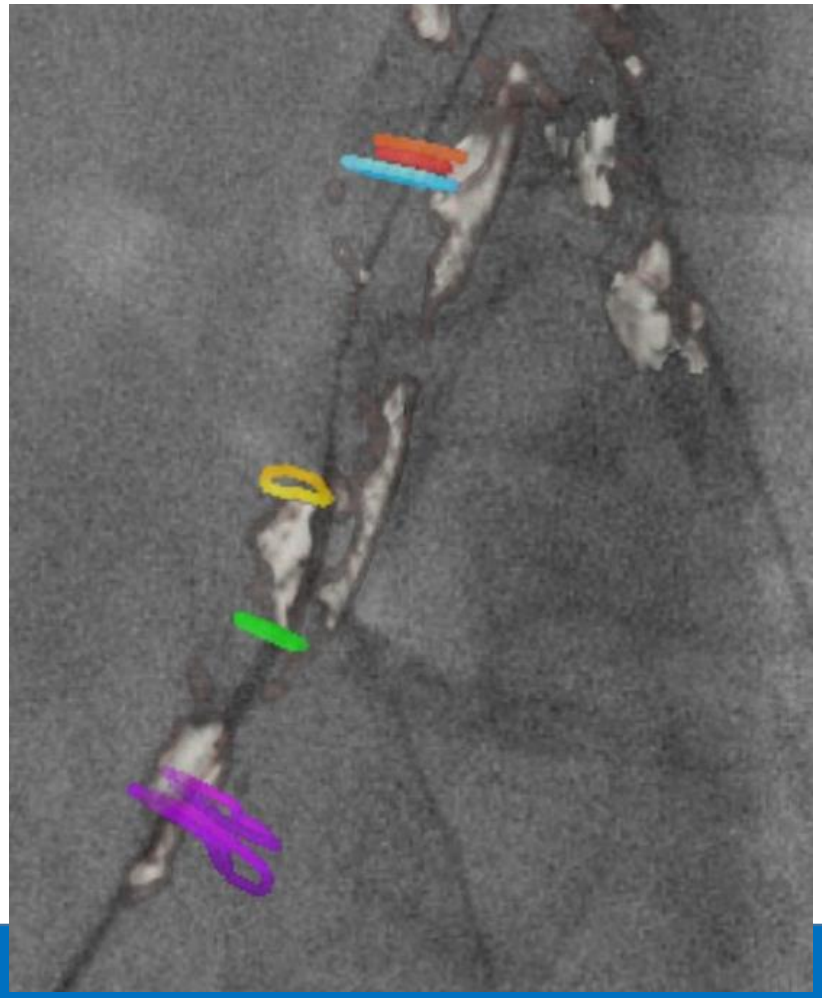


Planning circles and modelling calcification volume

Line up the calcifications







Planning circles and modelling calcification volume

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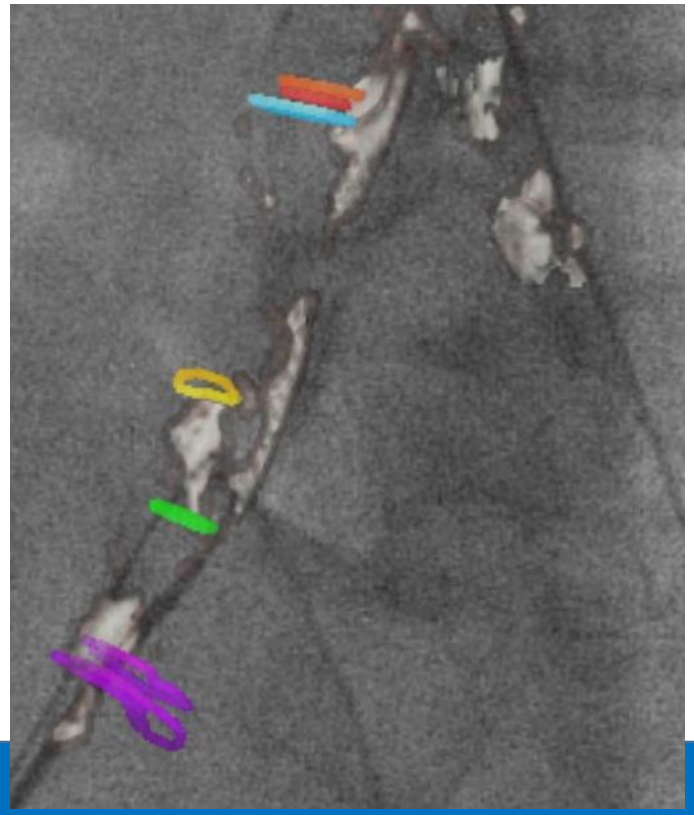
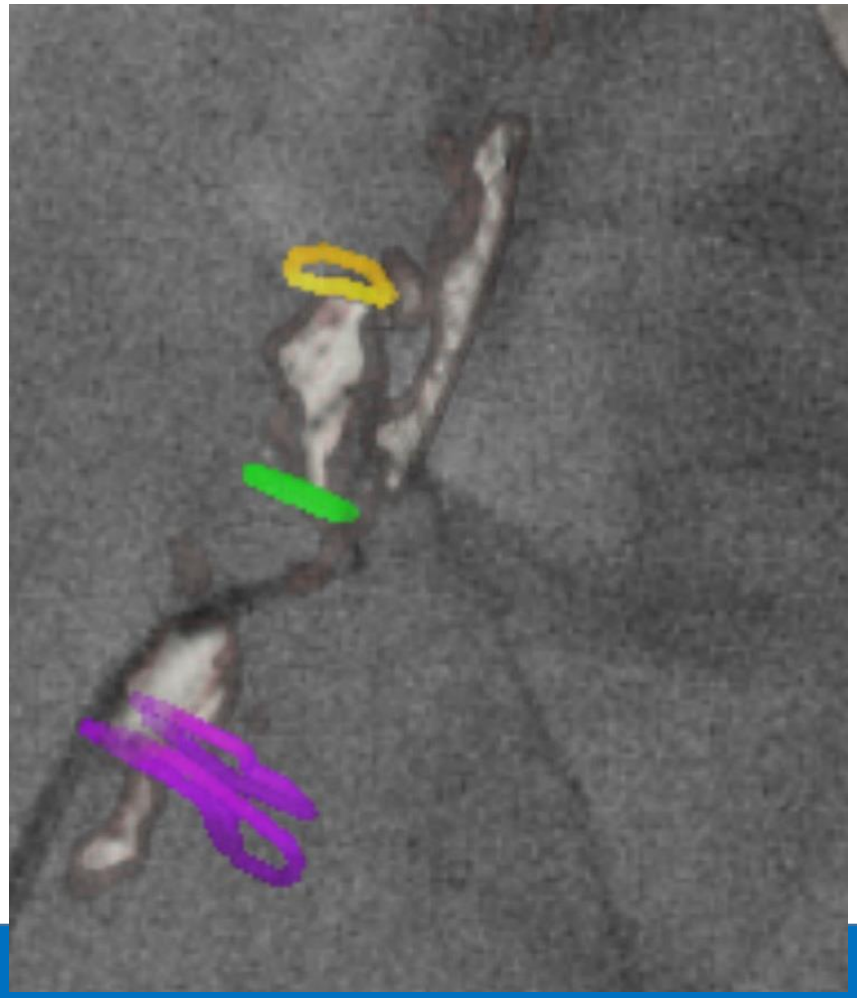
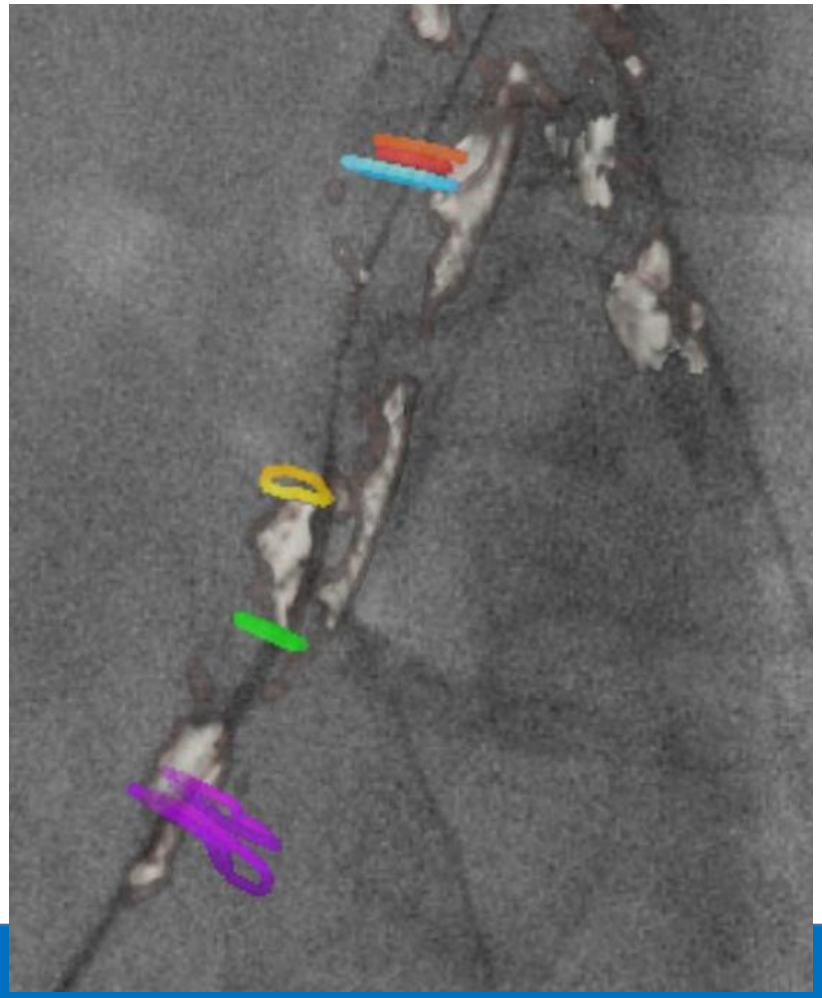
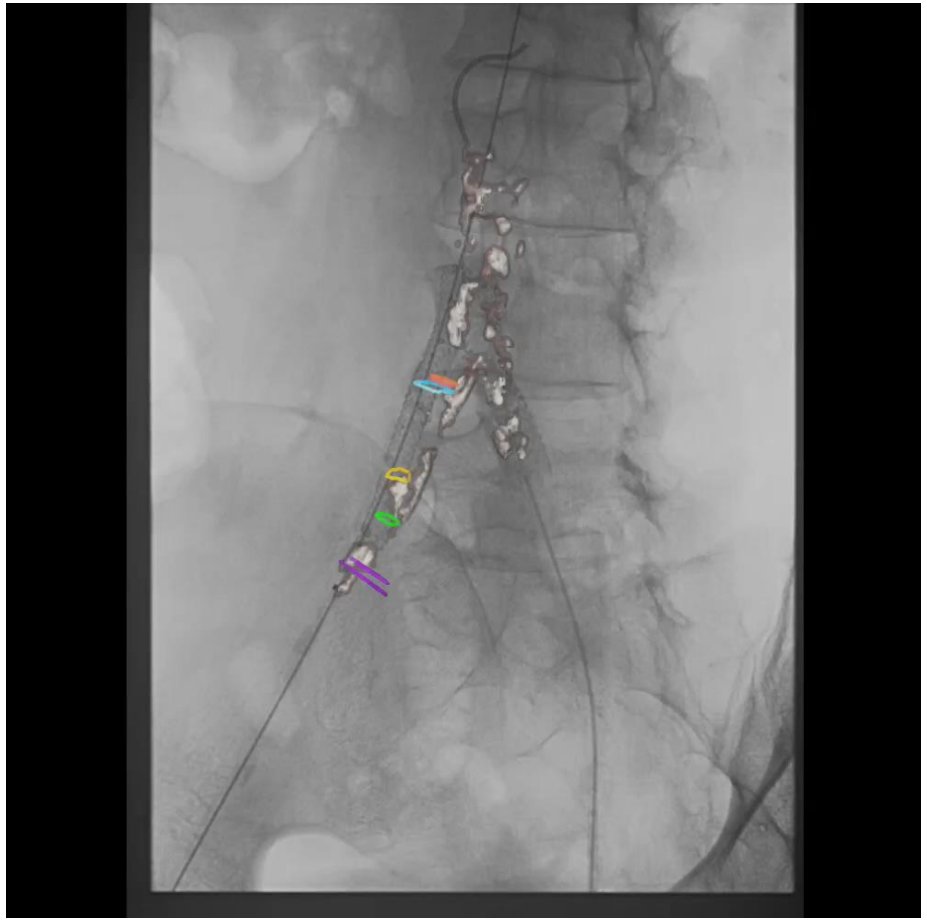






Planning circles and modelling calcification volume

Final Angiography



CONCLUSION

The *CTO with planning circles technique combined with the calcification modelisation:*

1. Allow most often to stay in the good lumen
2. Decrease the time of procedure
3. Decrease the radiation
4. Decrease the use of the re-entry devices (Economic cost-effectiveness)
5. Simplify the complex cases

THANK YOU

LOUIS Nicolas, Vascular Surgeon

Hôpital Privé les Franciscaines, Nîmes

France

I-MEET, NICE
JUNE 2018