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# Modélisation de l'écoulement au sein des anévrismes cérébraux suite au déploiement successif de stents

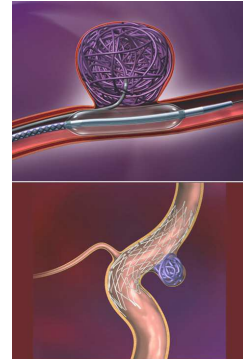
*Modeling flow inside intracranial aneurysms after flow diverting stent deployment for patient-specific surgery prediction*

## Context

### Intracranial aneurysms/ Treatments

Problem: Aneurysms if they rupture → terrible consequences for the patient

Treatment : endovascular stents and coils deployment → not always successful (incomplete thrombosis)



Aneurysmal treatment :  
stent + coils



Treatment failure  
(Aliseda et al., 2015)

### Patient – specific surgery prediction

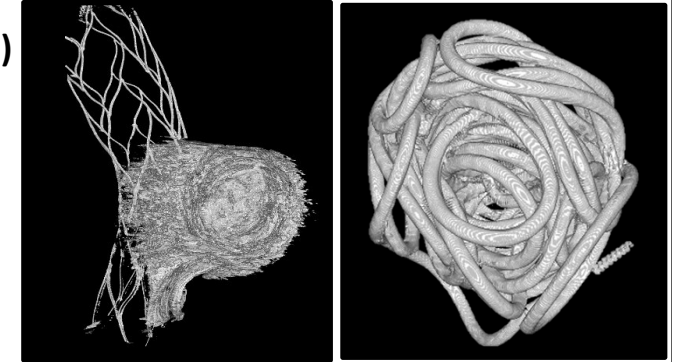
Modeling the effects of different treatments in an aneurysm for each patient -> To identify the best one.

Objective: to improve existing numerical model to describe de flow in cerebral aneurysms after treatment

## Method

### 1. To characterize the microstructure of stents (or coils) in cerebral aneurysms phantom using X-ray tomography

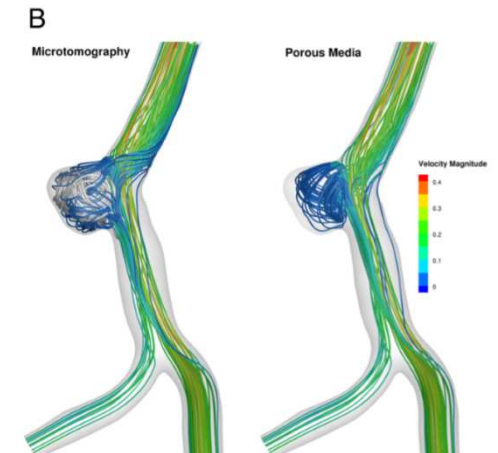
- Aneurysm phantom based on a patient-specific geometry reconstructed from 3D rotational angiographic images
- The treatments used in these models are the same that the ones in the actual patients



Images of the stent and coil obtained with synchrotron X-ray tomography

### 2. To propose an equivalent model allowing to describe to the flow through the stents (or coils) using the homogenization.

- Describing the stents and coils as a porous media (surface or volume) with a theoretical model.



Numerical simulation of blood flow in artery with an aneurysm: comparison of porous media model and real geometry of the coil (Levitt et al., 2016)

### 3. To study experimentally and numerically the blood flow inside the aneurysmal sac --> To validate the numerical model with in vitro model using particule image velocity (PIV)