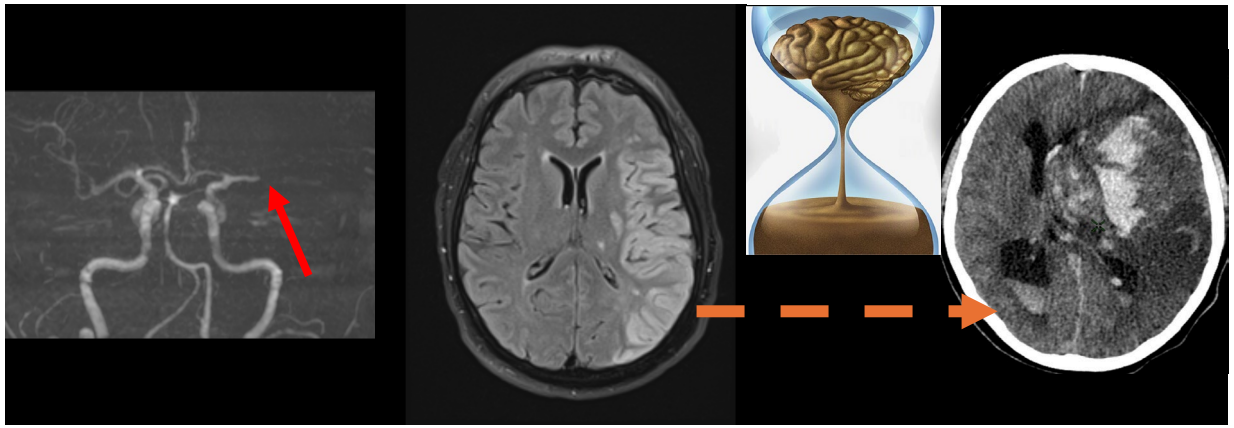
SFTH
SOCIÉTÉ FRANÇAISE DE THROMBOSE ET D'HÉMOSTASE
CONGRÈS DE LA SOCIETE FRANÇAISE DE THROMBOSE ET D'HÉMOSTASE
30 SEPT. 02 OCT. 2026

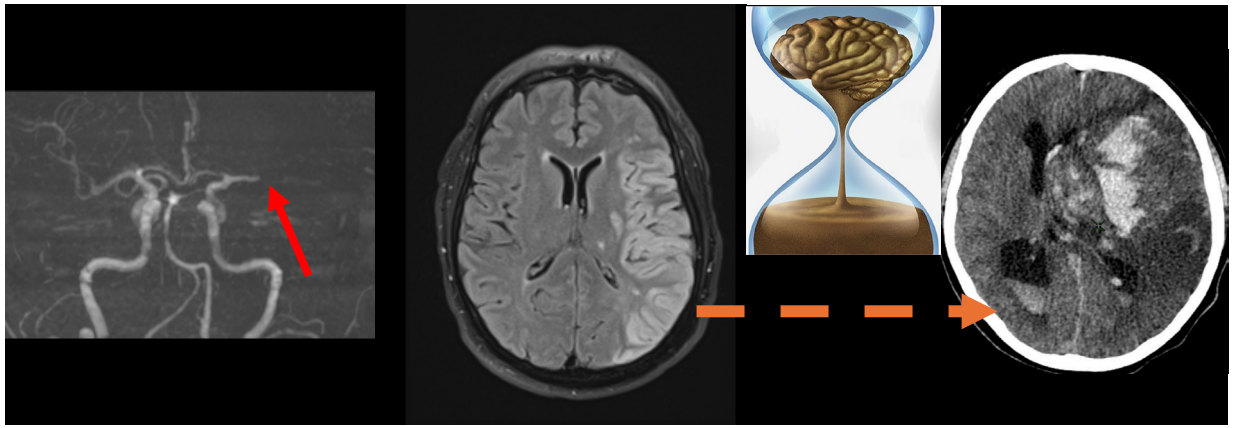
Composition des thrombi cérébraux et fibrinolyse: impact clinique

Emilie Doche, Marseille

Infarctus cérébral et traitements de recanalisation



Infarctus cérébral et traitements de recanalisation



Thrombolyse intraveineuse par rt-PA

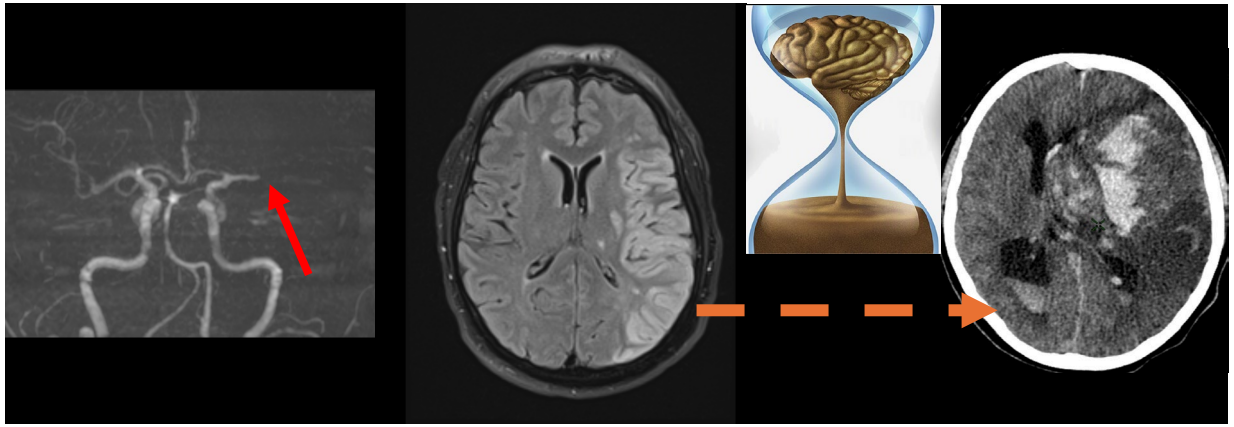




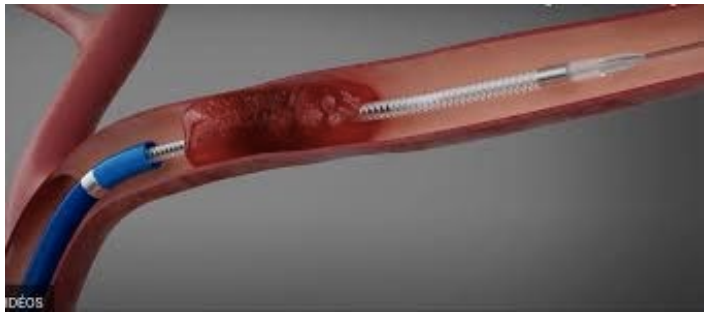
Taux de recanalisation post TIV

Broderick et al. NEJM. 2013.

Infarctus cérébral et traitements de recanalisation

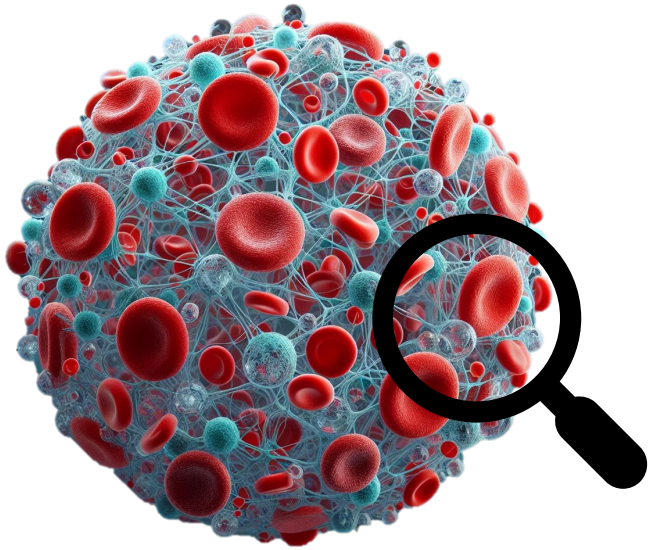


Thrombolyse intraveineuse par rt-PA



Thrombectomie mécanique





Taux de recanalisation post TIV

Broderick et al. NEJM. 2013.

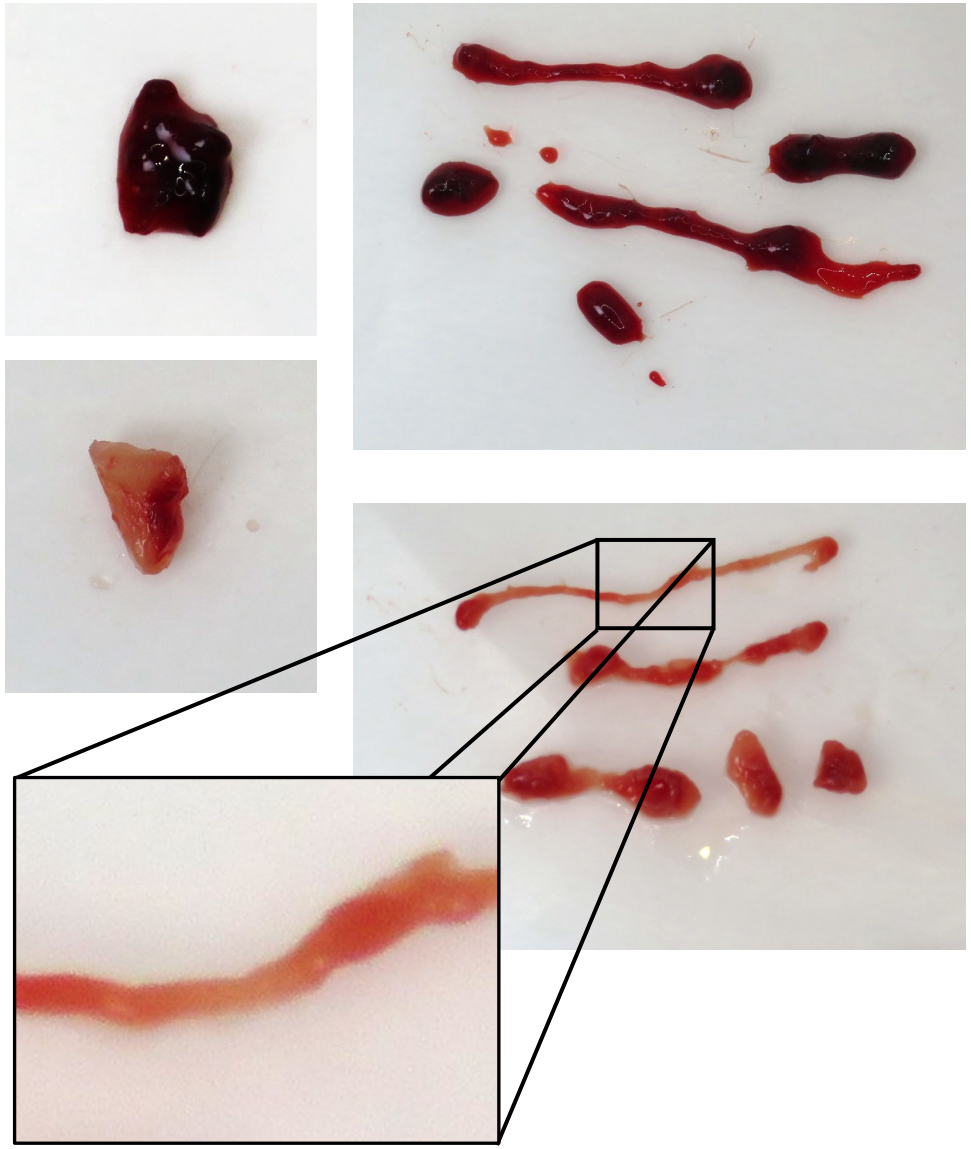
Hétérogénéité macroscopique des thrombi



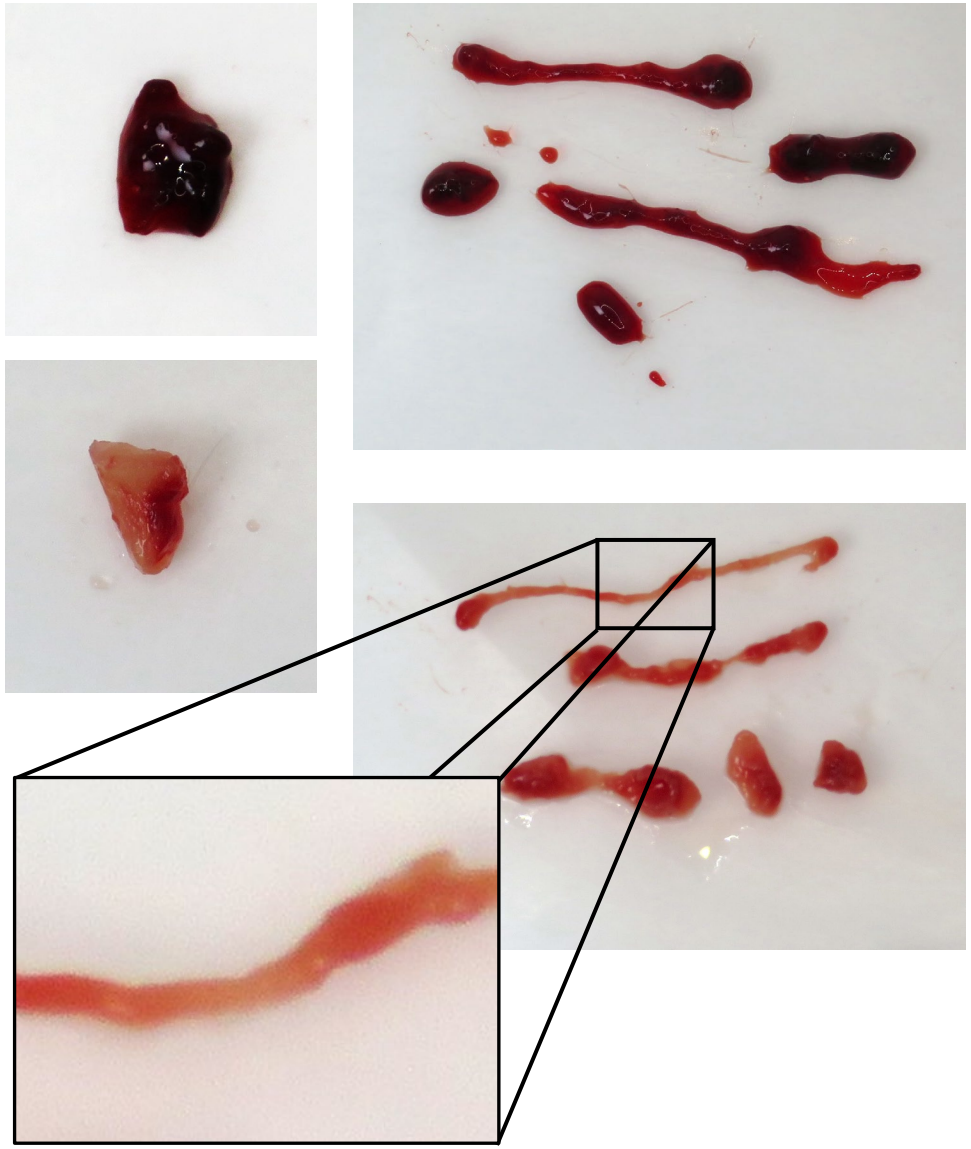




Hétérogénéité macroscopique des thrombi

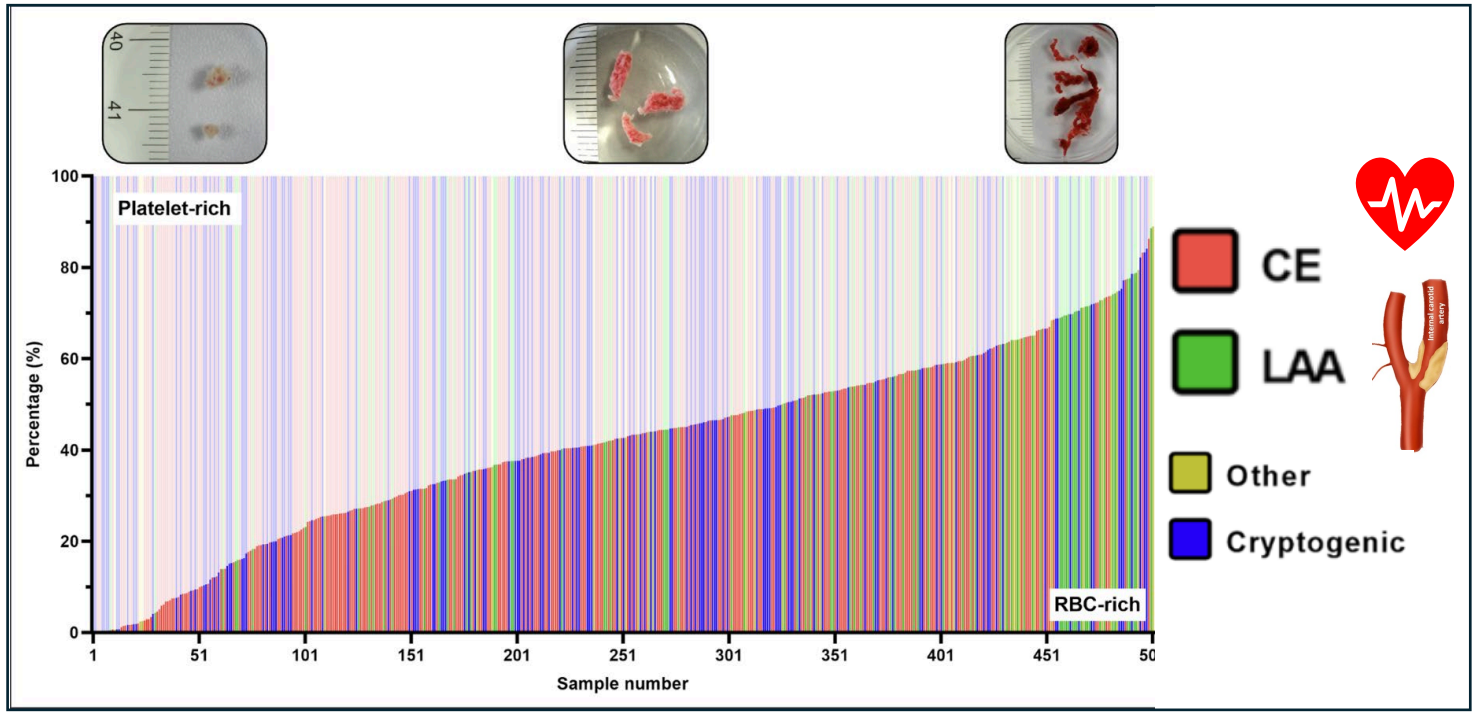


Hétérogénéité macroscopique des thrombi



Causes multiples

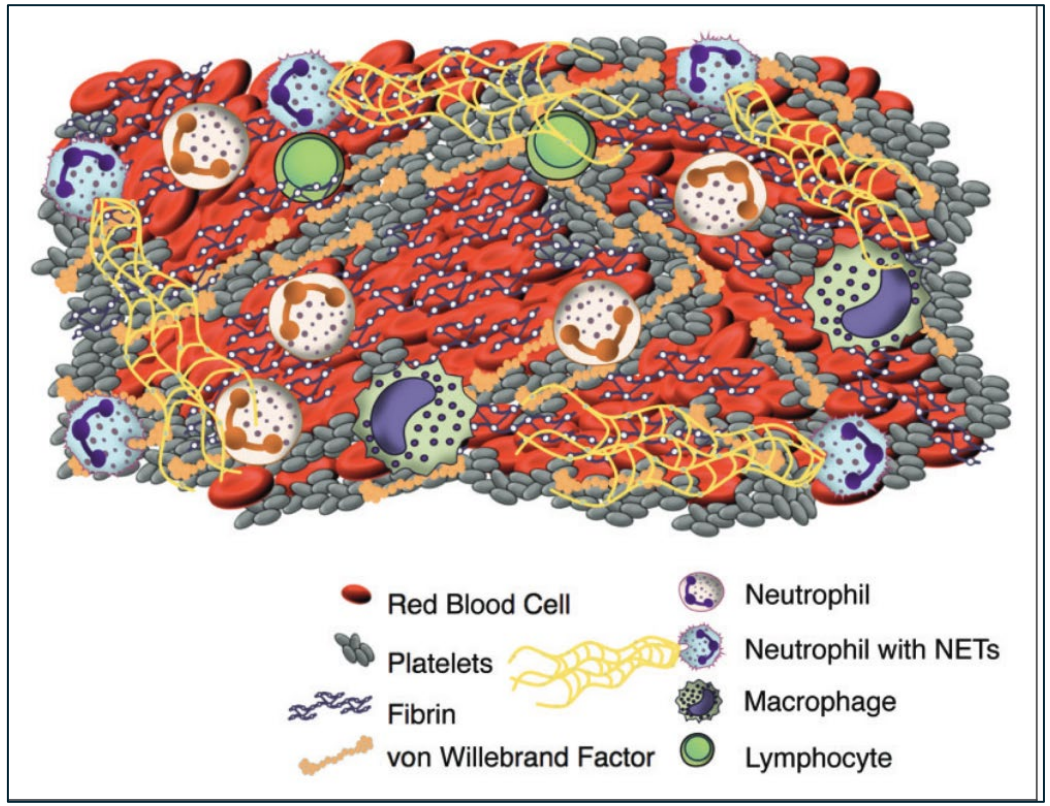
Origine? Conditions de formation?
Composition sanguine? Âge?



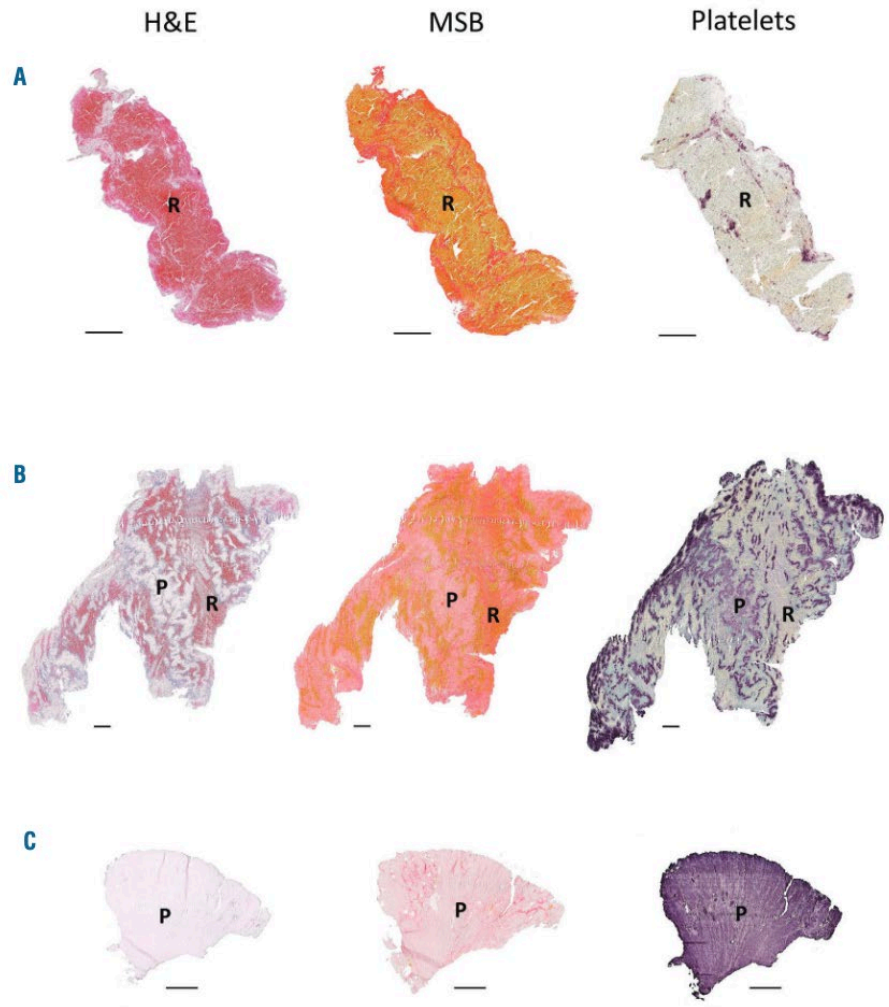
Staessens et al. Stroke 2025

Hétérogénéité de la composition histologique

Proportion variable entre les thrombi, selon la zone du thrombus

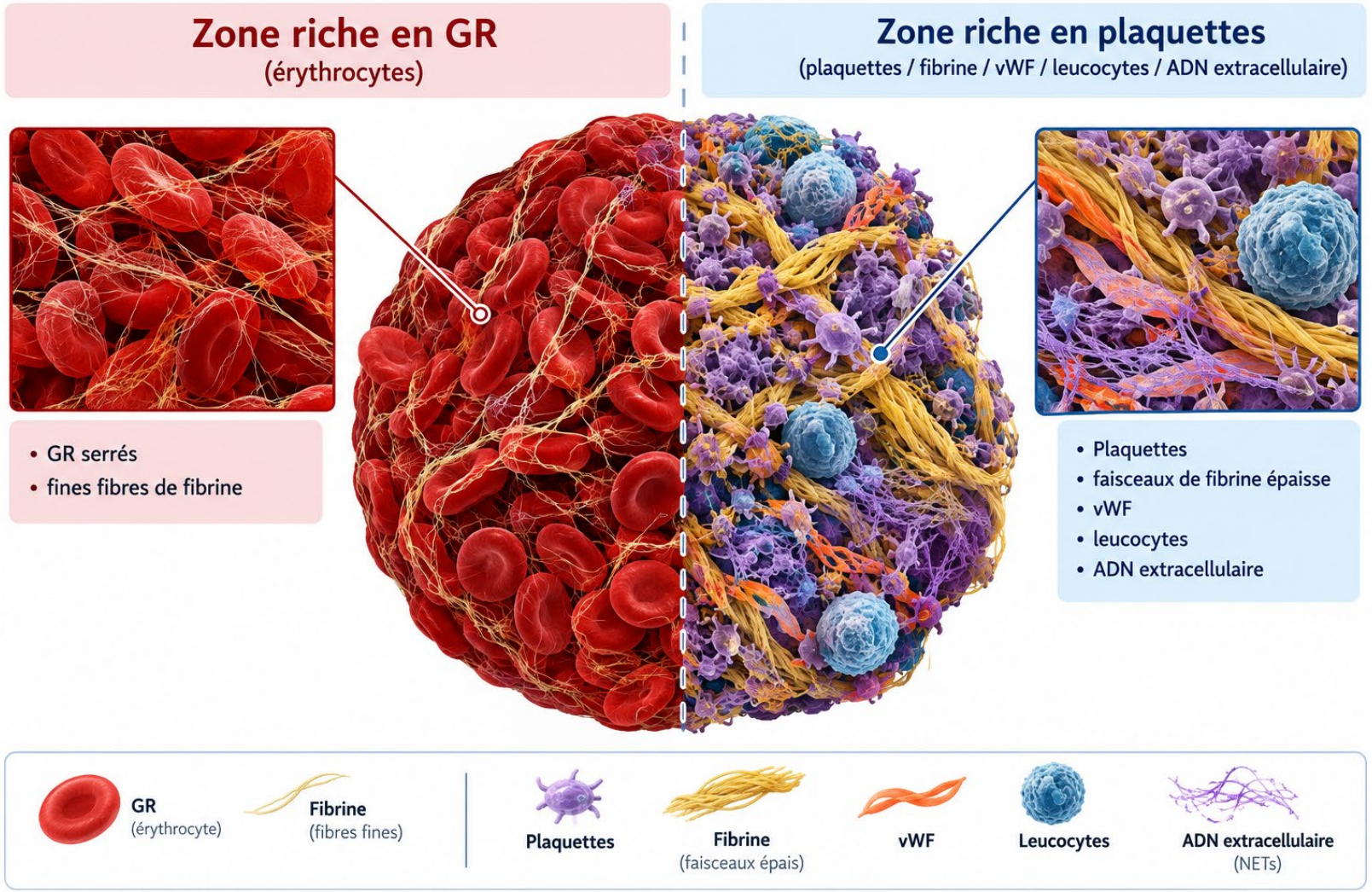


Bacigaluppi et al. JCBFM2019



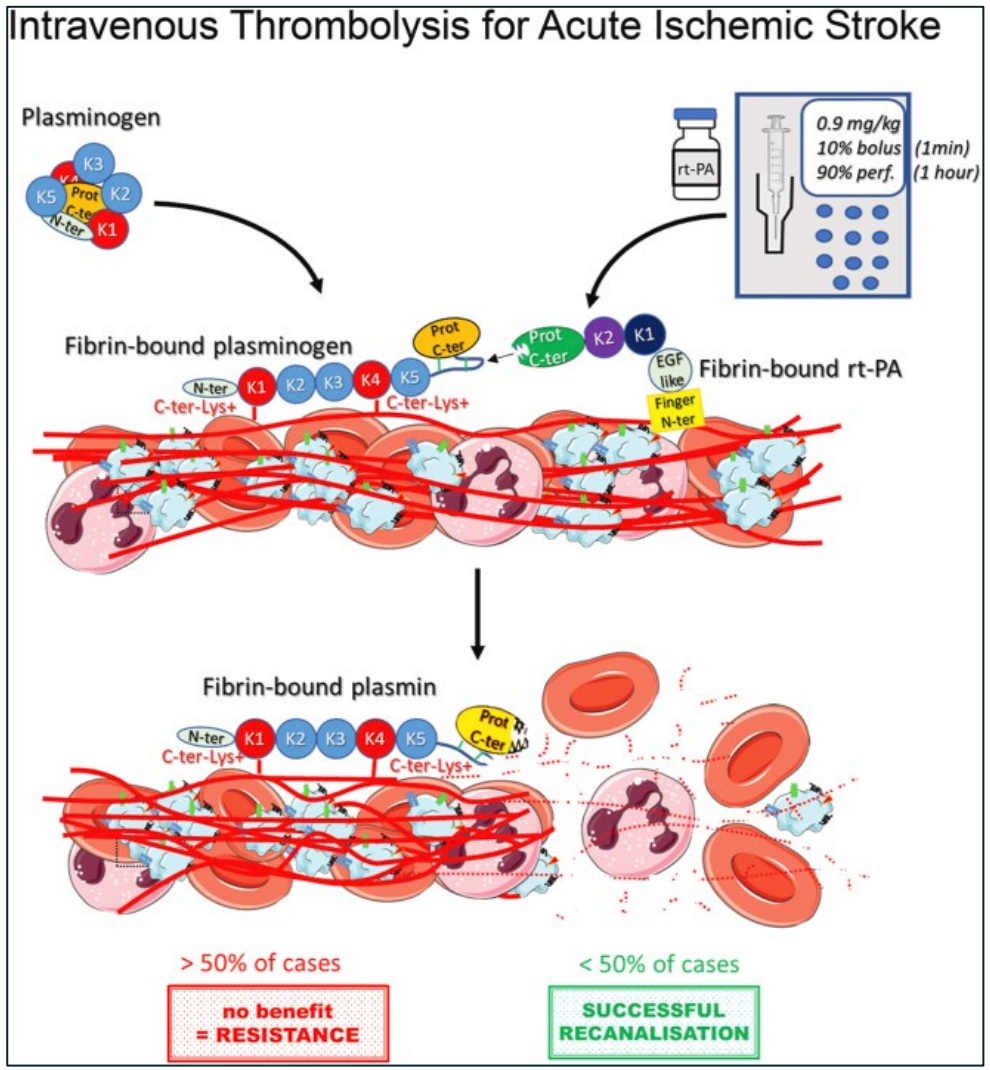
Staessens et al. Hematologica 2020

Hétérogénéité de la composition histologique

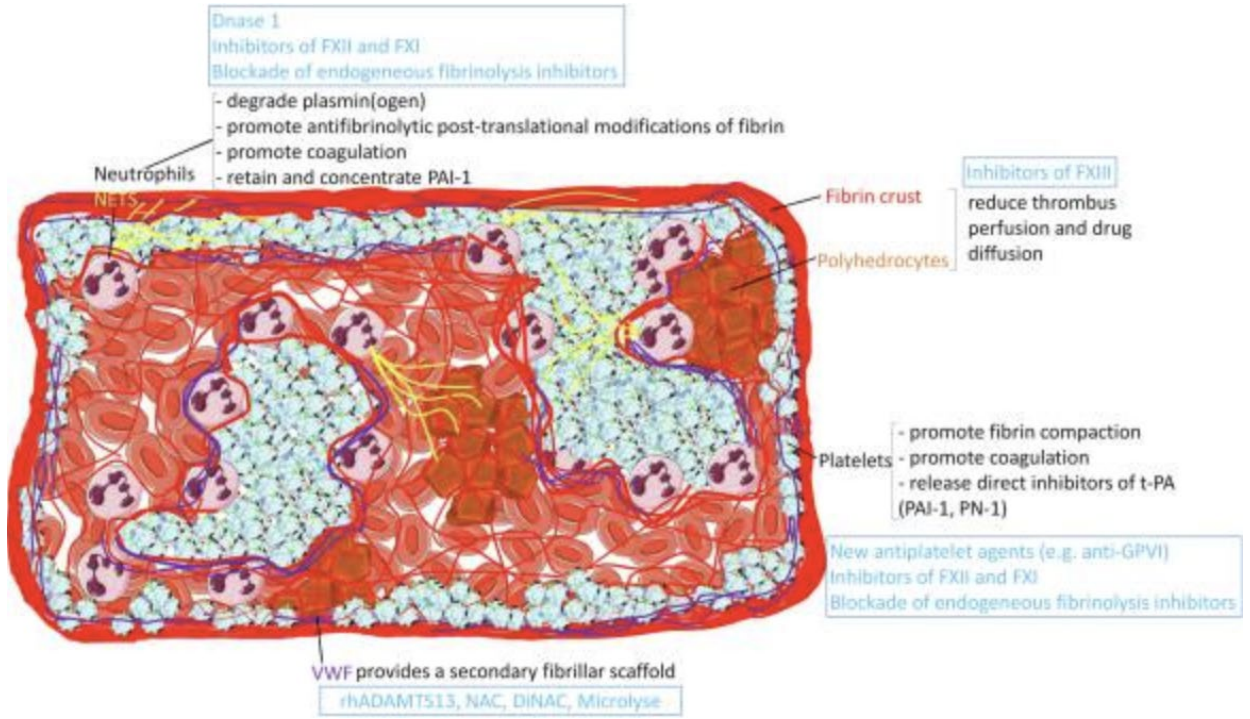


La fibrine au cœur de la thrombolyse



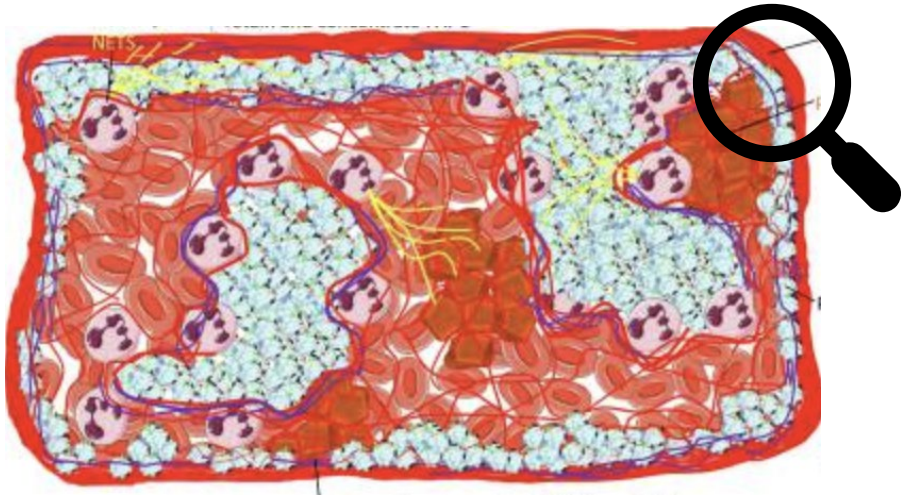


Mais 50% des thrombi sont résistants à la fibrinolyse

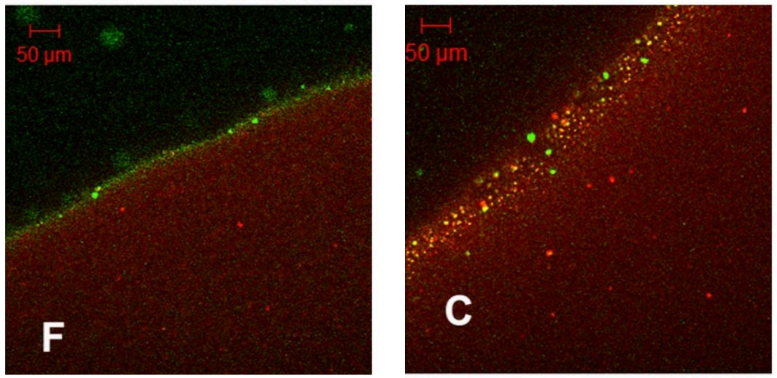


Ho-Tin-Noé et al. Res Pract Thromb Haemost 2023

Résistance à la fibrinolyse

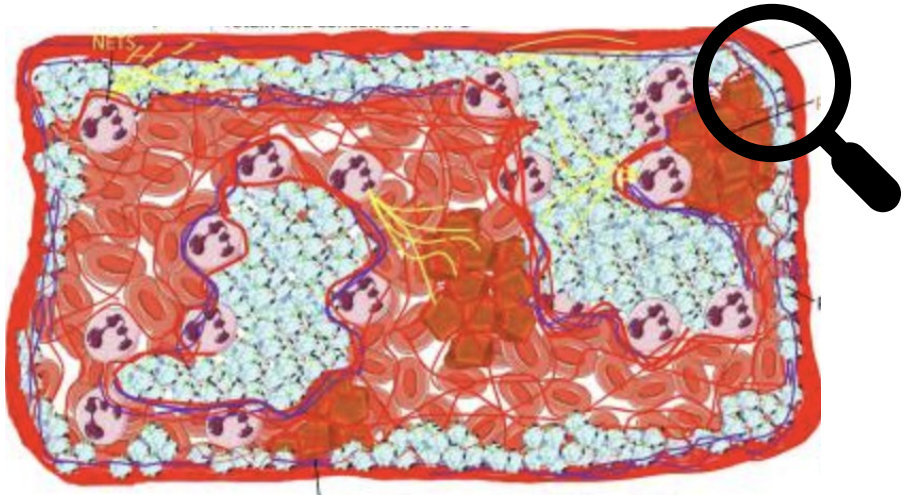


Pénétrabilité

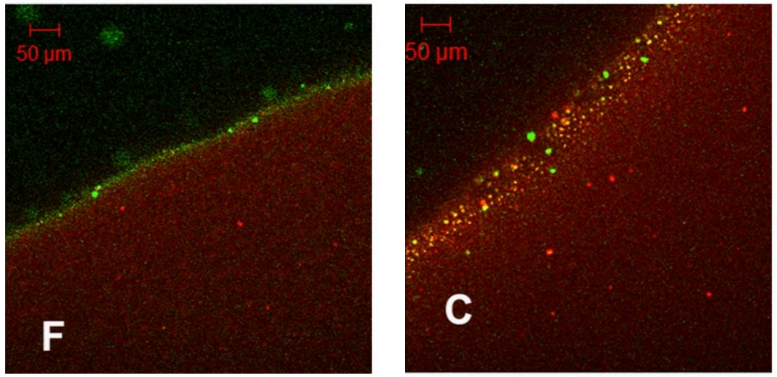


Longstaff et al. Blood 2011

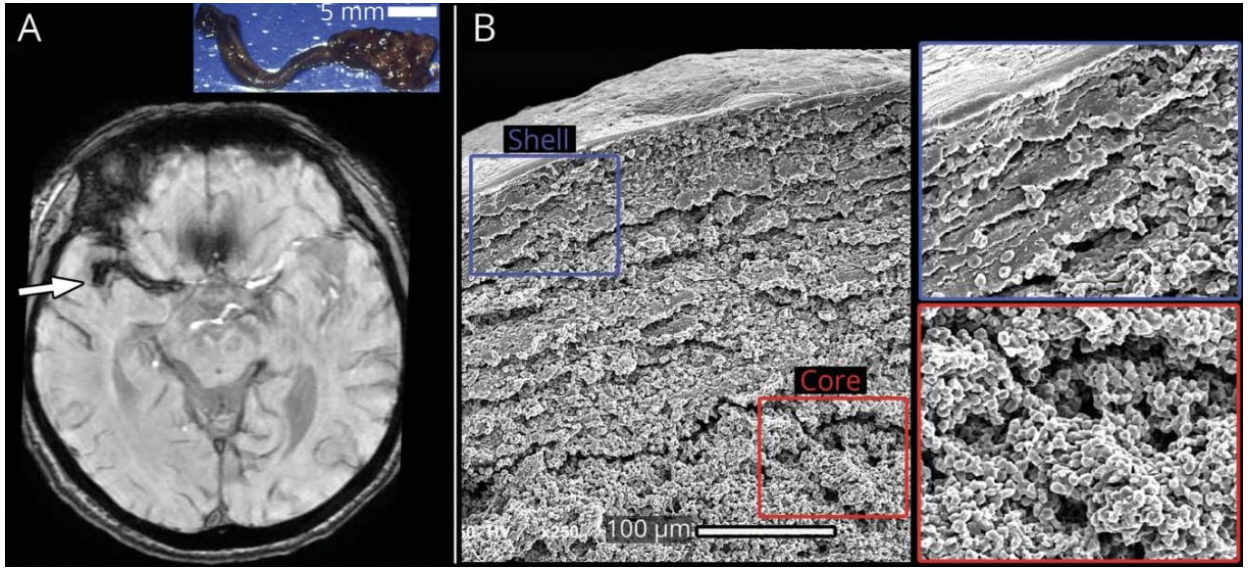
Résistance à la fibrinolyse



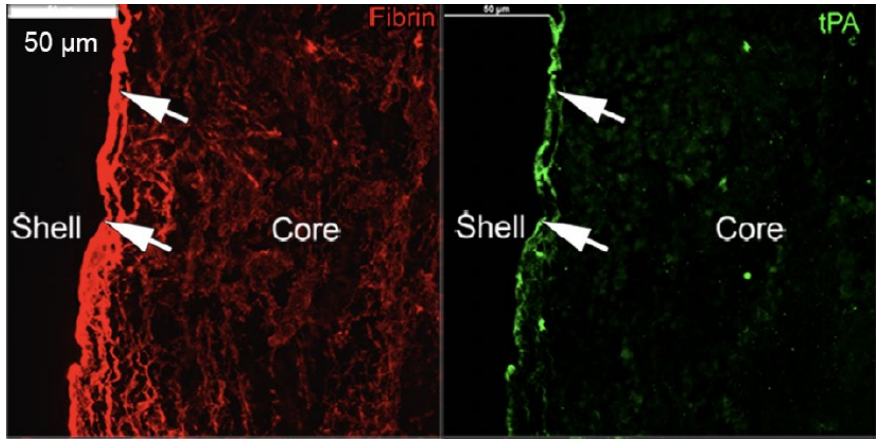
Pénétrabilité



Longstaff et al. Blood 2011

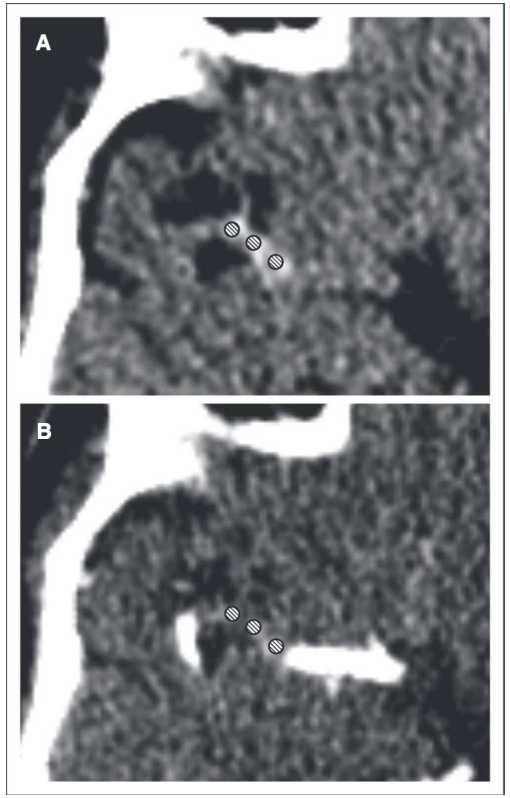


Di Meglio et al. Neurology 2018

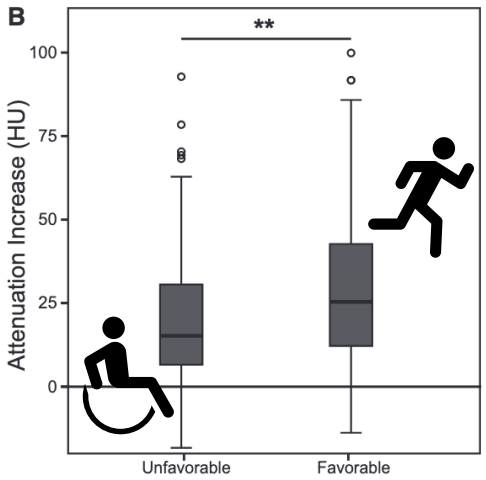


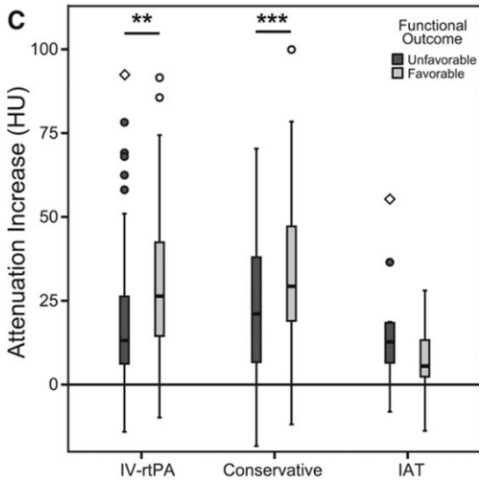
Solo Nomenjanahary et al. Ann Neurol 2026

Perméabilité du thrombus



Estimée par la pénétrabilité de l'agent de contraste

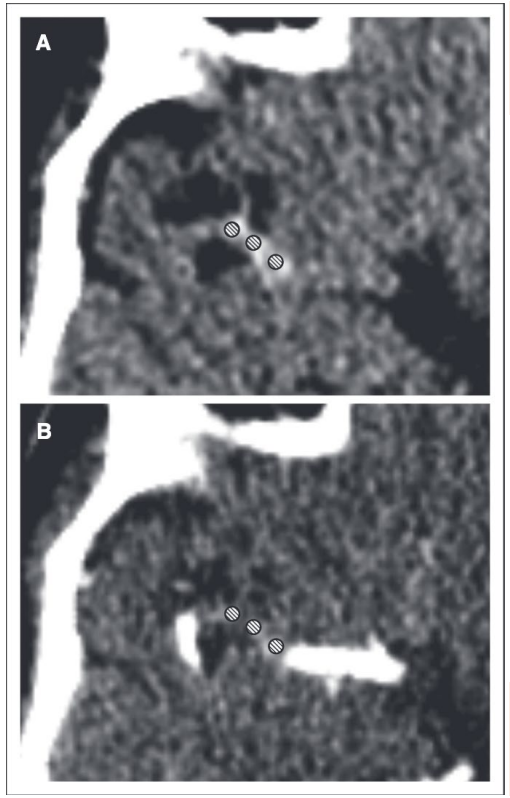




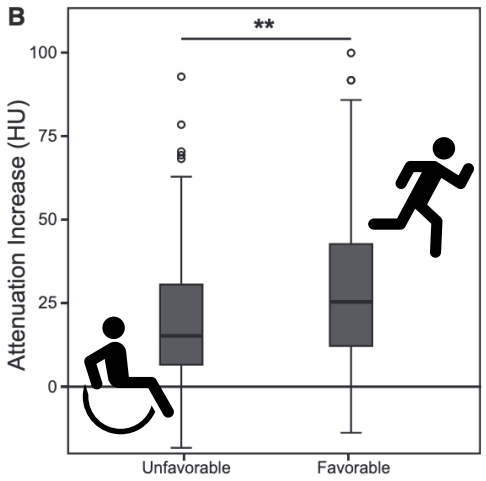
Est associée au pronostic clinique

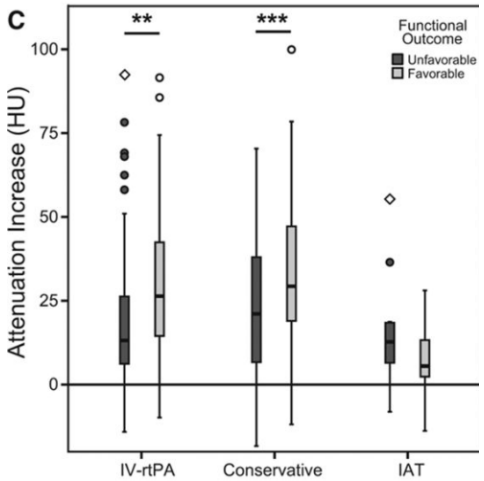
Santos et al. Stroke 2016

Perméabilité du thrombus



Estimée par la pénétrabilité de l'agent de contraste



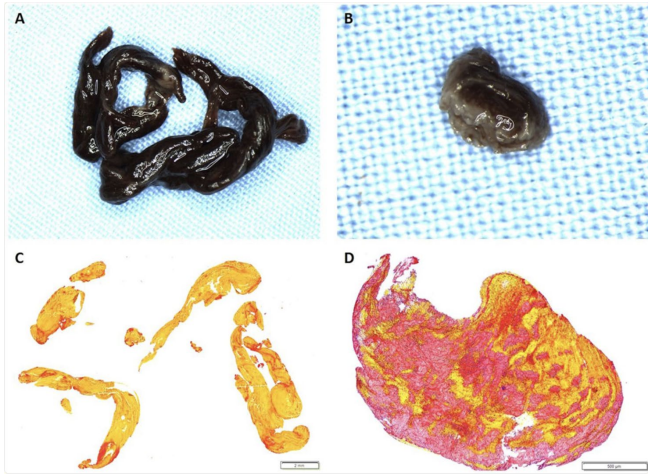


Est associée au pronostic clinique

Santos et al. Stroke 2016

Et à la composition

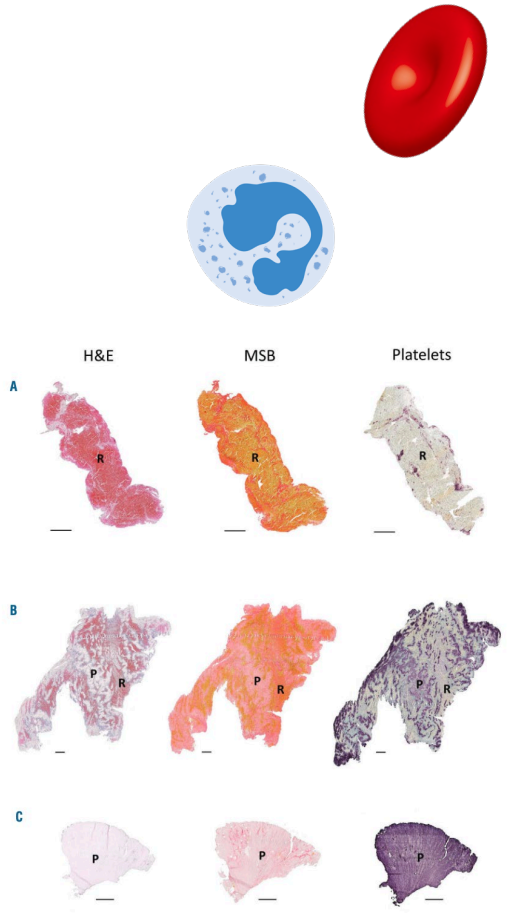
	Pervious clots (n, %)	Impervious clots (n, %)	p value
RBC-rich	23 (60.5%)	6 (31.6%)	0.04
WBC-rich	15 (39.5%)	14 (73.7%)	0.01
Fibrin-rich	15 (39.5%)	14 (73.7%)	0.01
Platelet rich	16 (42.1%)	13 (68.4%)	006



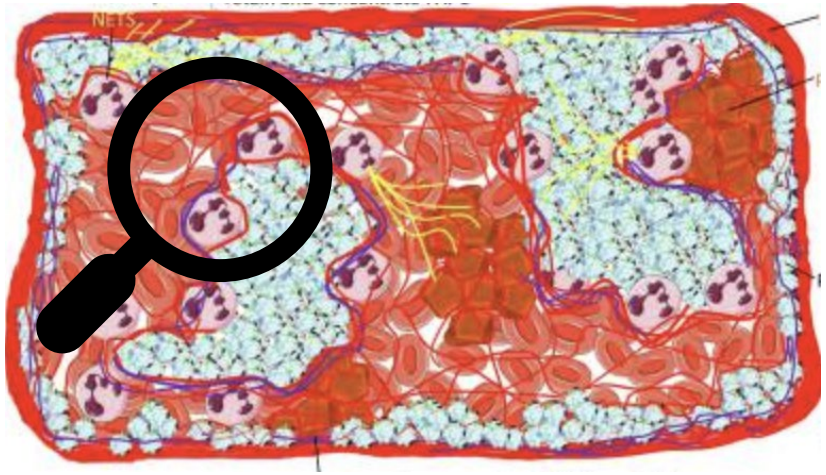
Benson et al. J Neurointerv Surg 2019

Résistance à la fibrinolyse

Composition



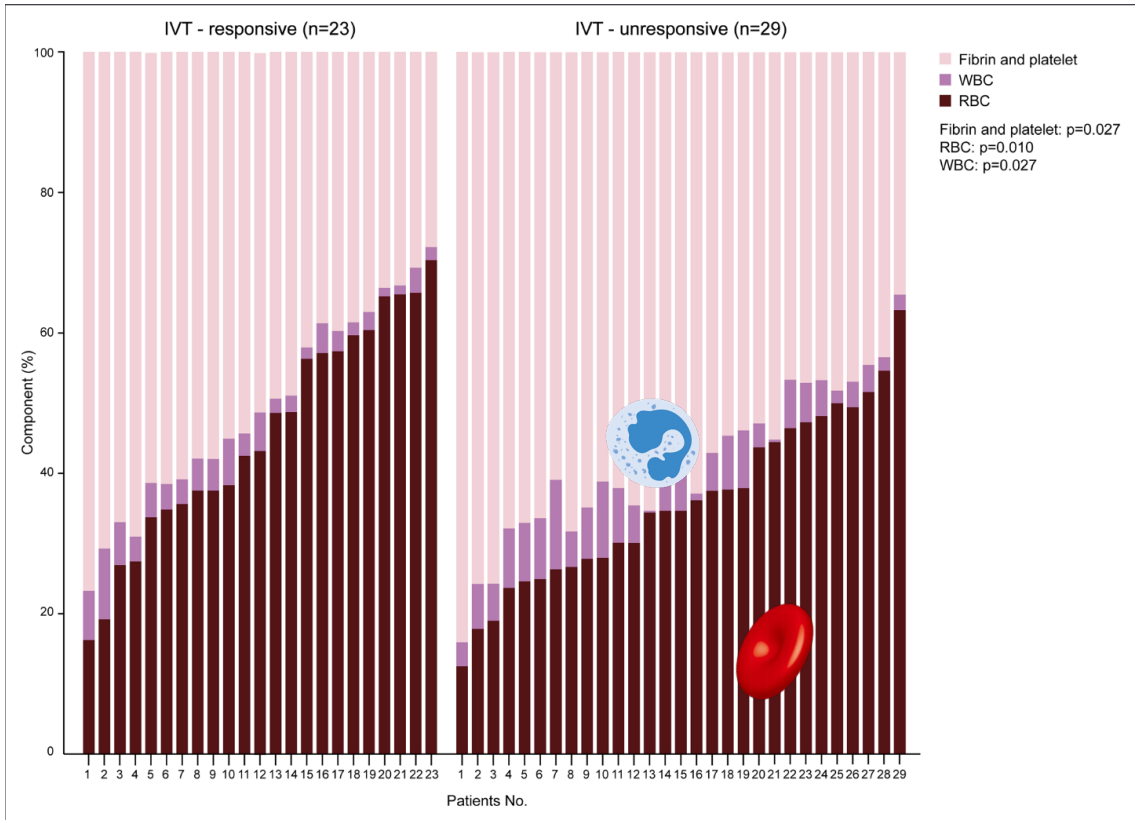
Pénétrabilité



Composition, imagerie et sensibilité à la TIV

Thrombi sensibles à la fibrinolyse plus « rouges »

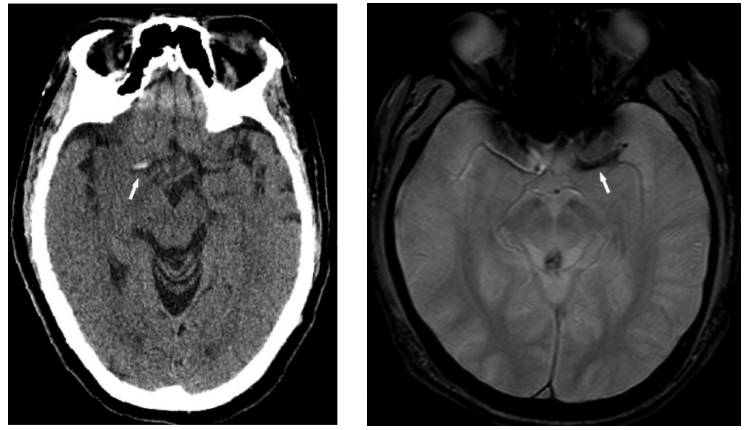
Réponse à la TIV évaluée par le Clot Burden Score



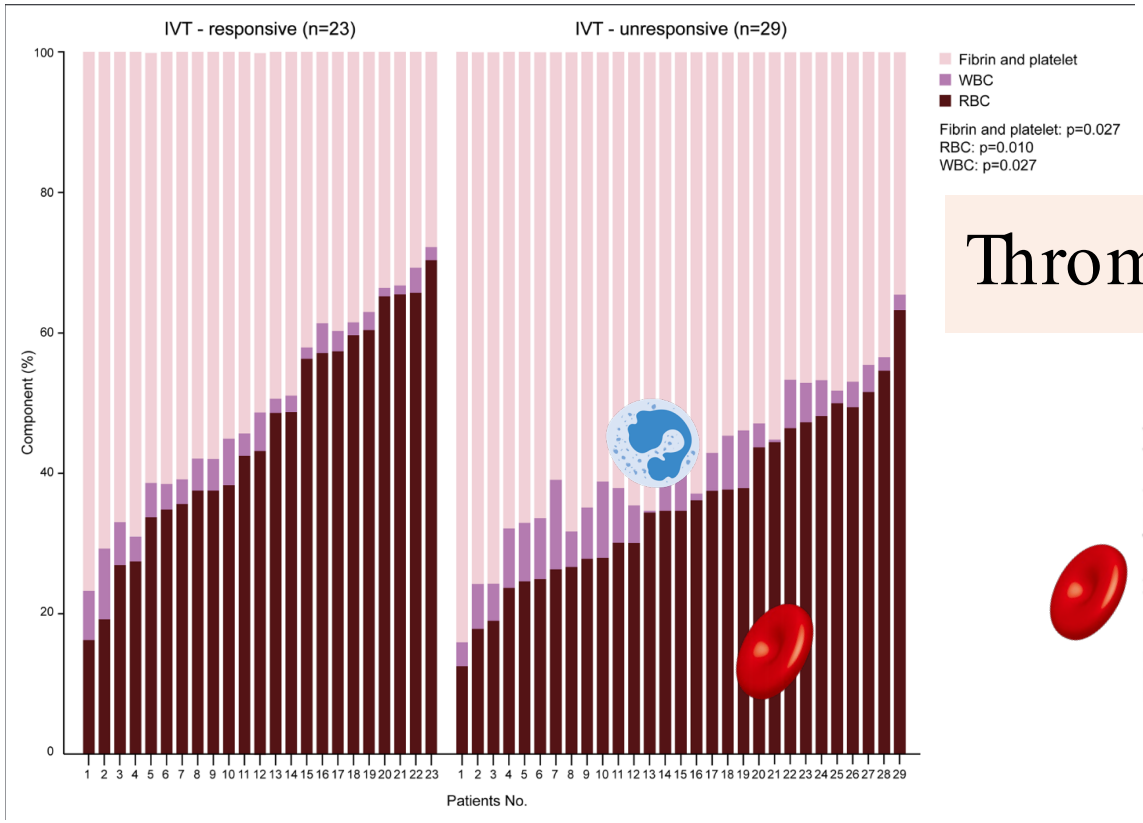
Choi et al. Stroke 2018

Composition, imagerie et sensibilité à la TIV

Thrombi sensibles à la fibrinolyse plus « rouges »

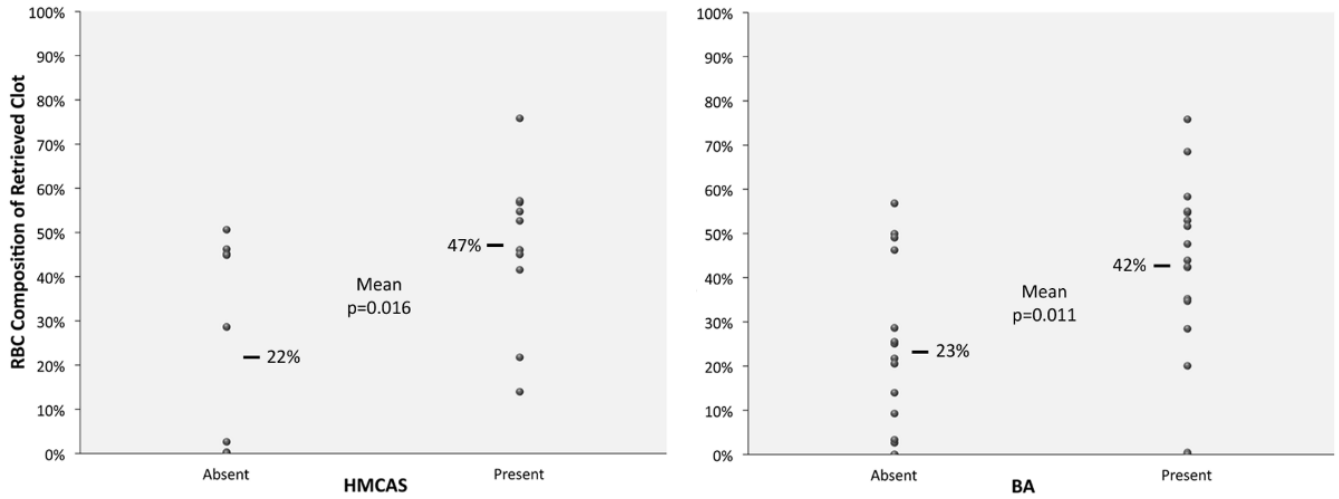


Réponse à la TIV évaluée par le Clot Burden Score



Choi et al. Stroke 2018

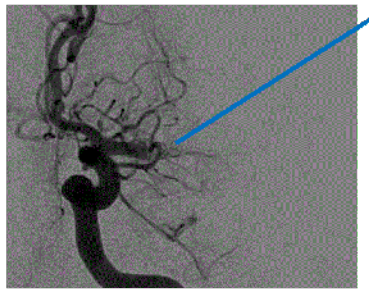
Thrombi plus « rouges » visibles sur l'imagerie



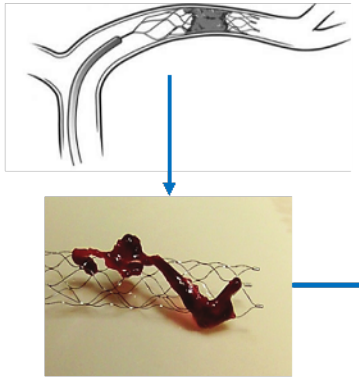
Liebeskind et al. Stroke 2011

Etude protéomique des thrombi et fibrinolyse

Infarctus cérébral par occlusion de grosse atère

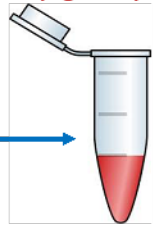


Thrombectomie mécanique

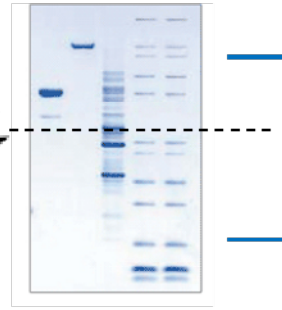


Thrombus Cérébral
n=104

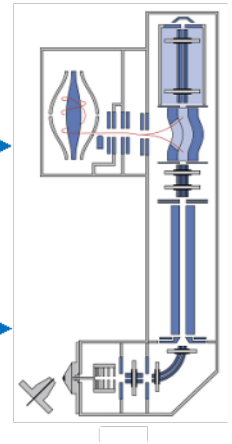
Solubilisation
Normalisation:
100 µg de protéines



Electrophorèse

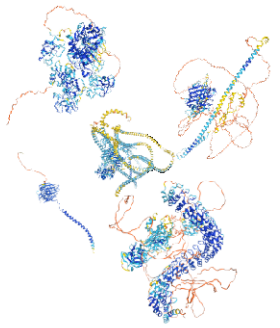


LC-MS/MS

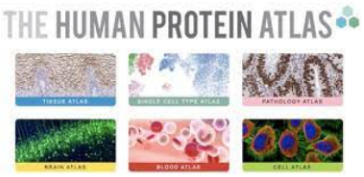




Proteome Discoverer
Sequest HT



Protéome





Annotation des protéines



Protéines de coagulation



Protéines des GR



Protéines des GB

Protéines des Plaquettes

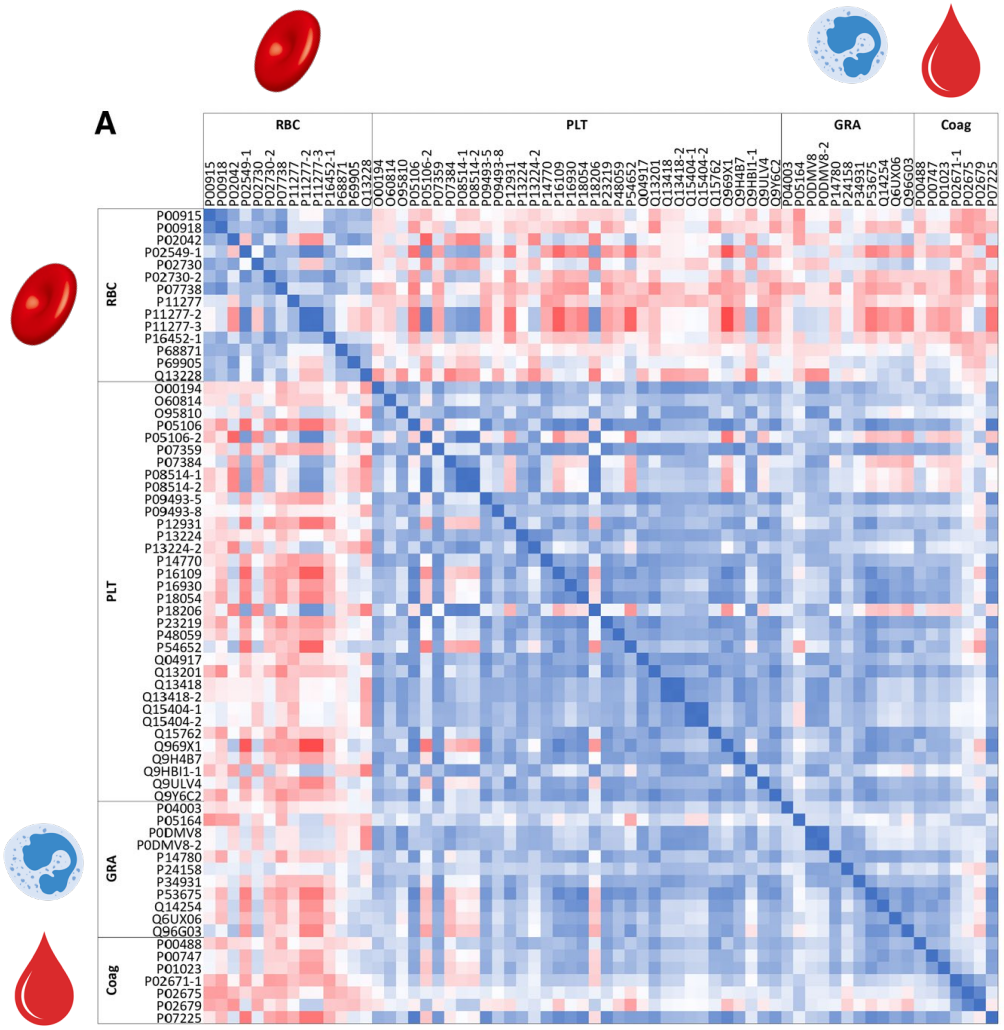
Doche et al. Stroke 2024

Protéome des thrombi

- 298 protéines identifiées
- 66 spécifiques d'un composant du thrombus

Plaquettes, globules blancs et protéines de la coagulation corrélées entre elles

et inversement corrélées aux globules rouges

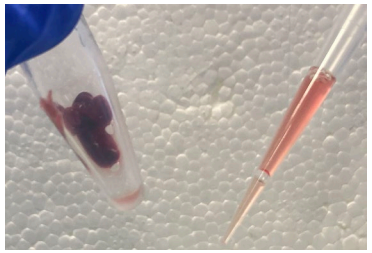


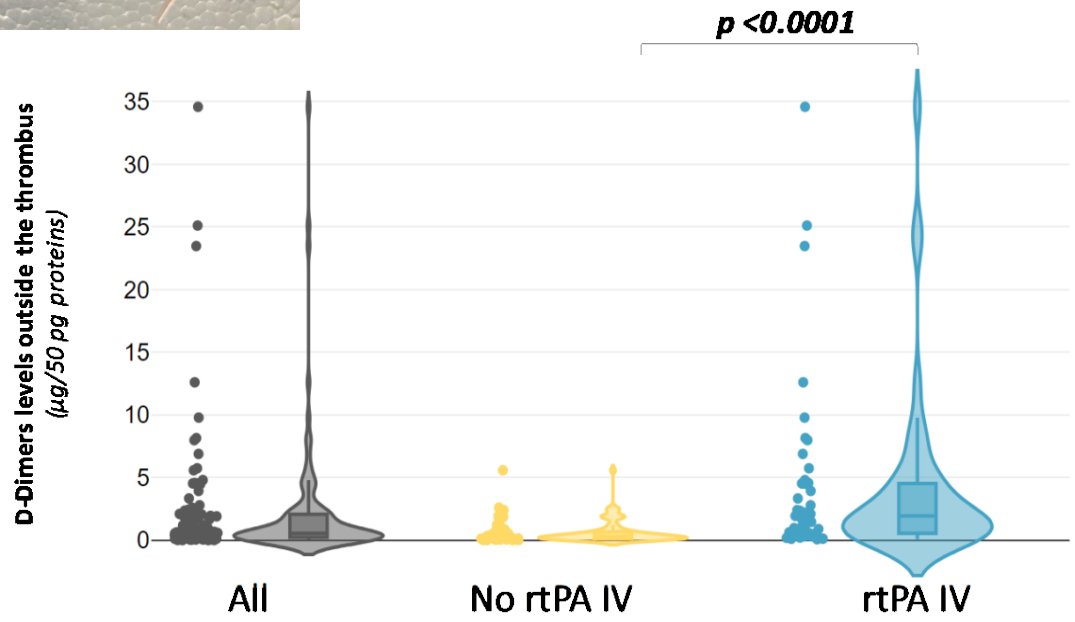
Matrice de corrélation (Pearson)

Evaluation de l'activité fibrinolytique

Al'extérieur du thrombus

Dosage des D-Dimères dans l'eau de rinçage

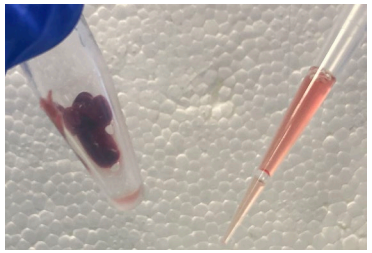


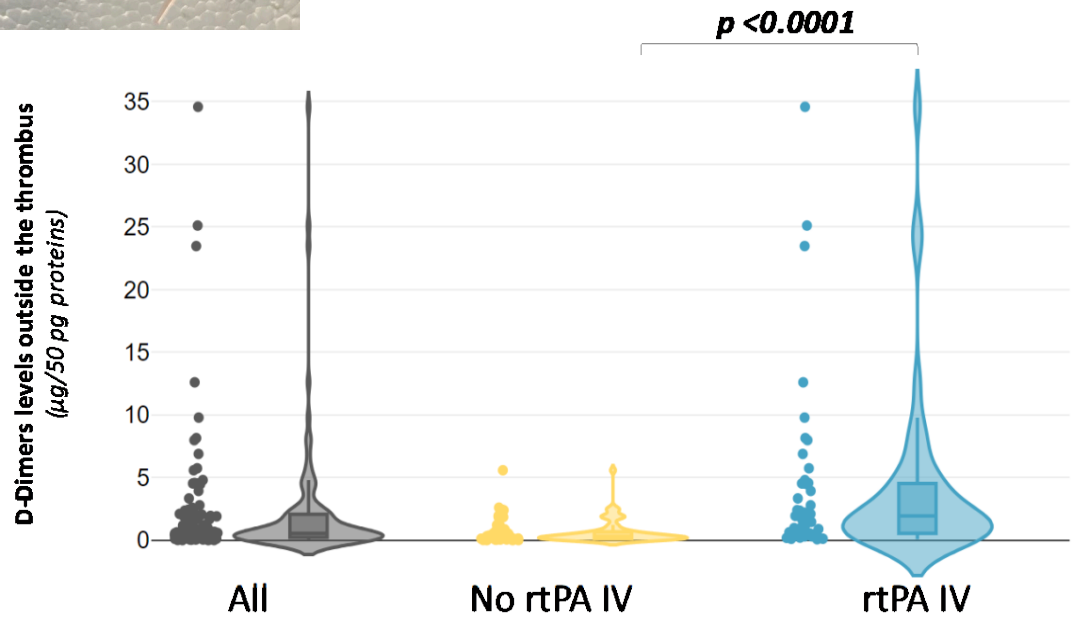


Evaluation de l'activité fibrinolytique

À l'extérieur du thrombus

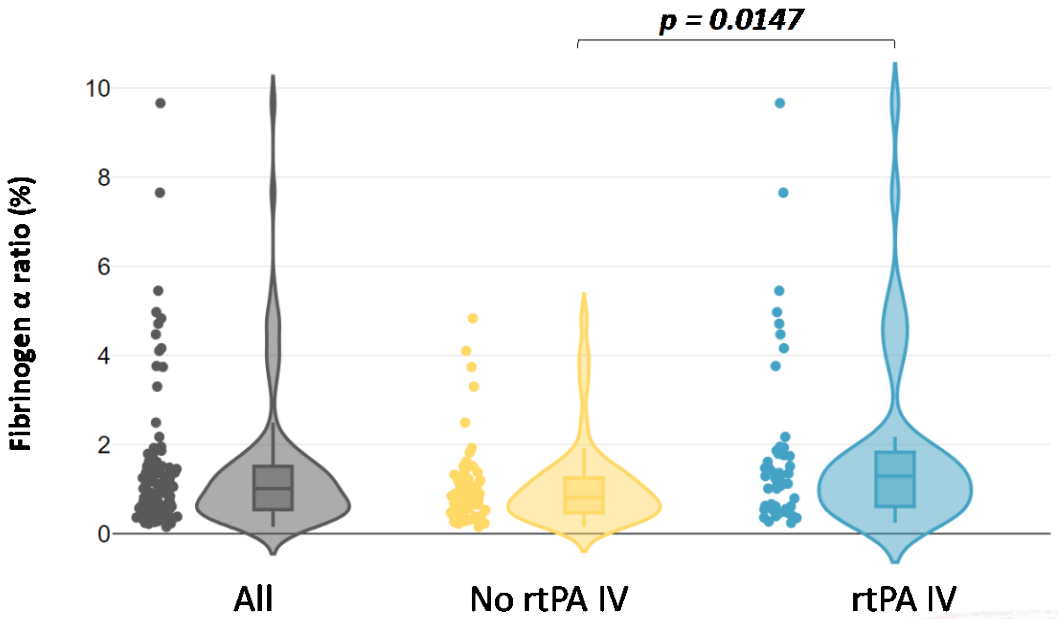
Dosage des D-Dimères dans l'eau de rinçage





À l'intérieur du thrombus

Ratio formes dégradées et entières de fibrinogène

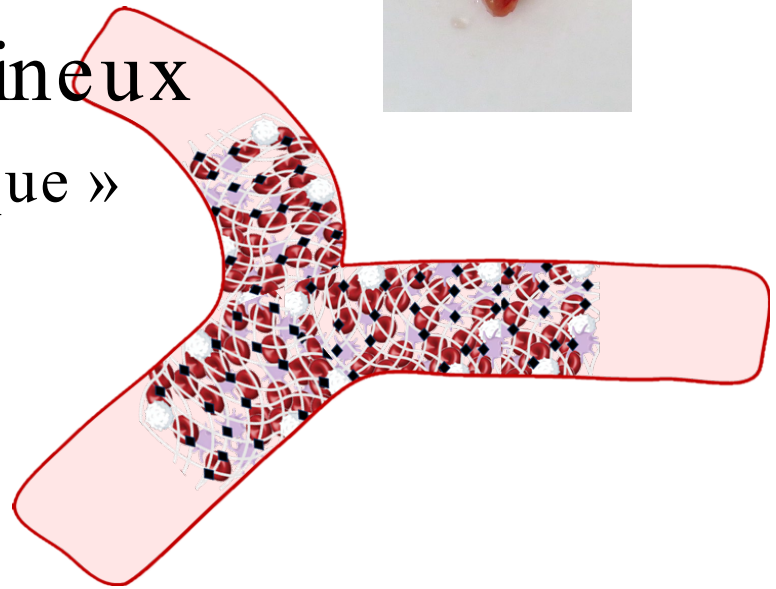


Liens entre composition protéique et fibrinolyse

Thrombi fibrineux

«cardio-embolique »





(r)t-PA

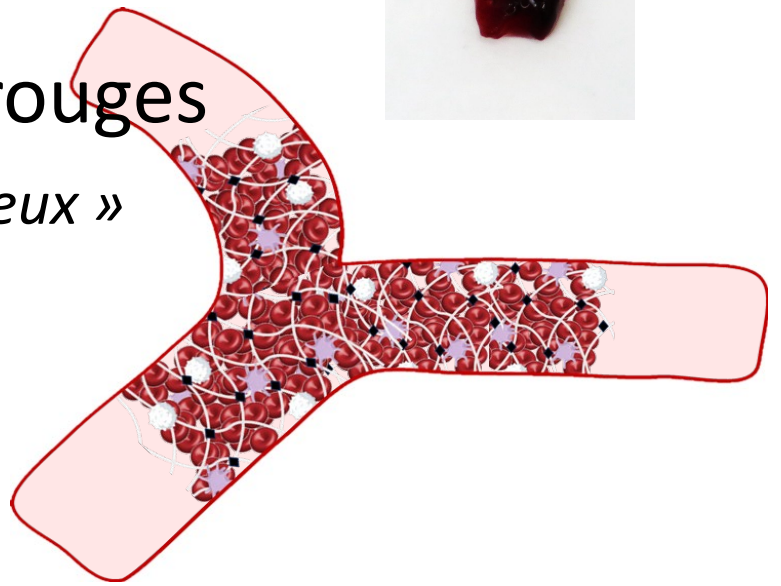
↑ Fibrinolyse à l'extérieur

↓ Fibrinolyse à l'intérieur

Thrombi rouges

« athéromateux »

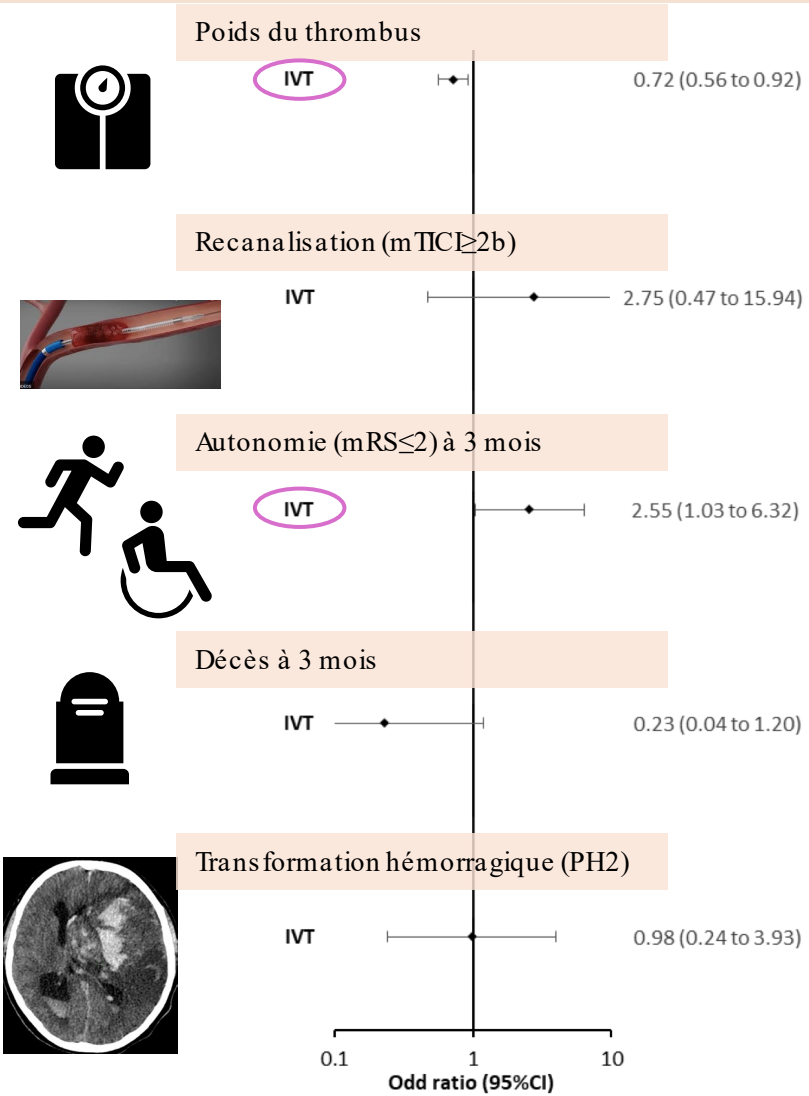




↓ Fibrinolyse à l'extérieur

↑ Fibrinolyse à l'intérieur

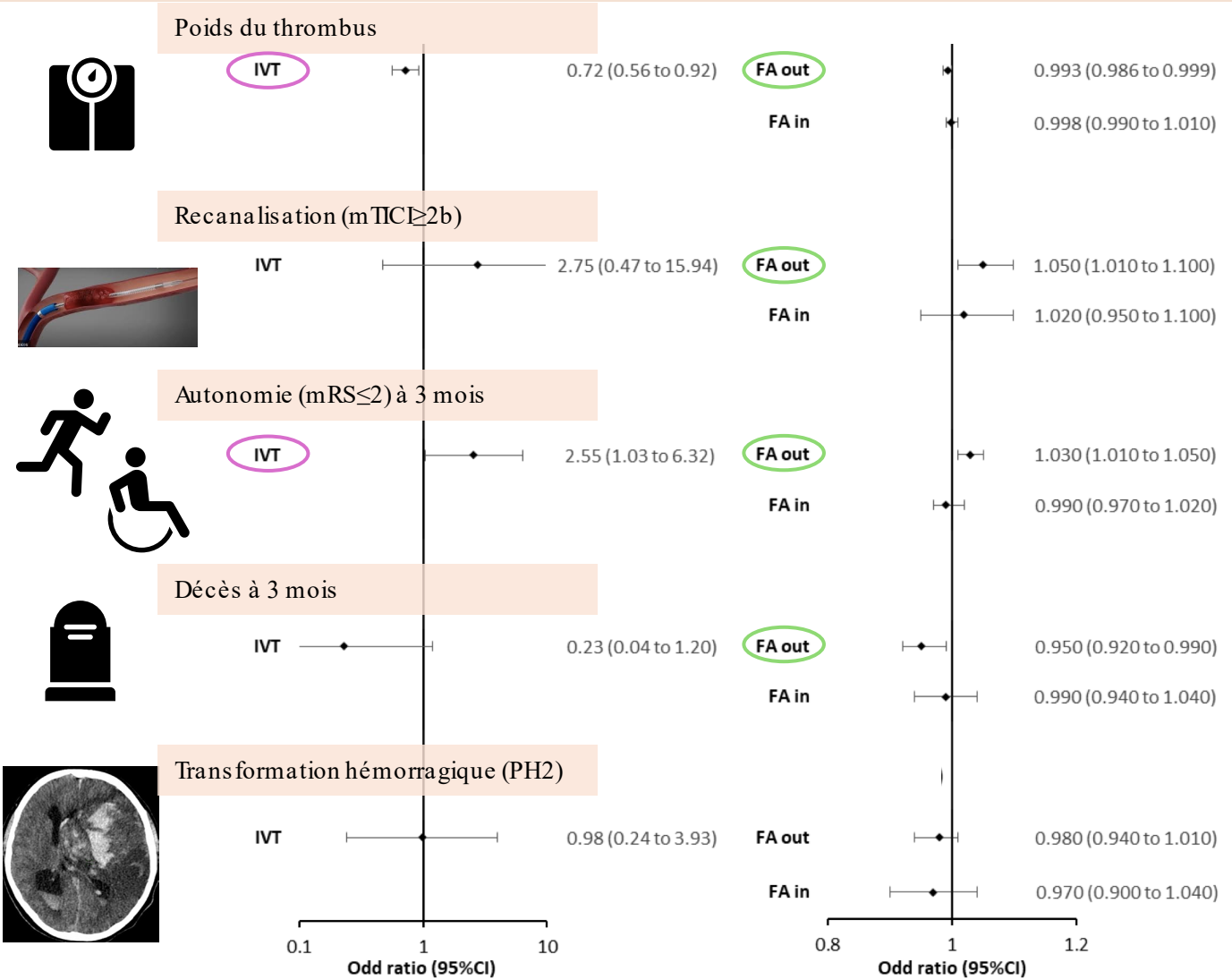
Impact clinique



Facteurs explicatifs du pronostic clinique en régression logistique

Doche et al. Stroke 2024

Impact clinique



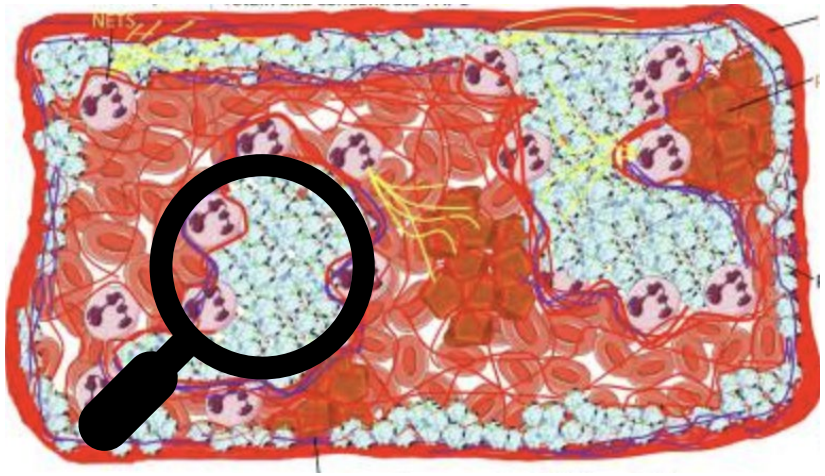
Seule l'activité fibrinolytique à l'extérieur du thrombus améliore le pronostic clinique

Facteurs explicatifs du pronostic clinique en régression logistique

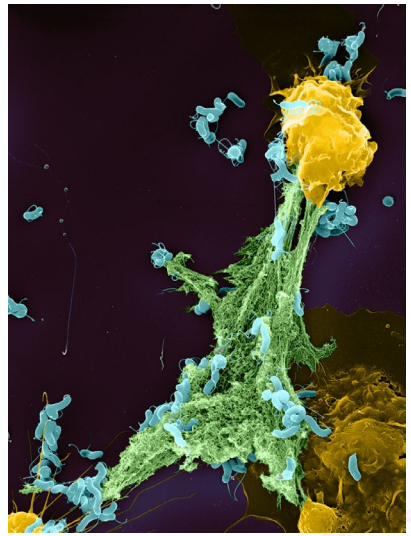
Doche et al. Stroke 2024

Résistance à la fibrinolyse

Composition



Pénétrabilité

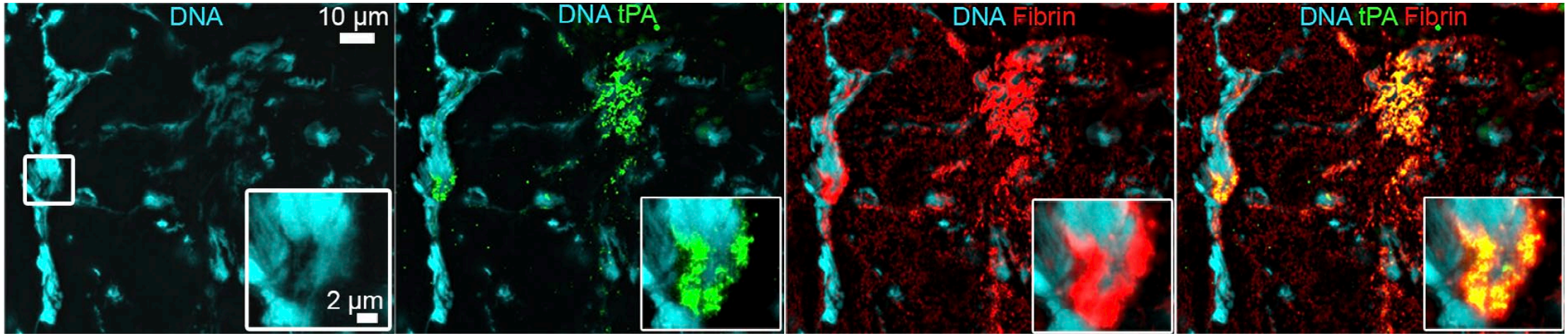


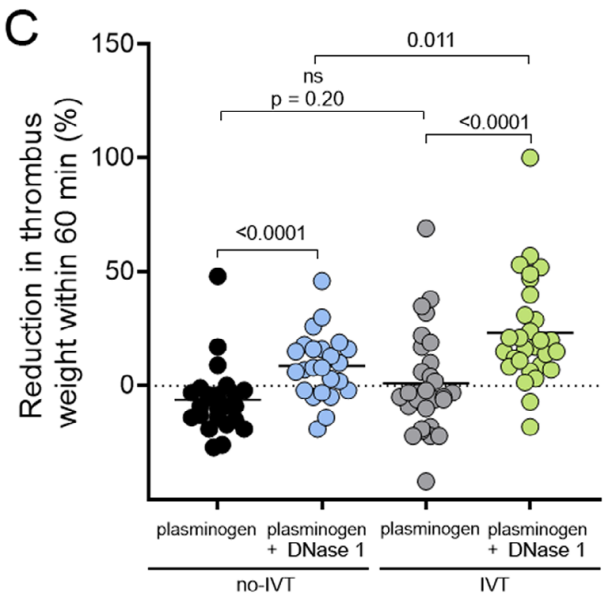
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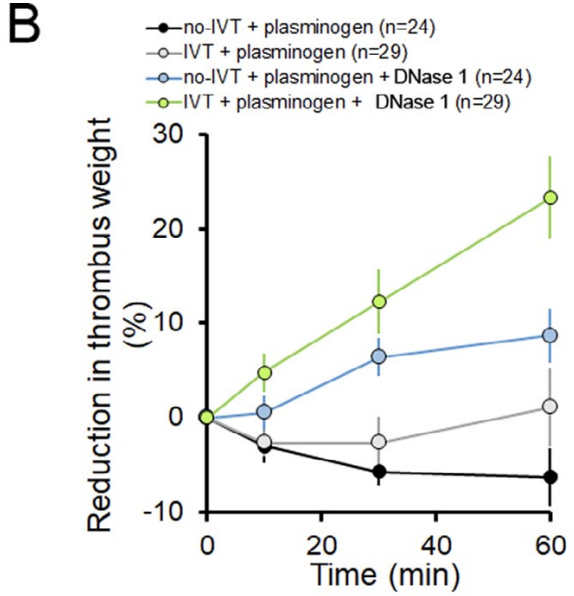
Anti-Fibrinolytique

PAI-1

NETs







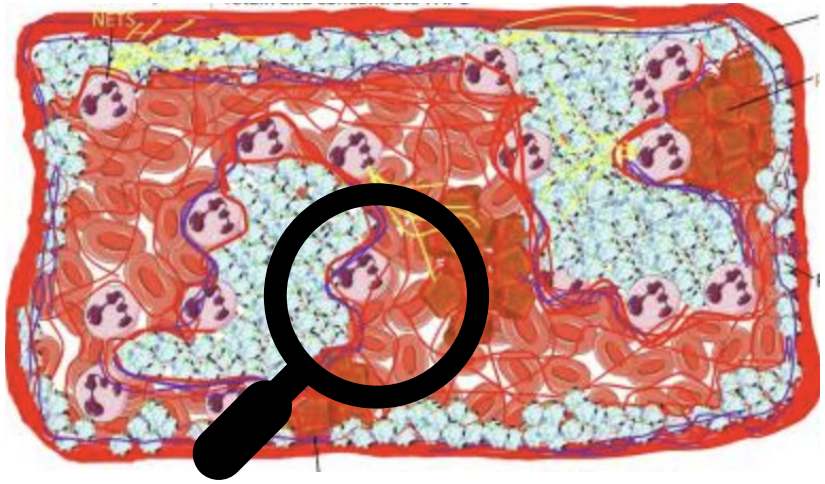
Diminuent la disponibilité du t-PA

Solo Nomenjanahary et al. Ann Neurol 2026

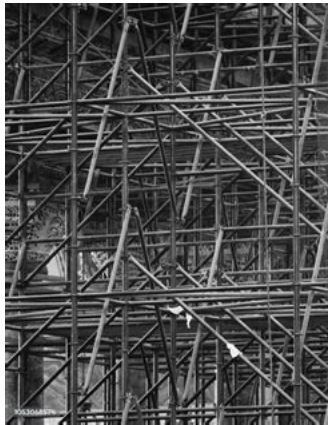
Résistance à la fibrinolyse

Composition

Pénétrabilité



Anti-Fibrinolytique



Architecture

Architecture

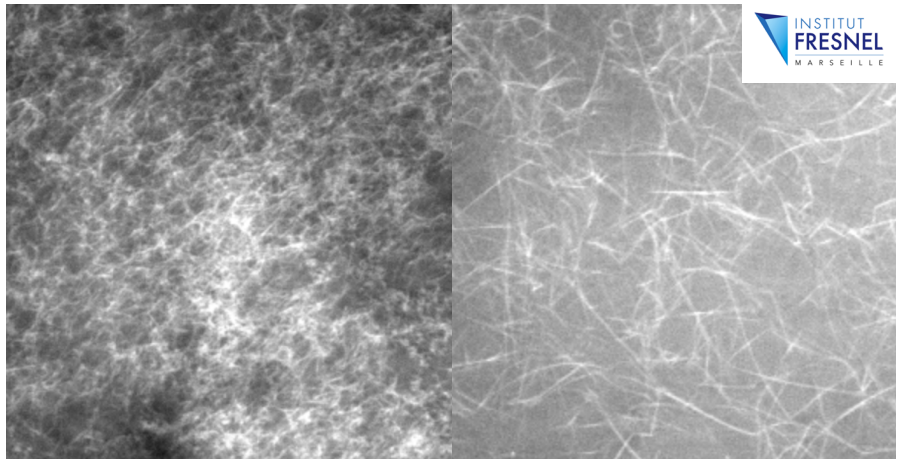
Réseau de fibrine

Influencée par

la composition sanguine,

les conditions de formation,

les modifications post-traductionnelles, …



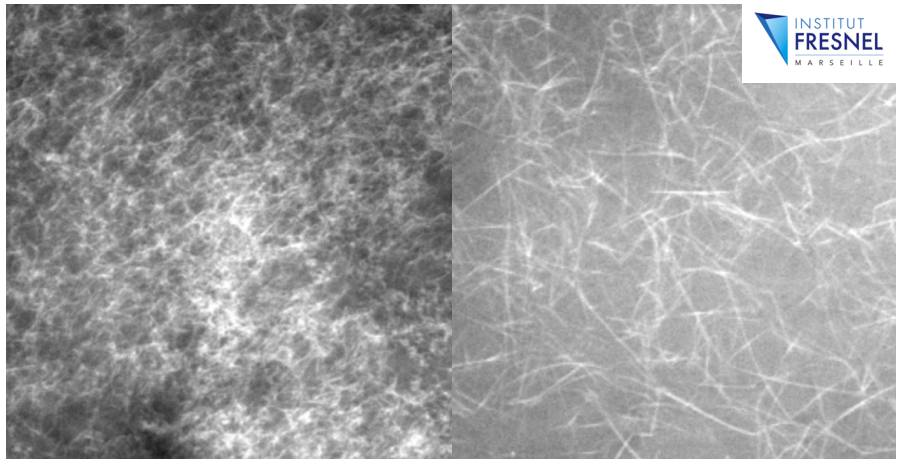
Avec l'aimable autorisation de E. Romagne et H. Rigneault

Architecture

Réseau de fibrine

Influencée par

la composition sanguine,
les conditions de formation,
les modifications post-traductionnelles, …



Avec l'aimable autorisation de E. Romagne et H. Rigneault

Autres acteurs participant à l'échafaudage



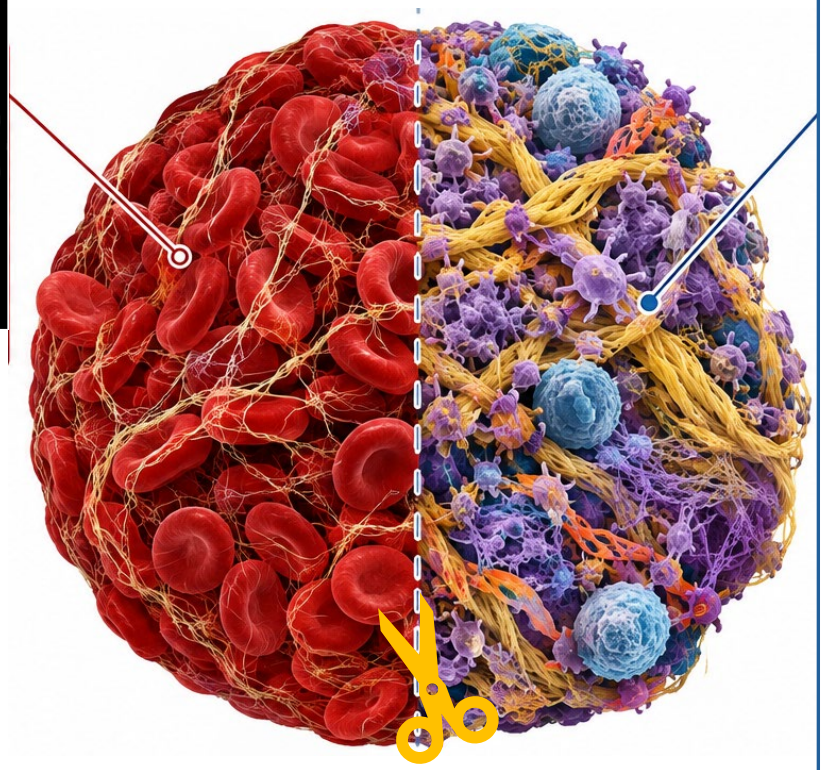
Facteur von Willebrand
ADN extracellulaire
Facteur XIII
Fibronectine, …

Au-delà de la Fibrin(ogen)e

Conclusion







rt-PA

Anti-plaquettaires

DNAse

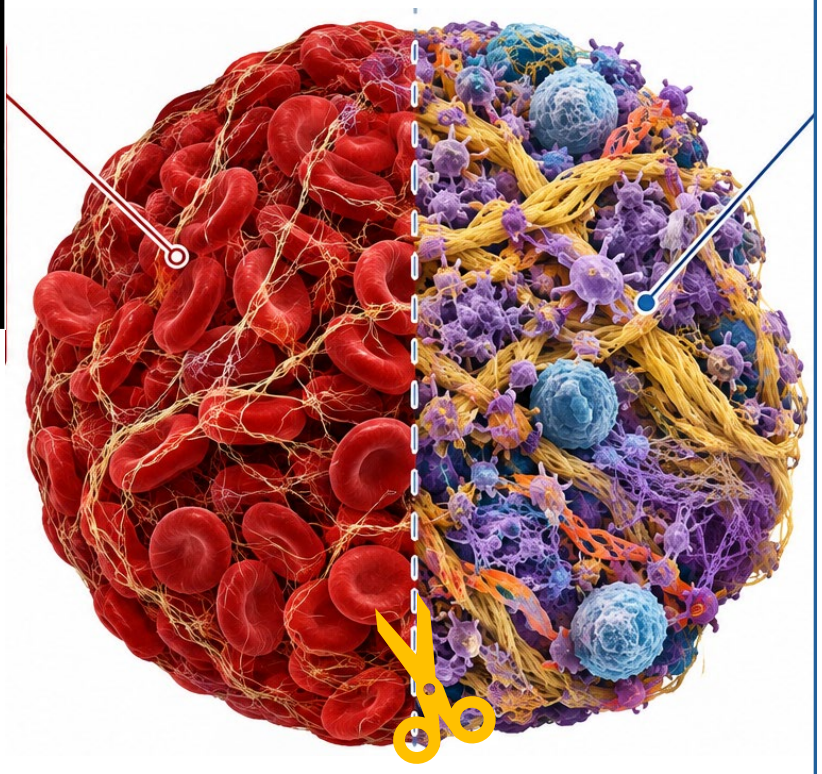
Anti-facteur von Willebrand

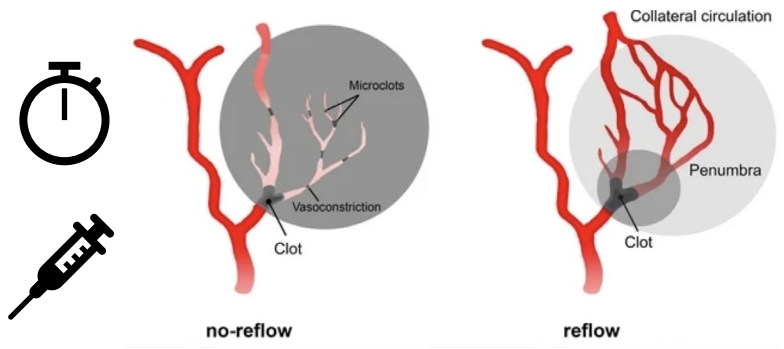
Autres?

Conclusion









El Amki et al. IJMS 2017

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Anti-plaquettaires

DNAse

Anti-facteur von Willebrand

Autres?

Merci de votre attention