



**PHYSIO DAY**

JOURNÉES DE PHYSIOLOGIE  
EN CARDIOLOGIE INTERVENTIONNELLE

# FFR et microcirculation

*La part de l'invisible*

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**HÔTEL SHERATON · NICE**



# Statement of financial interest

**Speaker's name : Frédéric Bouisset**

I have the following potential conflicts of interest to report:

Consultant: Abbott, Amgen, B-Braun, Medtronic, Boston Scientific

**1**

## Hyperemia

What is hyperemia?  
Why do we use hyperemia to measure FFR?

**2**

## Gradient and lesion phenotype

How does the lesion phenotype impact the translesionnal pressure gradient?

**3**

## Lessons for clinical practice

How does microvascular function and lesion phenotype impact FFR results?



1

# Hyperemia

# Compartments of coronary circulation

## MACRO circulation

## MICRO circulation



Large arteries  
> 400  $\mu\text{m}$   
Conductance or  
Epicardial arteries



**Transport**

Small arteries  
< 400  $\mu\text{m}$   
Resistance arteries or  
Microvasculature



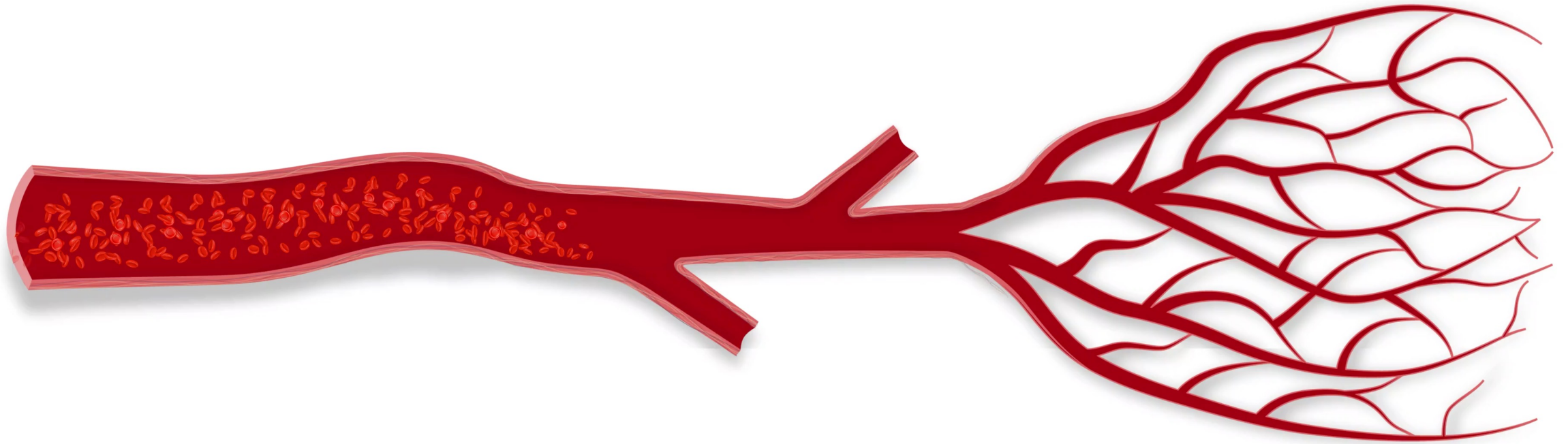
**Regulation**

Capillaries



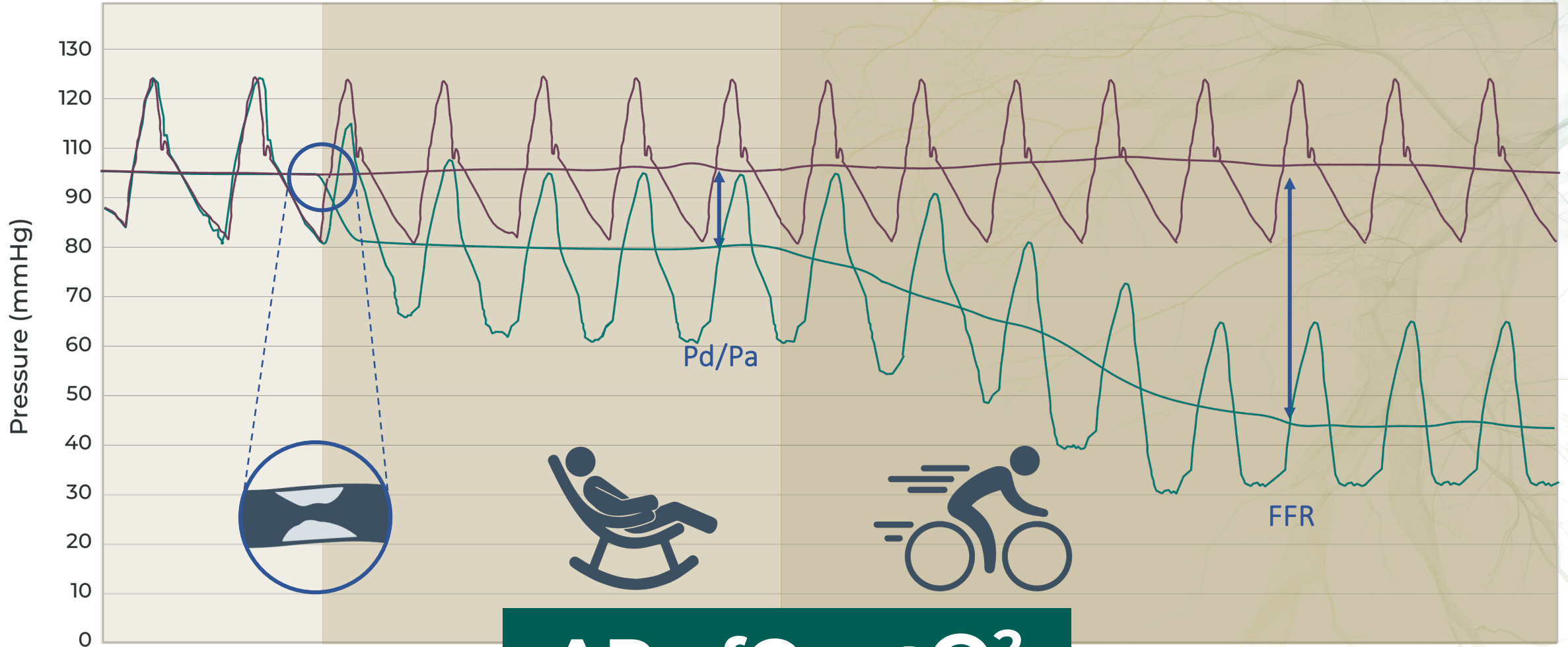
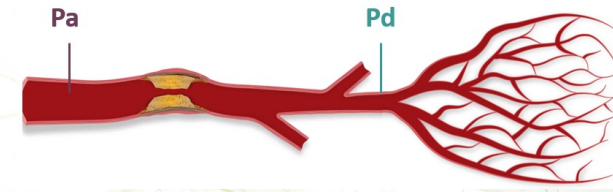
**Exchanges**

# Hyperemia



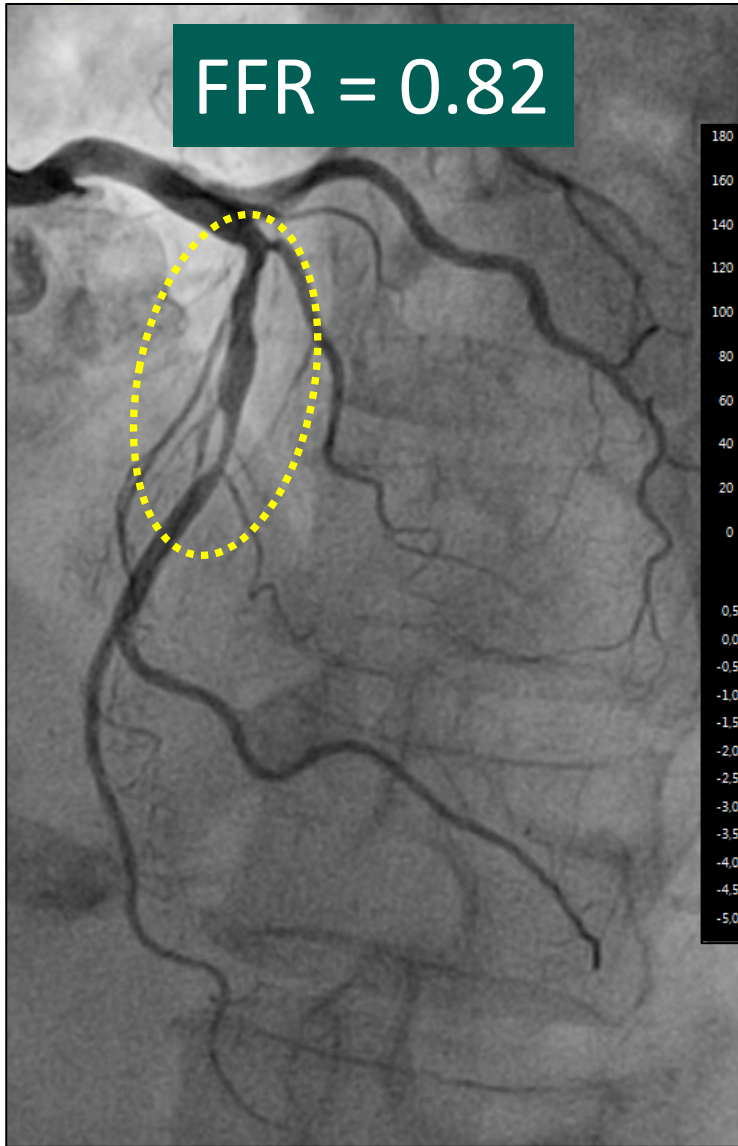


# Why do we use hyperemia?



$$\Delta P = fQ + sQ^2$$

# Φ The boundaries conditions



IMR = 40 mmHg.s

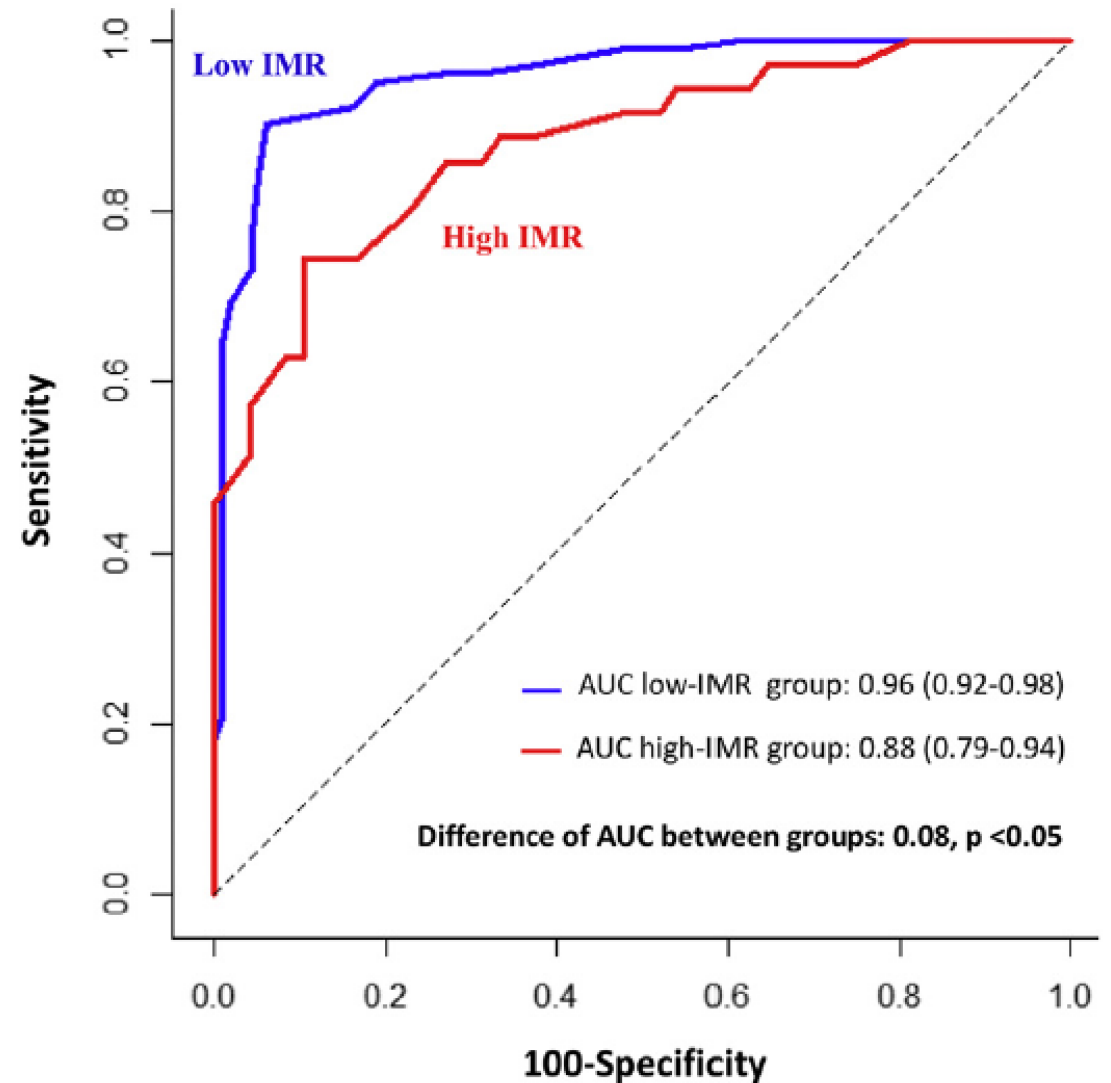




# The boundaries conditions

Agreement between FFR and QFR is affected by subtended CMD, reflected as abnormal IMR values.

CMD constitutes the dominant cause of false positive values of QFR, compared with FFR.





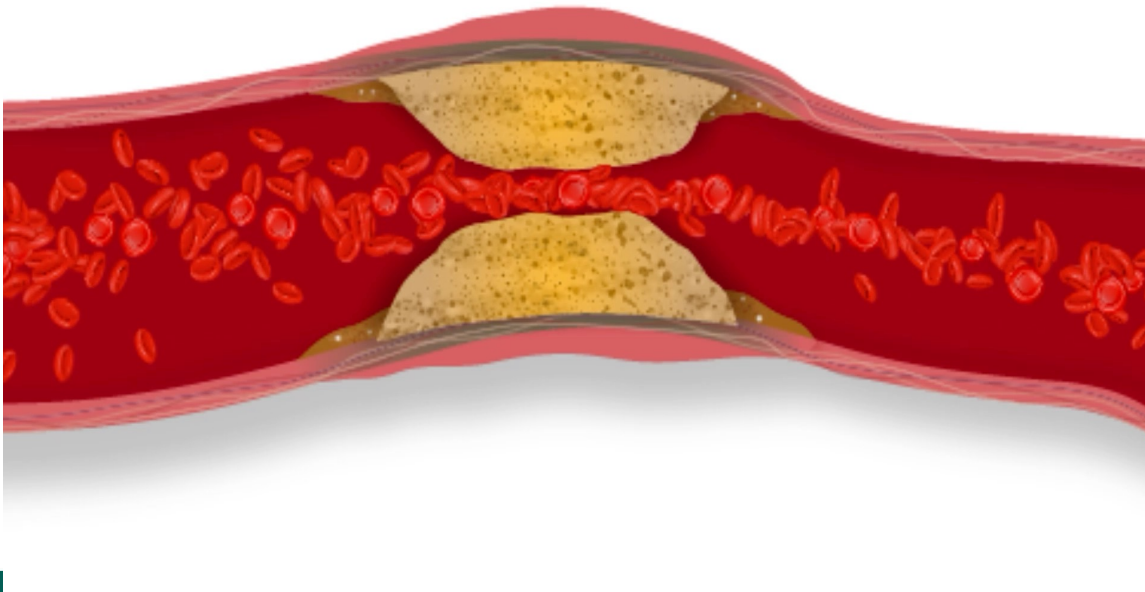
2

## Gradients and phenotypes

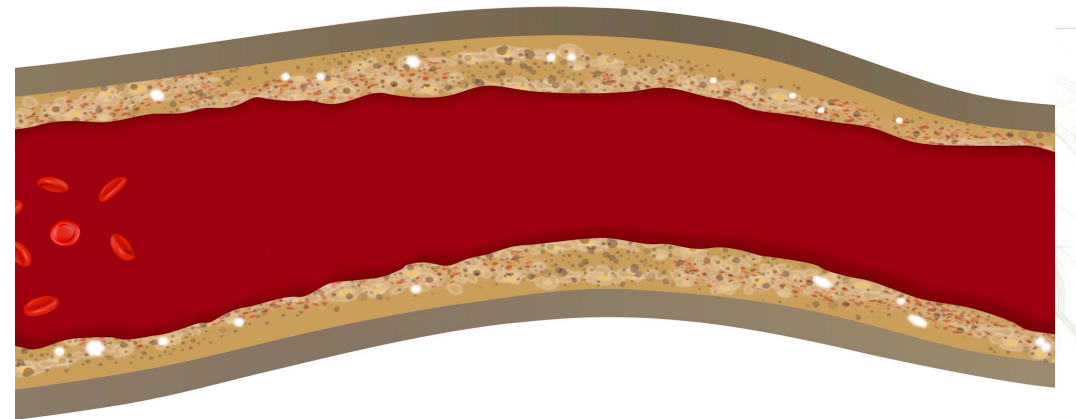
# Gradient and phenotypes

$$\Delta P = fQ + sQ^2$$

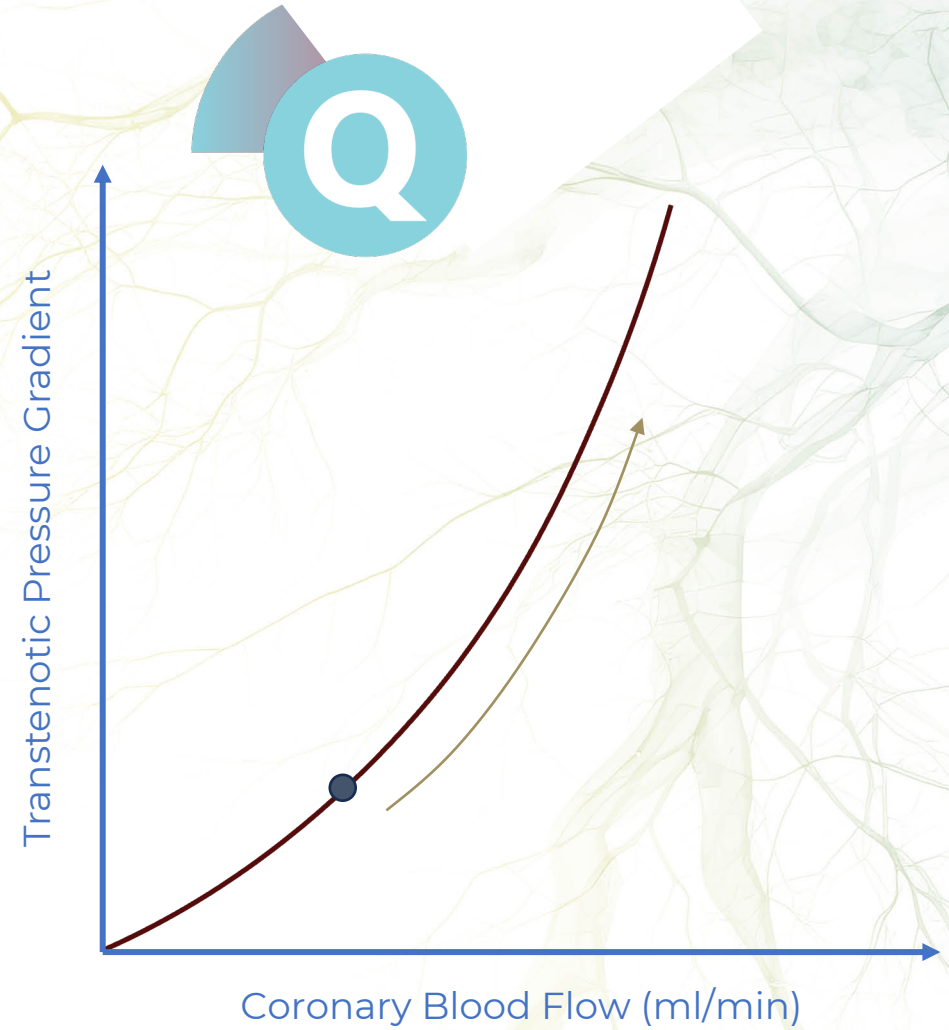
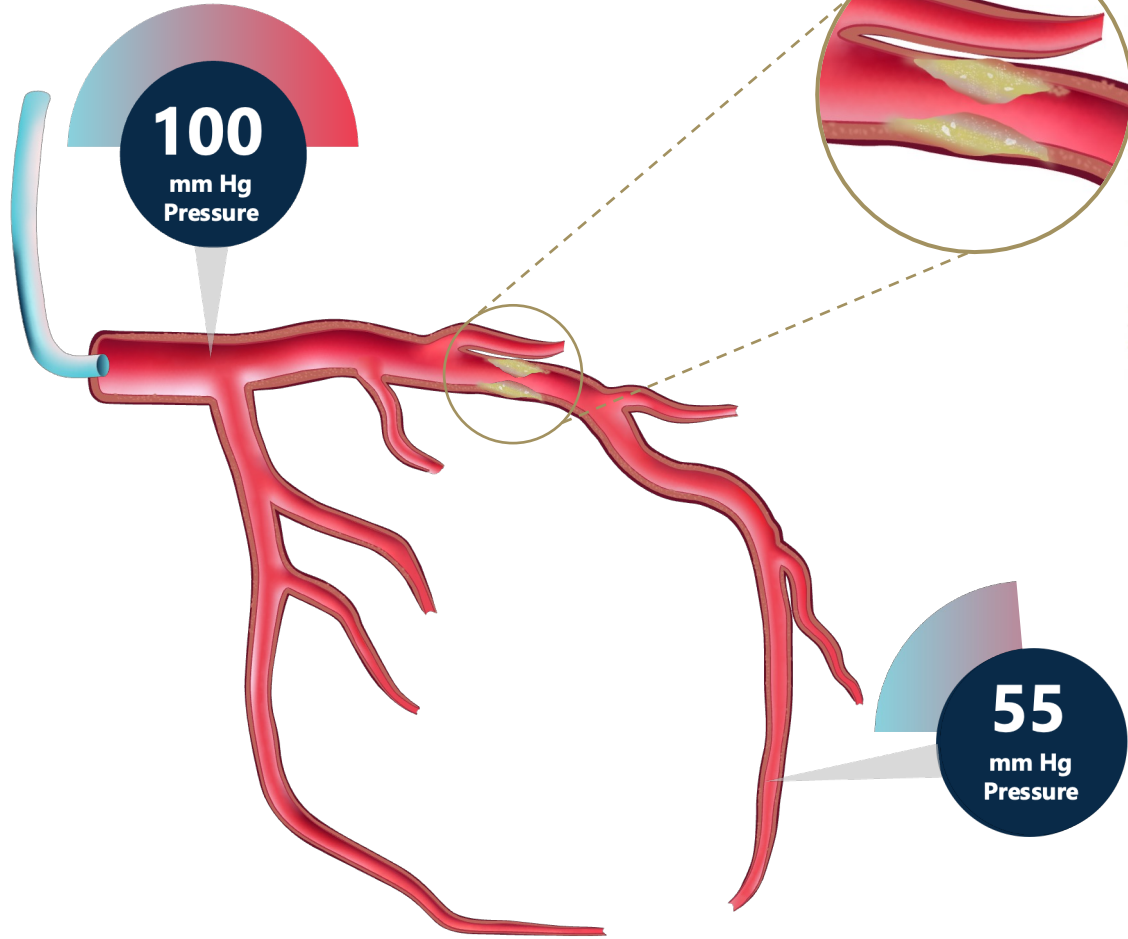
**Focal lesions**



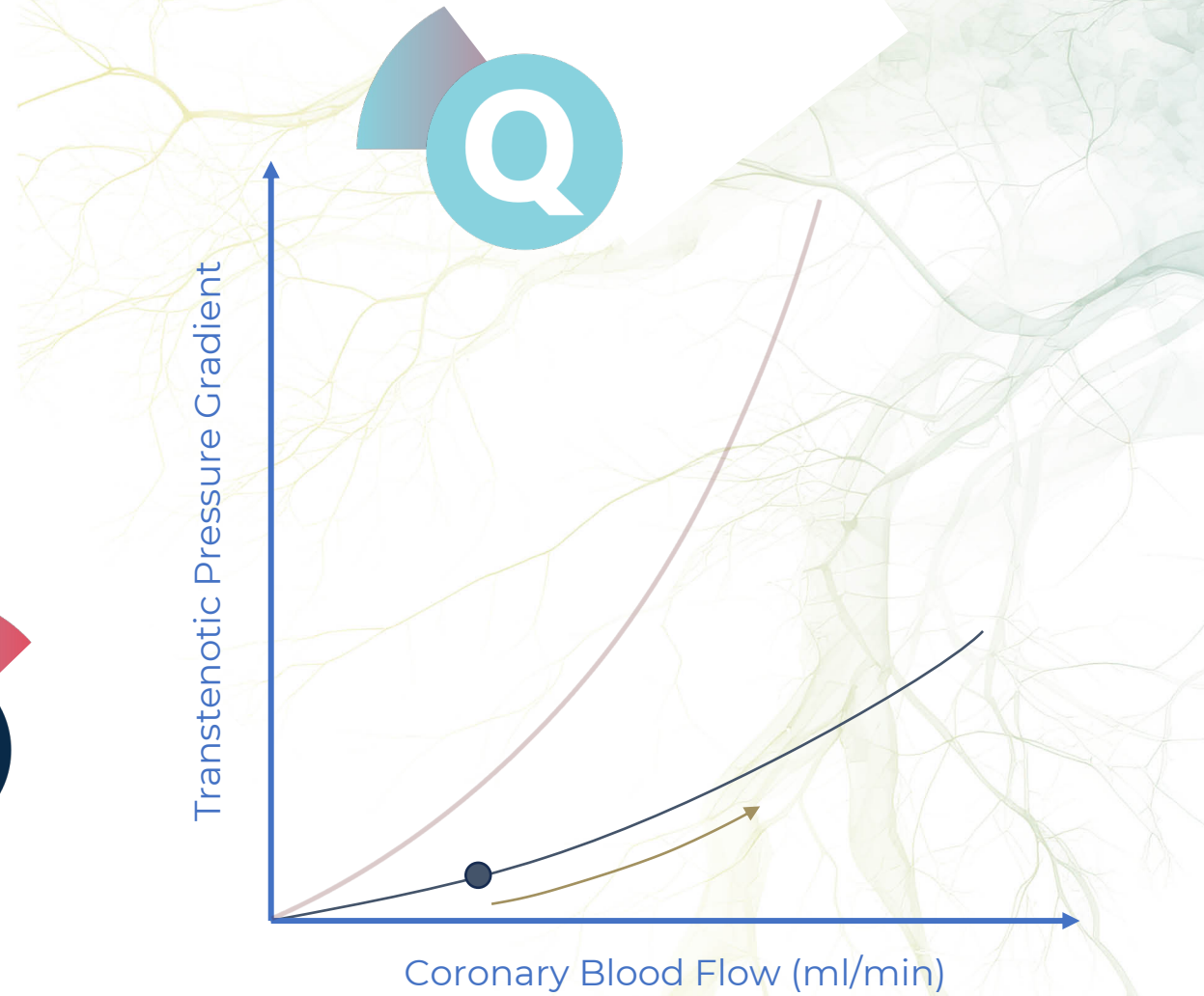
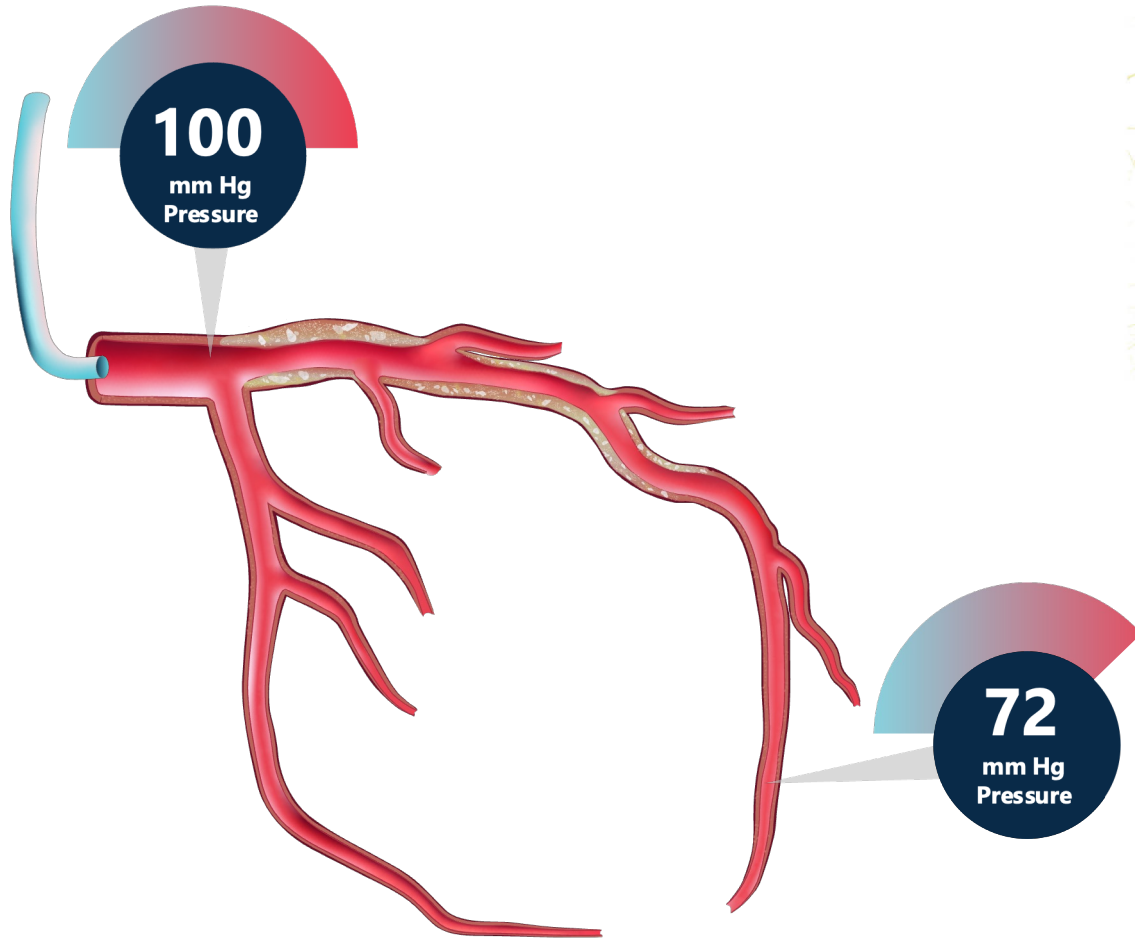
**Diffuse disease**



# Gradient and phenotypes



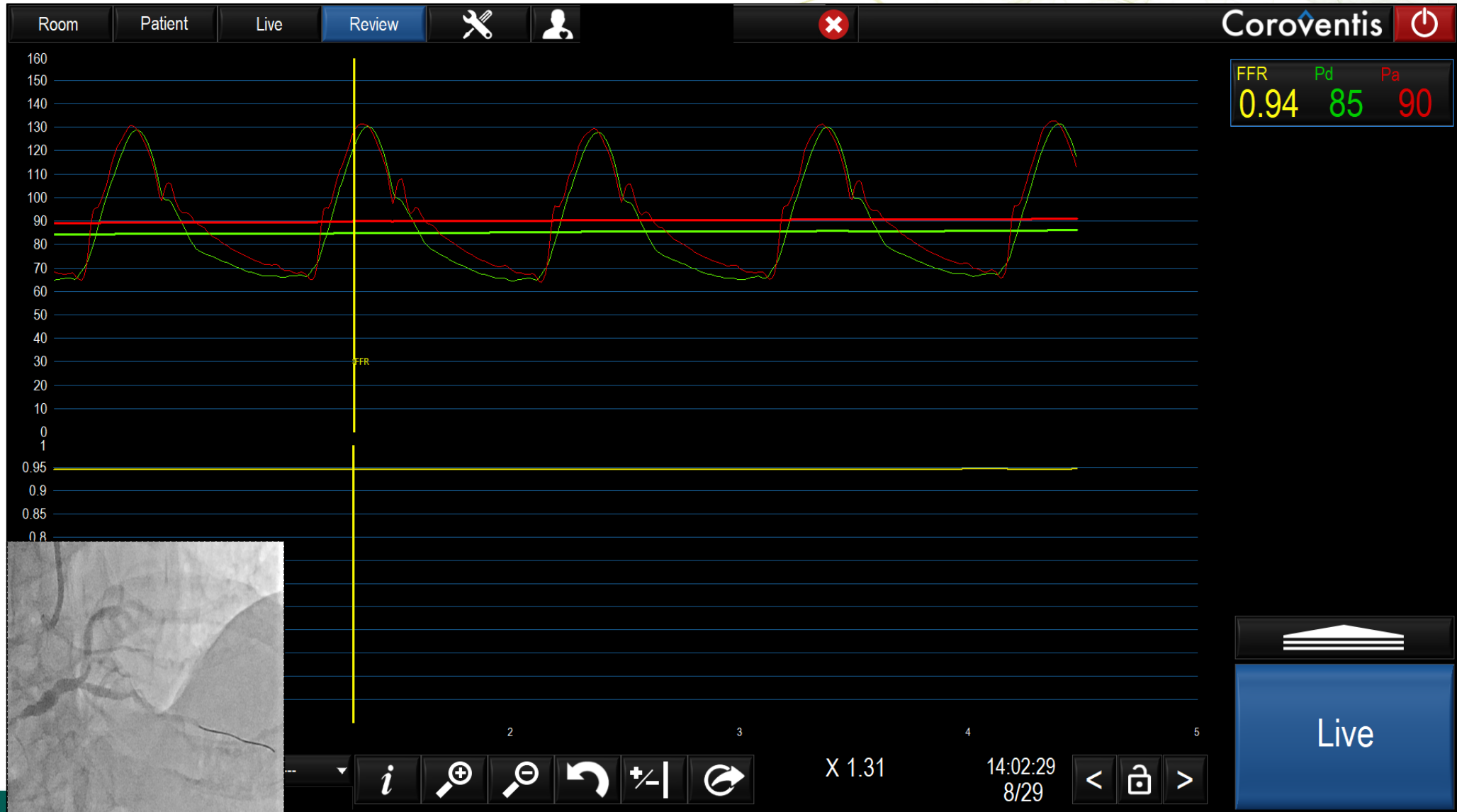
# Gradient and phenotypes



# NHPR and focal lesions



# PHYSIODAY NHPR and focal lesions

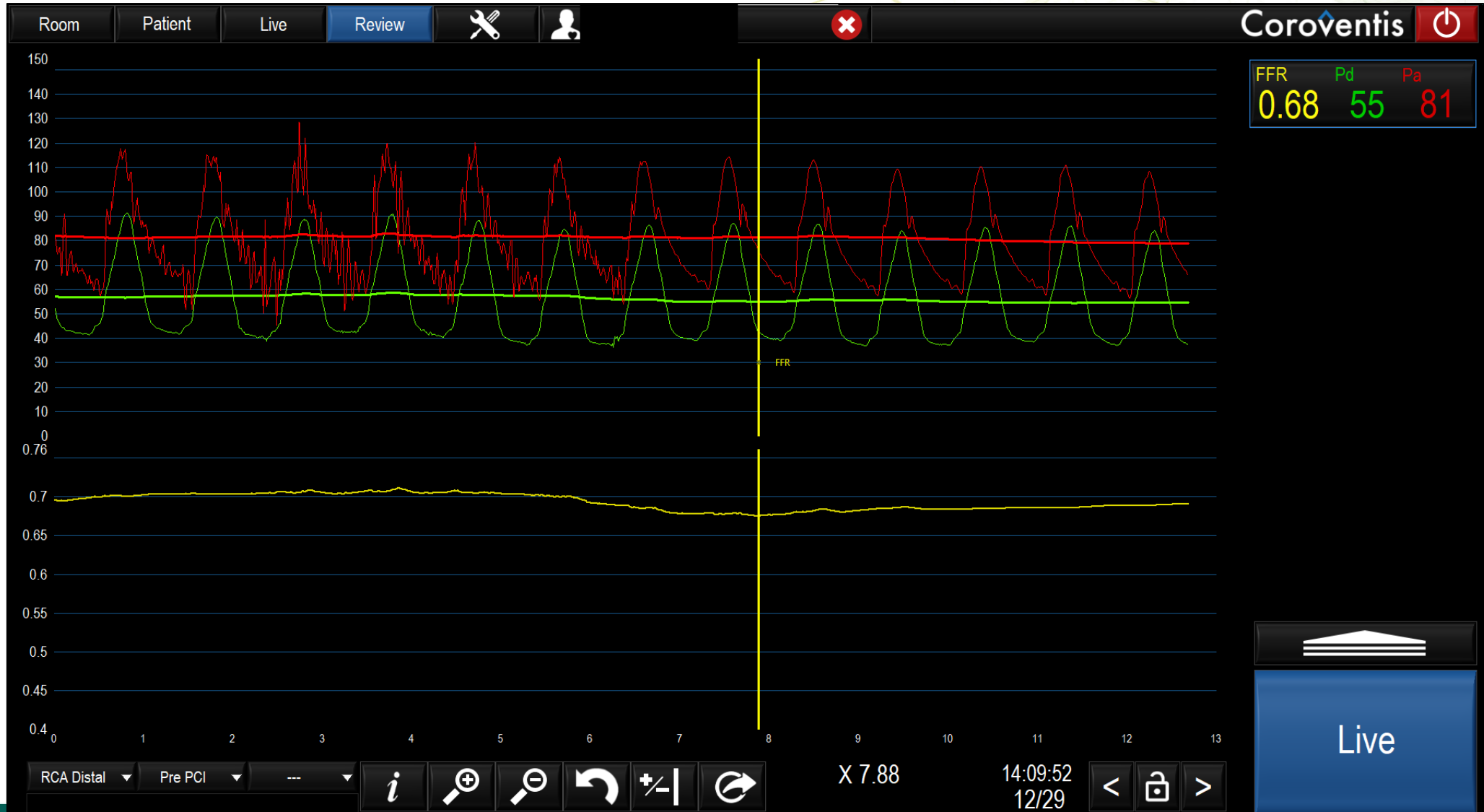


# PHYSIODAY NHPR and focal lesions

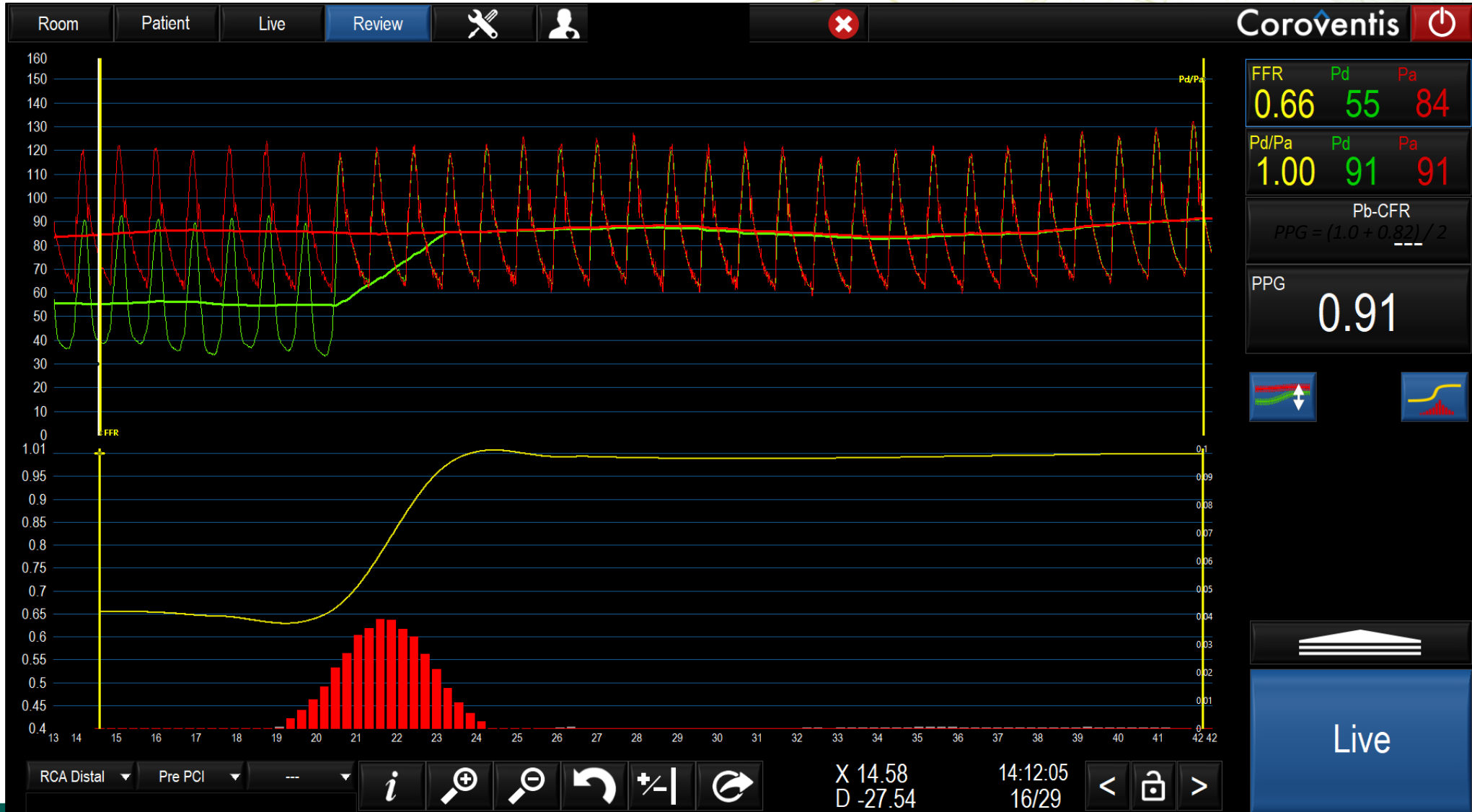




# PHYSIODAY NHPR and focal lesions



# PHYSIODAY NHPR and focal lesions



**1**

**Microvascular function  
drives hyperemic flow**

**The coronary blood flow  
drives the translesional  
gradient**

**2**

**Lesion phenotype  
influences the gradient  
response to hyperemia.**

**In focal lesions, FFR and  
NHPR might be discordant**

**3**

**Invasive physiology using  
FFR allows a comprehensive  
assessment of the  
epicardial lesions' impact**



**Thank you!**

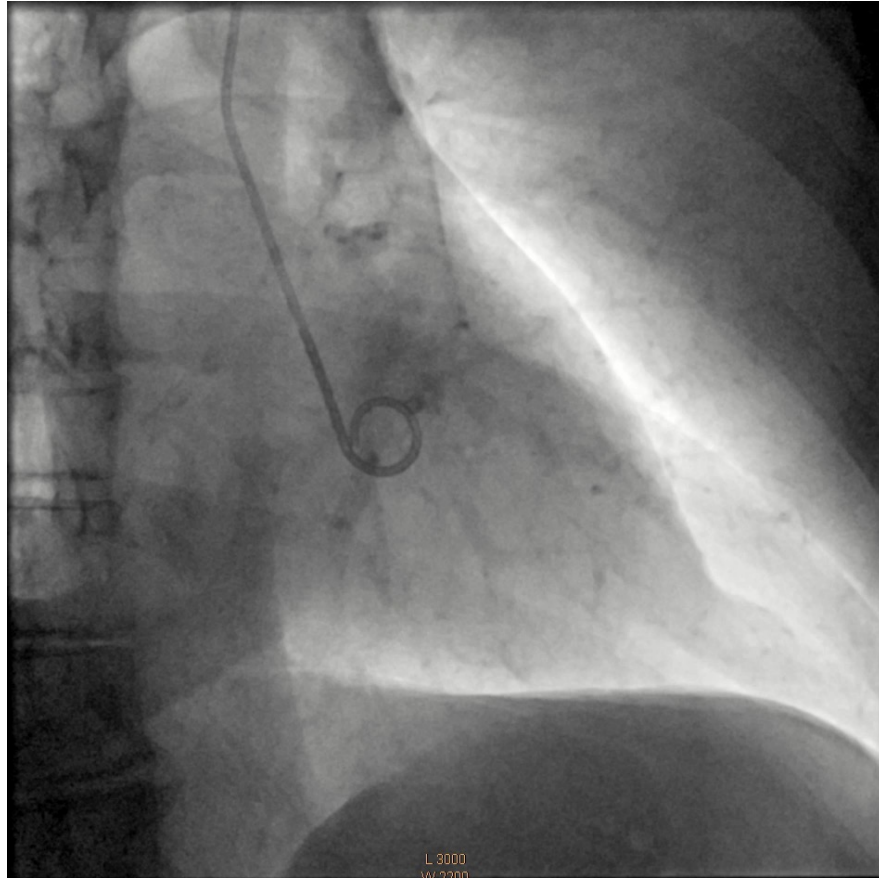




# Back-up slides



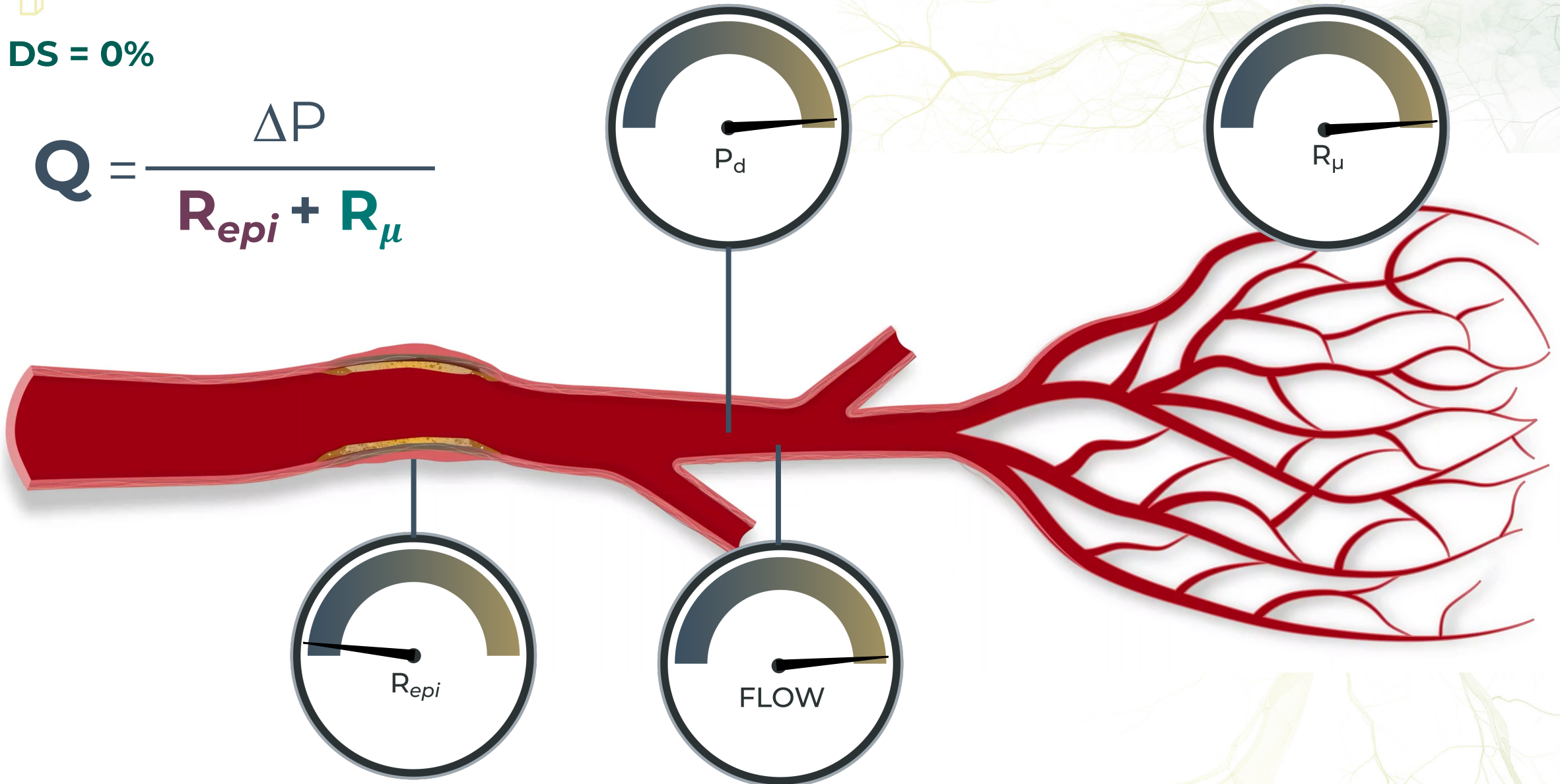
# Compartments interplay: the autoregulation



# Compartments interplay: the autoregulation

DS = 0%

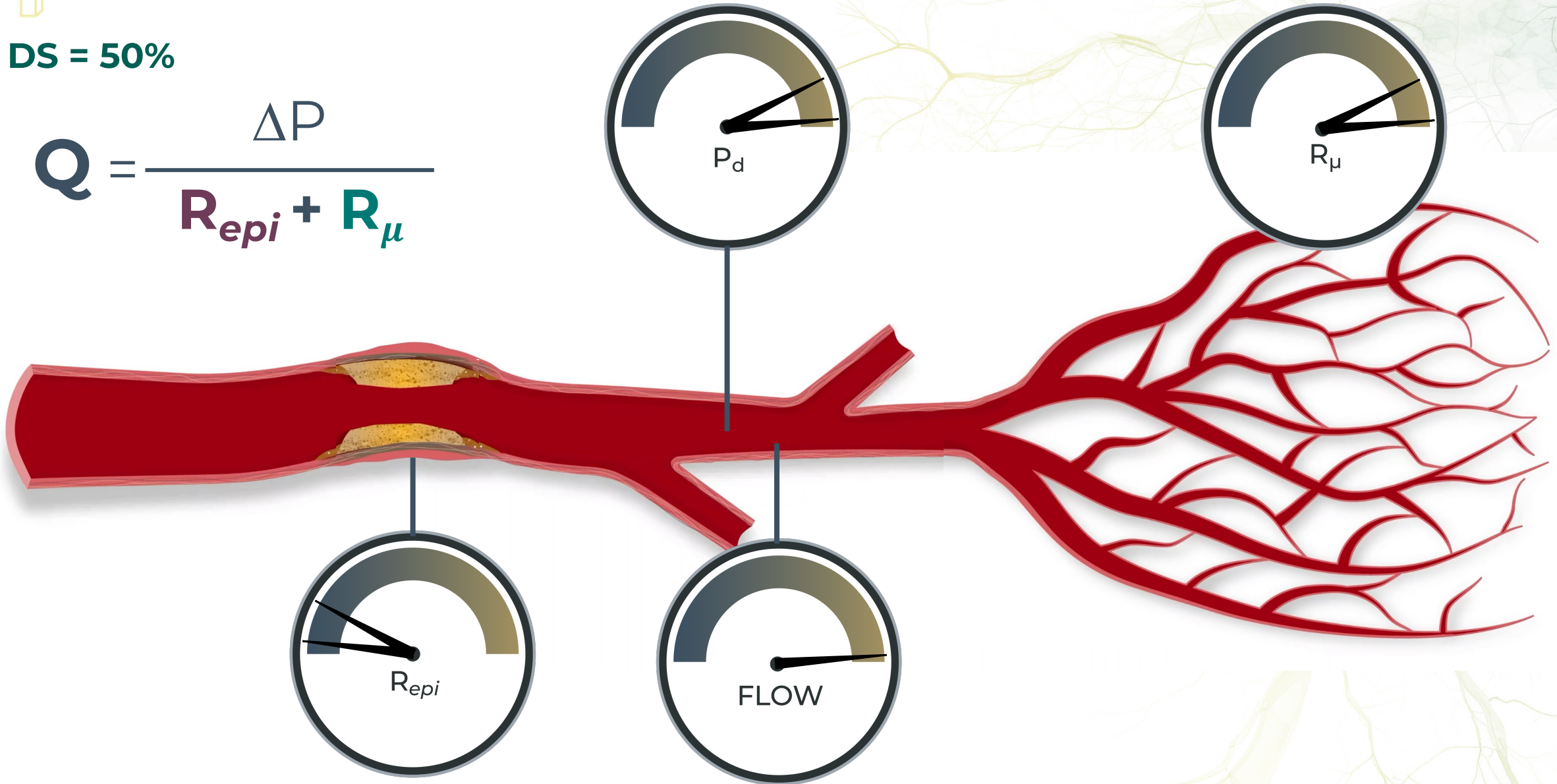
$$Q = \frac{\Delta P}{R_{epi} + R_{\mu}}$$



# Compartments interplay: the autoregulation

DS = 50%

$$Q = \frac{\Delta P}{R_{epi} + R_{\mu}}$$

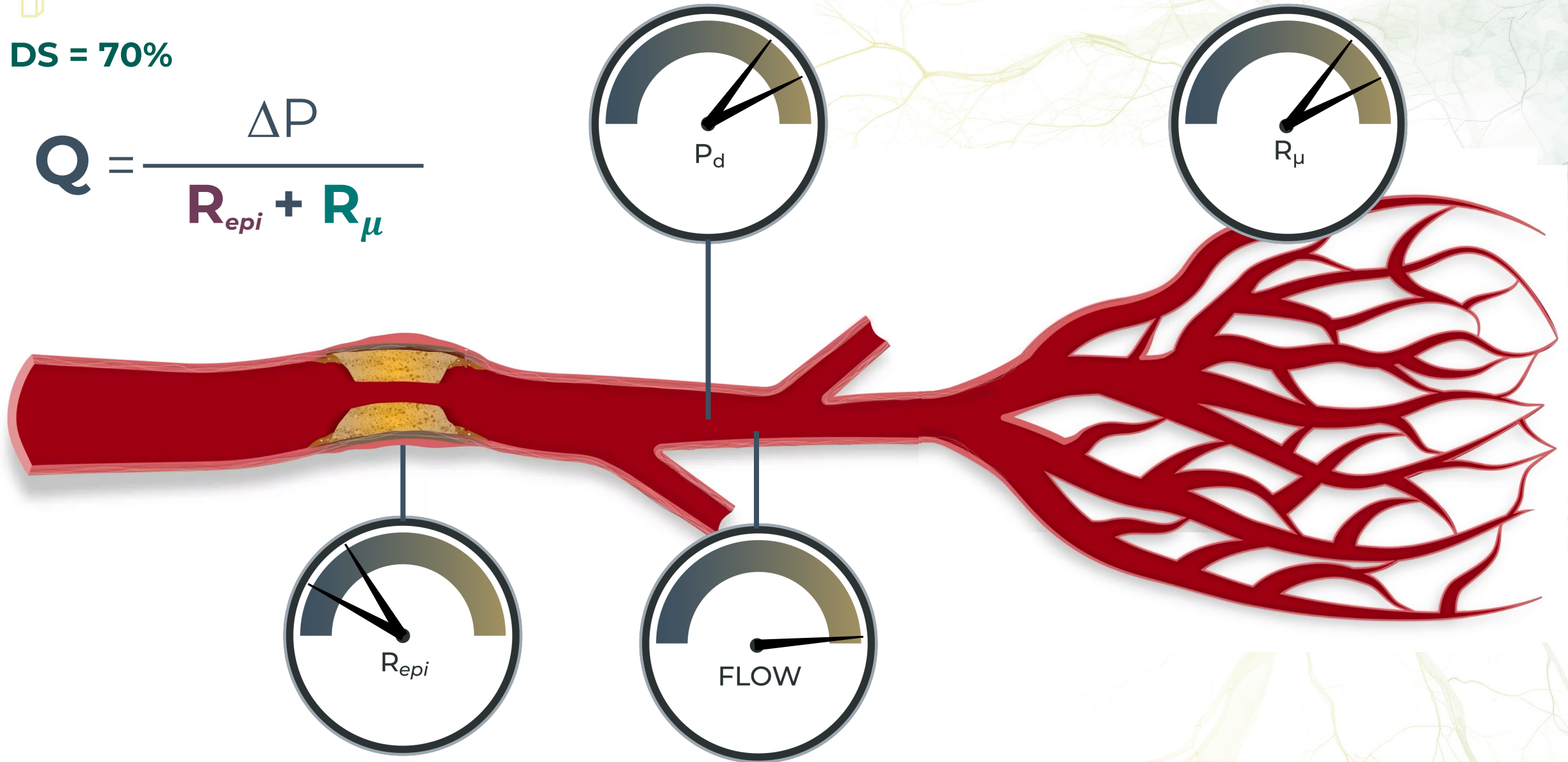




# Compartments interplay: the autoregulation

DS = 70%

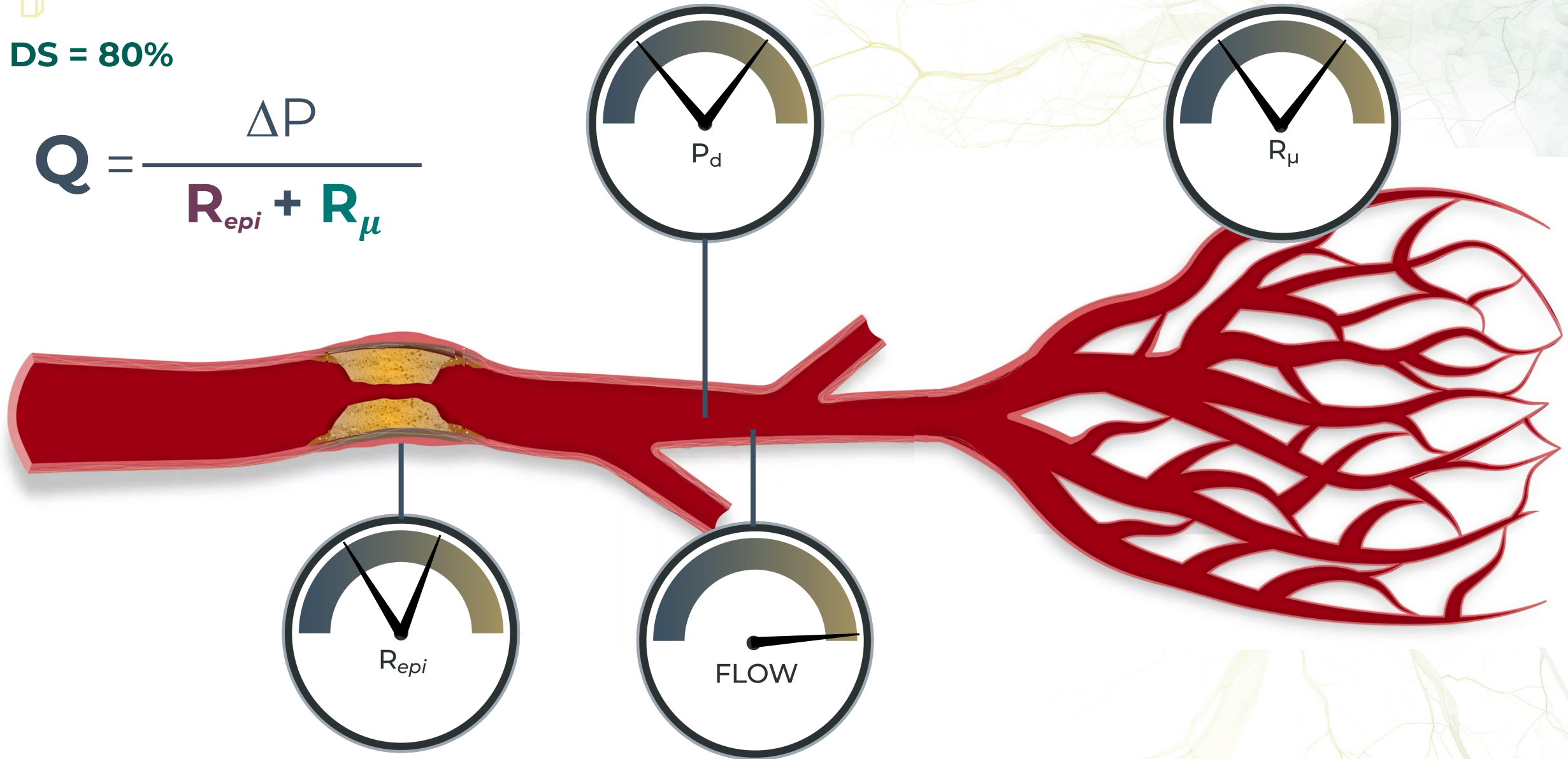
$$Q = \frac{\Delta P}{R_{epi} + R_{\mu}}$$



# Compartments interplay: the autoregulation

DS = 80%

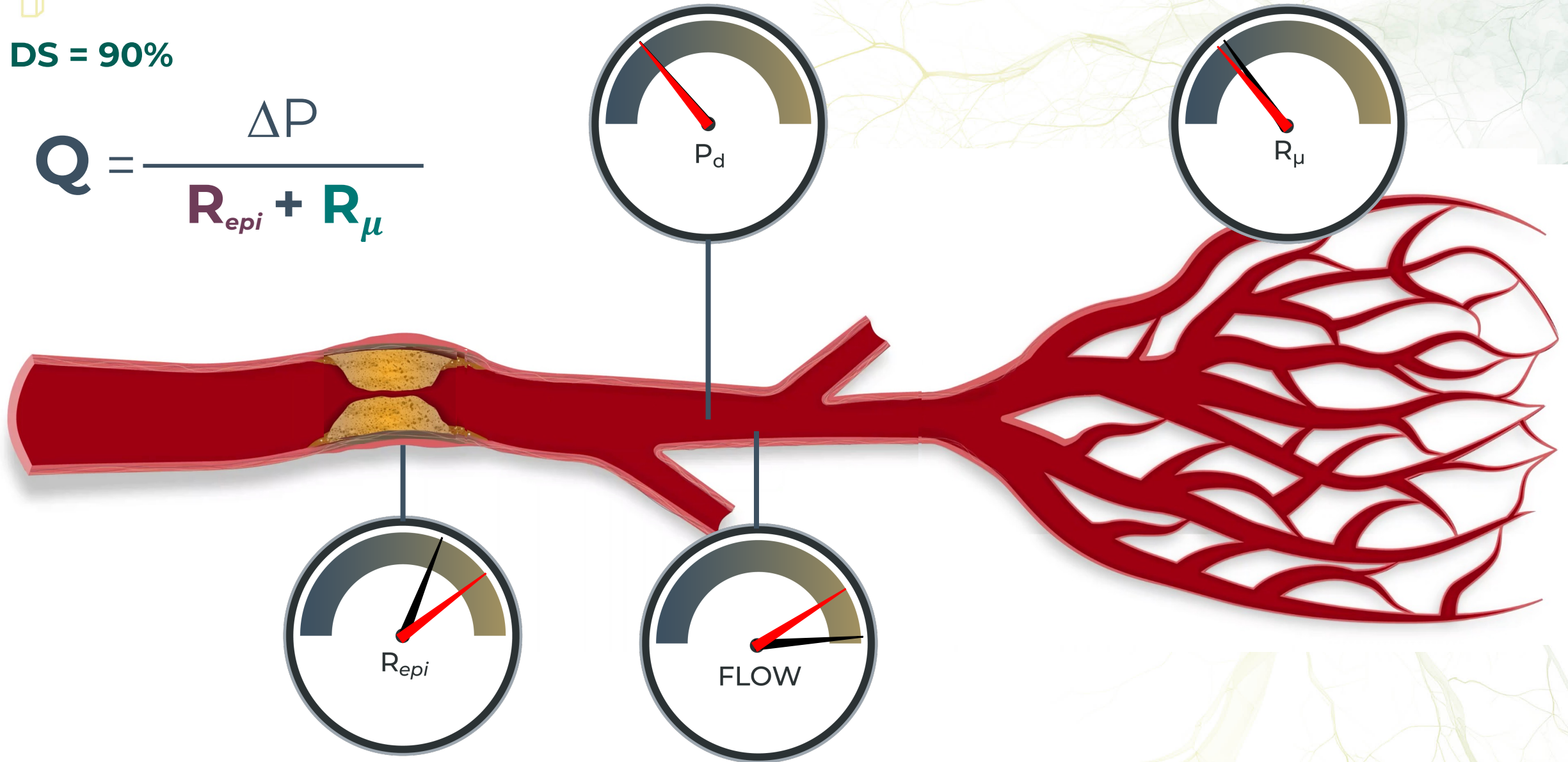
$$Q = \frac{\Delta P}{R_{epi} + R_{\mu}}$$



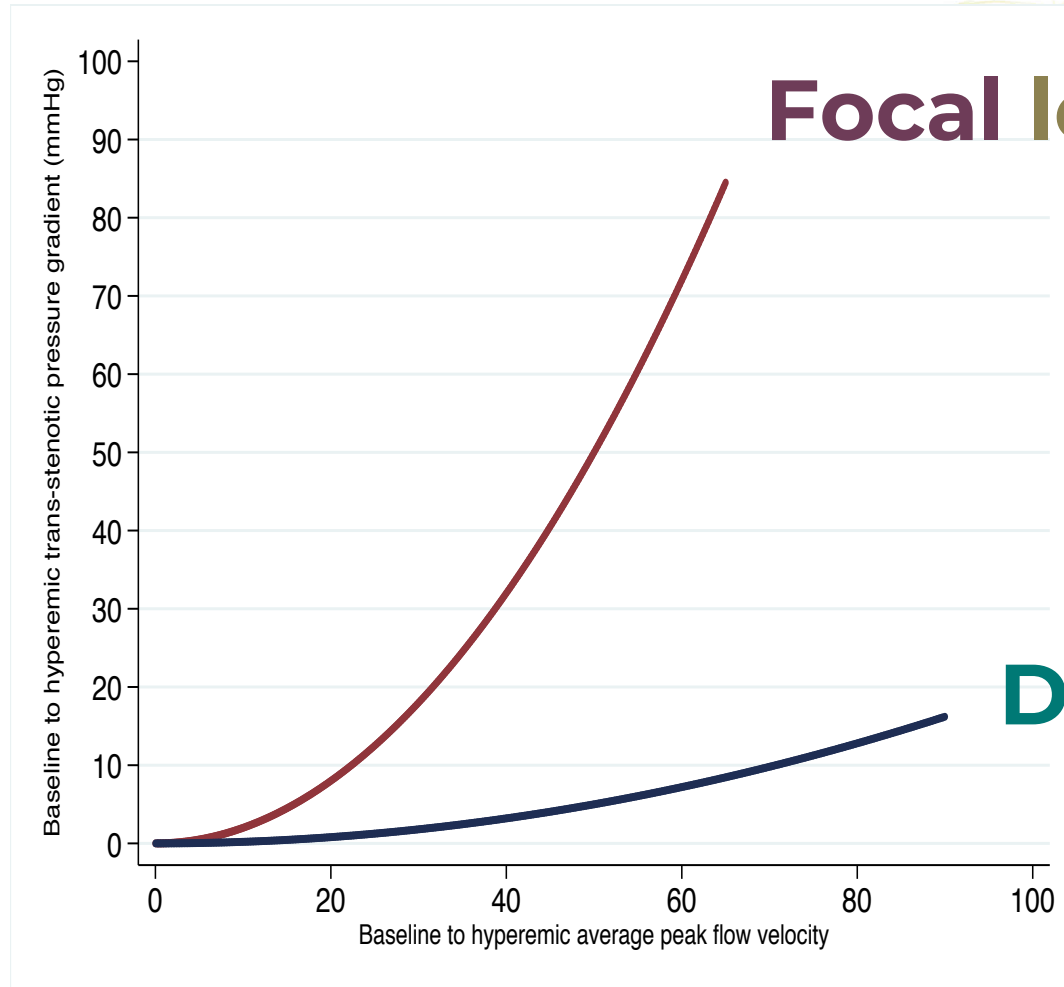
# Compartments interplay: the autoregulation

DS = 90%

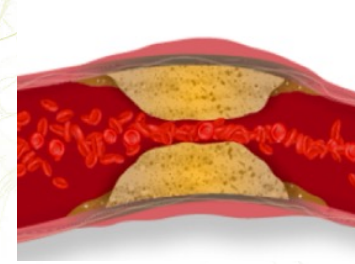
$$Q = \frac{\Delta P}{R_{epi} + R_{\mu}}$$



# Gradient and phenotypes



**Focal lesions**



$$\Delta P = fQ + sQ^2$$

**Diffuse disease**

