

# Should We Do PCI in Diffuse Disease?

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# Potential conflicts of interest

Within the past 12+ months, Carlos Collet has had a financial interest/arrangement or affiliation with the organization(s) listed below.

## Institutional Support

- Abbott Vascular
- HeartFlow Inc
- GE Healthcare
- ShockWave Medical
- Boston Scientific
- Insight Lifetech
- Pie Medical
- Medis Medical Imaging
- Hexacath
- Coroventis
- Cathworks

## Equity/stock options

- Medyria
- Xenter

## Consultancy fees

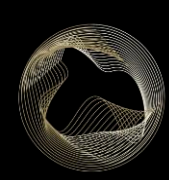
- Abbott Vascular
- HeartFlow Inc
- GE Healthcare
- Boston Scientific
- Insight Lifetech
- Early Bird
- Pfizer
- Siemens
- Zoll

## Others

CoreAalst BV

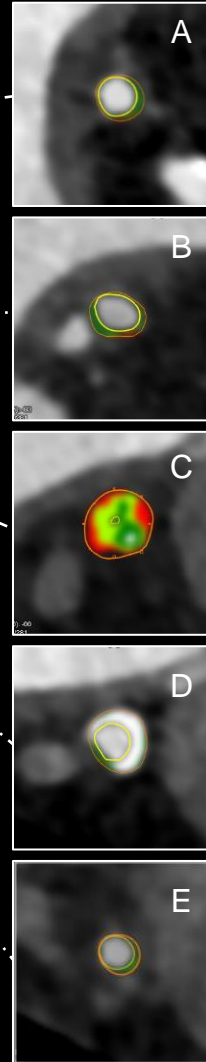
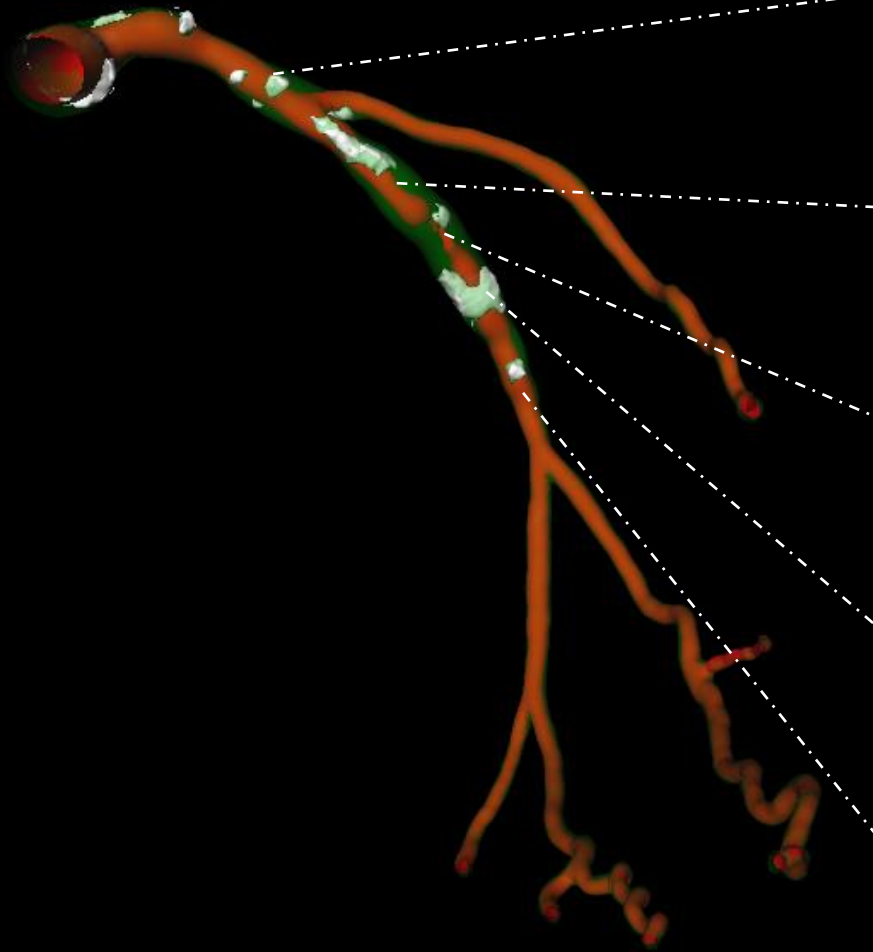
Patents filed: US20220164950A1, US20220175260A1, WO2022136637A1 and WO2021224458A1

# How to detect diffuse disease

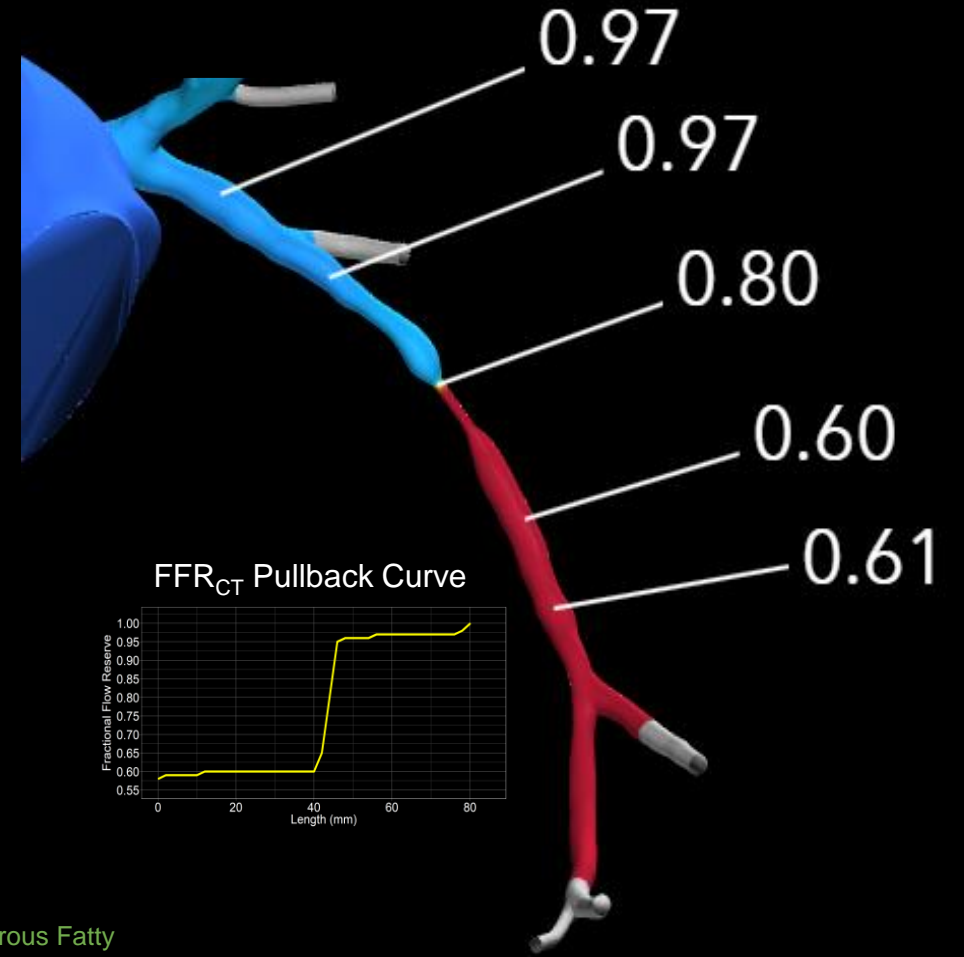


# CAD Patterns

## Diffuse disease

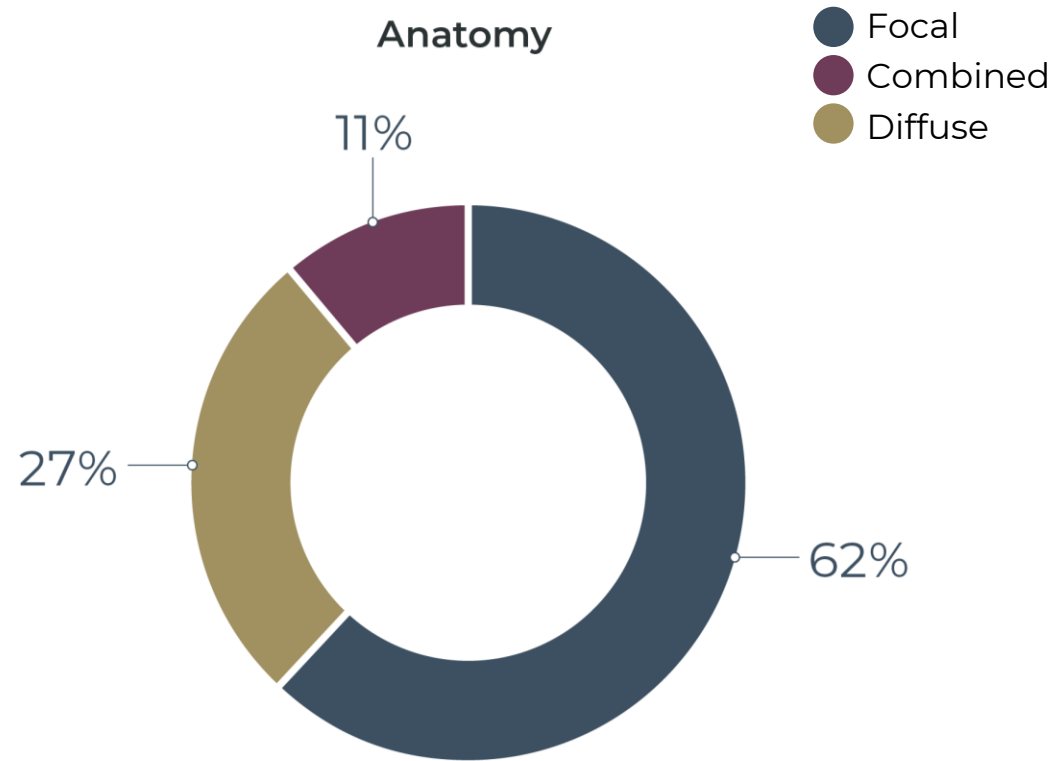


## Focal disease

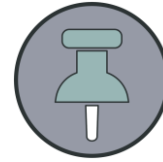
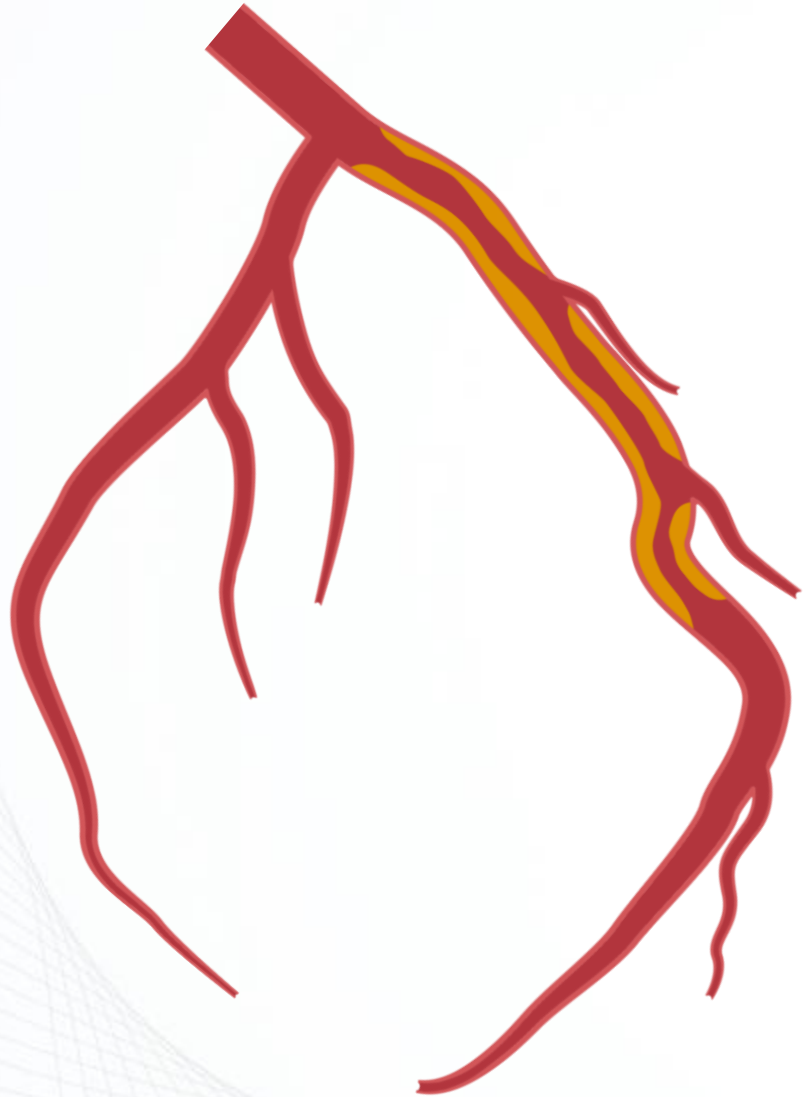


- Fibrous Fatty
- Fibrous
- Necrotic Core
- Calcium

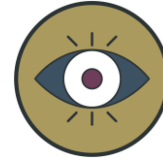
# Anatomy versus physiology: CAD patterns



# Diagnosis of diffuse disease



No standardized criteria



Relies on visual assessment



Low interobserver reproducibility



Cannot be detected by angiography

# Using physiology to understand CAD

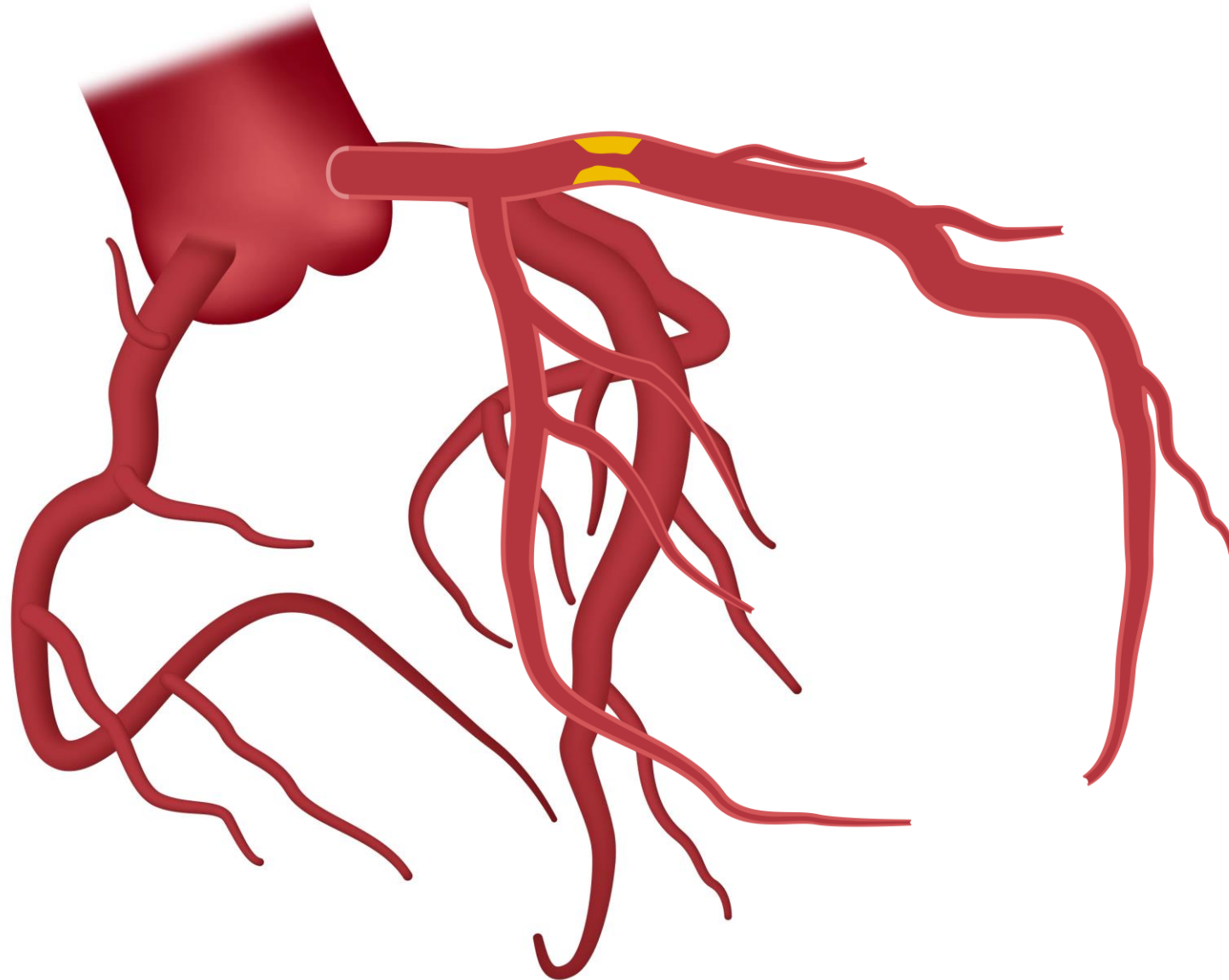


**Single-point**



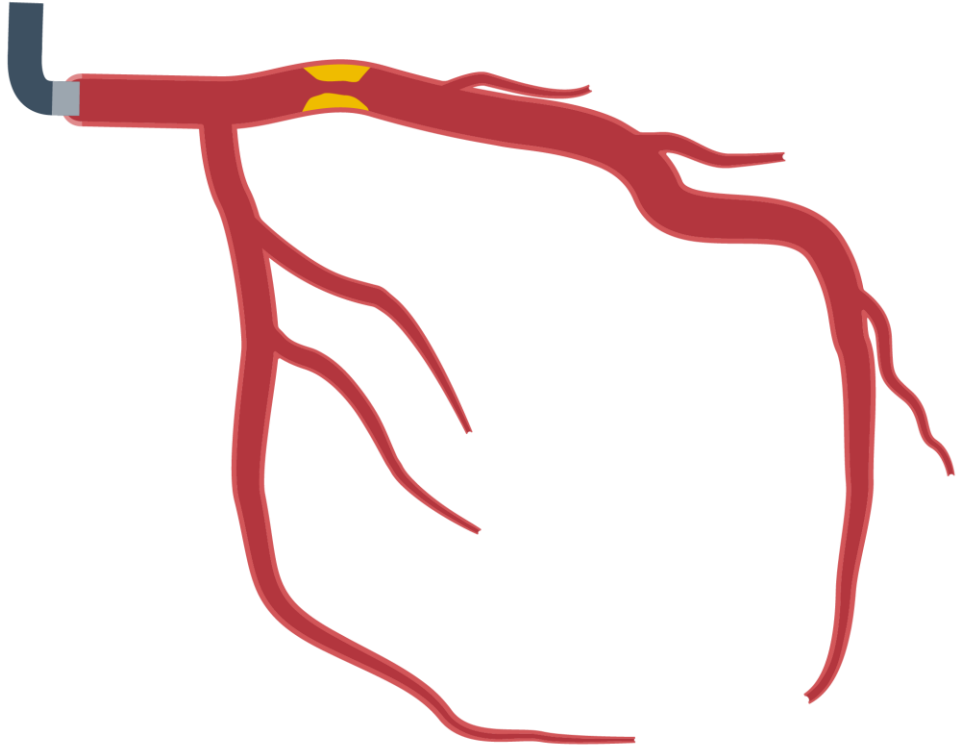
**Pullback**

# Outcomes of PCI in **focal** vs **diffuse** disease



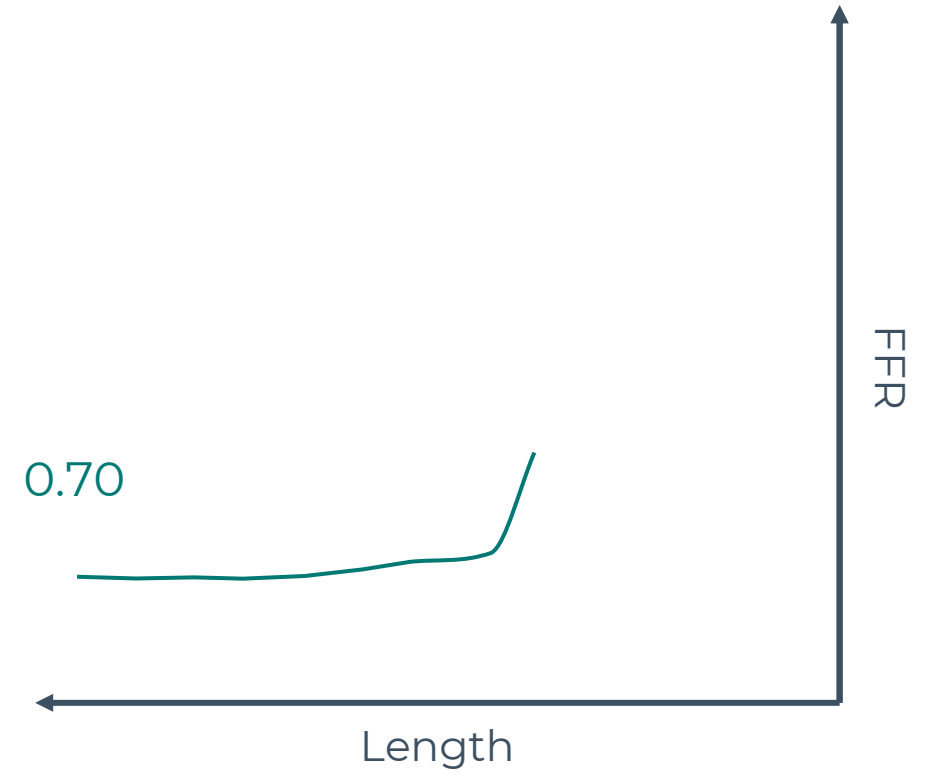
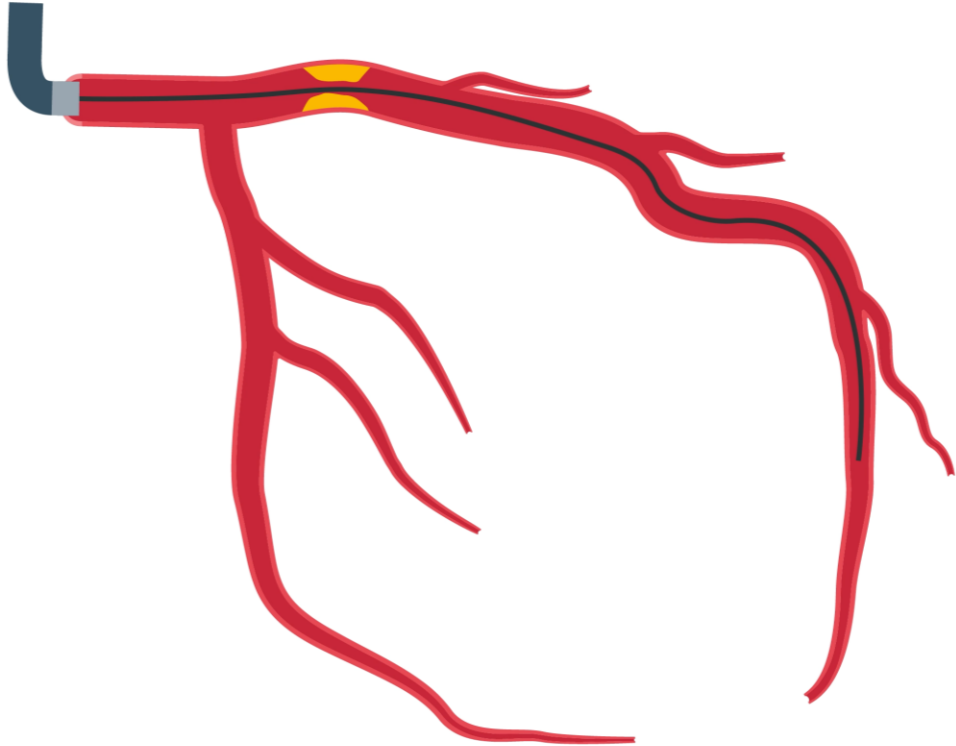


# PCI in focal CAD



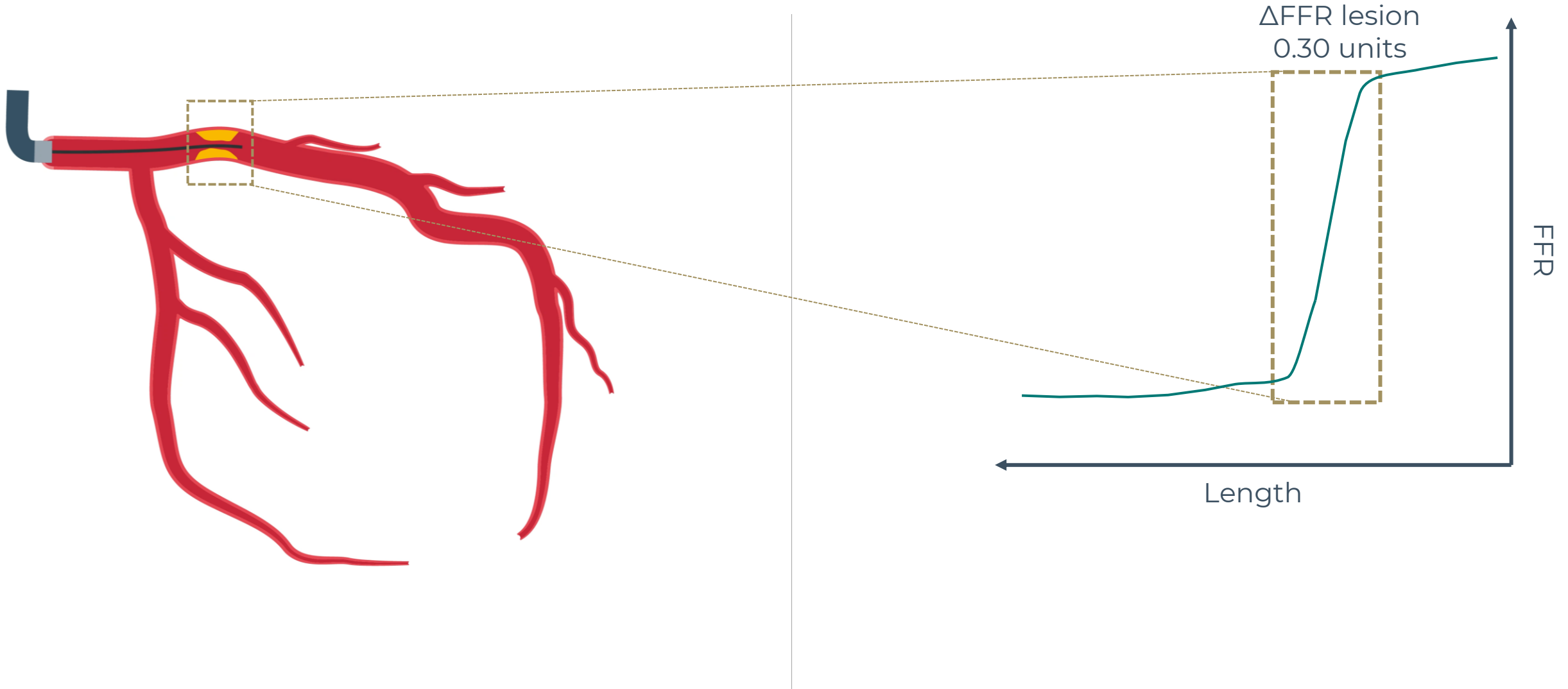
# PCI in focal CAD

FFR	Pd	Pa
0.70	70	100



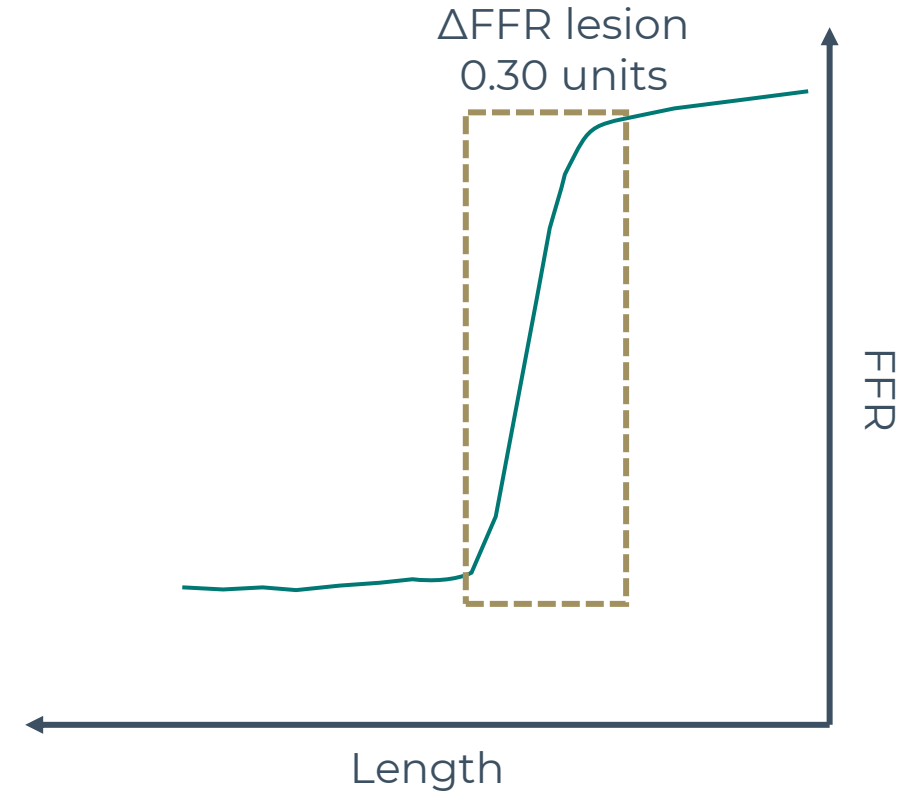
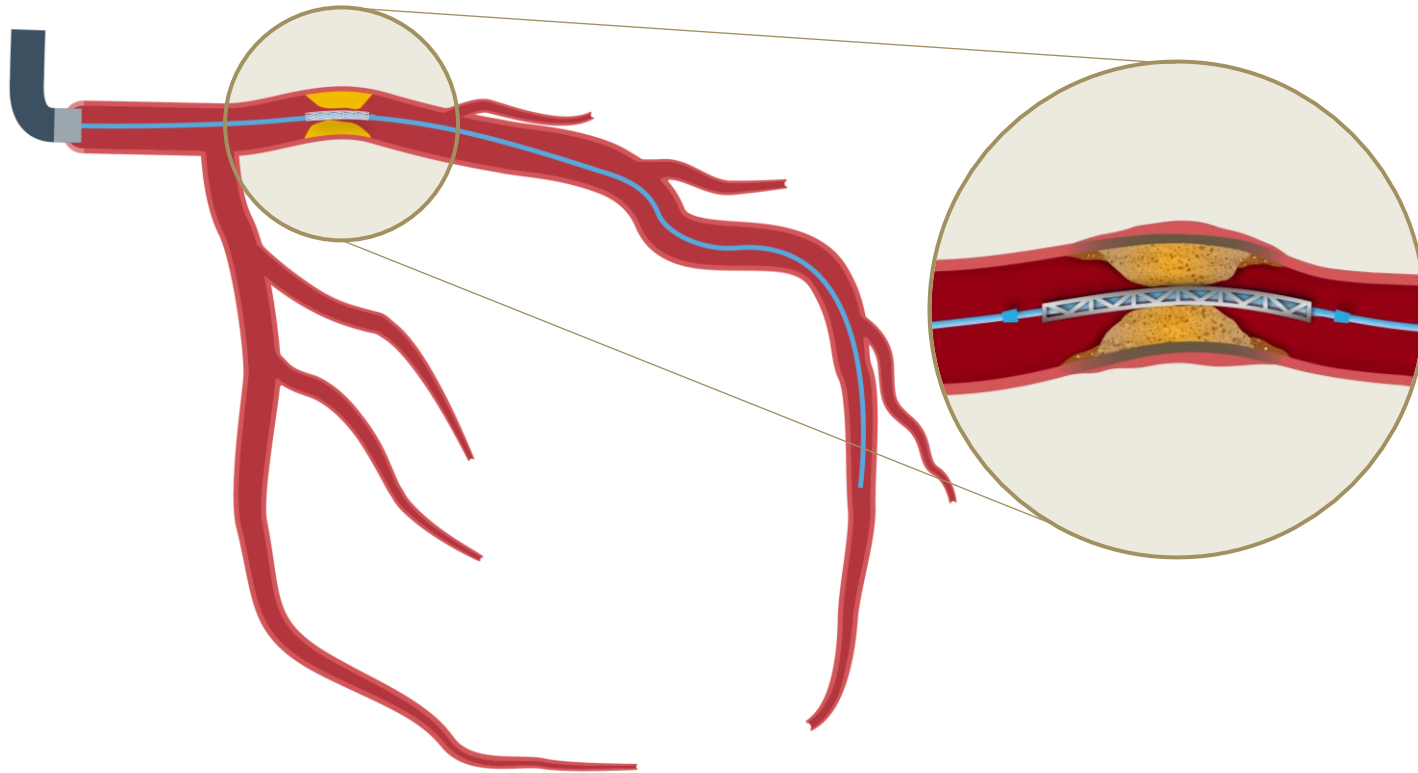
# PCI in focal CAD

FFR	Pd	Pa
0.70	70	100



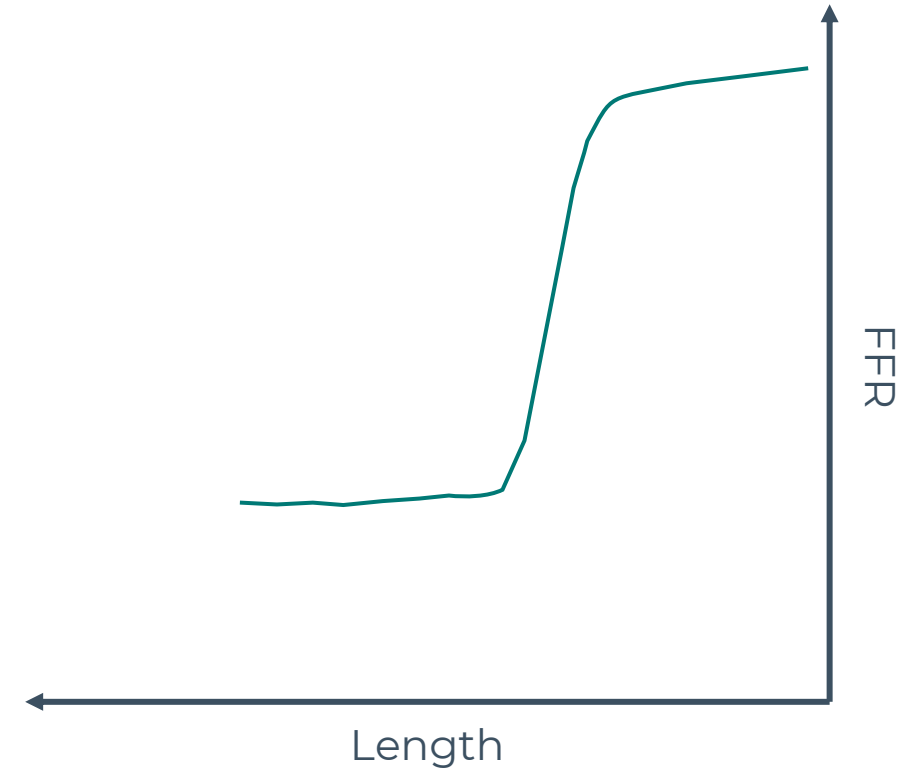
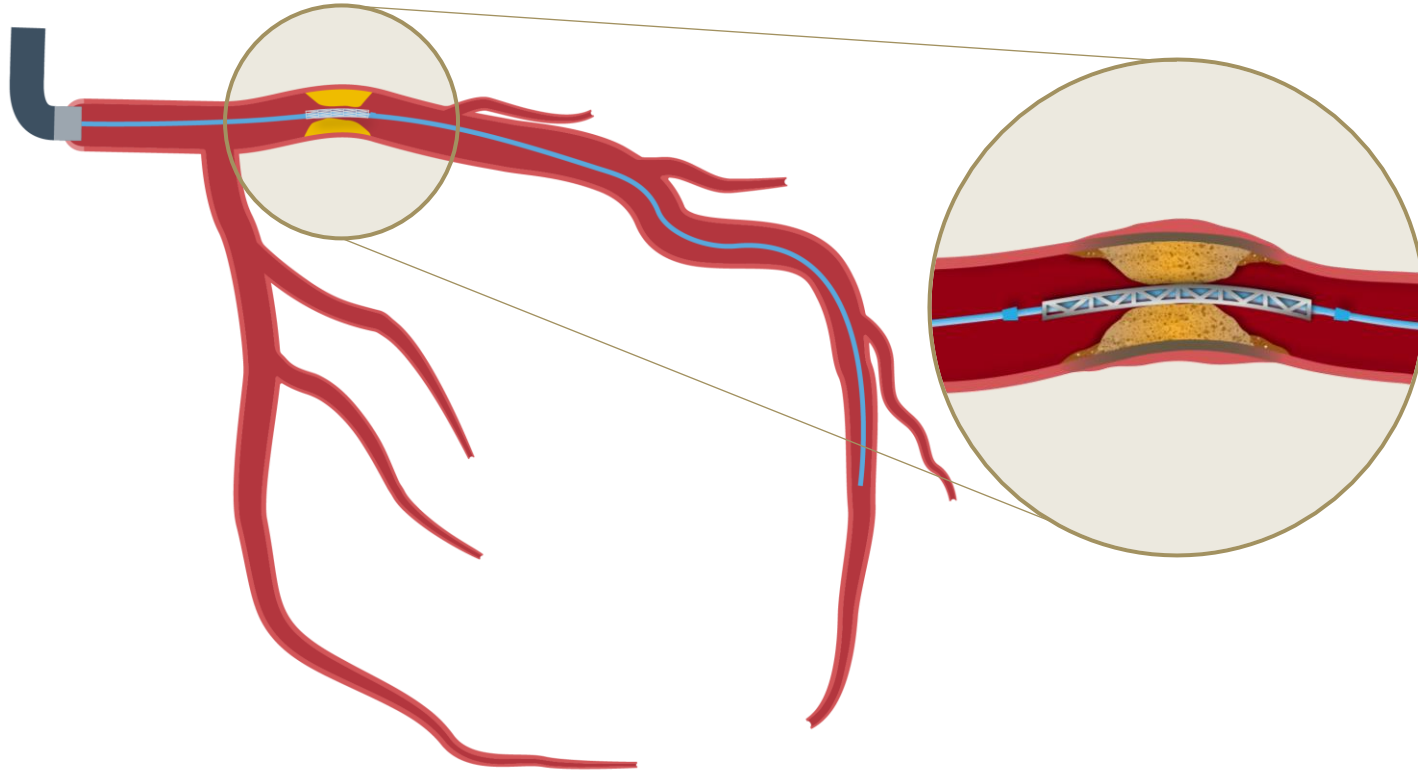
# PCI in focal CAD

FFR	Pd	Pa
0.70	70	100



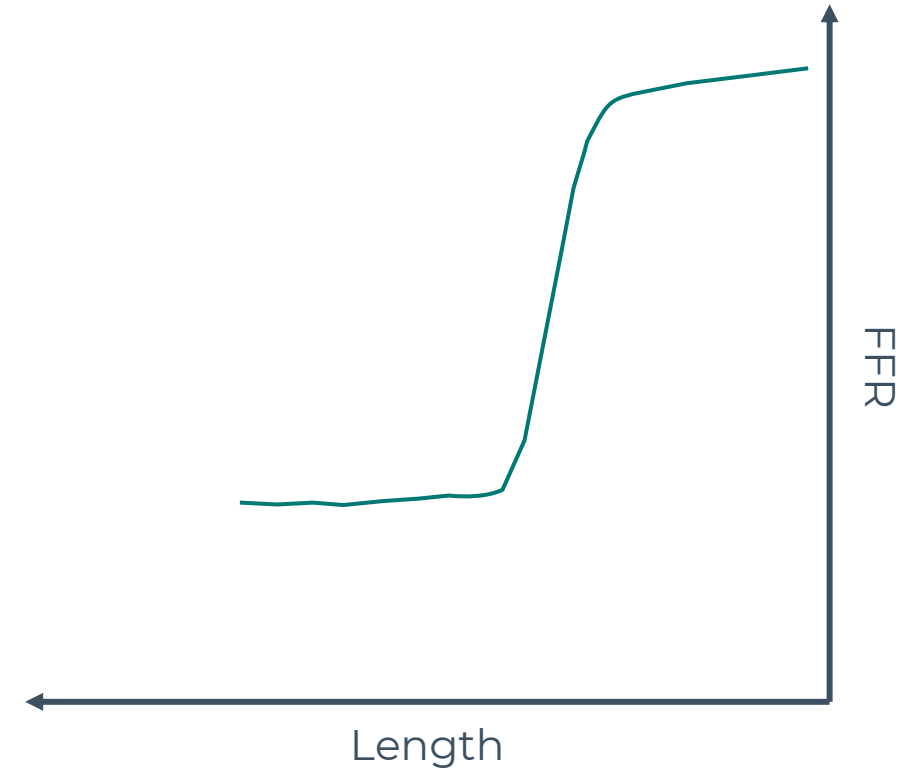
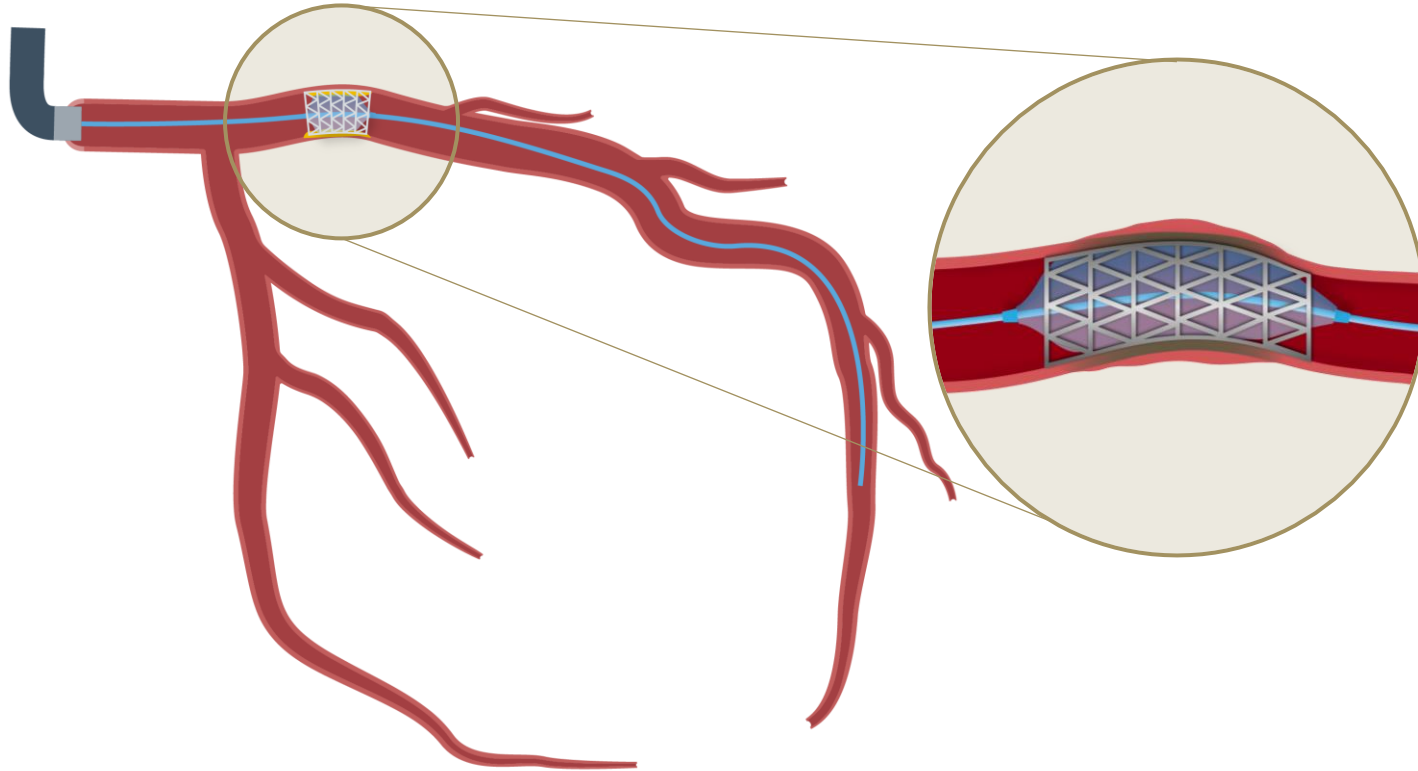
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0.70	70	100



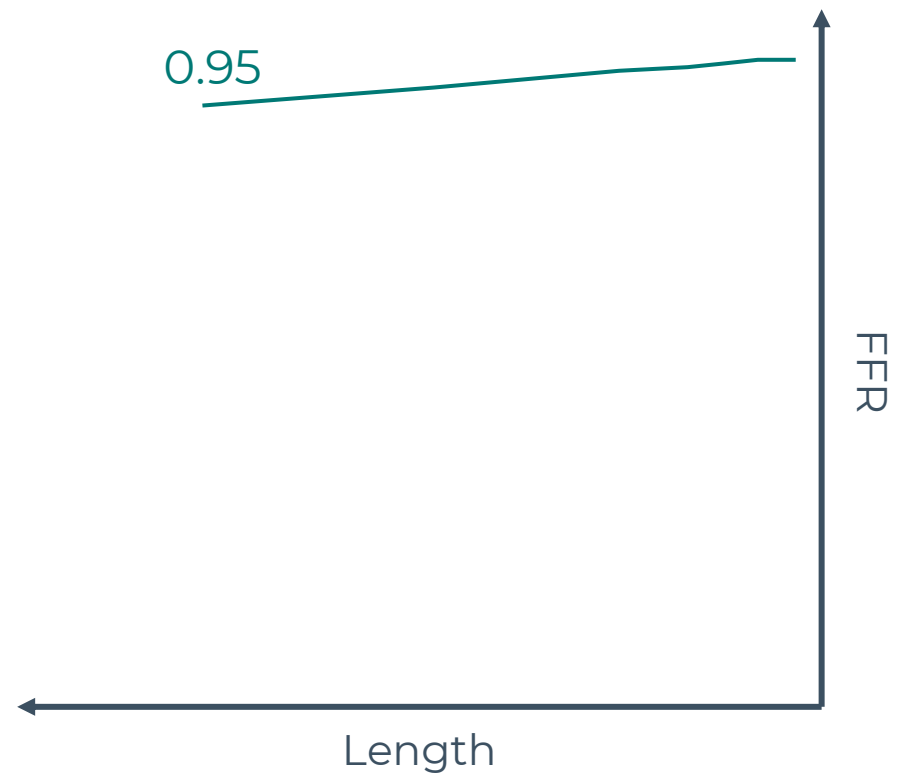
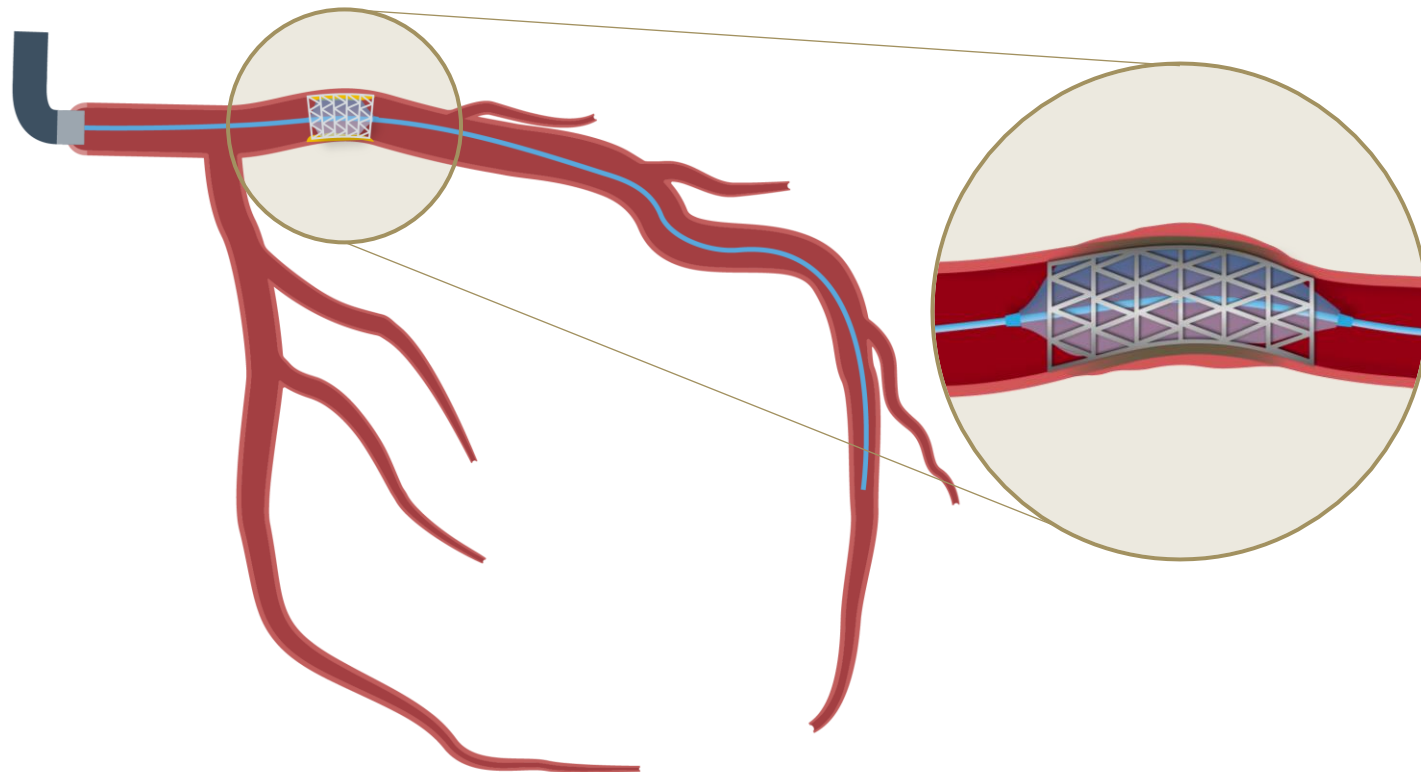
# PCI in focal CAD

FFR	Pd	Pa
0.70	70	100



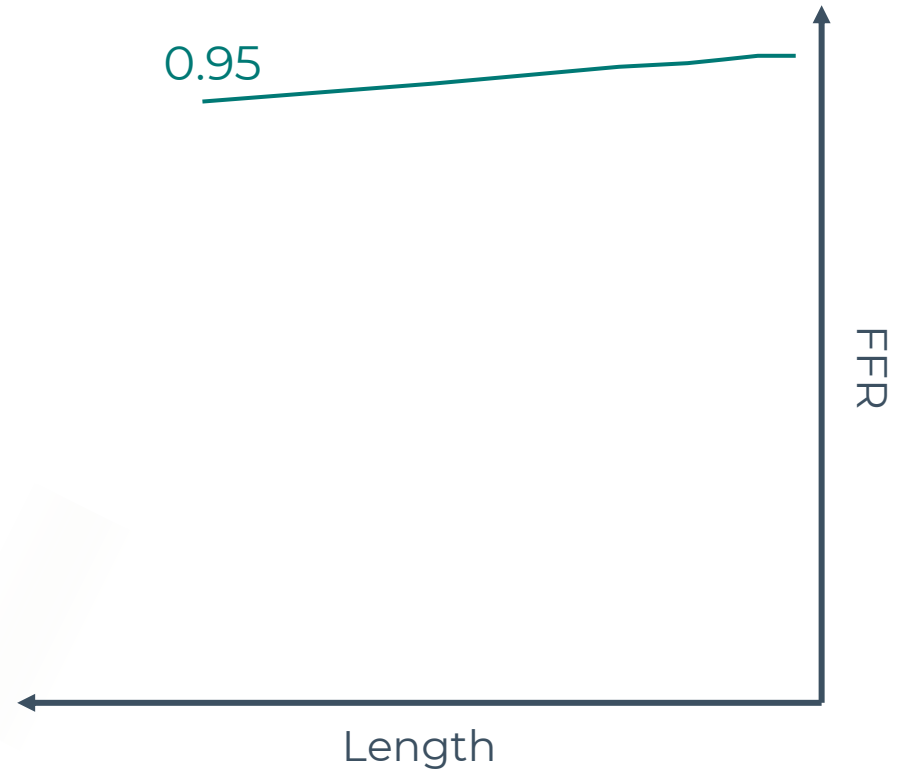
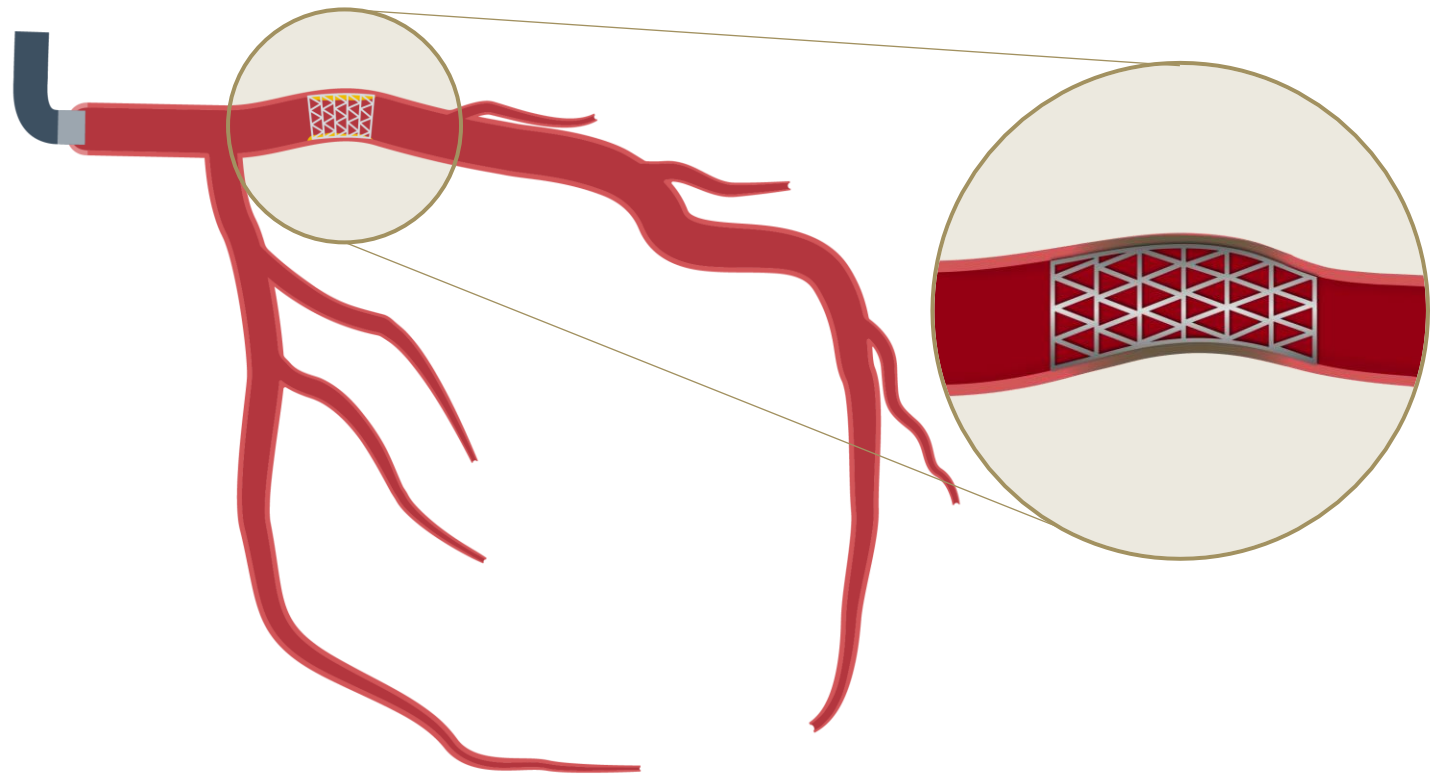
# PCI in focal CAD

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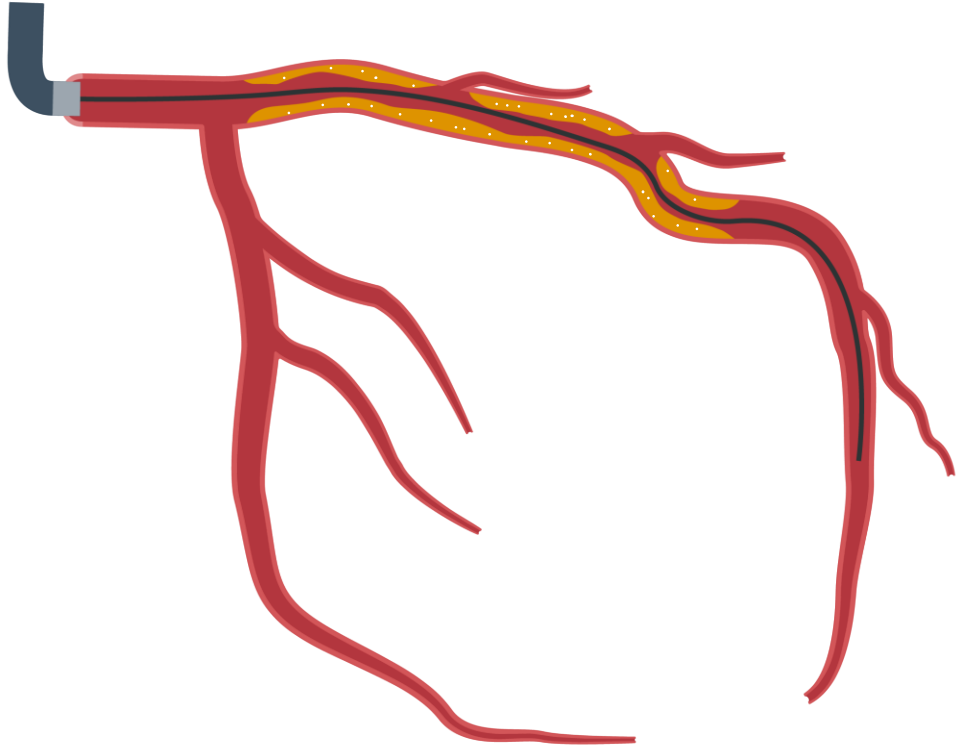
# PCI in focal CAD

FFR	Pd	Pa
0.95	95	100



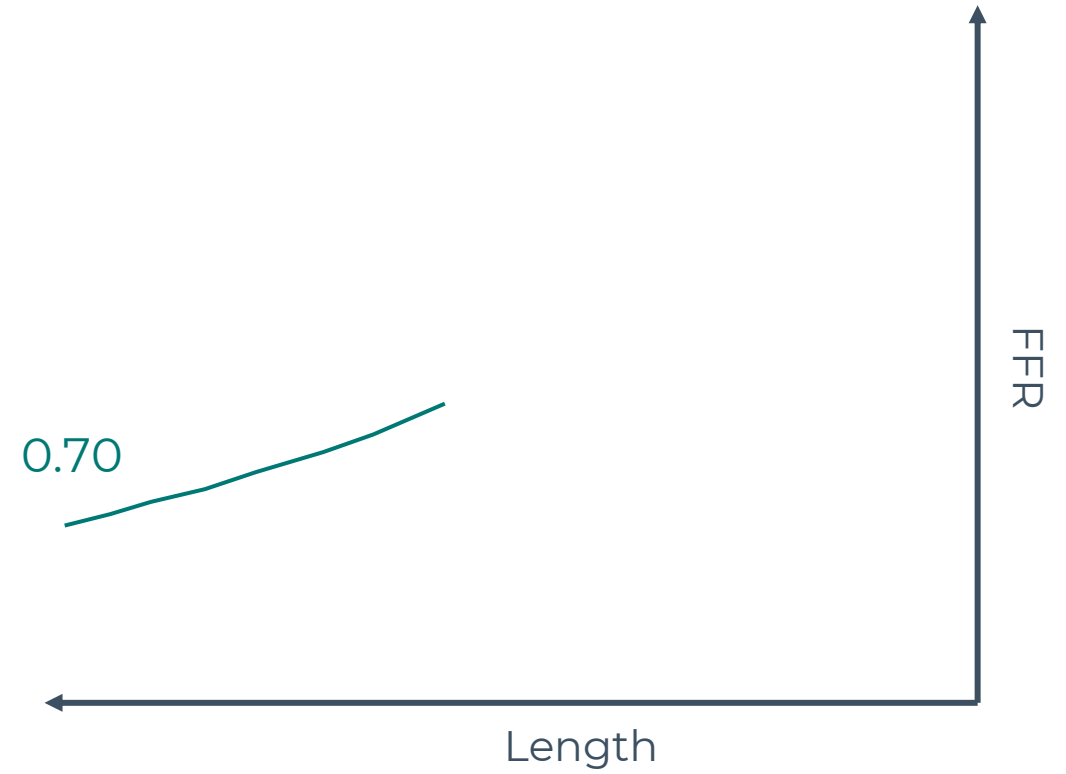
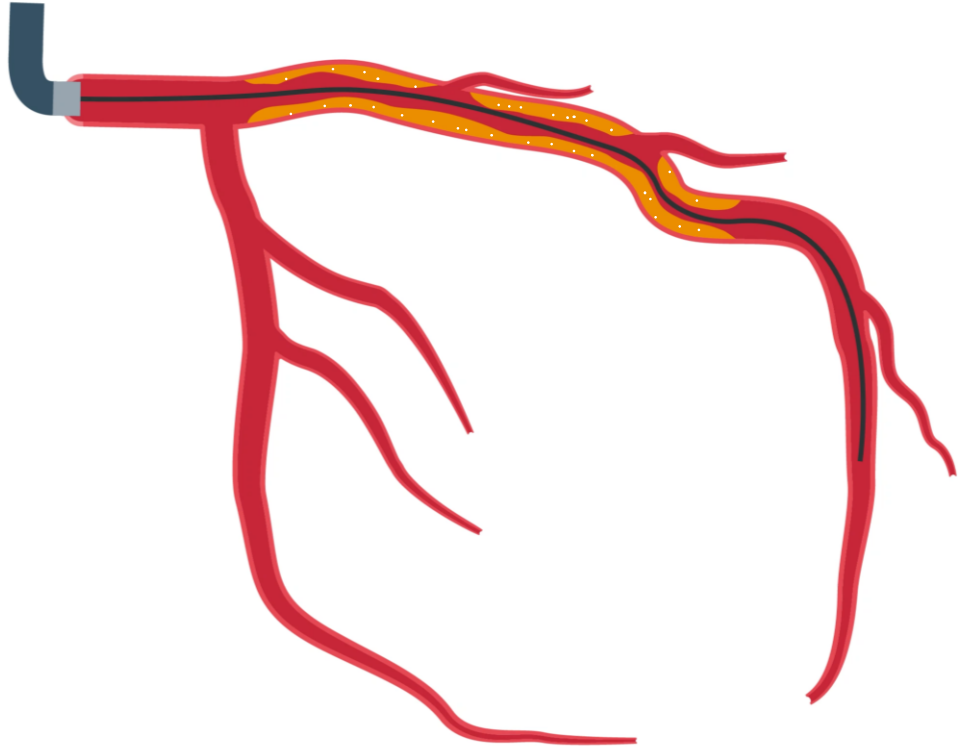


# PCI in diffuse CAD



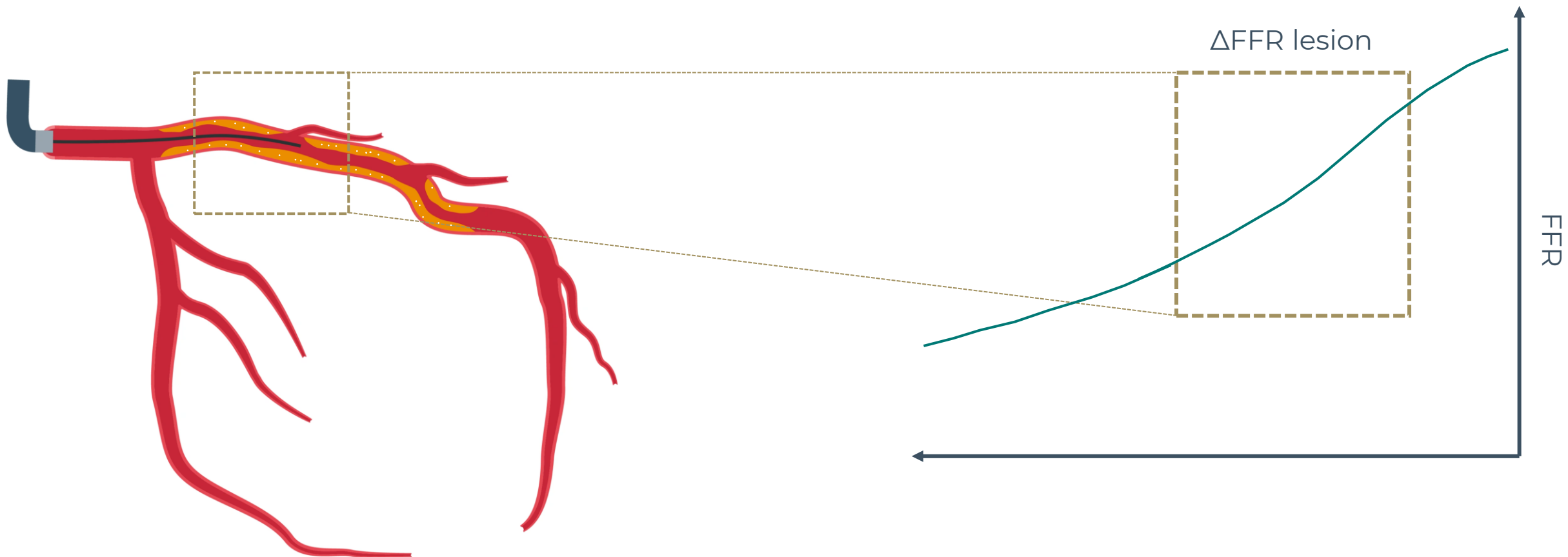
# PCI in diffuse CAD

FFR	Pd	Pa
0.70	70	100



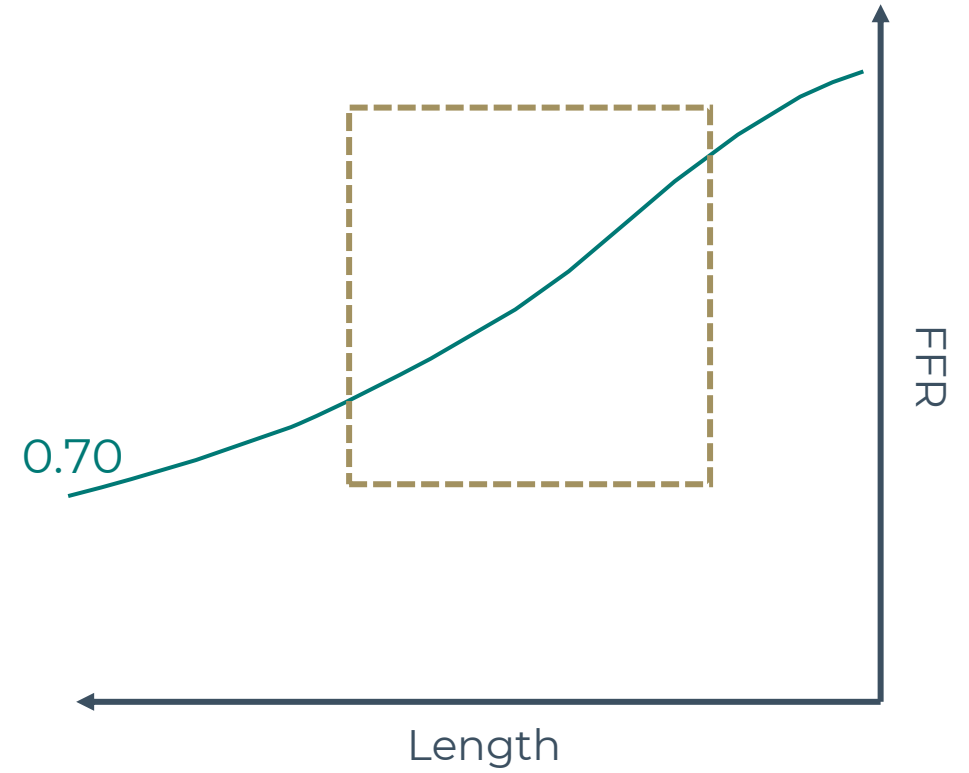
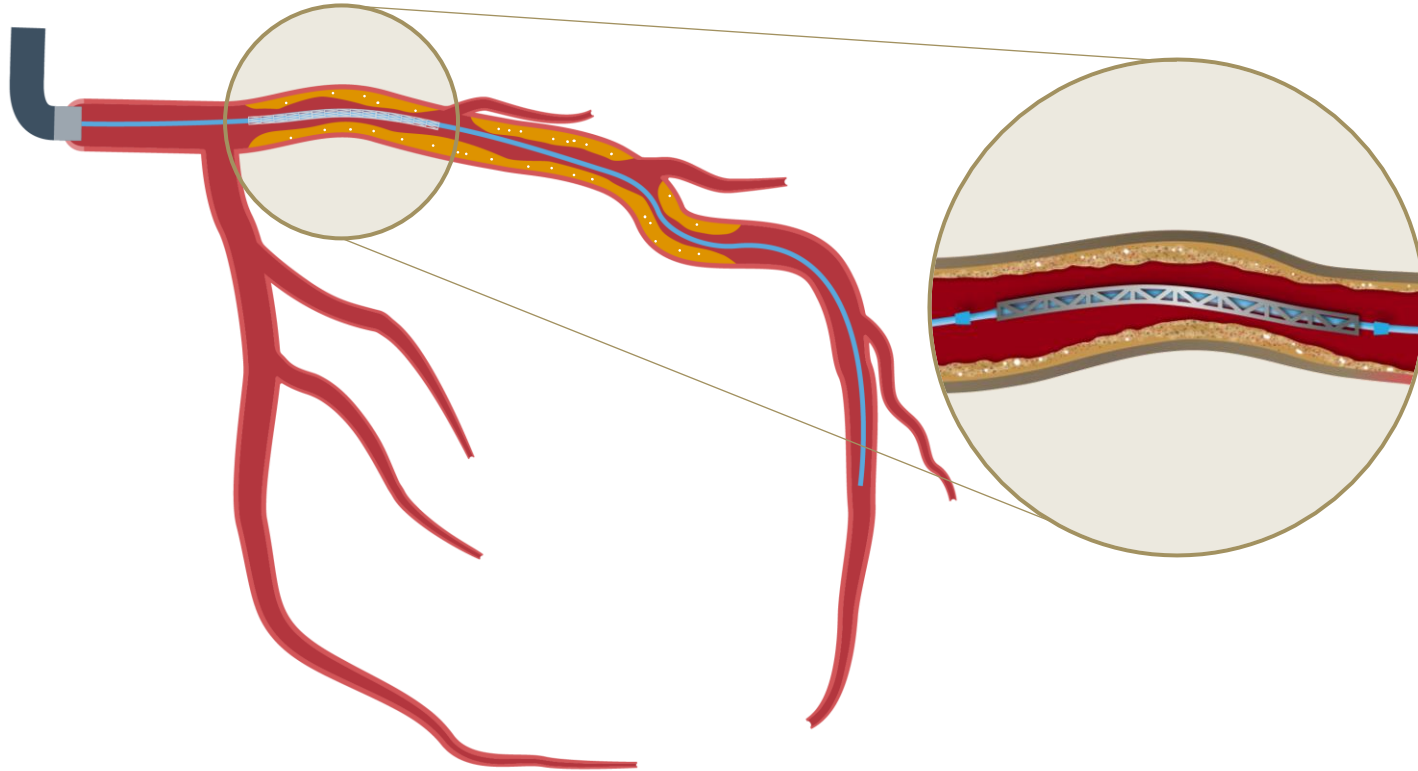
# PCI in diffuse CAD

FFR 0.70 Pd 70 Pa 100



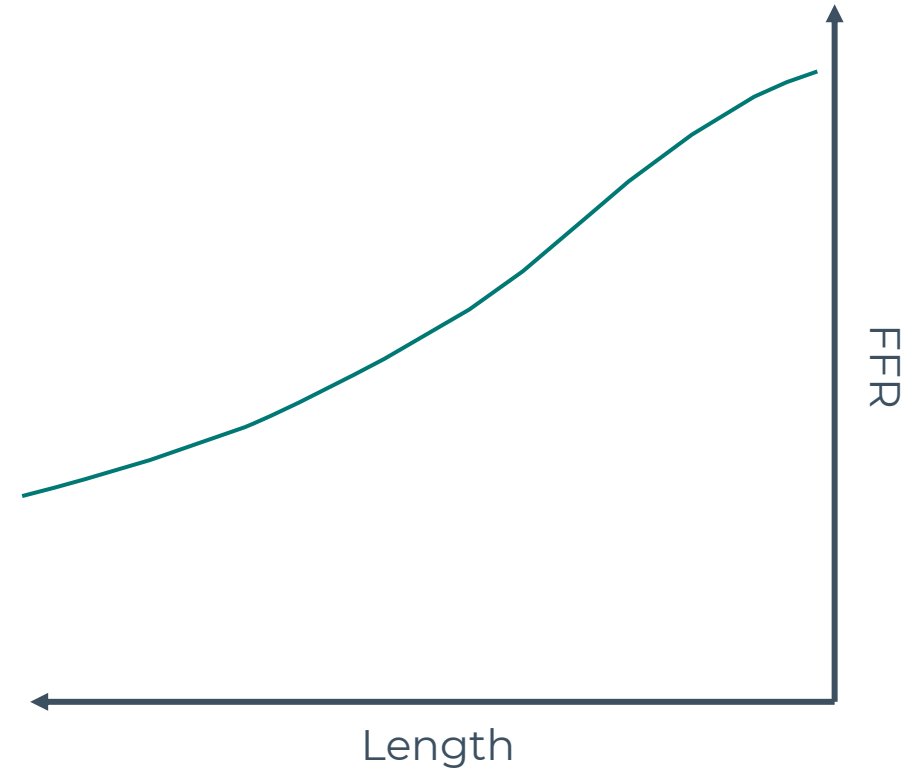
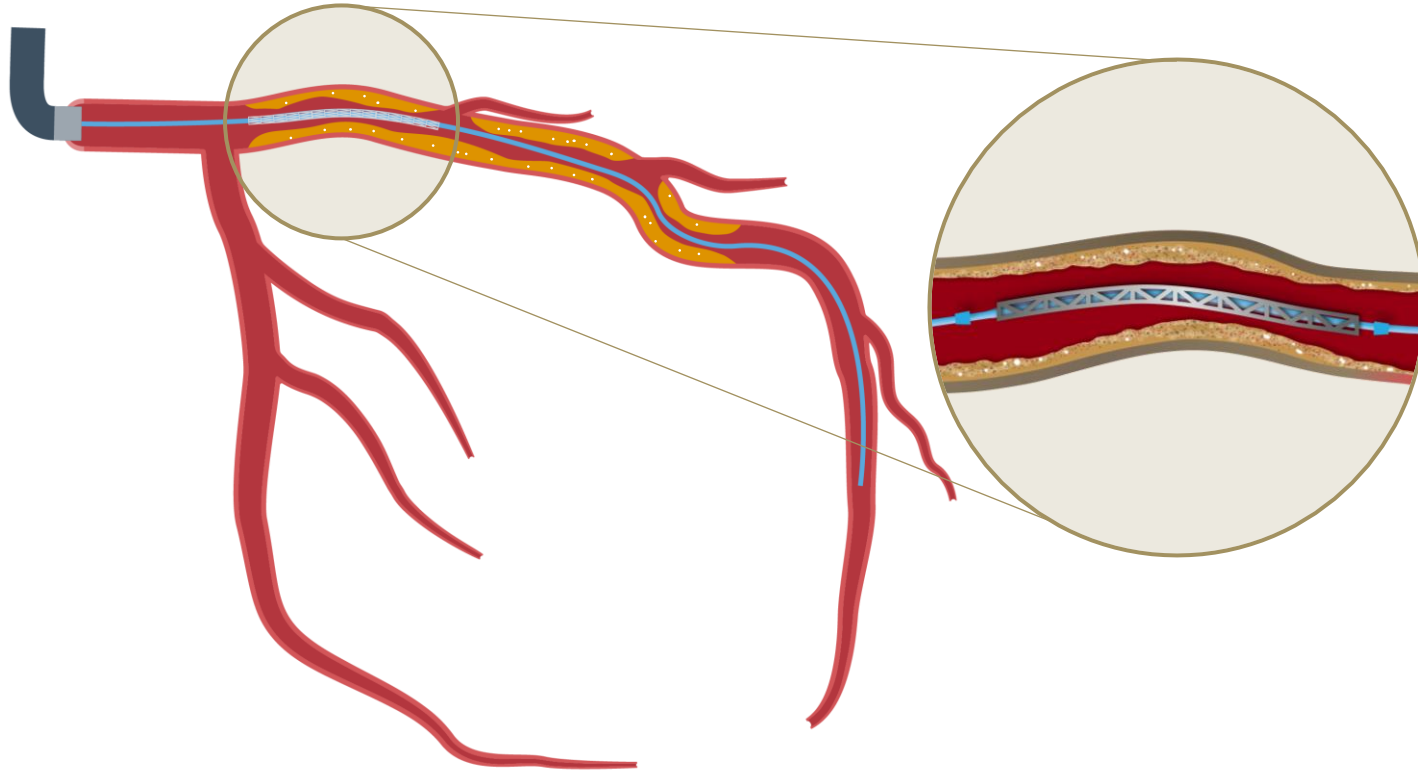
# PCI in diffuse CAD

FFR	Pd	Pa
0.70	70	100



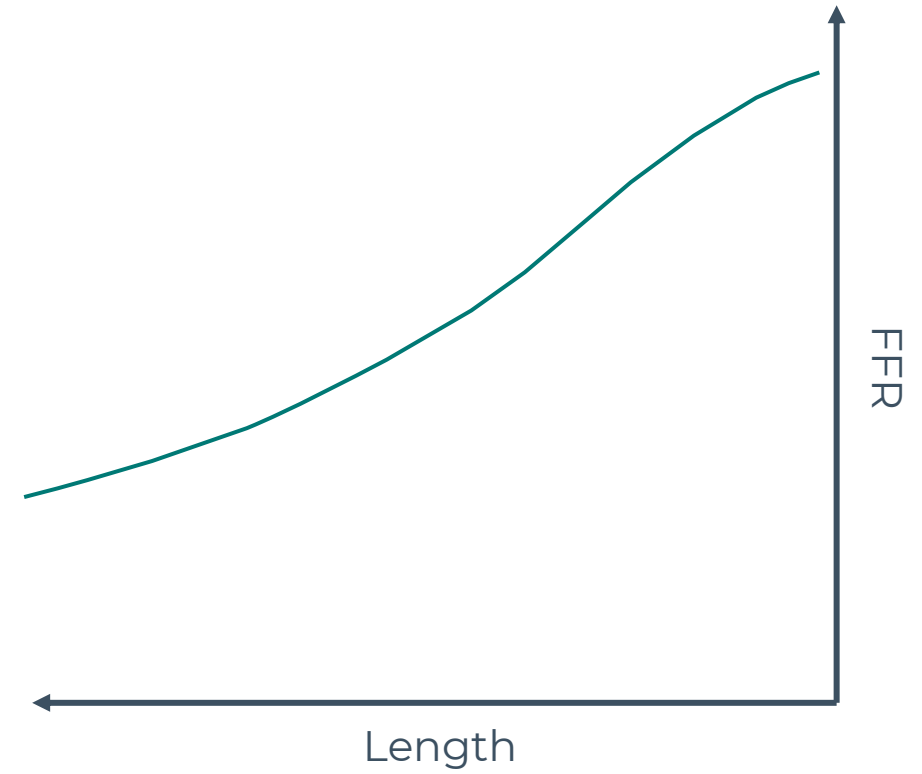
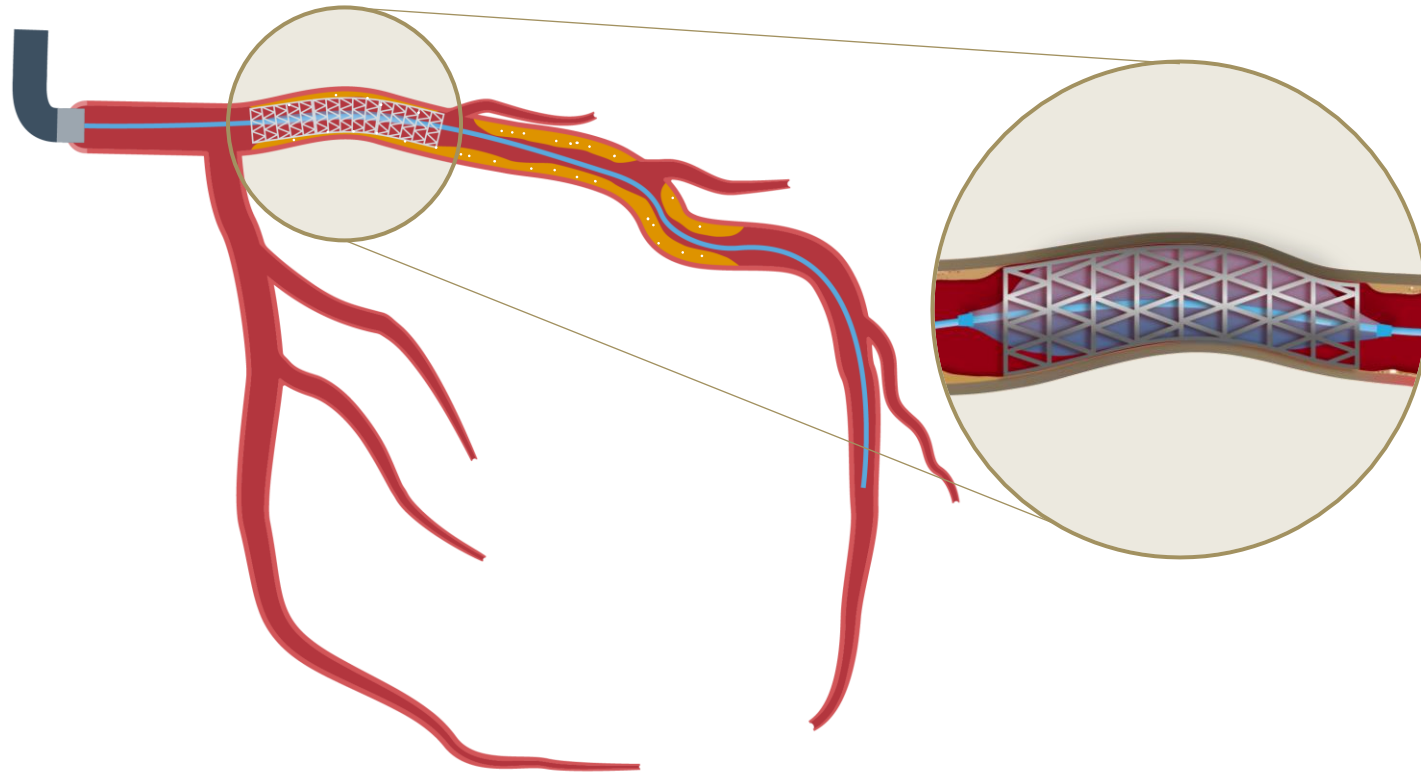
# PCI in diffuse CAD

FFR	Pd	Pa
0.70	70	100



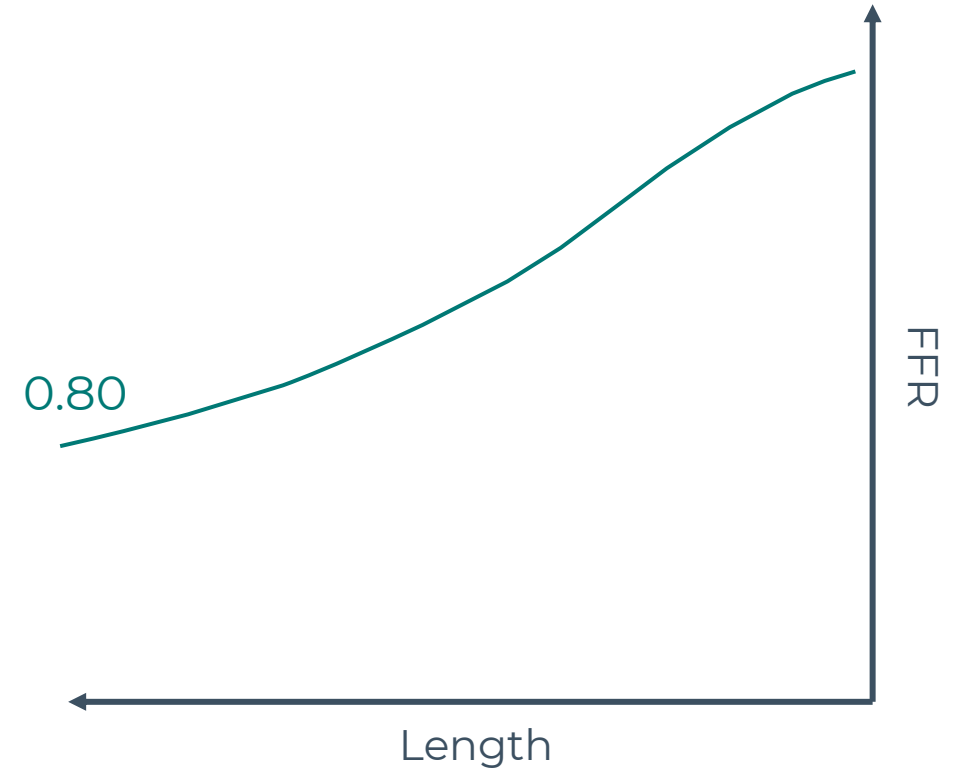
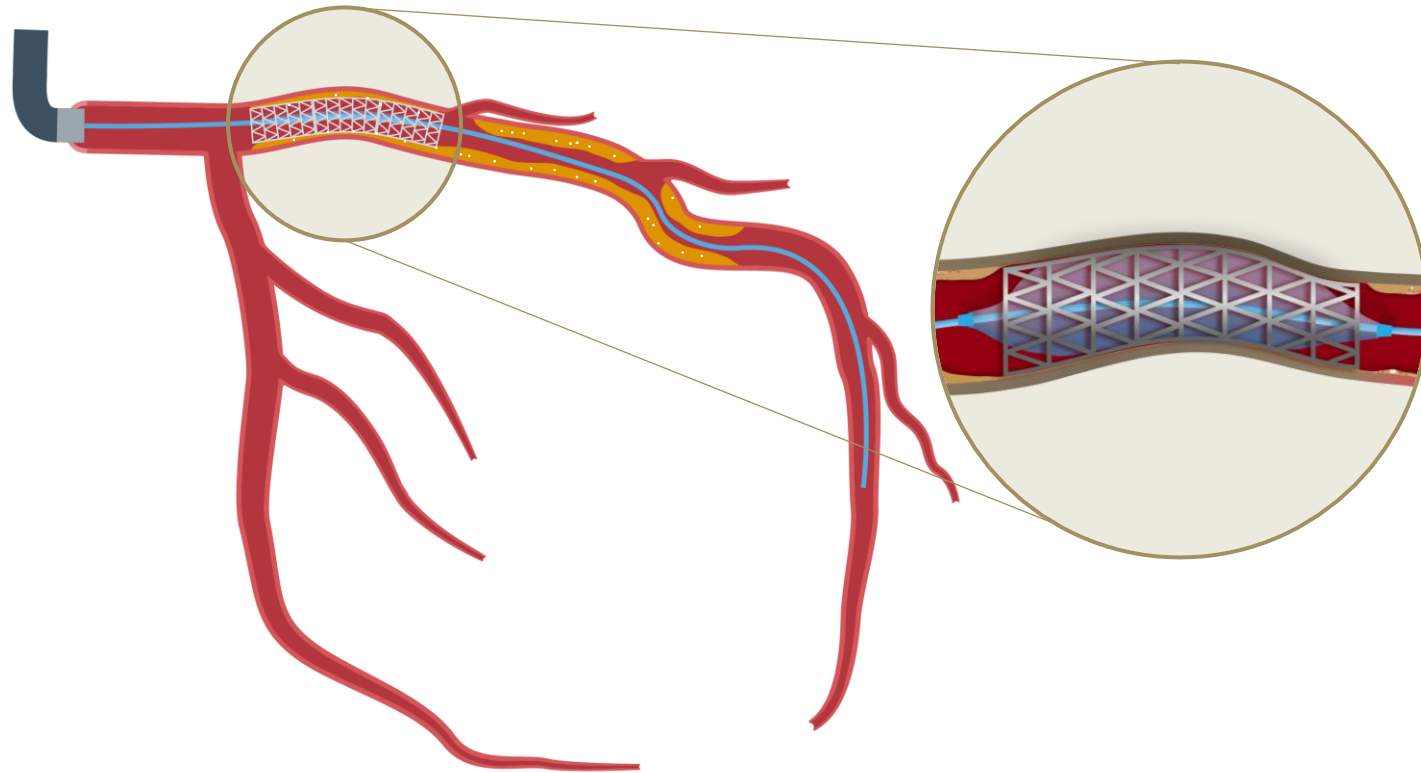
# PCI in diffuse CAD

FFR	Pd	Pa
0.70	70	100



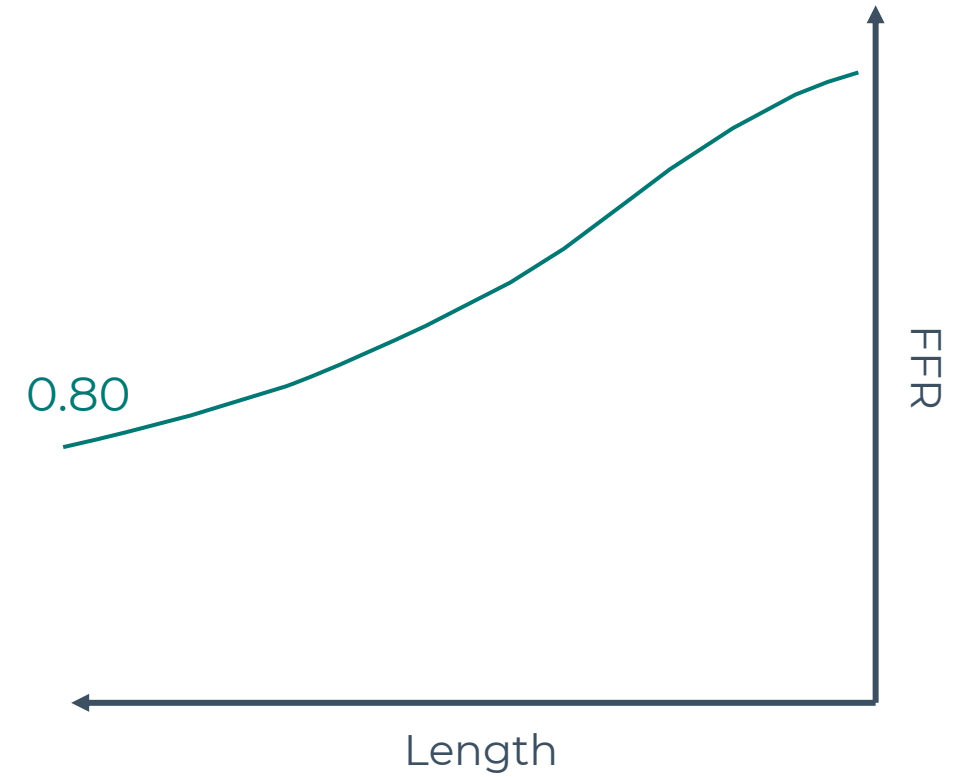
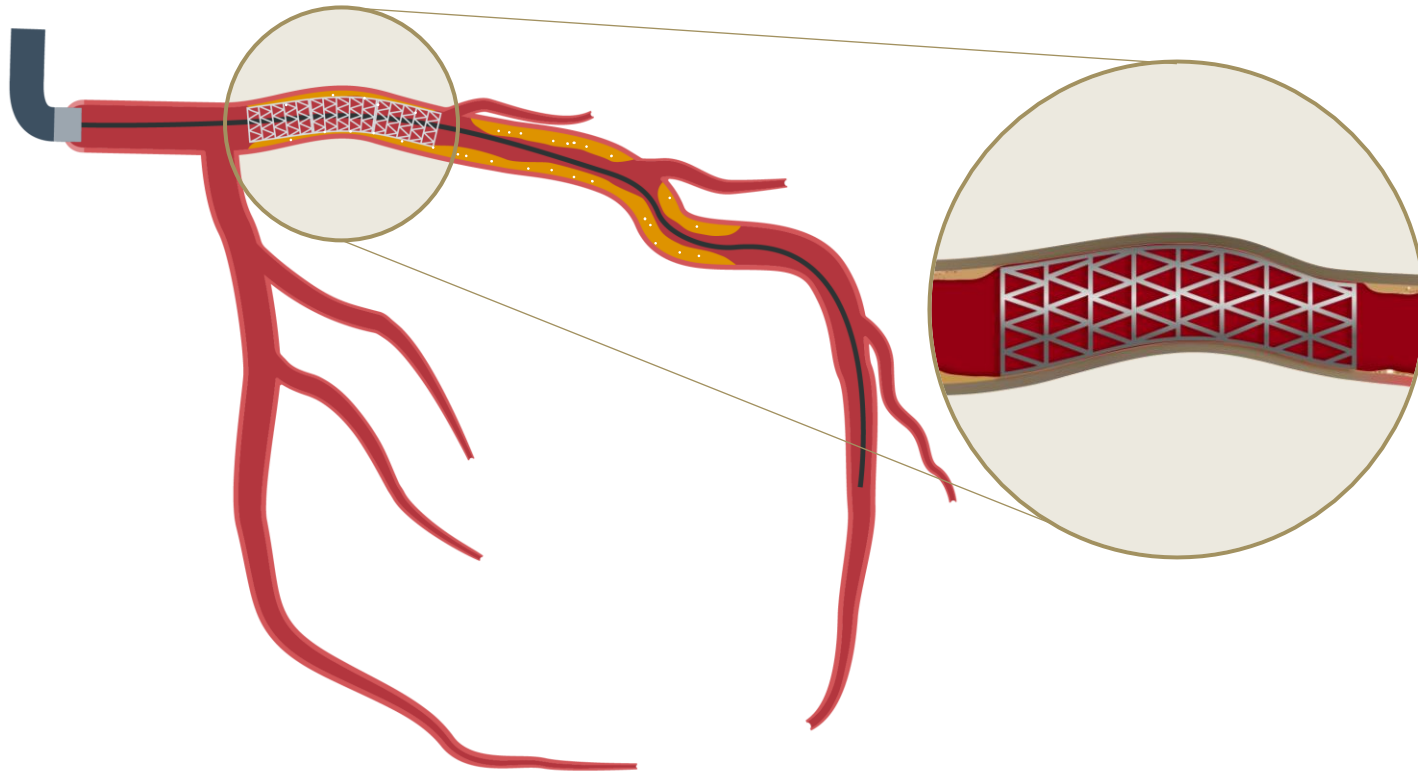
# PCI in diffuse CAD

FFR	Pd	Pa
0.80	80	100



# PCI in diffuse CAD

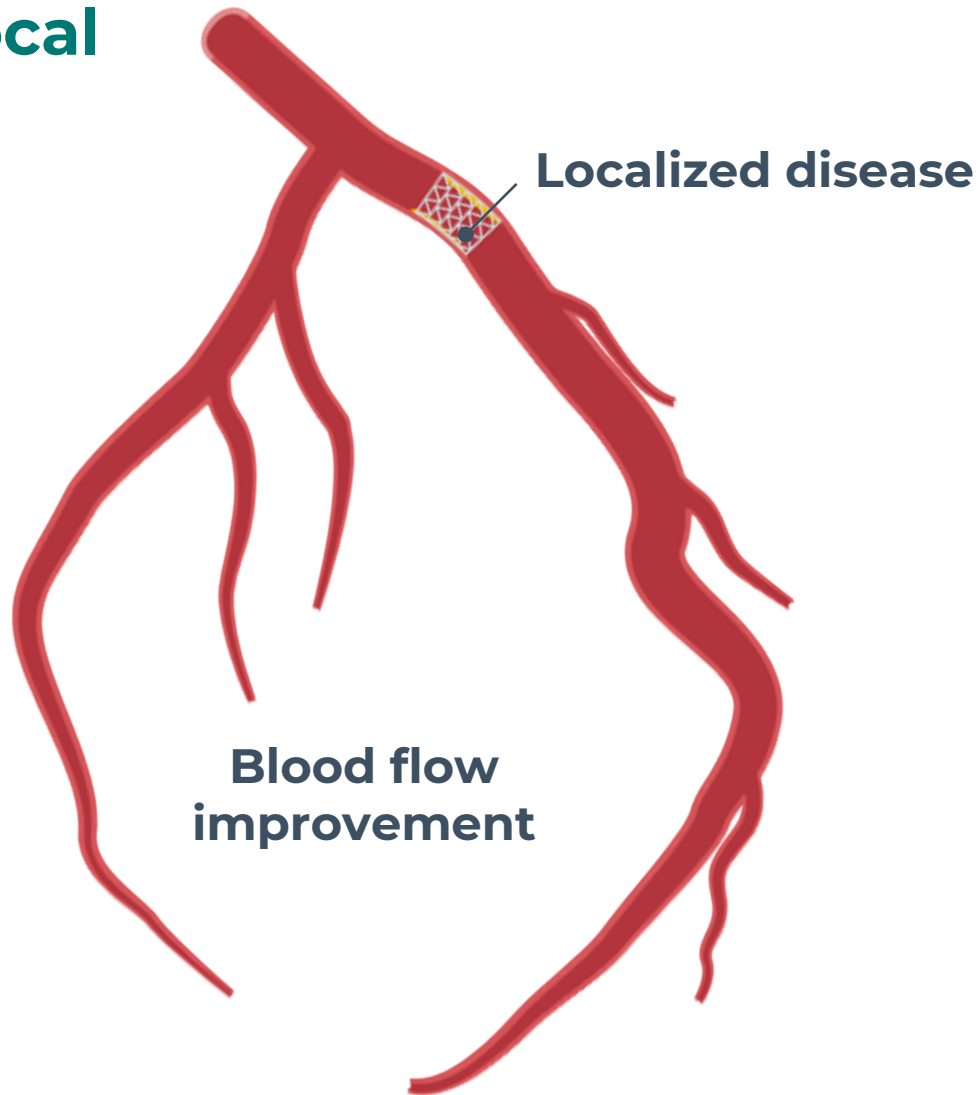
FFR	Pd	Pa
0.80	80	100



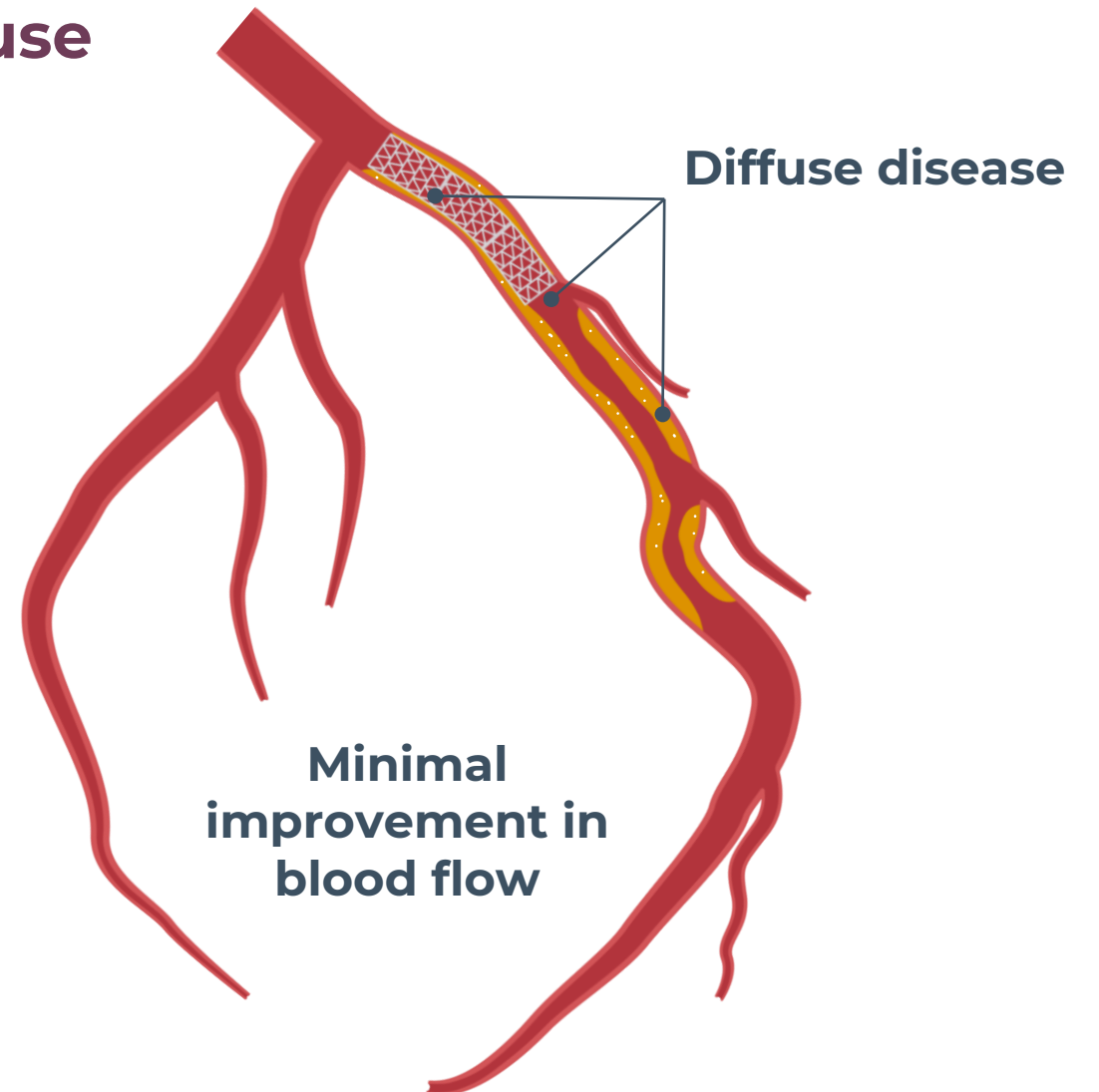


# Outcomes of PCI by disease pattern

## Focal

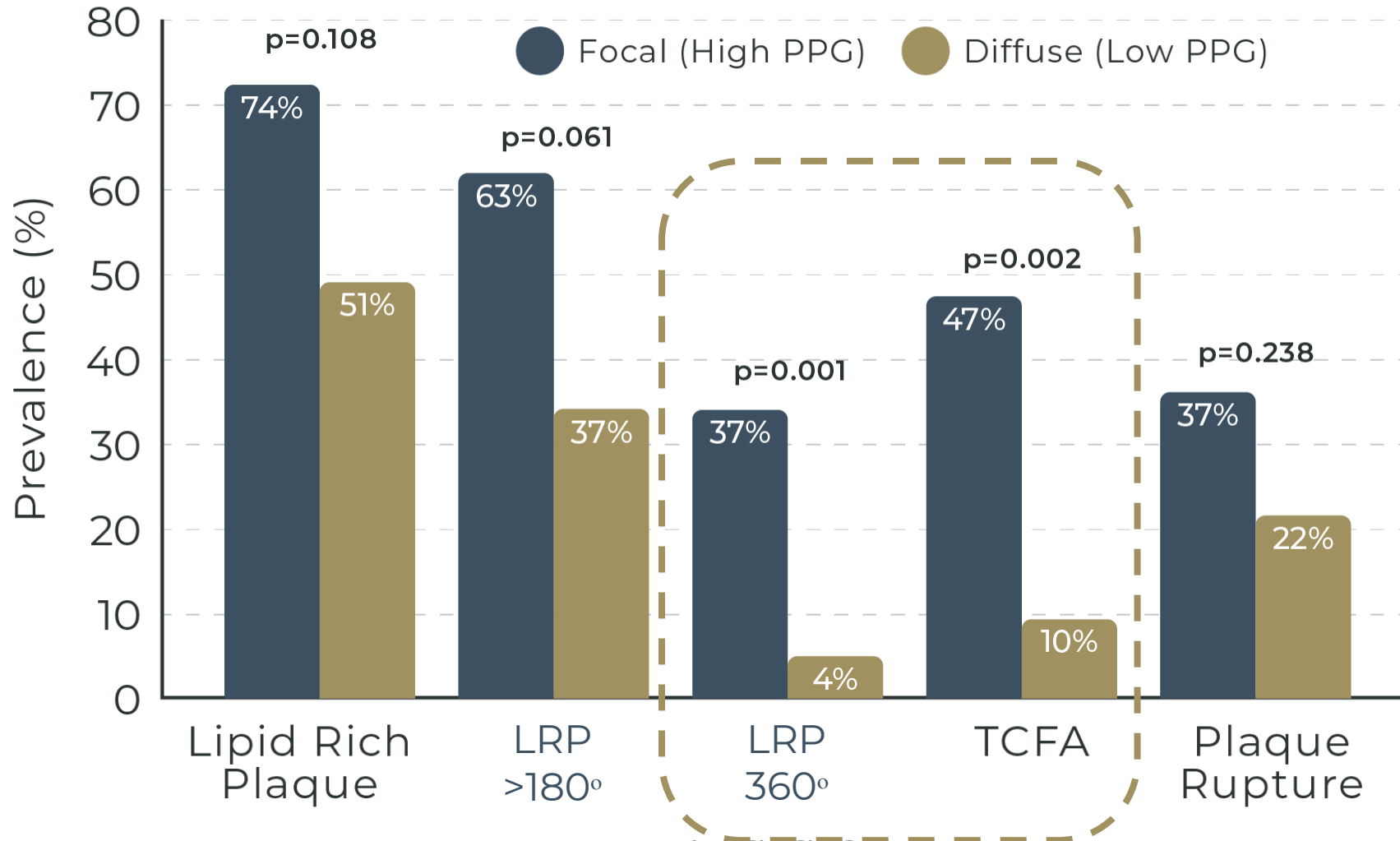


## Diffuse



# Diffuse disease and plaque characteristics

# PPG and OCT vulnerable plaque features



# PPG and calcium

Variables	Diffuse CAD (PPG $\leq 0.66$ )	Focal CAD (PPG $> 0.66$ )	p-value
Number of vessels, n	60	60	-
Plaque burden at MLA, %	82.3 $\pm$ 9.8	87.1 $\pm$ 7.5	0.003
Lesion non-calcified plaque burden, %	77.5 $\pm$ 18.3	84.4 $\pm$ 14.9	0.027
Lesion calcified plaque burden, %	22.5 $\pm$ 18.3	15.7 $\pm$ 14.9	0.027
Calcium thickness, mm	1.4 $\pm$ 1.1	1.1 $\pm$ 1.1	0.121
Calcium length, mm	7.6 $\pm$ 7.6	3.6 $\pm$ 4.5	0.003
Calcium arc, degree	50.0 [10.0, 180.0]	20.0 [0.0, 95.0]	0.056
Agatston score per vessel	151.0 [45.8, 359.9]	50.2 [8.8, 165.8]	0.019

# PPG and calcium

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<b>Lesion calcified plaque burden, %</b>	<b>22.5 <math>\pm</math> 18.3</b>	<b>15.7 <math>\pm</math> 14.9</b>	<b>0.027</b>
Calcium thickness, mm	1.4 $\pm$ 1.1	1.1 $\pm$ 1.1	0.121
<b>Calcium length, mm</b>	<b>7.6 <math>\pm</math> 7.6</b>	<b>3.6 <math>\pm</math> 4.5</b>	<b>0.003</b>
<b>Calcium arc, degree</b>	<b>50.0 [10.0, 180.0]</b>	<b>20.0 [0.0, 95.0]</b>	<b>0.056</b>
<b>Agatston score per vessel</b>	<b>151.0 [45.8, 359.9]</b>	<b>50.2 [8.8, 165.8]</b>	<b>0.019</b>

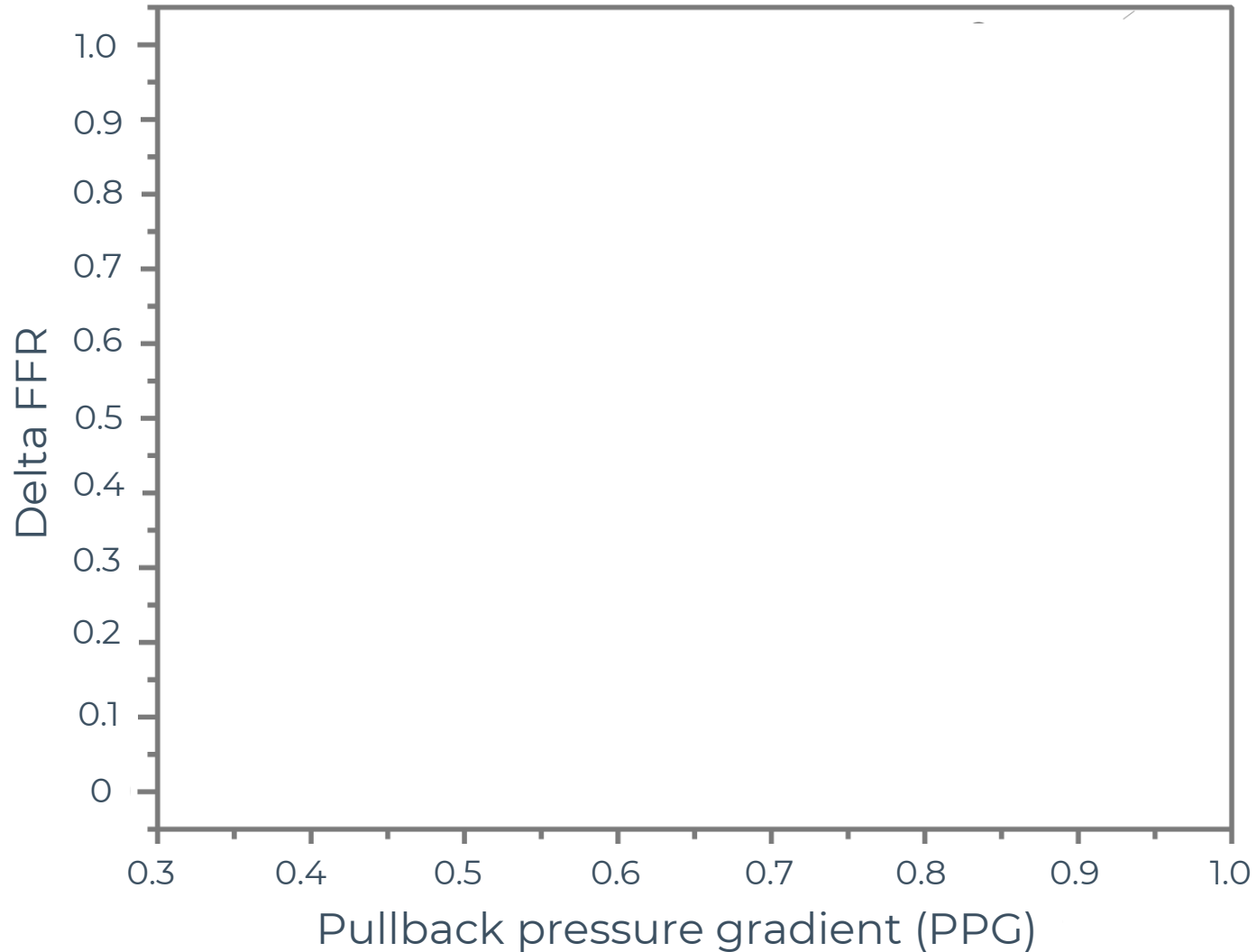
# Diffuse disease and outcomes after PCI

# Diffuse disease: procedural outcomes

**TABLE 2** Procedural Characteristics Stratified by Coronary Artery Disease Patterns

	Overall (N = 103)	Focal (PPG ≥0.66) (n = 51)	Diffuse (PPG <0.66) (n = 52)	P Value
Diameter stenosis, %	61.4 ± 15.7	65.2 ± 16.4	57.6 ± 14.3	0.013
PPG	0.65 ± 0.14	0.77 ± 0.06)	0.54 ± 0.09	<0.001
Predilatation	103 (100.0)	51 (100.0)	52 (100.0)	NA
Postdilatation	101 (98.1)	49 (96.1)	52 (100.0)	0.467
Intravascular imaging	20 (19.4)	4 (7.8)	16 (30.8)	0.007
PIOS <sup>a</sup>	53 (51.5)	26 (51.0)	27 (51.9)	1.000
Number of stents, per vessel	1.0 [1.0-2.0]	1.0 [1.0-2.0]	1.5 [1.0-2.0]	0.036
Stent diameter	3.20 ± 0.41	3.23 ± 0.44	3.17 ± 0.38	0.443
Total stent length, mm	42.61±21.51	37.43±19.20	47.69±22.61	0.015
Residual diameter stenosis	14.82 ± 9.13	14.78 ± 9.54	14.86 ± 8.80	0.962
Residual SYNTAX score	2.16 ± 4.02	2.76 ± 4.84	1.57 ± 2.92	0.146
Post-PCI Pd/Pa	0.93 ± 0.05	0.96 ± 0.05	0.91 ± 0.04	<0.001
Post-PCI FFR	0.86 ± 0.08	0.89 ± 0.07	0.83 ± 0.07	<0.001

# PPG and change in FFR after OCT-guided PCI

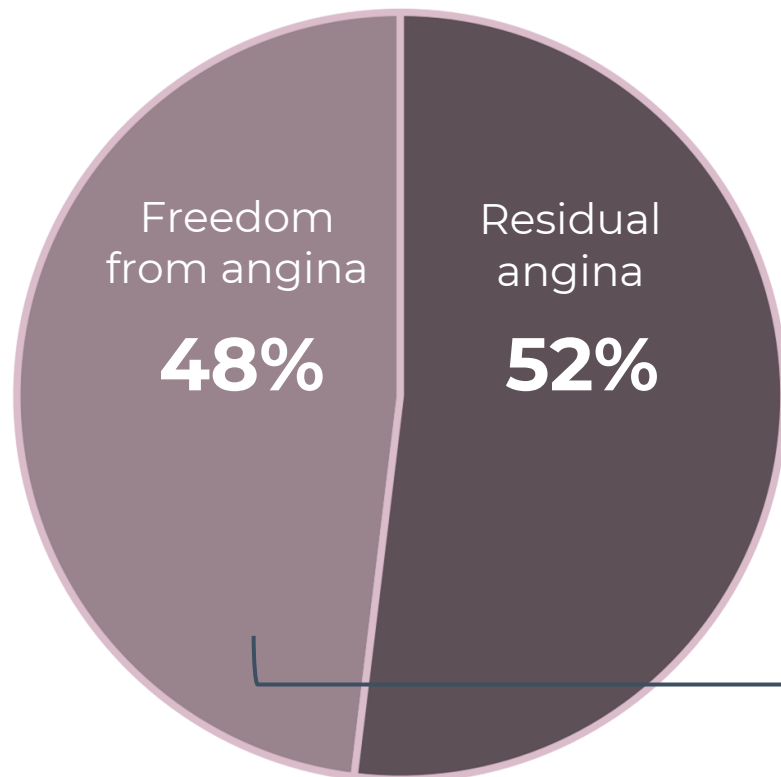


**$R^2 = 51\%$**

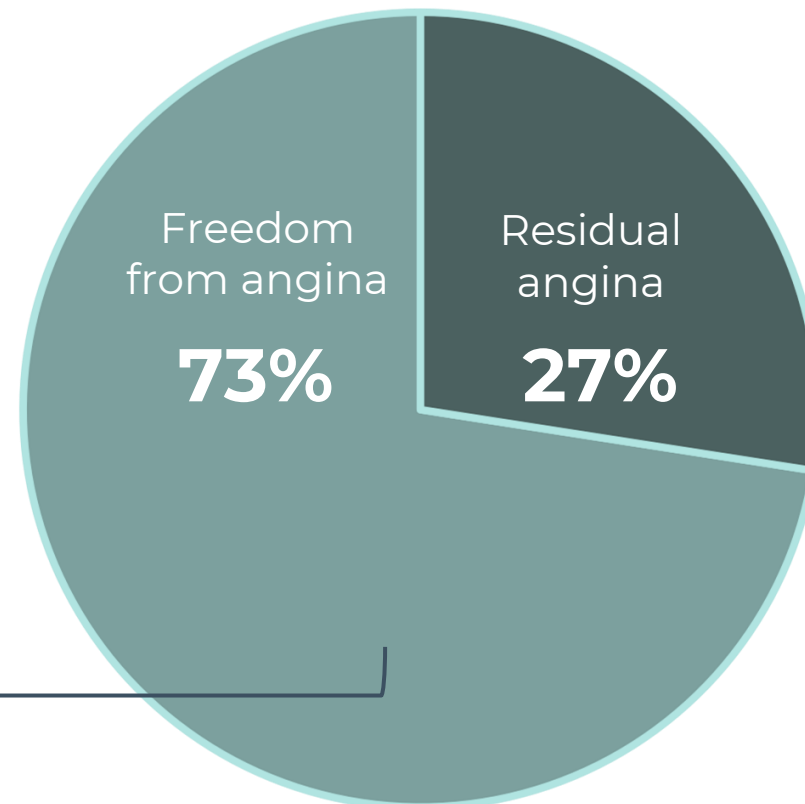


# PPG and patient-reported outcomes

## Diffuse CAD (Low PPG)



## Focal CAD (High PPG)

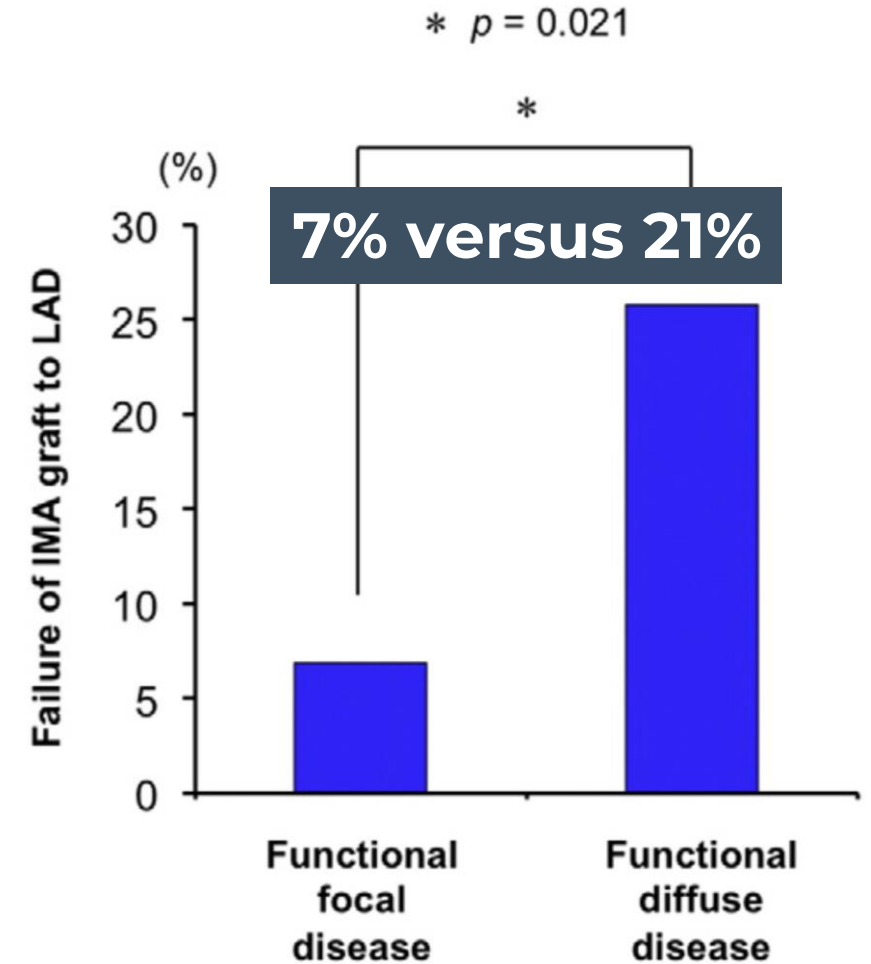
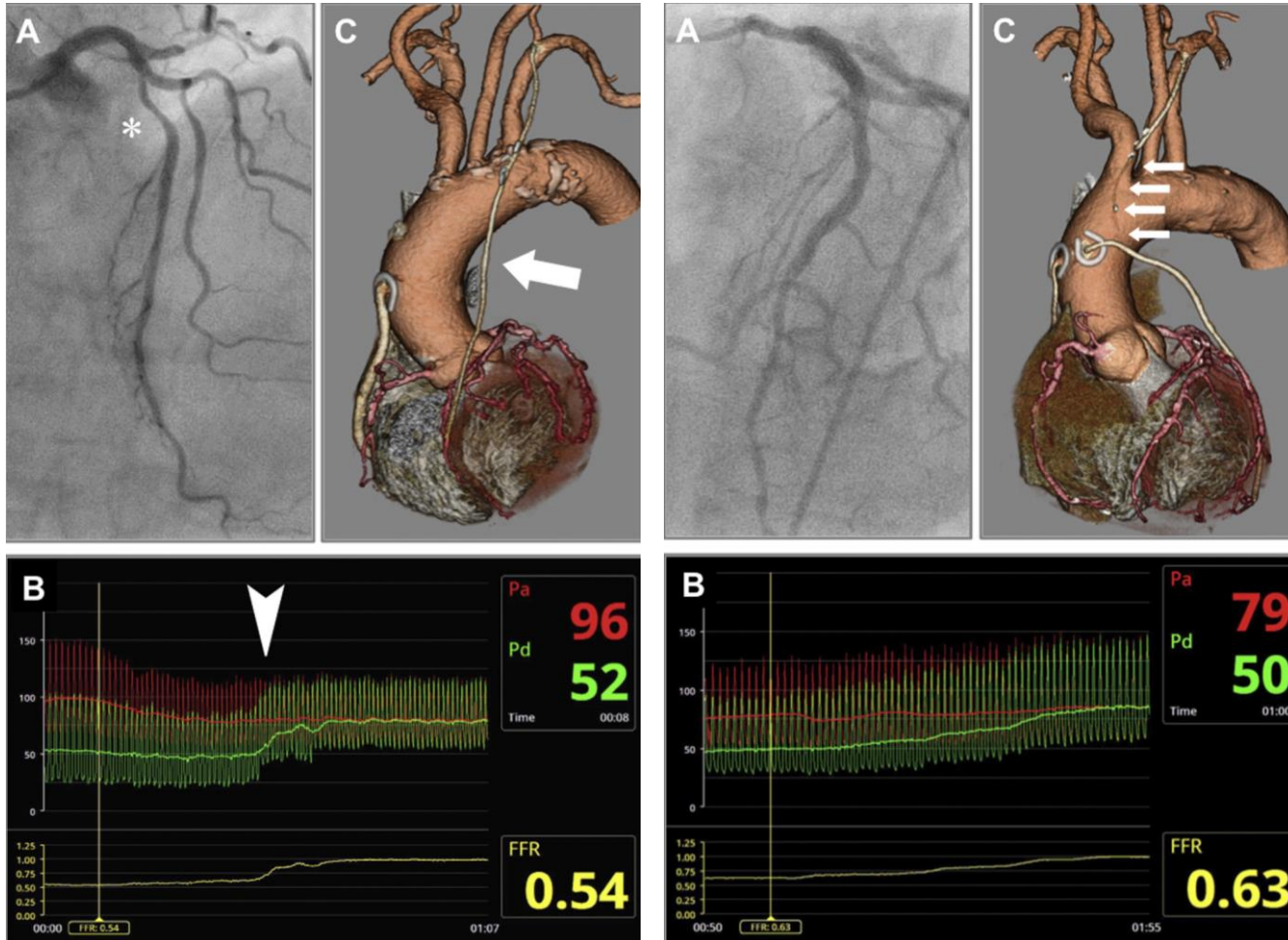


P-value = 0.02

Freedom from Angina is defined as SAQ-7 = 100

# How to treat diffuse disease?

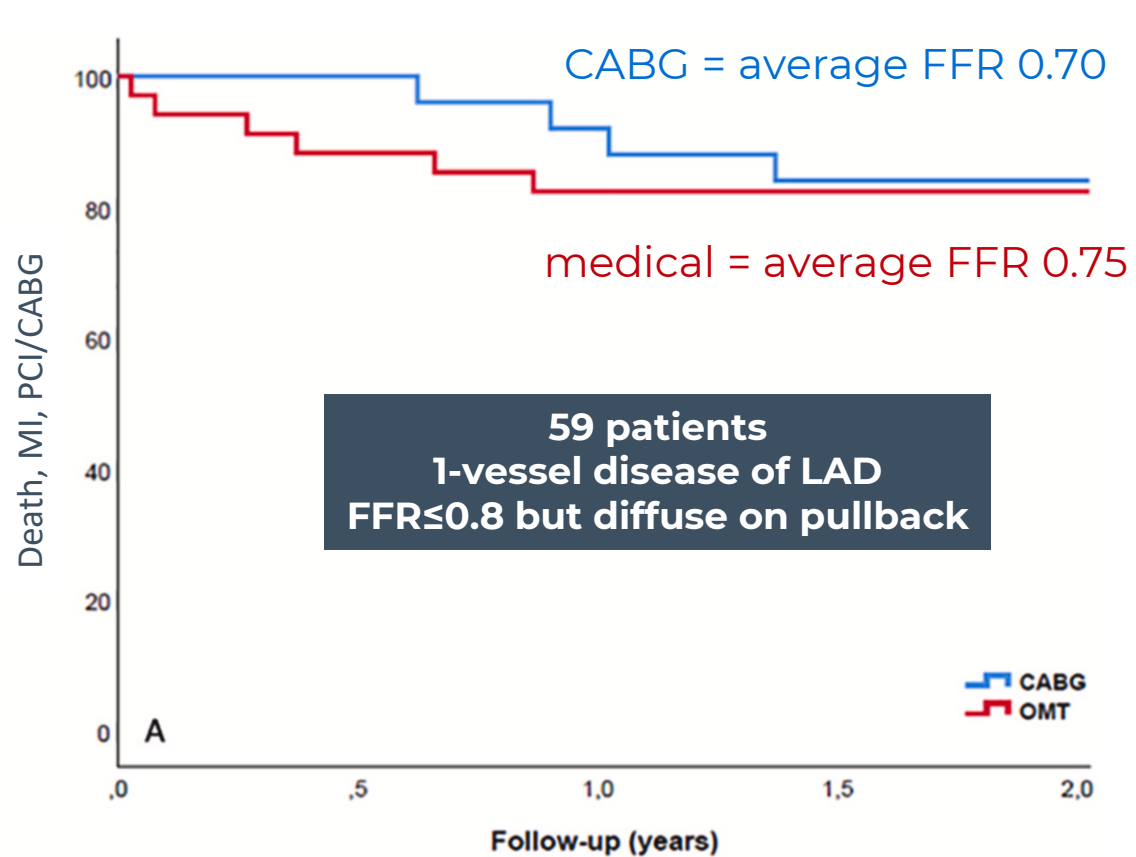
# Treat diffusely diseased LAD with LIMA?



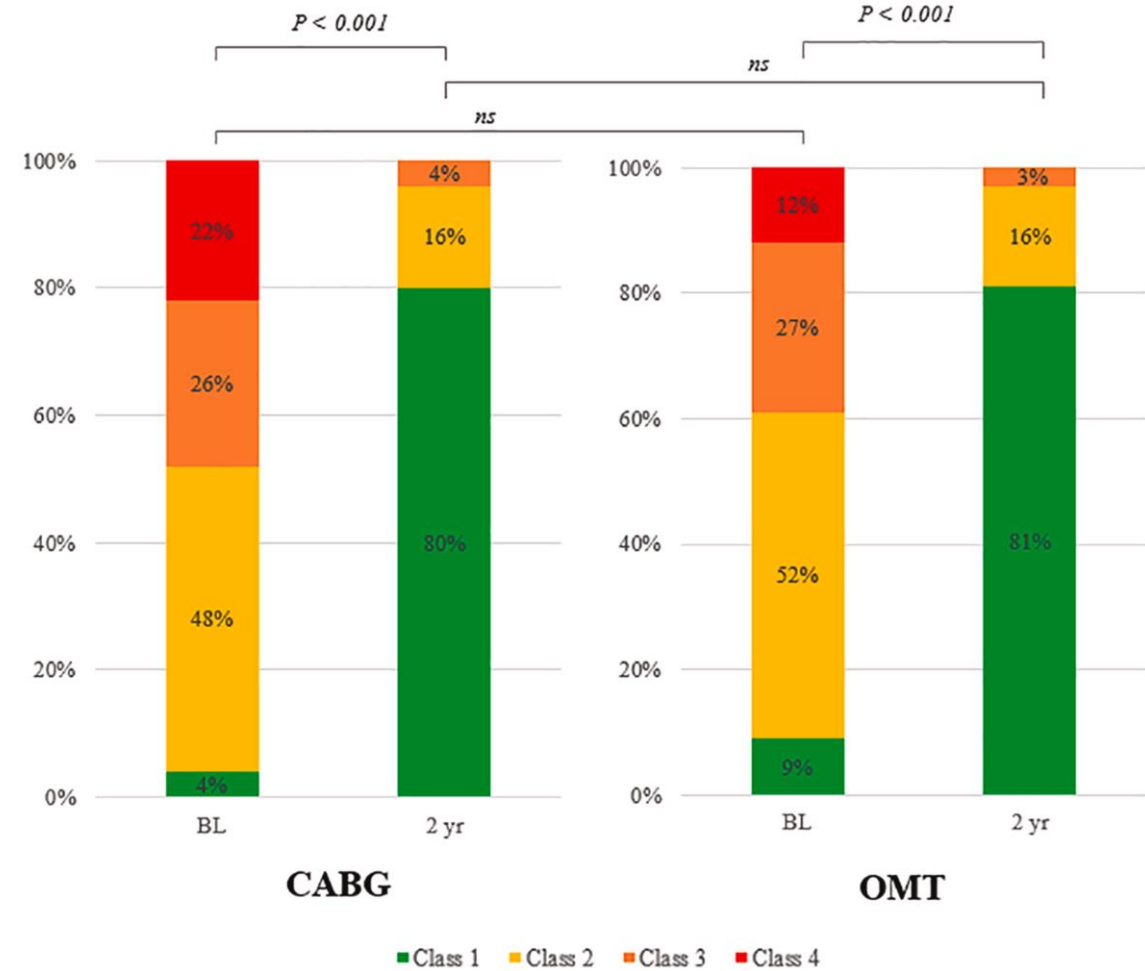
Focal disease  
Patent LIMA @ 3 months

Diffuse disease  
Atretic LIMA @ 4 months

# Treat diffusely diseased LAD with LIMA?

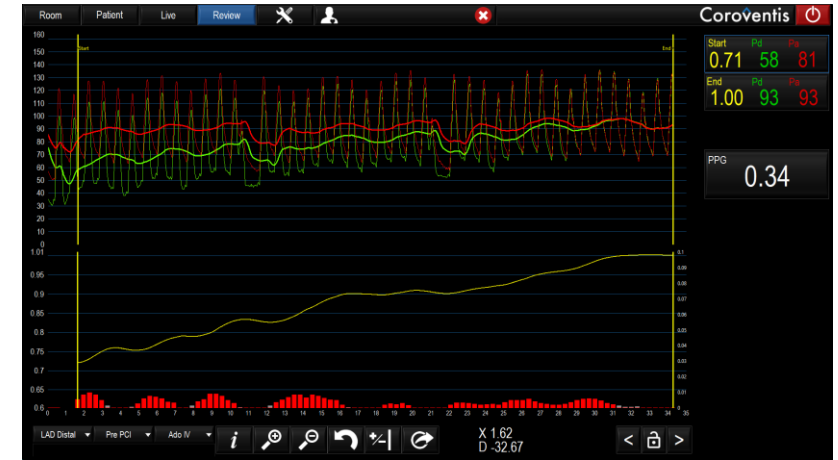
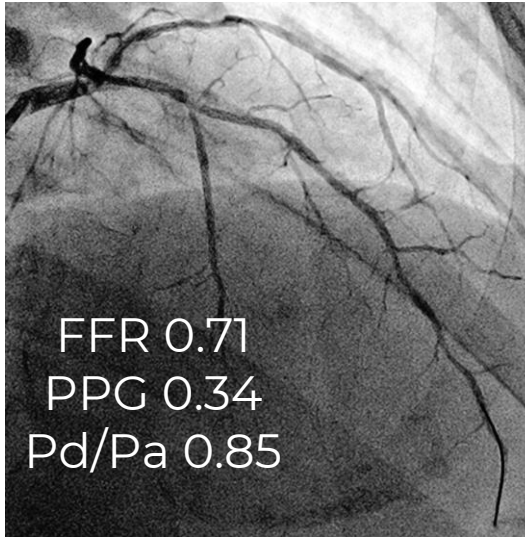


Number at risk	0	.5	1.0	1.5	2.0
CABG	25	25	23	21	21
OMT	34	30	28	28	28

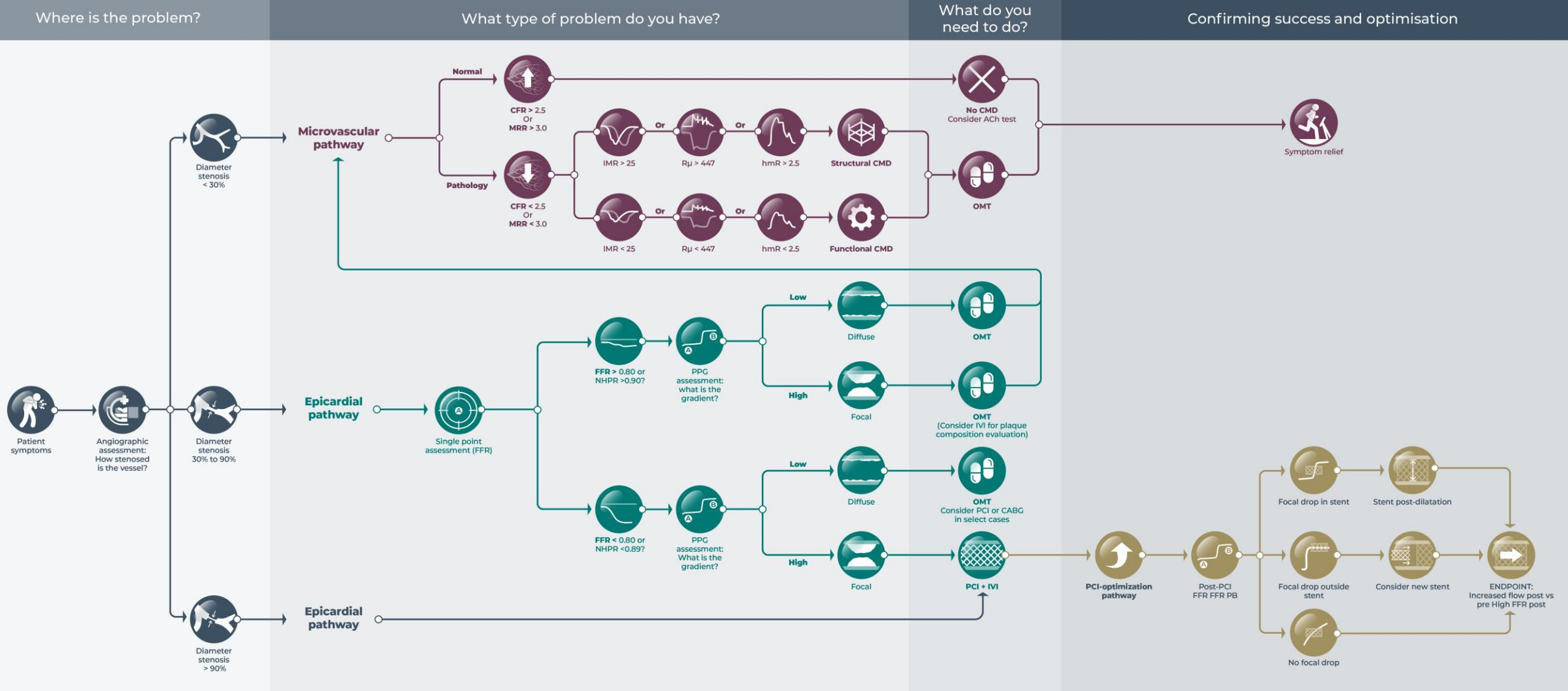


# How Dr. Johnson approaches diffuse disease?

Baseline  
2017 Jan 27

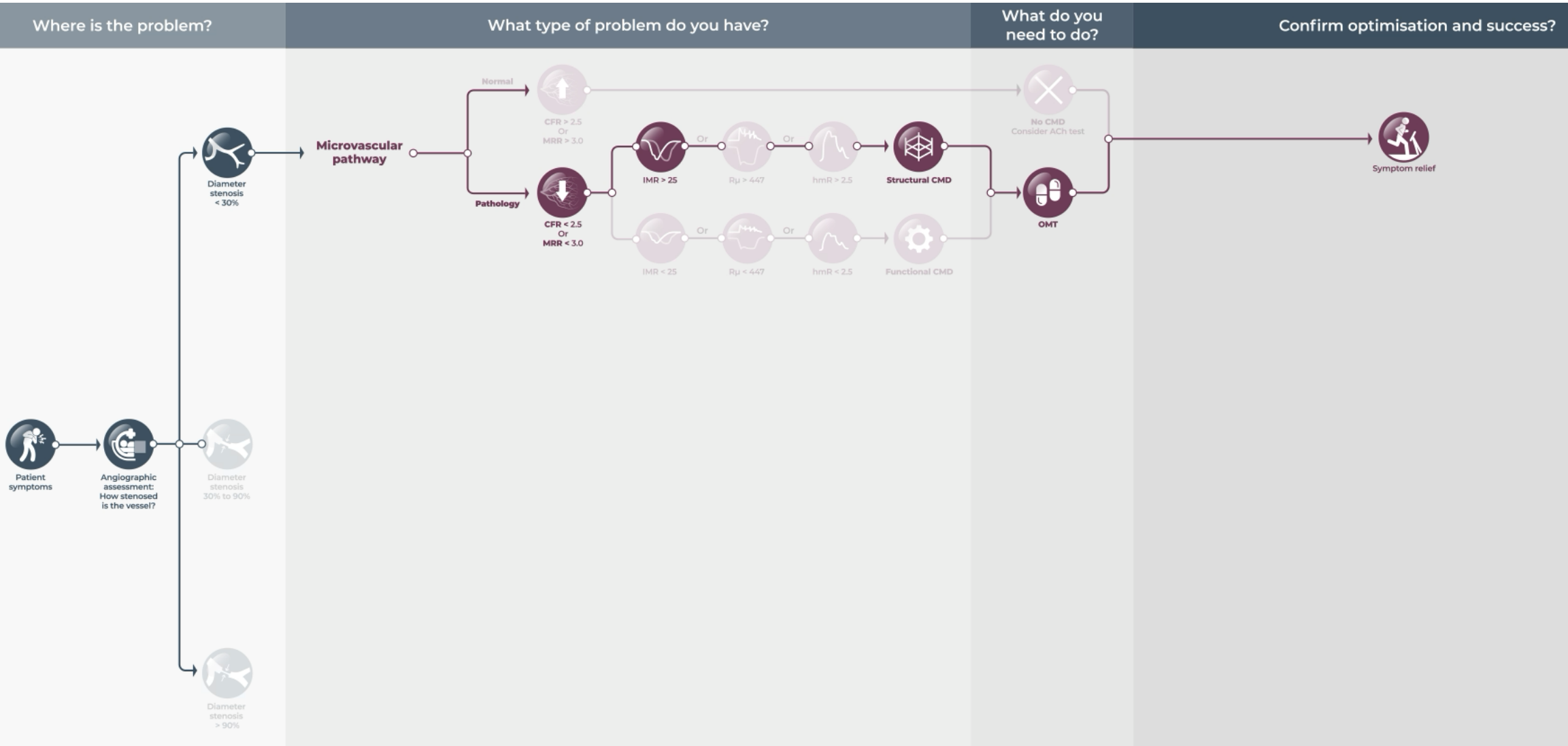


# Diffuse disease: decision-making using physiology

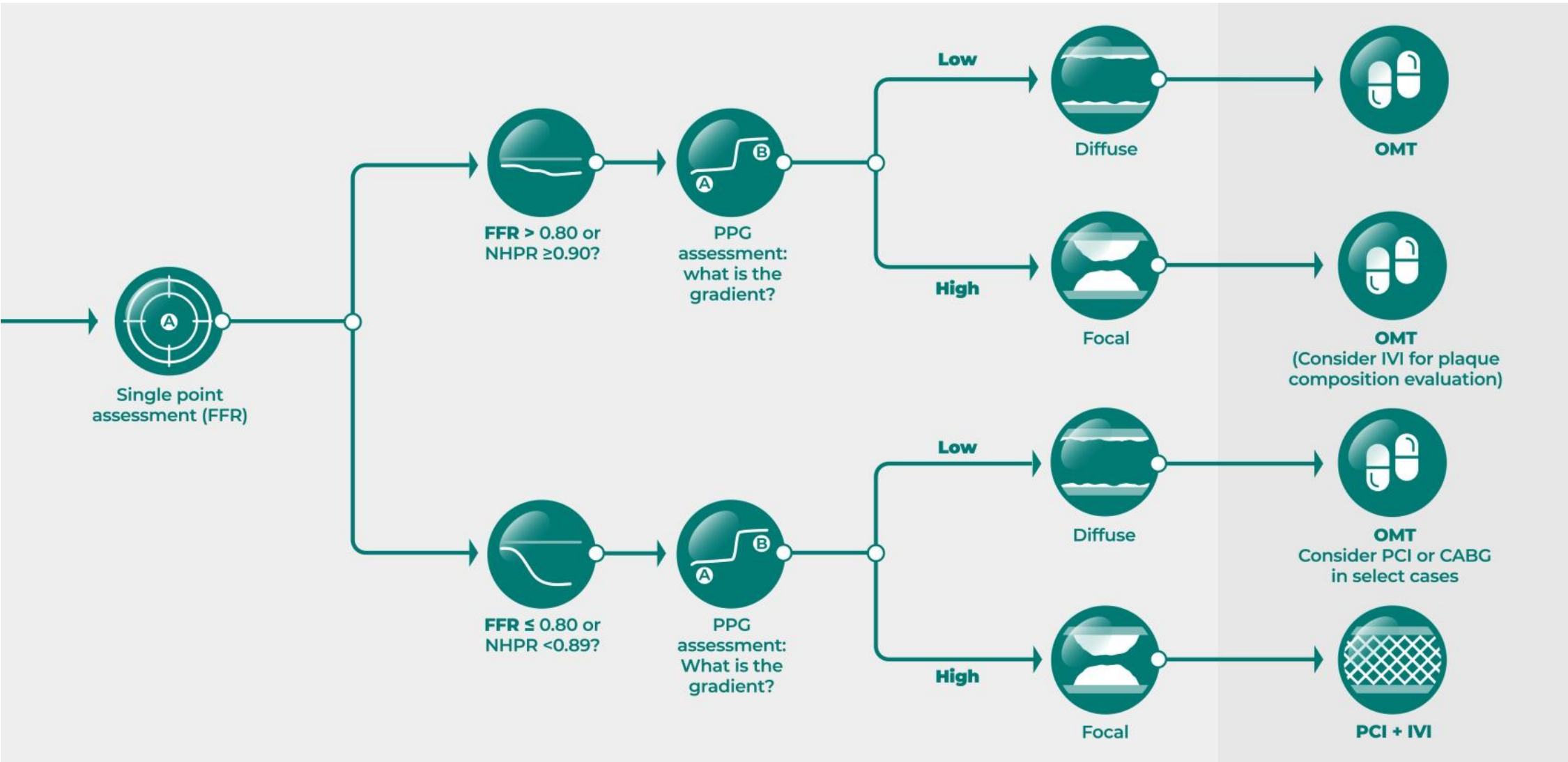




# Diffuse disease: decision-making using physiology



# Exploring the epicardial pathway: LAD lesion





# Conclusion

- The use of physiology with a pullback maneuver is required to detect **hemodynamic** diffuse disease.
- Diffuse disease has a low prevalence of high-risk plaques (TCFA) and more calcification.
- PCI in diffuse disease is less effective (i.e., **lower post-PCI FFR, smaller MSA, and higher procedural injury**) and more than half of the patients remain symptomatic after PCI.
- More data is warranted to define the best therapy for patients with diffuse disease.