

Non-Culprit Lesion Plaque Morphology in Patients With ST-Segment Elevation Myocardial Infarction: Results from the COMPLETE Trial Optical Coherence Tomography (OCT) Substudy

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Disclosures

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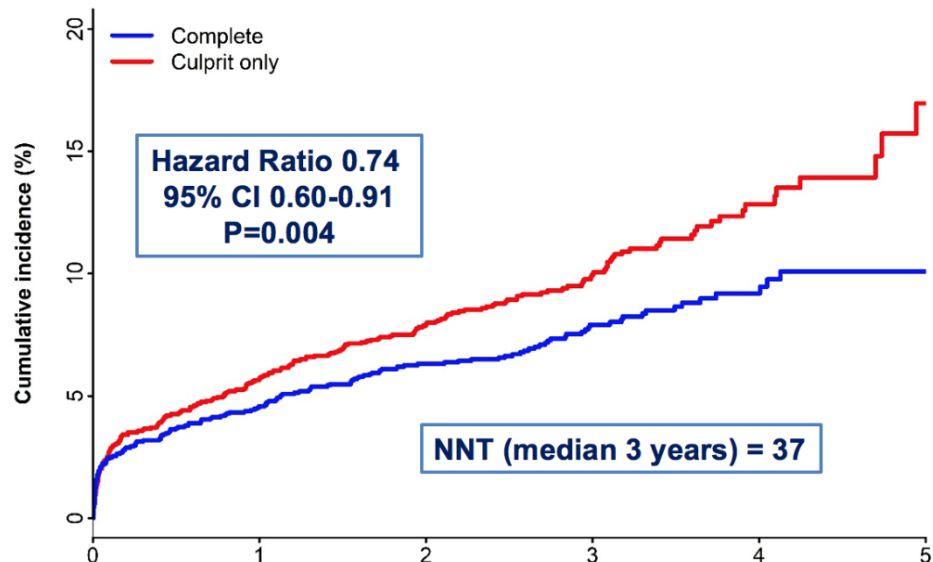
Coordinated by the Population Health Research Institute
Hamilton, Canada



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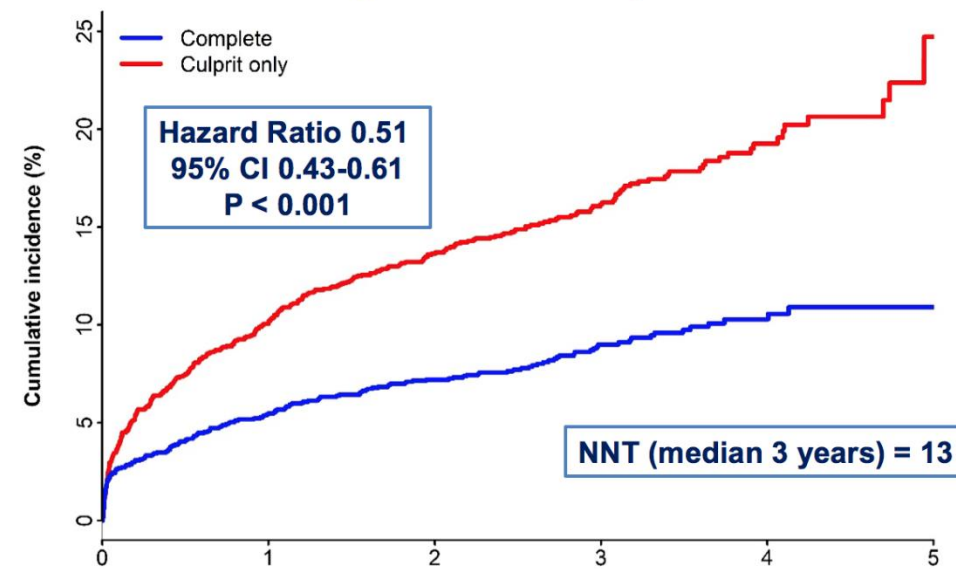
COMPLETE Trial – Primary outcomes

First Co-Primary Outcome: CV Death or New MI



No. at Risk		Years of Follow-up					
Complete	2016	1904	1677	938	337	70	
Culprit only	2025	1897	1666	933	310	59	

2nd Co-Primary Outcome: CV Death, New MI, or IDR



No. at Risk		Years of Follow-up					
Complete	2016	1886	1659	925	329	66	
Culprit only	2025	1808	1559	865	294	57	

The COMPLETE trial demonstrated that routine angiography-guided staged PCI of non-culprit lesions reduced the composite of cardiovascular death or new myocardial infarction by 26% ($p=0.004$).





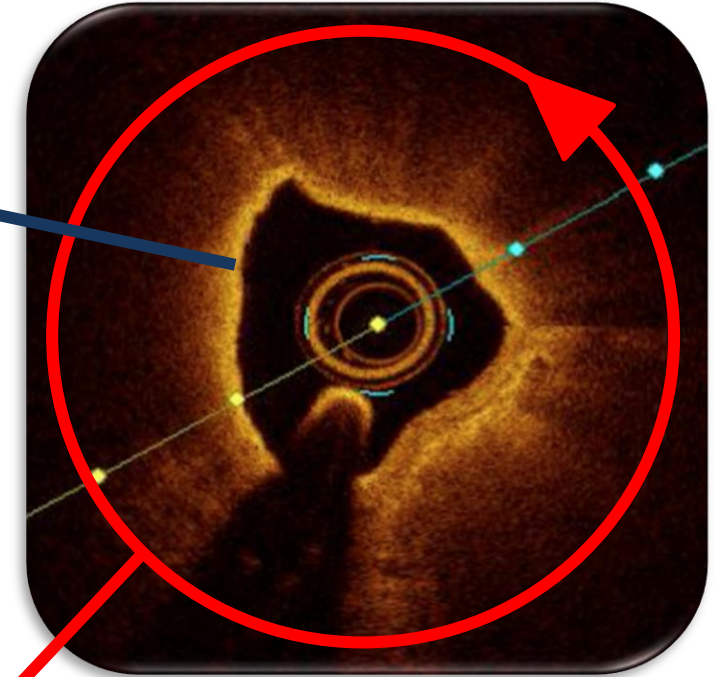
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Background

- Whether the benefit of routine non-culprit lesions PCI might be associated with underlying vulnerable plaque morphology is unclear.
- Thin-cap fibro atheroma (TCFA) is a well recognized feature of vulnerable plaque.
- Optical Coherence Tomography (OCT) is a high definition intracoronary imaging modality that can identify vulnerable plaque.

TCFA: Thin Cap Fibro Atheroma

FCT: Fibrous
Cap Thickness
< 65 μm



Overlying a
lipidic plaque
Lipid arc > 90°



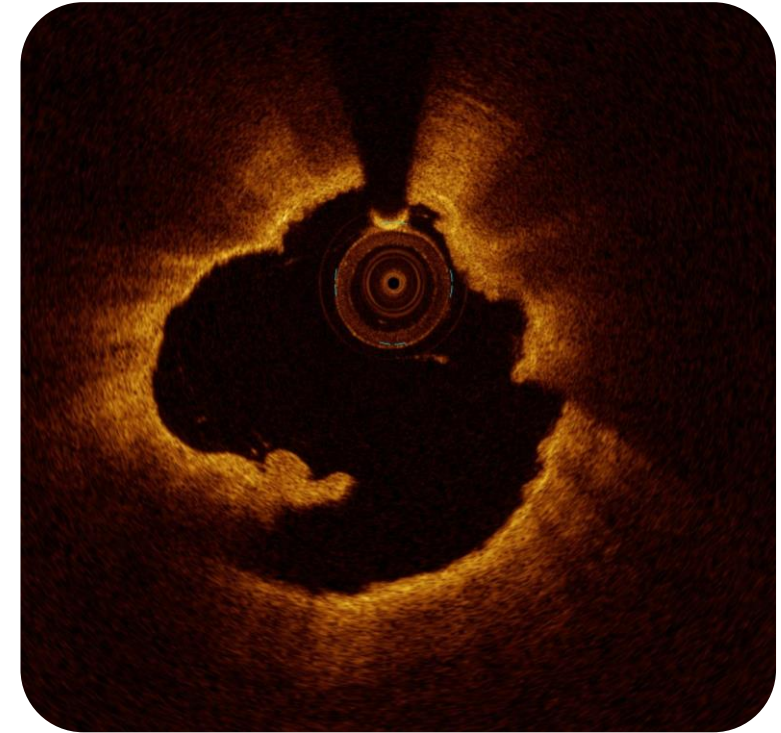
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 Hamilton
Health
Sciences

McMaster
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Background

- Whether the benefit of routine non-culprit lesions PCI might be associated with underlying vulnerable plaque morphology is unclear.
- Thin-cap fibro atheroma (TCFA) is a well recognized feature of vulnerable plaque.
- Optical Coherence Tomography (OCT) is a high definition intracoronary imaging modality that can identify vulnerable plaque.



Plaque rupture

Hypothesis

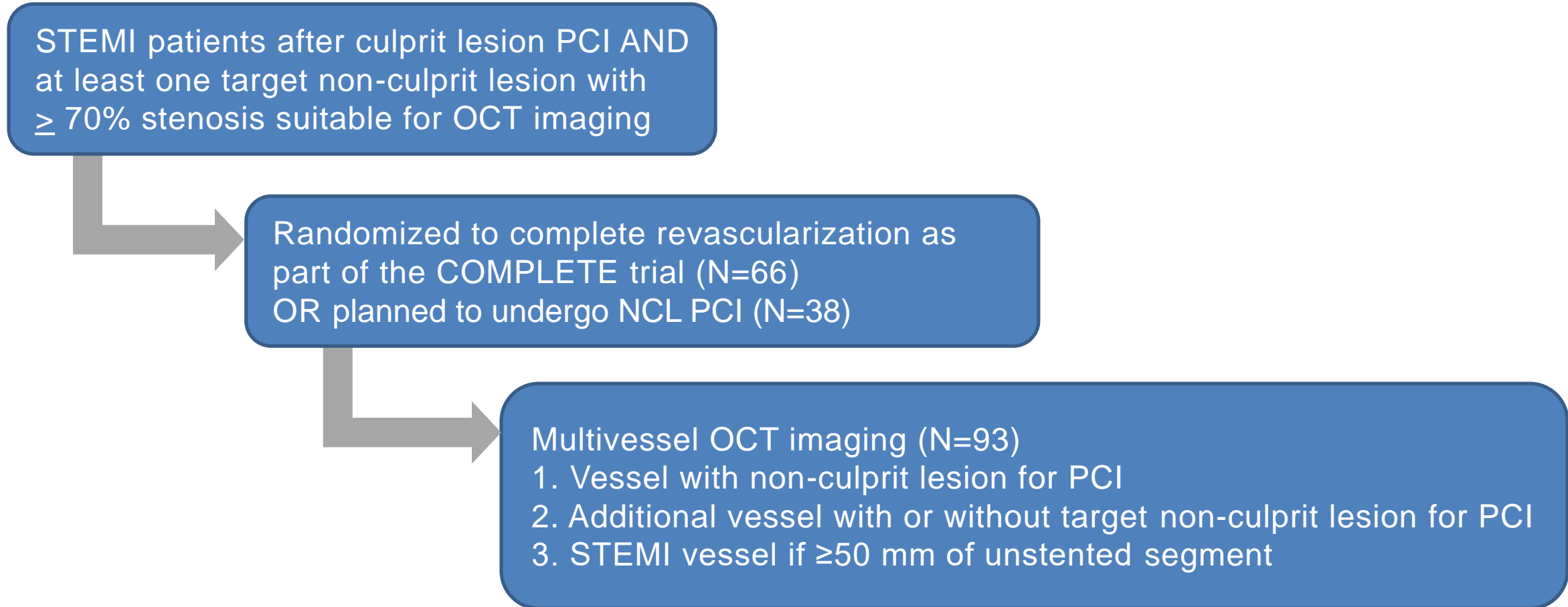
- TCFA will be more prevalent in obstructive compared with non-obstructive non-culprit lesions.

Primary Objective

In patients presenting with STEMI and multi-vessel coronary artery disease undergoing staged non-culprit lesion PCI after successful primary PCI, the objective is:

To determine the prevalence of vulnerable plaque (i.e., biologically active TCFA) in obstructive compared with non-obstructive non-culprit lesions.

Methods

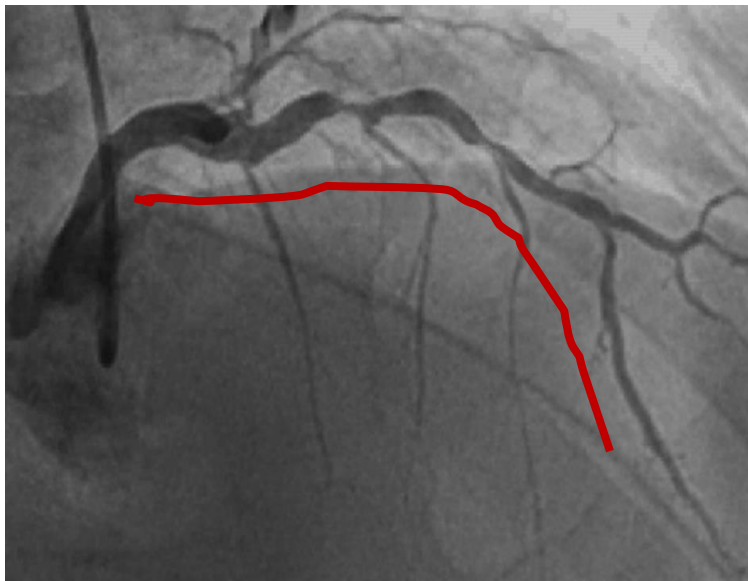




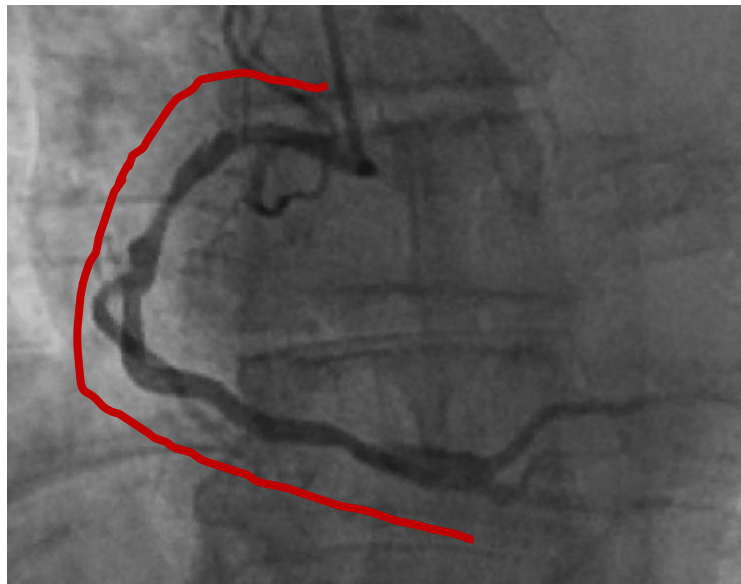
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OCT COMPLETE: Imaging Protocol

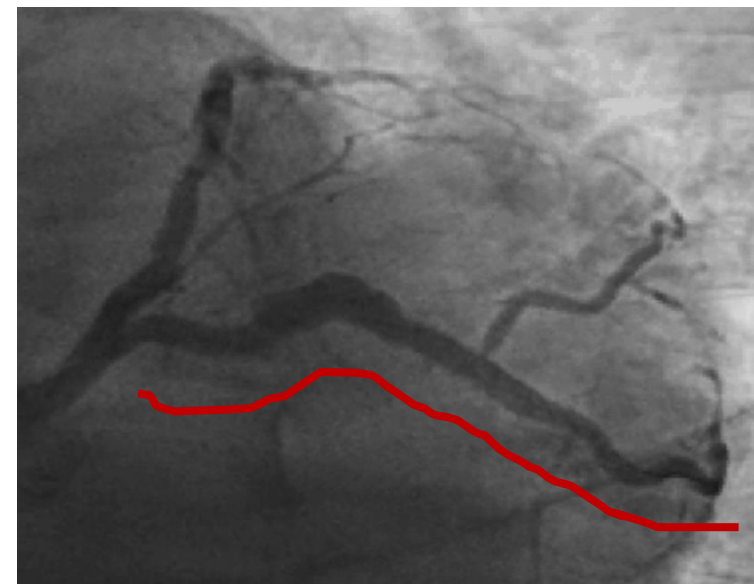
— OCT imaged segment (staged non-culprit PCI procedure)



Target 1 (LAD)
Obstructive NCL



Target 2 (RCA)
Additional vessel
Obstructive or Non-obstructive lesions



Target 3 (LCX)
STEMI vessel
If ≥ 50 mm unstented segment

- Number of pullbacks / patient (mean): 2.82
- Imaged length / patient (mean): 152.5 mm

Example: Inferior STEMI
Culprit lesion LCX, Non-culprit lesion LAD



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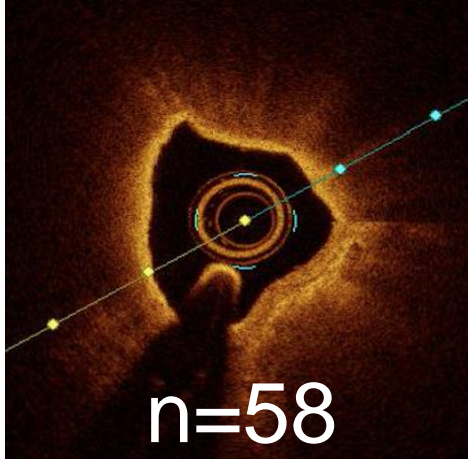
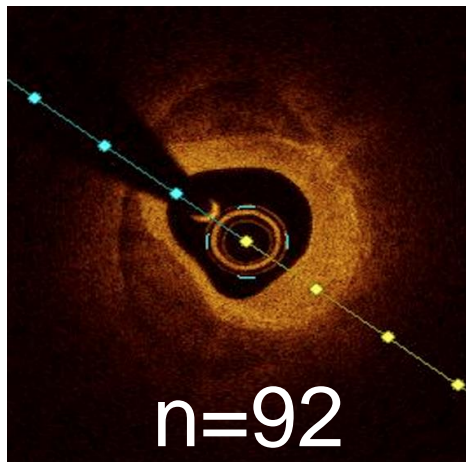
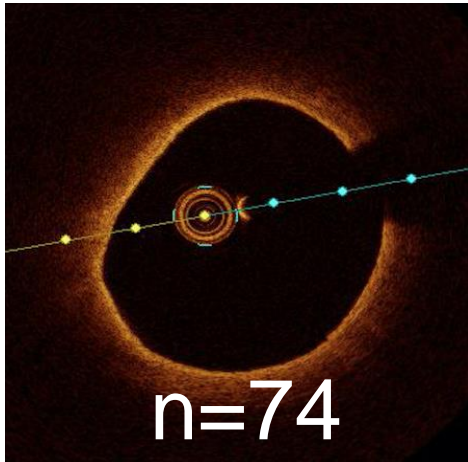
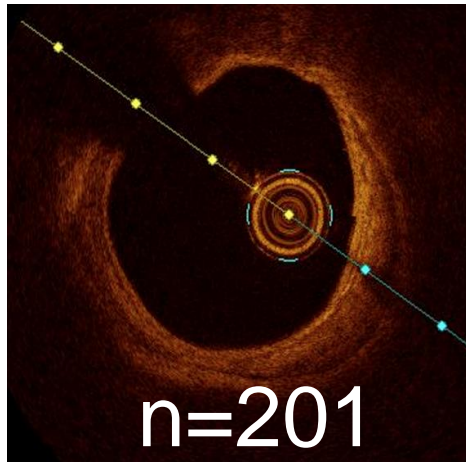
Baseline and Procedure Characteristics

	OCT Complete N=93
Age (yrs)	61.2
Gender (% male)	82.8
Diabetes (%)	12.9
Chronic renal insuff. (%)	1.1
Prior MI (%)	8.6
Current smoker (%)	38.5
Hypertension (%)	41.9
Dyslipidemia (%)	43
Prior PCI (%)	7.5
Prior stroke (%)	1.1
Hemoglobin A1C	6.1
LDL (mmol/L)	2.9
Creatinine (μmol/L)	82

	OCT Complete N=93
Residual diseased vessels	
1	64%
≥2	36%
NCL location	
Left main	0%
LAD	41%
Proximal LAD	10.4%
Mid LAD	24.6%
Circumflex	32.1%
RCA	26.9%
NCL stenosis (visual)	
70-79%	40.7%
80-89%	31.7%
90-99%	26.8%
100%	0.8%

No significant differences compared with the overall COMPLETE trial characteristics

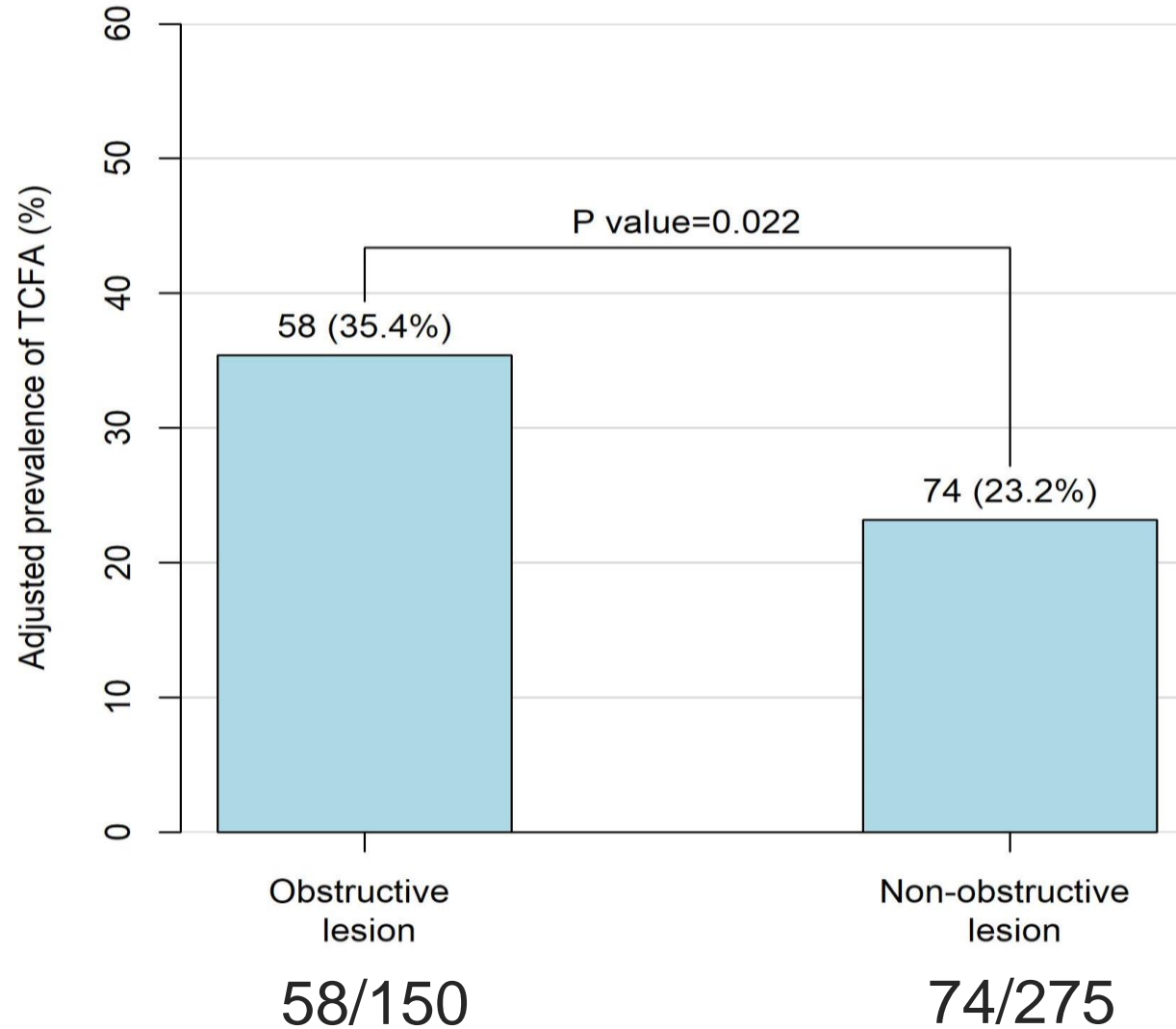
Classification of non-culprit lesions

		TCFA (FCT < 65 μ m overlying a lipidic plaque)	
		Yes	No
Obstructive $\geq 70\%$ DS	Yes	 <p>n=58</p>	 <p>n=92</p>
	No	 <p>n=74</p>	 <p>n=201</p>

N=425

TCFA: Thin Cap Fibro Atheroma
FCT: Fibrous Cap Thickness

Primary Outcome: Prevalence of TCFA (per lesion)



Obstructive non-culprit lesions are most likely to be vulnerable

TCFA: Thin Cap Fibro Atheroma



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Results: Features of TCFA vs Non-TCFA in Obstructive lesions ($\geq 70\%$ diameter stenosis)

	TCFA (N=58)	Non-TCFA (N=92)	P value
Lesion Length (mm)	23.1	20.8	0.16
Number of LIPID quadrants	55.2	19.2	<0.001
% of LIPID quadrants	78.4	36.5	<0.001
Number of Fibrous quadrants	9.4	21.2	<0.001
% of Fibrous quadrants	16.9	43.7	<0.001
Number of Calcified quadrants	2.5	9.8	<0.001
% of Calcified quadrants	4.1	20.1	<0.001
Maximum Lipid Arc	342.2	212.5	<0.001
Mean Lipid Arc	203.8	84.5	<0.001
Mean FCT (μm)	54.5	152.2	<0.001
Minimum Lumen Area	1.9	1.7	0.52
Macrophages	55	48	<0.001
Microvessels	19	28	0.77
Cholesterol Crystals	48	42	<0.001

**Obstructive TCFA
lesions had
significantly more lipid
and more features of
plaque vulnerability
compared with
non-obstructive TCFA
lesions**

TCFA: Thin Cap Fibro Atheroma



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Results: TCFA (FCT < 65 µm overlying a lipidic plaque)

	Obstructive (N=58)	Non-obstructive (N=74)	P value
Lesion Length (mm)	23.1	16.7	<0.001
Number of LIPID quadrants	55.2	36.4	0.05
% of LIPID quadrants	78.4	76.8	0.73
Number of FIBROUS quadrants	9.4	7.1	0.10
% of FIBROUS quadrants	16.9	16.2	0.88
Number of CALCIFIED quadrants	2.5	1.7	0.26
% of CALCIFIED quadrants	4.1	7.0	0.39
Maximum Lipid Arc	342.2	304.0	0.06
Mean Lipid Arc	203.8	191.8	0.34
Mean FCT (µm)	54.5	54.5	0.98
Minimum Lumen Area	1.9	4.8	<0.001
Macrophages	55	65	0.28
Microvessels	19	23	0.86
Cholesterol Crystals	48	29	<0.001

Obstructive and non-obstructive TCFA lesions have similar plaque composition

Obstructive TCFA lesions were longer and had a smaller MLA

TCFA: Thin Cap Fibro Atheroma
FCT: Fibrous Cap Thickness
MLA: Minimum Lumen Area



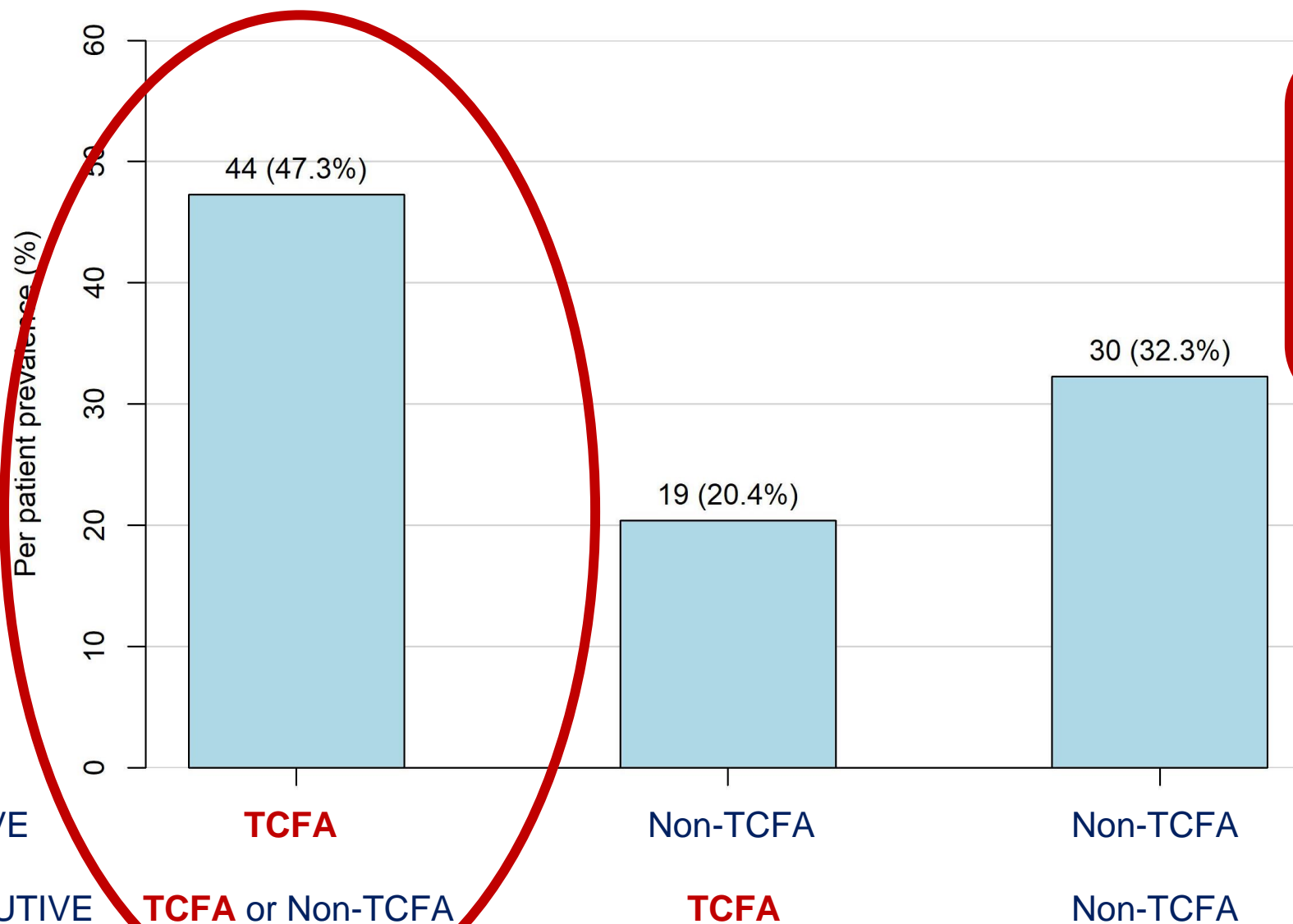
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Results: Prevalence of TCFA (per patient)



Half of patients had
an obstructive non-
culprit lesion containing
vulnerable plaque



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Limitations

- The COMPLETE OCT substudy was observational and designed to better understand NCL plaque morphology. It was not powered to link clinical events to plaque morphology.
- The requirement for angiographically suitable arteries for OCT imaging may have excluded certain plaque types.
- Pre-dilatation was required in some severely-stenosed obstructive lesions before imaging (18.6%), the MLA may have been overestimated in these cases.

Conclusions

In patients with STEMI and multi-vessel coronary artery disease:

- Half of patients had a non-culprit lesion with vulnerable plaque morphology by OCT.
- Obstructive lesions (>70% visual diameter stenosis) more commonly harbor vulnerable plaque morphology than non-obstructive lesions.
- This may explain the benefit of routine PCI of obstructive non-culprit lesions in patients with STEMI and multivessel disease.