Imaging for Patients with MINOCA: What can we see?

TCTAP 2021

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Disclosure

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Epidemiology

- Prevalence: 5-6% of AMI
- Women 50%

  Women: STEMI = NSTEMI
  Men: STEMI > NSTEMI

- Age: 58 years
- Less likely ECG changes, smaller troponin elevation
- Ethnicity: black, Maori, Pacific, Hispanic
- Lower risk factors: HL, HTN, DM, tobacco, FH

Diagnostic Criteria

1. Biomarker (+) and clinical evidence of infarction:
    - Symptoms
    - ECG changes
    - New loss of myocardium or new RWMA
    - Intracoronary thrombus

2. Stenosis < 50% on angiogram

3. No other clinically overt causes (sepsis, PE, myocarditis)

Etiology

1. Coronary causes
    - Plaque rupture or erosion
    - SCAD
    - Aortic dissection extending to coronary artery
    - Coronary embolism
    - Microvascular disease
    - Coronary spasm
    - Coronary aneurysm
    - Spontaneous coronary thrombosis: thrombophilia, Factor V Leiden
    - Vasoconstrictive agents: cocaine, methamphetamines

2. Non-coronary causes with cardiac disorders

3. Non-coronary causes with extra-cardiac disorders

Etiology

2. Non-coronary causes with cardiac disorders
    1. Myocarditis
    2. Takotsubo
    3. Cardiomyopathies
    4. Cardiac trauma
    5. Strenuous exercise
    6. Tachyarrhythmia
    7. Cardiotoxins: chemo

3. Non-coronary causes with extra-cardiac disorders
    1. Stroke
    2. PE
    3. Sepsis
    4. ARDS
    5. ESRD

MINOCA

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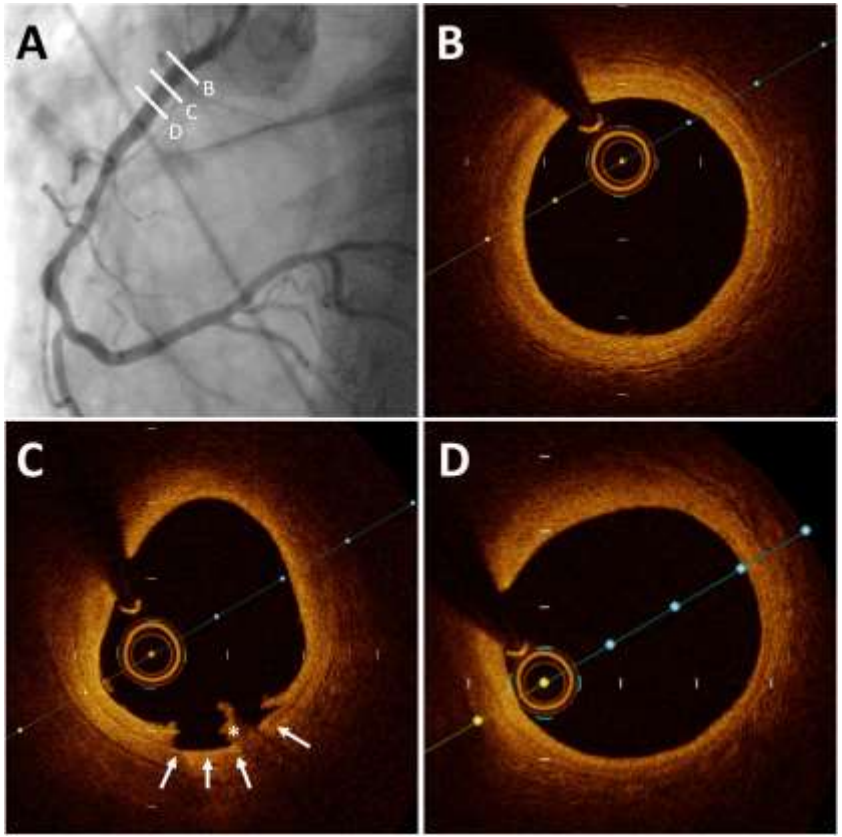

MINOCA studies

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Study	Type	Modality	Women %	Imaging Protocol	Patients imaged	Imaging abnormality	Lone Thrombus	Plaque rupture	Plaque erosion	Calcified nodule	SCAD	Other
Reynolds 2011	Prospective	IVUS	100	Presumed culprit, if none then LAD+LCx	42	16 (38)	NA	12 (29)	4 (10)	NA	NA	NA
Opolski 2019	Prospective	OCT	55	Presumed culprit, if none then LAD+LCx	38	15 (39)	2 (5)	9 (24)	4 (11)	2 (5)	NA	NA
Gerbaud 2020	Prospective 2-center	OCT	37.5	Presumed culprit, if none then second vessel	40	32 (80)	3 (8)	14 (35)	12 (30)	1 (3)	2 (5)	NA
Taruya 2020	Prospective	OCT	30	Presumed culprit vessel, if none then multivessel	82	42 (51)	7 (9)	13 (16)	1 (1)	9 (11)	7 (9)	5 (6)
Reynolds 2020	Prospective, multicenter, international, observational	OCT	100	All three coronary arteries	145	67 (46)	5 (3)	8 (6)	NA	NA	1 (1)	53 (37)

Bode M, Jang IK. Submitted

Contemporary MINOCA studies

- Opolski MP et al. Mechanism of MI in patients with nonobstructive CAD. JACC CV Img 2019

- Gerbaud E et al. OCT and CMR for the diagnosis of patients presenting with MINOCA and suspected epicardial disease. JACC CV Img 2020

- Reynolds HR et al. Coronary OCT and CMR imaging to determine underlying causes of MINOCA in women. Circulation 2020

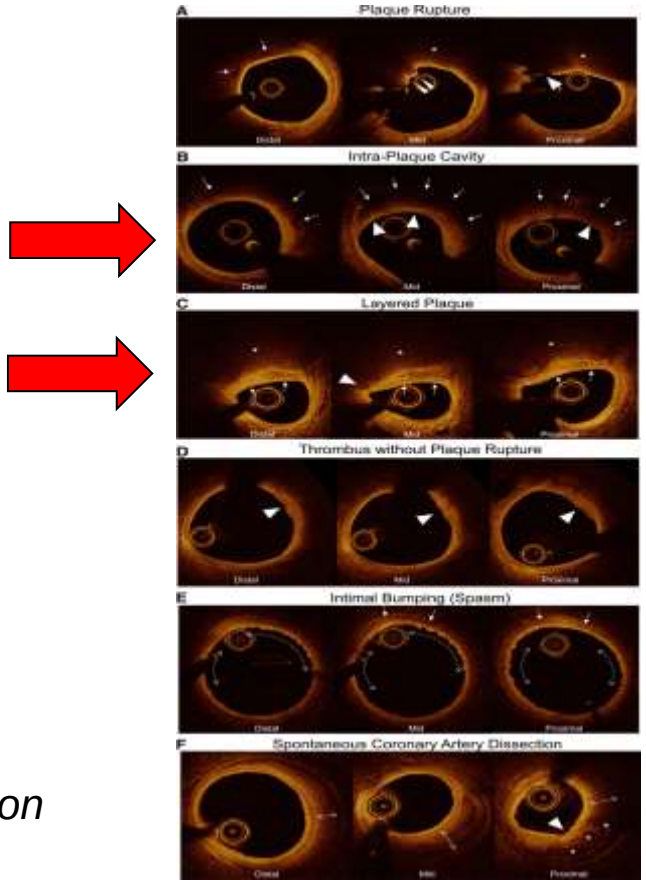
MINOCA studies

	Opolski	Gerbaud	Reynolds (n=145)
Aim	To assess plaques as the cause of MINOCA using OCT and CMR	To evaluate diagnostic yield of OCT and CMR	To determine vascular (OCT) or myocardial (CMR) causes
Eligibility	MI	Ischemic ECG ~ WMAs Suspected epicardial	Women with MI
# patients	38	40	145 OCT, 116 CMR
Age (y)	62	50	60
Female	55%	38%	100%
STEMI	39%	33%	3.5%

OCT findings

	Opolski (n=10)	Gerbaud (n=40)	Reynolds (n=145)
Plaque rupture	40% (4/10)	35% (14/40)	5.5% (8/145)
Plaque erosion	30% (3/10)	30% (12/40)	3.1% (5/145)
Calcified plaque		2.5% (1/40)	
Intraplaque cavity			21.4% (31/145)
Layered plaque			13.1% (19/145)
Thrombus	50% (5/10)	75% (30/40)	
Lone thrombus		7.5% (3/40)	
SCAD		5% (2/40)	0.7% (1/145)
Spasm			2.1% (3/145)

OCT findings



Reynolds. Circulation

OCT findings

- An association between an “intraplaque cavity” and AMI in the absence of plaque disruption or local thrombus has not been reported to our knowledge.
- “Layered plaque” is a consequence, rather than an etiology, of plaque destabilization.
- Coronary plaque features such as intraplaque cavity and layered plaque in patients with MINOCA do not prove a causal relationship but may simply be incidental findings.

Allard-Ratick, McCarthy, Jang. Submitted.

CMR findings

	Opolski (n=31)	Gerbaud (n=40)	Reynolds (n=116)
LGE	52% (16/31)		74.1%
Ischemic LGE	23% (7/31)	77.5%	53.4%

Abnormal findings and Conclusion

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	Opolski	Gerbaud	Reynolds
OCT	40% (4/10)	35% (14/40)	46.2% (67/145)
CMR	30%	77.5% (31/40)	74.1% (86/116)
OCT+CMR		57.5% (23/40)	84.5% (98/116)

	Opolski	Gerbaud	Reynolds
Conclusion	- Plaque disruption and thrombus are common → maybe ischemic injury. - OCT is valuable.	- Abnormal OCT or CMR: 100% - Abnormal OCT and CMR: 57.5%	- Abnormal OCT or CMR: 84.5%

Management

- Statin (HR 0.77)
- ACEI/ARB (HR 0.82)
- Beta blocker (HR 0.86, ns)
- DAPT (HR 0.9, ns)
    - Plaque disruption: DAPT for 1 year and SAPT for lifetime

Outcome

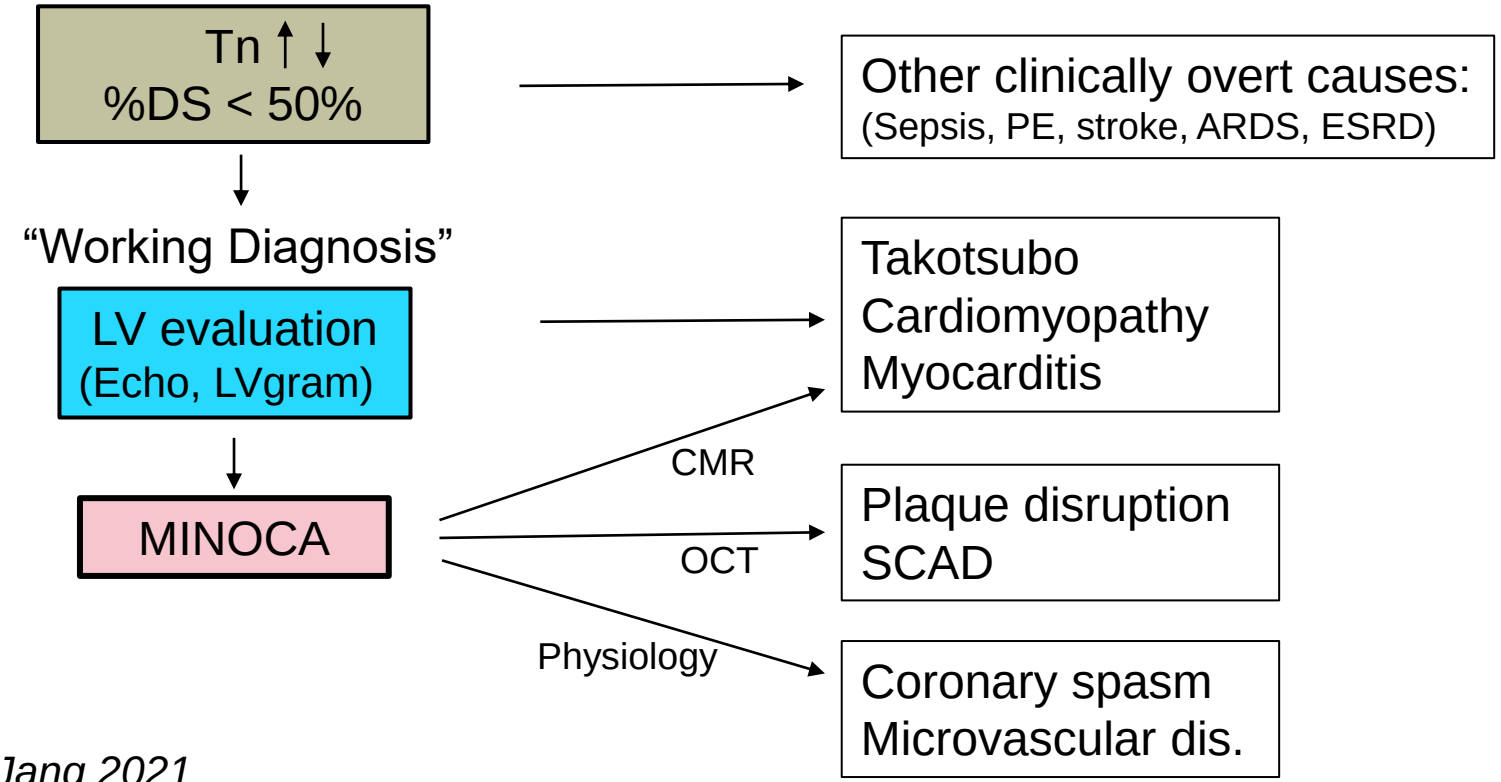
CV Mortality

- In-hospital: 1.1%
- 1 year: 4.7%
- 4 years: 13.4%

Recurrent angina: 10-25% at 1 year

At 4 years: Re-MI: 7.1%, ischemic stroke: 4.3%

Proposed approach



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Conclusion

Research opportunities!

Thank you