MINOCA
– úloha invazivní diagnostiky

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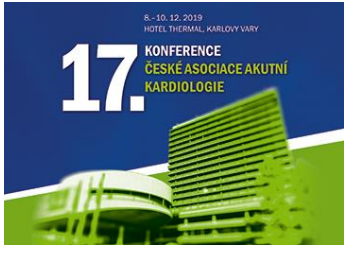
9.12.2019



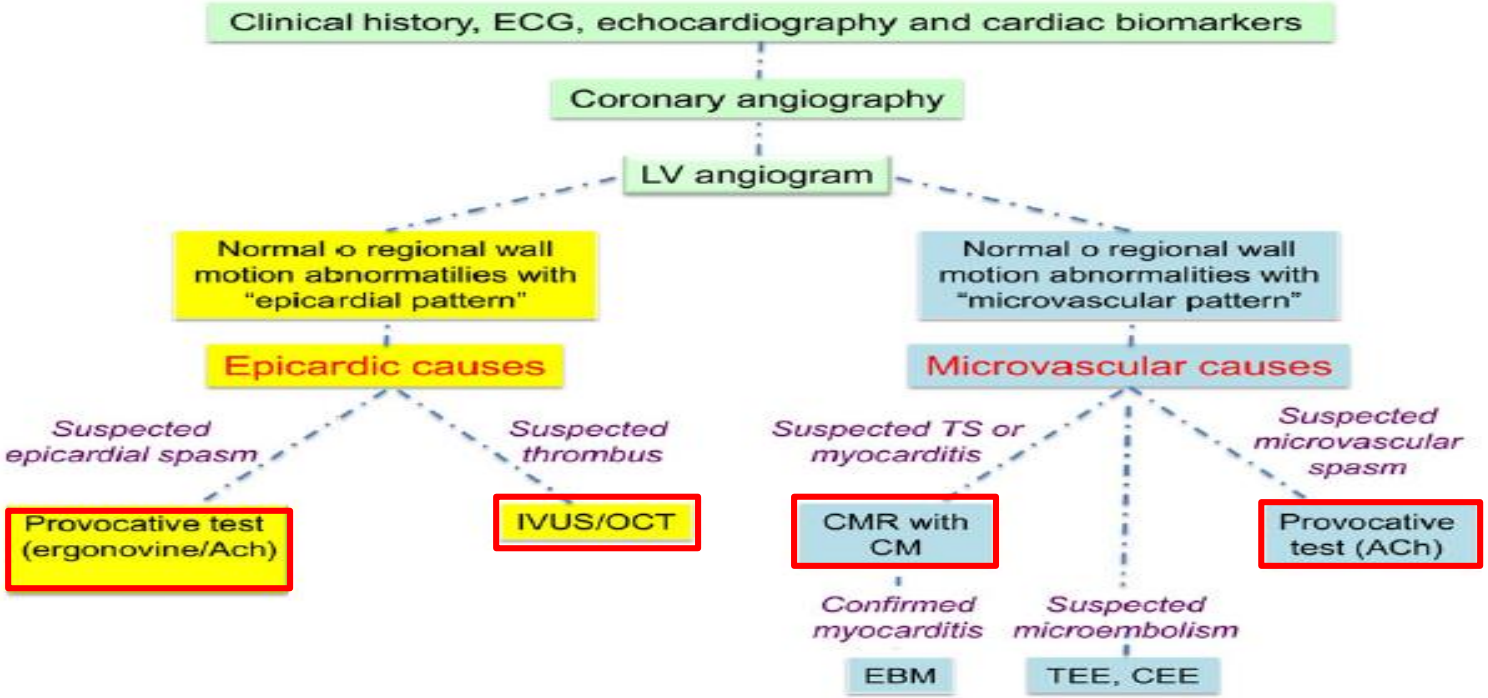
MINOCA: Diagnostická kritéria

ESC working group position paper on myocardial infarction with non-obstructive coronary arteries

The diagnosis of MINOCA is made immediately upon coronary angiography in a patient presenting with features consistent with an AMI, as detailed by the following criteria:
(1) Universal AMI criteria[8]
(2) Non-obstructive coronary arteries on angiography, defined as no coronary artery stenosis ≥50% in any potential IRA
(3) No clinically overt specific cause for the acute presentation

European Heart Journal (2017) **38**, 143–153

MINOCA: Diagnostický algoritmus



Niccoli G et al. European Heart Journal (2015) 36, 475–481

Koronární vasospasmus

Systematic Review of Patients Presenting With Suspected Myocardial Infarction and Nonobstructive Coronary Arteries

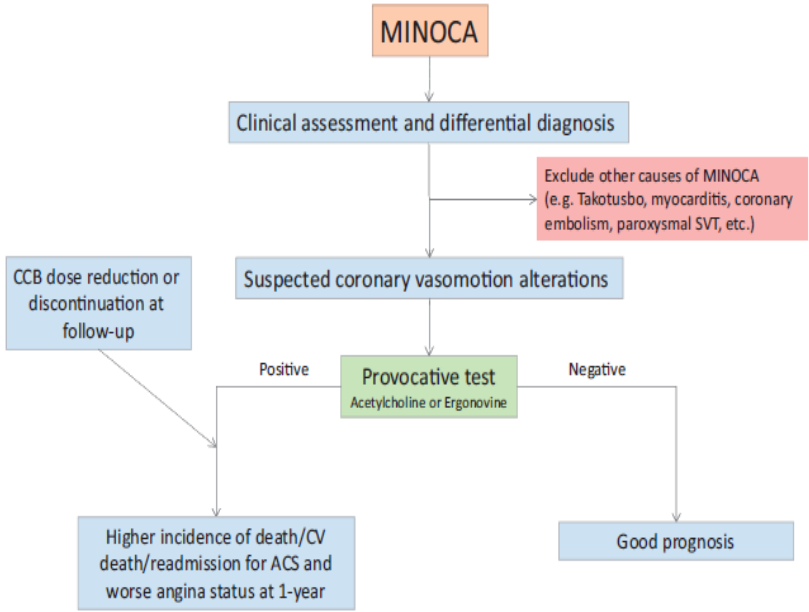
Provocative Spasm Testing in Patients With MINOCA

Publications	No. of Patients in the Study	Provocation Test	Spasm Definition	Provoked/ Spontaneous Spasm, n (%)
Early provocative spasm testing (within 6 wk of acute myocardial infarction)				
Bory, 1988	59	iv ergot	≥50% constriction on angio	2/59 (3%)
Fukai, 1993	21	iv ergot	≥75% constriction on angio	13/16 (81%)
Dacosta, 2001	91	iv ergot	≥70% constriction on angio	11/71 (15%)
Wang, 2002	23	ic ergot	≥90% constriction on angio	17/23 (74%)
Hung, 2003	19	ic ergot	≥70% constriction on angio	18/19 (95%)
Dacosta, 2004	82	iv ergot	≥70% constriction on angio	13/82 (16%)
Abid, 2012	21	iv ergot	≥70% constriction on angio	5/21 (24%)
Ong, 2008	7	ic acetylcholine	≥75% constriction on angio	4/7 (57%)
Total (provocative spasm testing <6 wks)				(83/298) 28%
Late provocative spasm testing (≥6 wk after myocardial infarction)				
Legrand, 1982	18	iv ergot	Chest pain & ST elevation	6/18 (33%)
Raymond, 1988	74	iv ergot	≥75% constriction on angio	5/16 (31%)
Ammann, 2000	23	Hyperventilate	ST elevation	0/23 (0%)
Kim, 2005	33	iv ergot	RWMA on echocardiography	20/33 (61%)
Total (provocative spasm testing ≥6 wks)				(31/90) 34%
Undefined timing for provocative spasm testing (relative to myocardial infarction)				
Salem, 1985	10	iv ergot	Chest pain & ST elevation	0/7 (0%)
Verheugt, 1987	21	iv ergot	NR	0/7 (0%)
Provocative spasm testing in cocaine induced MINOCA patients				
*Kossowsky, 1989	5	cold pressor	NR	0%
Overall pooled spasm				114/402 (28%)

Pasupathy et al. Circulation. 2015;131:861-870

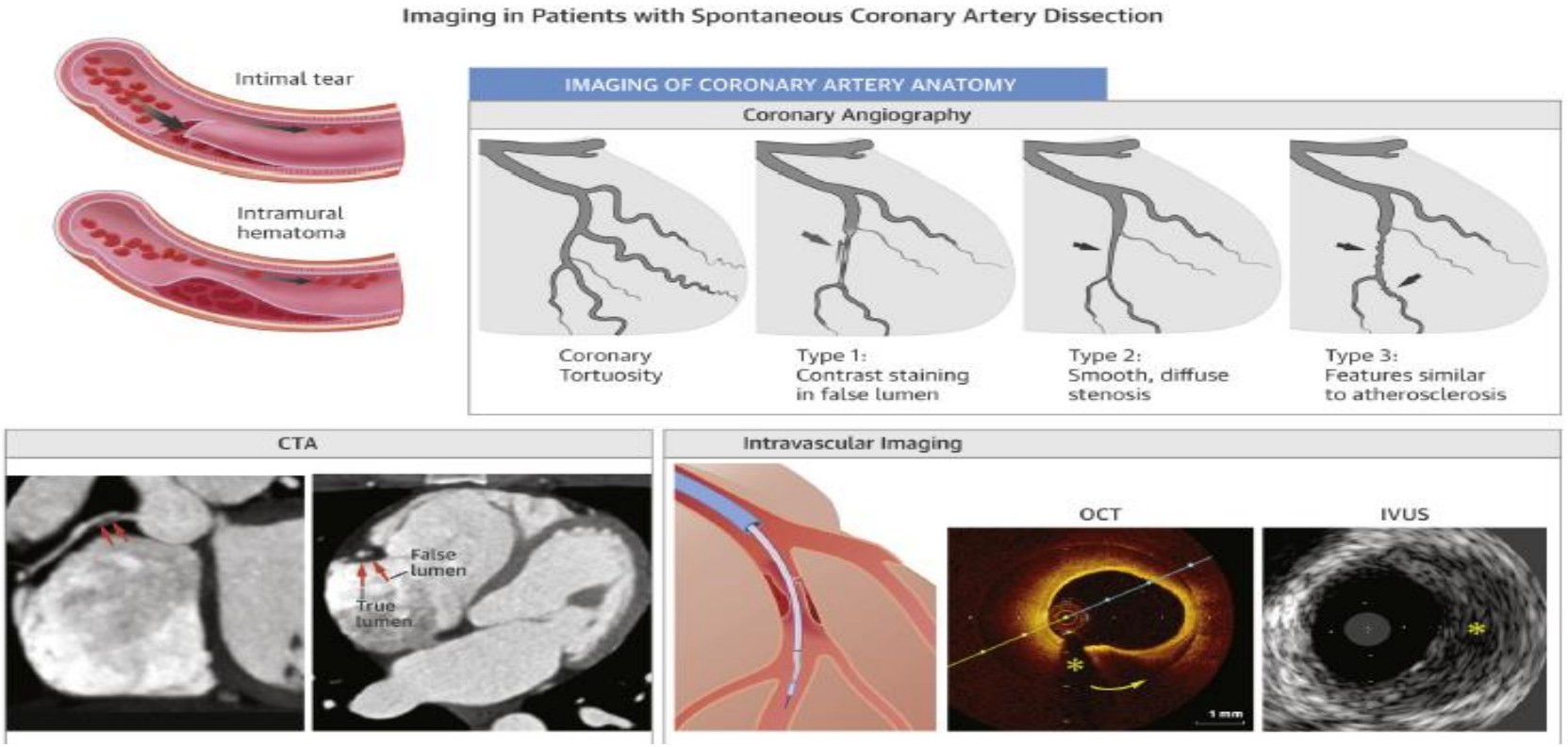
Patients with acute myocardial infarction and non-obstructive coronary arteries: safety and prognostic relevance of invasive coronary provocative tests

Rocco A. Montone, Giampaolo Niccoli*, Francesco Fracassi, Michele Russo, Filippo Gurgoglione, Giulia Cammà, Gaetano A. Lanza, and Filippo Crea



Montone et al. Eur Heart J 2017; 1:1-9

Koronární disekce



Courtesy F. Pellicia

Koronární tromboembolismus

„Primárně“ tromboembolie

Table 4. Thrombophilia Screening in Patients With MINOCA

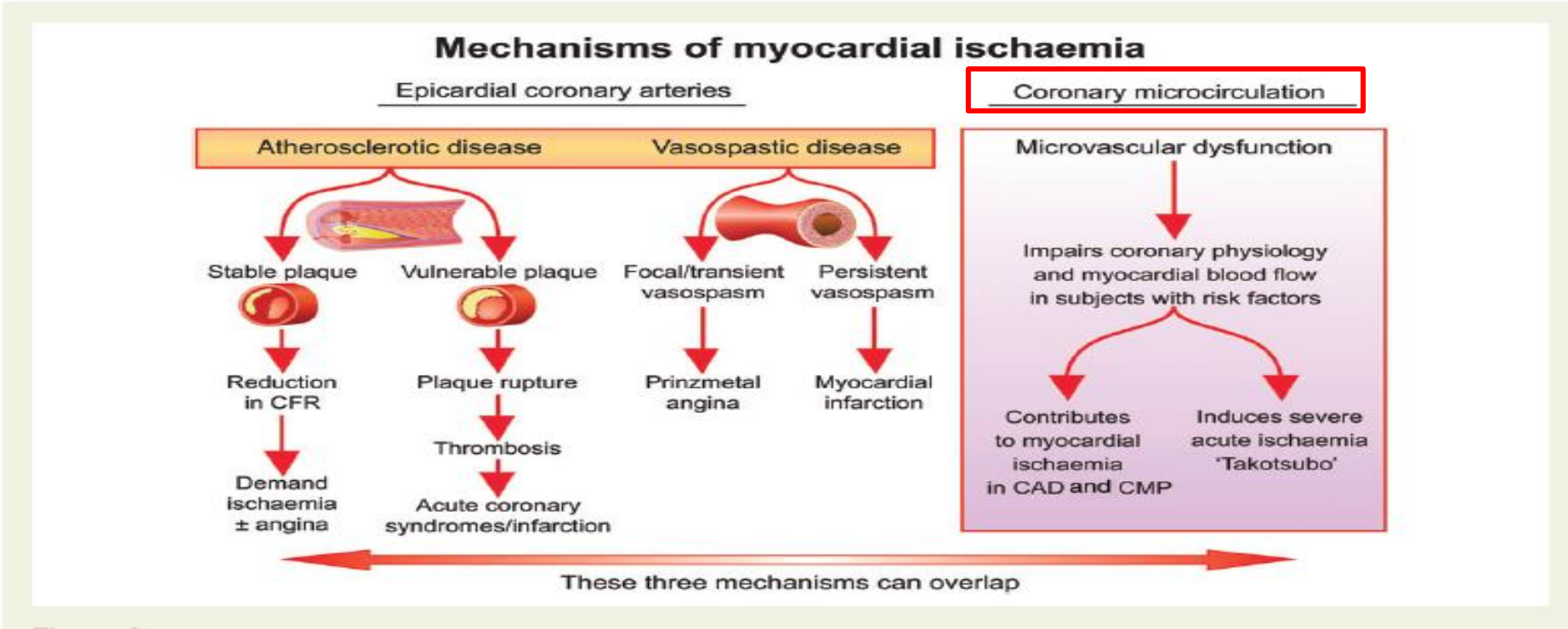
Publications	No. of Patients in the Study	APCR/ Factor V Leiden	Protein C/S Deficiency	Factor XII Deficiency	Thrombotic Disorders, n (%)
Brecker, 1993	12	NE	0	NE	0/12 (0%)
DaCosta, 1998*	22	2	1	1	4/22 (18%)
Lande, 1998	26	3	2	NE	5/14 (36%)
Mansourati, 2000	107	13	NE	NE	13/107 (12%)
Van de Water,2000	60	8	NE	NE	8/60 (13%)
DaCosta, 2001	91	7	1	1	9/73 (13%)
DaCosta, 2004	82	8	1	3	12/78 (15%)
Abid, 2012	21	2	1	0	4/12 (33%)
Overall		41/344 (12%)	5/189 (2.6%)	4/163 (2.5%)	51/356 (14%)

Embolie „primárně“ netrombotické

- Vegetace/kalcifikace chlopní
- Srdeční nádory (myxom..)
- Iatrogenní – vzduchová embolie

Circulation. 2015;131:861-870

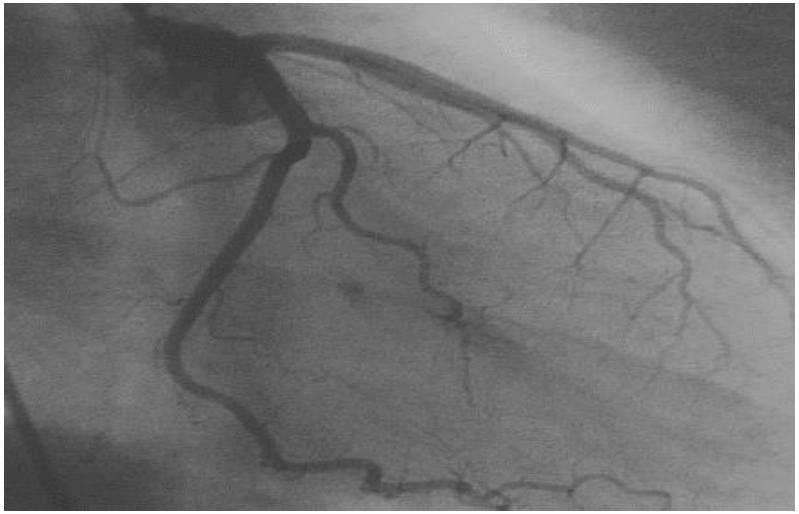
Postižení mikrocirkulace



Crea, Camici, Merz. Eur Heart J. 2014;35:1101–1111

Koronární mikrocirkulace

5% koronární cirkulace



5+95% koronární cirkulace

Mikroembolizace: ruptura/eroze plátu

Mechanisms of Myocardial Infarction in Women Without Angiographically Obstructive Coronary Artery Disease

Harmony R. Reynolds, MD; Monvadi B. Srichai, MD; Sohah N. Iqbal, MD; James N. Slater, MD; G.B. John Mancini, MD; Frederick Feit, MD; Ivan Pena-Sing, MD; Leon Axel, MD, Michael J. Attubato, MD; Leonid Yatskar, MD; Rebecca T. Kalhorn, MD; David A. Wood, MD; Iryna V. Lobach, PhD; Judith S. Hochman, MD

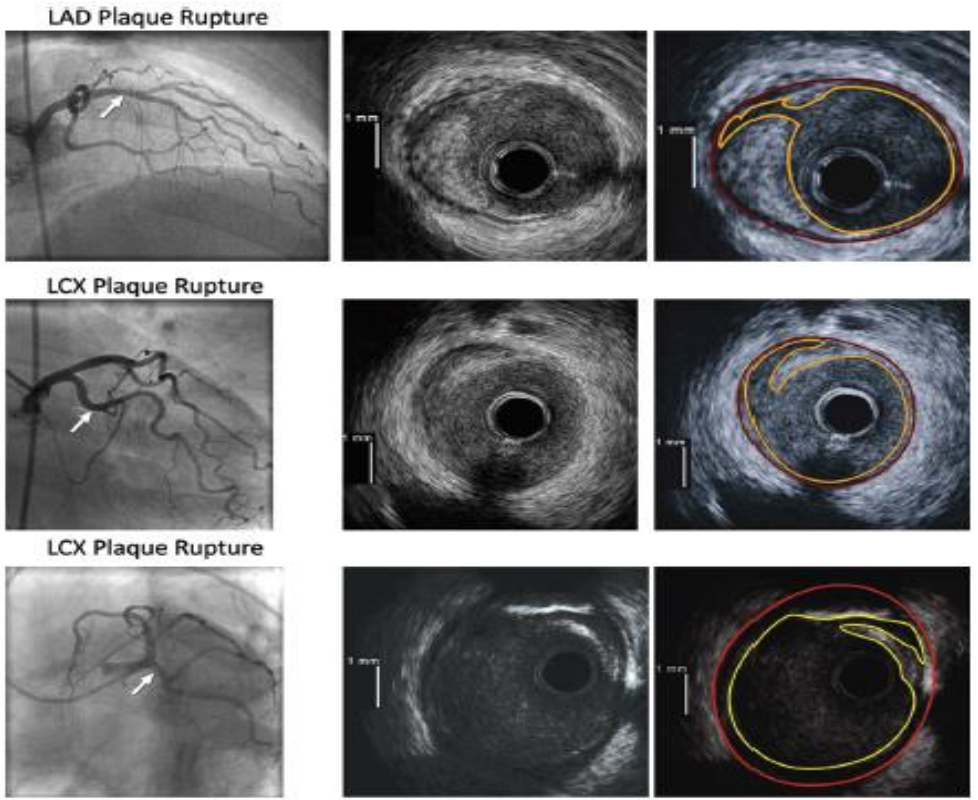
Background—There is no angiographically demonstrable obstructive coronary artery disease (CAD) in a significant minority of patients with myocardial infarction, particularly women. We sought to determine the mechanism(s) of myocardial infarction in this setting using multiple imaging techniques.

Methods and Results—Women with myocardial infarction were enrolled prospectively, before angiography, if possible. Women with ≥50% angiographic stenosis or use of vasospastic agents were excluded. Intravascular ultrasound was performed during angiography; cardiac magnetic resonance imaging was performed within 1 week. Fifty women (age, 57±13 years) had median peak troponin of 1.60 ng/mL; 11 had ST-segment elevation. Median diameter stenosis of the worst lesion was 20% by angiography; 15 patients (30%) had normal angiograms. Plaque disruption was observed in 16 of 42 patients (38%) undergoing intravascular ultrasound. There were abnormal myocardial cardiac magnetic resonance imaging findings in 26 of 44 patients (59%) undergoing cardiac magnetic resonance imaging, late gadolinium enhancement (LGE) in 17 patients, and T2 signal hyperintensity indicating edema in 9 additional patients. The most common LGE pattern was ischemic (transmural/subendocardial). Nonischemic LGE patterns (midmyocardial/subepicardial) were also observed. Although LGE was infrequent with plaque disruption, T2 signal hyperintensity was common with plaque disruption.

Conclusions—Plaque rupture and ulceration are common in women with myocardial infarction without angiographically demonstrable obstructive coronary artery disease. In addition, LGE is common in this cohort of women, with an ischemic pattern of injury most evident. Vasospasm and embolism are possible mechanisms of ischemic LGE without plaque disruption. Intravascular ultrasound and cardiac magnetic resonance imaging provide complementary mechanistic insights into female myocardial infarction patients without obstructive coronary artery disease and may be useful in identifying potential causes and therapies.

Clinical Trial Registration—URL: http://www.clinicaltrials.gov. Unique Identifier: NCT00798122.

(*Circulation*. 2011;124:1414-1425.)



Reynolds R et al 2011; Circulation 2011; 124:1414-25

Možnosti léčby

T.č. nejsou RCT na sekundární prevenci *(MINOCA BAT (Randomized Evaluation of b-Blocker and ACEI/ARB Treatment in MINOCA Patients; ClinicalTrials.gov Identifier: NCT03686696)*

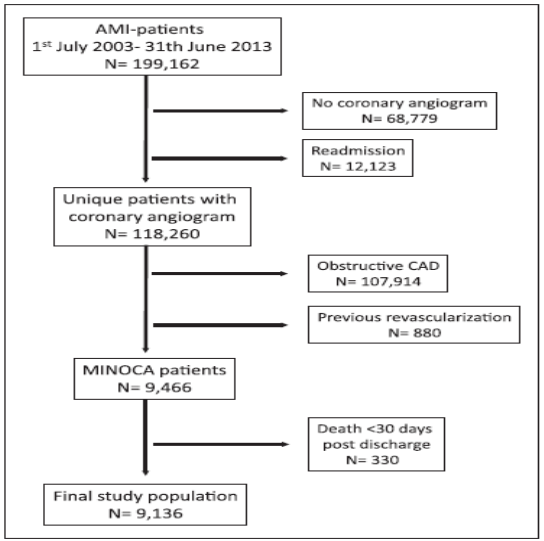
Mechanism	Diagnosis	Therapy
Epicardic causes		
Coronary artery disease	Intravascular imaging	PCI; antiplatelet therapy, statins, angiotensin-converting enzyme inhibitors/angiotensin receptor blockers, beta-blocker treatment
Coronary dissection	Intravascular imaging	Conservative treatment (beta-blocker and single antiplatelet therapy)
Coronary artery spasm	Intracoronary ergonovine or Ach test	Calcium antagonist, nitrates, rho-kinase inhibitors
Microvascular causes		
Microvascular coronary spasm	Intracoronary Ach test	Rho-kinase inhibitors?
Takotsubo syndrome	Ventriculography, echocardiography with adenosine, CMR	Heart failure treatment

Scalone G et al. European Heart Journal: Acute Cardiovascular Care 2018

Možnosti léčby

Medical Therapy for Secondary Prevention and Long-Term Outcome in Patients With Myocardial Infarction With Nonobstructive Coronary Artery Disease

Observational study of 9,136 MINOCA patients recorded in the SWEDEHEART registry

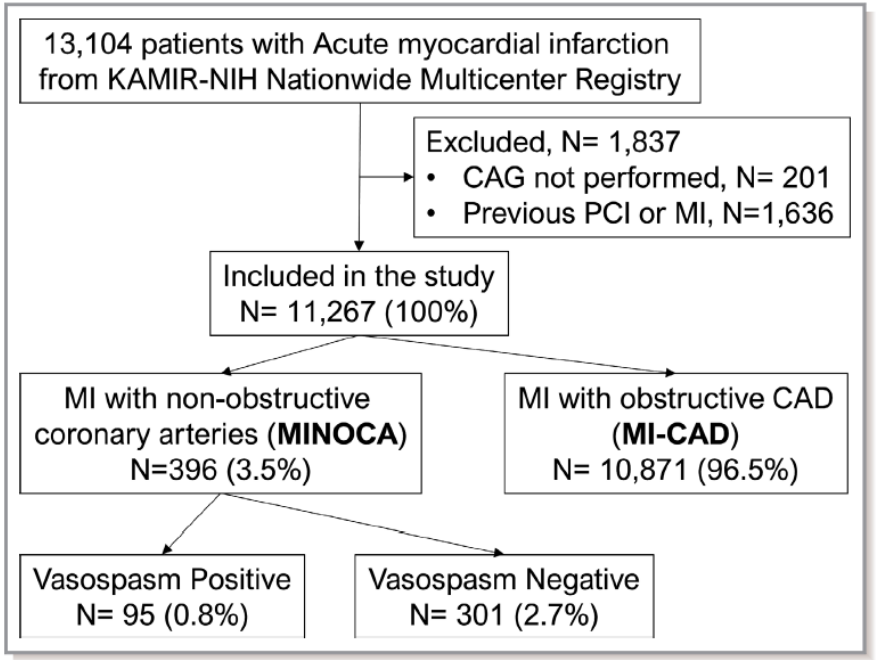


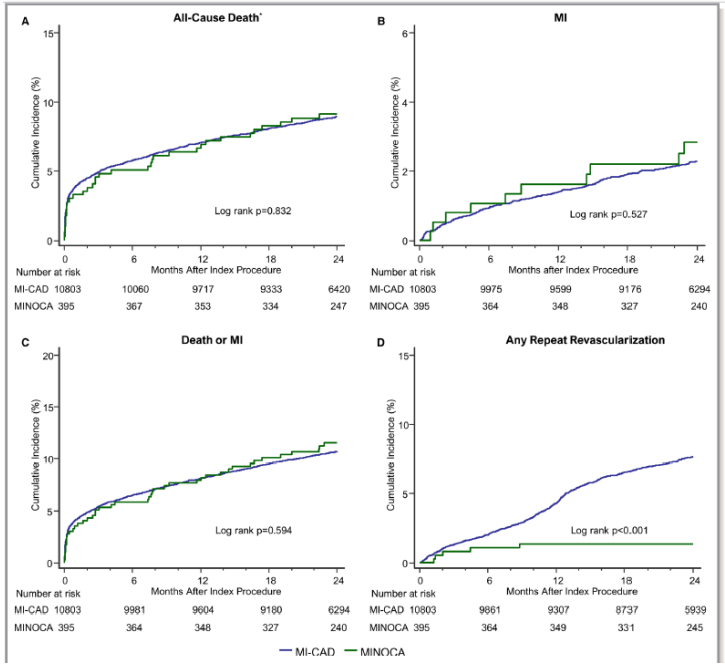
	Statins n=7512	ACEI/ARB n=5904	β-Blockers n=6362	DAPT* n=8118
MACE	0.77 (0.68–0.87)	0.82 (0.73–0.93)	0.86 (0.74–1.01)	0.90 (0.74–1.08)
All-cause mortality	0.66 (0.57–0.77)	0.87 (0.74–1.02)	0.81 (0.66–0.99)	0.75 (0.56–1.01)
CV mortality	0.59 (0.47–0.75)	0.91 (0.70–1.18)	0.80 (0.57–1.14)	0.87 (0.54–1.40)
AMI	0.88 (0.68–1.13)	0.83 (0.67–1.03)	0.74 (0.56–0.97)	1.02 (0.71–1.47)
Stroke	0.67 (0.50–0.90)	0.80 (0.60–1.06)	0.97 (0.66–1.41)	0.82 (0.52–1.30)
CHF	0.88 (0.70–1.12)	0.92 (0.70–1.21)	0.88 (0.62–1.23)	0.83 (0.58–1.17)
Bleeding events	0.99 (0.70–1.39)	1.04 (0.75–1.43)	0.92 (0.63–1.35)	1.33 (0.73–2.42)

Circulation. 2017;135:1481–1489

Prognosis and Predictors of Mortality in Patients Suffering Myocardial Infarction With Non-Obstructive Coronary Arteries

Eun Ho Choo, MD; Kiyuk Chang, MD; Kwan Yong Lee, MD; Dongjae Lee, MD; Jae Gyung Kim, MD; Youngkeun Ahn, MD; Young Jo Kim, MD; Shung Chull Chae, MD; Myeong Chan Cho, MD; Chong Jin Kim, MD; Hyo-Soo Kim, MD; Myung Ho Jeong, MD; KAMIR-IH Investigators*





J Am Heart Assoc. 2019;8:e011990.

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Table 3. Comparison of 2-Year Clinical Outcomes

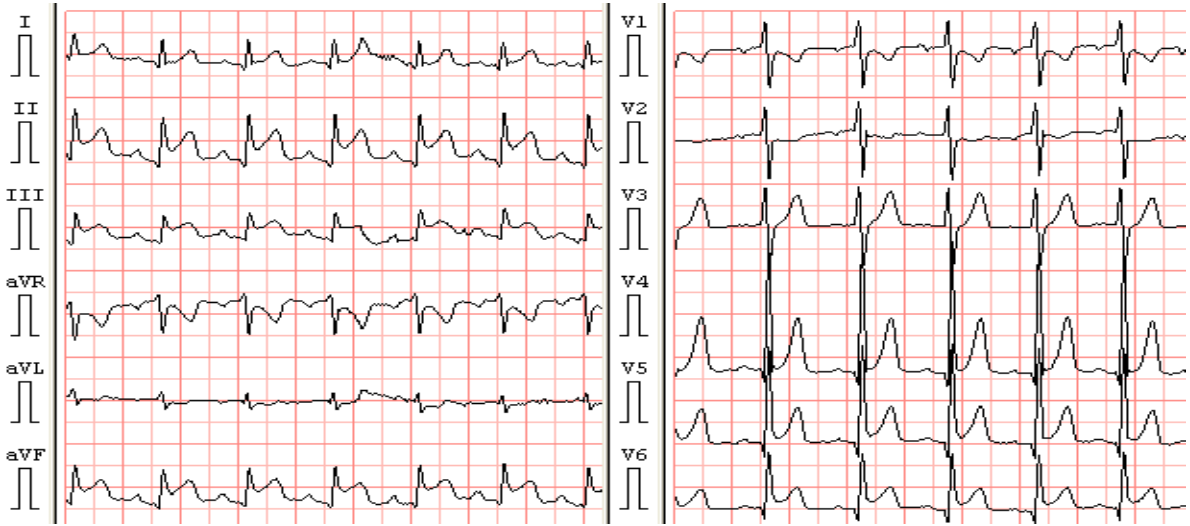
			Unadjusted		Multivariable-Adjusted		Propensity-Score Matched	
	MINOCA (N=396)	MI-CAD (N=10 871)	HR (95% CI)	*P* Value	HR (95% CI)	*P* Value	HR (95% CI)	*P* Value
All-cause death*	9.1 (36)	8.8 (954)	1.04 (0.74–1.45)	0.832	1.18 (0.74–1.87)	0.493	1.25 (0.77–2.05)	0.364
Noncardiac death	4.0 (16)	2.6 (285)	1.55 (0.93–2.56)	0.09	1.21 (0.59–2.48)	0.596	1.81 (0.80–4.10)	0.154
Cardiac death	5.1 (20)	6.2 (669)	0.82 (0.53–1.28)	0.384	1.13 (0.62–2.08)	0.689	1.01 (0.54–1.87)	0.986
Recurrent MI	2.8 (11)	2.2 (241)	1.23 (0.65–2.31)	0.528	1.12 (0.52–2.42)	0.764	0.92 (0.39–2.18)	0.856
Any repeat revascularization	1.3 (5)	7.2 (783)	0.17 (0.07–0.41)	<0.001	0.22 (0.09–0.53)	0.001	0.15 (0.06–0.38)	<0.001
Death or MI	11.6 (46)	10.7 (1158)	1.08 (0.81–1.46)	0.594	1.17 (0.78–1.75)	0.451	1.14 (0.74–1.74)	0.554

Table 4. Independent Predictors of All-Cause Death in Patients With MINOCA

	Hazard Ratio	95% CI	*P* Value
Age	1.04	1.01 to 1.08	0.02
Atypical symptom	5.98	2.68 to 13.37	<0.001
ST elevation at presentation	3.57	1.61 to 7.90	0.002
Killip Class I	Reference		
Class II	0.81	0.27 to 2.40	0.705
Class III	1.81	0.64 to 5.17	0.265
Class IV	6.05	2.13 to 17.20	0.001
Diabetes mellitus	3.12	1.47 to 6.64	0.003
Nonuse of RAS blocker	2.63	1.08 to 6.25	0.033
Nonuse of statin	2.17	1.04 to 4.54	0.039

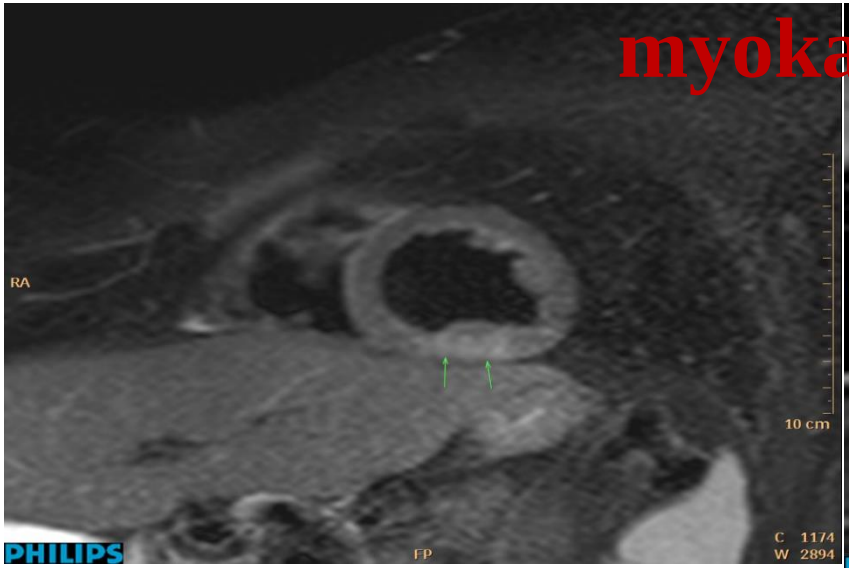
J Am Heart Assoc. 2019;8:e011990.

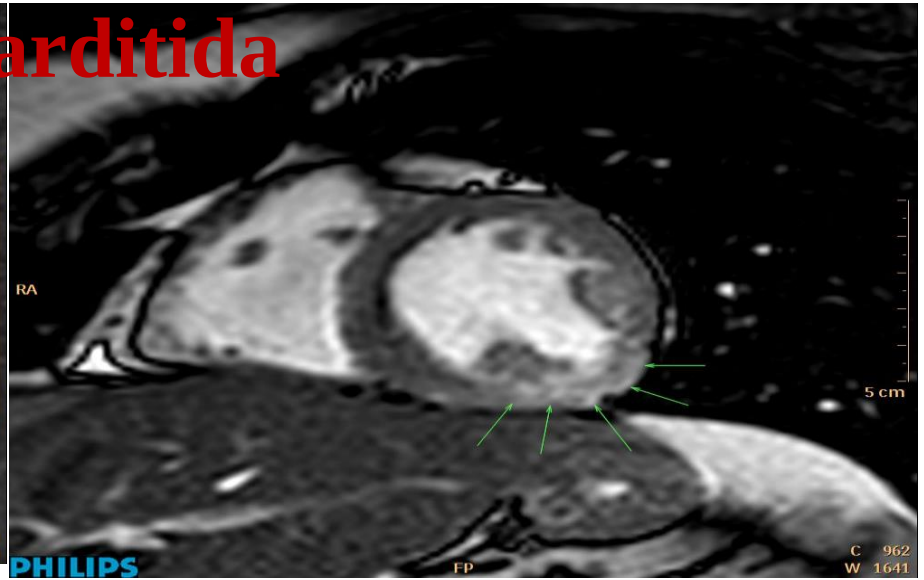
Kazuistika 1.
Typická klinika + ekg + troponin



- muž, 21 let
- osobní anamnéza: asthma bronchiale
- RF pro ICHS: rodinná anamnéza
- Klin. průběh: 10 dnů „viróza“, infekce horních dýchacích cest
- Symptomy: náhle vzniklé bolesti na hrudi s propagací do obou ramen, bez dalších vegetativních příznaků

Kazuistika 1. nevýznamný koronarografický nález - CMR – subepikardiální postižení = myokarditida

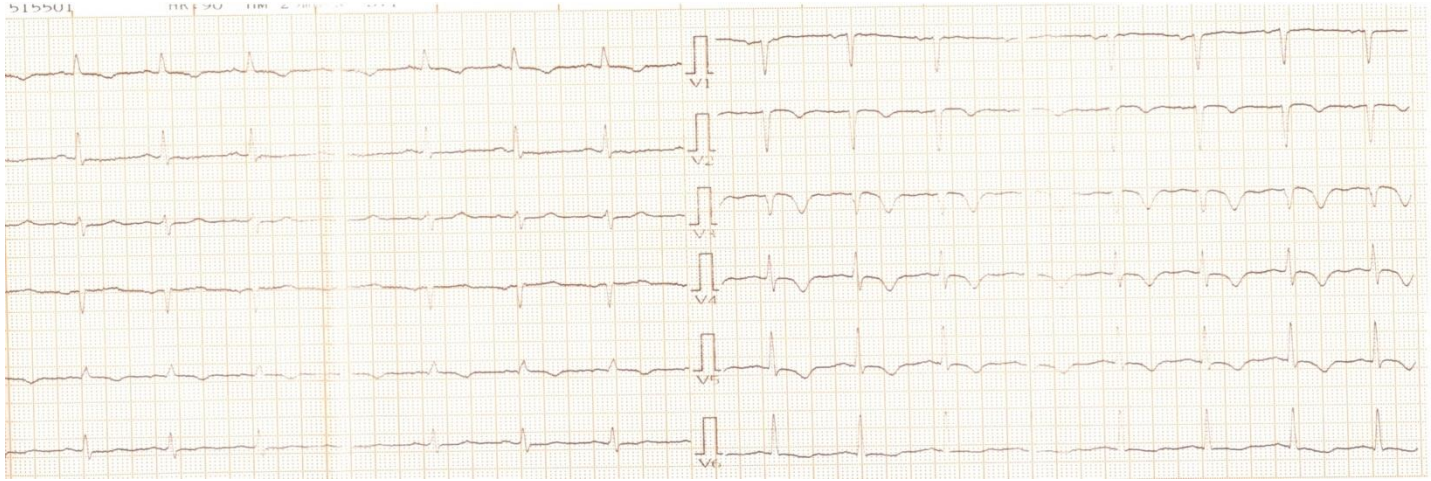




Zvýšení signálu na T2 váž. obrazech znamená vyšší obsah „vody“, tedy známky edému stěny LK

Šipky označují okrsky patologického sycení v supepikard. lokalizaci na dolní a dors. stěně LK

-Kazuistika 2

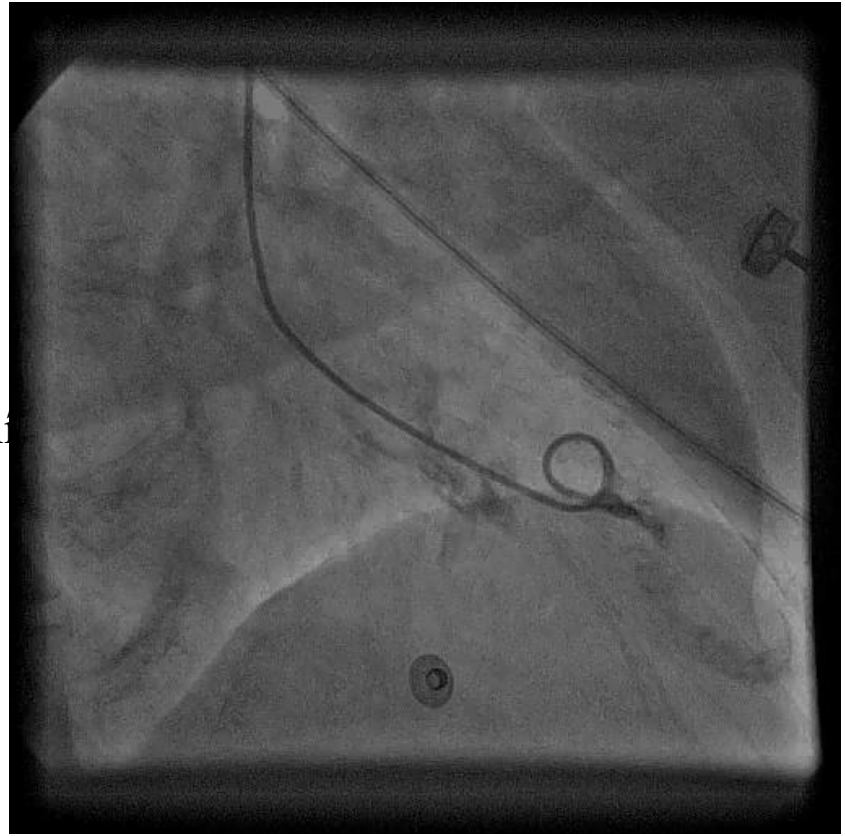


Žena 55 let

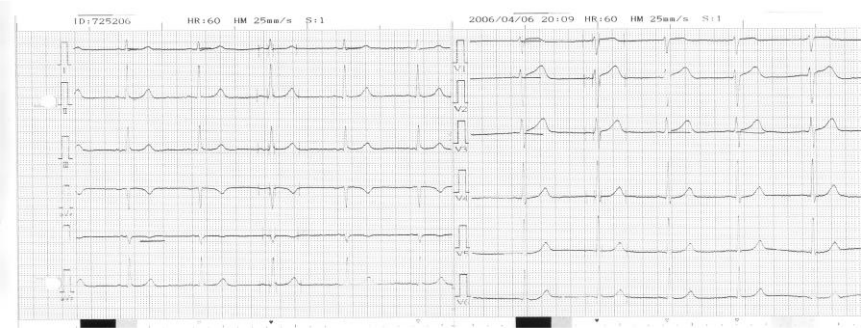
- osobní anamnéza: hypothyreoza
- RF pro ICHS: 0
- Klinický průběh: 3 dny před přijetím bolesti na hrudi trvající prakticky celý den, od té doby zvýšená dušnost a pocit tlaku na hrudi. Dle ekg obraz subakutního QIM PS.
- Laboratoř: mírná elevace troponinu, CRP 1

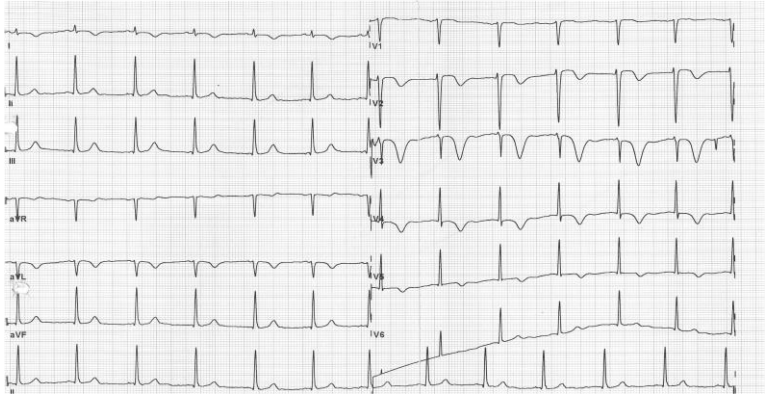
Kazuistika 2 – Tako-tsubo kardiomyopatie

Tako-tsubo kardiomyopatie
- Ženy nad 60 let
- Symptomy podobné AIM
- Předchozí stress
- Ekg známky ischémie
- Typický obraz levé komory, normální koronární tepny
- Úprava funkce levé komory



Kazuistika 3



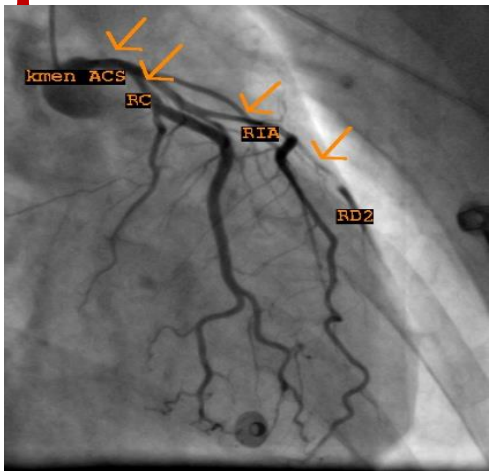


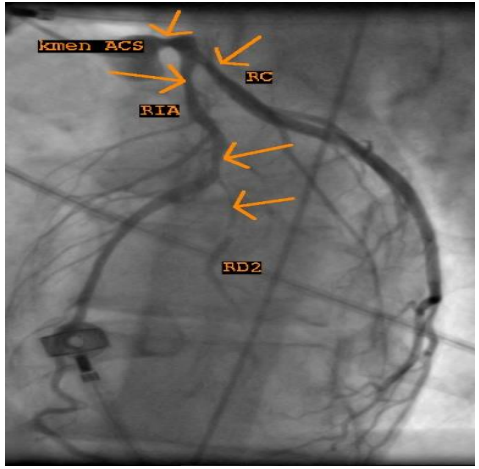
Žena 31 let

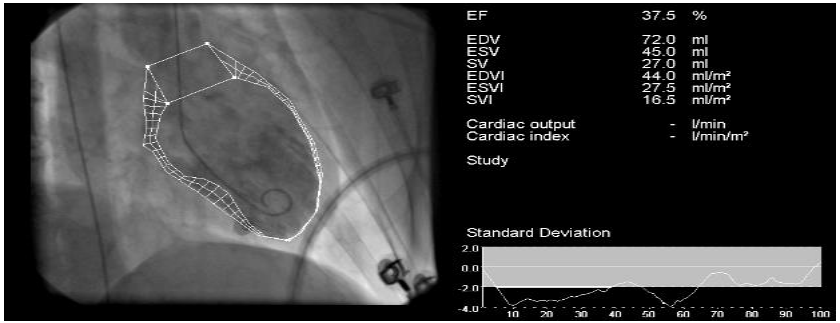
- Osobní anamnéza: 0
- RF pro ICHS: 0
- Klinický průběh: Pacientka přijata pro hodinu trvající bolesti na hrudi s vegetativním doprovodem k observaci, při přijetí bez potíží. Po 12 hod od bolestí pozitivní troponin, dle echo hypokineza PS. Pro recidivu stenokardií indikována k akutní SKG.

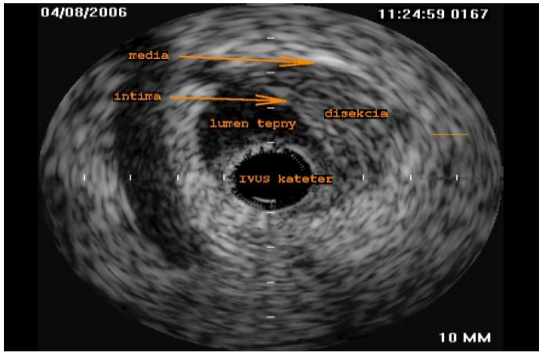
Kazuistika 3

Spontánní disekce koronární tepny









Individualizovaný přístup k pacientům s AIM

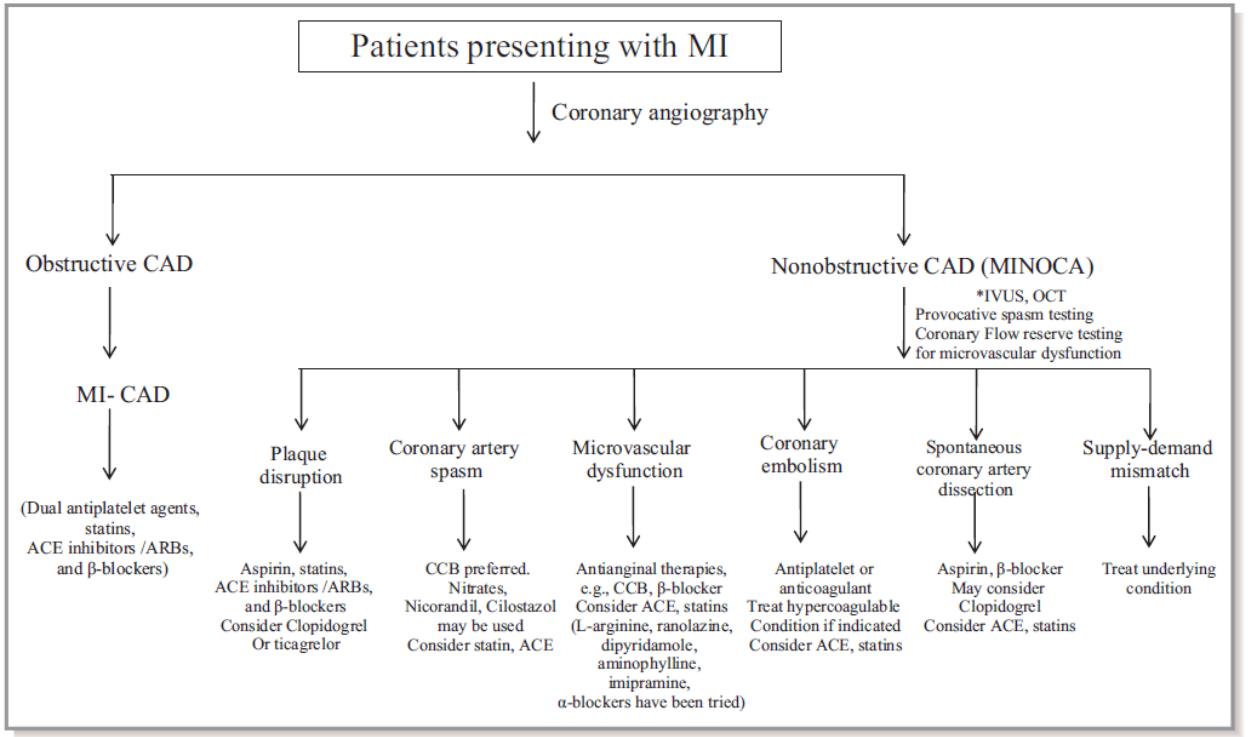


Figure. Individualized approach to the management of patients with myocardial infarction (MI) with nonobstructive coronary arteries on the basis of the underlying cause. *Additional investigations that may be considered in addition to routine evaluation for patients with acute MI and nonobstructive (<50%) coronary artery stenosis. ACE indicates angiotensin-converting enzyme; ARB, angiotensin receptor blocker; CAD, coronary artery disease; CCB, calcium channel blocker; IVUS, intravascular ultrasound; MINOCA, MI in the absence of obstructive coronary

DOI: 10.1161/JAHA.119.013361

MINOCA - – úloha invazivní diagnostiky
Závěry

- Vzhledem k heterogenním příčinám postižení koronární cirkulace (epi+mikro) je nutné cíleně hledat možnou patologii.
- Základní SKG je často nedostatečná a vždy by mělo být zváženo rozšíření o další invazivní testy na přítomnost koronárních spasmů/posouzení mikrocirkulace.
- I tak zůstane otázka OMT (vždy ACEI/ARB a statin, indiv. ost).
- Role invazivní diagnostiky je tedy **zásadní při individuálním posouzení koronární patologie..spolu s klinickou rozvahou a CMR** (otázka využití CTCA).

Děkuji za pozornost.