

Le mystère de l'infarctus du myocarde à coronaires saines

Iulia Iatan

MD PhD

R2, Médecine Interne, Université McGill

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Conflits d'intérêts

- Aucun

Évaluation initiale

- Appel du Nord, Kuujjuarapik
- **55F**, caucasienne
- **RC**: DRS soudaine au repos, 10/10, irradiant à la mâchoire et au dos, ~ 45 min, avec toux et vomissements
- Fumeuse, 1 paquet/jour cigarettes, marijuana 1-2/semaine et EtOH occasionnel
- Aucun médicament, ni d'allergies
- Pas de DM, HTN, DLP

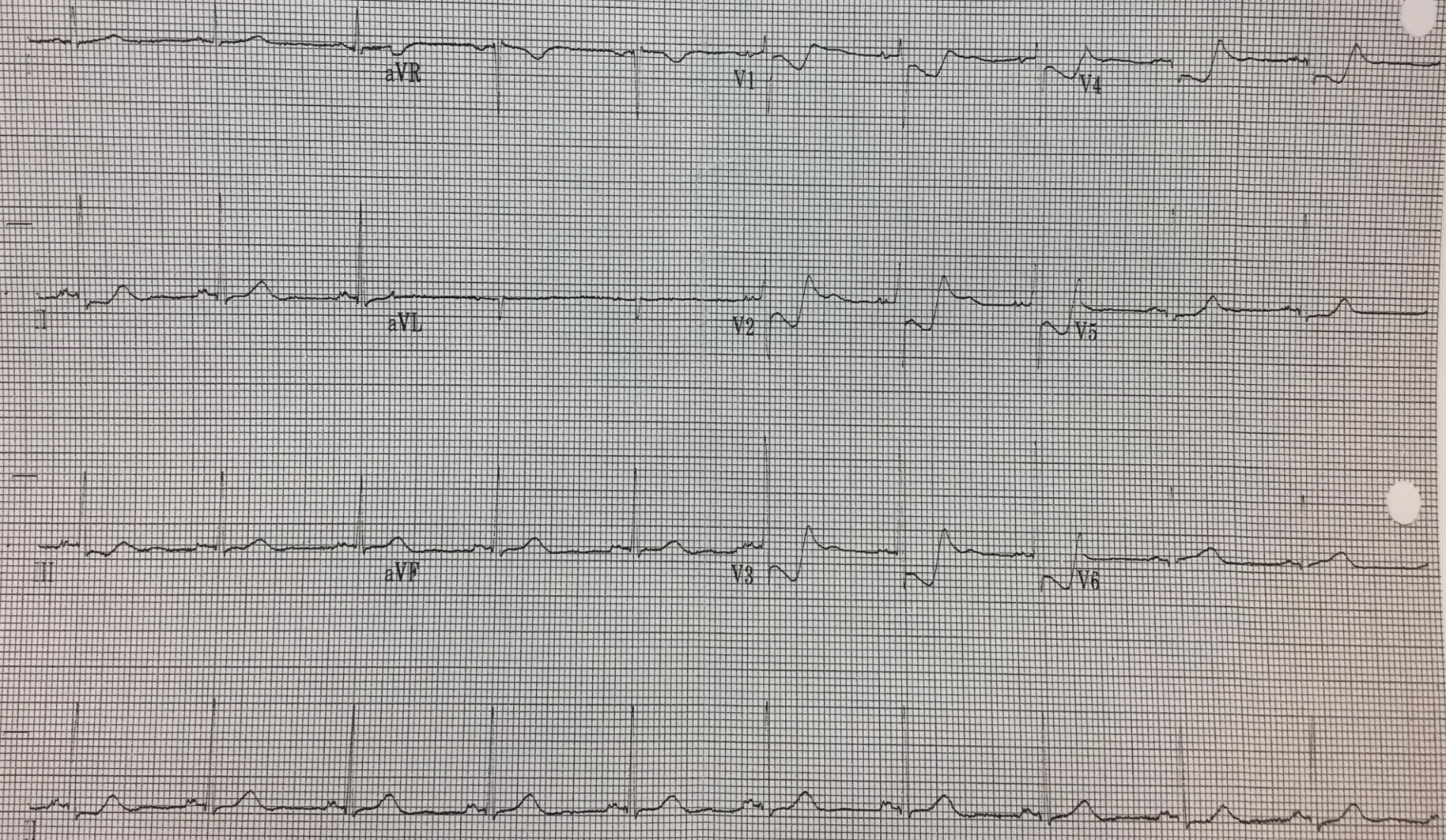
Évaluation initiale E/P

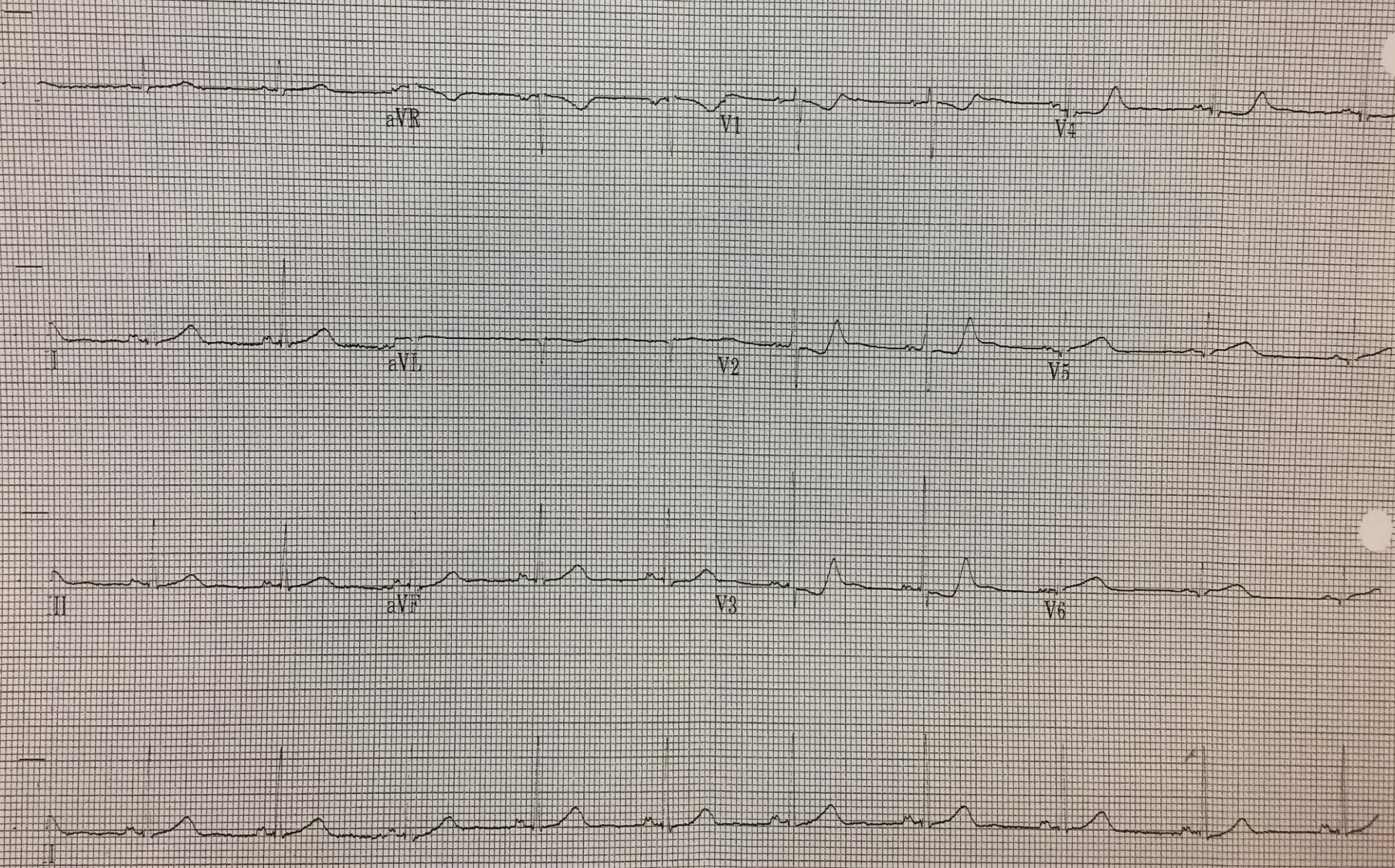
- À l'urgence/clinique, diaphorétique
- TA 154/81, FC 65 rég., RR 22, Sat 97% AA
- S1S2 N, pas de S3/S4, TVP normale
- Poumons clairs
- Pas d'œdème pédieux, pouls palpables
- MI et MS bien perfusés

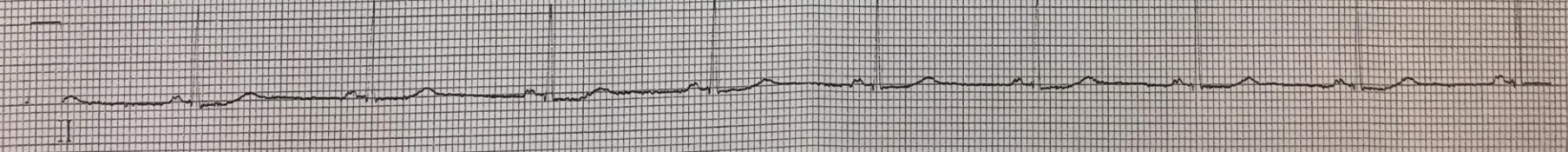
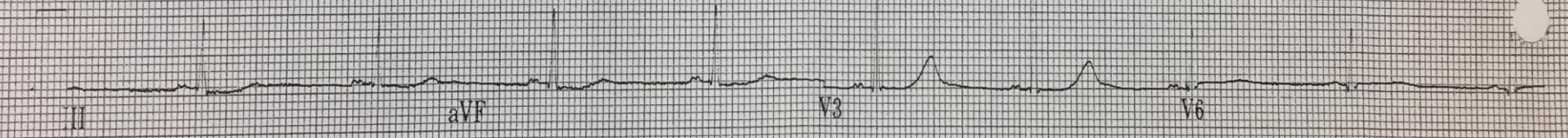
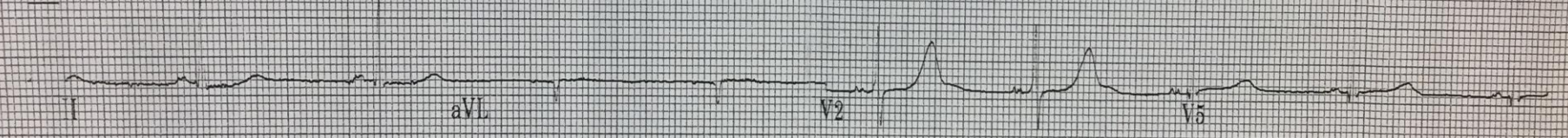
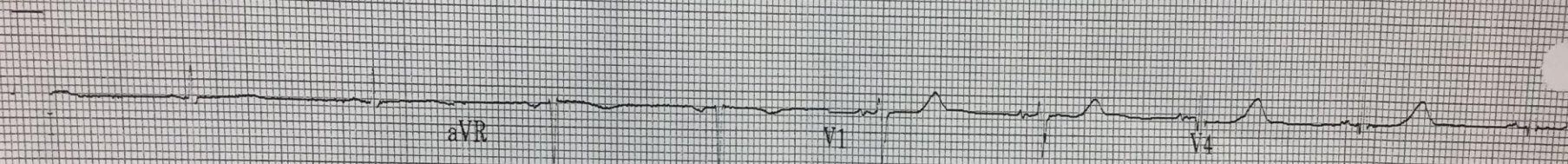
- **Reçu nitroglycérine IV et morphine**

Référe par:

Non valide





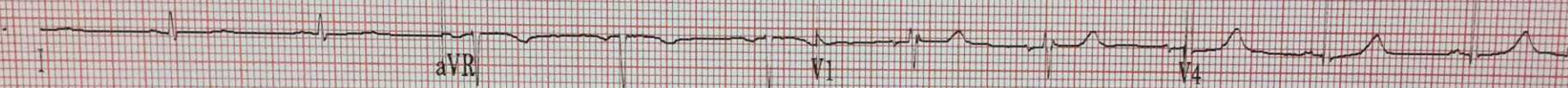


Évaluation initiale

- **ECG**: ischémie sous-endocardique antéro-septale
- Héparine IV et Plavix donnés
- Lors du transfert à 2 am, résolution dépression segment ST
- Arrivée à Montréal, sans douleur

Tests de laboratoire

- Troponine 10-8-22-74
- Fonction hépatique normale
- Électrolytes normaux, créatinine 61
- FSC normale (Hgb 138)



Questions

- Diagnostic différentiel?
- Prochaines démarches diagnostiques et thérapeutiques?
- Pronostic du patient?

Echo

Coronarographie

IRM

IRM

- Infarctus transmural très récent du territoire Cx, pourrait représenter un vasospasme
- T1 est significativement augmenté dans le territoire Cx = œdème myocardique.
- Atypique pour une myocardite ou une maladie infiltrante
- FEVG 53%, FEVR 54%

Infarctus du myocarde à coronaires saines / sans atherosclérose obstructive

• *Myocardial Infarction with Non-obstructive Coronary Arteries: MINOCA*

Table I Diagnostic criteria for 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 acute myocardial infarct, as detailed by the following criteria:

(1) AMI criteria.¹

- (a) Positive cardiac biomarker (preferably cardiac troponin) defined as a rise and/or fall in serial levels, with at least one value above the 99th percentile upper reference limit.

and

- (b) Corroborative clinical evidence of infarction evidenced by at least one of the following:

- (i) Symptoms of ischaemia
- (ii) New or presumed new significant ST-T changes or new LBBB
- (iii) Development of pathological Q waves
- (iv) Imaging evidence of new loss of viable myocardium or new RWMA
- (v) Intracoronary thrombus evident on angiography or at autopsy

(2) Non-obstructive coronary arteries on angiography:

- Defined as the absence of obstructive CAD on angiography, (i.e. no coronary artery stenosis $\geq 50\%$), in any potential infarct-related artery.
- This includes both patients with:
 - normal coronary arteries (no stenosis $>30\%$)
 - mild coronary atheromatosis (stenosis $>30\%$ but $<50\%$).

(3) No clinically overt specific cause for the acute presentation:

- At the time of angiography, the cause and thus a specific diagnosis for the clinical presentation is not apparent.
- Accordingly, there is a necessity to further evaluate the patient for the underlying cause of the MINOCA presentation.

- Prévalence moyenne 6-10 % (Pasupathy 2016)
- Absence de spécificité clinique hormis:
 - Patients un peu plus jeunes ~ 55 ans, 40 % femmes
- 1/3 SCA ST+, 2/3 SCA ST-
- Pronostic
 - Mortalité hospitalière 0,9 %, Mortalité à 1 an 4,7 %
 - Même traitement que SCA, Diagnostic +++
- Diagnostic par excès d'infarctus avec corollaires sociaux, professionnels, psychologiques

Diagnostic

- Critères d'infarctus aigu
 - Augmentation des troponins
 - Signes d'ischémie
 - Douleur thoracique ± dyspnée
 - Modifications ECG (ST, BBG, ondes Q)
 - Perte de viabilité (imagerie de perfusion)
 - Dysfonction VG régionale
- Coronarographie normale
 - Strictement normale 50 % des cas (artères lisses)
 - Athérome non sténosant 50 % des cas
- Absence d'autres étiologies : IRM +++
 - Myocardite, Tako Tsubo

Troponin-positive nonobstructive coronary arteries (TP-NOCA)

Coronary Disorders (MINOCA)

Coronary Dissection
Plaque Disruption
Coronary Spasm
Microvascular Dysfunction
Coronary thrombus/embolus

Myocardial Disorders

Myocarditis
Takotsubo cardiomyopathy
Other cardiomyopathies

Non-cardiac Disorders

Pulmonary embolism
Renal Impairment

MINOCA - Causes

- 1-10% de SCA
- Myocardite (33%)
- Lésion obstructive recanalisée (21%)
- Takotsubo (10-20%)
- Embolie (petit thrombus mural, prolapsus MV, myxome)
- Spasme
- Pont myocardique
- Dissection coronaire
- Artérite coronaire
- CAD dans des vaisseaux trop petits pour être vus sur cath
- Thrombose in situ de polyglobulie, drépanocytose, DIC, TTP
- Thyrotoxicose, utilisation d'amphétamines, hypotension,
- Fistule artério-veineuse coronaire

- Jeunes patients, fumeurs
- Aucune angine antérieure, aucun prodrome
- Dyskinésie localisée et hypokinésie
- Spasme ou thrombose avec dysfonction endothéliale sous-jacente ou plaque

MINOCA



European Heart Journal (2017) 38, 143–153
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CURRENT OPINION

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

Stefan Agewall^{1*}, John F. Beltrame², Harmony R. Reynolds³, Alexander Niessner⁴, Giuseppe Rosano^{5,6}, Alida L. P. Caforio⁷, Raffaele De Caterina⁸, Marco Zimarino⁸, Marco Roffi⁹, Keld Kjeldsen¹⁰, Dan Atar¹, Juan C. Kaski⁶, Udo Sechtem¹¹, and Per Tornvall¹², on behalf of the WG on Cardiovascular Pharmacotherapy

¹Oslo University Hospital Ullevål and Institute of Clinical Sciences, University of Oslo, Oslo, Norway; ²The Queen Elizabeth Hospital Discipline of Medicine, University of Adelaide, Central Adelaide Local Health Network, Adelaide, Australia; ³Cardiovascular Clinical Research Center, Leon H. Charney Division of Cardiology, Department of Medicine, NYU School of Medicine, New York, NY, USA; ⁴Department of Internal Medicine II, Division of Cardiology, Medical University of Vienna, Wien, Austria; ⁵Centre for Clinical and Basic Research, Department of Medical Sciences, IRCCS San Raffaele Pisana, Rome, Italy; ⁶Cardiovascular and Cell Sciences Research Institute, St George's University of London, London, UK; ⁷Division of Cardiology, Department of Cardiological Thoracic and Vascular Sciences Padua University Medical School, Policlinico Universitario, Via N. Giustiniani, 2, 35128 Padova, Italy; ⁸Institute of Cardiology, G. d'Annunzio University, Chieti, Italy; ⁹Division of Cardiology, University Hospital, 1211 Geneva 14, Switzerland; ¹⁰Copenhagen University Hospitals (Rigshospitalet and Holbæk Hospital), Copenhagen and Holbæk, and The Faculty of Medicine, Aalborg University, Aalborg, Denmark; ¹¹Abteilung für Kardiologie, Robert-Bosch Krankenhaus Stuttgart, Auerbachstr. 110, 70376 Stuttgart, Germany; and ¹²Department of Clinical Science and Education Södersjukhuset, Karolinska Institutet, Stockholm, Sweden

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Causes d'élévation de troponines

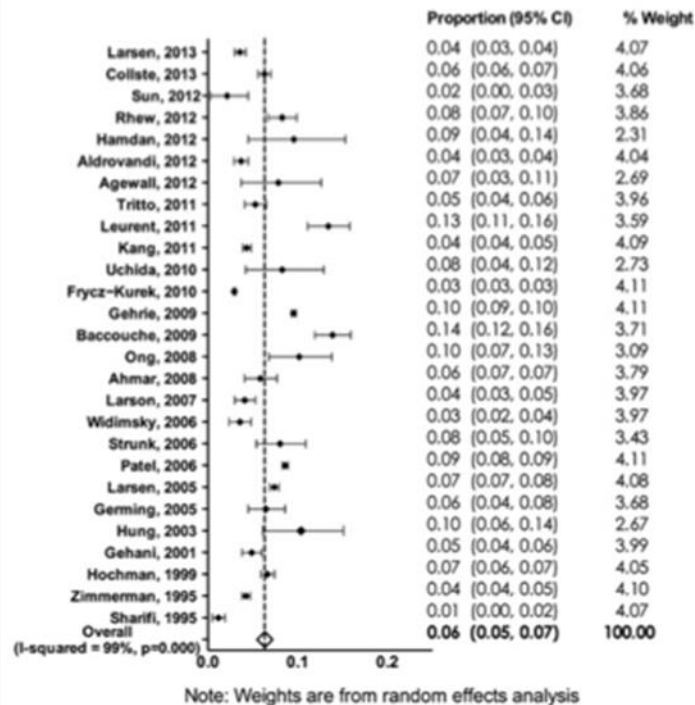
Table 2 Potential causes of an elevated troponin adapted from Agewall et al.¹¹

- (1) Coronary causes
 - Plaque rupture or erosion
 - Coronary artery spasm
 - Spontaneous coronary dissection
 - Acute aortic dissection with coronary extension
 - Coronary microvascular disorders
 - Spontaneous coronary thrombosis–thrombophilia disorders
 - Coronary emboli
 - Sympathomimetic agents—cocaine, methamphetamines
- (2) Non-coronary causes
 - (a) Associated with cardiac disorders
 - Myocarditis
 - Takotsubo cardiomyopathy
 - Cardiomyopathies
 - Cardiac trauma
 - Strenuous exercise
 - Tachyarrhythmias
 - Cardiotoxins—chemotherapeutic agents
 - (b) Associated with extra-cardiac disorders
 - Stroke
 - Pulmonary embolism
 - Sepsis
 - Adult respiratory distress syndrome
 - End-stage renal failure

Coronary Heart Disease

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

Sivabaskari Pasupathy, BSc(Hons); Tracy Air, BA (Hons), M.Biostatistics;
 Rachel P. Dreyer, BSc(Hons), PhD; Rosanna Tavella, BSc(Hons), PhD;
 John F. Beltrame, BSc, BMBS, PhD



Prevalence 6%

Figure 2. Prevalence of myocardial infarction with nonobstructive coronary arteries (MINOCA). Forest plot of published studies examining the prevalence of MINOCA using random effects meta-analysis. Data presented as percentage (%) and 95% confidence intervals (CI; %).

Circulation 2015;131:861-870

Table 1. Cardiovascular Risk Factors in Patients With MINOCA or MI-CAD

Risk Factors	Comparative Studies			All MINOCA Studies
	MI-CAD % (95% CI)	MINOCA % (95% CI)	Mean difference/OR (95% CI) & P Value	
Age	61.3 (52.2, 70.4)	58.8 (51.6, 66.1)	4.1 (2.9, 5.4) P<0.001	54.7 (50.5, 58.7)
Women	24% (19%, 30%)	43% (35%, 51%)	2.1 (1.7, 2.7) P<0.001	40% (33%, 46%)
Hyperlipidemia	32% (15%, 48%)	21% (6%, 35%)	0.6 (0.5, 0.7) P<0.001	33% (25%, 41%)
Hypertension	45% (30%, 59%)	52% (41%, 62%)	1.3 (0.9, 1.9) P=0.183	44% (38%, 50%)
Diabetes mellitus	22% (14%, 29%)	15% (9%, 20%)	0.8 (0.5, 1.3) P=0.333	13% (11%, 16%)
Smoking	39% (26%, 52%)	42% (33%, 51%)	1.1 (0.7, 1.5) P=0.785	42% (36%, 48%)
Family history	27% (10%, 43%)	21% (5%, 38%)	1.0 (0.7, 1.3) P=0.794	28% (17%, 39%)

Data presented as either mean or percentage (%) with 95% confidence intervals (CI; %) where appropriate. MI-CAD indicates myocardial infarction with coronary artery disease; MINOCA, myocardial infarction with nonobstructive coronary arteries; and OR, odds ratio.

Table 3. 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%)
Fukui, 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%)				

Data presented as n (%). angio indicates coronary angiography; ergot, ergonovine; ic, intracoronary; iv, intravenous; MINOCA, myocardial infarction with nonobstructive coronary arteries; NR, not recorded; and RWMA, regional wall motion abnormality.

*Kossowsky et al was ignored from the calculations because it represents the cohort of cocaine abuse patients.

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%)

Data presented as n (%). APCR indicates activated protein C Resistance; MINOCA, myocardial infarction with nonobstructive coronary arteries; and NE, not examined.

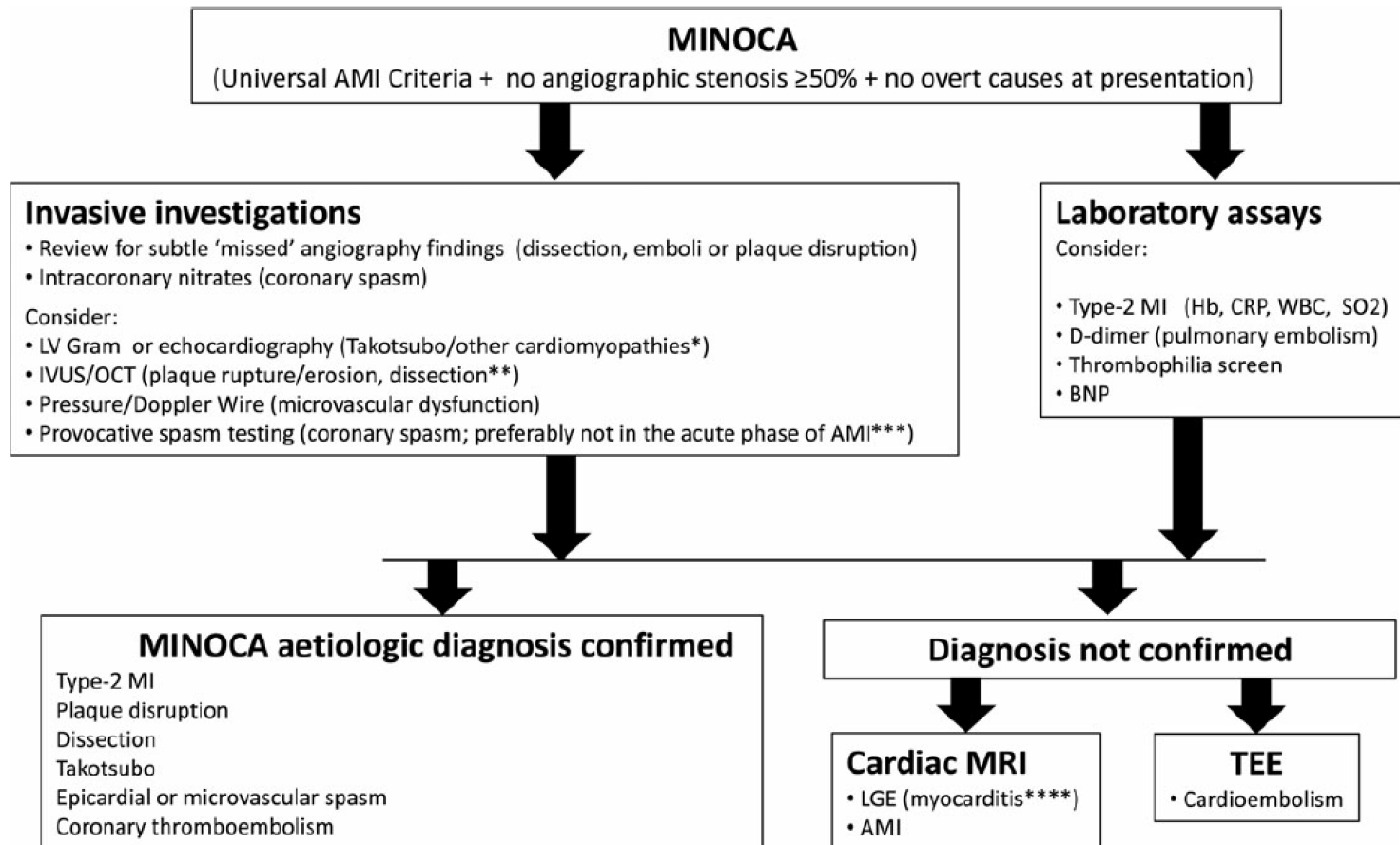
*Dacosta et al (1998) was ignored from the calculations because the same patient cohort was again used in Dacosta et al (2004).

Table 2. All-Cause Mortality in Patients With MINOCA or MI-CAD

All-Cause Mortality	Comparative Studies			All MINOCA Studies
	MI-CAD % (95% CI)	MINOCA % (95% CI)	OR (95% CI) <i>P</i> Value	
In-hospital	3.2% (1.8%, 4.6%)	1.1% (-0.1%, 2.2%)	0.37 (0.2–0.67) <i>P</i> =0.001	0.9% (0.5%, 1.3%)
12-month	6.7% (4.3%, 9.0%)	3.5% (2.2%, 4.7%)	0.59 (0.41–0.83) <i>P</i> =0.003	4.7% (2.6%, 6.9%)

Data presented as percentage (%) and 95% confidence intervals (%) with odds ratio (OR) and *P* values. MI-CAD indicates myocardial infarction with coronary artery disease; and MINOCA, myocardial infarction with nonobstructive coronary arteries

Algorithme diagnostique



Évolution de notre patient

Conclusion

- Pathologie fréquente
- IRM indispensable au diagnostic et à la mise en place de la stratégie thérapeutique
 - Imagerie endocoronaire : OCT
 - Infarctus : Aspirine, Statine
 - IEC, Béta-bloquant ou inhibiteur calcique si spasme
 - Faible niveau de preuve
 - Pronostic proche des SCA ST+ ou ST-