Non-conducted premature atrial complexes: a silent culprit of atrial fibrillation onset

Armando Lo Savio[a], Giampaolo Vetta[a], Antonio Parlavecchio[a], Rodolfo Caminiti[a], Michele Magnocavallo[b], Lorenzo Pistelli[a], Olga Mariarita La Cognata[a], Domenico Giovanni Della Rocca[c], Gianluca Di Bella[a], Pasquale Crea[a]

[a] *Cardiology Unit, Department of Clinical and Experimental Medicine, University of Messina, Messina, Italy*
[b] *Arrhythmology Unit, Cardiology Division, S. Giovanni Calibita Hospital, Isola Tiberina, Rome, Italy*
[c] *Heart Rhythm Management Centre, Postgraduate Program in Cardiac Electrophysiology and Pacing, Universitair Ziekenhuis Brussel-Vrije Universiteit Brussel, European Reference Networks Guard-Heart, Brussels, Belgium*

ARTICLE INFO

Article history:
Submitted: 12. 8. 2023
Revised: 25. 12. 2023
Accepted: 2. 1. 2024
Available online: 5. 2. 2024

Klíčová slova:
Elektrokardiogram
Fibrilace síní
Holterovské monitorování
Předčasné síňové komplexy

Keywords:
Atrial fibrillation
Atrial premature complexes
Electrocardiogram
Holter-monitoring

SOUHRN

Fibrilace síní (FS) je nejčastější srdeční arytmií u dospělých a příčinou značné morbidity a mortality. Ve srovnání s běžnou populací zvyšuje FS riziko cévních mozkových příhod pětinásobně, přičemž základem prevence vzniku cévních mozkových příhod je perorální antikoagulační léčba. Aby bylo možno vyhledávat pacienty s vysokou pravděpodobností vzniku FS, je třeba zjistit faktory predikující vznik FS. Popisujeme případ 69letého pacienta s asymptomatickou palpitací, u něhož 24hodinové holterovské monitorování prokázalo několik nepřevedených předčasných síňových komplexů (non-conducted premature atrial complex, ncPAC) vedoucích ke vzniku FS.

ABSTRACT

Atrial fibrillation (AF) is the most common cardiac arrhythmia in adults with substantial morbidity and mortality. AF increases the risk of stroke 5-fold compared to the general population and oral anticoagulant therapy represents the cornerstone for stroke prevention. Therefore, it is necessary to identify predictive factors for the onset of AF in order to screen patients with a high probability of AF development. We report the case of a 69-year-old patient asymptomatic for palpitation with a 24-hour Holter ECG showing several ncPACs (non-conducted premature atrial complexes) leading to AF onset.

Introduction

Atrial fibrillation (AF) is the most common sustained cardiac arrhythmia in adults.[1] AF is associated with substantial morbidity and mortality and therefore carries a significant burden on patients, societal health and the health economy.[1] AF increases the risk of stroke 5-fold compared to the general population and oral anticoagulant therapy represents the cornerstone for stroke prevention.[1] Therefore, it is necessary to identify predictive factors for the onset of AF in order to screen patients with a high probability of AF development. Frequent premature atrial complexes (PACs) are a well-known electrocardiographic (ECG) predictor of AF onset, as proven in cohort studies of both stroke patients and asymptomatic individuals.[2] Moreover, in a recent study, non-conducted premature atrial complexes (ncPACs) proved to be a an independent predictor of AF onset in cryptogenic stroke patients.[3] We report the case of a 69-year-old patient asymptomatic for palpitation with a 24-hour Holter ECG showing several ncPACs leading to AF onset.

Case report

An asymptomatic 69-year-old male patient was admitted to the emergency room of our hospital following evidence of tachycardia on blood pressure measurement with

Address: Rodolfo Caminiti, MD, FISC, Cardiology Unit, Department of Clinical and Experimental Medicine, University of Messina, Messina, Italy, e-mail: rodolfocaminiti@msn.com
DOI: 10.33678/cor.2024.001

Please cite this article as: Lo Savio A, Vetta G, Parlavecchio A, et al. Non-conducted premature atrial complexes: a silent culprit of atrial fibrillation onset. Cor Vasa 2024;66:84–86.

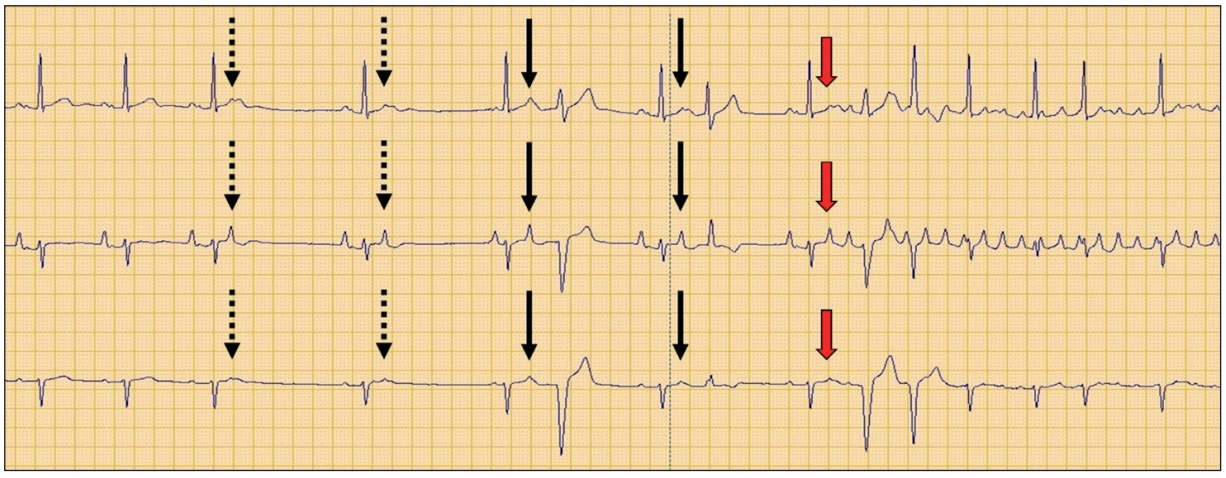

Fig. 1 – Atrial fibrillation induction by non-conducted premature atrial complexes. Sinus rhythm interrupted by ncPACs (dot arrows) and PACs (black arrows) conducted with alternating left bundle branch block and right bundle branch block aberrancy. The red arrow points to the ncPAC causing the AF onset. AF – atrial fibrillation; ncPACs – non-conducted premature atrial complexes; PACs – premature atrial complexes.

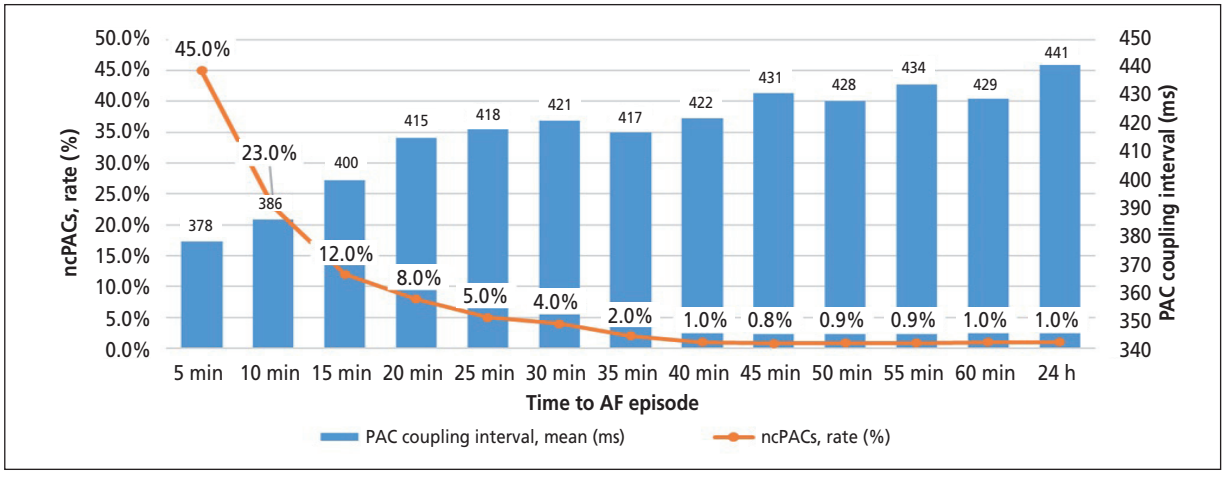

Fig. 2 – Relationship between time to AF onset, ncPACs rate, and PAC coupling interval.
AF – atrial fibrillation; ncPACs – non-conducted premature atrial complexes; PACs – premature atrial complexes.

automatic home blood pressure monitor (heart rate 170 bpm). The patient suffered from hypertension treated with telmisartan. There were no other cardiovascular risk factors. Cardiopulmonary examination showed bilateral air entry and normal heart sounds. There was no peripheral oedema. Blood tests were normal. A 12-lead ECG was performed, which showed sinus bradycardia with a heart rate of 55 bpm and a first-degree atrioventricular block. Transthoracic echocardiography revealed no significant organic cardiopathy. The patient underwent a 3-lead 24-hour Holter ECG monitoring during hospitalization. Holter ECG showed sinus rhythm interrupted by a single AF episode, the longest one lasting about 3 hours with an average frequency of 150 bpm. There were 15489 isolated PACs with 154 ncPACs. Figure 1 displays the onset of the AF episode. The Holter ECG tracing shows an initial sinus rhythm, interrupted by ncPACs and PACs conducted with alternating left bundle branch block and right bundle branch block aberrancy. In the end, last ncPAC leads to the AF onset. In the 5 minutes preceding the AF episodes compared to the average recording of the remaining 24 hours there was an increased ncPACs burden (45.0% vs 1%) and a reduced average PAC coupling interval (378 ms vs 441 ms) (Fig. 2). The CHA_2DS_2-VASc Score was 3 points. The patient started therapy with Edoxaban 30 mg daily, Flecainide 100 mg twice a day and Bisoprolol 2.5 mg once daily. The patient was discharged with an outpatient cardiology follow-up appointment.

Discussion

NcPACs were defined as PACs not followed by a QRS complex because, due to their shorter coupling interval, the impulse found the atrioventricular node within the absolute refractory period.

The possible link between the PACs burden at the 24-hour Holter ECG and AF occurrence was investigated in several studies.[2,4,5] Wallmann and colleagues proved the association of frequent PACs and AF occurrence in patients with acute ischaemic stroke and no known history of AF.4 Indeed, after a mean follow-up of 22.4 months,

33% of patients with frequent PACs (>70 PACs/day) developed new AF compared with only 5% of those without frequent PACs. In our prospective study in a population of 112 patients with cryptogenic stroke, we proved that ncPACs burden ≥ 7 in the 24-hour Holter ECG recordings was an independent predictor of AF onset at 6-month follow-up (HR 12.4; 95% CI 4.8–32.8; p <0.0001).[3] Furthermore, ncPACs showed statistically higher diagnostic accuracy compared to PACs in predicting AF onset at follow-up (AUC:0.80 vs 0.67; p = 0.029).[3] Thus, in our patient's Holter ECG, the number of ncPACs increased closer to AF onset (Fig. 2). NcPACs could lead to the AF onset due to the dispersion of atrial refractory periods. The ncPACs, occurring early during a dispersion of refractory period of nearby atrial cells, results in a slower conduction velocity of the stimulus that propagates through partially repolarized cells, allowing the genesis of unidirectional blocks and the appearance of multiple re-entries, leading to the triggering and maintenance of AF.[6–8] Our case report highlights the importance of the presence of ncPACs in the 24-hour Holter ECG as a predictor and trigger for AF onset.

Acknowledgements
None.

Conflict of interest
The authors declare that there is no conflict of interest.

Funding
The authors did not receive support from any organization for the submitted work.

Ethical statement
Ethical approval was waived by the local Ethics Committee of Policlinico G. Martino of Messina in view of the retrospective nature of the study and all the procedures being performed were part of the routine care.

References

1. Hindricks G, Potpara T, Dagres N, et al. 2020 ESC Guidelines for the diagnosis and management of atrial fibrillation developed in collaboration with the European Association for Cardio--Thoracic Surgery (EACTS). Eur Heart J 2021;42:373–498.
2. Tao Y, Xu J, Gong X, Sun J, Yang D. Premature atrial complexes can predict atrial fibrillation in ischemic stroke patients: A systematic review and meta-analysis. Pacing Clin Electrophysiol 2021;44:1599–1606.
3. Vetta G, Parlavecchio A, Caminiti R, et al. Non-conducted premature atrial complexes: A new independent predictor of atrial fibrillation in cryptogenic stroke. J Electrocardiol 2022;74:46–53.
4. Wallmann D, Tüller D, Kucher N, et al. Frequent atrial premature contractions as a surrogate marker for paroxysmal atrial fibrillation in patients with acute ischaemic stroke. Heart 2003;89:1247–1248.
5. Kolb C, Nürnberger S, Ndrepepa G, et al. Modes of initiation of paroxysmal atrial fibrillation from analysis of spontaneously occurring episodes using a 12-lead Holter monitoring system. Am J Cardiol 2001;88:853–857.
6. Moe GK, Rheinboldt WC, Abildskov JA. A computer model of atrial fibrillation. Am Heart J 1964;67:200–220.
7. Lee S, Khrestian CM, Sahadevan J, Waldo AL. Reconsidering the multiple wavelet hypothesis of atrial fibrillation. Heart Rhythm 2020;17:1976–1983.
8. Bagnato G, Imbalzano E, Aragona CO, Iet al. New-Onset Atrial Fibrillation and Early Mortality Rate in COVID-19 Patients: Association with IL-6 Serum Levels and Respiratory Distress. Medicina (Kaunas) 2022;58:530.