

# Impact of photoplethysmography on therapeutic decisions in atrial fibrillation

Miłosz Starczyński<sup>1</sup>, Bartosz Krzowski<sup>1</sup>, Monika Gawałko<sup>2,3</sup>, Dominik Linz<sup>3-6</sup>, Piotr Łodziński<sup>1</sup>

<sup>1</sup>1<sup>st</sup> Department of Cardiology, Medical University of Warsaw, Warszawa, Poland

<sup>2</sup>Institute of Pharmacology, West German Heart and Vascular Center, University Duisburg-Essen, Germany

<sup>3</sup>Department of Cardiology, Maastricht University Medical Center, Cardiovascular Research Institute Maastricht, Maastricht, The Netherlands

<sup>4</sup>Department of Cardiology, Radboud University Medical Center, Nijmegen, The Netherlands

<sup>5</sup>Faculty of Health and Medical Sciences, Department of Biomedical Sciences, University of Copenhagen, Copenhagen, Denmark

<sup>6</sup>Centre for Heart Rhythm Disorders, University of Adelaide, Adelaide, Australia

## Correspondence to:

Bartosz Krzowski, MD,  
1<sup>st</sup> Chair and Department of  
Cardiology,  
Medical University of  
Warsaw,  
Banacha 1A,  
02-097 Warszawa, Poland,  
phone: +48 22 599 29 58,  
email:  
bartekkrzowski@gmail.com  
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In the era of the SARS-CoV-2 pandemic, the global health crisis required limiting face-to-face patient consultations. This situation demanded rapid identification and implementation of remote healthcare delivery methods.

A 42-year-old man with a 4-year history of paroxysmal palpitations (European Heart Rhythm Association IIb) and a documented first episode of atrial fibrillation (AF) a year before was admitted to the department for catheter ablation. He had a history of stable ischemic heart disease, hypertension, and hyperlipidemia. The pulmonary vein isolation procedure was performed with a CARTO 3D mapping system and NaviStar Smart SF catheter (Biosense Webster, Irvine, CA, USA). The left atrium and pulmonary veins were mapped with PentaRay multielectrode catheter (Biosense Webster) and merged with 3D reconstruction from rotational angiography. At the end of the procedure, sinus rhythm was documented, and the patient was discharged from the hospital in good condition without any periprocedural complications. Three months after the discharge, and therefore after the blanking period, the patient was included in a novel pan-European project TeleCheck-AF, designed to facilitate remote management of patients with AF [1, 2]. Participation consisted of measuring heart rate, rhythm, and symptoms using the FibriCheck mobile app on-demand at scheduled time points after AF ablation procedures. The FibriCheck app uses a photoplethysmography (PPG) technique through the camera built into a smartphone. Measurements are made by placing a finger over the camera for 1 minute.

Our patient was instructed to perform rate and rhythm measurements 3 times a day

and in case of symptoms for one week. The PPG recordings were instantly transferred to a secured cloud, which was then evaluated by an attending physician and further discussed with the patient during a teleconsultation [3]. The PPG recordings indicated a recurrence of AF, and nearly half of the measurements were accompanied by palpitations (Figure 1), which was confirmed during a physical examination. Due to these measurements, the patient was scheduled for another re-do catheter ablation procedure qualification. The patient had standard electrocardiogram, ECHO, and Holter electrocardiogram before making a decision. The re-do procedure included the left atrial roof and cavotricuspid isthmus ablation. There were no periprocedural complications.

Many mobile apps and wearable devices used to control cardiac arrhythmias are currently available. Many studies have shown high sensitivity and specificity of PPG-based apps ranging between 91.5%–98.5% and 91.4%–100% compared to an electrocardiogram. Despite these optimistic values, they should be treated with caution because of the small populations studied and a possible bias due to signal selection [4]. The FibriCheck was established to have a sensitivity of 95.6% and a specificity of 96.6% in a diagnostic accuracy study [5]. Regular monitoring of heart rhythm increases the chances of detecting a recurrence of AF after an AF ablation procedure; it supports an informed treatment decision and ultimately reduces symptoms in our patients.

This case highlights the feasibility of PPG applications in monitoring patients after ablation and shows how the results can be used to guide further therapeutic decisions. Further



**Figure 1.** Photoplethysmography signal during **A.** normal sinus rhythm and **B.** during atrial fibrillation with concomitant palpitations

study is warranted to investigate if the PPG technology can be used as routine rhythm monitoring for the follow-up after AF ablation.

### Article information

**Conflict of interest:** None declared.

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### REFERENCES

1. Pluymaekers NA, Hermans ANL, van der Velden RMJ, et al. Implementation of an on-demand app-based heart rate and rhythm monitoring infrastructure for the management of atrial fibrillation through teleconsultation: *TeleCheck-AF.* *Europace.* 2021; 23(3): 345–352, doi: 10.1093/europace/eaab201, indexed in Pubmed: 32887994.
2. Gawałko M, Duncker D, Manninger M, et al. TeleCheck-AF investigators. The European TeleCheck-AF project on remote app-based management of atrial fibrillation during the COVID-19 pandemic: centre and patient experiences. *Europace.* 2021; 23(7): 1003–1015, doi: 10.1093/europace/eaab050, indexed in Pubmed: 33822029.
3. Linz D, Pluymaekers NA, Hendriks JM. TeleCheck-AF for COVID-19. *Eur Heart J.* 2020; 41(21): 1954–1955, doi: 10.1093/eurheartj/ehaa404, indexed in Pubmed: 32379309.
4. 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): The Task Force for the diagnosis and management of atrial fibrillation of the European Society of Cardiology (ESC) Developed with the special contribution of the European Heart Rhythm Association (EHRA) of the ESC. *Eur Heart J.* 2020; 42(5): 373–498, doi: 10.1093/eurheartj/ehaa612, indexed in Pubmed: 32860505.
5. Proesmans T, Mortelmans C, Van Haelst R, et al. Mobile phone-based use of the photoplethysmography technique to detect atrial fibrillation in primary care: diagnostic accuracy study of the fibricheck app. *JMIR Mhealth Uhealth.* 2019; 7(3): e12284, doi: 10.2196/12284, indexed in Pubmed: 30916656.