IJC Heart & Vasculature 29 (2020) 100609

Contents lists available at ScienceDirect

IJC Heart & Vasculature

journal homepage: www.journals.elsevier.com/ijc-heart-and-vasculature

Editorial

Recurrence of atrial fibrillation following non-cardiac surgery or acute illness: A common but rarely detected complication

One-third of patients with atrial fibrillation (AF) is diagnosed during a secondary precipitant, e.g. surgery, infection, acute pulmonary disease, alcohol consumption, or myocardial infarction [1]. Stressors promoted by these conditions such as inflammation, oxidative stress, and sympathetic activation may initiate AF in a vulnerable (but until then sub-clinical) substrate (Fig. 1) [2,3]. For example, the incidence of AF is 5–10% in patients undergoing vascular or large colorectal surgery, 10–30% after larger lung resections or esophagogastrectomy, and up to 40% after cardiac surgery [2,4]. Several clinical trials and meta-analyses have studied different drugs for the prevention of AF after cardiac and non-cardiac thoracic surgery, including beta-blockers, antiarrhythmic drugs and colchicine. Although there is evidence for a protective effect in some studies, post-operative AF remains common and further research is needed to optimize the prophylaxis of secondary AF [2,5]. Recommendations in clinical practice guidelines regarding new-onset AF under these circumstances are still incomplete, likely because recurrences of secondary AF are rarely detected [6,7]. Although transient AF events, secondary to surgery or acute medical disease that revert before discharge have traditionally been considered benign, more recent evidence has associated secondary AF with increased risks of mortality, stroke, and AF recurrence [1,8,9]. Moreover, the same clinical risk factors that contribute to the vulnerable substrate for AF and that may play a role in the development of the secondary precipitant will likely also increase the risk for stroke, e.g., reflected by increased CHA_2-DS_2-VASc score [10]. In agreement, some evidence suggests that patients with new AF-onset after non-cardiac surgery benefit from anticoagulation therapy, reducing the risk of thromboembolic events [11]. Thus, the detection of recurrent AF may result in an indication for anticoagulation and appropriate treatment may improve clinical outcomes (Fig. 1).

Although common, secondary AF has been challenging to study because patients are often not treated in cardiology departments and were frequently excluded from previous studies [1]. Moreover, the identification of both secondary AF and AF recurrences often relies on symptoms. These symptoms usually include palpitations, dyspnea, chest pain, exercise intolerance, or dizziness, which are also common complaints due to the secondary precipitants themselves [12]. Moreover, one-third of AF patients are asymptomatic, further complicating AF detection [12,13]. Consequently, secondary AF and its recurrence rates have likely been underestimated. Recent technological developments have enabled new strategies for self-monitoring of AF at home [14–16]. These developments create opportunities for early detection of recurrent AF in patients with transitory AF events during acute illness or following non-cardiac surgery, enabling subsequent initiation of anticoagulation and other therapies.

In this issue of the *International Journal of Cardiology Heart & Vasculature*, Lowres et al. [17] investigated the feasibility of self-monitoring for AF recurrence in patients with secondary AF. This highly interesting and relevant prospective pilot study recruited patients with new-onset AF due to non-cardiac surgery or non-cardiovascular acute medical disease that required hospitalization from three different tertiary hospitals in Australia. Identification of new-onset AF was done by a research nurse one or three times a week, or by cardiology registrars, depending on the hospital. Patients without a history of AF and who reverted to sinus rhythm before discharge were included in the study and used a handheld single-lead ECG device for self-monitoring of AF recurrence 3 times per day for 4 weeks. Willingness to participate in the project, compliance with the intervention, and AF recurrence were the primary outcomes.

After 13 months of recruitment, 224 patients with secondary AF were identified out of 16,454 patients screened. Only 29 of the 94 eligible patients were in the end enrolled in the study, 16 of whom completed the 4 weeks of self-monitoring. AF recurrence was identified in 10 out of 29 patients (34%), mostly in the first 9 days after discharge, even though 11 out of 29 patients (38%) were on rhythm-control drugs (including 3 of the 10 patients showing a recurrence). Only 50% of patients with recurrent AF reported symptoms. These data, although based on a small, highly-selected cohort, provide important information: although identifying patients with transient new-onset AF and equipping them with self-monitoring tools is challenging, their AF recurrence rate is substantial. Identifying patients with secondary AF after non-cardiac surgery is challenging as these patients are typically neither monitored nor seen by cardiovascular specialists. Even in intensive care units where there is continuous ECG monitoring of patients, new-onset AF recognition and documentation as clinical AF can be as low as 16% [18]. In this pilot study, a non-systematic evaluation was performed to recruit patients, therefore likely relying extensively on symptomatic patients. As such, it is probable that a significant number of new-onset AF patients were not recognized. Consequently, the improvement of strategies for detecting secondary AF before discharge is essential to optimize the efficiency of this approach. In addition, a large number of eligible patients with secondary AF were already discharged or transferred before

https://doi.org/10.1016/j.ijcha.2020.100609

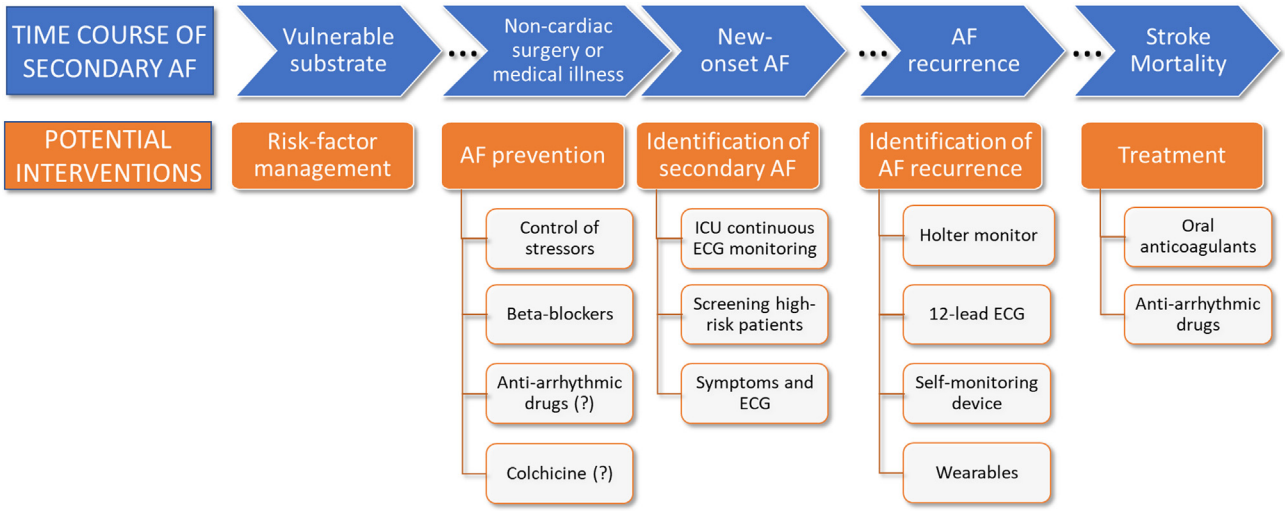

Fig. 1. Time course of secondary AF. In a vulnerable substrate, non-cardiac surgery or acute medical illness can activate triggers that initiate new-onset AF. Subsequent AF recurrences are common and associated with adverse outcomes. Potential interventions, including the identification of AF recurrence, enabling early initiation of oral anticoagulation, are shown in orange.

they could be included in the study (40 of 94 patients), indicating the potential challenges involved in initiating self-monitoring for cardiac conditions in patients located outside of the control of the cardiology department. Future research is needed to determine how representative the present cohort is for the total population of patients with secondary AF. On the other hand, 60% of patients with recurrent AF in the present study had a potential indication for oral anticoagulation with a CHA_2DS_2-VA score ≥ 2, suggesting that this challenging task may have important clinical consequences.

From the 29 initial patients, only 16 completed 4 weeks of self-monitoring and answered semi-structured interviews after the end of the observation period. They reported that the device was easy to use, "reassuring" and gave them a "sense of control". Two patients that withdrew before one week of observation stated that they disliked pop-up advertisements, notifications and app update requests in the device. Conducting more detailed interviews in patients that fail to complete could reveal possible improvement opportunities in the protocol to facilitate compliance. Besides, conditions in elderly patients such as dementia or essential tremor may hinder the application of this method in this particularly vulnerable population, unless they have enough social support. Thus, it is important to collect information about social support and comorbidities that could potentially prevent the patient from using the device. On the other hand, technological improvements (e.g., based on wearables) will eventually allow patients to use self-monitoring devices with minimal effort. Similarly, such advances will increase the sensitivity and specificity for detecting AF, which at present remain suboptimal for some detection methods [15]. Until then, a better understanding of paroxysmal AF patterns could provide useful information to optimize the self-monitoring protocol in each patient. For example, Wineinger et al. identified two distinct patterns in paroxysmal AF with different frequencies and durations of the AF events [19]. Patients with more frequent and shorter events may be better detected using continuous monitoring (e.g., using Holters or wearables), whereas patients with less-frequent and longer events are more likely to be identified using the protocol proposed in this study.

Taken together, the work by Lowres et al. [17] supports the notion that AF recurrence in patients with secondary AF in the setting of non-cardiac surgery or acute illness is common and has potentially important clinical consequences. At present, identifying patients with AF recurrence that would benefit from additional treatment remains challenging due to the difficulties of 1) identifying the initial episode of secondary AF in patients that are not seen by cardiologists and 2) establishing the prerequisites for self-monitoring before a patient is discharged. At the same time, the self-monitoring process itself is becoming easier due to the development of more user-friendly monitoring devices. Future studies are needed to demonstrate whether it is worthwhile to overcome these challenges and embrace technological advances to enable early initiation of appropriate therapies in patients with recurrent AF.

Funding

The authors are supported by National Institutes of Health (R01-HL131517, R01-HL136389, and R01-HL089598, to DD) and German Research Foundation (DFG, Do 769/4–1, to DD).

CRediT authorship contribution statement

Cristian Barrios Espinosa: Conceptualization, Visualization, Writing - original draft. **Martin E.W. Hemels:** Writing - review & editing. **Dobromir Dobrev:** Writing - review & editing. **Jordi Heijman:** Conceptualization, Supervision, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Received 18 July 2020
Received in revised form 29 July 2020
Accepted 1 August 2020

Available online 6 August 2020

[1] This author takes responsibility for all aspects of the reliability and freedom from bias of the data presented and their discussed interpretation.