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Editorial

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Can Current Subclinical Atrial Fibrillation Be Verified by P Wave of 12-Lead ECG at Present? The Answer Already Exists in the Atrial Substrate

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There are situations in which it is important to "predict and timely diagnose" atrial fibrillation (AF) since AF is often subclinical and causes problem that could have been avoided. Typical cases are heart failure (HF) and ischemic stroke. When HF is accompanied by AF, its prognosis is worse than those without AF,[1] and AF related strokes are more frequently disabling and likely to recur.[2]

Currently, clinical AF diagnosis can be made only after both components of AF, mature substrate and trigger, meet together at the same time and electrocardiographic (ECG) documentation of AF.[3] But subclinical AF stays in sinus rhythm for a long time and even when AF occurs, clinical symptoms are often not obvious and making its timely diagnosis difficult. Various screening methods, systematic screening over a certain age or opportunistic screening in a specific population, have been tried, but only limited improvements have been shown in terms of diagnostic yields because of the huge temporal variations of AF.[4] In order to find a definite answer to this clinically difficult questions, continuous ECG recording over a long period has been considered the only answer.[5] Recently, implantable loop recorder (ILR), enabled us long-term continuous ECG monitoring for up to several years. As clinical experiences with ILR increases, new problems were identified. For example, if subclinical AF was suspected as the cause of embolic stroke of uncertain source (ESUS) and AF is documented after several years of tireless follow-up with an ILR, the causal relationship between the index stroke event in the past and the currently documented AF at present should be carefully verified. In such a complex situation, clinically important clues can be found in the atrial electrical remodeling within the 12-lead ECG at the time of the index event, which can help determine whether there is a closer relationship between the two or not.[6] The degree of atrial electrical remodeling can be quantified through the duration of P wave, but P wave in 12-lead ECG was not widely used because its beginning and end were unclear especially in patients with substantial atrial remodeling. Alternatively, prolonged P wave duration measured by signal averaged ECG demonstrated significant predictive value in patients with ESUS.[7]

Similarly, it is important to predict AF in HF patients who are planning cardiac resynchronization therapy (CRT) or implantable cardioverter defibrillator (ICD). Since AF is not only very common in HF patients, but also AF increases in proportion to the HF severity,[8] even in currently subclinical AF, clinical AF detection shortly after device implantation in HF patients who require device therapies is not uncommon. Especially in the cases of CRT, the response to therapy can vary greatly depending on the presence or absence of AF, therefore the accompanying AF can be sought and confirmed through Holter ECG for a short period of time before planning it, but this is not always sufficient. However, treatment such as CRT, which is important in the HF treatment, cannot be delayed or even tried because of potential AF. HF is progressive but if it is timely managed in a reversible stage, the risk of future AF can be reduced and better HF treatment results can be expected. Thus, trying to find subclinical AF by delaying treatment for a long time does not fit in a clinical context. Efforts to quantitatively assess the atrial substrate for AF and to stratify the possibility of accompanying AF in the current state is necessary.

In the current issue, Pay et al.[9] demonstrated the efficacy of ECG risk score for AF by assessing P wave morphology, voltage, and duration in HF patients with reduced ejection fraction and ICD. Although it is a retrospective single-institutional study, ECG waveform changes suggestive of atrial remodeling in HF patients were comprehensively and quantitatively estimated and its clinical usefulness was verified and proved a correlation by prolonged continuous ECG recording by ICD and subsequent AF diagnosis.

Atrial substrate at present does not imply subclinical AF at present, but sufficiently mature atrial substrate is *sine qua non* of AF. It is a good attempt to objectively and quantitatively analyse the ECG for a future AF diagnosis with 12-lead ECG at present. Furthermore, it is expected that additional information to distinguish subclinical AF at present without clinically confirmed diagnosis from AF that does not currently exist but develope *de novo* and diagnosed in the course of long-term follow-up through ILR tracking. It is still difficult to find a clinically relevant answer because it overlaps with the extended area of atrial cardiopathy, but more specific and clinically relevant investigation differentiating the two classifications may become possible soon.

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