Remote monitoring and the twin epidemics of atrial fibrillation and chronic heart failure

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Atrial fibrillation and heart failure are two epidemic pathological states that may affect the patient either alone or together.1 The incidence and prevalence of both of these increases exponentially day by day since both are synergistic to one another. Thus, it is very frequent to observe paroxysmal, persistent, or permanent atrial fibrillation causing heart failure because of associated high ventricular rates sustained for very long periods and/or because of the loss of atrial contribution to cardiac output, which may be particularly important in patients with structural heart diseases. Conversely, more and more heart failure patients change their rhythm from sinus to atrial fibrillation, in any one of its different types, i.e. paroxysmal, persistent, or even permanent. Electrical transthoracic cardioversion and/or catheter ablation are frequently needed to restore sinus rhythm in patients with or without heart failure together with antiarrhythmic drug therapy and full anticoagulation to prevent arrhythmia recurrence and systemic embolism, respectively. Similarly, heart failure treatment is frequently necessary in many atrial fibrillation patients.

The ideal targets for any therapeutic strategy probably are prevention of atrial fibrillation recurrences, systemic embolism, acute decompensation of heart failure, and emergency rehospitalization. Although this presents a major challenge, during the last 10 years it has become very clear that implanted devices (pacemakers and defibrillators) which continuously monitor heart rhythm and some physical parameters to prevent heart failure (e.g. fluid accumulation in the chest, reduction in physical activity, etc.) may be very useful. These devices may have interventional therapies, e.g. antitachycardia atrial pacing may be automatically activated for paroxysmal atrial tachyarrhythmias (atrial tachycardia, atrial flutter) to restore sinus rhythm, thus preventing their degeneration into atrial fibrillation. In a few instances, 50 Hz burst pacing may be able to abolish very fast atrial tachyarrhythmias. Furthermore, monitoring of daily burden of atrial fibrillation by implanted devices may facilitate a prompt change in pharmacological antiarrhythmic therapy and prevent progression to persistent atrial fibrillation.2 Finally, the establishment of a persistent atrial fibrillation in an asymptomatic patient may be recorded by the device and may alert the patient and the implanting centre. On the other side, the alarm for haemodynamic deterioration or fluid accumulation in the chest by an implanted defibrillator, may alert the patient and allow the doctor to increase the diuretic regimen or the complete pharmacological therapy, if needed, preventing, in many instances, acute pulmonary oedema and emergency rehospitalization.3–5

All these automatic systems that record intra- and/or extracardiac data, integrated into most modern implantable devices, may reach their highest level of utility and efficacy if patients or their doctors could be advised as soon as possible if any abrupt changes occurring in the trends of the continuously collected data observed.6 For these reasons remote monitoring of implanted devices, which at its outset was envisioned only as a mechanism to monitor the device performance, has become today an invaluable tool to follow the clinical condition of the patient and to allow the doctors to modify their therapeutic strategy accordingly. As clearly appears from Ricci’s report,7 in this issue, early detection of atrial fibrillation by remote monitoring allows a significant reduction of the time between the start of the arrhythmia and its detection by the implanting centre, thus enabling immediate reaction (cardioversion, anticoagulation, etc.). Again Ricci et al. showed a potential reduction of the risk of the stroke resulting from early AF detection ranging from 9 to 18% in 2 years, compared with the group of patients controlled in the hospital with a conventional inter-visit interval of 6–12 months. In patients with heart failure treated by cardiac resynchronization therapy devices, the presence of sinus rhythm was associated with reduction in the composite endpoint of death and hospitalization for heart failure compared with atrial fibrillation.8

The ability to monitor heart rhythm and prolong periods of sinus rhythm as much as possible with remote monitoring should probably...
reduce also the recurrences of heart failure episodes. However, there is currently little clinical experience reported in the present literature to support this potential relationship and therefore awaits rigorous prospective study. In fact, while the idea of monitoring fluid accumulation in the chest appears very intriguing and potentially useful in the prevention of acute pulmonary oedema and emergency rehospitalization, the various parameters available with device monitoring (Optivol index, daily physical activity, night/day heart rate, etc.) have not shown clinical efficacy in the patient populations studied. Furthermore, in several instances, false-positive detection created significant anxiety among patients (and possible harm) and overwork in the control centre. In some patients, the algorithm was finally switched off. Certainly new clinical parameters under current investigation, together with a combined analysis of all of them, will very probably allow us in the near future to have a more specific detection ability for developing heart failure episodes.

In conclusion, remote monitoring of implanted devices should be considered today a gold standard for all cardiovascular implantable electronic device patients and particularly for those affected by atrial fibrillation and heart failure either in isolation or combined. Future clinical studies will allow us to better evaluate both the efficacy of this strategy and cost–benefit ratio of remote management of both these pathological conditions and guide industrial research towards new clinical and electrical parameters and therapeutic algorithms.

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**References**