

Echocardiography as a guidance in CRT management: the GPS system in a labyrinth?

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Abstract Although progress has been made to understand the factors for non-responsiveness, fine tuning and comprehensive strategies are needed to make echocardiography the GPS system in cardiac resynchronization. Taking the wrong turn in the labyrinth of dyssynchrony is expensive and time consuming without improving well being of the heart failure patient. Possibly other imaging techniques could help in fine tuning cardiac resynchronization.

Keywords Cardiac resynchronisation · Heart failure · Cardiac imaging · Echocardiography

Congestive heart failure remains an increasing health problem. This despite advances in medical treatment with antagonist of neurohumoral pathways and after-load reducing agents [1]. Therefore, alternative treatment strategies are more than welcome in these patients. From animal experiments and patients with eccentric activation of the heart we know, that

electromechanical dyssynchrony may result in pathological remodelling and ultimately heart failure [2–4]. Several groups have shown that eccentric septal mechanical activation by pacemakers or Wolf Parkinson White syndrome may provoke left ventricular dyssynchrony and left ventricular dysfunction. It has also been shown, that restoring ventricular synchronization by left ventricular or biventricular pacing in heart failure patients with left bundle-branch block acutely enhances systolic function while modestly lowering energy cost [5, 6]. After the pioneering work of Cazeau et al. [6] cardiac resynchronization therapy (CRT) has been proven to give clinical improvement in severe heart failure. Later biventricular pacing has been shown to cause reverse remodelling, increase functional capacity, decrease mortality and hospital readmissions for heart failure and therefore CRT has become a class I (level of evidence A) indication for treatment of heart failure in American and European guidelines [7–9]. This for those patients with an left ventricular ejection fraction $\leq 35\%$, a QRS ≥ 120 ms, who remain symptomatic (NYHA class III-IV) despite optimal treatment [10, 11]. Unfortunately selection of patients with electrocardiographic criteria alone identifies only 70% of responders to therapy [12]. This seems dramatically low, but is equal to or even a better response to therapy than traditional medical heart failure therapy [13]. However, due to the high costs of resynchronization therapy echocardiographic criteria were developed to select patients. Multiple echocardiographic criteria have been proposed, with no

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consensus as to which parameter better predicts CRT response. In the current issue of the International Journal of Cardiac Imaging Pavlopoulos and Nihoyannopoulos give a comprehensive review of selection criteria used to select patients for cardiac resynchronisation therapy [14]. Unfortunately there is still a lack of consensus for standard criteria, that should be selected to define non-responders [15, 16]. Patients who are defined as non responder with echocardiographic criteria may have less symptoms clinically [13]. Additionally, symptomatic improvement does not indicate a better prognosis. The authors summarize some factors for non-response such as suboptimal location of the pacing lead, the presence of scarring in the region of the left ventricular lead placement, suboptimal A-V and /or VV optimisation, unsuitable coronary venous system for appropriate lead implantation, suboptimal medical therapy, lead dislodgement and ischemic heart disease [14]. Although progress has been made to understand the factors for non-responsiveness, fine tuning and comprehensive strategies are needed to make echocardiography the GPS system in cardiac resynchronization. Taking the wrong turn in the labyrinth of dyssynchrony is expensive and time consuming without improving well being of the heart failure patient. Possibly other imaging techniques could help in fine tuning cardiac resynchronization [17].

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