

CARDIAC RESYNCHRONIZATION THERAPY (CRT): A NEW PACING THERAPY FOR CHRONIC HEART FAILURE

Ammar Al-Hamdi *FRCP*

It has almost become a cliché to say that chronic heart failure (CHF) is a major health problem all over the world^[1]. It constitutes 1-3% of the population and 10% in the elderly, and about 5% of all medical admissions^[1].

CHF combines a high prevalence with a terrible burden of symptoms and morbidity, all of these contributing to a huge societal and health care costs^[1,2]. To compound the problem, patients with CHF live only a short time, though CHF predominantly afflicts the elderly, it is still a cause of significant premature loss of life and affecting children, young and middle age group^[3].

Cardiac fibrosis has been proposed to alter cardiac performance, namely diastolic function, in fact accumulation of collagen fibers within the myocardium is mainly responsible for an increase in intrinsic myocardial stiffness that may alter left ventricular diastolic properties and the pattern of left ventricular filling.

In addition, fibrosis may affect the conduction system of the heart including left bundle branch block (LBBB) or right bundle branch block (RBBB) and AV conduction delay, which cause biventricular dyssynchrony^[4].

Cardiac contraction normally occurs in a spatially and temporally uniform manner, so that all portions of the wall contract

synchronously. Biventricular dyssynchrony, which occurs in CHF with intraventricular conduction delay especially in LBBB, is disadvantageous to the heart causing:

1. Inefficient ejection.
2. Abnormal regional loading which alters function and arrhythmogenicity
3. Abnormal mitral valve function causing mitral regurgitation^[4].

Resynchronization by means of left or biventricular pacing has been found to improve the timing of regional contraction, enhance chamber systolic function and reduces mitral regurgitation with end result of 40% increase in cardiac output^[5].

Biventricular pacing allows significant hemodynamic improvement in most patients with chronic CHF and intraventricular conduction delay, especially LBBB. Growing experiments indicate that the pacing site and the optimization of atrioventricular / intraventricular delay (PR interval optimization) seem to be crucial to obtain short and long term improvement of LV function^[5].

Cardiac resynchronization therapy (CRT) has been recently proposed as a supplementary treatment of drug refractory CHF^[6].

This new therapy aims to improve quality of life and exercise capacity in patients selected as the basis of a dilated cardiomyopathy and cardiac asynchrony. In this particular heart failure population,

Professor of Cardiology, Dept. Medicine,
College of Medicine, Al-Nahrain University
E-mail: amar_alhamdi@hotmail.com

the expected benefits depend on careful placement of the pacing leads, particularly that responsible for left ventricular (LV) pacing.

In practice, the optimal LV lead placement associated with the best hemodynamic improvement is of ten varies from one patient to another due to the variable coronary sinus anatomy.

The LV lead is placed in the lateral vein of the LV. Prior to the implant, echocardiography and more precisely tissue Doppler imaging investigations, may be helpful to identify the ideal LV pacing site, based on the late activated segmental contraction, which in most of the cases turns out to be the midlateral wall^[5,7].

Complications observed during LV lead implantation remain low, consisting mainly of phrenic nerve stimulation and coronary sinus perforation in < 1% and should further decrease with the use of new instrumentation dedicated to the procedure^[5].

Three randomized trials (PATH-CHF^[5], MUSTIC and MIRACLE) have reported similar short, mid and long-term improvement of functional class, exercise capacity and quality of life of patients with CHF chronically paced with CRT.

The significant symptomatic benefits have also been confirmed a large European registry, the COTAK registry, including more than 1000 patients followed up to 6 months after CRT^[5].

The indications for CRT are:

1. Advanced heart failure (NYHA class III-IV).
2. Right BBB or left BBB
3. Low ejection fraction with or without mitral regurgitation refractory to medical therapy.

In the Cardiology Unit, Al-Kadhimiya Teaching Hospital CRT is available now moreover, we have implicated 30 CRT

over the last 12 months. The results up till now are encouraging; more patients are waiting for implantation of the device.

References

1. Petrie, M., and McMurray, J.: Changes in nations about heart failure. *Lancet*, 2001; 358: 432-4.
2. Berry, C., Murdoch, D.R., and Murray, J.J.: Economics of chronic heart failure. *Eur J Heart Fail*, 2001; 3: 283-91.
3. Machntyre, K., Capiwell, S., Stewart, S., Chalmers, J.C.V., et al.: Evidence for improving prognosis in heart failure, trends in case fatality in 66,547 patients hospitalized between 1986-1995. *Circulation*, 2000; 102: 1126-31.
4. Kass, D.A.: Dys-synchrony, segmental kinetics and vavular incompetence. VII European Scientific Symposium, Lisbon, Portugal, October 26-27, 2001; p.p. 36.
5. Tavazzi, L.: Ventricular pacing: a promising new therapeutic strategy in heart failure, for whom? *Eur Heart J*, 2000; 21: 1211-4.
6. Farweel, D., Patel, N.R., Hall, A., et al.: How many people with heart failure are appropriate for biventricular resynchronization? *Eur Heart J*, 2000; 21 (15): 1246-50.
7. Stellbrile, A.A.: The pacing therapies for congestive heart failure (PATH-CHF) study rational, design and endpoints of a proposed randomized multicenter study. *Am J cardiol*, 1999; 83 (suppl. 5B): 130D-5D.