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ArrhythmiaNEWS

From the Arrhythmia Service of St. Luke's-Roosevelt Hospital Center

Arrhythmia News is a physician bulletin providing arrhythmia updates and information on services at **St. Luke's-Roosevelt Hospital Center** which may benefit your practice and your patients.

Narrow QRS and Ventricular Dyssynchrony in Heart Failure

Cardiac resynchronization therapy (CRT) has become a mainstay in the treatment of symptomatic heart failure. Multiple clinical trials have demonstrated the benefit of CRT, highlighting its capability in reducing the symptoms of heart failure, improving exercise capacity, reducing likelihood for hospitalization and improving quality of life. In general, patients have about **one heart failure class improvement** after implementation of CRT.

More recently, CRT has been demonstrated to reduce the high mortality rates faced by patients with advanced heart failure. When the CRT device is combined with the defibrillator (CRT-D), **total mortality is reduced by approximately 36%**. A recent European study (CARE-HF) demonstrated, quite remarkably, that CRT alone reduces heart failure mortality independent of the defibrillator component.

In addition, and probably responsible for the overall improvement in heart failure outcome, CRT induces reverse remodeling. Over time, ventricular dimensions shrink, left ventricular systolic performance improves, diastolic filling increases and severity of mitral regurgitation is diminished.

The current accepted indications for CRT therapy include a QRS duration in excess of 120 ms, and class III or IV heart failure symptoms despite optimal medical therapy (beta blocker, ace inhibitor, diuretic, digoxin and spironalactone) in the setting of severe left ventricular dysfunction with an ejection fraction ≤35%. Both non-ischemic and ischemic cardiomyopathy patients appear to benefit.

Ventricular Dyssynchrony A Common Factor in Patients Needing CRT Therapy

CRT was developed to address the myocardial functional abnormalities that were observed to result from left bundle branch block. Similar abnormalities may be seen with non-specific IVCD and some cases of right bundle branch block. As a whole, it has been observed that these patients experience **ventricular dyssynchrony**, i.e. a temporal dispersion of myocardial contractility. Typically, the lateral wall contracts much later then the septal wall creating inefficient and diminished cardiac performance. The vast majority of patients with bundle branch block can be observed to have ventricular dyssynchrony.

More recent data suggests that patients with a narrow QRS can have **similar abnormalities of ventricular dyssynchrony** that are observed in patients with a wide QRS. The ability to detect these myocardial functional abnormalities is facilitated by sophisticated echocardiographic analysis using tissue Doppler imaging (TDI). Briefly, segmental myocardial motion is quantified using Doppler velocity principles. This can result in a temporal description of myocardial segment movement relative to one another, and can be displayed quantitatively or graphically.

A number of measurements and indices have been proposed, and it is not clear which is the ideal technique at the present time. However, it has become clear that this is a far superior way to identify mechanical dyssynchrony than any prior technique available in the clinical arena. Tagged MRI and nuclear scans are capable of providing similar information, but are less practical.

Electrical Dyssynchrony Differs From Mechanical

About 75% of patients with bundle branch block will have ventricular dyssynchrony identifiable using tissue Doppler techniques. Interestingly, about 25% of patients **do not** have significant dyssynchrony. In part, this may explain why not all patients respond to CRT. It also leads one to conclude that electrical dyssynchrony

is not identical to mechanical dysynchrony and thus specific techniques must be used to identify the latter.

An even more startling observation has been the fact that heart failure patients with a narrow QRS (<120 milliseconds) can also have ventricular dyssynchrony in the absence of electrical conduction delay. From published results, about 25% of such patients will have a similar degree of mechanical dyssynchrony as patients with bundle branch block. Normal subjects, i.e. with a narrow QRS in the absence of LV dysfunction and heart failure do not exhibit ventricular dyssynchrony. Thus, **mechanical dyssynchrony is a specific and identifiable characteristic** of the heart failure condition.

The aforementioned observations beg the question about whether narrow QRS patients who have ventricular dyssynchrony would benefit from CRT. Very limited acute hemodynamic data suggests that this indeed may be the case but there are no large scale clinical trials and no long-term follow-up.

The Arrhythmia Service is beginning to conduct a clinical investigation to determine whether CRT benefits patients with narrow QRS, heart failure and ventricular dyssynchrony. Eligible patients are those with class III or IV heart failure, QRS duration <120 ms, LVEF≤35%, and specific criteria related to ventricular dyssynchrony defined by tissue Doppler imaging.

Please call our Service if you would like to refer a patient.

References:

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