电气重同步化治疗失败的右心室

To the Editor:

Dubin et al recently published their experience with electrical resynchronization of the failing right ventricle (RV) in patients with congenital heart disease (CHD) (6 of 7 with tetralogy of Fallot). The authors used temporary atrioventricular (AV) sequential pacing from 3 RV sites with a paced AV delay set to 90% of the spontaneous PR interval to alleviate the consequences of right bundle branch block (RBBB) on RV electromechanical synchrony. They showed significant increase in cardiac index and maximum RV +dP/dt. No specification was given concerning the RV pacing sites (apex, outflow tract, or septum) that led to the best result. The authors concluded that patients with RV failure and electromechanical dyssynchrony could potentially be treated by electrical resynchronization.

This is not an entirely new concept. In an article published by our group, RV resynchronization by a similar method was used successfully to treat acute RV failure in patients with RBBB after surgical repair of CHD (tetralogy of Fallot in 4 of 7). Effect was documented by significant increase in arterial systolic and pulse pressure in all patients followed by immediate clinical improvement. It was concluded that RV resynchronization may be used as an adjunct to the treatment of low cardiac output after surgery for CHD.

Two problems should be mentioned. Atrial synchronous RV fusion pacing does not allow for AV delay optimization in patients with prolonged AV conduction, as premature RV pacing would induce left ventricular dyssynchrony and potentially offset positive effects of RV resynchronization. The choice of optimal RV pacing site has not yet been clarified. The inflow part of the RV free wall was chosen in our study and should be close to the region of latest RV activation in patients with isolated proximal RBBB. Distal RV conduction, however, may also be influenced by ventriculotomy, and RV activation sequence may vary among patients.

In conclusion, temporary RV resynchronization seems to be a useful tool for the treatment of acute RV failure. Potential clinical benefit of permanent RV resynchronization is still speculative.

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Response

We thank Dr Janousek for his comments. We studied a different patient group from that included in his study, and we used different methods. Dr Janousek and his group published important early work demonstrating hemodynamic benefit from atrioventricular optimization and right ventricular resynchronization. Their subjects were children (mean age 28 months) with acute heart failure. These subjects were receiving inotropic support after surgical repair of congenital cardiac lesions. They may have had significant left ventricular dysfunction from surgery and cardiopulmonary bypass. The hemodynamic analysis was limited to changes in blood pressure. This is a poor measure of right ventricular performance, and they did not measure cardiac output. Clearly, it is an open question from their study whether the benefit was achieved by altering right ventricular or left ventricular performance, or both, or by changes in ventricular interaction.

In contrast, we evaluated an older group of patients (mean age 23.6 years) with chronic right ventricular (RV) dysfunction. Therefore, this work illuminates a different aspect of RV resynchronization. We directly measured, and demonstrated improvement in, RV performance, as assessed by dP/dt, and cardiac output. No single RV site optimized RV performance for every patient. Rather, the selection of pacing site needed to be individualized. Furthermore, no single RV site produced the narrowest QRS complex for everyone. The narrowest QRS was produced by pacing the RV apex pacing in 3 subjects, the RV septum in 2, and the RV outflow in 2. We agree with Dr Janousek that the role of atrioventricular delay remains indeterminate, and our study does not address this issue.

We disagree with Dr Janousek in one critical area. We believe that our findings demonstrate that RV resynchronization can acutely improve RV performance in selected patients with chronic RV failure. Whether this benefit can be sustained, as it has been for left ventricular resynchronization,2 can only be answered by long-term studies of larger cohorts.

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Electrical Resynchronization of Failing Right Ventricle
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