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Left ventricular septal pacing as a single ventricular lead approach to cardiac resynchronization therapy: acute hemodynamic and electrophysiological effects

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Background/Introduction
Cardiac resynchronization therapy (CRT) usually employs a right (RV) and left ventricular (LV) lead, but proper positioning and fixation of the latter in the coronary sinus may be problematic. In a previous patient study, permanent placement of a LV septal pacing lead by transvenous approach through the interventricular septum proved to be feasible.

Purpose
To investigate non-inferiority of LV septal pacing as compared to conventional biventricular (BiV) pacing with respect to acute hemodynamic and electrophysiological effects in heart failure patients with an indication for CRT.

Methods
In this study, 15 patients undergoing a standard CRT implantation according to current guidelines underwent temporary pacing at various endocardial locations (LV septal pacing being achieved by transarterial approach). Acute hemodynamic response was assessed by LVdP/dtmax, relative to baseline AAI pacing. Electrical dyssynchrony was evaluated using the standard deviation of activation times (SDAT), computed from body surface isochronal maps based on 53-electrode body surface mapping.

Results
LV septal pacing resulted in a significant LV dP/dtmax increase (19.2% ± 11.1%), that was at least as large as the LV dP/dtmax increase during conventional BiV pacing (17.7% ± 7.6%) and significantly larger than that induced by RV septal pacing (figure, left panel). Combined RV and LV septal pacing did not provide an additional increase in LV dP/dtmax. The electrophysiological response of the various pacing sites was comparable to the hemodynamic response (figure, right panel). LV septal pacing resulted in the largest reduction in SDAT, indicating significant electrical resynchronization.

Conclusions
LV septal pacing results in both acute hemodynamic improvement and electrical resynchronization that is at least as large as conventional BiV pacing. These results suggest that LV septal pacing with a single ventricular lead may serve as an alternative for conventional BiV pacing to obtain cardiac resynchronization.
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！Δ LVdP/dt max (%)！

！Δ SDAT (%)！

* P < 0.05 compared to baseline
** P < 0.05 compared to LV septum