Variable left ventricular activation pattern in patients with heart failure and left bundle branch block

J W-H Fung, C-M Yu, G Yip, Y Zhang, H Chan, C-C Kum, J E Sanderson

Objective: To determine the left ventricular (LV) activation pattern in patients with chronic heart failure and left bundle branch block (LBBB) on ECG.

Design: Prospective study.

Setting: Tertiary cardiology referral centre in Hong Kong.

Patients: Seven patients with LV ejection fraction < 35% and typical LBBB on ECG with QRS duration > 130 ms were recruited. Five of them had non-ischaemic dilated cardiomyopathy.

Methods: Non-contact mapping was used to investigate the LV global activation sequences. Tissue Doppler imaging correlated well with non-contact mapping to locate the conduction block and the latest segment of activation.

Conclusions: LV endocardial activation sequences in patients with chronic heart failure and LBBB are variable. This may have implications for patient selection for treatment with cardiac resynchronisation.
DISCUSSION

The current study found that the LV depolarisation sequences in patients with chronic heart failure and LBBB were variable. Left bundle activation was preserved in three non-ischaemic patients despite LBBB. The LV conduction delay may have resulted from either an area of conduction block or slow but homogeneous myocardial propagation. The nature of the conduction block needs to be clarified by future studies. Whether the block was caused by scarred tissue or was functional cannot be determined from the present study.

In those with preserved left bundle activation, prolonged LV activation time was likely caused by slow myocardial electrical propagation but not conduction block in one patient. Both types of conduction delay were present in ischaemic and non-ischaemic heart failure. Moreover, the location of the type II block varied between patients. Anterolateral conduction block was observed in two patients and septal block in two patients. For the latest segment of activation, both posterior and lateral locations were observed in this cohort. These findings also suggested that ECG with LBBB could not predict the LV activation sequences. Whether these findings account for the different response to cardiac resynchronisation requires further investigation.

Detailed information about mechanical asynchrony in patients with heart failure and LBBB has been reported previously. However, information about the LV depolarisation sequences of these patients is lacking. The significance of preserved left bundle activation in these patients is unclear. In two patients with true left bundle blockade, the earliest activation was in apical anterior area rather than directly across the interventricular septum as generally believed. This anomaly may result from subendocardial conduction or other unknown mechanism that could not be detected by non-contact mapping.

The latest LV activation segments were located in either the lateral or posterior regions in this study. This finding is consistent with a study in which TDI was used to assess improved synchronicity after biventricular pacing, which found that systolic motion was latest in the lateral segments. However, in four patients, the latest segments were located in the posterior region. If sustained clinical improvement is related to pre-excitation of the latest segment, lateral placement of the lead may not always be optimal.

In conclusion, the LV endocardial activation sequences in patients with chronic heart failure and LBBB are variable. Left bundle activation was preserved in some patients with LBBB. TDI correlated well with non-contact mapping for locating the latest segment of activation in these patients and may guide the selection of optimal sites for biventricular pacing.

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Images in Cardiology

Neoplastic shock

A 48 year old woman complained of sudden onset of nausea and vomiting followed by paraesthesia of the tongue and face, dyspnoea, and weakness of her limbs. A severe shock syndrome ensued that necessitated mechanical ventilation and vasoressor support. Laboratory values showed a severe lactic acidosis, hyperglycaemia, and myocardial damage. A global myocardial stunning-like picture without regional motion abnormalities was seen on transoesophageal echocardiography. Aggressive vasoressor and volume therapy was maintained. Nevertheless, the overt left ventricular failure persisted and our patient succumbed to electromechanical dissociation.

Autopsy revealed a right sided retroperitoneal bleeding. A haemorrhagically infarcted phaeochromocytoma with characteristic pale brown cut surface and remnants of the adrenal gland eroded the adjacent vasculature (upper panel). Focal myocardial necrosis, diffuse infiltration of inflammatory cells, accumulation of fatty acids, and contraction band necrosis consistent with catecholamine induced myocarditis was detected (lower panel, haematoxylin-sudan staining). Lipolysis and subsequent accumulation of fatty acids in myocardial cells as well as hyperglycaemia are both metabolic consequences of catecholamine excess. Vasocostriction and impaired perfusion may account for tissue hypoxia, lactic acidosis, and organ failure. A high degree of clinical alertness is needed to achieve a timely identification of this tumour that has been called the great mimic because of its protean manifestations.

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Transient abnormal Q waves during exercise electrocardiography

F F M Alameddine, A M Zafari

Myocardial ischaemia during exercise electrocardiography is usually manifested by ST segment depression or elevation. Transient abnormal Q waves are rare, as Q waves indicate an old myocardial infarction. The case of a patient with exercise induced transient abnormal Q waves is reported. The potential mechanisms involved in the development of such an abnormality and its clinical implications are discussed.

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Paradoxical increase of pulmonary vascular resistance during testing of inhaled iloprost

M Emmel, B Keuth, S Schickendantz

The case of a 14 month old girl with primary pulmonary hypertension treated with domiciliary oxygen is described. After invasive evaluation and testing of nitric oxide with very good response, the testing was repeated to study the effect of inhaled iloprost on pulmonary vascular resistance (PVR). An unexpected and severe increase of PVR was observed, rising from 392 dynes·s·cm⁻⁵ with oxygen to a maximum of 1192 dynes·s·cm⁻⁵ with oxygen and iloprost. Underlying ventilatory and technical problems were excluded. While inhaled iloprost has been described to be highly effective in the treatment of primary pulmonary hypertension, the possibility of contrary “paradoxical” reactions in isolated patients is emphasised, with a dramatic increase of PVR and a possible adverse outcome.

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