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CARDIAC RESYNCHRONISATION THERAPY ACUTELY ALTERS METABOLIC SUBSTRATE UPTAKE, CORRELATING WITH IMPROVEMENTS IN SYSTOLIC FUNCTION AND LONG TERM REVERSE REMODELLING

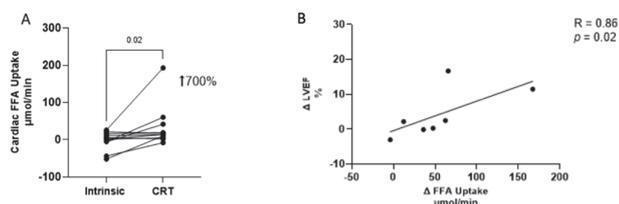
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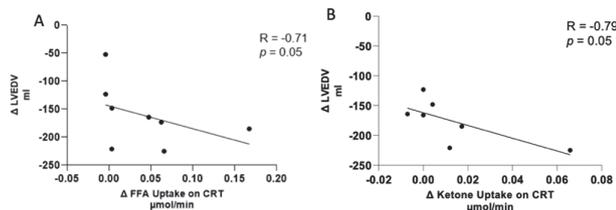
Introduction The failing heart is thought to be metabolically inflexible, and oxygen limited, shifting from free fatty acid (FFA) oxidation towards glucose metabolism. Whilst glucose metabolism is more oxygen efficient, fatty acid (FA) metabolism generates more adenosine triphosphate (ATP) per mole of substrate. Cardiac resynchronisation therapy (CRT) acutely improves cardiac haemodynamics in patients with severe heart failure and a left bundle branch block. However, whether CRT alters metabolic substrate usage and whether this correlates with functional improvement is unknown. Objectives To assess acute cardiac work, efficiency, and metabolic substrate uptake in response to CRT and correlate this with reverse remodelling.

Methods Participants with non-ischaemic cardiomyopathy were started on an insulin/dextrose infusion prior to CRT implant. During implant, measurements of left ventricular (LV) contractility (using a pressure-volume loop catheter), coronary flow (using a Doppler guide wire) and paired arterio-venous blood samples (from the left main stem and coronary sinus) were obtained with and without CRT at rest and during stress, pacing at 65% of predicted maximum heart rate. All measurements were repeated on a FFA infusion. Participants had cardiac magnetic resonance imaging at 6 months, with biventricular pacing in MRI-safe mode, to assess reverse remodelling.

Results Twelve participants were recruited (7 male, median age 64 [IQR 60–71]). Measures of LV contractility (work and dP/dtmax) were significantly improved by CRT at rest and stress on both infusions, without an increase in myocardial oxygen demand, resulting in improvement in cardiac efficiency



Abstract 85 Figure 1



Abstract 85 Figure 2

(insulin/dextrose at rest: +7.9%, $p = 0.02$; stress: +67%, $p = 0.03$; FFA at rest: +31%, $p = 0.02$; stress: +57%, $p = 0.09$). Metabolic flexibility was therefore retained. On insulin/dextrose, CRT at rest increased cardiac FFA uptake (Figure 1A), which positively correlated with improvement in LV ejection fraction (LVEF, Figure 1B). When FFA uptake was already increased during stress, CRT increased lactate uptake ($p = 0.02$). When FFA uptake was maximised on a FFA infusion, CRT increased ketone uptake both at rest and during stress, which positively correlated with improvement in cardiac work ($R = 0.55$, $p = 0.04$). At all points, the heart was a net lactate consumer rather than producer, implying that oxygen supply was not limited. Participants underwent significant reverse remodelling at 6 months with reduction in LV end-diastolic volume (LVEDV) and this correlated with acute changes in FFA (Figure 2A) and ketone uptake (Figure 2B) with CRT.

Conclusion CRT improves cardiac efficiency and reverses the metabolic phenotype of heart failure towards more physiological lipid-based metabolism. Acute increases in FFA and ketone uptake correlate with improvements in contractility and reverse remodelling at 6 months. Therapy targeting lipid metabolism may therefore be a useful strategy in the failing heart.

Conflict of Interest Nil

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LONG TERM CLINICAL OUTCOMES IN PATIENTS REQUIRING CARDIAC PACING DUE TO CONGENITAL COMPLETE HEART BLOCK

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Background Isolated congenital complete heart block (CCHB) is rare cardiac condition associated with maternal Anti-Rho antibodies. It is managed with permanent pacemaker insertion. We sought to determine the long-term outcomes of individuals with CCHB who had undergone pacemaker insertion.

Methods A database search was performed at a UK tertiary cardiac referral centre. The online medical records of patients with CCHB were analysed for pacing requirements and complications, echocardiographic data, and clinical status.

Results A total of 72 patients (female $n = 46$) were identified, 20% of whom were autoantibody positive. Mean age of initial implantation was 15.5 years (SD 12.7) with mean follow up of 21 years (SD 8.3). 88% of patients were NYHA class I at censure of data. Major adverse cardiac events (MACE) were observed in 2 patients with 0% mortality throughout the follow up period. 10 patients (13.9%) developed cardiomyopathy. Five patients had device related infections and 7 required system extractions. Mean left ventricular ejection fraction on most recent echocardiogram was 53.7% (SD 8.40) with no significant change compared with their historic scan. Mild tricuspid regurgitation was the most frequently observed valvular pathology, identified in 28% of patients. Only 2 patients (2.7%) had severe valve incompetence.

Conclusion Long-term outcomes for patients with congenital complete heart block who undergo pacemaker insertion are highly favourable. Despite high pacing requirements over an extended period, the incidence of MACE and pacing related complications is low. Cardiac function and valvular