Case of intractable NYHA Class 4 Heart Failure Treated With Leadless Endocardial Left Ventricular Pacing

Simon JAMES
Andrew Turley
Michael Chapman

Introduction: We present a 54 year old man with dilated cardiomyopathy (DCM) / severe left ventricular impairment that failed to respond to conventional CRT. He presented with refractory class 4 heart failure and underwent implantation of leadless endocardial LV pacing system (WiCS®-LV system) resulting in marked improvement in NYHA class, Echo and ECG parameters.

Methods: A 54 year old man with history of severe LV impairment due to DCM and AF with persistent high ventricular rates underwent AV node ablation and attempted upgrade of his dual chamber ICD to a Biventricular implantable cardioverter defibrillator in 2018. An LV lead was sited in the only vein branch of the coronary sinus that was present. He initially demonstrated an improvement in symptoms but the lead displaced within 4 weeks of implant and it was not possible to re-site. Despite optimal medical therapy he was admitted to hospital repeatedly with decompensated heart failure requiring intravenous (IV) diuretic therapy. A further attempt at LV lead implantation resulted in a lead being sited in a lateral branch of the great cardiac vein as there were no other targets. Following this he remained NYHA class 4, ejection fraction was 25% and required IV diuretics to remain stable.

Result: We elected to implant a leadless endocardial LV pacing system (WiCS®-LV system). This system uses ultrasound technology to transfer energy from a subcutaneously implanted pulse generator (transmitter) to a small receiver-electrode implanted on the LV endocardial wall, which then converts the acoustic energy to an electrical pacing pulse. The site of latest mechanical activation was identified by Speckle-tracking 2D radial strain echo analysis (as per protocol used in the TARGET (2) and STARTER (3) trials). The site of latest LV activation was shown to be the basal posterior segment. Implantation of the system was performed as a 2-stage procedure. First the transmitter was surgically anchored in a pre-specified intercostal location based on assessment of the acoustic window characteristics. The following day the patient underwent implantation of the LV endocardial receiver-electrode via right femoral venous access and a trans-septal approach. We were able to successfully implant the receiver-electrode in the LV segment targeted and establish biventricular pacing. Post implant he was successfully weaned off IV diuretics.

Conclusion: By 4 weeks post implant QRS width had decreased from 190 to 120msec. Dyssynchrony parameters had normalised. LV end systolic volume reduced from 191 to 157 mls, ejection fraction increased from 25% to 33.5% and GLS from 9 to 11%. NYHA class improved to 2 and Minnesota Living with Heart Failure Questionnaire score reduced by 44%. His 6 min walk distance was 330m. The response has persisted to 6 months post implant.