Abstract 150 Table 1

| | SGH ICC patients (n=101) | Long QT Syndrome patients (n=51) | HCM patients (n=506) | ARVC patients (n=106) | Brugada Syndrome patients (n=220) |
|---|---|---|---|---|---|
| Follow-up (months; mean±SD) | 74±53 | 87 | 44±33 | 58±35 | 38±27 |
| Appropriate therapy (%) | 26 | 24 | 20 | 24 | 8 |
| Inappropriate therapy (%) | 18 | 29 | 27 | 19 | 20 |
| Lead failure (%) | 21 | 25 | 7 | 2 | 9 |
| Complication rate excluding lead failure (%) | 26 | 31 | n/a | 34 | 20 |

**Results** 101 patients (mean age 44.1±14.8 years; 59 male) were included (idiopathic VF 15%; DCM 17%; ARVC 22%; HCM 21%; long QT syndrome 17%; Brugada syndrome 6%; others 2%). During a mean follow-up of 74.0±53.2 months 2 patients died (1 inappropriate shocks; 1 stroke). Indications were secondary prevention in 71.3% of patients. ICD types were 56.4% single chamber; 39.6% dual chamber; 4.0% biventricular. Appropriate therapy successfully terminated VT/VF in 27 (26.7%) patients 34.7% of secondary and 6.9% of primary prevention patients received appropriate therapy. Inappropriate therapy occurred in 18 (17.8%) patients and lead failure (noise/wear/fracture) in 22 (20.8%) patients (Abstract 150 table 2). 12 out of 18 inappropriate shocks were due to lead failure, 5 sensing errors (1 T-wave oversensing; 4 AF), 1 generator fault. 10/22 leads that failed were Medtronic Sprint Fidelis and these were responsible for 8/12 patients receiving inappropriate shocks including one death due to lead fracture. Comparison with other studies indicates a high lead failure rate due to the long follow-up period, similar to the LQT Study which reports 25% lead failure over 87 months (Abstract 150 table 1). With lead failure excluded the complication rate is comparable to shorter follow-up studies. Inappropriate and appropriate therapy rates are similar among all studies.

Abstract 150 Table 2

| Complication | Number of patients | % of patients |
|---|---|---|
| Lead failure | 21 | 20.8 |
| Inappropriate shock | 18 | 17.8 |
| Lead displacement | 5 | 4.9 |
| Infection | 5 | 4.9 |
| Pneumothorax/Haemothorax | 5 | 4.9 |
| Box/Wound/Other revision procedure | 7 | 6.9 |
| Thrombosis (venous/lead) | 2 | 1.9 |
| Haematoma | 5 | 4.9 |
| Chronic abdominal cavity post-explant | 1 | 0.9 |

**Conclusions** There is a significant rate of ICD lead failure in patients with ICCs, which may be expected given the high frequency of Sprint Fidelis leads implanted during this period and the long follow-up. Our results compare favourably to other similar studies. The high rate of appropriate therapy highlights the clinical effectiveness of ICD intervention in secondary prevention. Lead complications may be lower with the use of new ICD technology in selected patients.

## 151 RISK OF RECURRENCE FOLLOWING EXTRACTION OF CARDIAC IMPLANTABLE ELECTRONIC DEVICES FOR INFECTION: WHEN SHOULD A NEW DEVICE BE RE-IMPLANTED?

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**Background** The recommended management of cardiac implantable electronic device (CIED) infection is complete system extraction. There are limited clinical data on the optimal time for device re-implantation. A small series reported good results with simultaneous contralateral implantation. We evaluated this approach in our institution for patients without signs of systemic sepsis. We present clinical outcomes and completeness of extraction.
**Methods** The clinical records of all patients undergoing lead extraction in our institution since January 2008 were reviewed.
**Results** 68 patients underwent CIED extraction for infection during this time period (see Abstract 151 table 1). In 34 cases, the device was removed with simple traction, 9 with locking stylet, 22 with locking stylet and laser sheath, 1 with locking stylet and mechanical sheath and 2 with femoral snare. There was complete hardware removal in 64 cases (94%). One patient with lead related endocarditis required a subsequent surgical procedure to remove a lead fragment and in 4 other patients who had erosion, pocket infection or threatened erosion, a small fragment of lead remained. 18/68 patients were re-implanted with a new device on the contralateral side on the same day as the extraction. 28/68 patients received a new device between 1 and 227 days later and 22/68 have not undergone reimplantation. An active fixation bipolar TPW (temporary pacing wire) was used in 6 patients for a mean 7.8±2.7 days. 3 patients had a further device related procedure during a mean follow-up of 445±304 days: 1 lead reposition, 1 pocket washout and 1 extraction. Of the 2 procedures carried out for recurrent infection, 1 was managed with a TPW for 7 days prior to reimplantation and 1 underwent reimplantation at 14 days without TPW. In addition, the patient requiring pocket washout had a fragment of lead remaining following their initial extraction.

Abstract 151 Table 1

| Indication for device extraction | Number of patients, n=80 (%) |
|---|---|
| Erosion | 31 (39) |
| Pocket infection | 25 (31) |
| Lead infection | 7 (9) |
| Threatened erosion | 4 (5) |
| Pain | 1 (1) |

**Conclusion** We report low rates of recurrent infections following CIED extraction. None of the 18 individuals simultaneously re-implanted with a new device on the contralateral side needed any further procedures during the follow-up period. This approach may be appropriate, particularly in pacing dependant patients who would otherwise require a TPW with its associated risks. In those individuals who required a TPW, the risk of recurrent infection in our series was 17% despite our use of an active fixation pacing lead and externalised pulse generator which has a lower reported complication rate. Only one of the 4 patients with a residual lead fragment required re-intervention for recurrent infection. This provides some supportive evidence that in patients with high surgical risk and pocket abnormalities, if fragments of lead may remain, the patient may be treated conservatively and monitored for signs of recurrent CIED infection.

## 152 REAL-TIME CARDIAC MR ANATOMY AND DYSSYNCHRONY OVERLAY TO GUIDE LEFT VENTRICULAR LEAD PLACEMENT IN CRT

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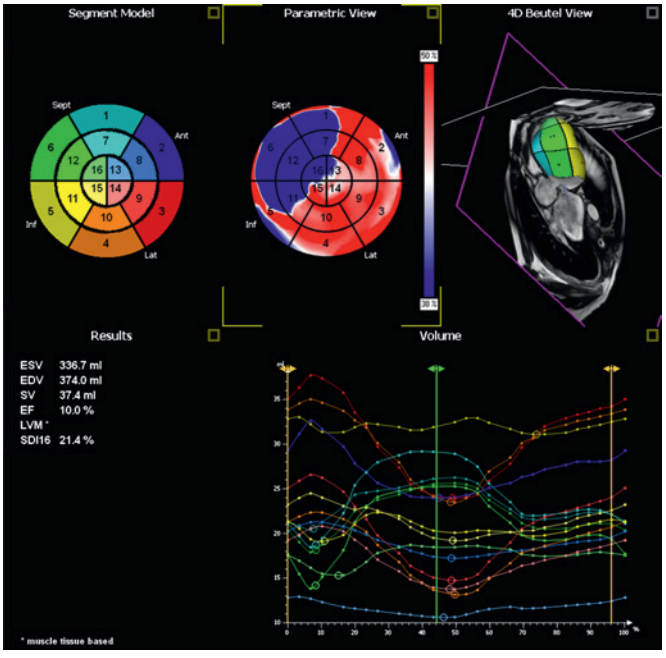
**Introduction** Optimal left ventricular (LV) lead placement via the coronary sinus (CS) is a critical factor in defining response to cardiac resynchronisation therapy (CRT). Using novel semi-automated image acquisition, segmentation, overlay and registration software

we set out to guide lead placement by avoiding scar and targeting the region of the LV with the latest mechanical activation.

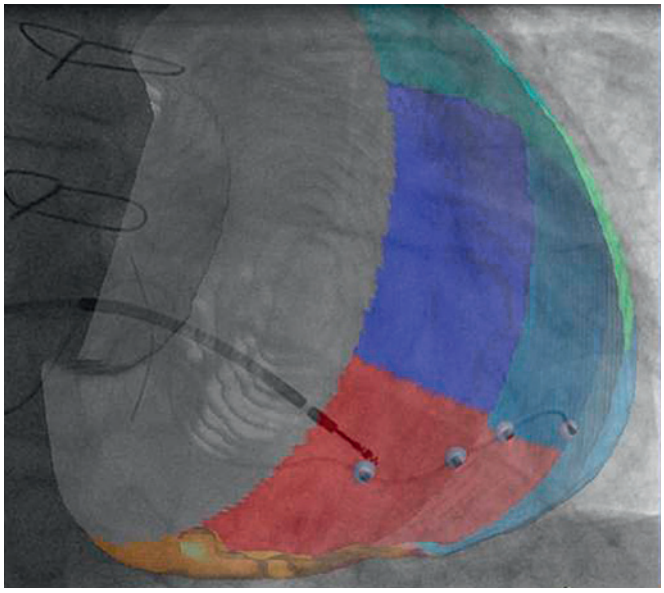
**Methods** 17 patients underwent cardiac magnetic resonance (CMR) scans. 3D whole heart images were segmented to produce high fidelity anatomical models of the cardiac chambers and coronary veins. 2, 3, 4 chamber and short axis cine images were processed using Tomtec software to give a 16 segment time volume-dyssynchrony map. In patients with myocardial scar the late gadolinium enhancement images were manually segmented and registered to the anatomical model along with the dyssynchrony map. The 3 latest mechanically activated segments with <50% scar were identified and this information was overlaid at CRT implant on to live fluoroscopic images using a prototype version of the Philips EP Navigator software. Subsequently, the x-ray C-arm and table could be moved freely while automatically maintaining a registered roadmap. We used a high fidelity pressure wire to assess the acute haemodynamic response to pacing in different regions of the overlaid 16 segment model. All dP/dt measurements were compared to baseline AAI or VVI (for those patients in AF) pacing at 5—10 beats/min above intrinsic rate.

**Results** 15 of the 17 patients underwent successful placement of a LV pacing lead via the CS with satisfactory pacing parameters and no phrenic nerve stimulation at implant. The mean time from insertion of the CS guide catheter into the venous sheath to successful cannulation of the CS was 1.3±1.0 min. In 2 patients we were unable to place a LV lead successfully in any branch of the CS. We paced in at least one of our 3 target segments in 11 patients. 67% of patients were responders as defined by a 10% increase in +dP/dt over baseline. The mean change in +dP/dt for the best lead position vs baseline+dP/dt was 15.9±11.3% for DDDLV pacing. This compares to a mean change in+dP/dt of 14.9±12.3% when the CMR dyssynchrony-map defined target region was paced DDDLV. The region of best+dP/dt response was postero-lateral, lateral or posterior in all cases.

**Conclusion** We have shown it is feasible to acquire, overlay and accurately register cardiac MR data on to fluoroscopic images at the time of CRT implant. Our data suggest that it is also possible to identify and place the LV lead in at least one target region in most patients. This appears to give close to the best acute haemodynamic response that can be achieved in any branch of the CS. The initial results of this pilot study suggest that a MR dyssynchrony guided approach to LV lead placement may allow ideal LV lead positioning (Abstract 152 figures 1 and 2).




Abstract 152 Figure 1



Abstract 152 Figure 2

## 153 VENTRICULAR PACING ALONG INDIVIDUAL BRANCHES OF THE CORONARY SINUS USING A QUADRIPOLAR LV PACING LEAD

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**Introduction** Cardiac resynchronisation therapy (CRT) usually involves placing the left ventricular (LV) pacing lead in the postero-lateral or lateral region of the LV epicardial surface as this is thought likely to re-coordinate myocardial contraction most effectively. The LV lead is standardly placed in a position with the best pacing parameters and satisfactory stability. It is not known, however, whether there is a significant difference in haemodynamic response to LV pacing in different regions of the same coronary sinus (CS) vein. In this study we aimed to evaluate the difference in acute haemodynamic response to pacing along individual branches of the CS.

**Methods** 16 patients underwent an acute haemodynamic study during their CRT-defibrillator implant. We used a high fidelity pressure wire to assess the acute haemodynamic response (AHR) to pacing in different branches of the coronary sinus. We used a novel quadripolar lead (Quartet, St Jude Medical, Sylmar, California, USA) that has four poles on the LV lead–distal tip and 3 ring electrodes. The 3 ring electrodes are spaced 20 mm, 30 mm and 47 mm from the distal tip electrode and the four poles allow bipolar pacing between them. It was thus possible for us to test pacing parameters and AHR along a significant proportion of a CS branch without having to reposition the LV lead.

**Results** DDDLV pacing was attempted in as many different CS branches as possible in each patient (total 56 different positions used). The mean overall percentage difference in AHR (measured by change in +dP/dt compared to baseline AAI pacing or VVI pacing in AF patients) between an individual CS branch bipole with the lowest +dP/dt and that with the highest was 6.6±5.6%. Much larger differences in change in +dP/dt were seen, however, between different branches of the CS in the same patient with a mean difference in change in +dP/dt in the best CS vein compared to the worst CS vein of 16.7±6.3%. Although the difference in AHR seen between different bipoles within the same vein were not large, we did find that in some cases no pacing capture was found with one