Five patients were considered as non responders to biventricular pacing. Five patients died during the follow-up: 2 non responders (1 for refractory HF and 1 for cancer) and 3 responders (1 sudden death; and 2 refractory renal failure). A significative reduction of the mean furosemide dose per day (–56.2 mg) was observed during the follow-up.

**Conclusions:** in our experience CRT improved cardiac function with beneficial impact on reverse remodelling and cardiovascular events. This effect was evident both in pts with sinus rhythm and in pts with atrial fibrillation. Further investigations for a better identification of patients non responders to CRT are needed.

### 16.6 EFFECTS OF DIFFERENT LEFT PACING SITES ON REVERSE REMODELING IN PATIENTS UNDERGOING RESYNCHRONIZATION THERAPY

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Patients with cardiac heart failure (CHF) usually have dilated cardiomyopathy with completely altered left ventricular geometry. Cardiac resynchronization therapy (CRT) improves symptom status, while changes in left ventricular remodeling have not been adequately investigated.

Aim of our study was to investigate the effects of different pacing sites on the cardiac geometry. We analyzed 25 consecutive pts undergoing to CRT. In 12 pts (group A) the left ventricular lead was positioned in middle-lateral position whereas in 13 pts (group B) the lead was positioned in the apex. An over the wire system was used in all patients. The two groups were similar for NYHA class, etiology of the cardiomyopathy, ejection fraction (EF) and QRS duration. Echocardiographic examination was performed before and one week after CRT. An average of 3 cardiac cycles was used for echo measurements. Sphericity index (SI) was calculated as the ratio between the end systolic volume/mcq (area-length in apical four chambers view) and the theoretic volume of a sphere assuming the diameter equal to long systolic axis. A statistical significant reduction of SI was observed for group A (0,60±0,284 vs 0,556±0,173 p=0,66). No differences were observed in group B (0,60±0,284 vs 0,556±0,173 p=0,66). Our data indicate that the left pacing site is able to modify the geometry of the left ventricular contraction through a reduction of the left systolic transversal diameter. This effect was evident only in patients of the group A. The left middle lateral position appears to be a better pacing site, leading to an acute benefit on reverse remodeling.

### 16.7 METHOD FOR AUTOMATIC LEFT HEART AV NORMALIZATION IN BIVENTRICULAR PACEMAKERS USING ONLY CLINICAL CRITERIA FOR PROGRAMMING

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Optimization of AV interval is critical in patients requiring multichamber pacing for resynchronization therapy. A large part of the success of this therapeutic approach is related to an optimal left heart AV sequence. Although there have been numerous attempts to optimize the AV interval by using intracardiac and external hemodynamic sensors, none of these is applicable for beat-to-beat adjustments, a requirement for ambulatory patients in whom changes of P-sensing to atrial pacing are continuously expected. We have previously shown that a beat-to-beat AV normalization algorithm is possible, using the value of the P-sensed and atrial-paced interatrial electromechanical delays (IAEMD). Since these delays may be predictable from P wave parameters (surface ECG) and/or left atrial size (estimated clinically or measured by M-mode Echo), an algorithm is presented and a programmer user interface is suggested that would allow physicians to input only the value of P wave duration or left atrial size to automatically program the pacemaker for beat-to-beat left heart AV normalization upon changing rate and or pacing/sensing mode. The P wave duration can be measured from ECG lead II as seen on the programmer screen. Once these are set, the pacemaker's AV interval can be programmed by the press of a button. Similarly, if the ECG is unreliable, and no measured value of the left atrial size is available, a clinical estimate may be input to allow the prediction of the value of IAEMD, the key parameter for AV normalization in patients with biventricular pacemakers. Optionally, an automatic V-V delay may be added for those patients with long IAEMD and relatively short PR intervals.

**Conclusion:** The algorithm and user interface permit automatic optimization of left heart AV interval using only clinical criteria.d clinically or measured by M-mode Echo), an algorithm is presented and a programmer user interface is suggested that would allow physicians to input only the value of P wave duration or left atrial size to automatically.

## 17. CARDIAC RESYNCHRONIZATION THERAPY: IMPLANTATION ISSUES AND RESULTS

### 17.1 ECHOCARDIOGRAPHY AND HEART FAILURE: A DIFFERENT APPROACH FOR CORONARY SINUS CANNULATION DURING AN IMPLANT PROCEDURE OF A BIVENTRICULAR PACING SYSTEM

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**Background:** in clinical activity echocardiography has been always used to diagnose heart failure (HF) to follow up HF patients. Biventricular pacing reached important results, during last years, in the treatment of this pathology but still shows a weakness point in the cannulation of the coronary sinus (CS) and the left ventricle (LV) lead final placement.

**Aim:** This study evaluates in 16 patients, 11 males and 5 females, 64.6±9.7 of age, the benefits of echocardiographic approach in CS searching and cannulation procedures, using dedicated introducers and a two-dimensional (2D) echocardiographic machine that implements a second harmonic imaging (SHI). The second main purpose is to validate the usefulness of this technique in time reduction during implants of devices for cardiac resynchronisation therapy (CRT) and in reduction of related adverse events like CS dissections.

**Methods:** These patients underwent to a CRT device implant; the LV lead placement have been performed with the conventional – fluoroscopic – and/or the echocardiographic approach: the first method to use and the time duration of the attempt before switching to the second one was at the discretion of the primary investigator.

**Results:** The technique with echo (WE) allowed to incresase the success percentage from 13% without echo (WoE) to 100% in all the biventricular implants; mean time to locate and place guide catheter in coronary sinus was 9.7 min with echo, range 3–30 minutes, and 75 min without echo, range 20–360 minutes. Average time to place lead was 8.5 minutes with echo, range 3–15 min, and 14.55 without echo, range 5–25 minutes. One patient suffered small CS dissection during fluoroscopic guiding sheath cannulation of os; however, echo procedure allowed to continue and the lead was successfully implanted.

**Conclusions:** echocardiographic approach to LV lead implant is able to reduce the following mean times: implant procedure duration, fluoroscopy time, CS cannulation time, lead final positioning time. At the same time, as related effects, with this technique it's possible to improve safety, haemodynamic conditions and quality of life (QoL) of the patient during the implant procedure.

### 17.2 CARDIAC RESYNCHRONIZATION: MULTICENTER EXPERIENCE WITH A NEW CORONARY SINUS LEAD

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Aim of this study is to assess the feasibility of the implantation of a new coronary sinus (CS) lead for left ventricular pacing (LVP) Corox LVS (CLVS) (Biotronik, Germany). Forty six pts (37 m; 76±8 y) with severe heart failure (35 in NYHA III and 11 in NYHA IV), systolic dysfunction (EF <35%) and LBBB (QRS>140ms) despite maximal therapy underwent biventricular pacing (BVP) using the CLVS lead. Forty three (93.5%) procedures were successfully performed, 13 (30%) were upgrading from conventional to BVP. In 10 (23%) pts the CS was successfully approached using a preformed sheath that allows both retrograde venogram and lead insertion. In 33 (77%) pts the CS was successfully approached directly by the CLVS, in the attempt to reduce the implantation time. The mean X-ray exposition time was 19±9min. The distal CLVS was placed in a posterolateral branch in 19 pts, posterior in 2, lateral in 21, anterior branch in 1. The mean threshold of the LVP value at implantation was 1.1±0.9V. A significant reduction i n fluoroscopy time with the direct approach in comparison with the guided approach was observed (16.7±9.5min vs 26.5±6.4min; p = 0.02). Implantation failures were 3 (6.5%) due to high LVP thresholds, CS dissection or no cannulation of the CS respectively. During the follow-up (230±230 days), no significant threshold increments were observed, but in 1 case with an early lead displacement. In our experience the implantation of the CLVS lead appeared to be feasible and safe also with the direct approach.