
Clinical Case:

“My patient has heart failure, s.o.b., renal failure and diabetes: is CRT- D a therapeutic option?”

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Rozzano - Milano

Patient History

- 73y.o. Male, H 1,72 m, Kg 76, BMI 25,7
- History of untreated high blood pressure in the remote past
- Heavy smoker until 1987
- 1987 AMI (septal-inferior)
- 1987 CABG (4 venous grafts), Atenolol 50 mg o.i.d. added
- 1999 type 2 diabetes diagnosis, treated with diet.
- 2000 PAD (TEA left ICA) simvastatin 20 mg o.i.d. added
- 2002 s.o.b. Detection at Echo of LVEF 45%, BP165/105 mm Hg.
Started ACEI (enalapril 10 mg b.i.d. and hydrochlorothiazide 12,5 mg o.i.d.).

Patient History

- **2004 Worsening of diabetes control (HbA1c 8,3), on basis of insulin secretion added rosiglitazon 4 mg b.i.d.**
- **2005 acute HF decompensation (ECHO: LVEF 35% , LVDD 62 mm, Moderate MR) added furosemide 25 mg o.i.d., spironolactone 25 mg o.i.d.**
- **NYHA F.CI. II**
- **Creatinine 1,5 mg /dl, eGFR (MDRD) 47,3 ml/min/1,73 mq**
- **2007 (October) acute HF decompensation with severe fluid retention, atrial fib. ensue, acute pneumonia, glicemia 198 mg/dl, HbA1c 9,3, Creatinine 2 mg/dl, eGFR (MDRD) 35 ml/min/1,73 mq, ABP 145/95 mm Hg, HR 110 B/min.**

Admitted to the emergency Dept. of a primary care Hospital

Treated by adding torasemide i.v. 10 mg. t.i.d. and metolazone 5 mg o.i.d. per 3 days. Antibiotic therapy till to pneumonia resolution. Rosiglitazon replaced with glicazide 30 mg t.i.d.

Electric Cardioversion unsuccessfull.

Patient History

During in Hospital stay:

ECHO: LVEF 27% , LVDD 68 mm, Moderate-severe MR, LA a.p. diameter 51 mm, sPAP 65 mm Hg. Right ventricular hypo-kinesia, TAPSE 10.

ECG: AFib., HR 91, QRS width 98 msec, but LBBB heart rate dependent (QRS duration 130 msec).

Rx: β -blocker therapy switched to carvedilol 12,5 mg twice a day torasemide 10 mg tbl. o.i.d. and metolazone 2,5 mg o.i.d., digoxin 0,125 mg o.id., spironolactone 25 mg o.i.d.

Planned Hospital admission to tertiary care Center for therapy reassessment.

Clinical planning for tertiary care center admission

- Biochemistry work up for end organs function and diabetes assessment.
- Coronarography to assess coronary vessel patency and need for revascularization procedures
- Left ventricular function assessment
- Hierarchy assessment of possible interventional procedures (DES and anti-thrombus therapy before or after CRT-D + A-V ablation (?), ICD implant?)
- No indication to device therapy and medical follow up until??? SD, refractory HF development and chronic inotropic support?

EKG

QRS 92 ms
QT 360 ms
QTc 464 ms

FIBRILLAZIONE ATRIALE, FREQ. V 85-119
PROBABILE IVS CON ANOMALIE SECOND. RIPOL
ONDE Q ANTERIORI, PROB. DOVUTE A IVS

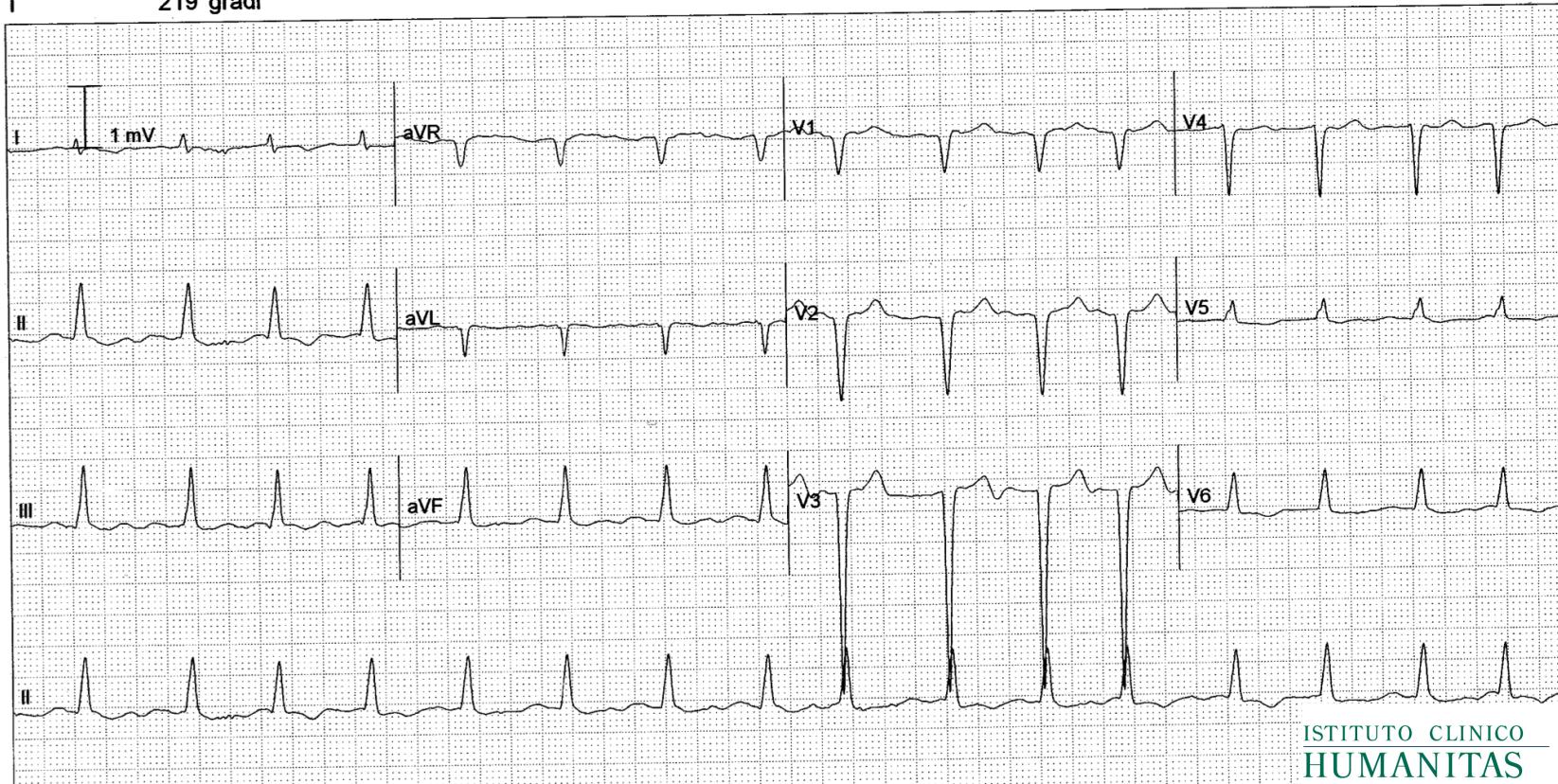
variaz. freq., attivita atr. irregolare
R56L/RISIII/S12R56/S3RL e anom. ripol.
Q >30mS, V1 V2 e IVS

Asse

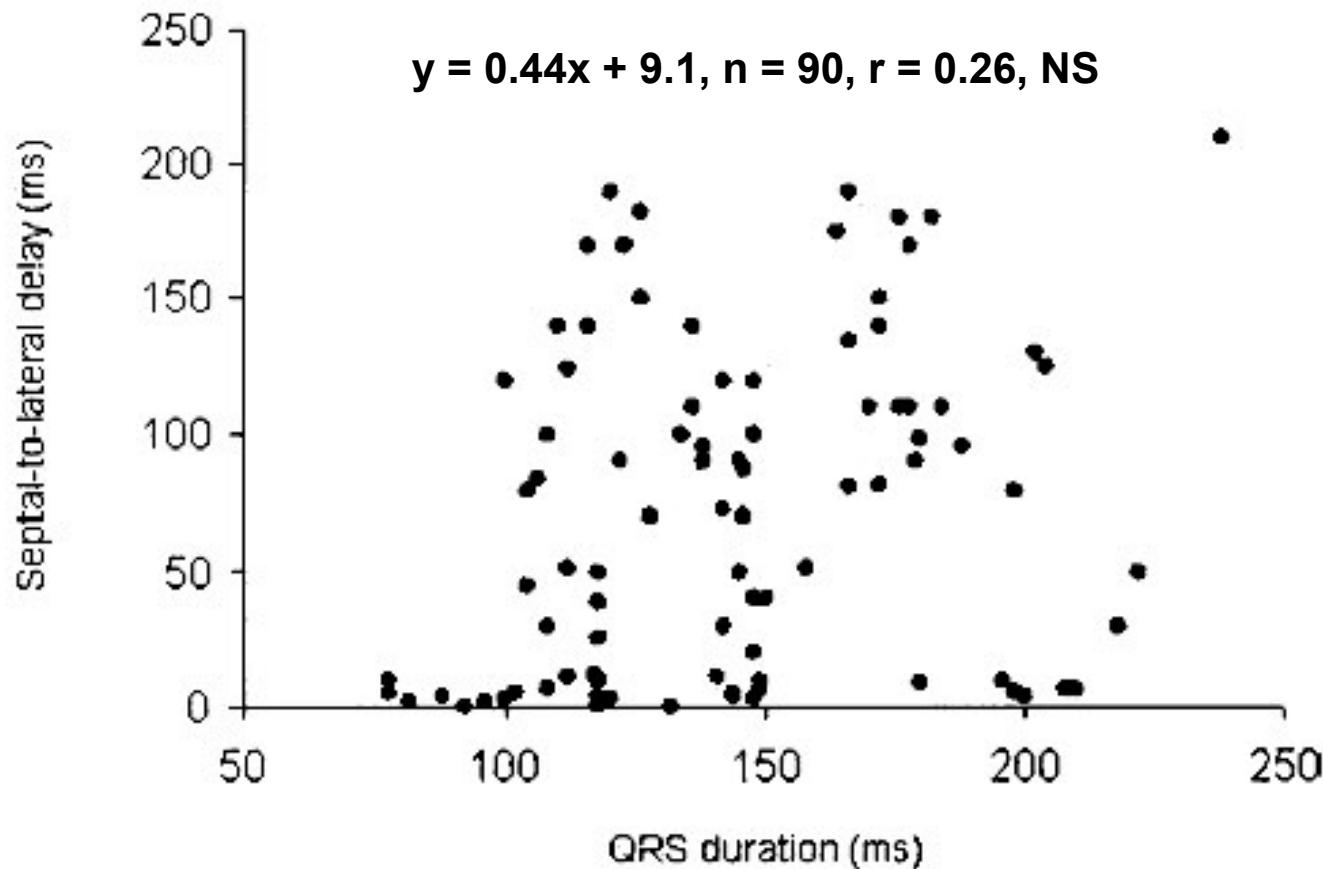
P gradi
QRS 83 gradi
T 219 gradi

- ECG ANORMALE -

Preliminare-Richiede re



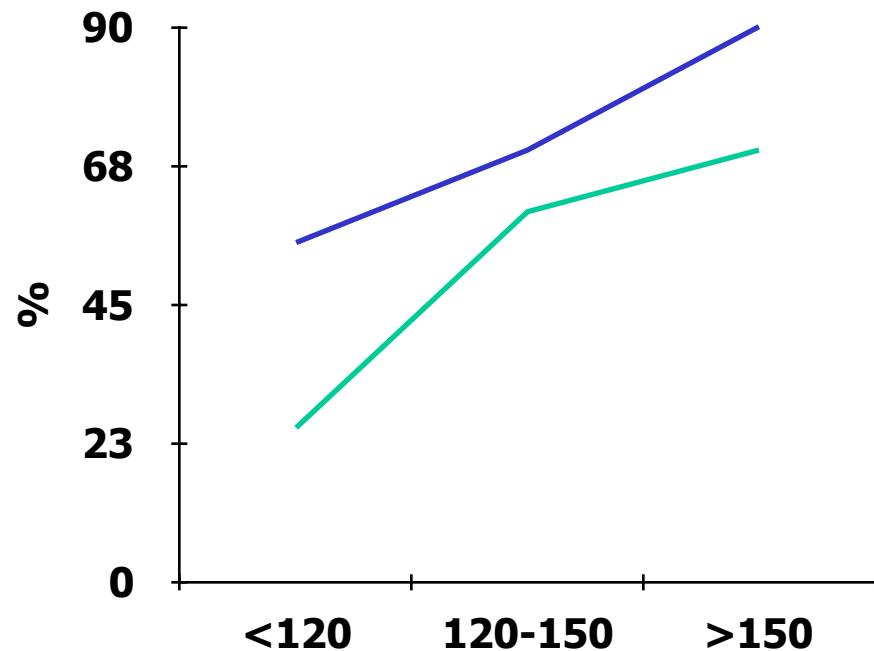
Relationship between septal-to-lateral delay and QRS duration in patients with end-stage HF



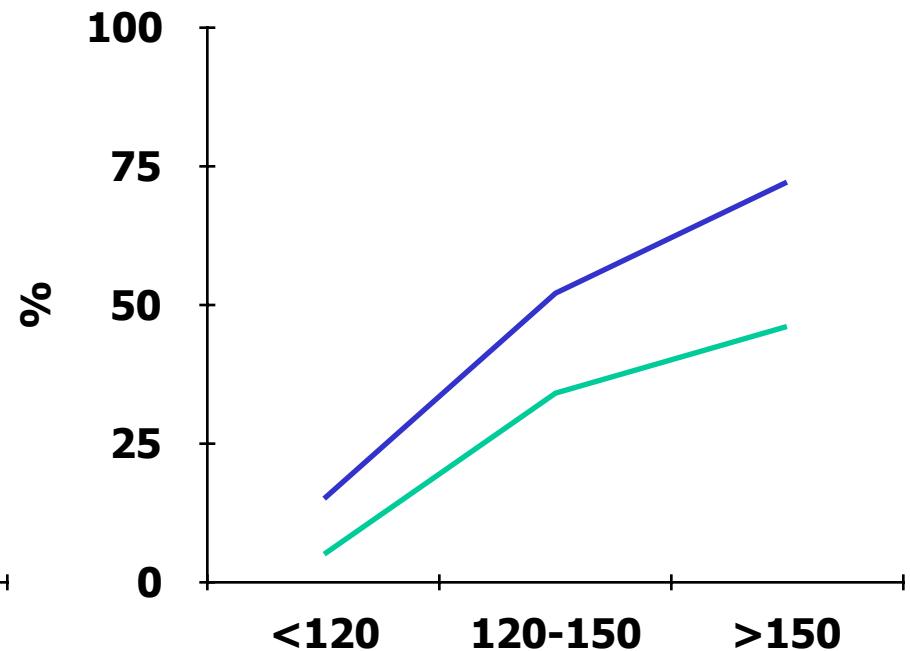
No significant relation existed between QRS duration and septal-to-lateral delay.

Systolic Mechanical Dyssynchrony

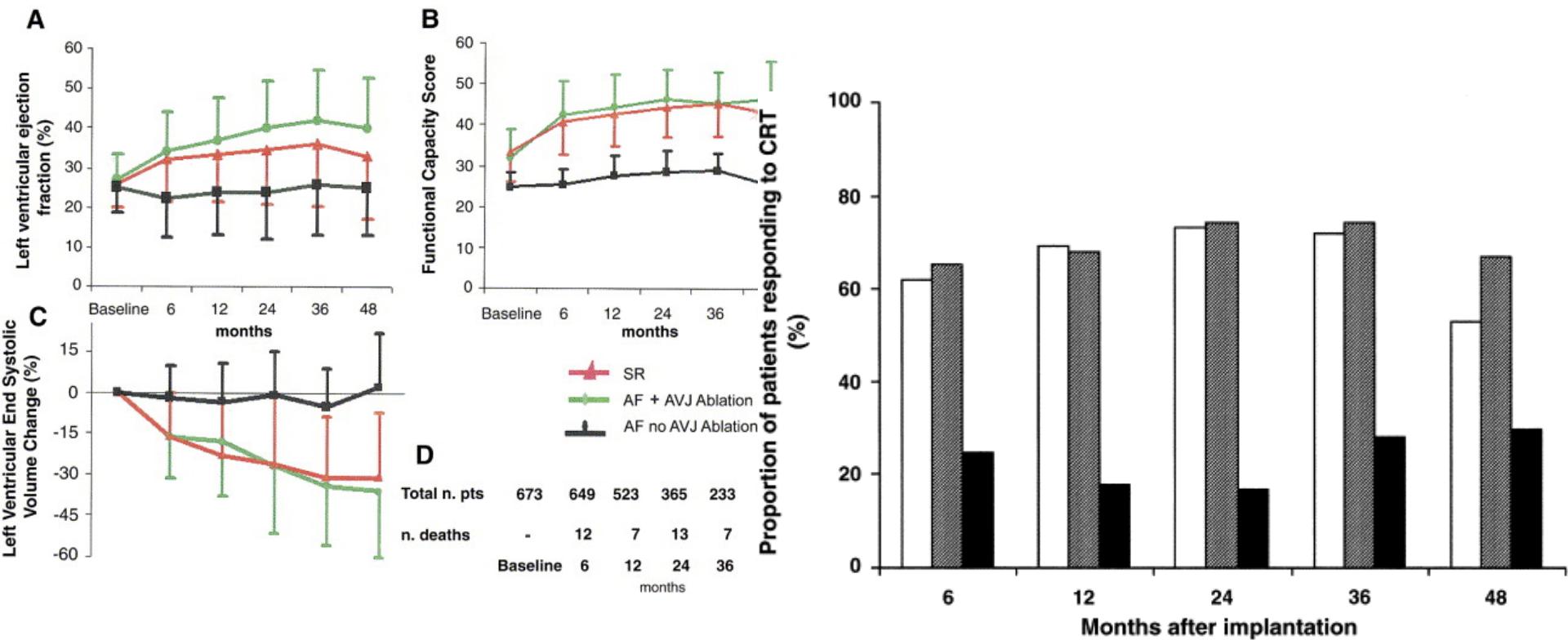
Intra-ventricular



Inter-ventricular



Four-Year Efficacy of CRT on Exercise Tolerance and Disease Progression: The Importance of Performing Atrioventricular Junction Ablation in Patients With Atrial Fibrillation



Gasparini M et al J Am Coll Cardiol 2006;48:734–43)

Biochemistry assessment at H admission

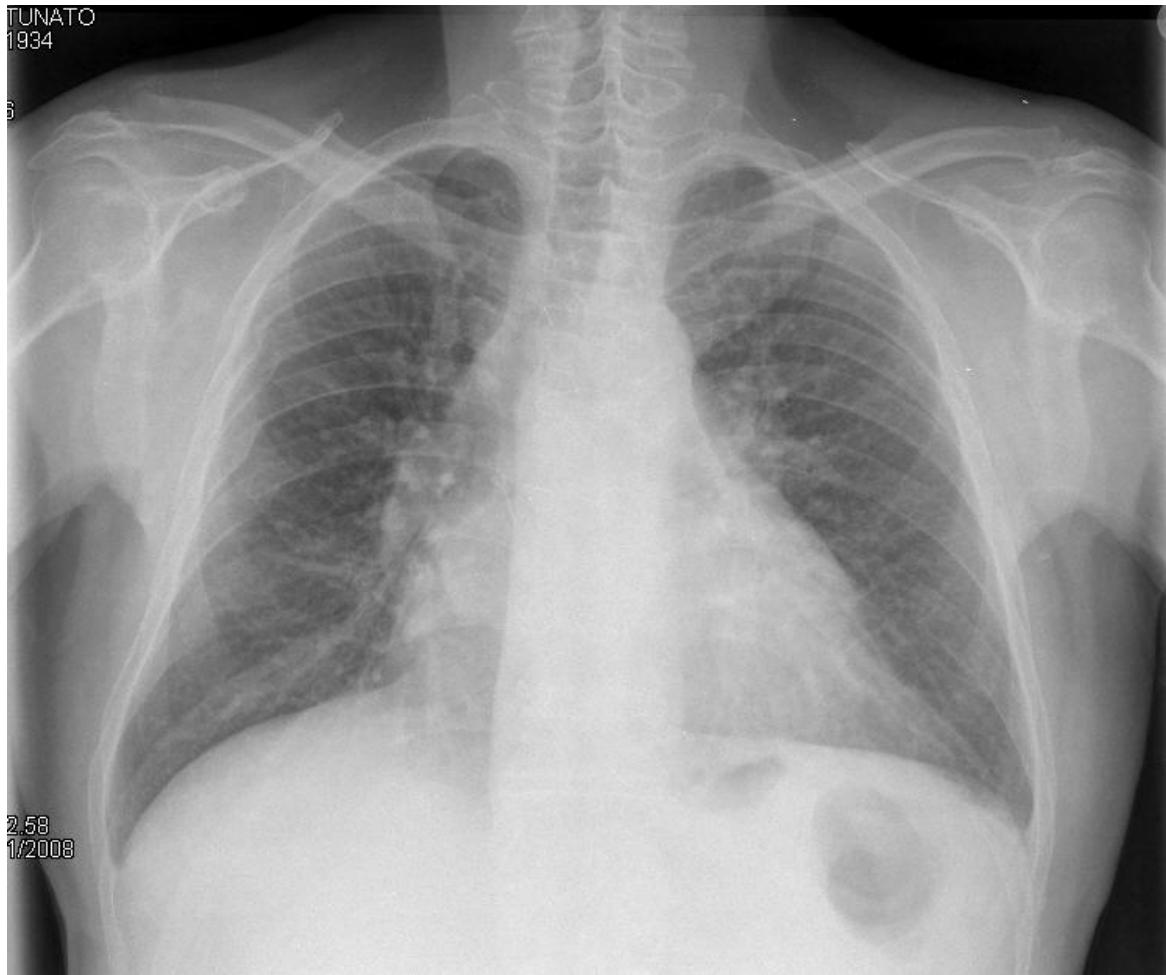
- Urea 75 mg/dL
- Creatinine 1,6 mg/dL
- eGFR (MDRD) 43 ml/min/1,73 m²
- Na⁺ 137 mmol/L
- K⁺ 4,4 mmol/L
- BNP 870 pg/ml
- Glic. 157 mg/dl
- HbA1c% 8
- Hb 12,5 gr, HT% 35, MCV 90
- Col. (total) 166, LDL 84, HDL 28 mg/dl
- Urine Alb./creat. 127 mg/g

Clinical assessment at H admission

- Body Weight 69 kg, BSA 1,74 m²
- NYHA f.cl. III
- BP 128/85 mm Hg, HR 78/SR, JVP (30° slope) 14 cm H₂O
- Weak heart sounds, Mitral Regurgitation Murmur (1-2/6)
- Harsh breath sound and bilateral wheezes at chest listening
- Mild limb edema

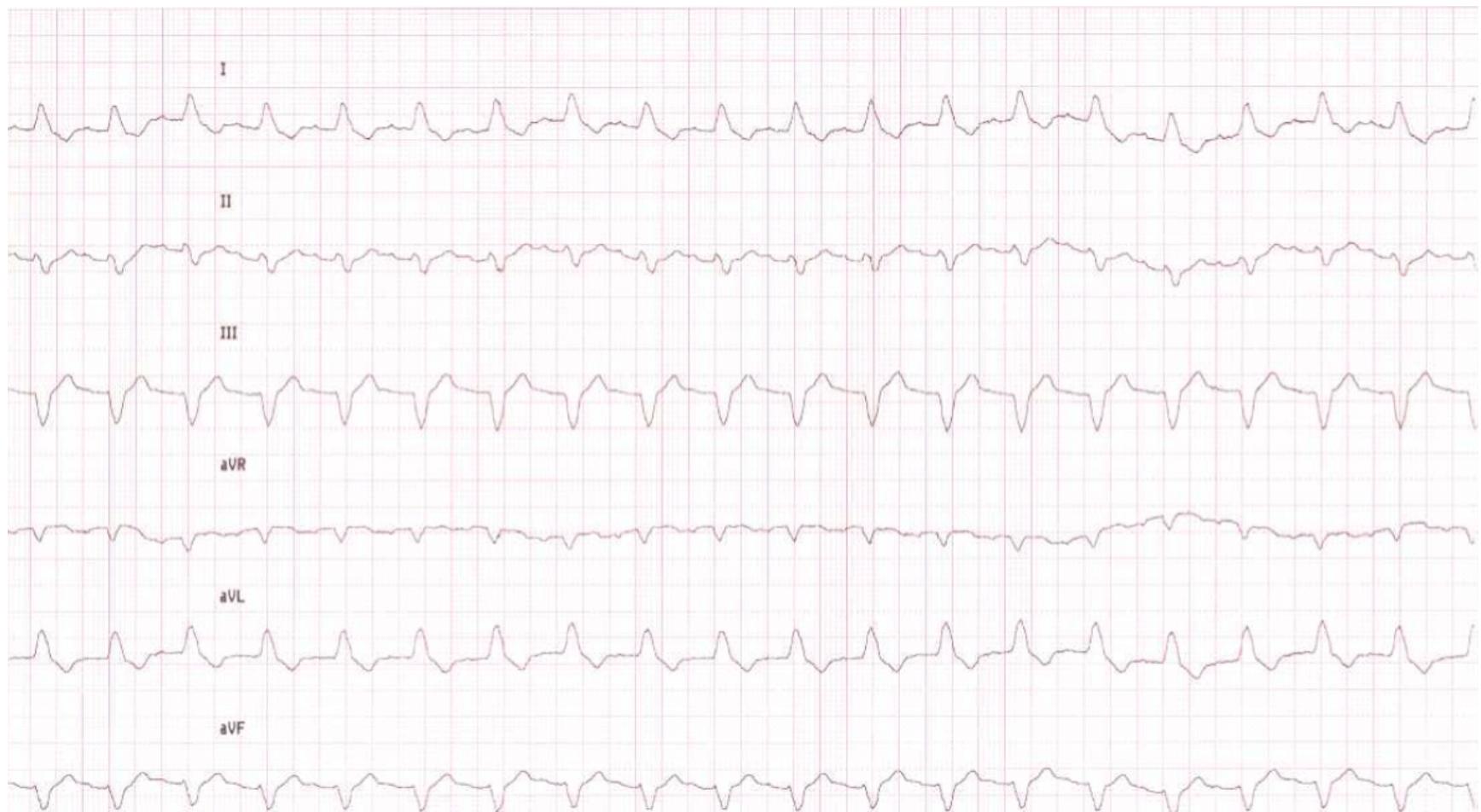
Chest X Ray

24 January '08



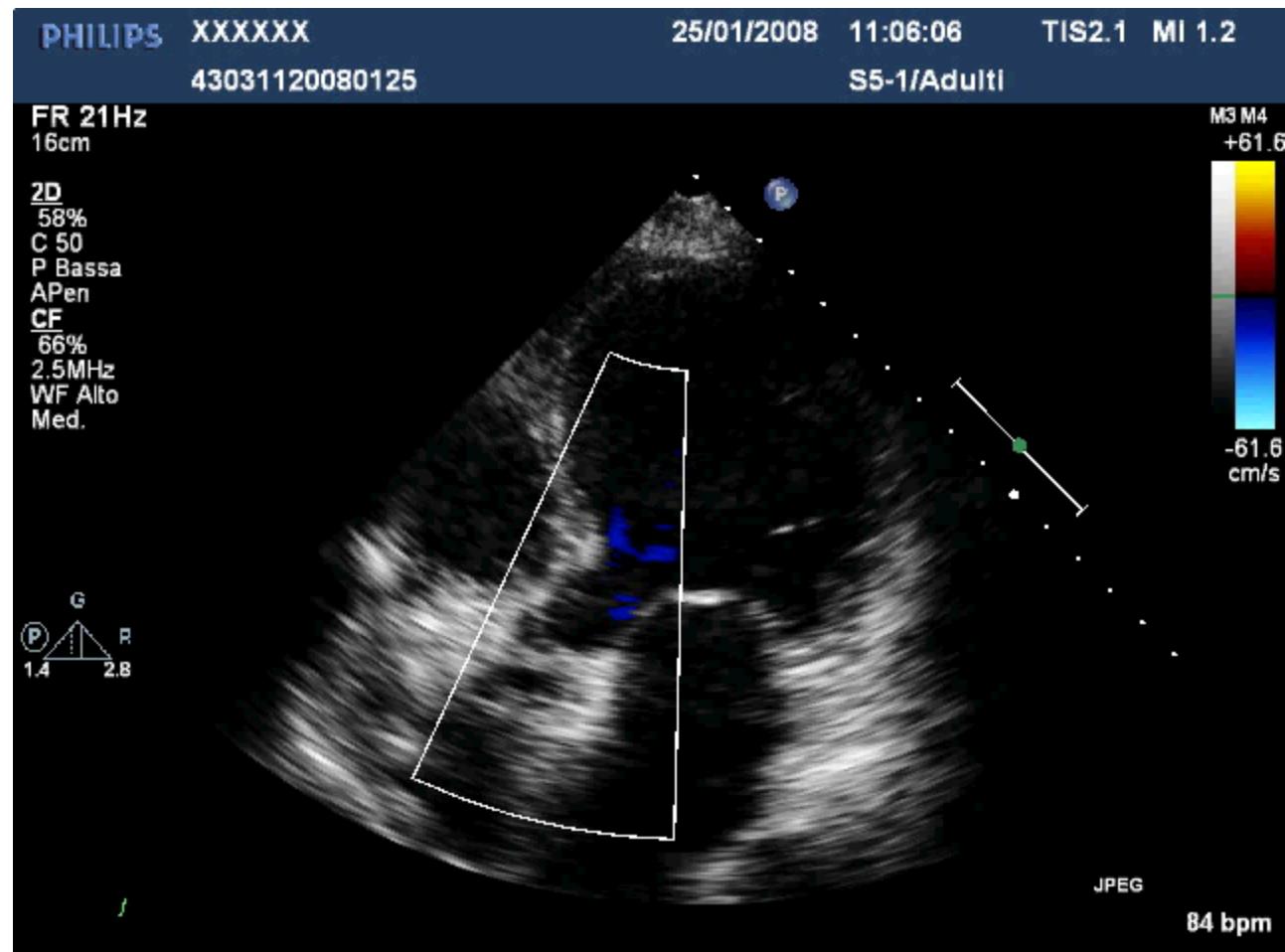
Chest X Ray: pulmonary venous congestion, interstitial edema, Kerley B line
Therapeutic decision : Furosemide 40 mg e.v. bolus

EKG

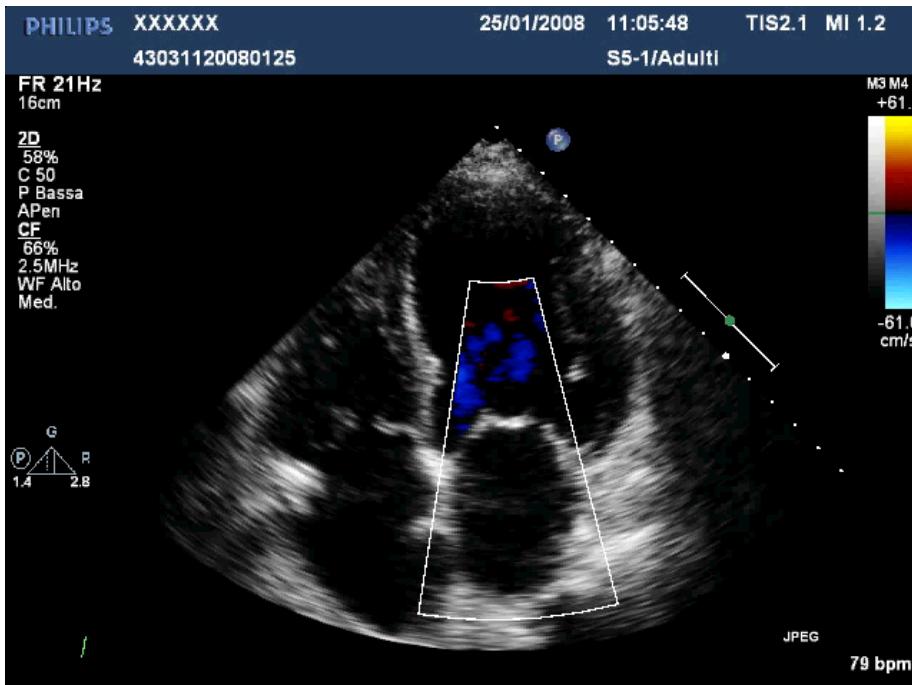


ECHOCARDIOGRAPHY

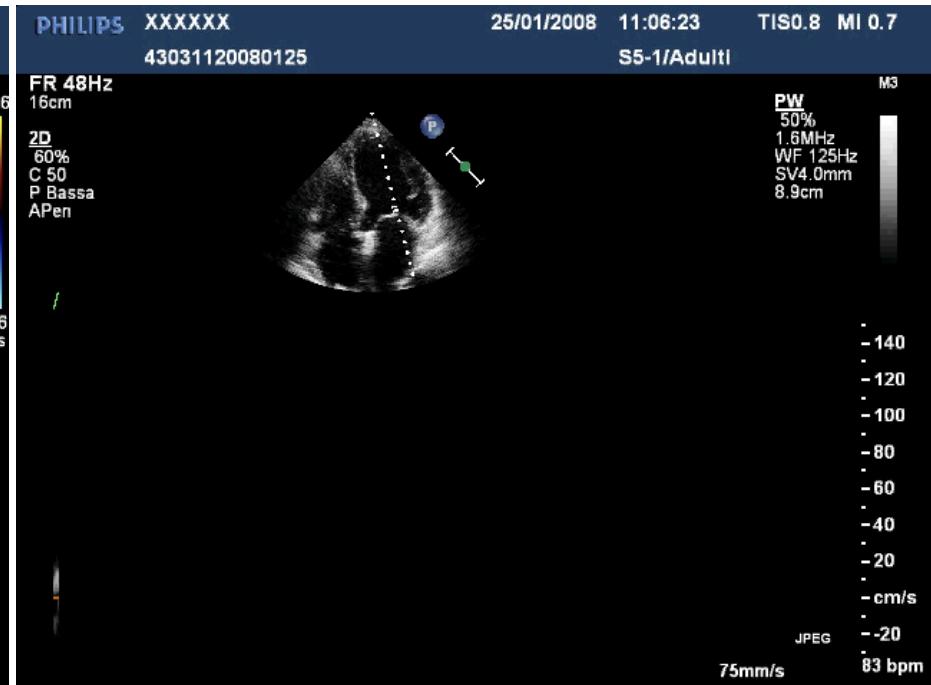
- EDD 70 mm
- Septum Th. 9 mm
- Posterior W. Th 9 mm
- L. Atr. Diameter 52 mm
- LV mass Ind. 144 g/m²
- D.T. 106 msec
- Restrictive filling pattern
- Color Doppler M.R. 2+/4+



ECHOCARDIOGRAPHY



ROA 0,22 cm²

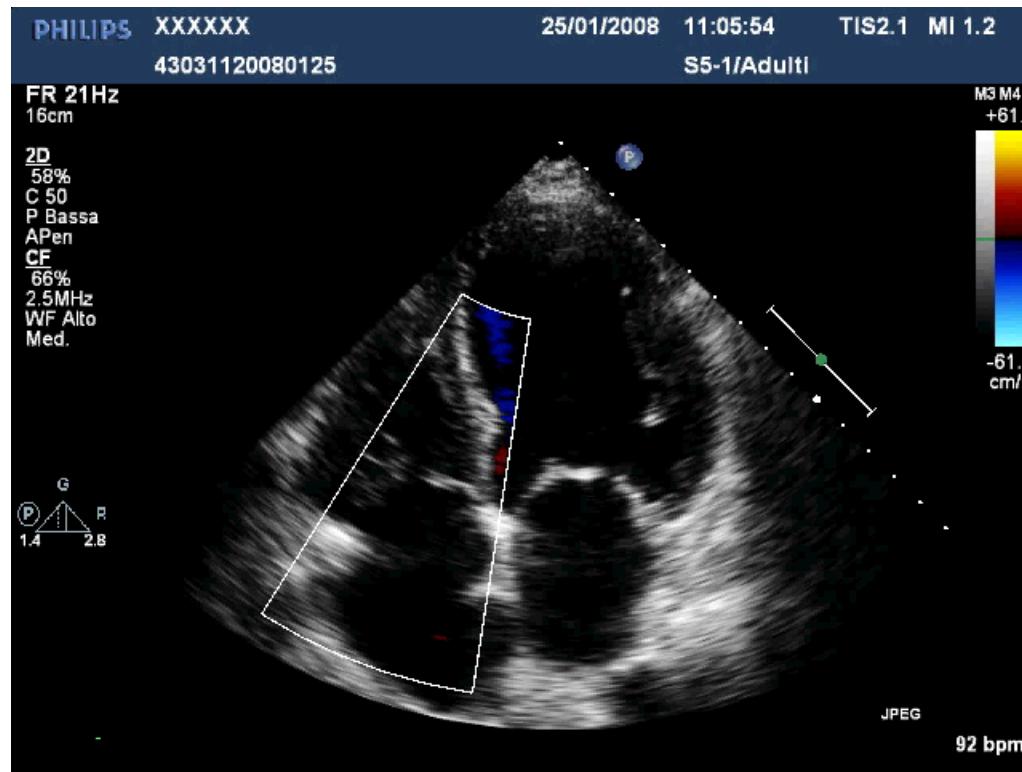


Restrictive filling pattern

ECHOCARDIOGRAPHY

Color Doppler

- Tricuspid Regurgitation
- TAPSE 8



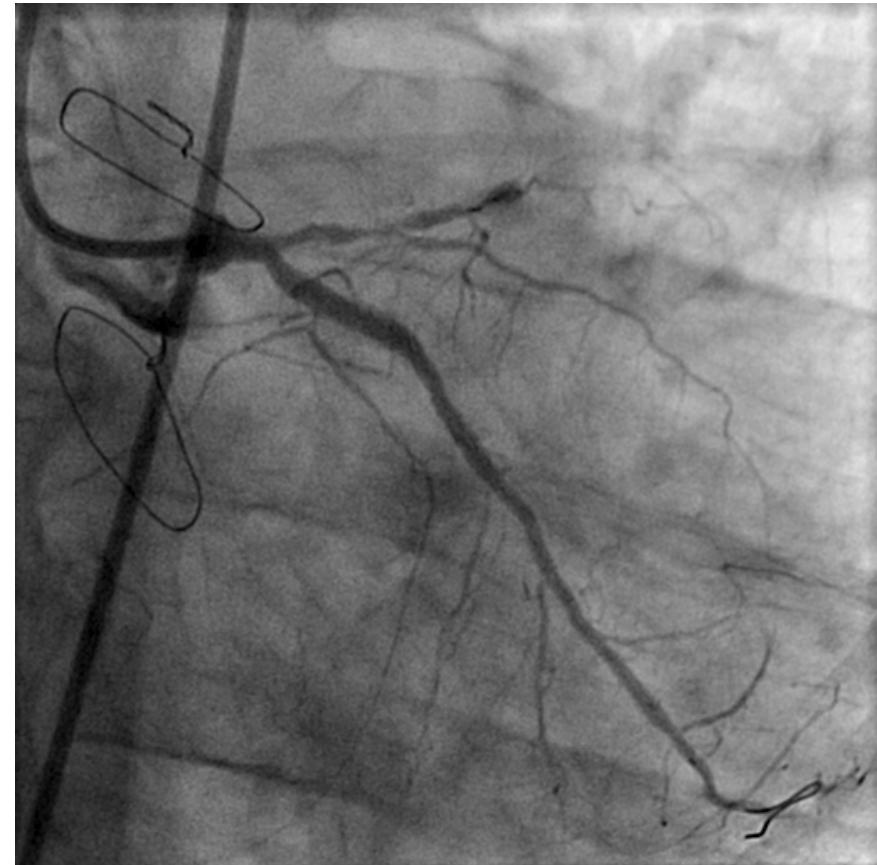
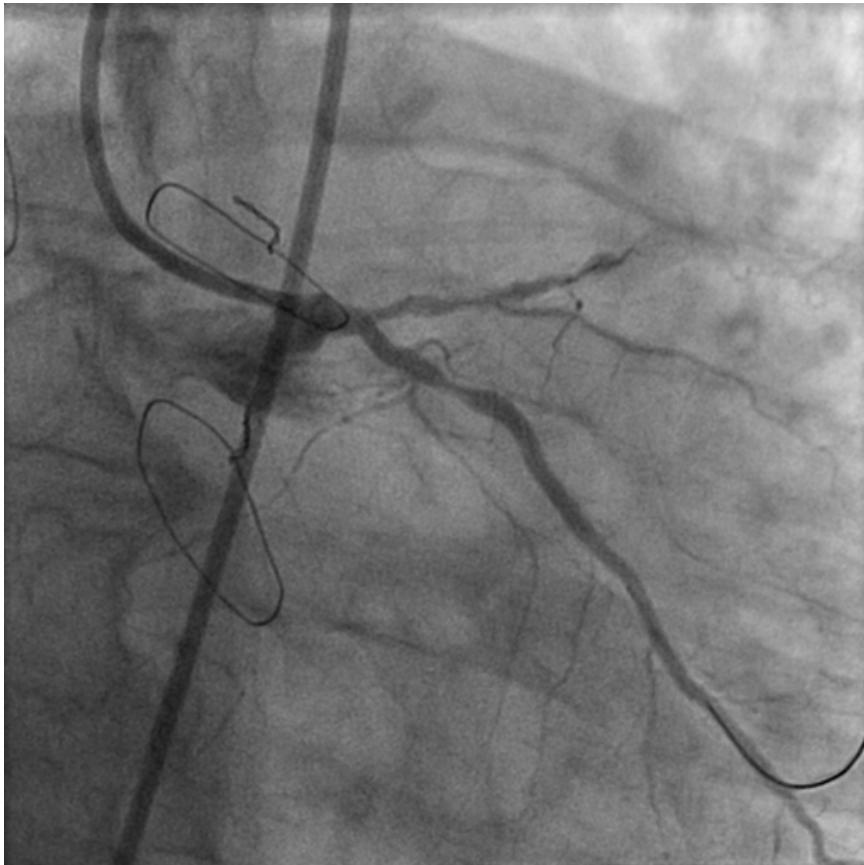
Right heart catheterization

4 February 2008

- Heart rate 98 (beats/min)
- Mean right atrial press. (mmHg) 16
- Pulmonary Pressure (Trunk) (mm Hg) 56/24 (average 38)
- Capill. Wedge Pressure (mm Hg) 26
- Cardiac Index (l/min/m²) 1,8
- Aortic Pressure (mm Hg) 98/68 mean 82

PCI procedure

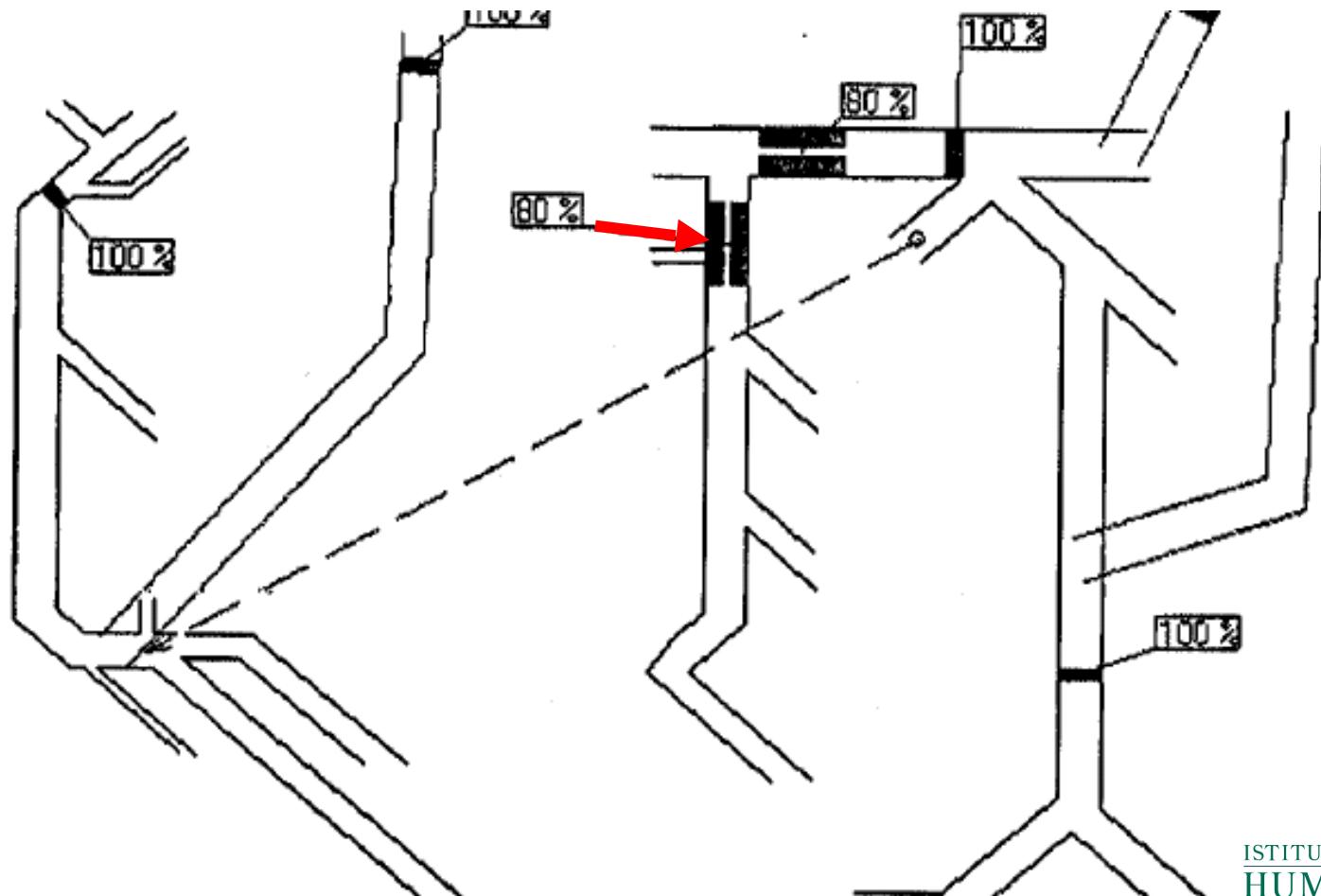
4 February 2008



During balloon inflation PAO dropped from 115 to 85 mm Hg

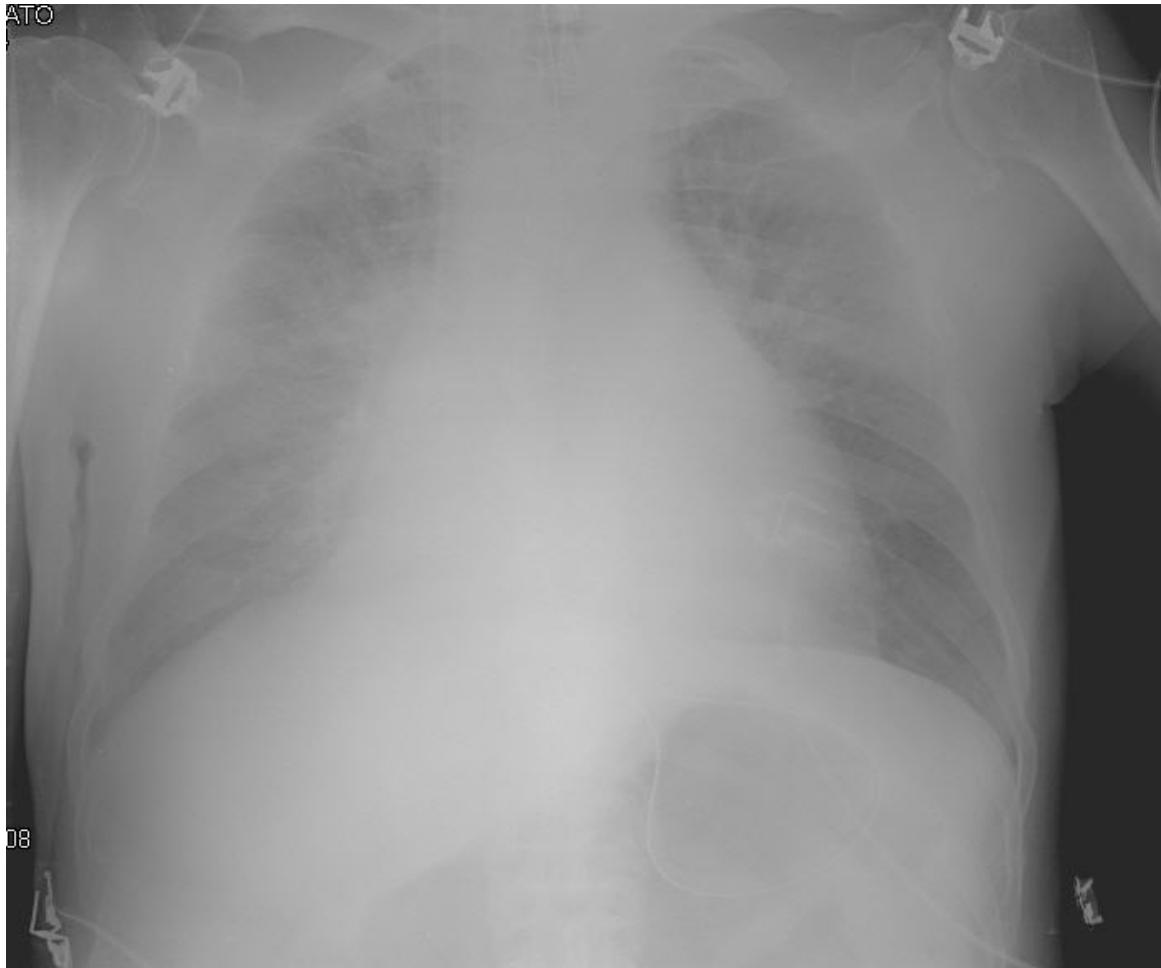
CORONAROGRAPHY

25 January 2008



Chest X Ray

25 January '08

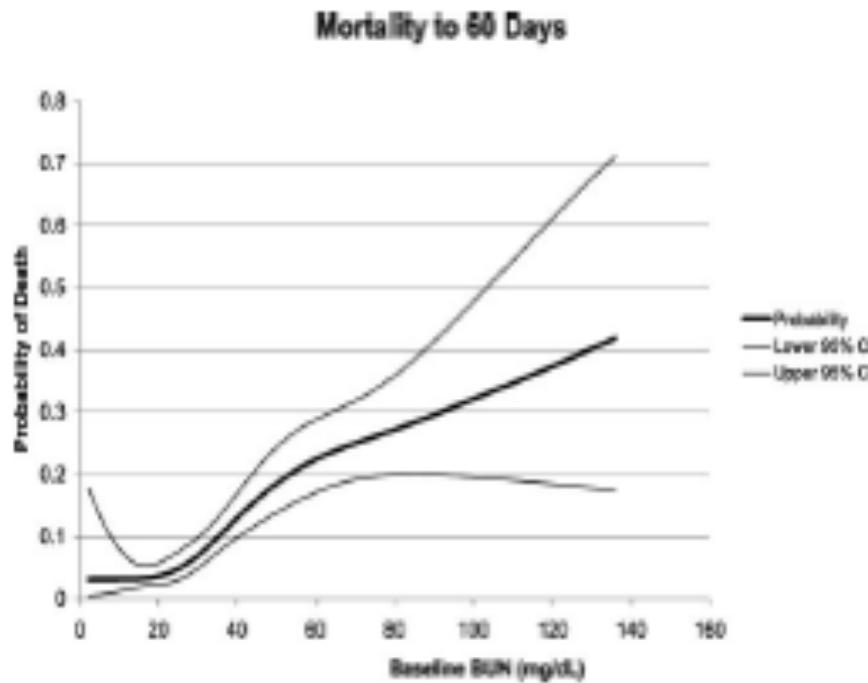


Admitted to Intensive Care Unit for acute pulmonary edema management

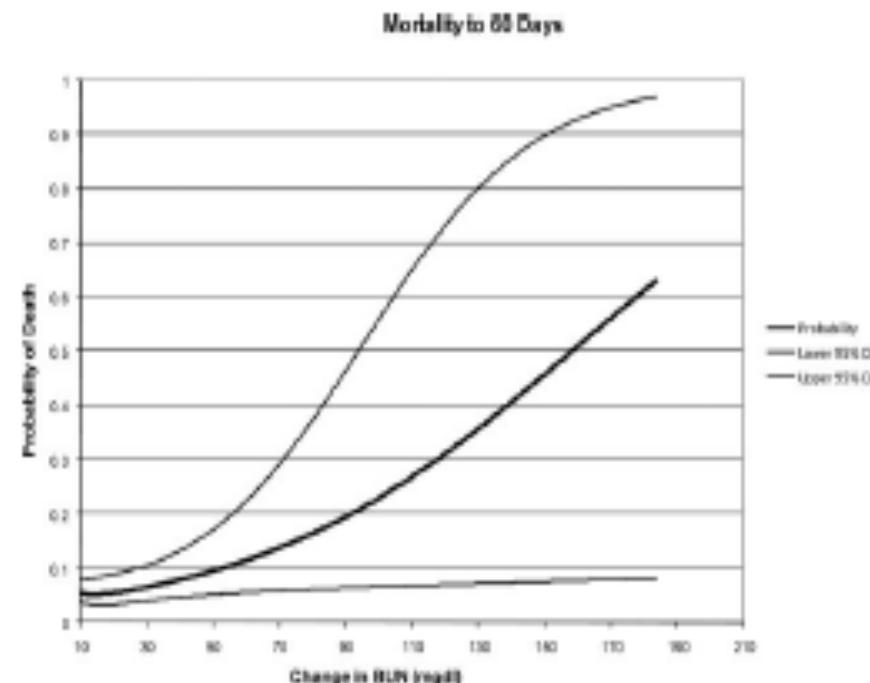
Biochemistry Assessment In ICU Under Mechanical Assisted Ventilation

- **Urea** **95 > 158** mg/dL
- **Creatinine** **1,6 > 1,8** mg/dL
- **eGFR (MDRD)** **43 > 33** ml/min/1,73 m²
- **BNP** **1160** pg/ml
- **Na⁺** **136 > 134** mEq/L
- **K⁺** **4,0 > 5,0** mEq/L
- **AST** **166 > 75** UI/L
- **ALT** **475 > 115** UI/L
- **Hb** **11,5 gr, HT% 33, MCV 92**

BUN Admission and Changes Predict 60 days outcome in AHF Pts

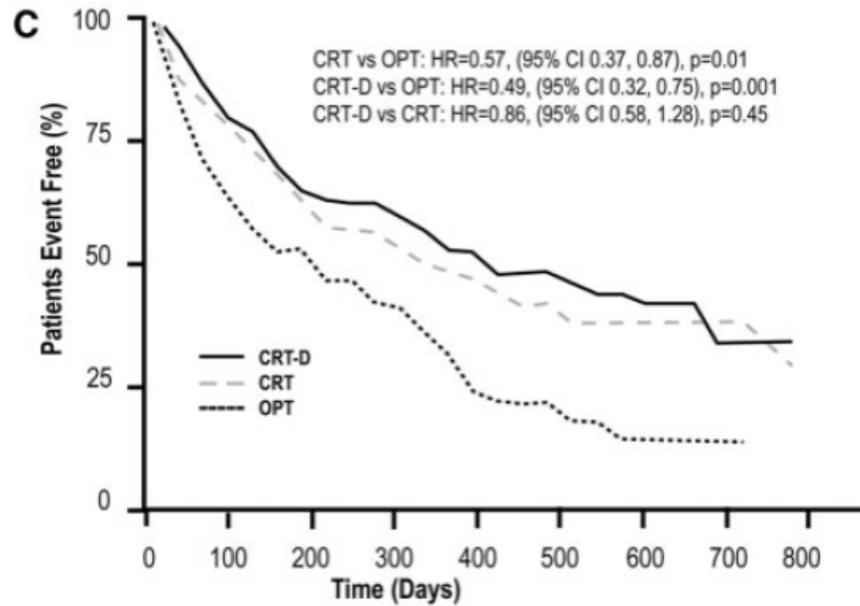


Baseline BUN and 60-day probability of death.



BUN changes and 60-day probability of death.

Effects of CRT on NYHA f. Cl. IV patients



| Treatment | Events (%) | Censored (%) | Median FU Time |
|--------------|------------|--------------|----------------|
| CRT-D (n=83) | 47 (57%) | 36 (43%) | 14.1 months |
| CRT (n=79) | 51 (65%) | 28 (35%) | 14.2 months |
| OPT (n=55) | 40 (73%) | 15 (27%) | 7.2 months |

Time to all-cause death or HF hospitalization

When Is It Too Late for Cardiac Resynchronization Therapy?

BENGT HERWEG, M.D. and S. SERGE BAROLD, M.D.

Arrhythmia Service and Division of Cardiology, Tampa General Hospital and University of South Florida, Tampa, Florida

Table I.

Published Reports of Cardiac Resynchronization in NYHA Class IV Patients on Intravenous Inotropic Therapy at the Time of Implantation

| Reference | No. pts | Etiology | Follow-up (Months) | No. Pts Weaned Off IV Inotrope Therapy | Symptomatic Improvement (no. pts) | Long- term Mortality |
|----------------------------------|---------|-----------------|-----------------------|--|---|---|
| Makati et al. ⁹ | 15 | ICM 73% | 12 | 1 | NA | 60% |
| Konstantino et al. ¹⁰ | 10 | ICM 100% | 9.5 median | 4 (median 5.5 mths) | 8 | 50% |
| Huneycutt et al. ¹¹ | 21 | ICM 50% | 12 | 18/21 (86%) | NA | 71% |
| Cowburn et al. ¹² | 10 | NA | 0.4 ± 0,4 | All 2 ± 2 days post-CRT | NA | 0% short-term |
| James et al. ¹³ | 6 | NA | 14 ± 11 | All survivors | NA | 50% |
| Simon et al. ¹⁴ | 18 | NA | 22 Median 5 | 6 (33%) | 11 | 25% |
| Milliez et al. ¹⁵ | 14 | ICM 5 NICM 9 | 36 | All within 3 days | All survivors | 15% |
| Herweg et al. ¹⁶ | 10 | ICM 4 NICM 6 | 25 ± 13 | 9/10 ± 15 ± 14 days post-CRT | 9 | 0%. |
| | | | | | | 3 pts underwent orthotopic transplantation 56, 257, and 910 days post-CRT |

No = number; pt = patient; mths = months; ICM = ischemic cardiomyopathy; NICM = nonischemic cardiomyopathy; NA = not available.

Repercussion of functional mitral regurgitation on reverse remodelling in cardiac resynchronization therapy

Fernando Cabrera-Bueno*, José Manuel García-Pinilla, José Peña-Hernández, Manuel Jiménez-Navarro, Juan José Gómez-Doblas, Alberto Barrera-Cordero, Javier Alzueta-Rodríguez, and Eduardo de Teresa-Galván

Servicio de Cardiología, Hospital Universitario Virgen de la Victoria de Málaga, Campus de Teatinos s/n, Colonia Santa Ines, Malaga, Spain

Conclusion

The baseline presence of important mitral regurgitation, with a ROA $\geq 0.20 \text{ cm}^2$, in patients with dilated cardiomyopathy who undergo CRT is associated with a lack of response in terms of reverse remodelling.

Clinical Decision

- CRT –D implant ruled out by the burden of age, ischemic HF etiology associated with other medical conditions (diabetes and renal failure) and by the presence of severe left systolic dysfunction coupled with relevant mitral regurgitation and right ventricular impairment.
- ICD implant not a primary need in a patient with progressive heart failure symptoms, despite optimized medical therapy.
- Treatment of proximal circumflex artery severe stenosis with PCI and DES, probably the most easy and appropriate therapeutic approach.
- Major limits of the therapeutic decision :
 - potentially inadequate
 - Could prevent or jeopardize further interventional device therapy for months.

Biochemistry assessment before H discharge

| | | |
|-------------------|------------------|----------------------------|
| • Urea | <u>99</u> | mg/dL |
| • Creatinine | 1,5 | mg/dL |
| • eGFR (MDRD) | 38,8 | ml/min/1,73 m ² |
| • Na ⁺ | 135 | mmol/L |
| • K ⁺ | 5,6 | mmol/L |
| • BNP | 348 | pg/ml |
| • Glic. | 135 | mg/dl |
| • Hb | 11,5 gr, | HT% 33, MCV 94 |

RX before H discharge

- Torasemide 10 mg b.i.d.
- Digoxin 0,0625 mg o.i.d.
- Spironolactone 12,5 mg o.i.d.
- Glicazide 30 mg t.i.d.
- Warfarin (to target INR 3)
- Ramipril 5 mg o.i.d.
- Water daily intake restriction 1L
- NaCl daily intake restriction 3 gr