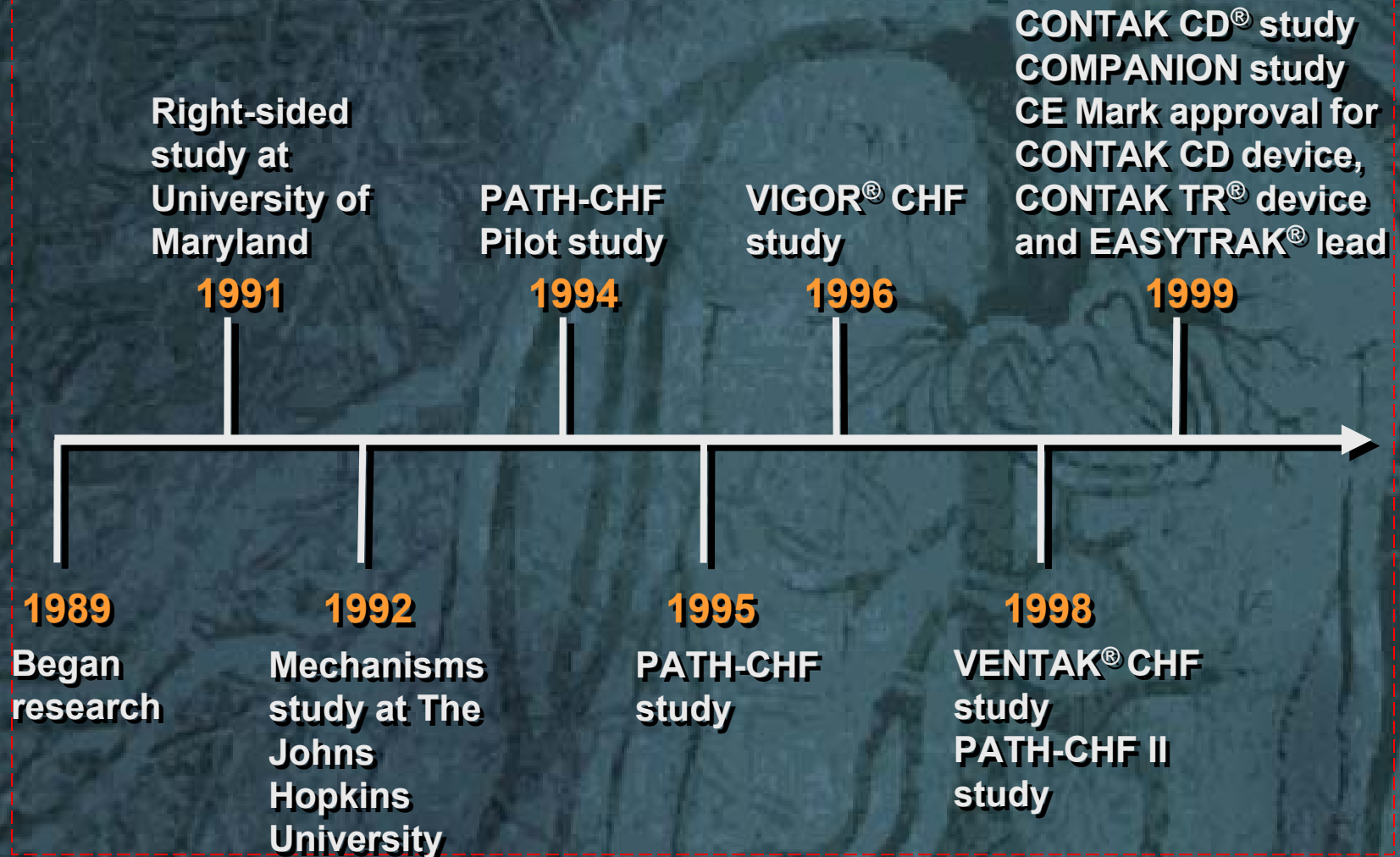


Element 15.00

Gilliam



Heart Failure Research



Multiple Issues Associated with Heart Failure

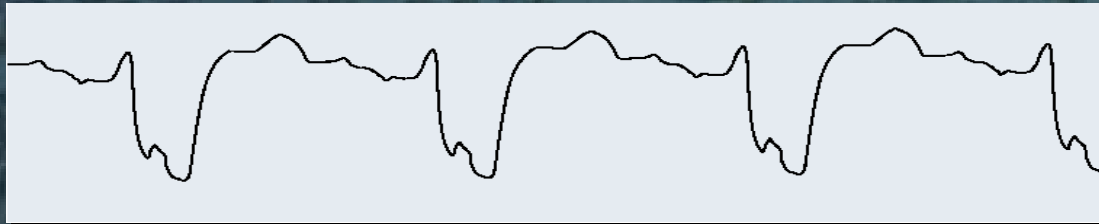
- Pts have conduction disturbances, wall motion abnormalities and mitral regurgitation
- These features impact ventricular filling, contractility and ultimately cardiac output

¹Van Orden Wallace, CJ. *Am J Cardiol.* 1992;70:1320-25.

Cardiac Resynchronization Therapy (CRT)

Ventricular Dysynchrony

- **Electrical:** *Inter- or intraventricular conduction delays typically manifest as LBBB*
- **Structural:** *disruption of myocardial collagen matrix impairing electrical conduction and mechanical efficiency*
- **Mechanical:** *Regional wall motion abnormalities with increased workload and stress—compromising ventricular mechanics*



Tavazzi L. Eur Heart J 2000;21:1211-1214

Cardiac Resynchronization

- Therapeutic intent of atrial synchronized biventricular pacing

Modification of interventricular, intraventricular, and atrial-ventricular activation sequences in patients with ventricular dyssynchrony

Complement to optimal medical therapy



Tavazzi L, Eur Heart J 2000;21:1211-1214

Sudden Cardiac Death (SCD)

High risk in heart failure patients

- **Heart failure pts experience SCD at 6-9 times rate of the general population**
- **Sudden death is the predominant mode of death in mild to moderate heart failure**

¹American Heart Association. 2002 heart and stroke statistical update. American Heart Association, 2001.

MERIT-HF study group. LANCET. 1999;353:2001-07.

SCD in Heart Failure

High risk in heart failure patients

■ Degree of SCD risk by class

Mortality NYHA class II is 5-15%

50 to 80% of the deaths are sudden

Mortality NYHA class III is 20-50%

Up to half of the deaths are sudden

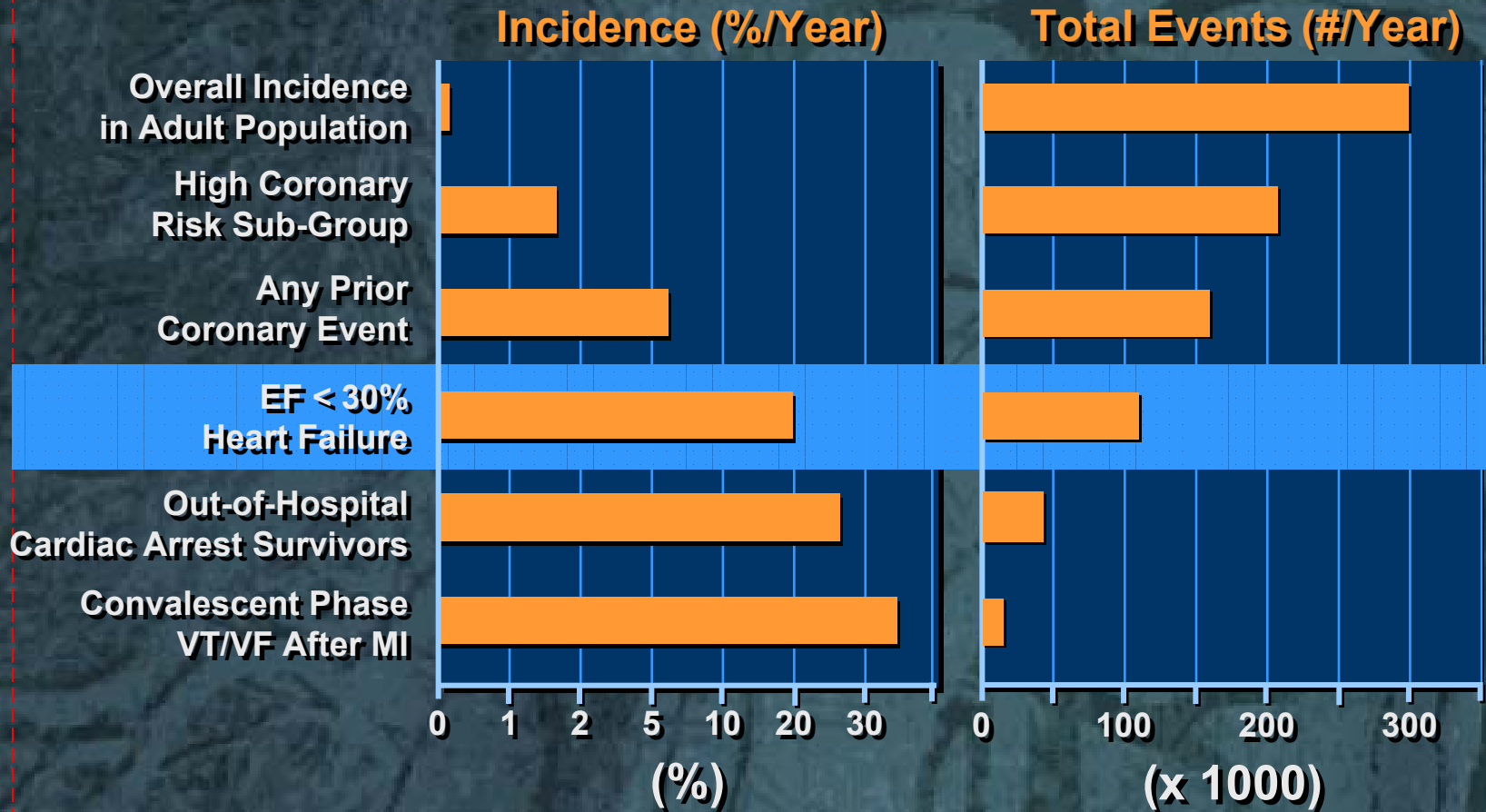
Mortality in NYHA class IV is 30-70%

5-30% of deaths are sudden

Uretsky BF, Sheahan RG. JACC. 1997;30:1589-1597

SCD in Heart Failure

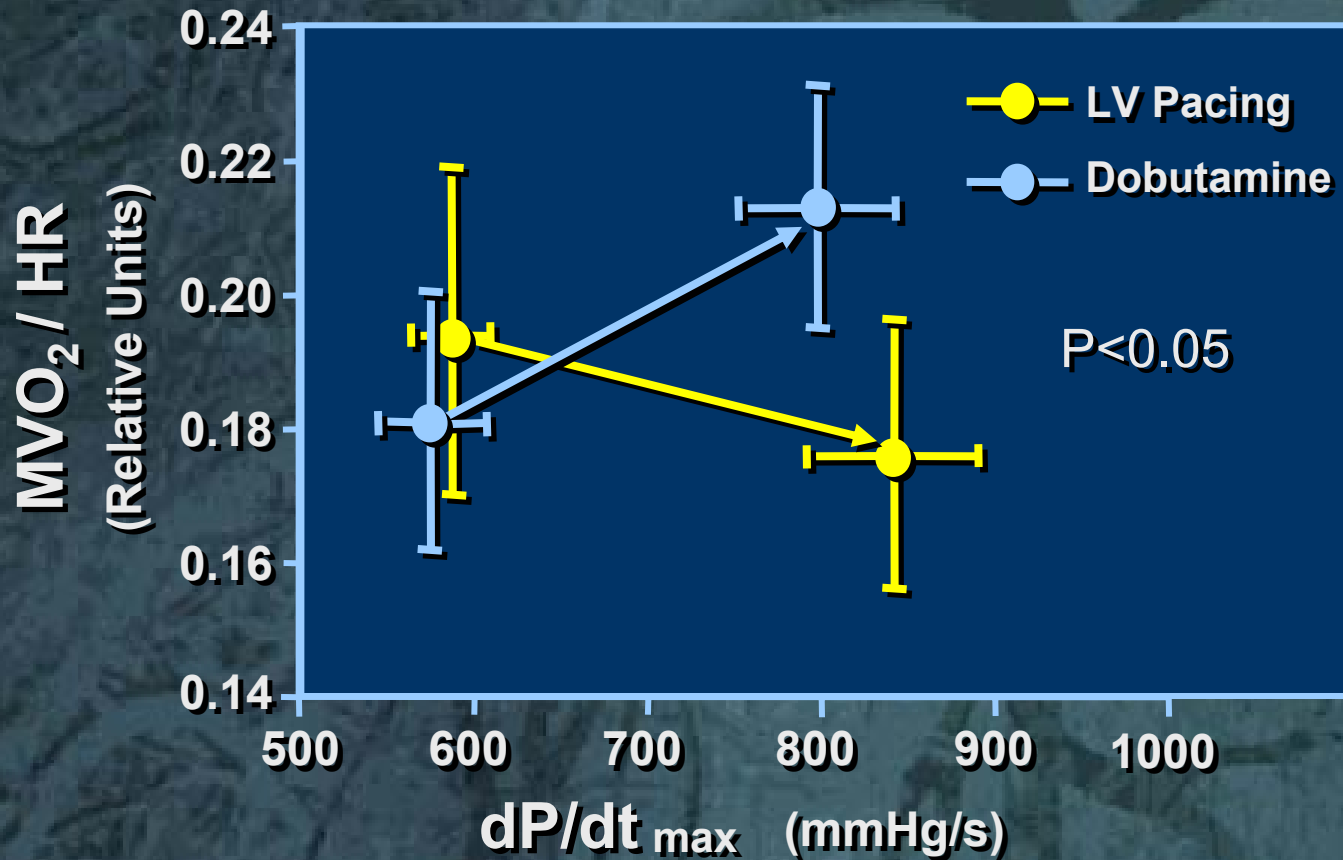
Incidence and total events



Myerbert RJ, et al. *Circ.* 1992;85(suppl I):I-2-I-10.

Energetics Data

CRT decreasing O2 consumption versus dobutamine



Nelson GS, et al. Circ. 2000;102:3057.

COMPANION

Comparison of Medical Therapy, Pacing and Defibrillation in Heart Failure

Hypothesis

- CRT with optimal pharmacologic therapy (OPT), alone or in combination with ICD backup, can:
 - Reduce all-cause hospitalization and mortality*
 - Reduce cardiac morbidity*
 - Increase total survival*
 - Improve exercise performance (sub-study)*
- ...when compared to OPT alone*

COMPANION

Study design

Parallel, randomized

Randomization

■ OPT

1



■ OPT

2



+



■ CRT

■ OPT

2



+

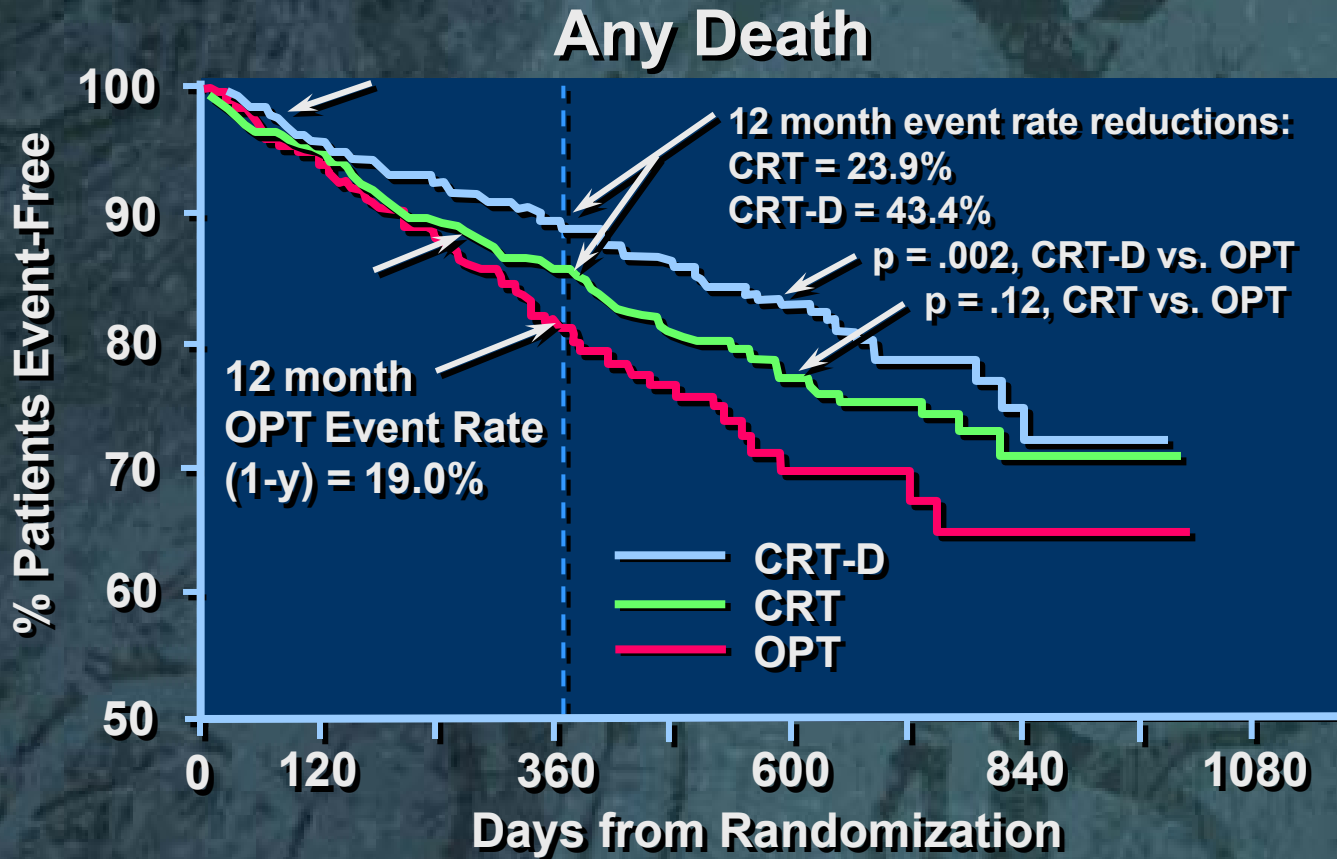


■ CRT-D

Companion Trial

- Largest heart failure trial ever
- 1st heart failure trial designed to study death and hospitalization in heart failure
- Enrollment >1600 pts at 130 centers
- Study halted on November 21, 2002 by the Data & Safety Monitoring Board, primary endpoints had been achieved.

Companion: Secondary Endpoint of All-Cause Mortality



ACC Late-Breaker 3/31/03 Preliminary Results

Implant Process Overview

- **Insertion of three leads (RA, RV, LV)**
 - Standard pacing lead in RA*
 - Standard pacing / defibrillation lead in RV*
 - LV lead placed transvenously in a cardiac vein branch, on the LV freewall (accessed coronary sinus)*
- **Implantation of cardiac resynchronization device**
 - Similar to standard pacemaker or ICD implant procedure*

Utilities ▾

Tachy Mode ▾

Monitor+Therapy



Heart Rate Variability

Graph

Trend

Last Measured

Date/Time: 16-JUL-2003 13:44
 % of Time Used: 100
 Footprint: 33 %
 SDANN: 83 ms
 Mode: VDD
 Lower Rate Limit: 40 ppm
 Max Tracking Rate: 120 ppm
 AV Delay: 100 ms
 Pacing Chamber: BiV

Battery Status

Intrinsic Amplitude

Lead Impedance

Pace Threshold

HRV

Activity Log

Trending

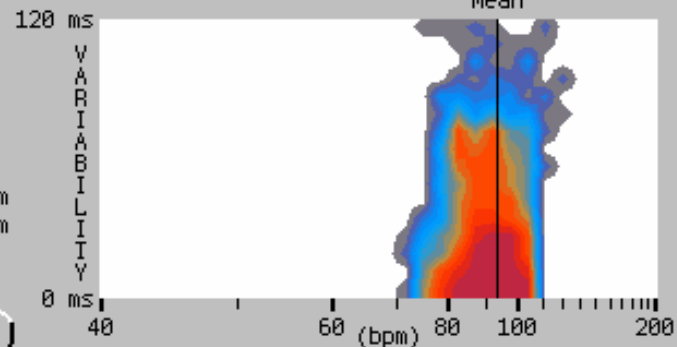
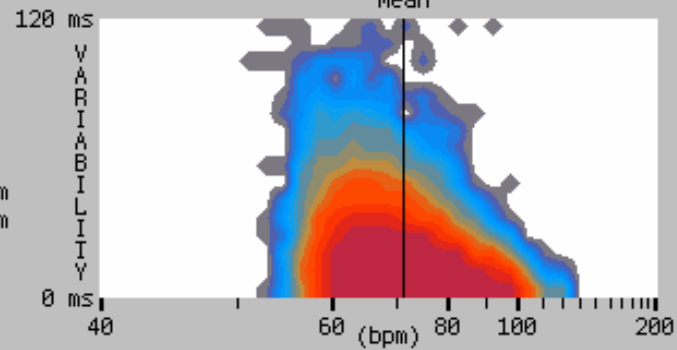
Snapshot Viewer



Reference

Date/Time: 06-JUN-2003 13:44
 % of Time Used: 100
 Footprint: 18 %
 SDANN: 32 ms
 Mode: VDD
 Lower Rate Limit: 40 ppm
 Max Tracking Rate: 120 ppm
 AV Delay: 100 ms
 Pacing Chamber: BiV

Copy from Last to Reference



System Summary

Quick Check

Tachy Parameters

HF/Brady Parameters

Setup

Therapy History

Diagnostic Evaluation

EP Test

Utilities ▾

Tachy Mode ▾

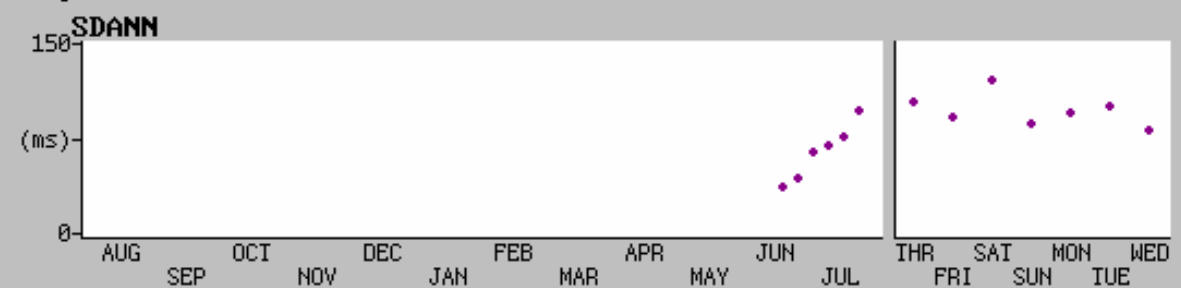
Monitor+Therapy



Heart Rate Variability

Graph **Trend**

- Battery Status
- Intrinsic Amplitude
- Lead Impedance
- Pace Threshold
- HRV**
- Activity Log
- Trending
- Snapshot Viewer



System Summary	Quick Check	Tachy Parameters	HF/Brady Parameters	Setup	Therapy History	Diagnostic Evaluation	EP Test
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Utilities ▾

Tachy Mode ▾

Monitor+Therapy



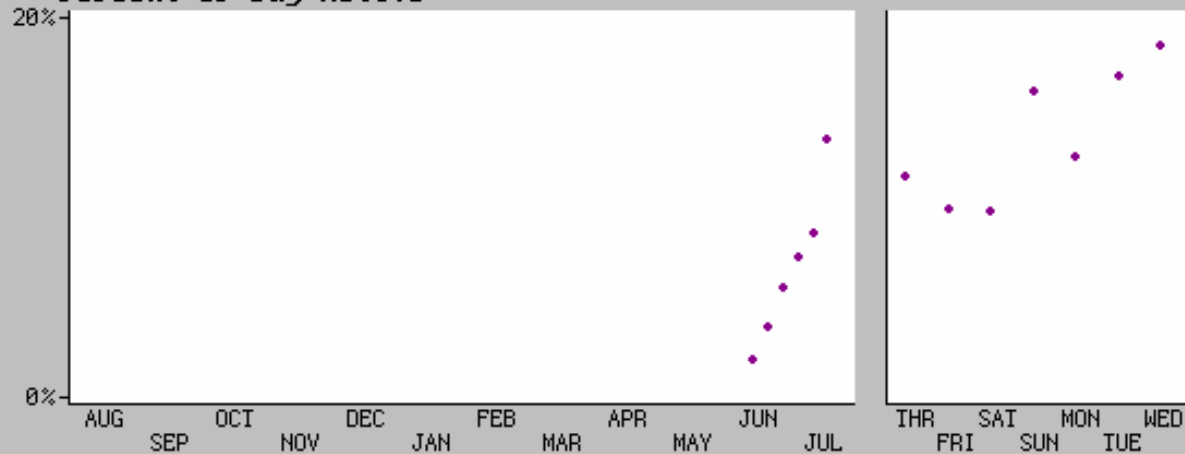
Off

Off

Activity Log

- Battery Status
- Intrinsic Amplitude
- Lead Impedance
- Pace Threshold
- HRV
- Activity Log**
- Trending
- Snapshot Viewer

Percent of Day Active



System Summary

Quick Check

Tachy Parameters

HF/Brady Parameters

Setup

Therapy History

Diagnostic Evaluation

EP Test

Utilities ▾

Tachy Mode ▾

Monitor+Therapy



Since Last Reset

Histograms

Normal Scale

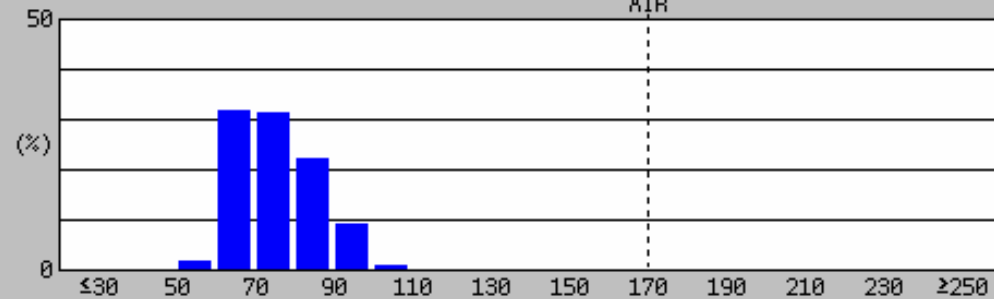
Device Totals

Magnify

04-JUN-2003 to 17-JUL-2003

Atrial

Paced
 Sensed



Conversion Summary

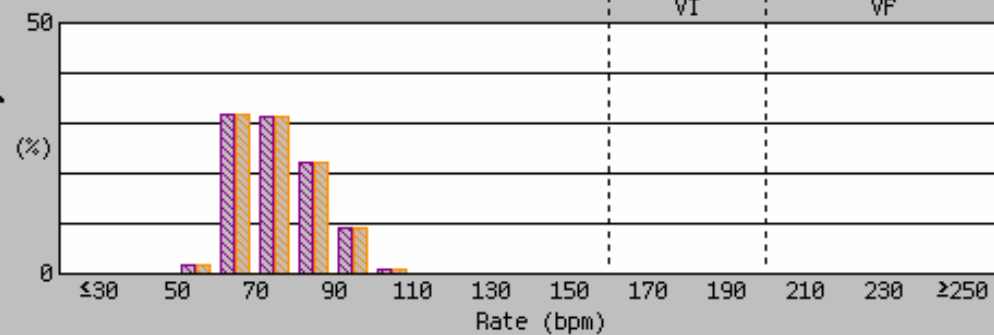
Arrhythmia Logbook

Counters

Histograms

Ventricular

RV LV
 Paced
 Sensed



Reset...

System Summary

Quick Check

Tachy Parameters

HF/Brady Parameters

Setup

Therapy History

Diagnostic Evaluation

EP Test

Cardiac Resynchronization Therapy

***Patient and Device Selection,
Implant and Follow-up Overview***

Follow-up Care

(Brief Overview)

- **Standard medical management by practice guidelines and clinician judgment**
- **Standard device follow-up by practice guidelines and clinician judgment**

Goal to achieve 100% biventricular pacing to deliver therapy

AV interval optimization recommended to achieve maximum diastolic filling time

Conclusions

Biventricular Pacing has been proven to be beneficial in CHF by improving both morbidity (hospitalization) and mortality (CRT-D)

In Summary

CRT offers an adjunctive approach for treating selected patients with ventricular dyssynchrony and moderate to severe heart failure who remain symptomatic despite optimal, stable medical therapy

