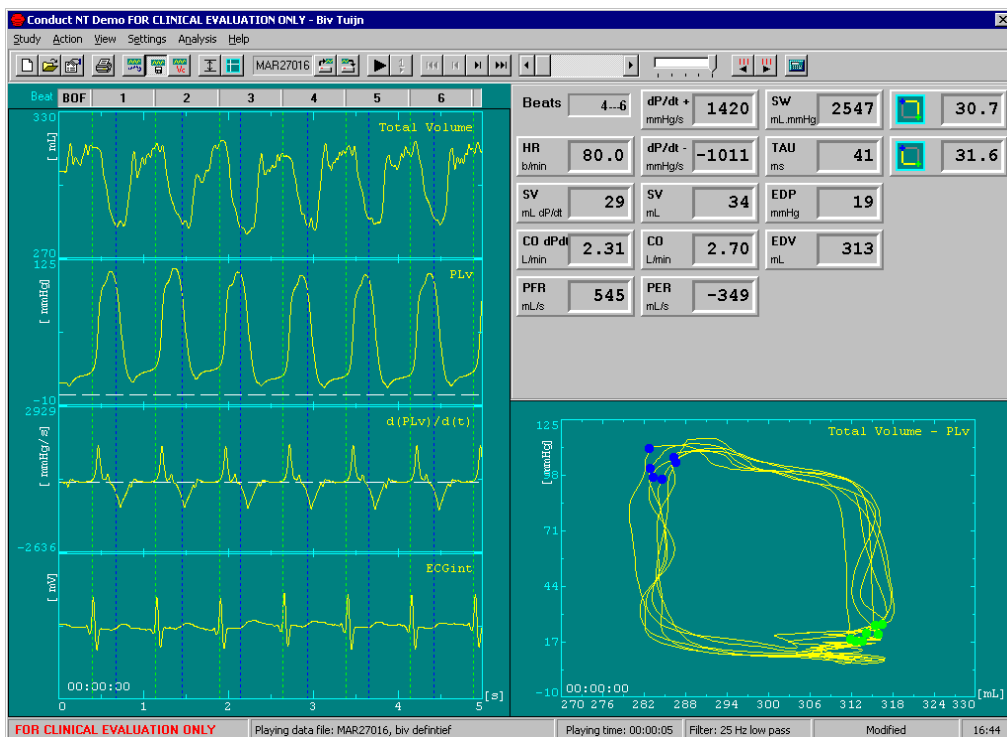


### Introduction

Cardiac Resynchronization Therapy (CRT) is an accepted tool in the treatment of drug refractory heart failure. One of the involved mechanisms is restoration of the inter- and/or intra ventricular delay, resulting in a homogeneous contraction with synchronous moving ventricles. Key point in CRT is an optimal position of the lead(s) as well as a hemodynamic setting of the parameters involved, such as the AV- and the VV-delay. Information about the cardiovascular processes and the effect on cardiac hemodynamics can help to define the best heart failure therapy for each individual or to optimize the used therapy as CRT. Pressure-Volume loops illustrate the influence of changed pre- and afterloads and thus reflect the autoregulatory change of the myocardial contraction force.



Thanks for using this picture to Cardio Thor. Surg. and Cardiol. dep. of the Academic Hospital Maastricht

### CFL-512

The CFL-512 can be used in a clinical setting to measure the effect of multi-site stimulation the contraction pattern of the ventricle, to define the hemodynamically optimal pacing. PV-measurement by conductance catheter can quickly and simply be applied in the clinical situation.

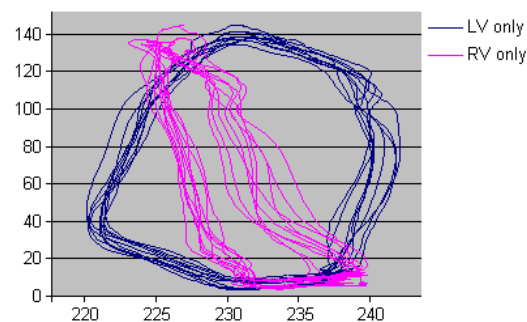
### Conduct NT

With the Conduct NT software program a clear and instant image of relative changes during CRT can be generated. In real-time, beat to beat many useful hemodynamic variables, like stroke volume, max dP/dt, stroke work, PER, PFR, Tau and values for dyssynchrony can be displayed.

### Pressure-Volume loops

In several hospitals: *Academic Hospital Maastricht; Isala Hospital Zwolle and the VU University Hospital Amsterdam* pressure-volume loops are used to define the optimal lead position. Based on these measurements the lead(s) are implanted with an optimal hemodynamic result.

The picture on the right demonstrates how pv-loop can change pacing on the left ventricle or right ventricle. These changes can be visualized within one second.



Thanks for using this picture to Isala Hospital Zwolle

### Conclusion

Understanding the cardiovascular process and its effect on cardiac hemodynamics is essential in the therapy of heart failure. With the aid of the CFL-512 in combination with the Conduct NT software module you are able to visualize and analyse the underlying mechanisms of cardiac dynamics with pressure-volume loops and LVdP/dt, and to optimise cardiac therapy in heart failure patients.

### Contact CD Leycom

For further questions or comments, please contact us  
 by phone +31 79 360 1780  
 or by E-mail [support@cdleycom.com](mailto:support@cdleycom.com).  
 Website [www.cdleycom.com](http://www.cdleycom.com)

## References

A. Dekker, B. Phelps, B. Dijkman, T. van der Nagel, F. van der Veen, G. Geskes, J. Maessen.

Epicardial left ventricular lead placement for cardiac resynchronization therapy: optimal pace site selection with pressure-volume loops.

P. Steendijk, S. Tulner, M. Wiemer, R. Bleasdale, J. Bax, E. van der Wall, J. Vogt, M. Schaliij.

Pressure-Volume measurements by conductance catheter during CRT

Willerson JT, Kereiakis DJ. Cardiac resynchronization therapy: helpful now in selected patients with CHF. Circulation 2004;109:308-309.

"It will be useful if additional parameters can be developed that identify dyssynchrony in the human heart in a more sensitive and specific way, and potentially helpful if they are utilized to help place CRT leads in the future."

Steendijk P, Tulner SA, Schreuder JJ, et al. Quantification of left ventricular mechanical dyssynchrony by conductance catheter in heart failure patients. Am J Physiol 2004;286:H723-730.

"Ventricular mechanical dyssynchrony can be measured real-time and operator-independent by the conductance catheter technique"

Schreuder JJ, Castiglioni A, Donelli , et al. Acute decrease of left ventricular mechanical dyssynchrony and improvement of contractile state and energy efficiency after left ventricular restoration. J Thorac Cardiovasc Surg 2005;129:123-129.

"The conductance catheter technique allows an analysis of dyskinesia and akinesia at high-time resolution"

Dekker A, Phelps B, Dijkman B, et al. Epicardial left ventricular lead placement for cardiac resynchronization therapy: Optimal pace site selection with pressure-volume loops. J Thorac Cardiovasc Surg 2004;127:1641-1647.

"Pressure-volume loops measured by the conductance catheter technique offer real-time guidance for epicardial lead placement in CRT therapy."

Schreuder JJ, Castiglioni A, Donelli , et al. Acute decrease of left ventricular mechanical dyssynchrony and improvement of contractile state and energy efficiency after left ventricular restoration. J Thorac Cardiovasc Surg 2005;129:123-129.

"Left ventricular mechanical dyssynchrony (mechanical inefficiency) correlated markedly inverse with left ventricular energy efficiency and contractile state as measured by end-systolic elastance."

Auricchio A, Abraham WT, Cardiac resynchronization therapy: current state of the art: costs versus benefit. Circulation 2004;109:300-307.

"Thus it conceivable that dyssynchrony represents a newly appreciated pathophysiological process that directly depresses ventricular function and ultimately leads to ventricular dilation and heart failure."

Leclercq C, Hare JM. Ventricular resynchronization. Circulation 2004;109:296-299.

"It remains unknown whether dyssynchrony represents a central pathophysiological process or is a marker of progressing cardiac dysfunction in CHF."

Brutsaert D. Nonuniformity: a physiologic modulator of contraction and relaxation of the normal heart. J Am Coll Cardiol 1987;9:341-348.

"LV mechanical dyssynchrony may act as a modulator of cardiac performance together with heart rate, contractile state, pre-load and afterload."

**For more references look at our website [www.cdleycom.com](http://www.cdleycom.com) .**

If you have any questions or comments:

**Please contact CD Leycom for more information**

by phone +31-79 -360 1780  
or by E-mail [support@cdleycom.com](mailto:support@cdleycom.com).