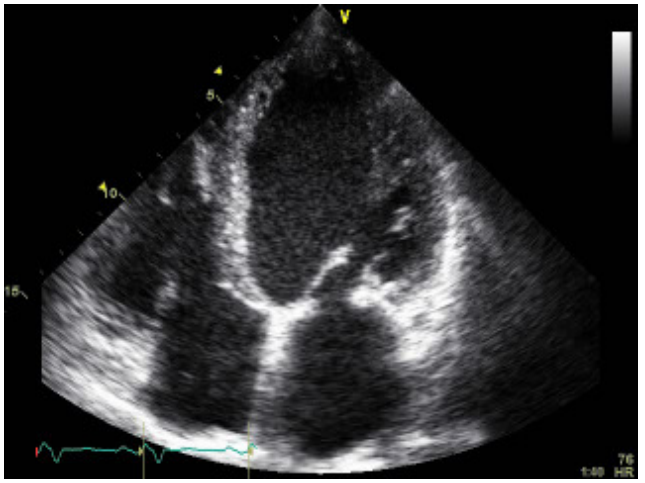
# Herbsttagung der DKG

## AG: „Kardiovaskuläre Intensiv- und Notfallmedizin“

## Der kardiogene Schock

# Herzchirurgische Möglichkeiten im Schock



Nürnberg, den 09.10.2010

**Nicolas Doll**

**Sana Herzchirurgie Stuttgart**

# Herbsttagung der DKG

sana

## Presenter Disclosure Information

Nicolas Doll

Within the past 12 months, the presenter or their spouse/partner have had a financial interest/arrangement or affiliation with the organization listed below.

| Company Name: | Relationship: |
| --- | --- |
| Atricure | Consultant |
| St. Jude Medical | Advisory Board |

# Chirurgische Optionen bei akuter Herzinsuffizienz

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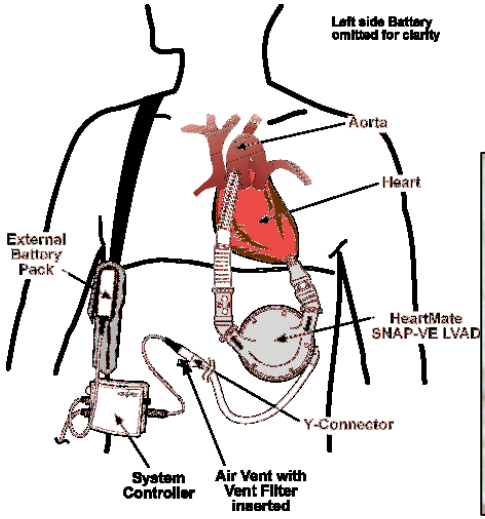
Bypasschirurgie

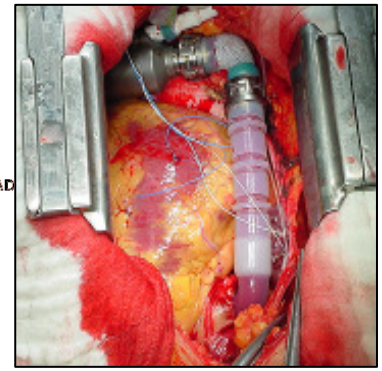
„konventionelle“ Chirurgie

Infarktkomplikationen

Akutes Herz Versagen

VAD / TAH



Transplantation

# Bypasschirurgie:
# Akutes Koronarsyndrom

## Emergency Coronary Artery Bypass Graft Surgery for Acute Coronary Syndrome

### Beating Heart Versus Conventional Cardioplegic Cardiac Arrest Strategies

Ardawan Julian Rastan, MD; Judith Isabell Eckenstein, MD; Bettina Hentschel, PhD; Anne Kathrin Funkat, PhD; Jan Fritz Gummert, MD, PhD; Nicolas Doll, MD, PhD; Thomas Walther, MD, PhD; Volkmar Falk, MD, PhD; Friedrich Wilhelm Mohr, MD, PhD

*Background*—Aim of this study was to compare the outcome of beating heart versus conventional coronary artery bypass graft (CABG) strategies in acute coronary syndromes for emergency indications.

*Methods and Results*—638 consecutive patients with acute coronary syndrome (ACS) receiving emergency CABG surgery via midline sternotomy from January 2000 to September 2005 were evaluated. Propensity score analysis was used to predict the probability of undergoing beating heart (BH) (n=240) versus cardioplegic cardiac arrest (CA) (n=398) strategies. Patients presented with stable hemodynamics (n=531) or in cardiogenic shock (CS) (n=107). Hospital and follow-up outcome was compared by propensity score adjusted multiregression analysis. BH included 116 on-pump and 124 off-pump (OPCAB) procedures. There was a propensity to operate CS patients on the beating heart (multivariate odds ratio [OR], 3.8; $P$=0.001). Under stable hemodynamics significant predictors for BH selection were logEuroSCORE >20% (OR, 2.05), creatinine >1.8 mg/dL (OR, 4.12), complicated percutaneous coronary intervention (OR, 1.88), ejection fraction <30% (OR, 2.64), whereas left main disease (OR, 0.68), circumflex artery (OR, 0.32), and 3-vessel disease (OR, 0.67) indicated preference for cardioplegic arrest. Time from skin incision to culprit lesion revascularization was significantly reduced in BH patients. BH surgery led to a significant benefit in terms of less drainage loss, less transfusion requirement, less inotropic support, shorter ventilation time, lower stroke rate, and shorter intensive care unit stay. In CS, BH was associated with lower incidence of stroke, inotropic support, acute renal failure, new atrial fibrillation and sternal wound healing complications. In CS patients, hospital mortality rate was reduced when using beating heart strategies ($P$=0.048). Overall survival, major adverse cerebral and cardiovascular event rate, and repeated revascularization was comparable during a 5-year follow-up.

*Conclusions*—Beating heart strategies are associated with an improved hospital outcome and comparable long-term results for high-risk patients presenting acute coronary syndrome with or without CS. (*Circulation*. **2006;114[suppl I]:I-477–I-485.**)

# Infarkt VSD

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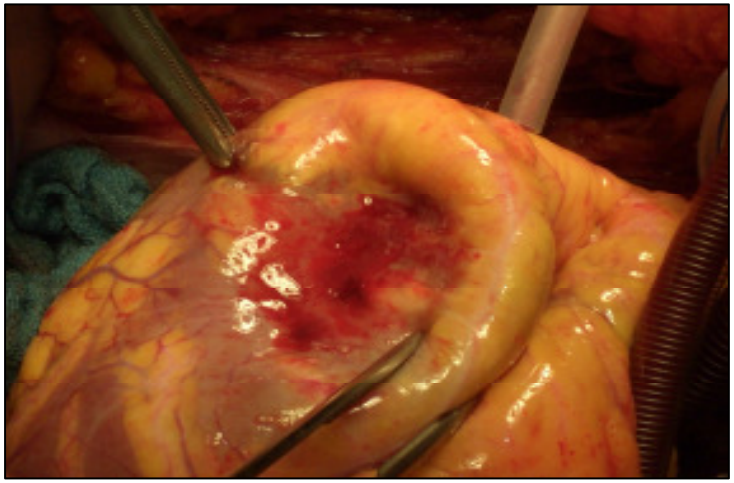

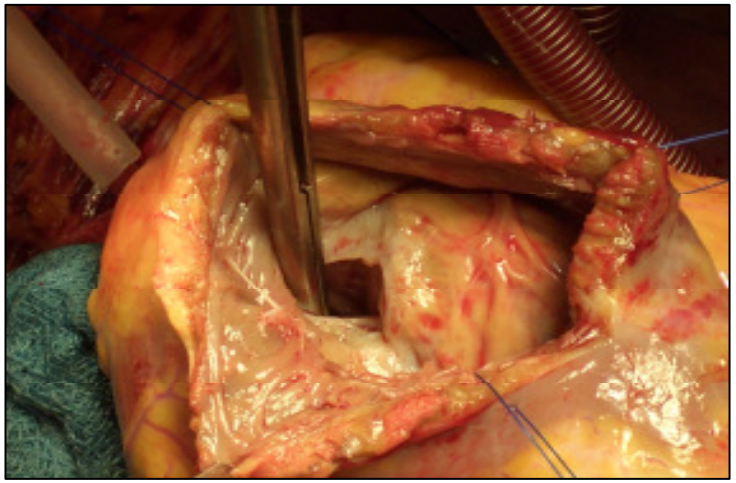

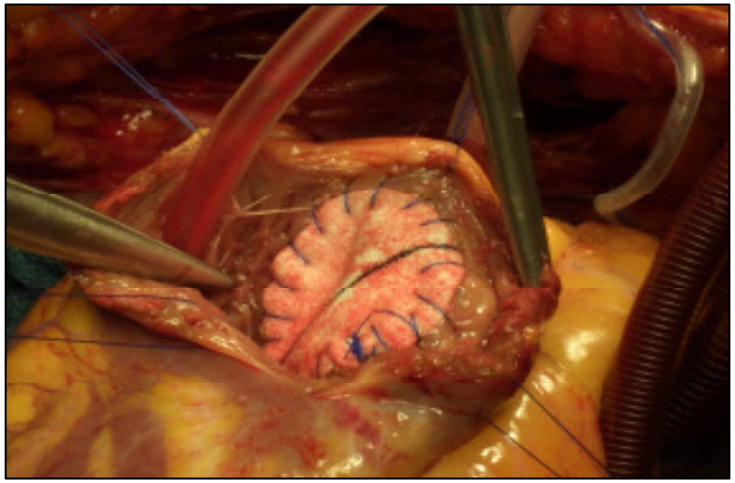

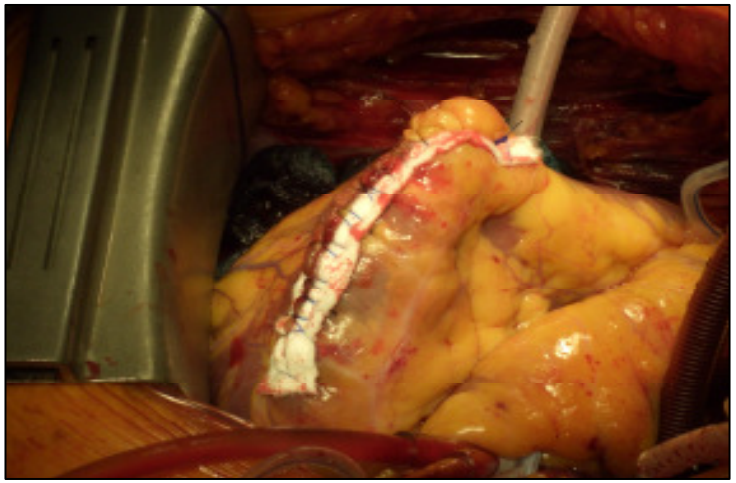

# Aktuelle Ergebnisse Infarkt VSD

- 41 Patienten
- Krankenhausletalität 32 %
  - Posteriores Septum 43 %
  - Anteriores Septum 30 %
- Reinterventionsrate 37 %
- Empfehlung: OP nach 4 Wochen
  ***verbessert Prognose***

*J Cardiothorac Surg. 2009 Jan 6;4(1):*

# Ventrikelreduktionsplastik

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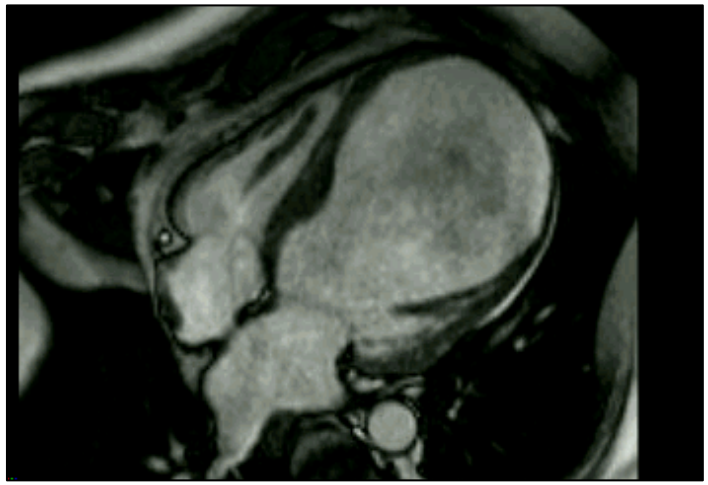
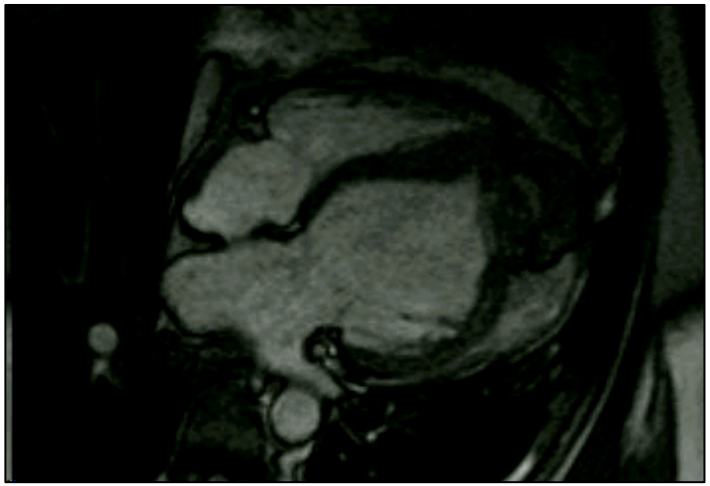
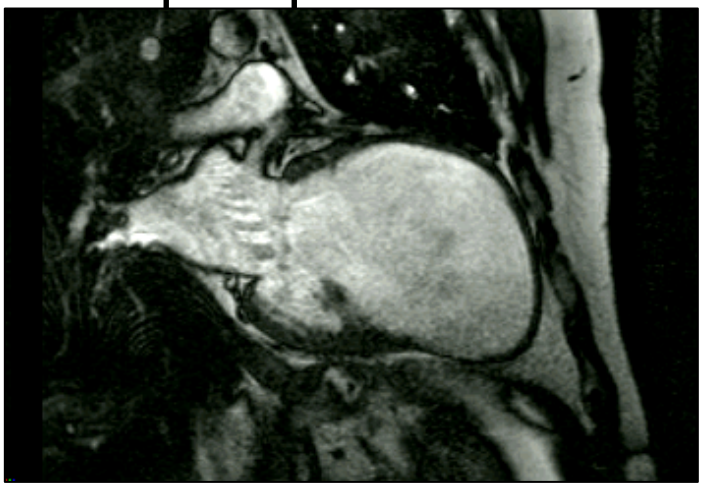
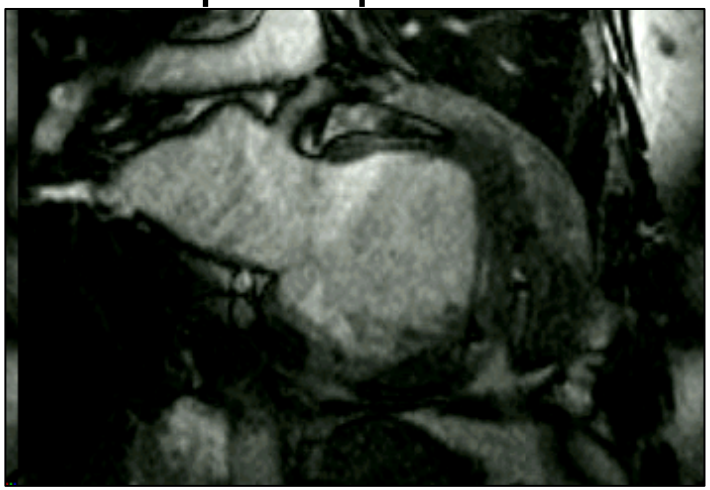


präoperativ



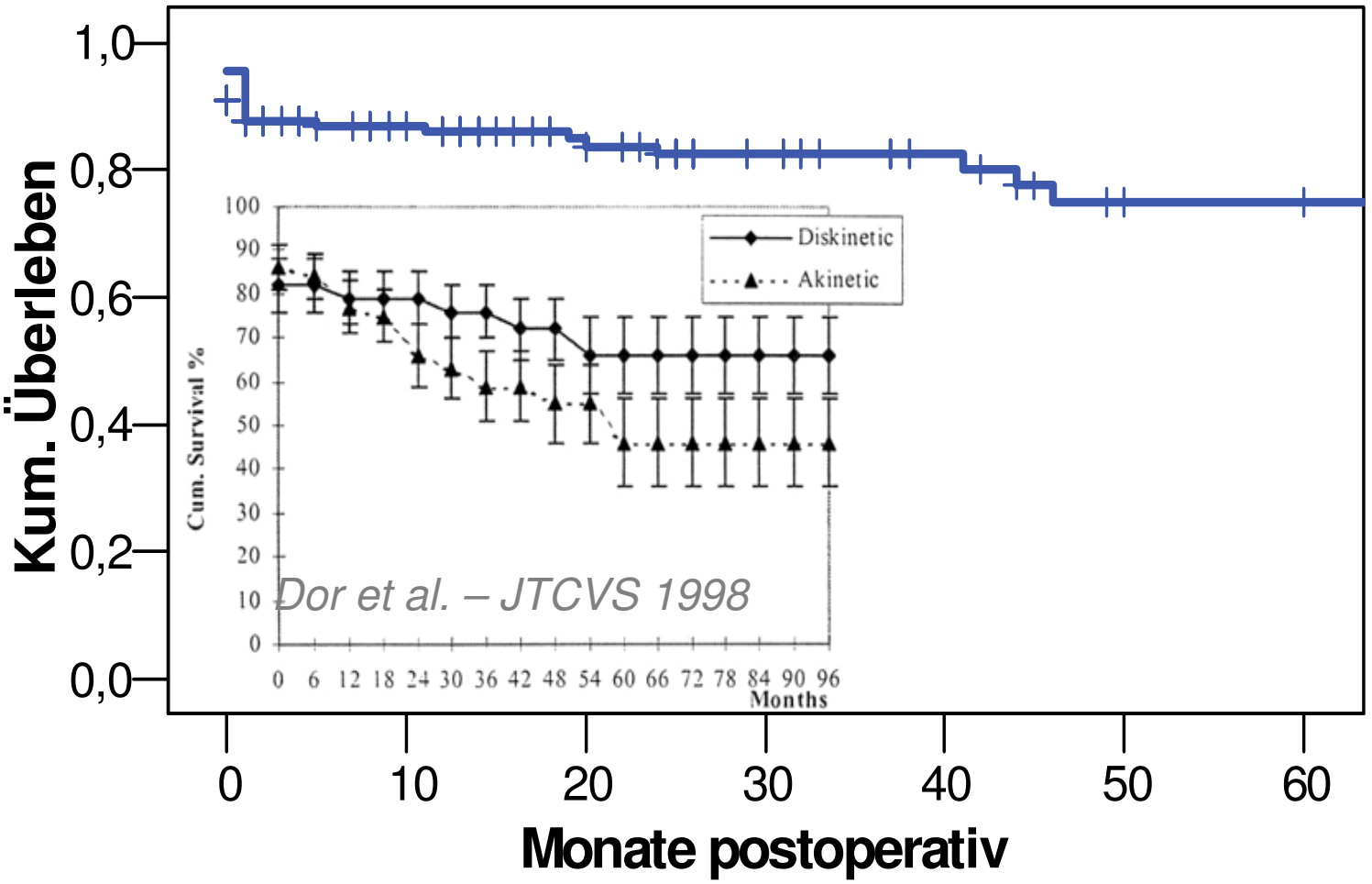
postoperativ





Pat. F.W., 48 Jahre

# 5 - Jahresüberleben nach Ventrikelreduktionsplastik (n = 208)




HZ Leipzig (1994 – 2004)

# Mechanische Kreislaufunterstützung
## Indikation

- Kardiogener Schock nach Herzinfarkt
- Postoperatives Low Output – Syndrom (nach herzchirurgischen Eingriffen)
- Stabilisierung bis zur Transplantation (bridge to transplant)
- Herzersatztherapie (destination therapy)

# Mechanische Kreislaufunterstützung
## Funktionsweise

- IABP / IABP ähnliche
- Zentrifugalpumpe
- Axiale Pumpe
- Pulsatile Pumpen
  - parakorporal / intrakorporal
  - linksventrikulär / biventrikulär
  - pneumatisch / elektrisch
- Kunstherz

# Mechanische Kreislaufunterstützung

## Indikation

| | |
|---|---|
| Cardiac Index | < 2,0l/min/m² |
| + eines der folgenden Kriterien | |
| RRsys | < 90 mmHg |
| ZVD | > 18 mmHg |

oder zwei der folgenden Kriterien

| | |
|---|---|
| Dopamin | > 10 µg/kg/min |
| Dobutamin | > 10 µg/kg/min |
| Adrenalin | > 0.2 µg/kg/min |

Sonstige kardiovaskuläre Medikamente in max. Dosierung

Intraaortale Ballonpumpe

Kardiopulmonaler Bypass

*Cardio West – Studie Copeland et al. – NEJM 351, 2004*

# John Heysham Gibbon and Mary Hopkinson with HLM

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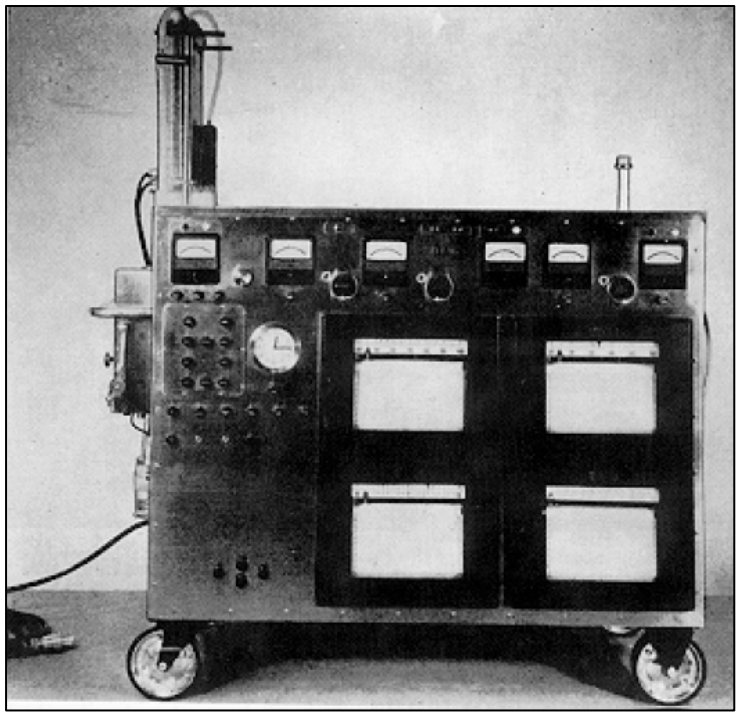
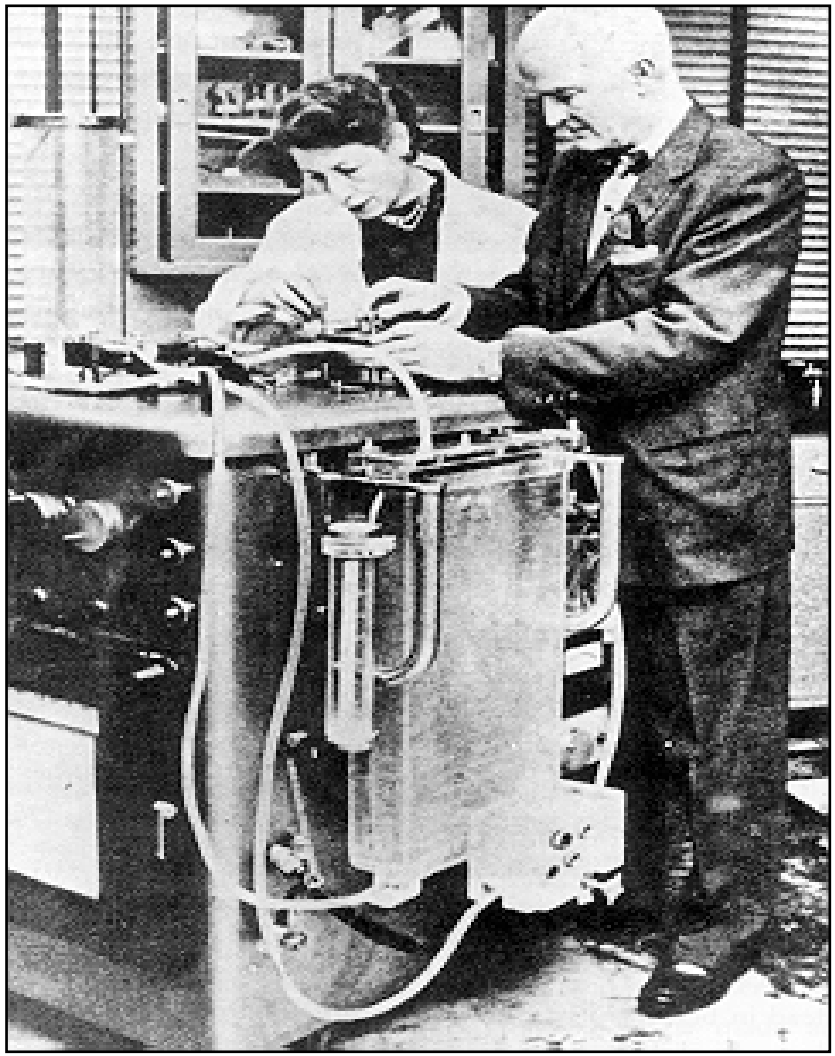
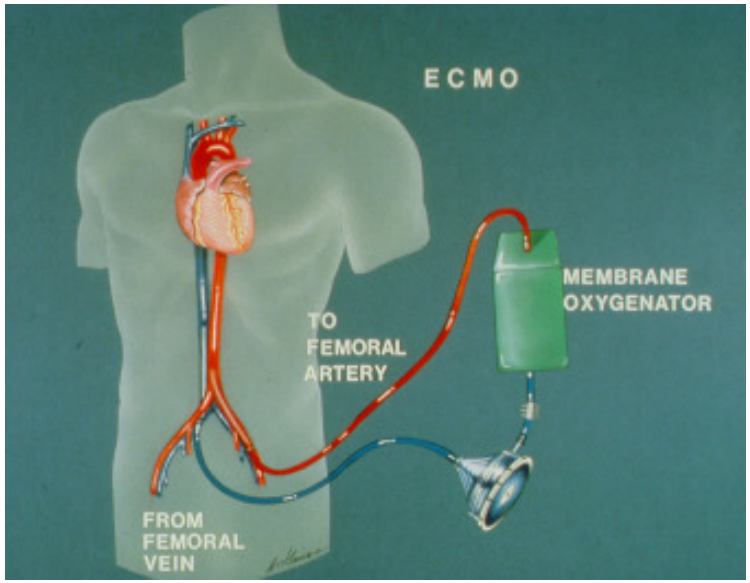
**1954**





# Zentrifugalpumpe / ECMO

- Aufbau fast wie HLM
- Heparin - beschichtete Systeme
- Arterielle Kanüle: Ascendens / Femoralis / Axillaris
- Venöse Kanüle: Rechter Vorhof oder Femoralis




# IABP and outcome

**n = 144 (66%)**

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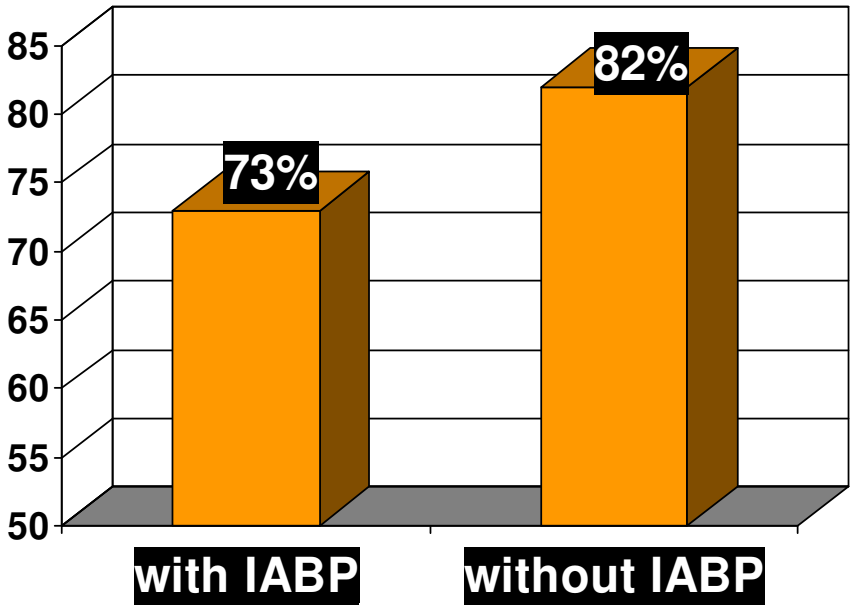
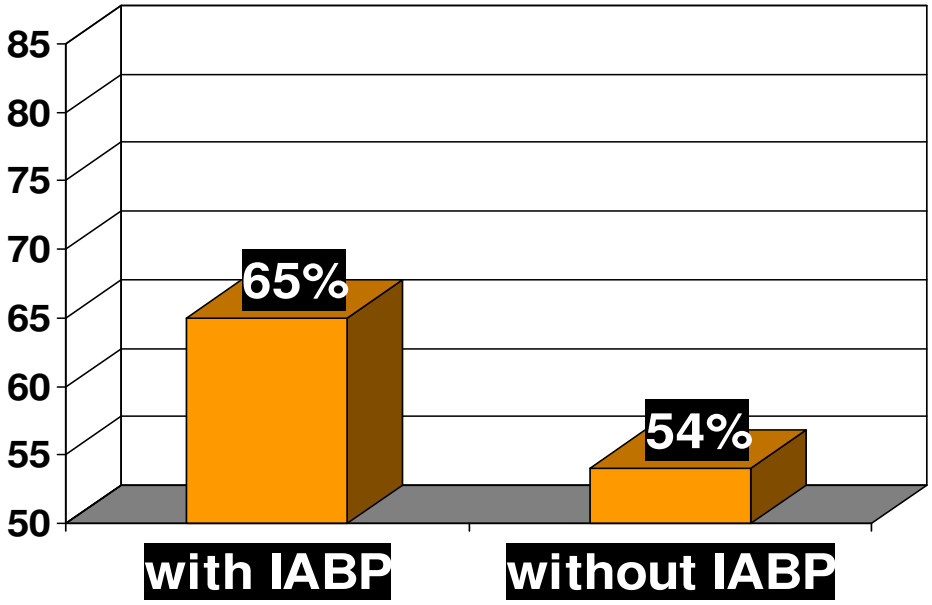
## Mortality




p < 0.0001

## Weaning




p < 0.0001

*Doll et al Annals 2004*

# Out of 18.150 pts.

## 219 received ECMO (1,2%)

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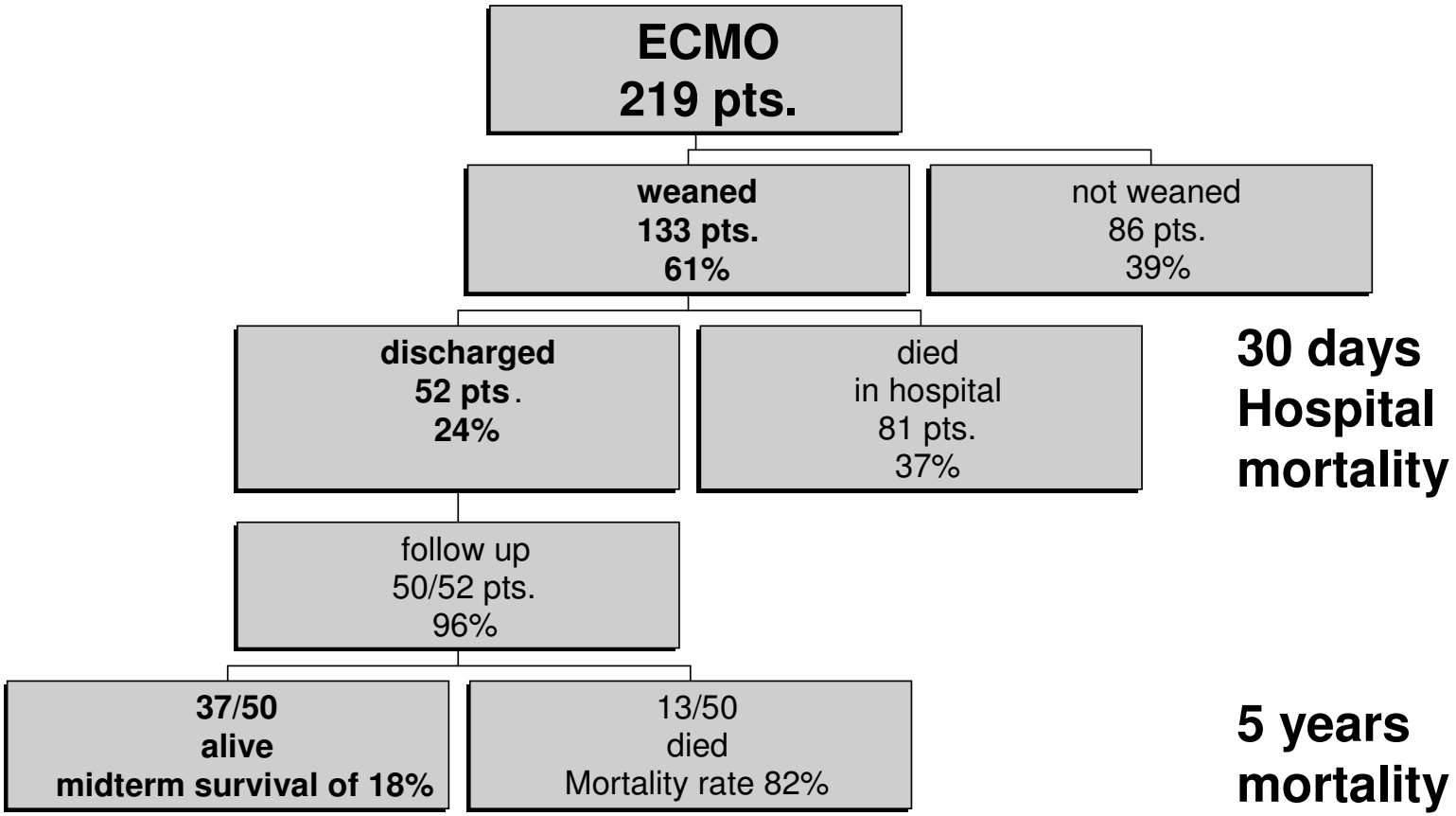


*Doll et al Annals 2004*

# 5-years follow-up

**n = 50 / 52 (96%)**

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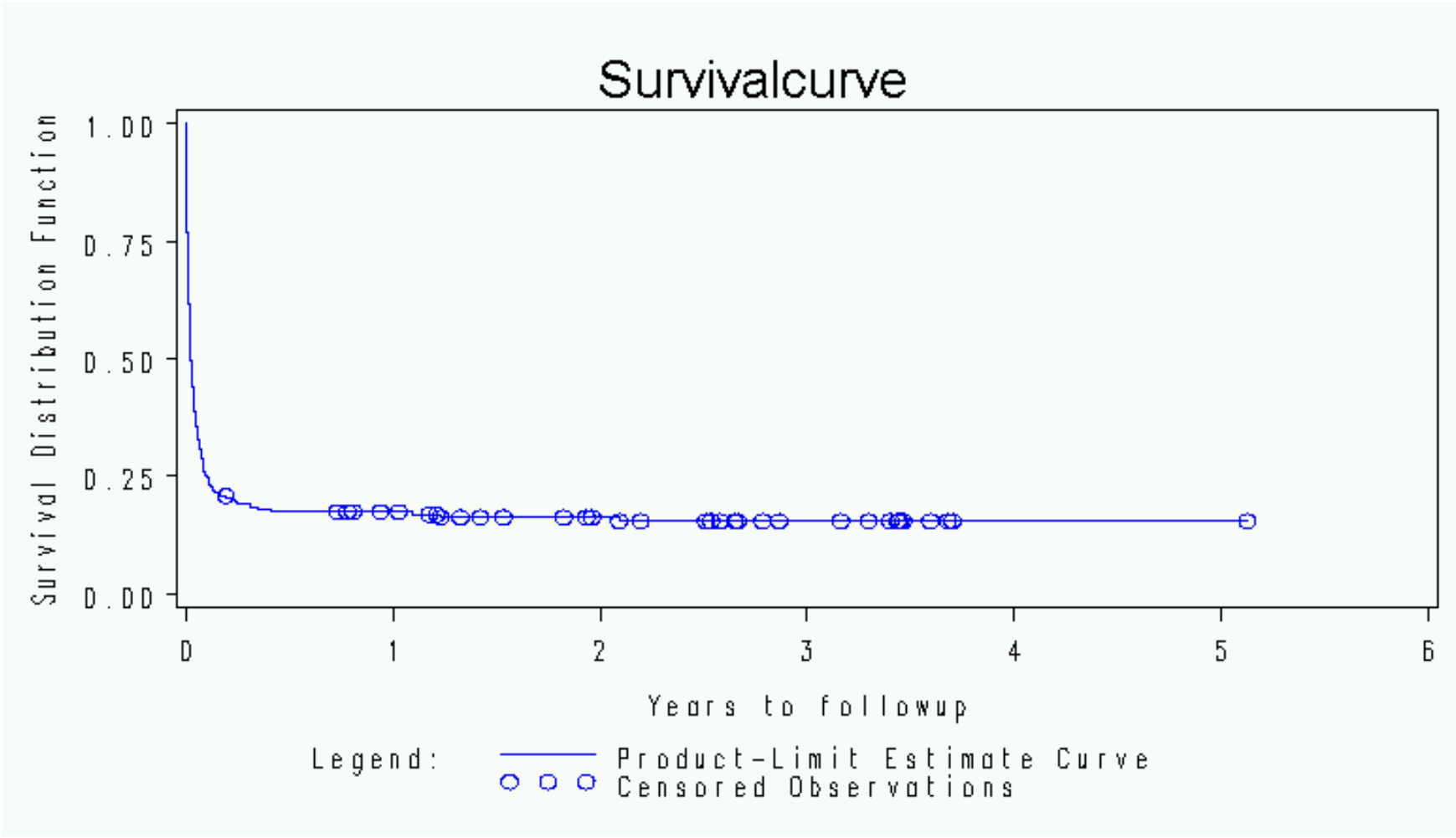


*Doll et al Annals 2004*

# Patient unter ECMO Therapie

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# Kardiale Unterstützungssysteme

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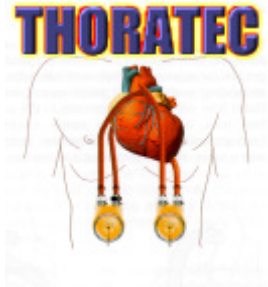
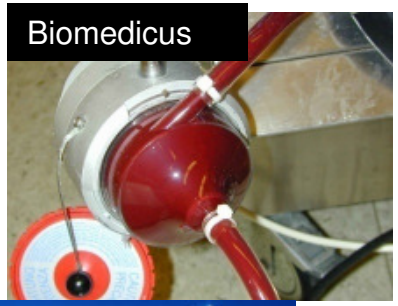
AB5000 Ventricle

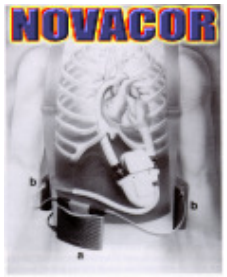


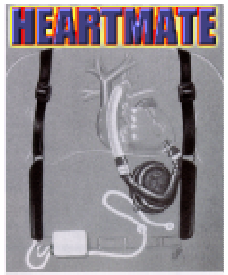

Abiomed BVS

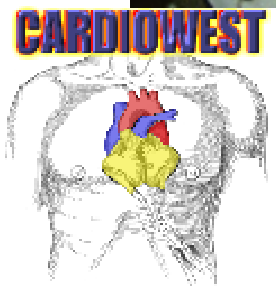
Biomedicus



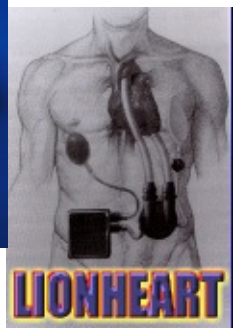
BerlinHeart Excor

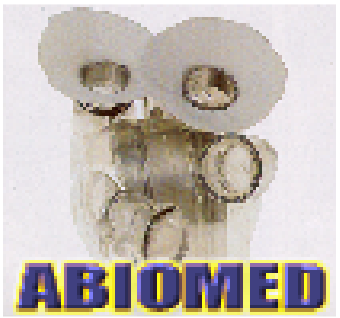


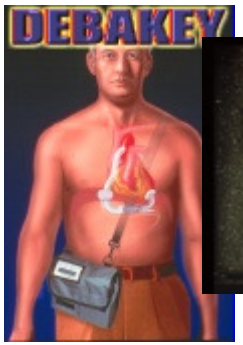




Medos

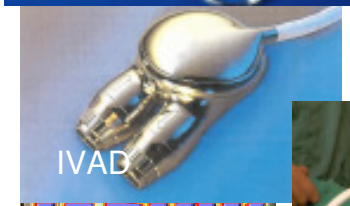


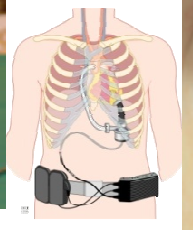

HeartMate II

INCOR





DuraHeart



CorAide

HeartQuest

Heartware

Heart Assist 5

# Excor (Berlin Heart)

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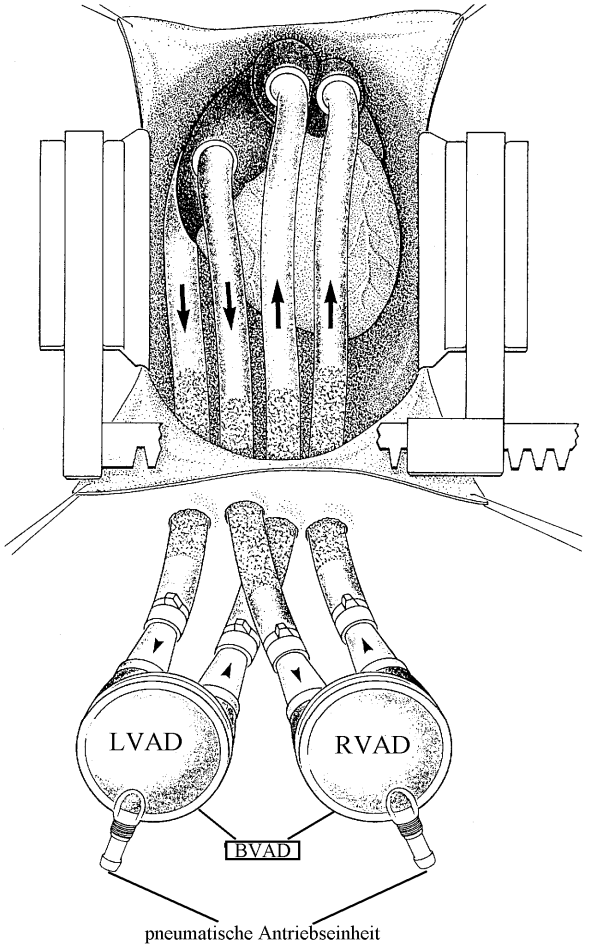


# Pulsatile Kardiale Assist-Systeme

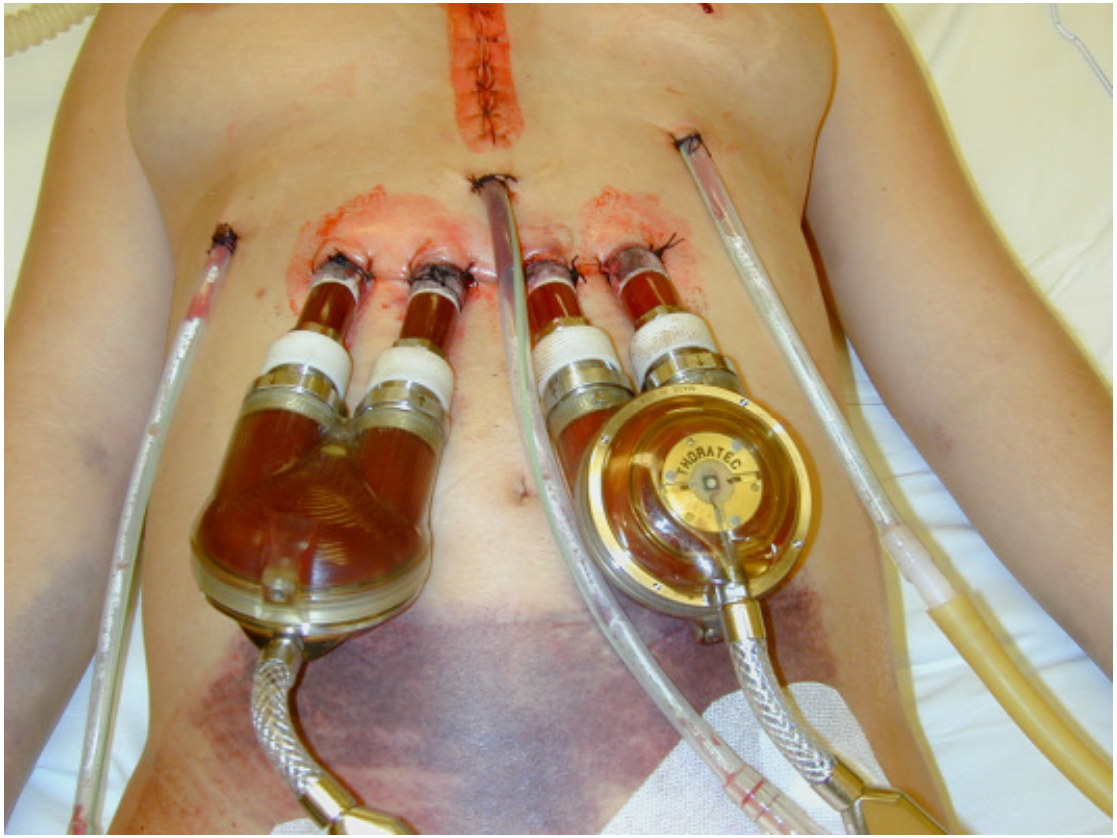
## parakorporale VAD Excor

- Primärindikationen ⇒ „bridge to HTx“ und postkardiotomie bedingtes LCOS
- univentrikulär und biventrikulär einsetzbar
- Größen für Kinder bis zum Erwachsenen

- pneumatischer Antrieb
- relativ gute Mobilität der Patienten
- ständige Antikoagulation notwendig

- Weaning möglich

# Thoratec Paracorporal BVAD




- Rescue System for patients in multi organ failure
- Mid-term  support

# Implantierbare LVAD

## Heart Mate™ LVAD

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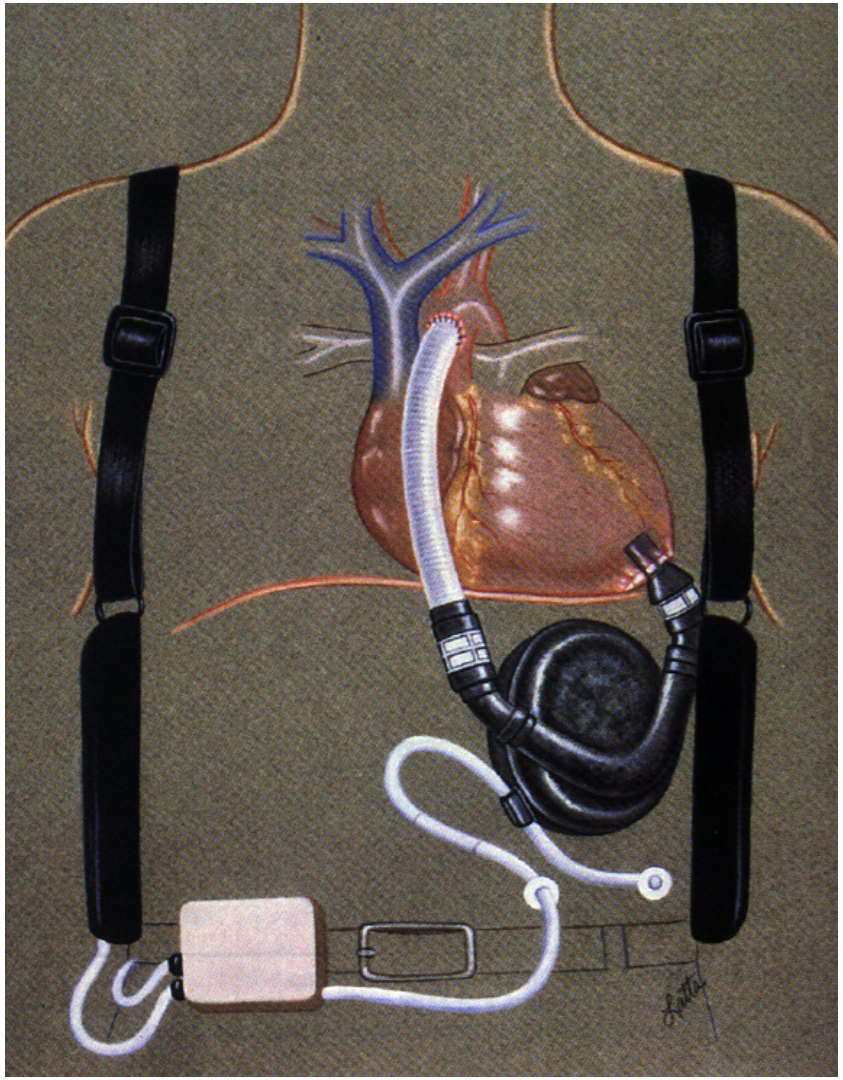

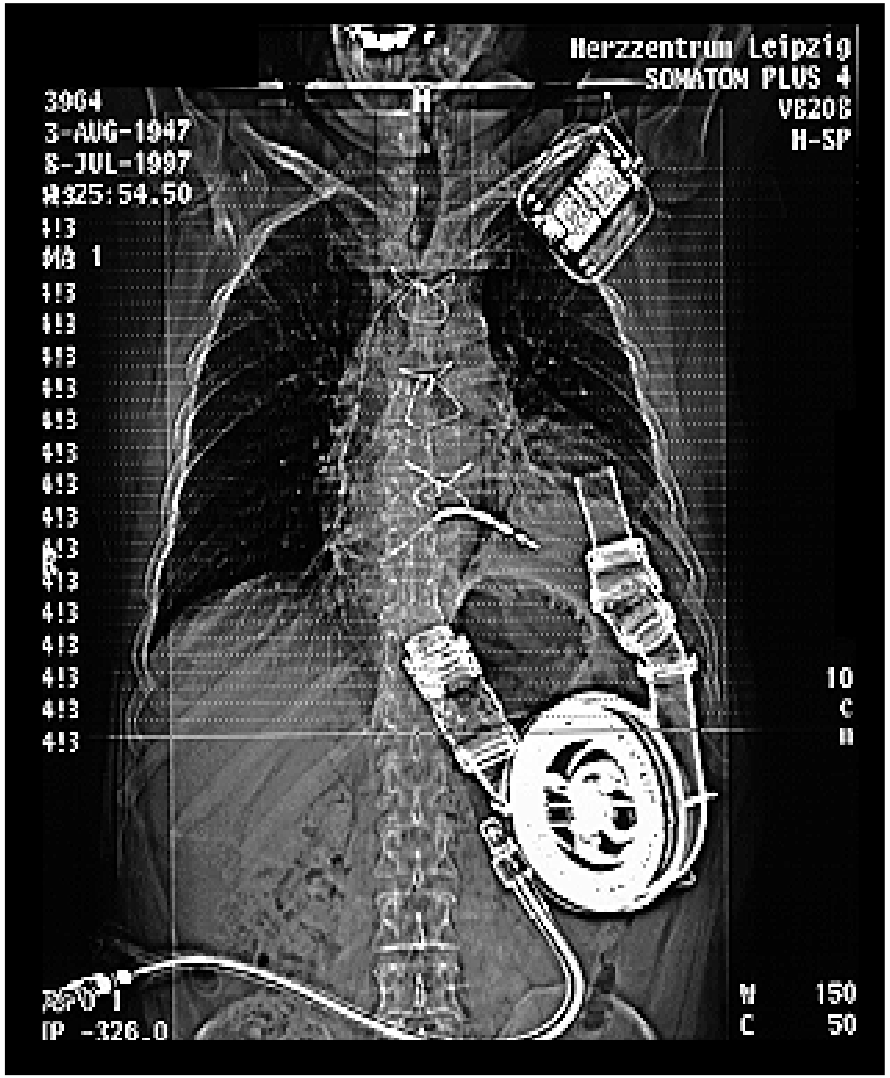

# Implantierbare LVAD

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# Zusammenfassung I

## EXCOR:

- parakorporal, uni- oder biventrikulär implantierbar, für alle Altersgruppen
- Patienten sind relativ gut zu mobilisieren
- „Bridging“ zur Transplantation oder „Weaning“
- sorgfältige Antikoagulation (ACT = 180 Sek.)
- Betreuung im Krankenhaus oder zu Hause möglich

# INCOR® (Berlin Heart)

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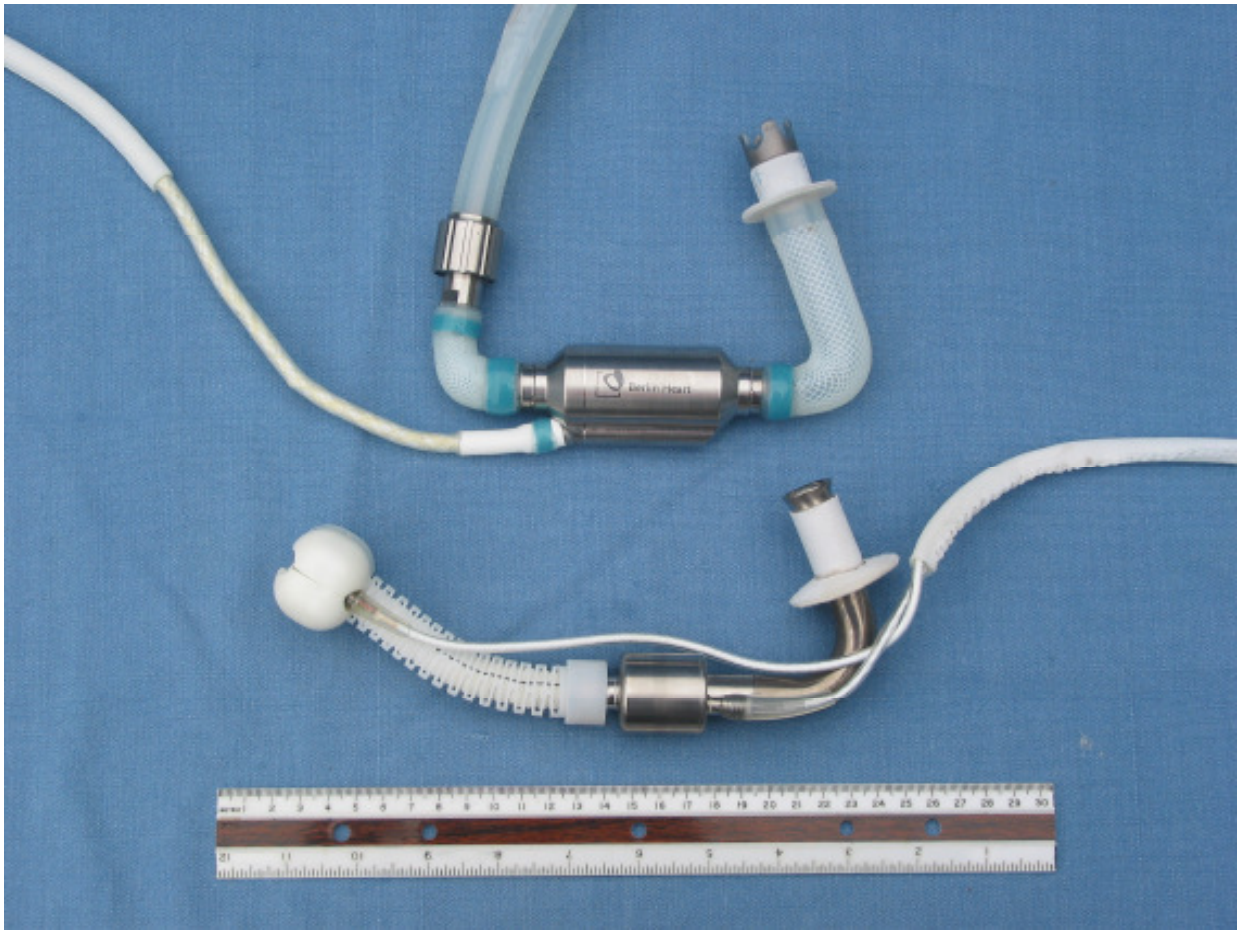

# INCOR® Implantation

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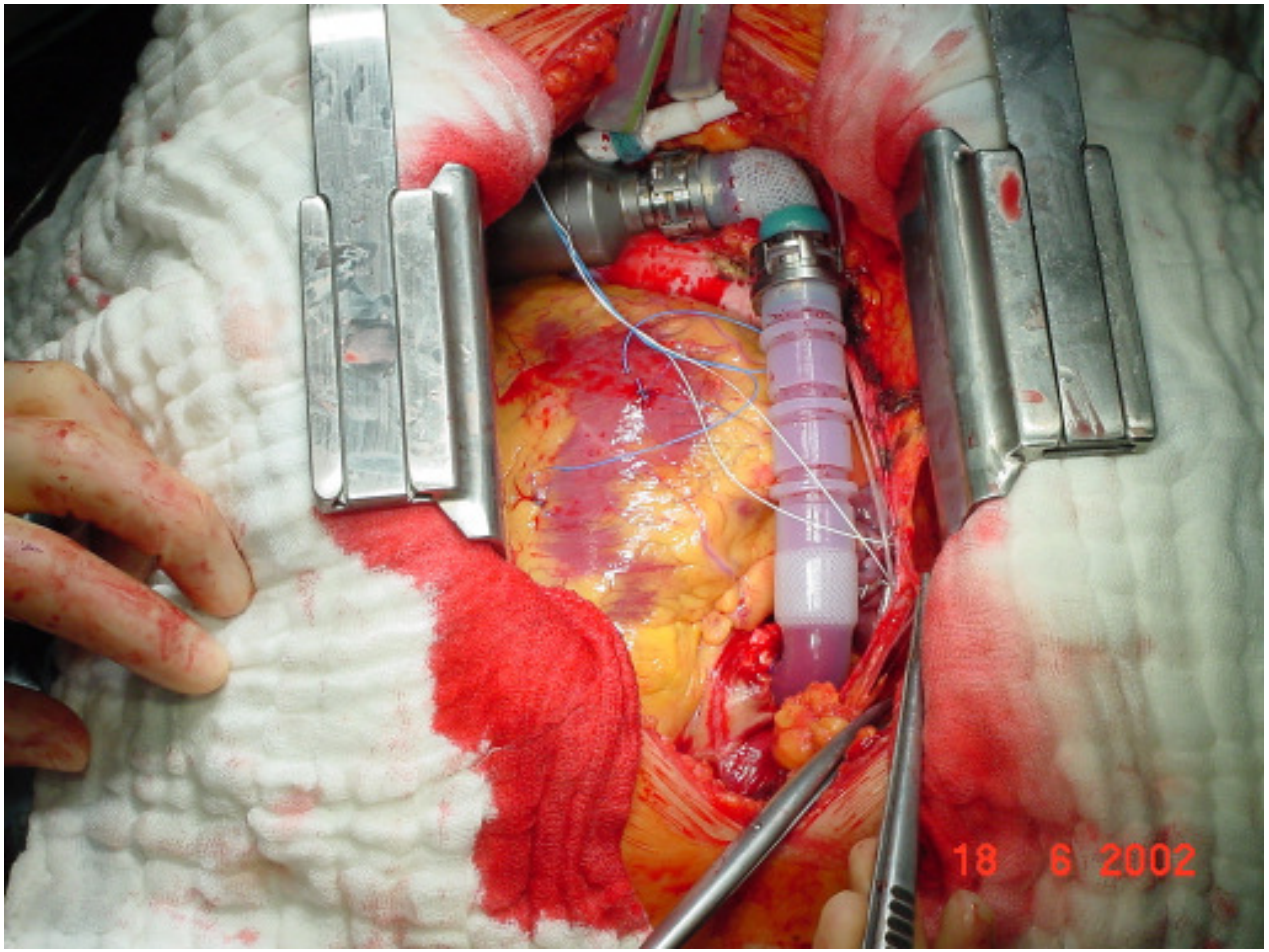

# Jarvic 2000

## Impeller Pumpe (1800 U/min)

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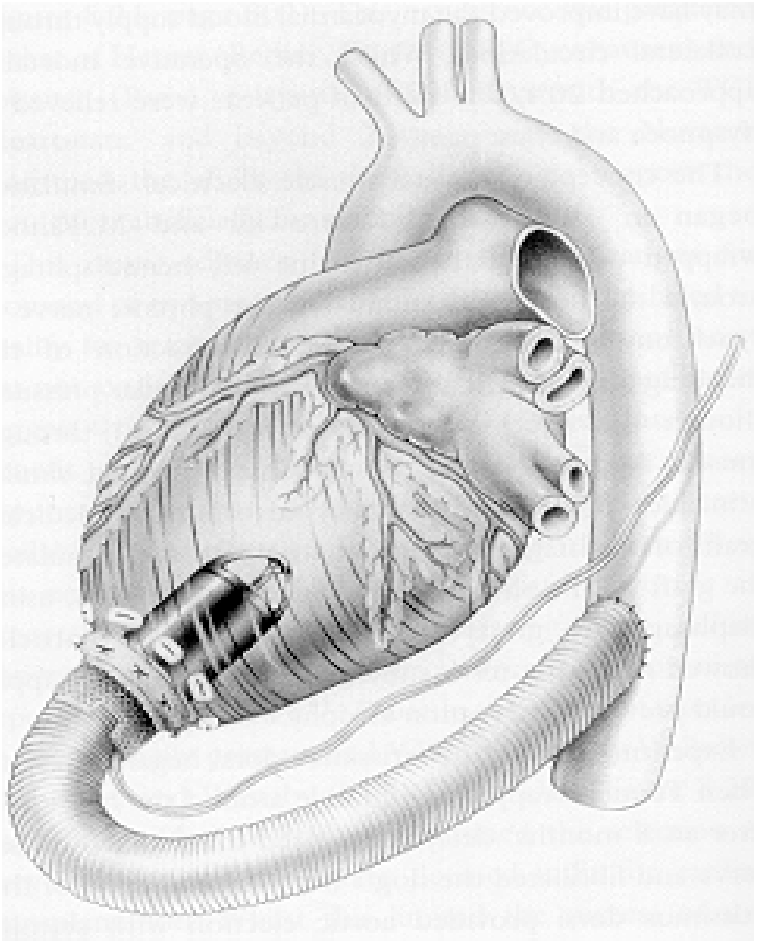
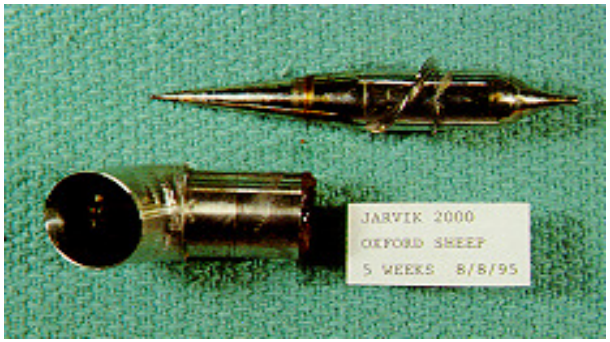
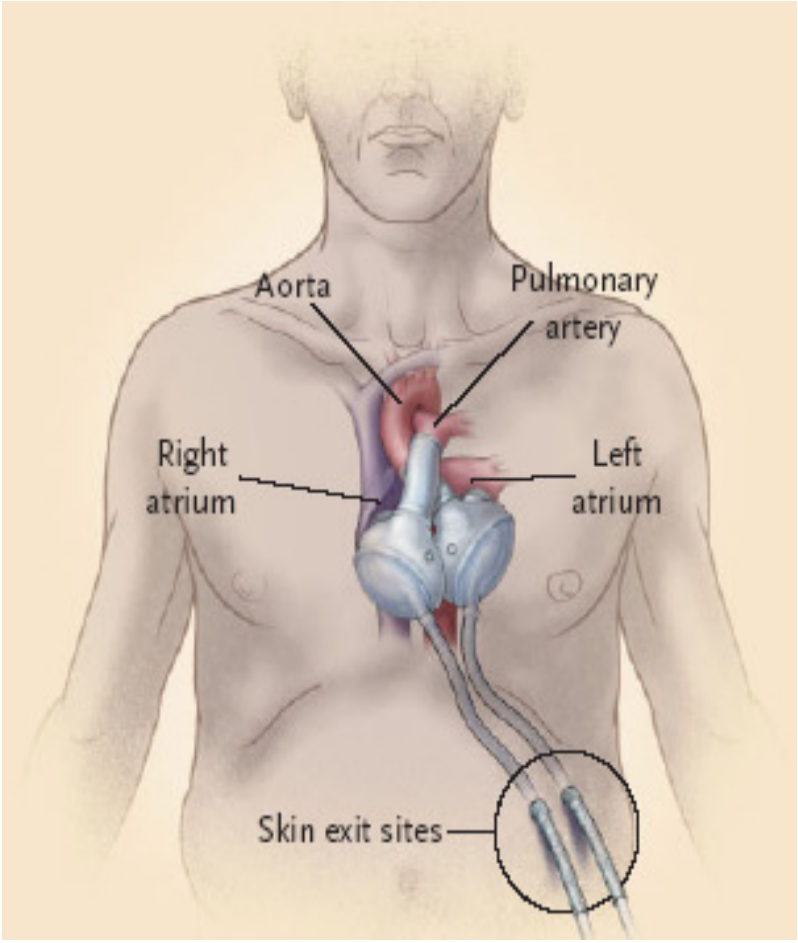




# CardioWest TAH



# Clinical Experience with CardioWest TAH

## Bad Oeynhausen **2001 - 2010** **(n=136)**

- Age 15 – 76
- Duration of support (d) 1 – 971

- Gender f/m 16 – 120

- 62 patients (46 %) on ECMO or VAD preoperativly

# Membranruptur

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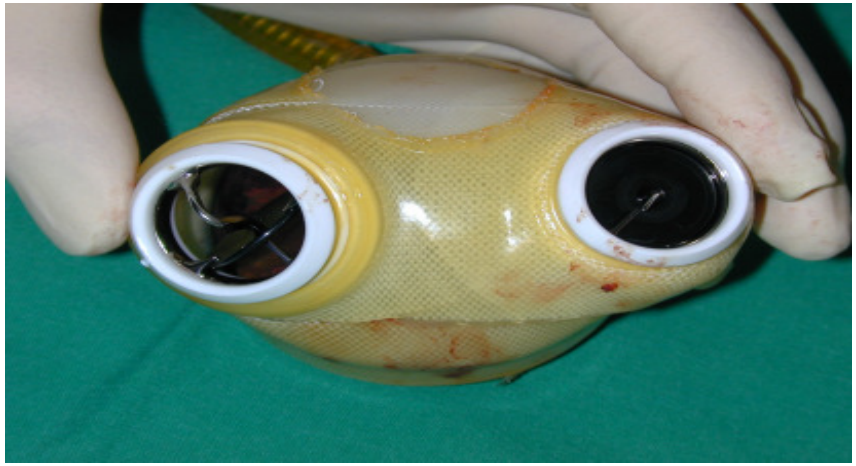
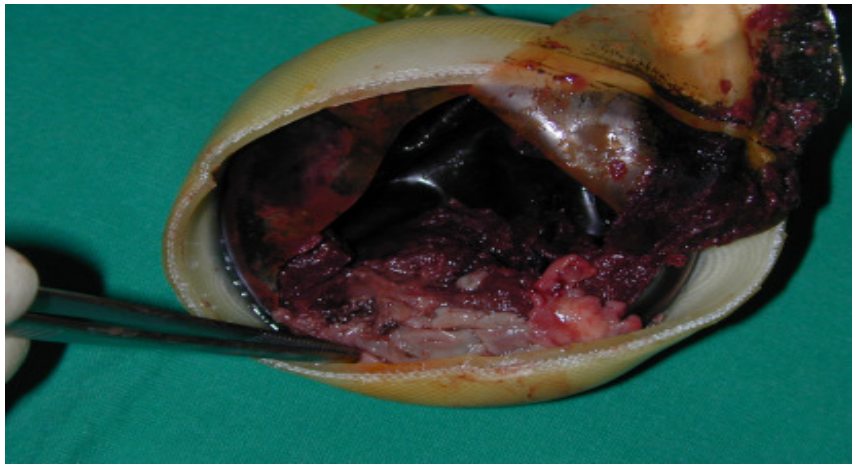
**n= 6 Patienten**





# Cause of death

## Bad Oeynhausen **2001 - 2010** **(n=136)**

- MOF n=50
- CVA / ICB / Brain-Death n=13
- Intestinal ischemia n=4
- Membrane rupture n=4
- Mediastinitis/Sepsis n=3
- Other n=5

# LionHeart (TAH)

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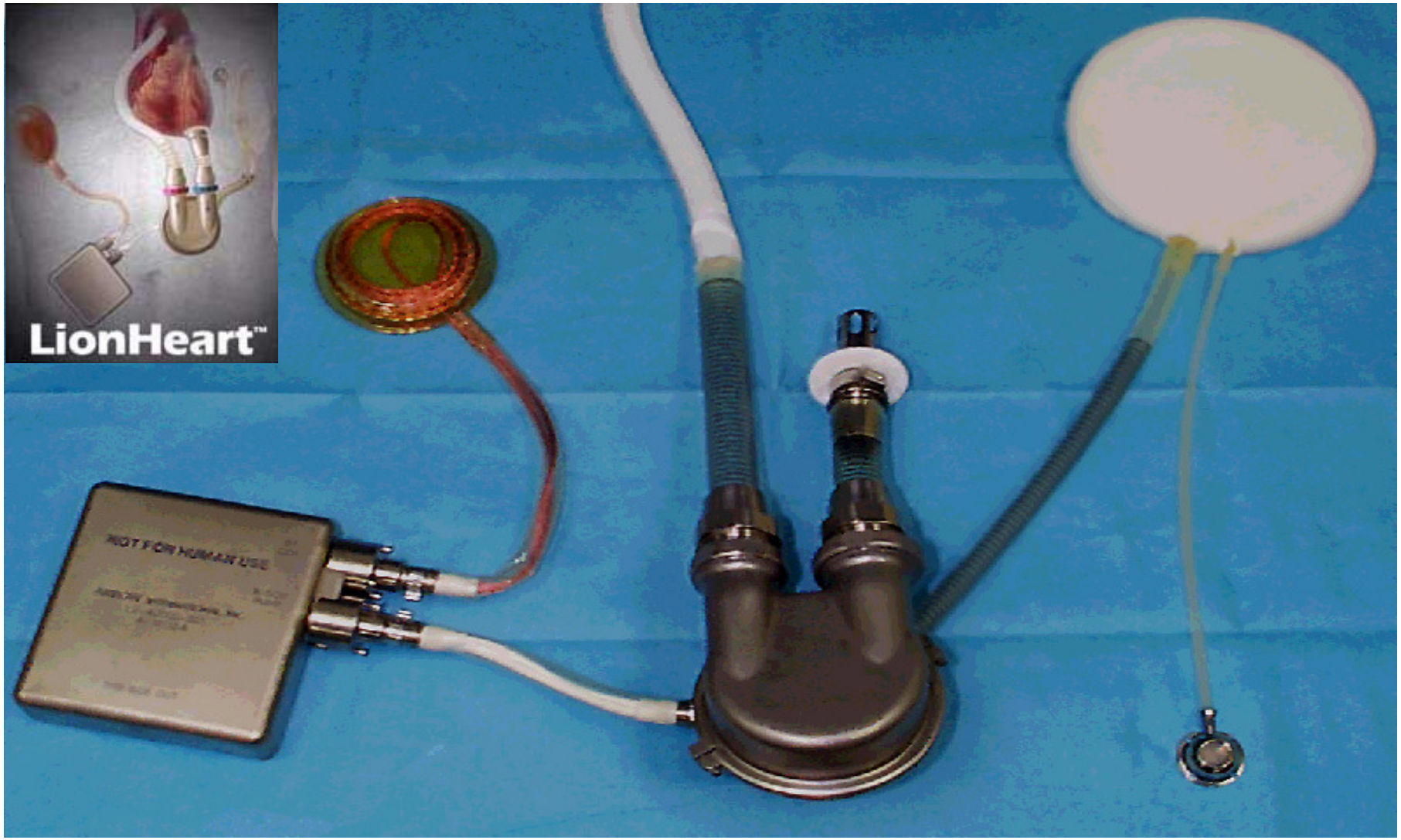

# Entwicklung der Assistsysteme geht nur schrittweise voran

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- Antikoagulation
- Mechanische Zuverlässigkeit
- Lebensqualität
- Infektion

**Transplantation** ist auch im Zeitalter der Assistsysteme weiterhin der Goldstandard

# Christian Barnard

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# Louis Washkansky

HTx am 03.12.1967

postop Klebsiellenpneumonie verst. am 22.12.67

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# Herztransplantation

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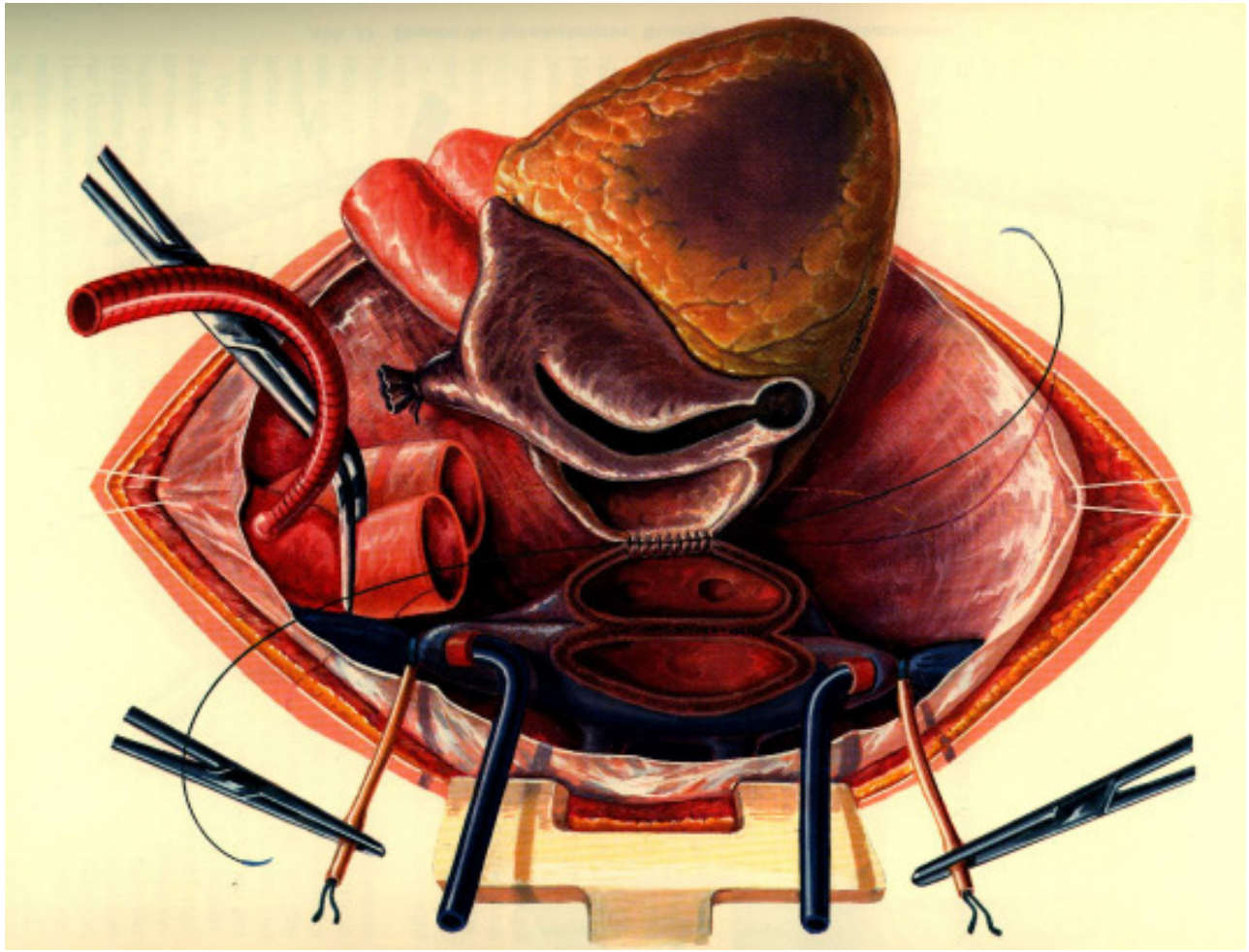

# Herztransplantationen
## im ET - Bereich

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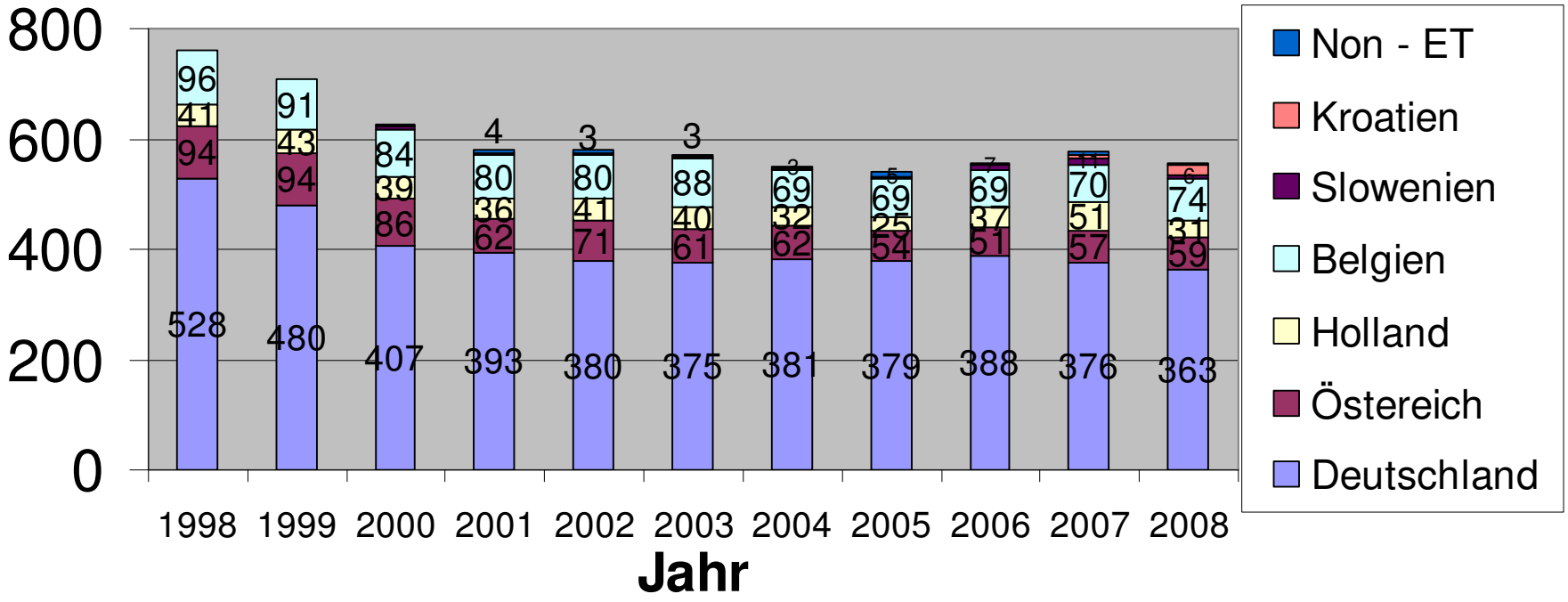
### Herztransplantation ET - Bereich



# HU vs.elektive Transplantation

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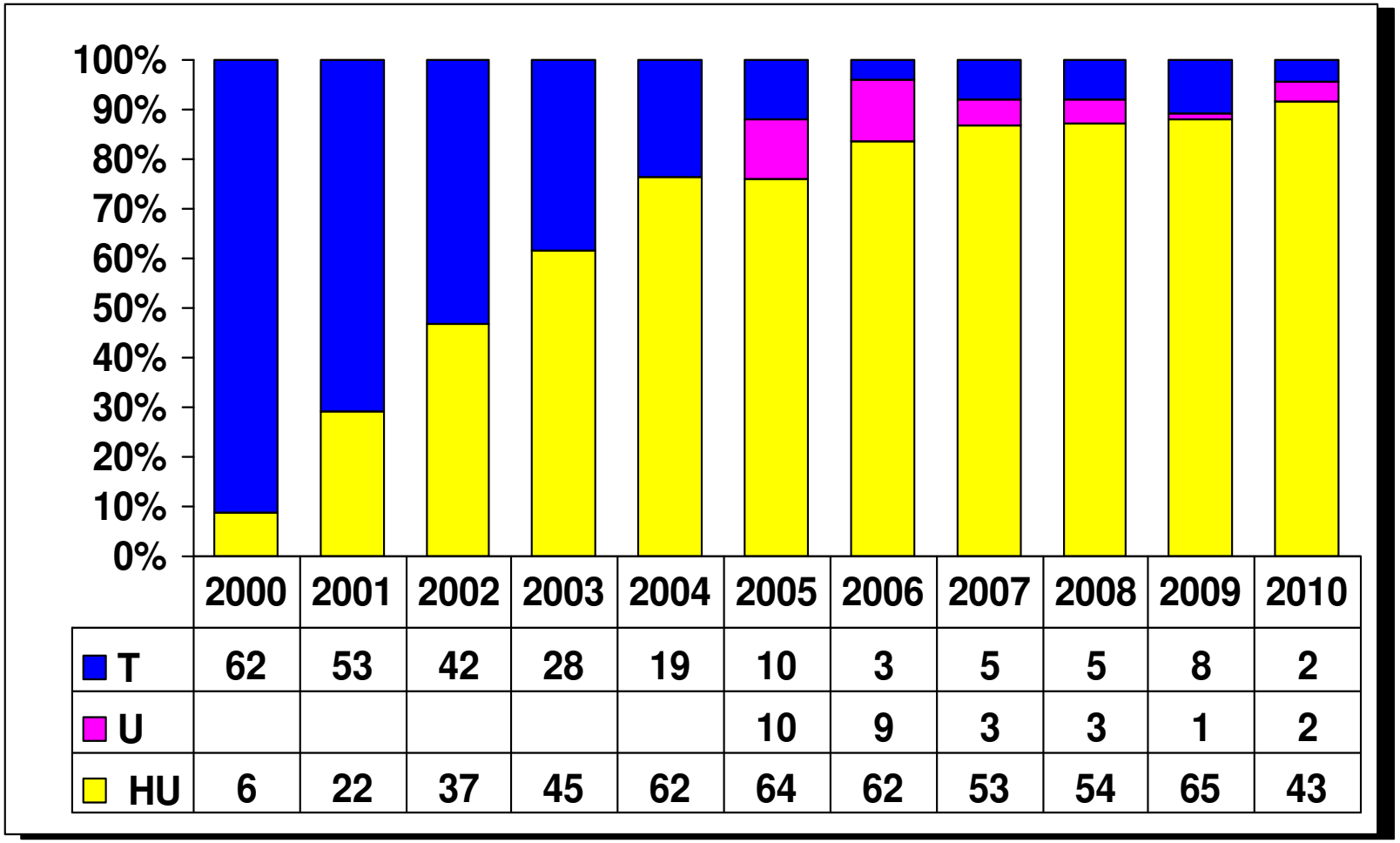


| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T | 62 | 53 | 42 | 28 | 19 | 10 | 3 | 5 | 5 | 8 | 2 |
| U | | | | | | 10 | 9 | 3 | 3 | 1 | 2 |
| HU | 6 | 22 | 37 | 45 | 62 | 64 | 62 | 53 | 54 | 65 | 43 |

# REMATCH-Studie

**(Einschlußphase 1998 – 2001)**

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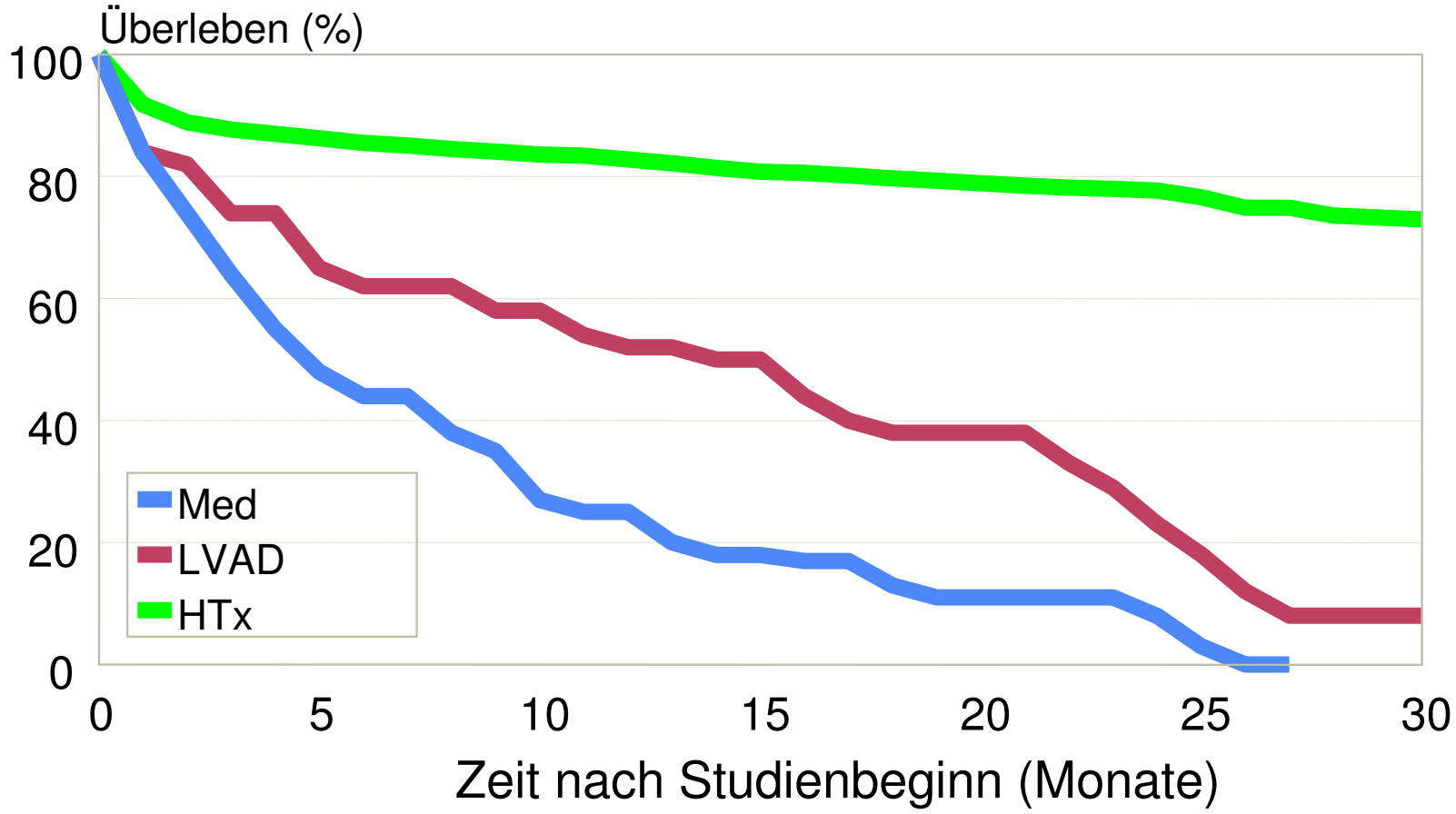


*Rose et al. NEJM 2001*

# Organspende

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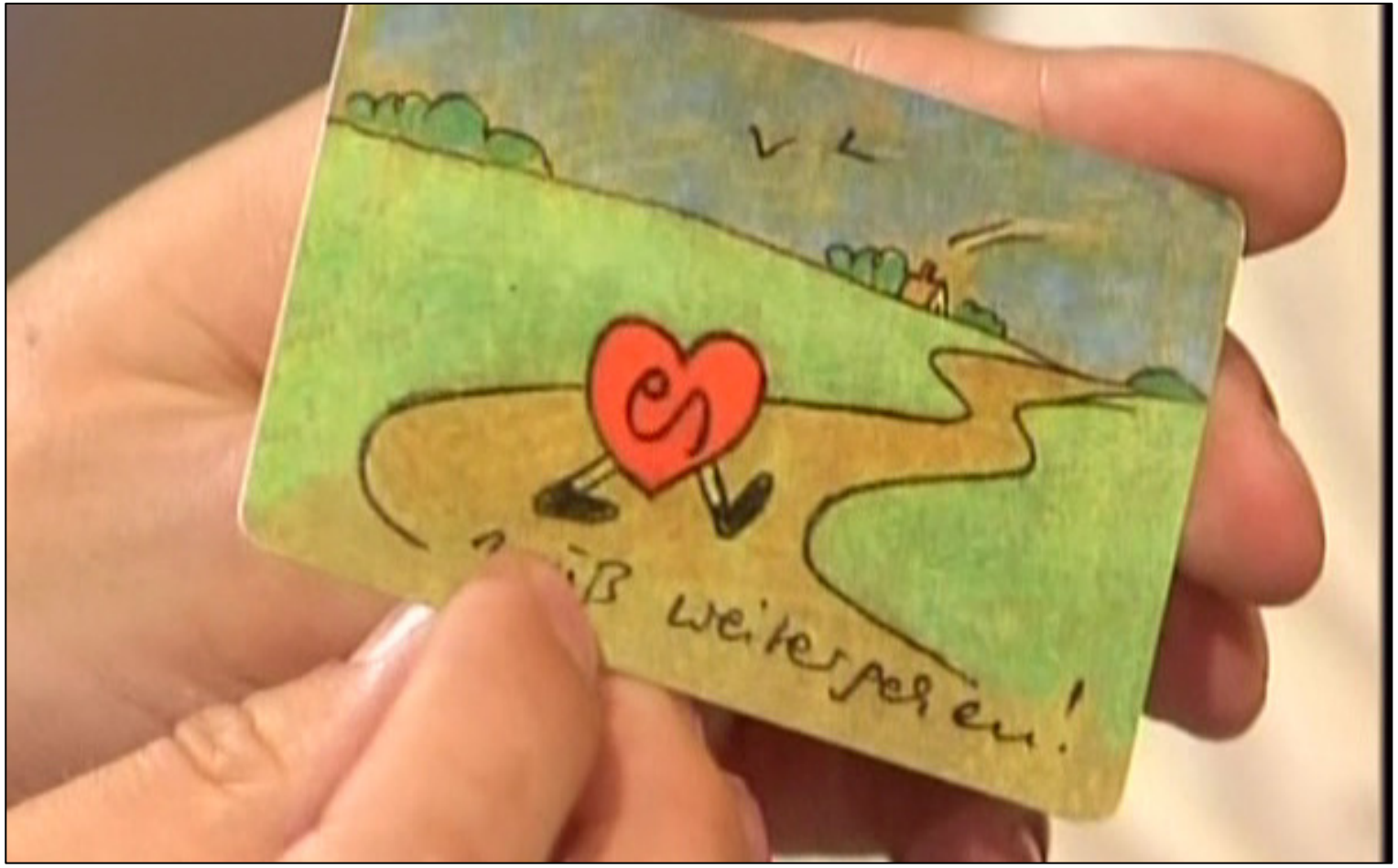

# Zusammenfassung II

- Wenn möglich Stabilisierung und konventionelle Herzchirurgie
- TX von ECLS – System möglich, besser LVAD oder BVAD als Bridging
- Im Multiorganversagen TAH / BVAD mit entsprechend schlechteren Ergebnissen als LVAD
- LVAD – Destination Therapie bei ausgewählten Patienten auch heute schon Realität

# Akute Herzinsuffizienztherapie:
## Team-Aufgabe

sana