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RESEARCH HOSPITAL

L'Assistenza Meccanica al Circolo Nell'Infarto Acuto

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UO di Cardiochirurgia

HUMANITAS CLINICAL AND RESEARCH HOSPITAL – ROZZANO (MI) - ITALY

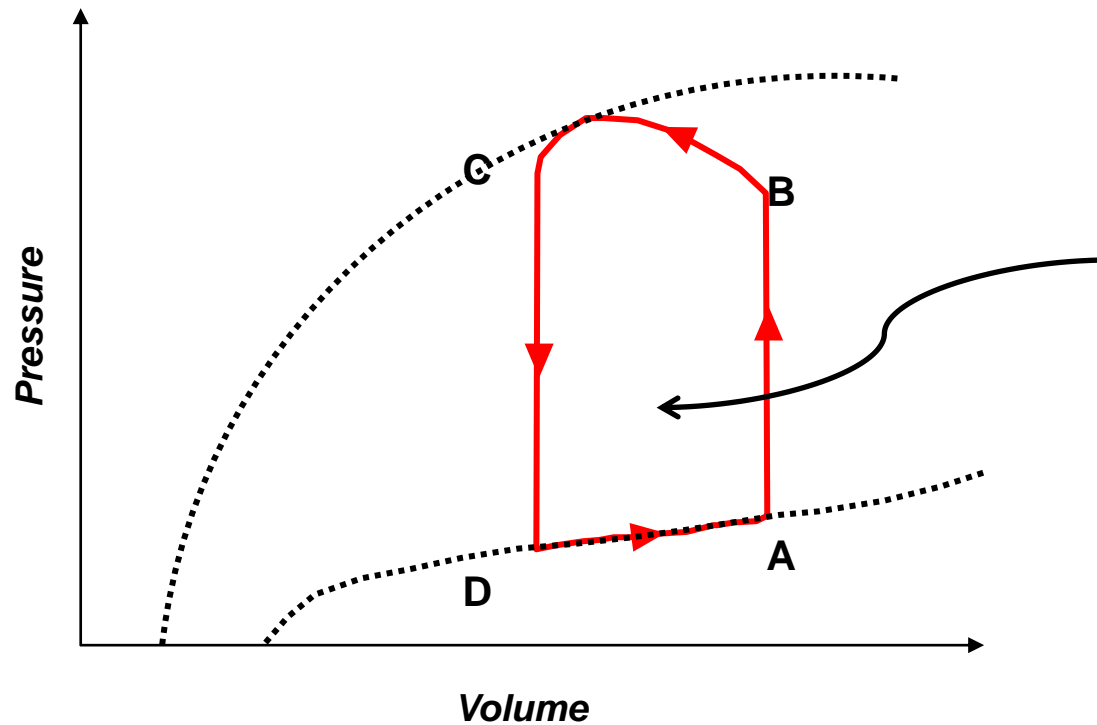
Scopo dell'assistenza Meccanica Al Circolo in Corso di Infarto

- Sostegno Emodinamico
 - *Mantenimento di pressione e portata cardiaca per scongiurare Shock Cardiogeno e/o danni neurologici*
- Protezione miocardica
 - *Riduzione della distensione del VS in corso di interruzione del flusso per alzare la soglia ischemica (Riduzione Gradiente Transparete)*
 - *Mantenimento di pressione arteriosa sistemica per favorire perfusione circolo coronarico.*

“Scaricare” ...Riduzione del Lavoro

(= consumo di O₂) Miocardico

Curva “Pressione – Volume” del Ciclo Cardiaco



- Lavoro = Pressione x Volume
- “Lavoro” Ventricolare = Area della curva L-V; proporzionale al Consumo di O₂
- Scaricare il Ventricolo= Ridurre l’Area della Curva P-V

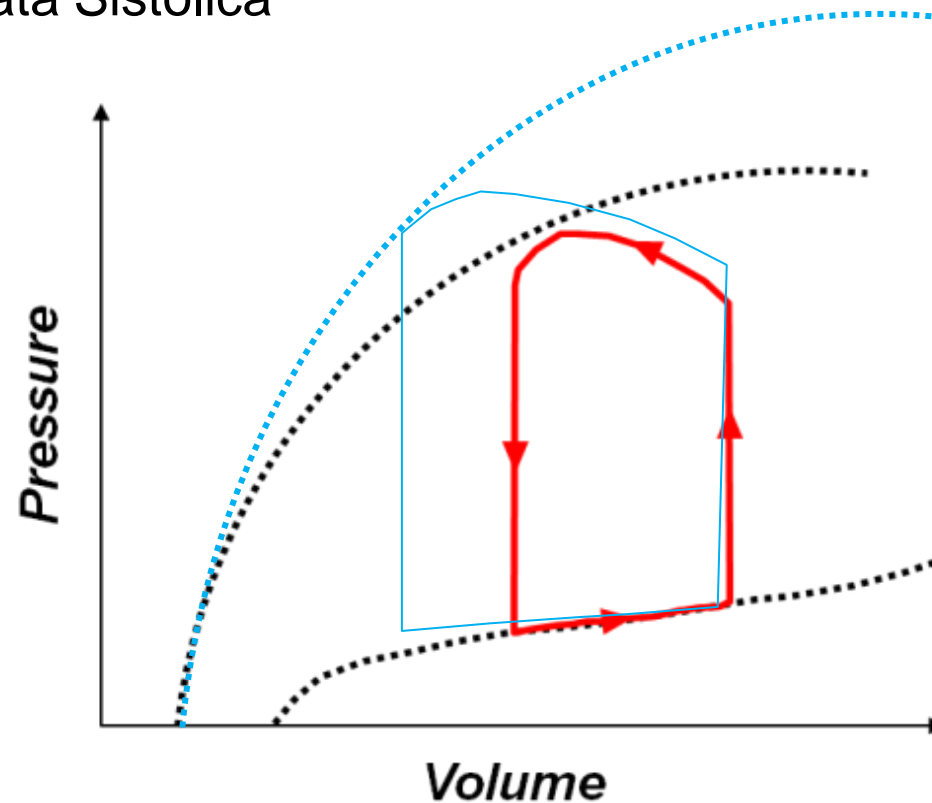
- A. Fine Diastole – Chiusura della Valvola Mitrale
- B. Apertura della Valvola Aortica
- C. Fine Sistole - Chiusura della Valvola Aortica
- D. Apertura della Valvola Mitrale

“Scaricare” ... Riduzione del LAVORO?

Riduzione dell'aria della Curva

Farmaci Inotropi:

- Aumento della Gittata Sistolica



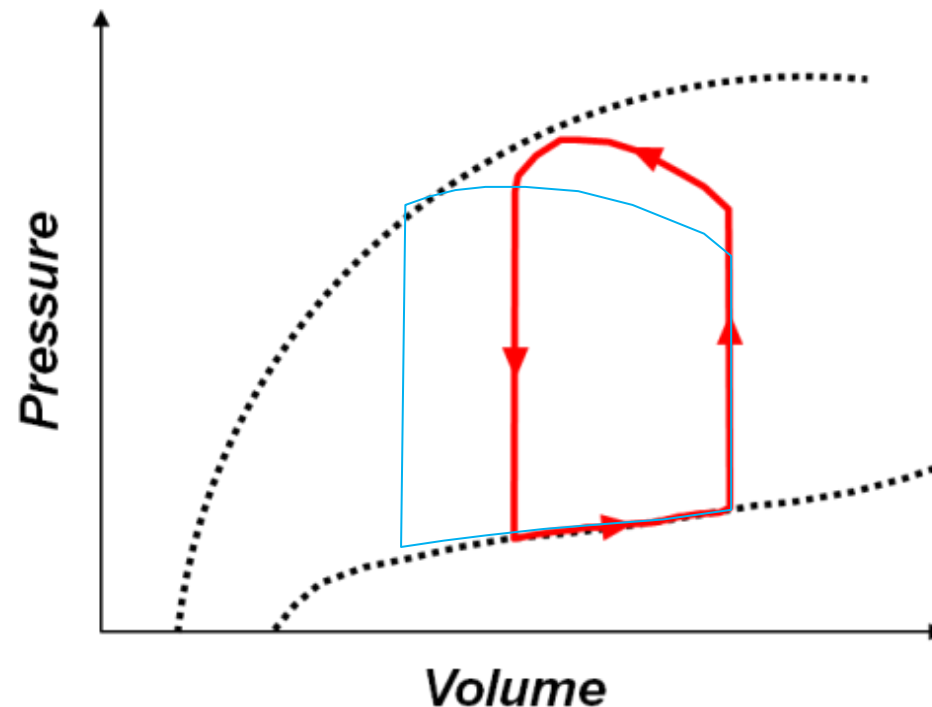
No: L'area della curva P-V aumenta

“Scaricare” ... Riduzione del LAVORO?

Riduzione dell'aria della Curva

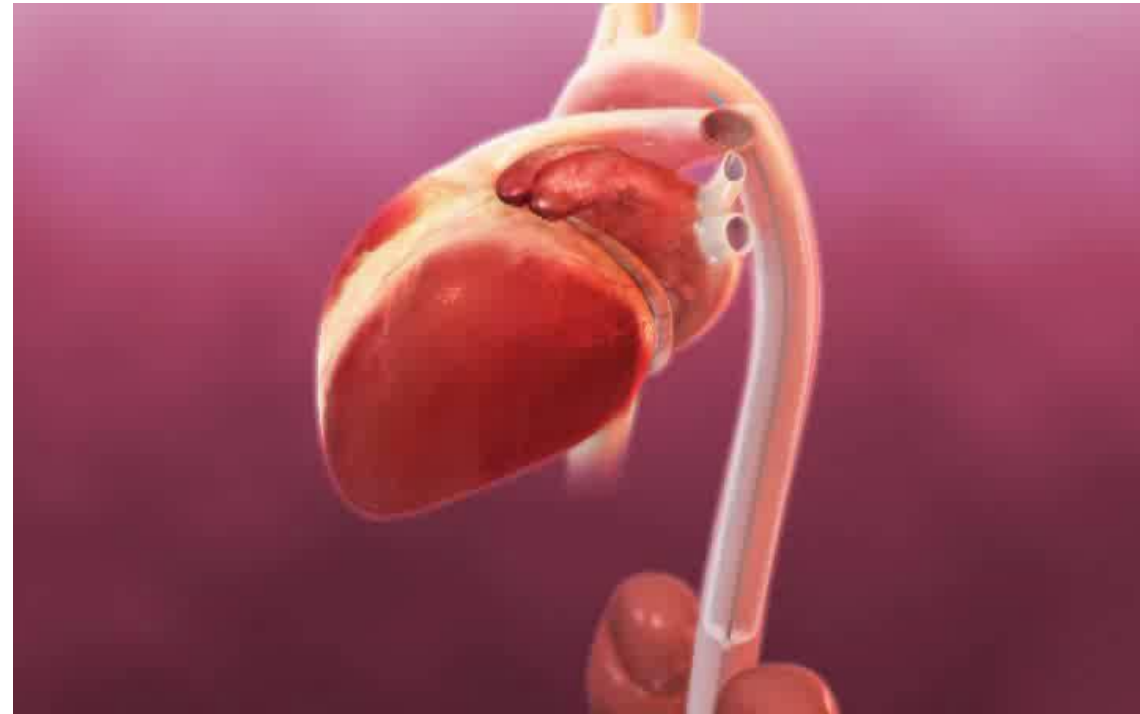
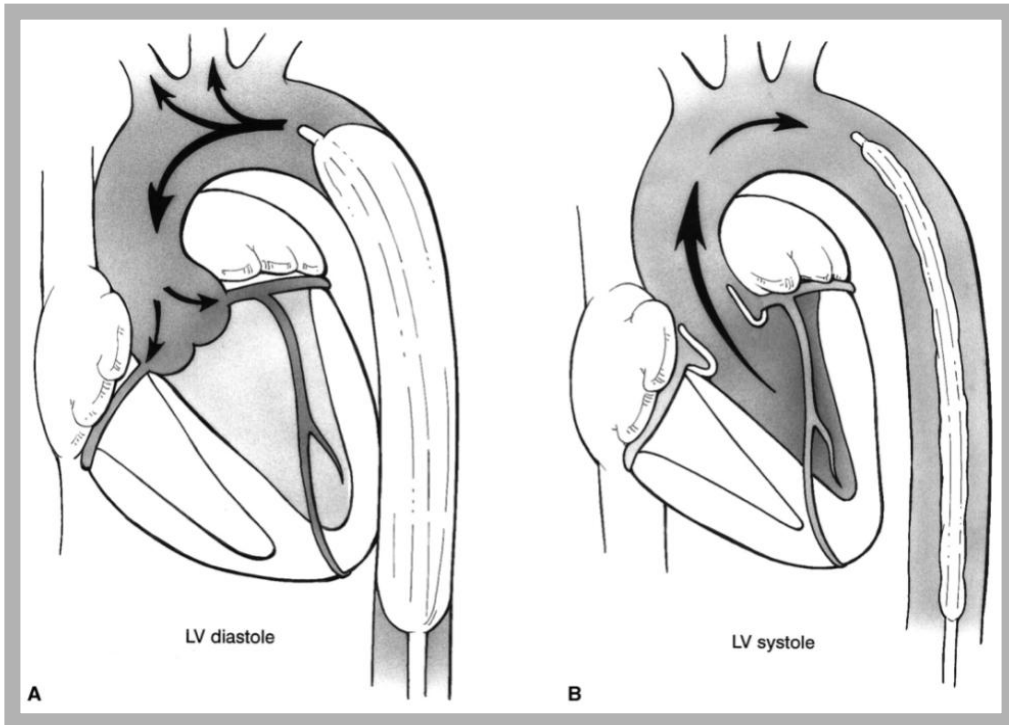
Contropulsazione

- Riduzione della pressione Telediastolica
- Minimo Aumento della Gittata Sistolica



No: L'area è mantenuta stabile dal rapporto fra $\downarrow P$ ed $\uparrow V$

Contropulsatore Aortico



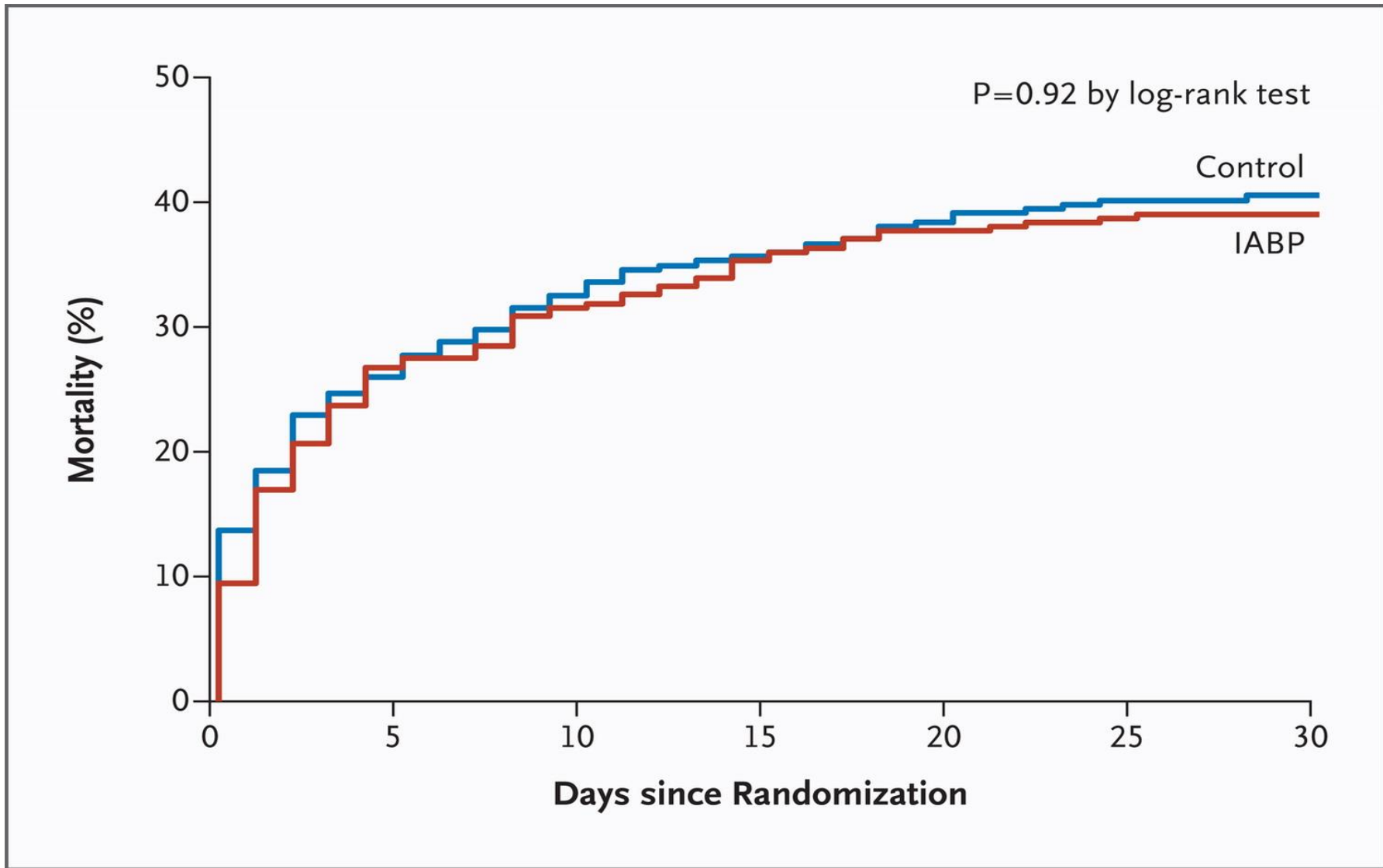
- IABP (Intra-aortic balloon) è lo Standard of Care: 202,000 IAB/year²
(2006: 124,000 US + 78,000 Europe)
- IAB non riduce la mortalità nello shock cardiogeno¹ MA
- Non genera flusso – Minimo aumento della portata cardiaca

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1. PAMI-II Stone et al, J Am Coll Cardiol 29:1459, 1997

2. Medtech Insight: Current and Emerging Technologies for the Management of Heart Failure in the U.S., March 2007

Time-to-Event Curves for the Primary End Point.



Thiele H et al. N Engl J Med 2012;367:1287-1296.

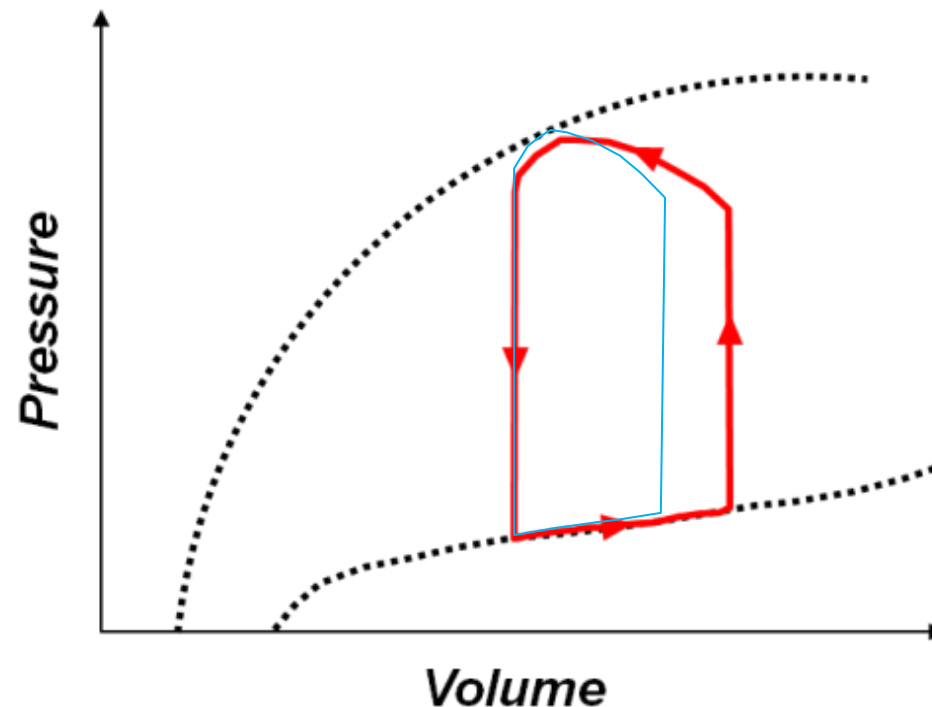
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“Scaricare” ... Riduzione del LAVORO?

Riduzione dell'aria della Curva

Assistenza Meccanica

- Scarica il Ventricolo
- Riduce il Volume Telediastolico

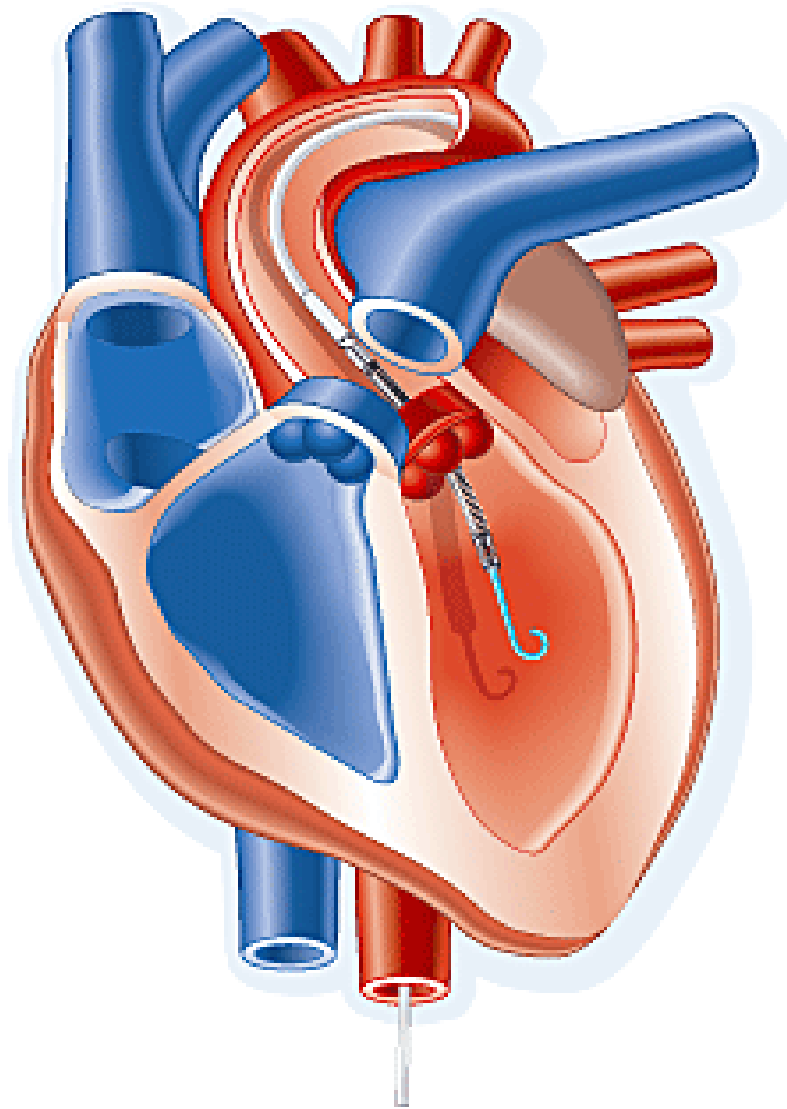


SI: la ↓ dei Volumi (↓ della Gittata Sistolica) comporta una riduzione dell'aera



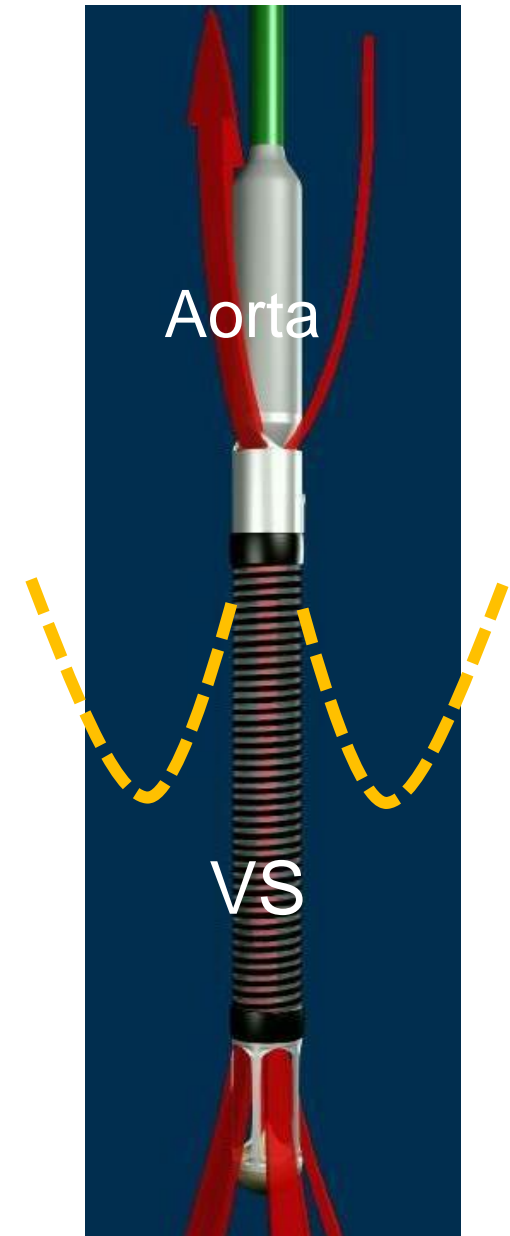
Sistema di Assistenza Ventricolare

IMPELLA®

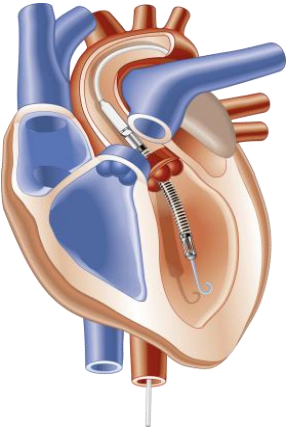
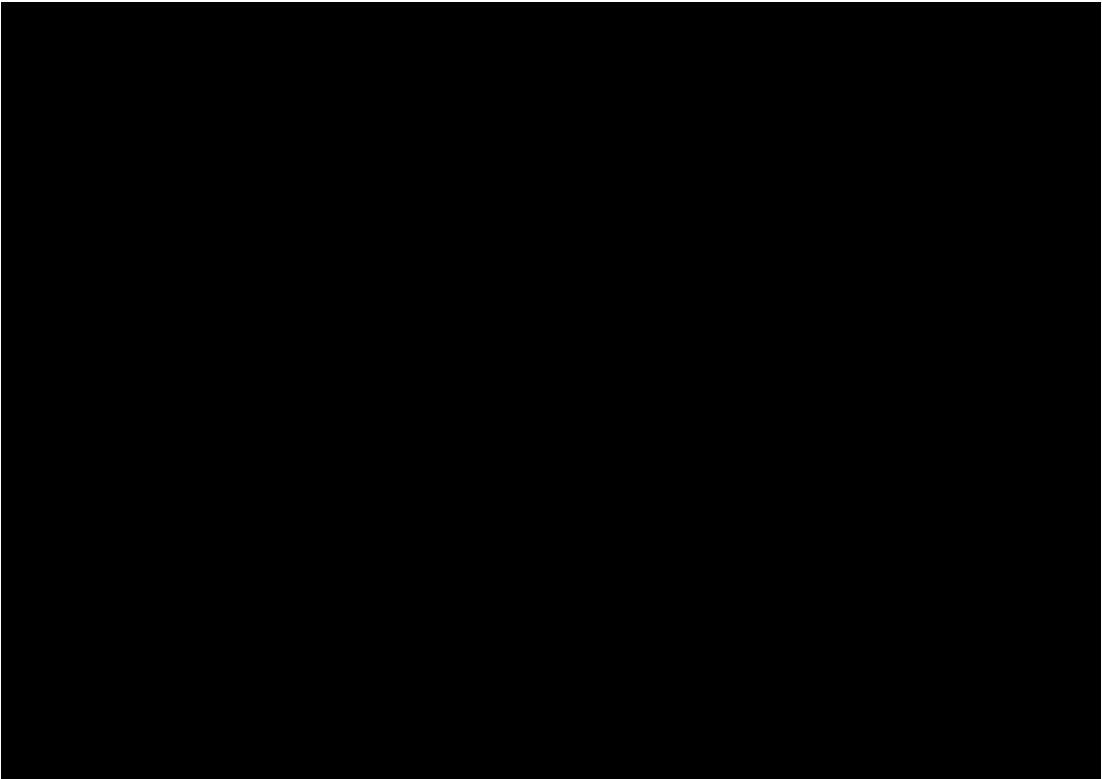


Valvola
Aortica

AS



Supporto Circolatorio Meccanico in Sala di Emodinamica

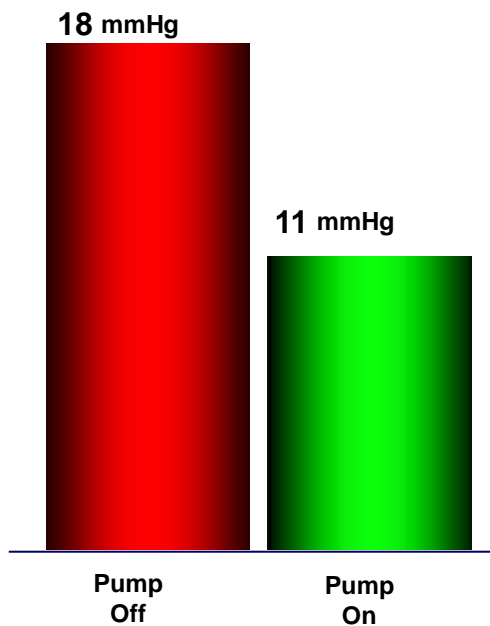


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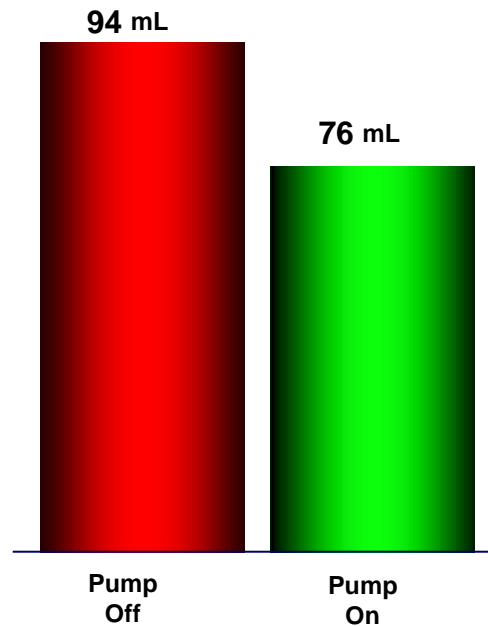


Effetto Cardiaco ed Emodinamico

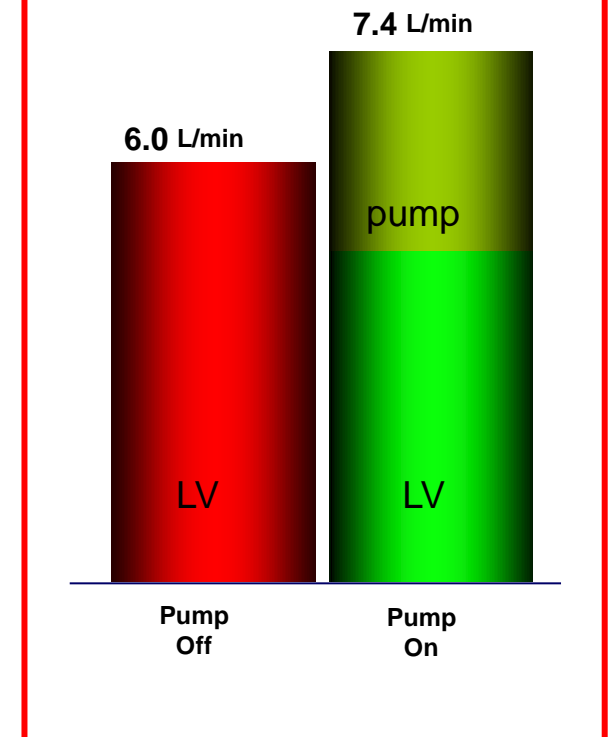
End-Diastolic
LV Pressure



End-Diastolic
Volume



Total
Cardiac Output



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Effetto Idraulico



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A Randomized Clinical Trial to Evaluate the Safety and Efficacy of a Percutaneous Left Ventricular Assist Device Versus Intra-Aortic Balloon Pumping for Treatment of Cardiogenic Shock Caused by Myocardial Infarction

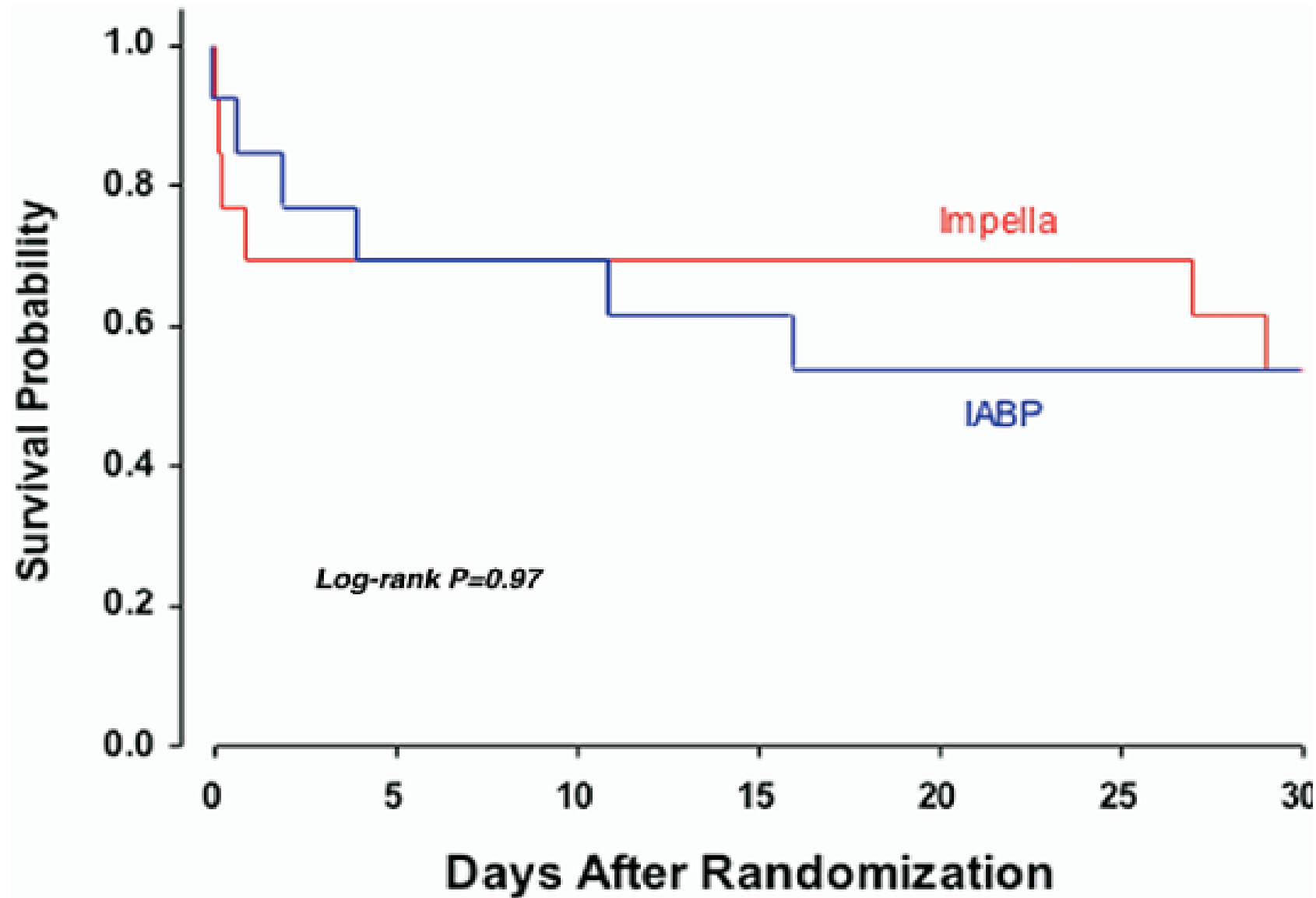
Results

In 25 patients the allocated device (n = 13 IABP, n = 12 Impella LP2.5) could be safely placed. One patient died before implantation. The CI after 30 min of support was significantly increased in patients with the Impella LP2.5 compared with patients with IABP (Impella: $\Delta\text{CI} = 0.49 \pm 0.46$ l/min/m²; IABP: $\Delta\text{CI} = 0.11 \pm 0.31$ l/min/m²; p = 0.02). Overall 30-day mortality was 46% in both groups.

Conclusions

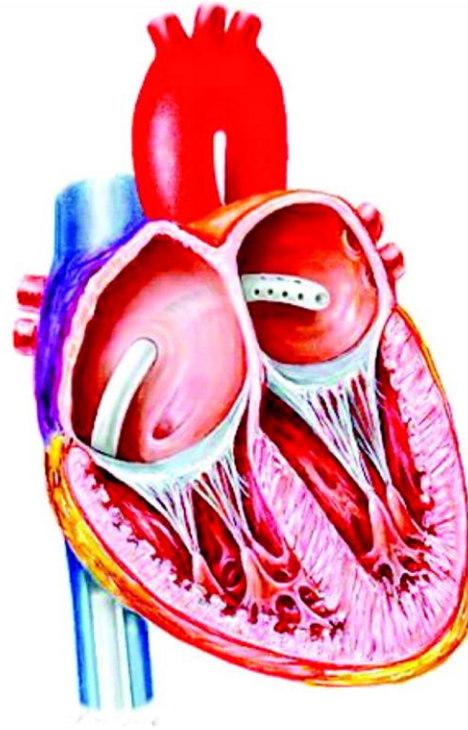
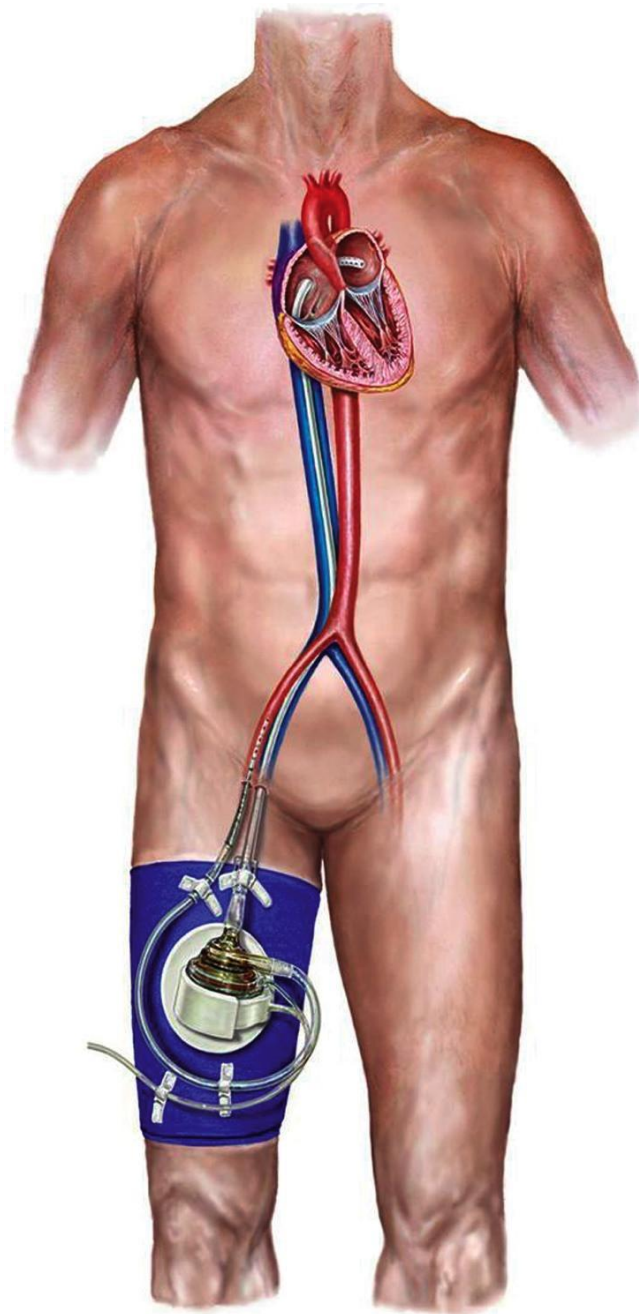
In patients presenting with cardiogenic shock caused by AMI, the use of a percutaneously placed LVAD (Impella LP 2.5) is feasible and safe, and provides superior hemodynamic support compared with standard treatment using an intra-aortic balloon pump. (Efficacy Study of LV Assist Device to Treat Patients With Cardiogenic Shock [ISAR-SHOCK]; NCT00417378) (J Am Coll Cardiol 2008;52:1584–8) © 2008 by the American College of Cardiology Foundation

Sopravvivenza???



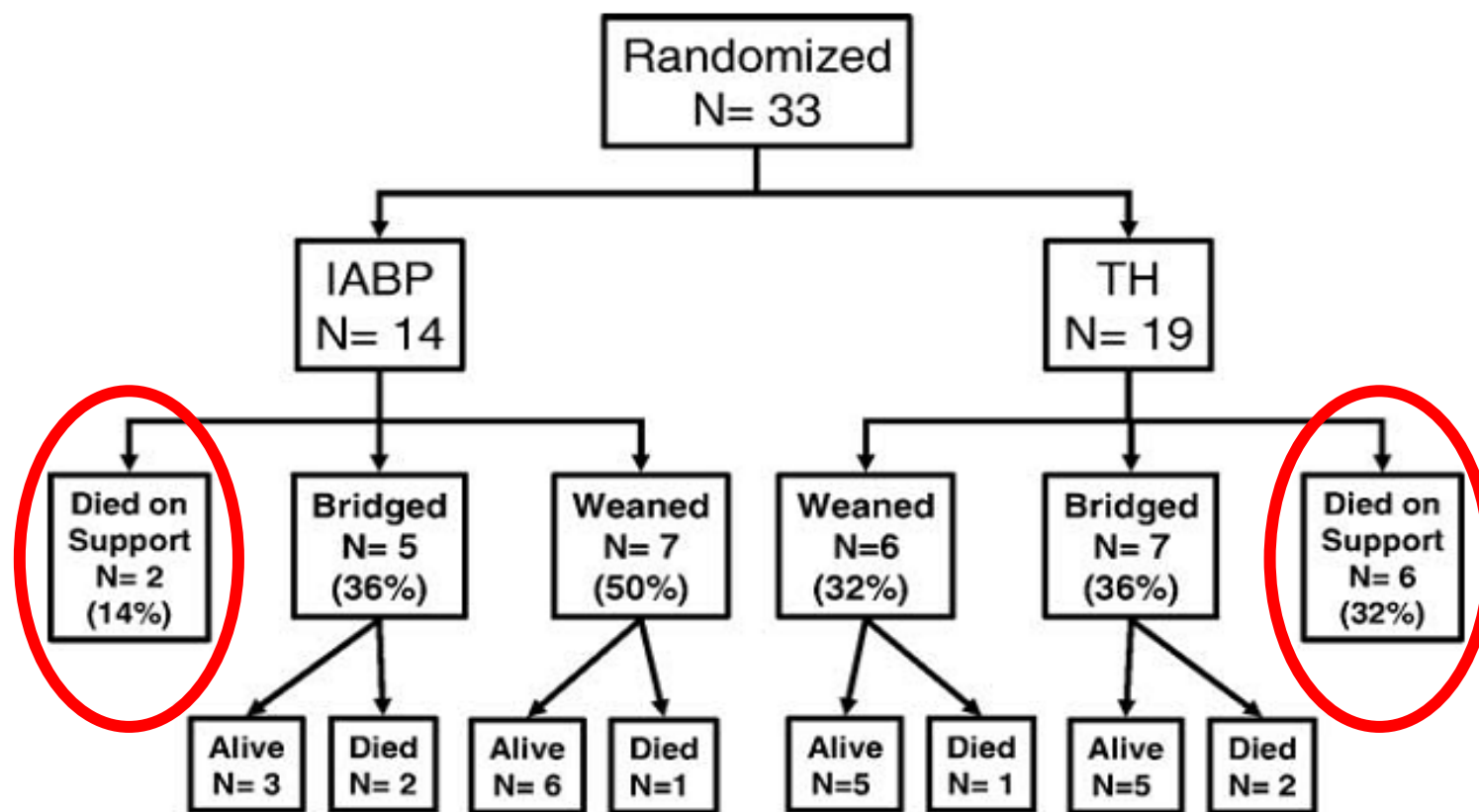
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TandemHeart®



A randomized multicenter clinical study to evaluate the safety and efficacy of the TandemHeart percutaneous ventricular assist device versus conventional therapy with intraaortic balloon pumping for treatment of cardiogenic shock

Daniel Burkhoff, MD, PhD,^a Howard Cohen, MD,^b Corinna Brunckhorst, MD,^c and William W. O'Neill, MD,^d for the TandemHeart Investigators Group^e *Orangeburg and New York City, NY; Zurich, Switzerland; and Royal Oak, MI*



Sopravvivenza???

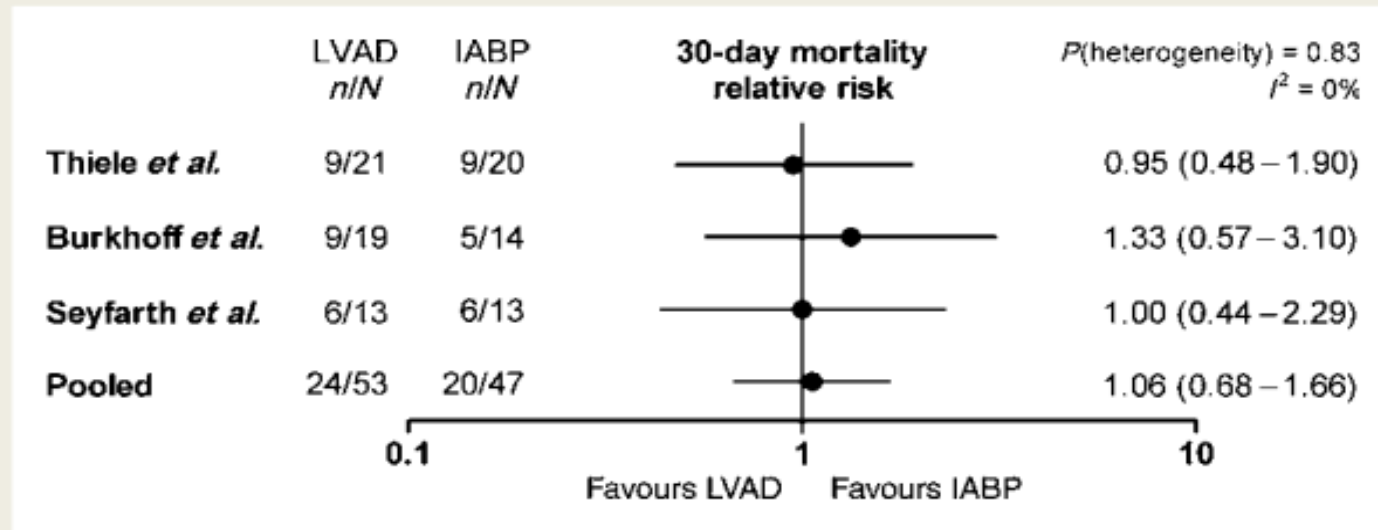


Figure 3 Meta-analysis showing the relative risk of crude 30-day mortality with use of percutaneous left ventricular assist devices. Random effects model was used for meta-analysis. Relative risks with 95% confidence intervals are presented on the right of the figure. IABP, intra-aortic balloon pump; LVAD, left ventricular assist device.

Improved Survival After Acute Myocardial Infarction Complicated by Cardiogenic Shock With Circulatory Support and Transplantation: Comparing Aggressive Intervention With Conservative Treatment

Wakkas Tayara, MD,^a Randall C. Starling, MD, MPH,^b Mohamad H. Yamani, MD,^b Oussama Wazni, MD,^b Fuad Jubran, MD,^b and Nicholas Smedira, MD^c

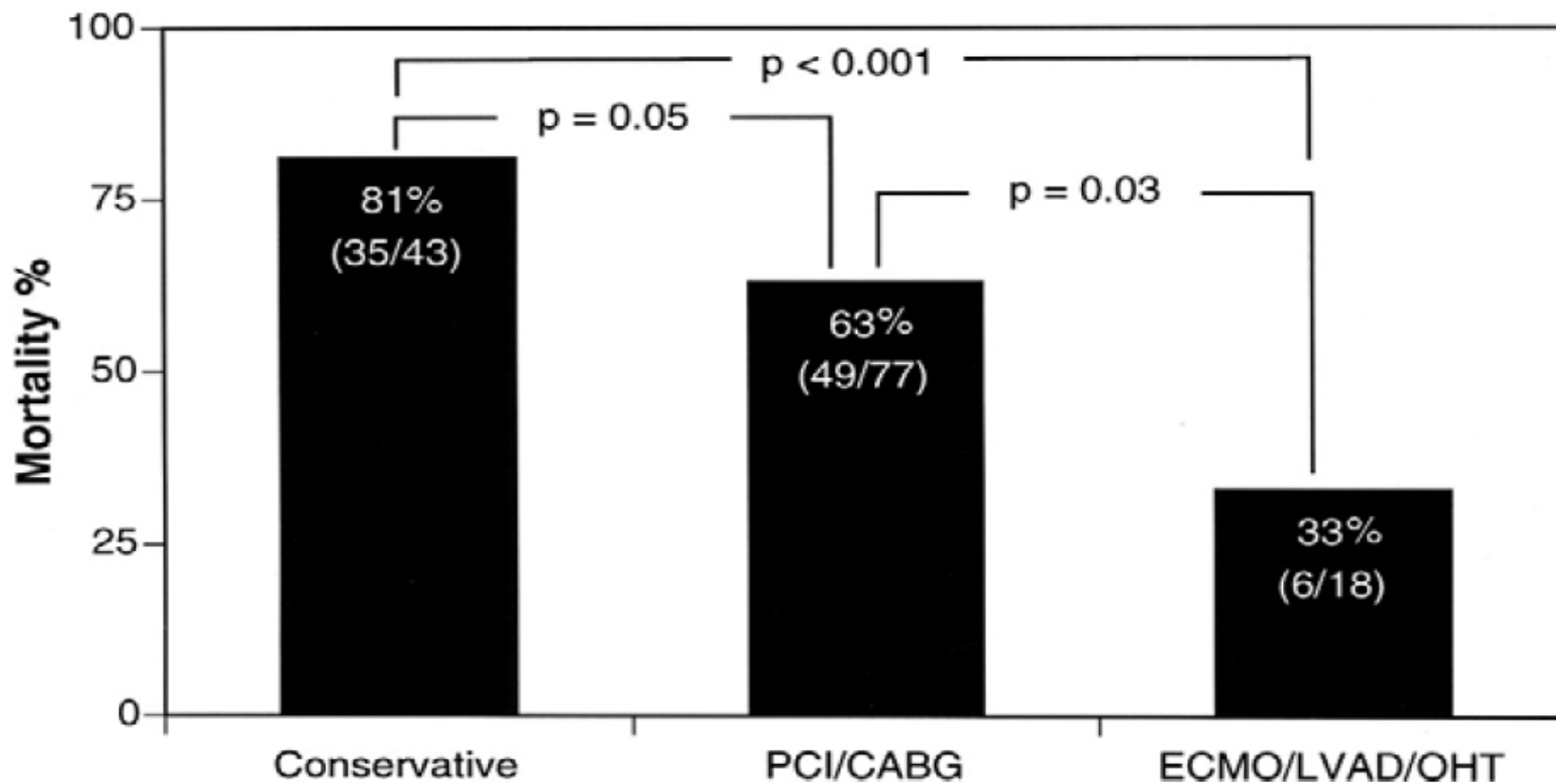


Figure 1. In-hospital mortality rates for the conservative and aggressive groups of patients. PCI, percutaneous coronary intervention; CABG, coronary artery bypass graft; ECMO, extracorporeal membrane oxygenation; LVAD, left ventricular assist device; OHT, orthotopic heart transplant.

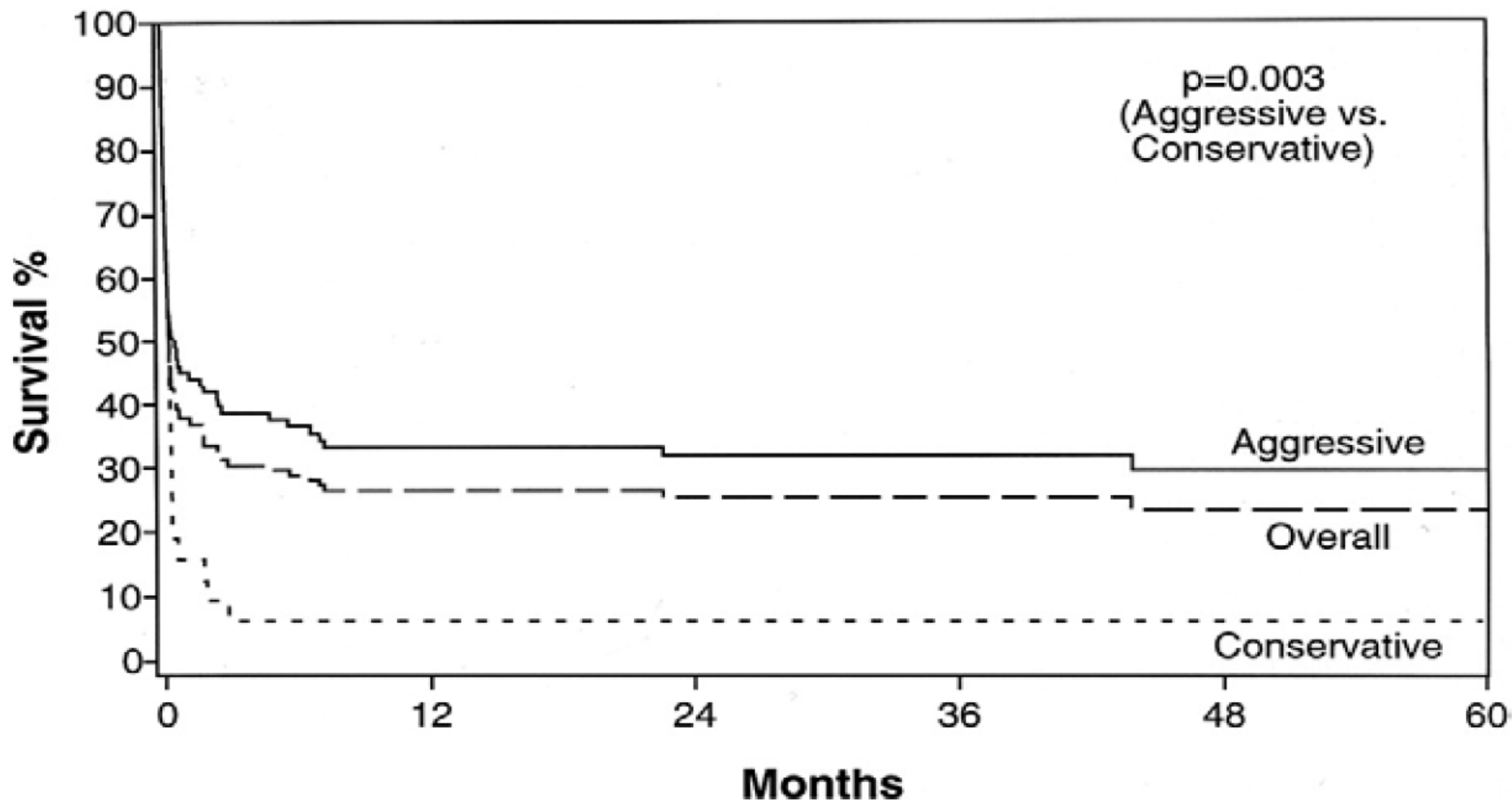


Figure 2. Kaplan–Meier 5-year survival for the overall patient population and the conservative and aggressive groups.

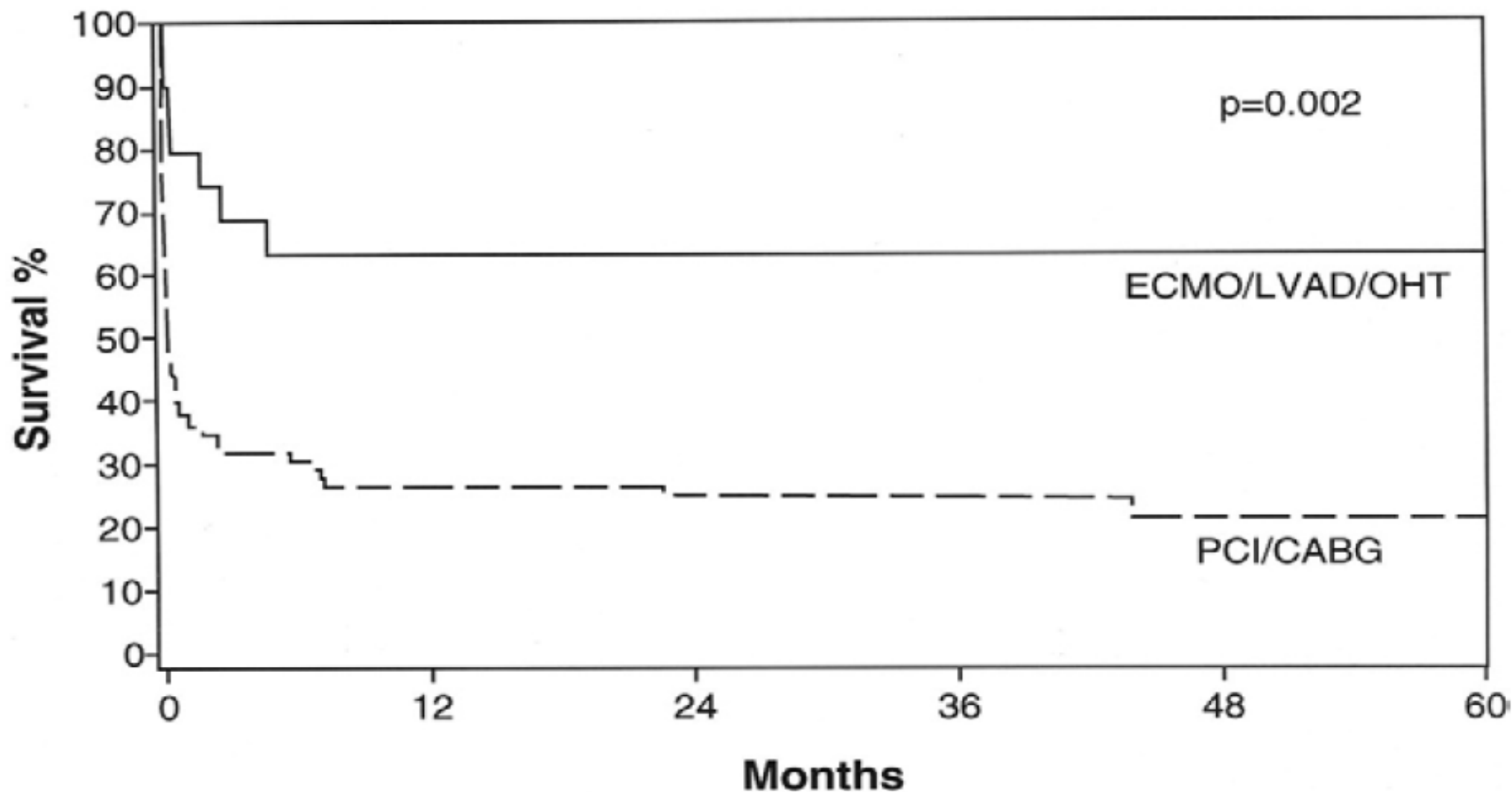


Figure 3. Kaplan–Meier 5-year survival for the aggressive sub-groups of patients. Abbreviations as in [Figure 1](#).

ECMO

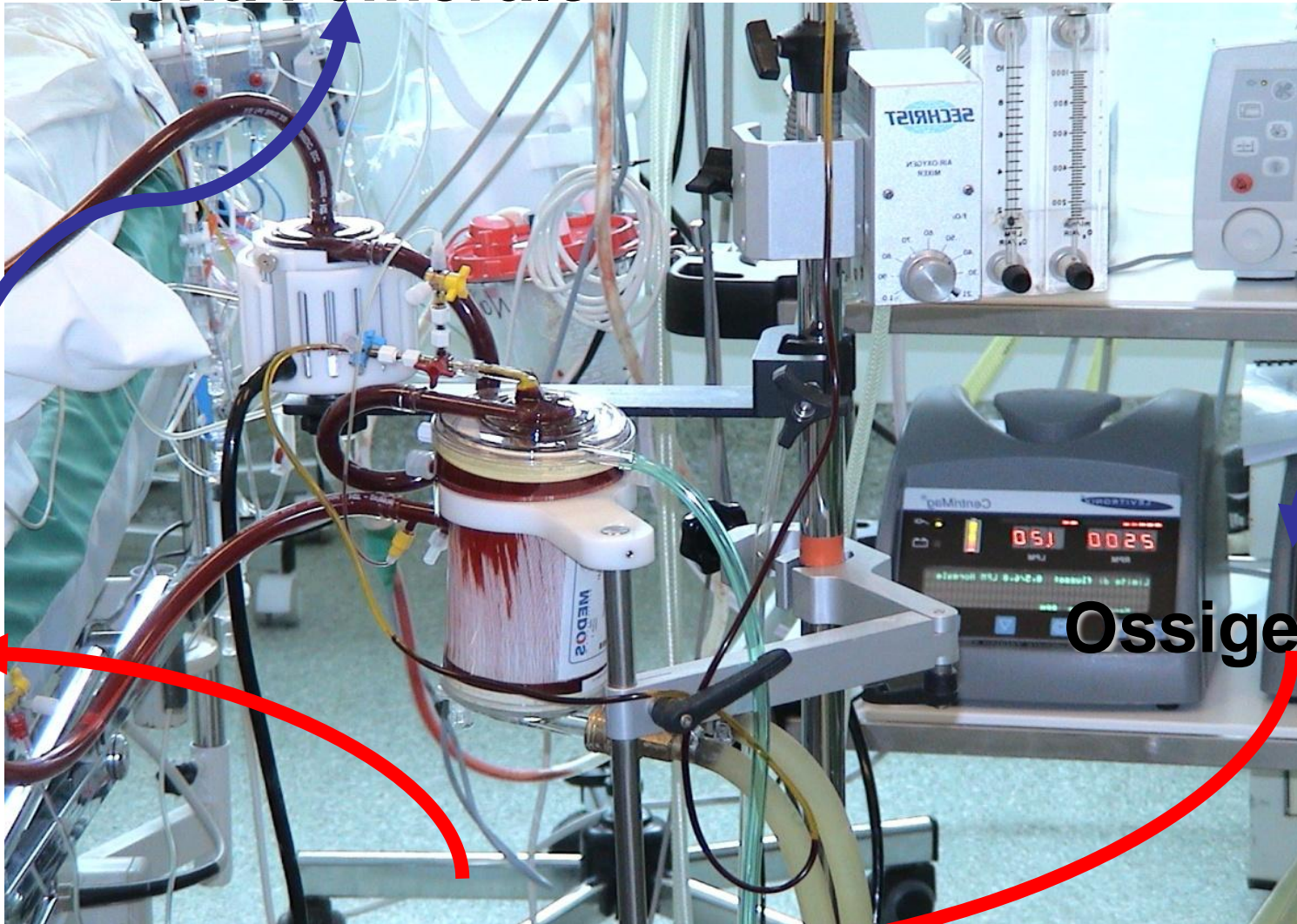
Vena Femorale

VAD

Ossigenatore

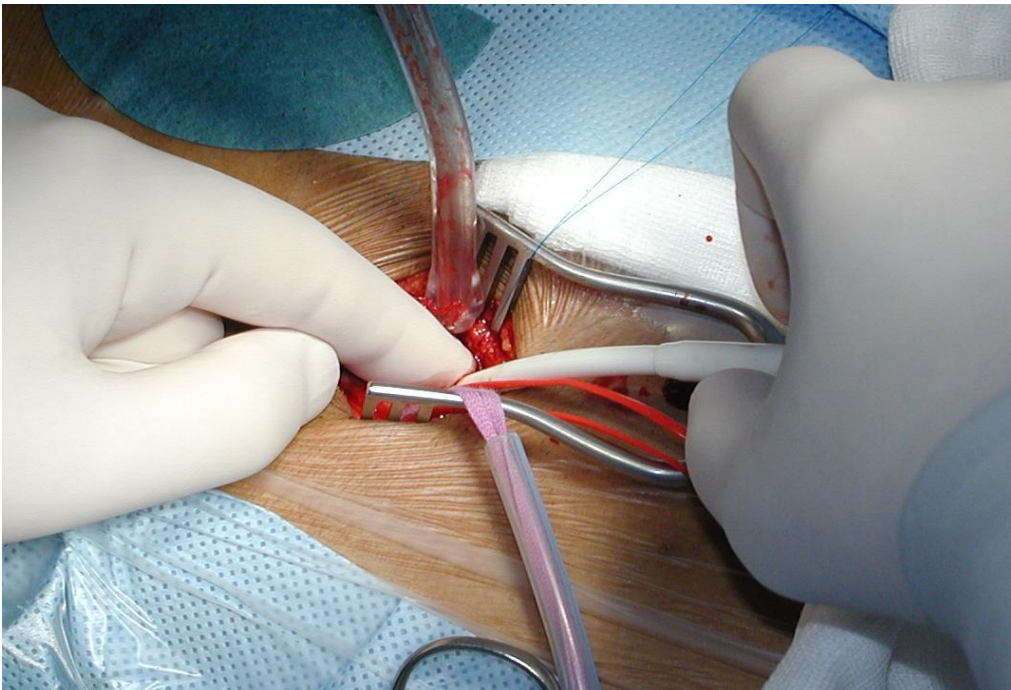
Arteria Femorale

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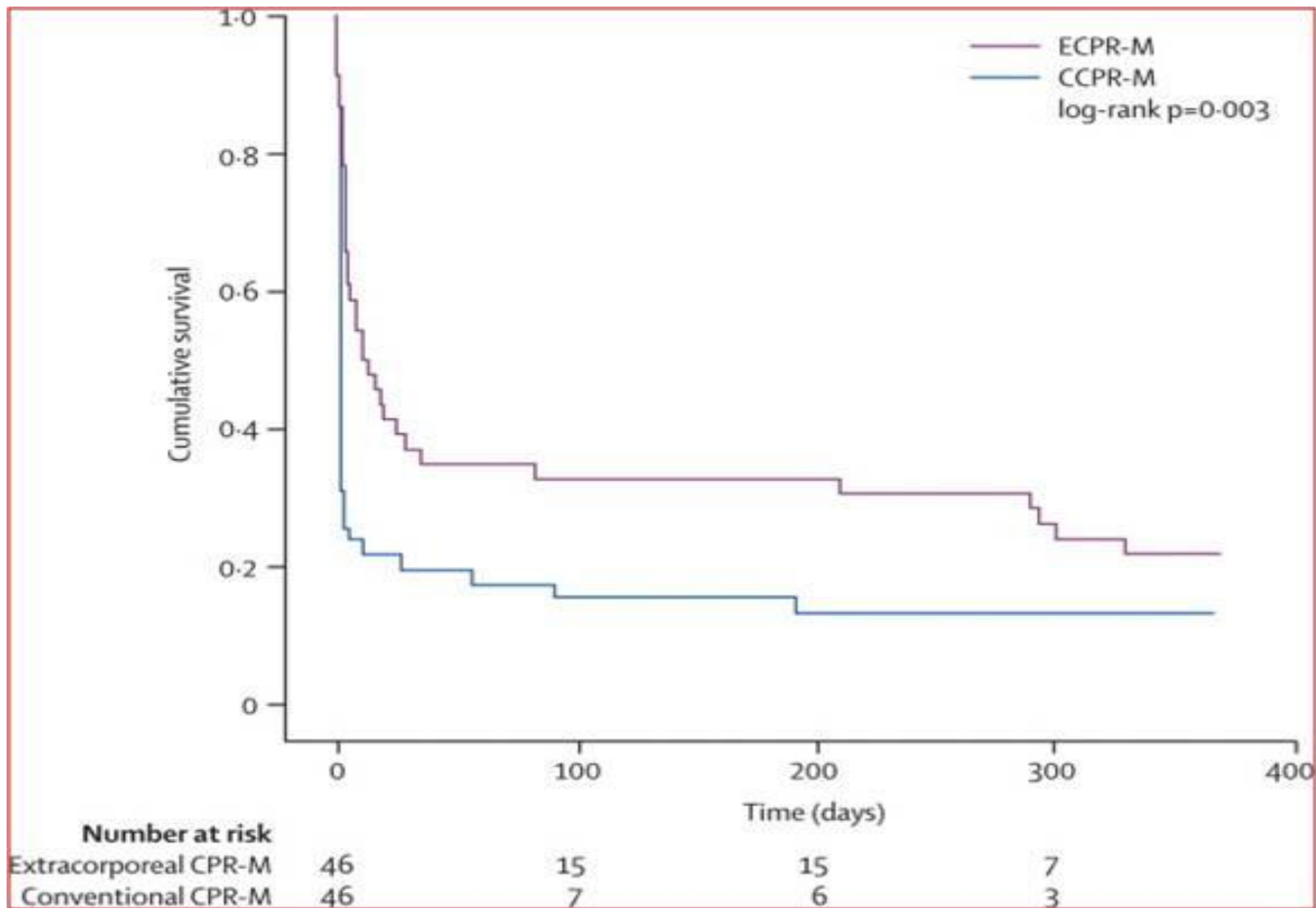
ECMO

- **Accesso**
 - **Centrale: Atrio Destro-Aorta (Sterno-Toracotomia)**
 - **Periferico: Vena Femorale-Arteria Femorale**
 - **Veno-Venoso: Vena-Femorale-Vena Giugulare (solo rimozione CO² – ARDS)**



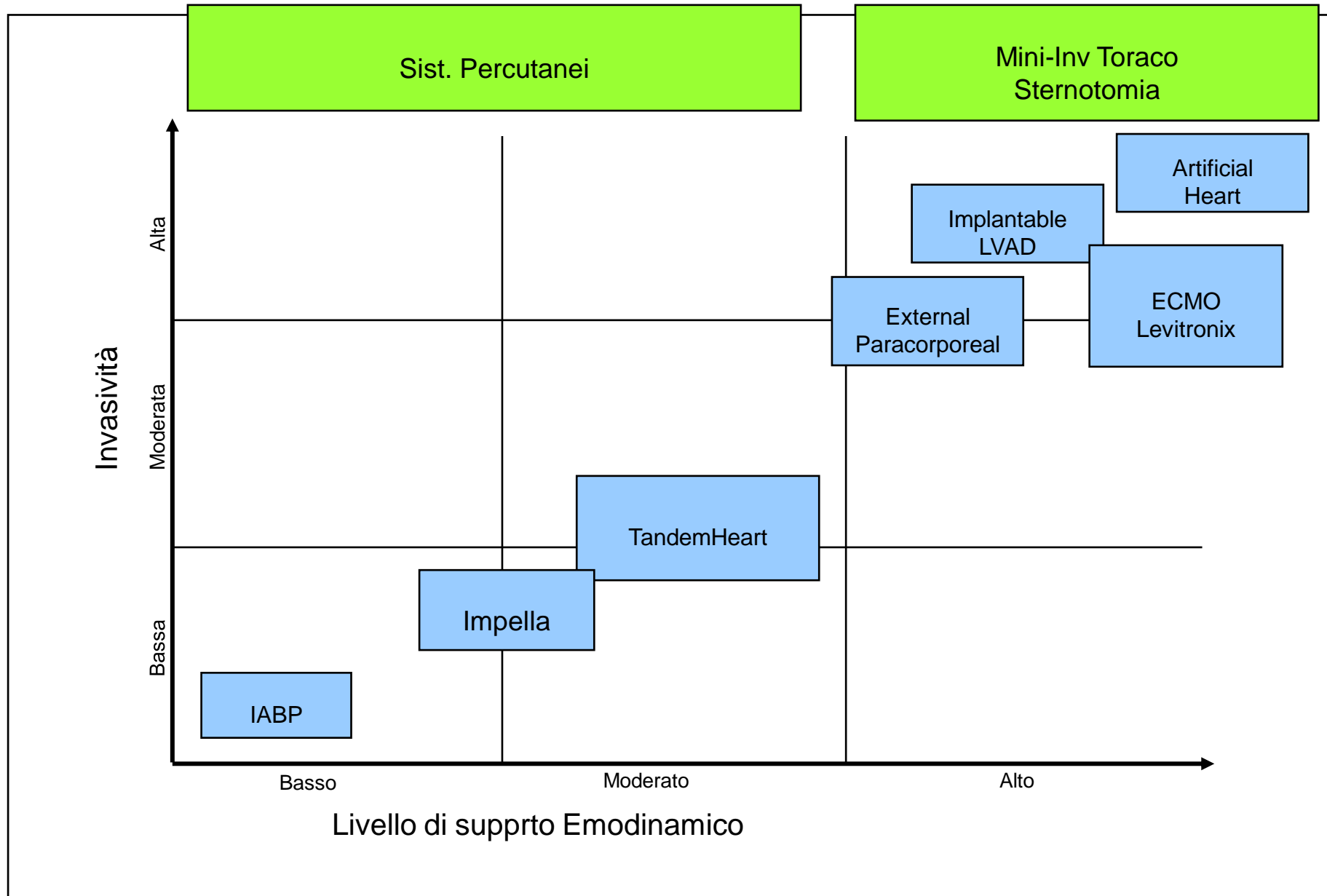
Riperfusione Periferica





Cardiopulmonary Resuscitation with Assisted Extracorporeal Life-Support versus Conventional Cardiopulmonary Resuscitation in Adults with In-Hospital Cardiac Arrest: An Observational Study & Propensity Analysis

Assistenza Meccanica al Circolo



Algoritmo per impianto di Assistenza Ventricolare in Shock Cardiogeno

Modified From: L.E. Samuels et al.
(Ann Thorac Surg 2001;71:S67-72)

