

# Manejo del Aturdimiento Cardiaco POST CEC

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# Definición

Miocardio que sufre una disfunción en la contractilidad transitoria y reversible, inducida por isquemia aguda.

La disfunción continúa luego de la reperfusión

No sufre de disfunción metabólica

En cirugía cardiaca: Uso de dispositivos de asistencia ventricular y/o más de 24 horas de soporte con inotrópicos

# Luego de salida de CEC

## Datos Hemodinámicos

- $IC < 1.8 - 2 \text{ L/min/m}^2$
- $TAM < 60$
- $PCPW > 20 \text{ mmHg}$
- $RVS > 2100 \text{ dyn/s/cm}^5$

## Laboratorios

- Aumento del lactato
- Saturación venosa mixta  $< 60\%$
- Acidosis

# Low Cardiac Output Syndrome

2 – 27%  
en Adultos

17 – 27%  
en Niños

Mortalidad  
de 38%

[Front Cardiovasc Med.](#) 2022; 9: 926957.

# Factores de Riesgo

## Factores preoperatorios

- Edad > 65 años
- FEVI < 50%
- DM y ERC
- Desnutrición

## Factores Intraoperatorios

- Cirugía de Emergencia
- Revascularización incompleta
- Tiempo de CEC

## Laboratorios

- BNP
- NT proBNP
- Anemia

Journal of Cardiothoracic and Vascular Anesthesia 31 (2017) 291–308

# Tratamiento

## Optimización de carrier de oxígeno

- Transfusiones

## Farmacológico

- Adrenalina
- Noradrenalina
- Levosimendán
- Dobutamina
- Milrinone

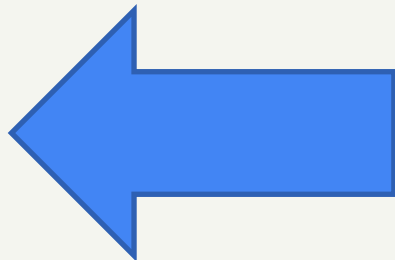
## Mecánico

- Balón de Contrapulsación
- Impella
- ECMO VA

# Vasoactive Inotropic Score

## VIS 2020:

$10,000 \times \text{Vasopressin dose (U/kg/min)} +$   
 $100 \times \text{Epinephrine dose (}\mu\text{g/kg/min)} +$   
 $100 \times \text{Norepinephrine dose (}\mu\text{g/kg/min)} +$   
 $50 \times \text{Levosimendan dose (}\mu\text{g/kg/min)} +$   
 $25 \times \text{Olprinone dose (}\mu\text{g/kg/min)} +$   
 $20 \times \text{Methylene blue dose (mg/kg/h)} +$   
 $10 \times \text{Milrinone dose (}\mu\text{g/kg/min)} +$   
 $10 \times \text{Phenylephrine dose (}\mu\text{g/kg/min)} +$   
 $10 \times \text{Terlipressin dose (}\mu\text{g/min)} +$   
 $0.25 \times \text{Angiotensin II dose (ng/kg/min)} +$   
 $\text{Dobutamine dose (}\mu\text{g/kg/min)} +$   
 $\text{Dopamine dose (}\mu\text{g/kg/min)} +$   
 $\text{Enoximone dose (}\mu\text{g/kg/min)}$





# Vasoactive Inotrope Score as a tool for clinical care in children post cardiac surgery

Maneesh Kumar, Rajesh Sharma, Sidharth Kumar

208 pacientes pediátricos  
VIS empíricamente con corte en 10  
Análisis Retrospectivo

Indian Journal of Critical Care Medicine October 2014 Vol 18 Issue 10

**Table 1: Linear regression analysis showing the association of VIS with baseline characteristics, intraoperative and post-operative variables**

| Baseline characteristics         | < 10 (n=154)<br>(%) | > 10 (n=54)<br>(%) | P value  |
|----------------------------------|---------------------|--------------------|----------|
| Parameters                       |                     |                    |          |
| Male                             | 110 (71.43)         | 40 (74.07)         | 0.7114   |
| Age (in months)                  | 80.85±102.12        | 27.26±58.93        | <0.001*  |
| Weight                           | 18.90±16.89         | 8.92±13.21         | <0.001*  |
| Intra-operative variables        |                     |                    |          |
| CPB time (min)                   | 61.25±27.44         | 101.62±48.26       | <0.001** |
| Pump failure                     | 3 (1.95)            | 5 (9.26)           | 0.0164*  |
| Post-operative variables         |                     |                    |          |
| Sepsis                           | 18 (11.69)          | 23 (42.59)         | <0.001*  |
| Hematological complications      | 7 (4.55)            | 15 (27.78)         | <0.001*  |
| Hepatic dysfunction              | 5 (3.25)            | 11 (20.37)         | <0.001*  |
| AKI during admission             | 5 (3.25)            | 15 (27.78)         | <0.001*  |
| Mortality                        | 0 (0.00)            | 5 (9.26)           | <0.001*  |
| Prolonged ventilator requirement | 8 (5.19)            | 25 (46.30)         | <0.001** |
| CPB time (min)                   | 61.25±27.44         | 101.62±48.26       | <0.001** |
| Inotrope score maximum           | 5.36±2.21           | 14.98±3.57         | <0.001** |
| Stay (days)                      | 10.91±2.21          | 13.25±4.16         | <0.001*  |

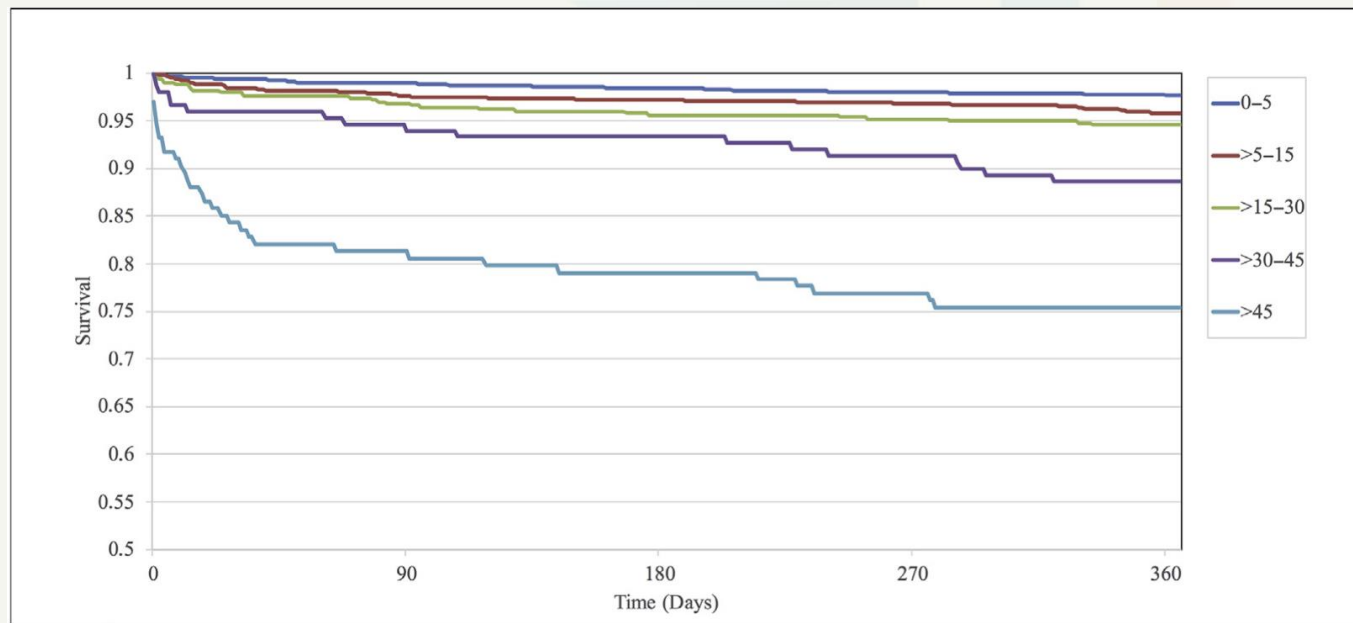
CPB: Cardiopulmonary bypass; AKI: Acute kidney injury; VIS: Vasoactive inotrope score



# Vasoactive-inotropic score and the prediction of morbidity and mortality after cardiac surgery

Timo Koponen<sup>1,4,\*</sup>, Johanna Karttunen<sup>1</sup>, Tadeusz Musialowicz<sup>2</sup>,

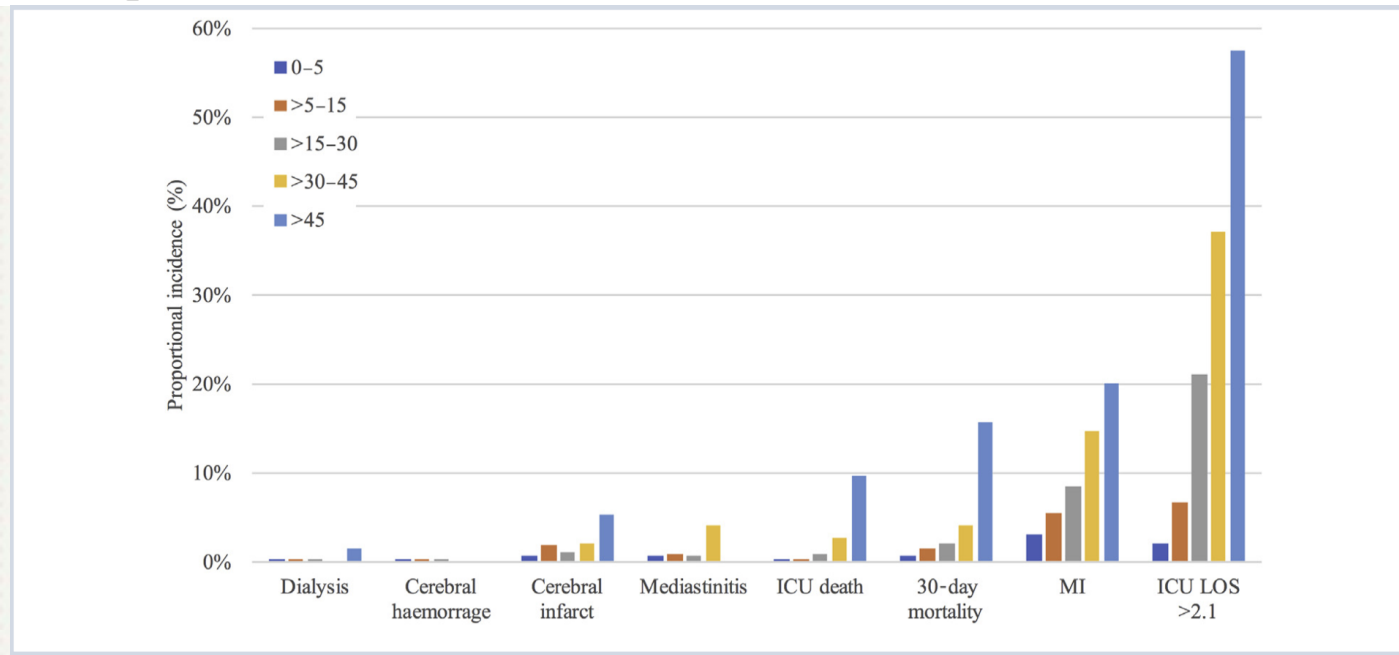
3213 Pacientes adultos  
VISmax primeras 24  
horas  
Estudio retrospectivo



British Journal of Anaesthesia, 122 (4): 428e436 (2019)

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# LA CRUDA REALIDAD

ALTAS DOSIS DE  
INOTRÓPICOS

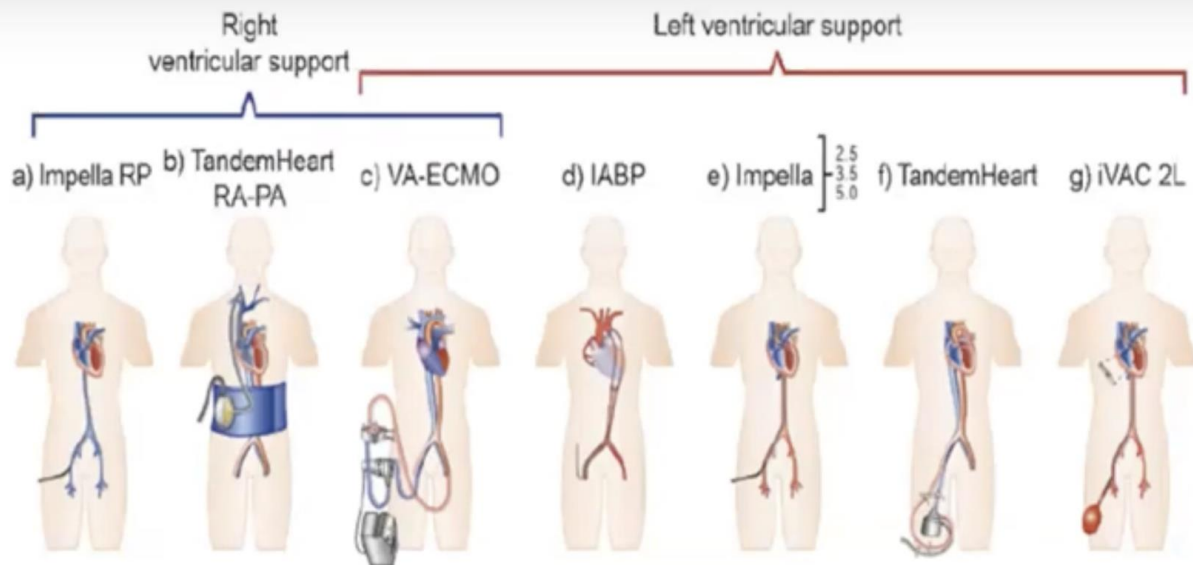
ALTA  
MORTALIDAD

# LA CRUDA REALIDAD

ALTAS DOSIS DE  
INOTRÓPICOS

ALTA  
MORTALIDAD

# Dispositivos de Asistencia Ventricular



|                         |              |                          |                                   |                |                 |                                                 |                |
|-------------------------|--------------|--------------------------|-----------------------------------|----------------|-----------------|-------------------------------------------------|----------------|
| Flow:                   | max. 4.0 L   | max. 4.0 L               | max. 7.0 L                        |                | 2.5-5.0 L       | max. 4.0 L                                      | max. 2.8 L     |
| Pump speed:             | 33.000 rpm   | max. 7.500 rpm           | max. 5000 rpm                     |                | max. 51.000 rpm | max. 7.500 rpm                                  | 40 ml/beat     |
| Cannula size:           | 22 F         | 29 F                     | 14-19 F arterial<br>17-21F venous | 7-8 F          | 12-14 F         | 12-19 F arterial<br>21F venous                  | 17 F           |
| Insertion/<br>Placement | Femoral vein | Internal jugular<br>vein | Femoral artery<br>Femoral vein    | Femoral artery | Femoral artery  | Femoral artery<br>Femoral vein<br>for LA access | Femoral artery |
| LV Unloading            | -            | -                        | -                                 | (+)            | +-++            | ++                                              | +              |
| RV Unloading            | +            | +                        | ++                                | -              | -               | -                                               | -              |



# Intraaortic Balloon Support for Myocardial Infarction with Cardiogenic Shock



Holger Thiele, M.D., Uwe Zeymer, M.D., Franz-Josef Neumann, M.D., Mirosław Ferenc, M.D.,

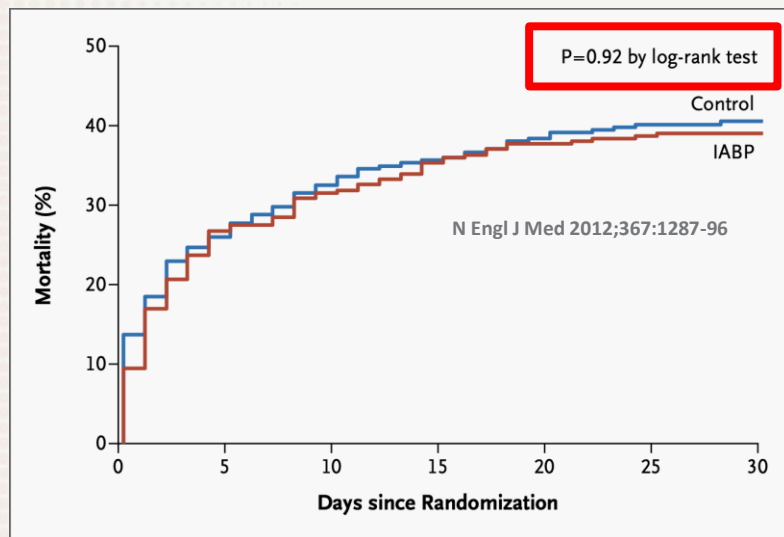


Table 3. Clinical Outcomes.

| Outcome                                                              | IABP<br>(N=300)<br>number (percent) | Control<br>(N=298)<br>number (percent) | P Value | Relative Risk<br>with IABP<br>(95% CI) |
|----------------------------------------------------------------------|-------------------------------------|----------------------------------------|---------|----------------------------------------|
| Primary end point: all-cause mortality at 30 days                    | 119 (39.7)                          | 123 (41.3)                             | 0.69    | 0.96 (0.79–1.17)                       |
| Reinfarction in hospital                                             | 9 (3.0)                             | 4 (1.3)                                | 0.16    | 2.24 (0.70–7.18)                       |
| Stent thrombosis in hospital                                         | 4 (1.3)                             | 3 (1.0)                                | 0.71    | 1.32 (0.30–5.87)                       |
| Stroke in hospital                                                   | 2 (0.7)                             | 5 (1.7)                                | 0.28    | 0.40 (0.08–2.03)                       |
| Ischemic                                                             | 2 (0.7)                             | 4 (1.3)                                | 0.45    | 0.49 (0.09–2.71)                       |
| Hemorrhagic                                                          | 0                                   | 1 (0.3)                                | 0.50    | —                                      |
| Peripheral ischemic complications requiring intervention in hospital | 13 (4.3)                            | 10 (3.4)                               | 0.53    | 1.29 (0.58–2.90)                       |
| Bleeding in hospital*                                                |                                     |                                        |         |                                        |
| Life-threatening or severe                                           | 10 (3.3)                            | 13 (4.4)                               | 0.51    | 0.76 (0.34–1.72)                       |
| Moderate                                                             | 52 (17.3)                           | 49 (16.4)                              | 0.77    | 1.05 (0.74–1.50)                       |
| Sepsis in hospital                                                   | 47 (15.7)                           | 61 (20.5)                              | 0.15    | 0.77 (0.54–1.08)                       |

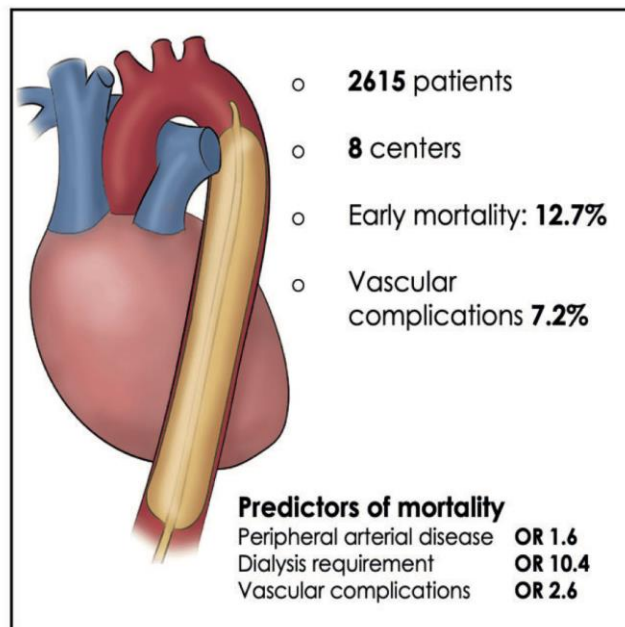
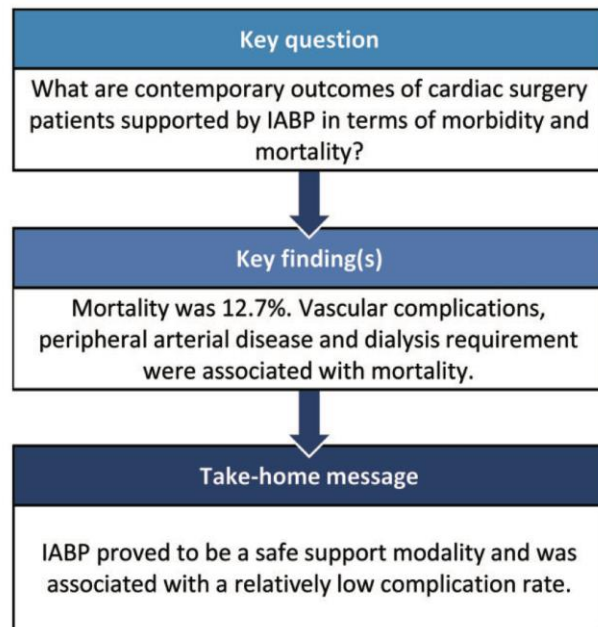
N Engl J Med 2012;367:1287-96

# Contemporary outcomes of cardiac surgery patients supported by the intra-aortic balloon pump

Roberto Lorusso <sup>a,b,c,x,†</sup>, Samuel Heuts <sup>a,†</sup>, Federica Jiritano <sup>d</sup>, Roberto Scrofani<sup>e</sup>, Carlo Antona <sup>e</sup>,

PERFUSION 2023

2615 Pacientes  
Retrospectivo  
No comparado con otro grupo

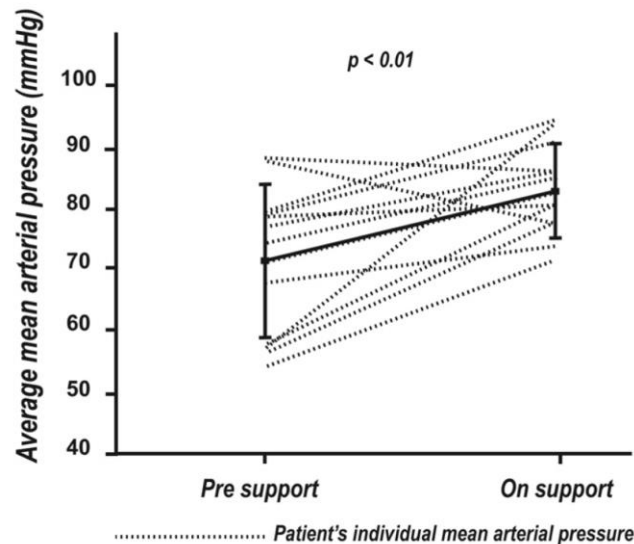
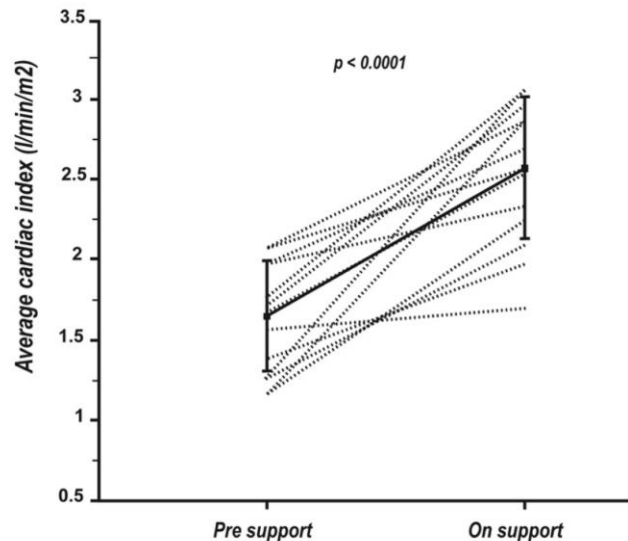


Interactive CardioVascular and Thoracic Surgery 2022, 35(1), ivac091

# The RECOVER I: A multicenter prospective study of Impella 5.0/LD for postcardiotomy circulatory support

Bartley P. Griffith, MD,<sup>a</sup> Mark B. Anderson, MD,<sup>b</sup> Louis E. Samuels, MD,<sup>c</sup> Walter E. Pae, Jr, MD,<sup>d</sup>

16 pacientes  
Estudio prospectivo  
LCOS luego de  
weaning de CEC

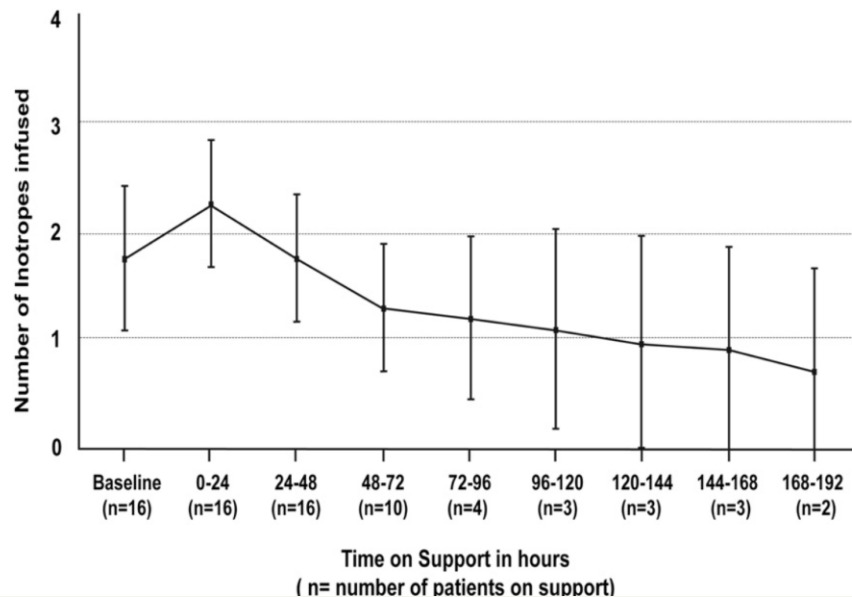


J Thorac Cardiovasc Surg 2013;145:548-54

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Sobrevida  
30 días 94%  
3 meses 81%  
1 años 75 %



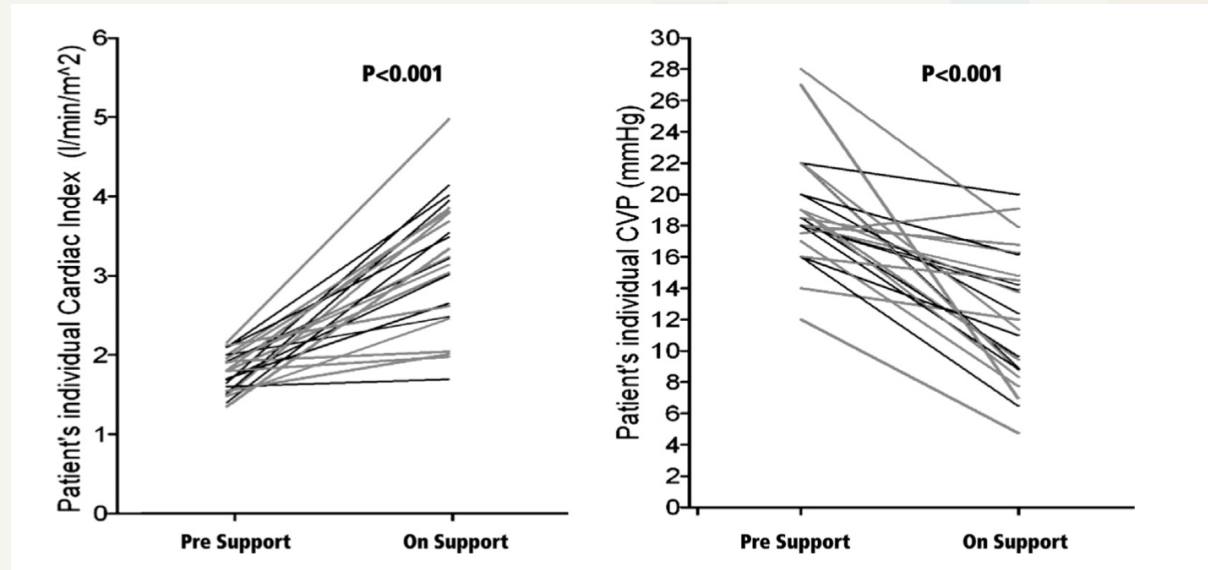
J Thorac Cardiovasc Surg 2013;145:548-54

# Benefits of a novel percutaneous ventricular assist device for right heart failure: The prospective RECOVER RIGHT study of the Impella RP device

Mark B. Anderson, MD,<sup>a</sup> James Goldstein, MD,<sup>b</sup> Carmelo Milano, MD,<sup>c</sup>

30 pacientes en dos  
cortes  
18 pacientes en LVAD  
2 post cardiotoromía  
5 post trasplante  
5 post infarto agudo de  
miocardio

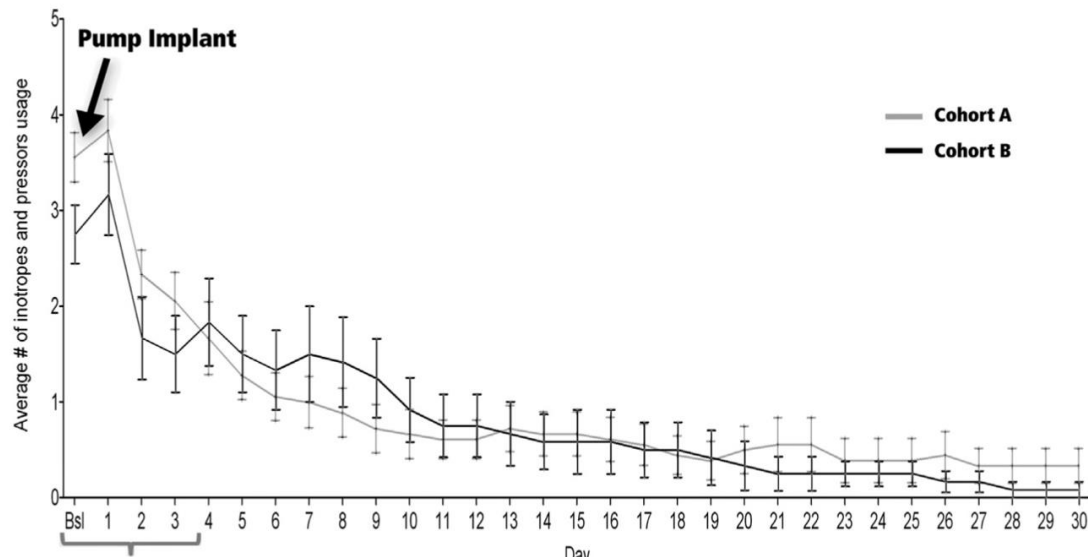
*J Heart Lung  
Transplant.* 2015; **30**: 1360-1367



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**Table 3** Patient Outcome

| Event                                    | All patients<br>(N = 30)<br>% (No.) |
|------------------------------------------|-------------------------------------|
| Alive at 30 Days                         | 73.3 (22)                           |
| Discharge 30 days/discharge/next therapy | 70.0 (21)                           |
| 180 days                                 | 73.3 (22)                           |
|                                          | 70.0 (21)                           |

**Table 4** Major Adverse Events to 30 Days

| Safety end points                                      | All patients<br>(N = 30)<br>% (No.) |
|--------------------------------------------------------|-------------------------------------|
| Death                                                  | 26.7 (8)                            |
| Major bleeding                                         | 60.0 (18)                           |
| Device access site                                     | 3.3                                 |
| Postoperative <sup>a</sup>                             | 36.7                                |
| Transfusion with no overt bleeding                     | 16.7                                |
| Other                                                  | 3.3                                 |
| Hemolysis                                              | 13.3 (4)                            |
| Pulmonary embolism                                     | 0.0 (0)                             |
| Tricuspid and pulmonary valve dysfunction <sup>b</sup> | 3.3 (1)                             |

*J Heart Lung Transplant.* 2015; **30**: 1360-1367



# Venoarterial Extracorporeal Membrane Oxygenation for Cardiogenic Shock and Cardiac Arrest: A Meta-Analysis

Ashleigh Xie,<sup>\*†</sup> Kevin Phan, BSc,<sup>\*¶</sup> Yi-Chin Tsai MBBS,<sup>‡</sup> Tristan D. Yan, MD, MS, PhD, FRACS,<sup>\*§¶</sup> and

ACTUALIZACIÓN EN  
PERFUSIÓN 2023

1199 Pacientes colocados en ECMO VA  
22 Estudios  
Hospitales Universitarios  
2000 en adelante

**Table 3. Summary of Venoarterial Extracorporeal Membrane Oxygenation Survival Outcomes**

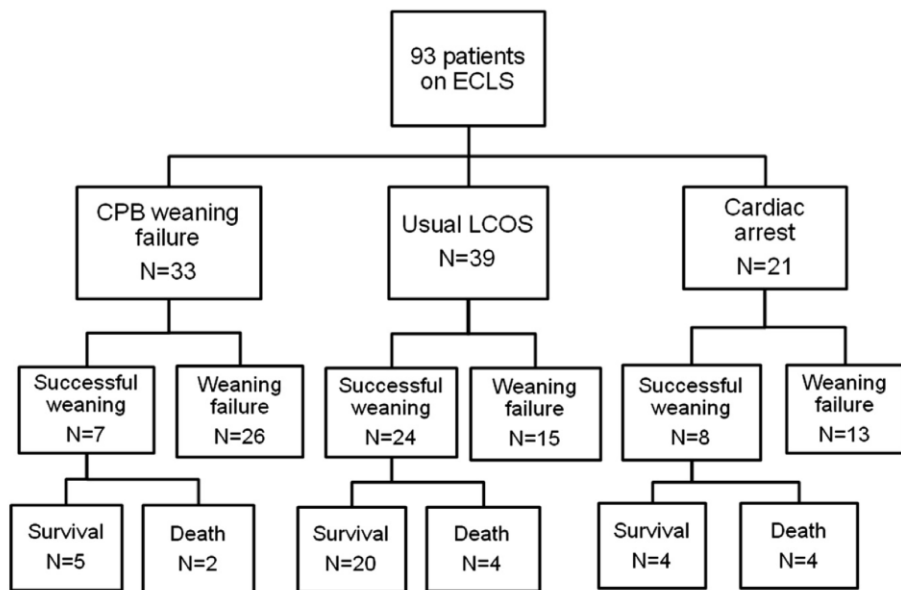
| First Author (Reference)               | Length of Hospital Stay (d) | Weaned Successfully (%) | Survival to Discharge (%) | 30-Day Survival (%) | 3-Month Survival (%) | 6-Month Survival (%) | 1-Year Survival (%) | Bridge to VAD (%) | Bridge to HTx (%) |
|----------------------------------------|-----------------------------|-------------------------|---------------------------|---------------------|----------------------|----------------------|---------------------|-------------------|-------------------|
| Cumulative complication rate           | —                           | 587/1104                | 340/841                   | 366/681             | 36/64                | 99/236               | 178/360             | 53/462            | 39/513            |
| p value heterogeneity                  | 0.007                       | <0.001                  | <0.001                    | <0.001              | 0.290                | <0.001               | <0.001              | <0.001            | 0.576             |
| I-squared (%)                          | 64                          | 74                      | 70                        | 80                  | 19                   | 92                   | 91                  | 88                | 0                 |
| Weighted pooled proportion or estimate | 23.9                        | 52.5                    | 40.2                      | 52.8                | 55.9                 | 47.6                 | 54.4                | 14                | 7.2               |
| 95% Confidence interval (%)            | 20.2-27.6                   | 46.4-58.5               | 33.9-46.7                 | 43.9-61.6           | 41.5-69.8            | 25.4-70.2            | 36.6-71.7           | 5.5-25.3          | 5-9.7             |

Journal of Cardiothoracic and Vascular Anesthesia, Vol 29, No 3 (June), 2015: pp 637–645

# Outcomes of extracorporeal life support for low cardiac output syndrome after major cardiac surgery



Sung Jun Park, MD, Joon Bum Kim, MD, Sung-Ho Jung, MD, PhD, Suk Jung Choo, MD, PhD,

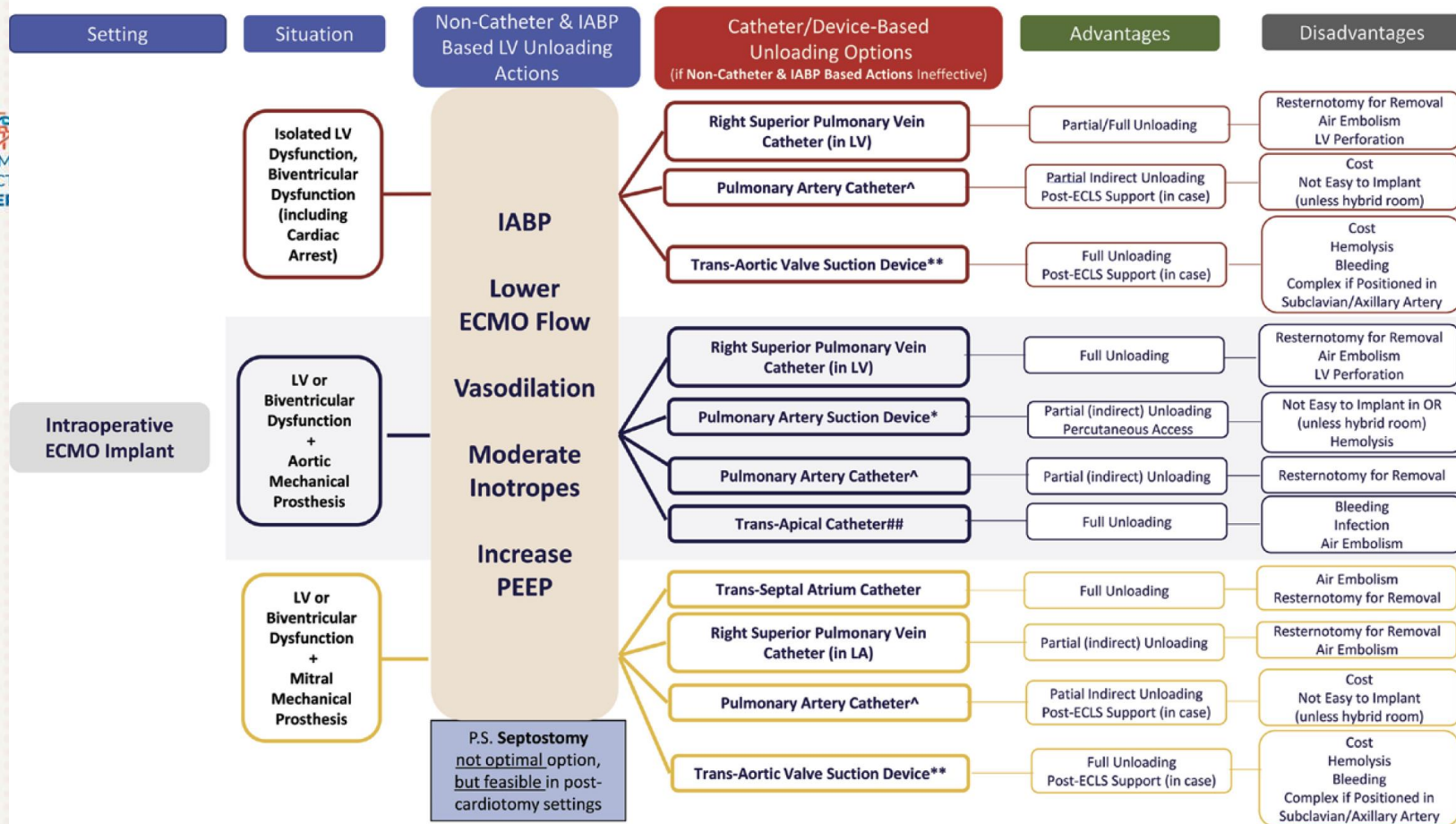


**TABLE 3. Multivariable risk factors analyses for weaning failure and mortality**

| Variables                            | Weaning failure |            |       | Mortality |           |        |
|--------------------------------------|-----------------|------------|-------|-----------|-----------|--------|
|                                      | HR              | 95% CI     | P     | HR        | 95% CI    | P      |
| Age                                  | 1.03            | 1.00-1.07  | .089  | 1.04      | 1.01-1.06 | .001*  |
| High serum lactate level before ECLS | 1.14            | 1.01-1.28  | .028* | 1.13      | 1.06-1.20 | <.001* |
| CPB weaning failure after surgery    | 6.50            | 2.03-20.79 | .002* | 3.22      | 1.79-5.78 | <.001* |
| Using nafamostat anticoagulant       | 0.33            | 0.09-1.23  | .099  | 0.47      | 0.23-0.97 | .04*   |

ECLS, Extracorporeal life support; CPB, cardiopulmonary bypass; HR, hazard ratio; CI, confidence interval. \* $P < .05$ .

J Thorac Cardiovasc Surg 2014;147:283-9



# Conclusiones

El aturdimiento miocárdico se manifiesta en forma de  
síndrome de bajo gasto

Su pilar de manejo son:

- Aumentar delivery de oxígeno

- Inotrópicos

- Manejo mecánico

El manejo con ECMO VA en el contexto de Shock  
Cardiogénico tiene una sobrevida menor de 50%