

Ein Unternehmen der LUKS Gruppe

luzerner kantonsspital  
KULTUR DER WIRTSCHAFT

## how to upgrade in cardiogenic shock: Impella 5.5 or ECMO?

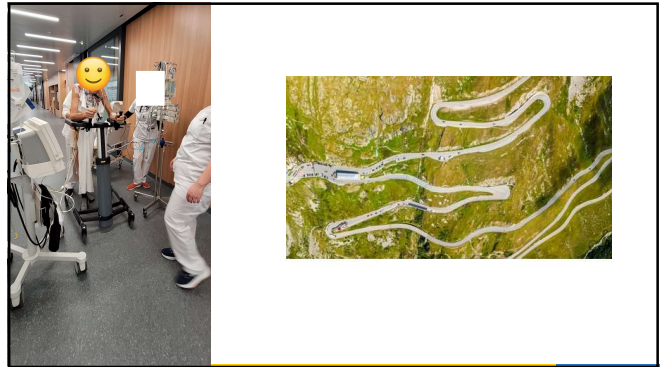
LUCCA – Lucerne Complex and Calcified PCI Meeting 3.0

Zentrum für Intensivmedizin – ICU

PD Dr. med. Andreas Bloch – Zentrum für Intensivmedizin – ICU – Luzerner Kantonsspital  
23.02.2024

herzlich, kompetent, vernetzt

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Management of patients with cardiogenic shock

ACI safety measure: complications

Emergency PCI or surgical revascularization

Medical and drug after reperfusion success

Consider oxygen support (Class Ia) AND Consider inotropic medications (Class IIa) AND Consider dobutamine therapy (Class IIb)

Reperfusion of myocardium and organ dysfunction

Consider patient care

ACI (Class Ia)  
AND/OR  
Resuscitative therapy (Class IIa)  
OR  
Consider patient care

Figure 18 Management of cardiogenic shock. ACS+ with various perfusion, ETT, and high-flow oxygenation/ECMO mechanical circulatory support. For cardiogenic shock with pulmonary edema, TACO, and/or pulmonary hypertension, avoid volume overload and consider diuresis. In the setting of other circulatory support, avoid TACO or ETT. Avoid hypotension. \*Other causes include acute renal dysfunction, pulmonary embolism, infection, acute respiratory distress syndrome (ARDS).

Images/loops generated from Harvi software <https://harvi.com/en/>

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Impella 5.5

filling pressures flow up to 5.5 l/min

RV failure venous return failure oxygenation failure costs

Images/loops generated from Harvi software <https://harvi.com/en/>

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**circulatory & pulmonary support quick insertion**

**afterload native cardiac function complications**

Images/loops generated from Harvi software (<https://harvi.com/loop>)

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**ORIGINAL ARTICLE**

### Extracorporeal Life Support in Infarct-Related Cardiogenic Shock

H. Thiele, G. Zeymer, L. Akin, M. Bohlen, T. Raschl, A.A. Mahabadi, B. Lehmann, I. Eitel, T. Groll, T. Seifried, A. Schuster, C. Skurk, D. Dierckheim, F. Clements, M. Hennrich, S. Fichtlscherer, J. Vogel, M. Seifried, S. John, S. Ewen, A. Linke, E. Tjebbes, P. Neuback, L. Bruch, C. Jung, J. Frantz, P. Lauten, S. Gossel, M.J. Friedrich, J. Traa, E. Kricheldorf, T. Ochan, S. Schwaiblmair, S. Dierck, and A. Frund, for the ECLS-SHOCK Investigators\*

Subgroup	Death from Any Cause at 30 Days	Extracorporeal Life Support	Relative Risk (95% CI)
Sex			
Male	75 (39.0%)	70 (37.0%)	0.98 (0.61-1.57)
Female	23 (9.9%)	22 (9.4%)	0.94 (0.38-2.36)
Age			
<65 yr	43 (22.4%)	38 (20.2%)	1.00 (0.61-1.66)
≥65 yr	42 (21.5%)	38 (20.4%)	0.95 (0.51-1.78)
Diseases			
MI	42 (21.4%)	37 (19.9%)	0.98 (0.60-1.61)
MI +	39 (20.3%)	32 (17.4%)	0.87 (0.50-1.51)
MI + other	30 (15.4%)	27 (14.6%)	0.96 (0.54-1.71)
MI + other +	24 (12.4%)	21 (11.2%)	0.92 (0.51-1.68)
MI + other + other	19 (9.8%)	17 (9.1%)	0.97 (0.51-1.78)
MI + other + other +	14 (7.3%)	12 (6.4%)	0.88 (0.46-1.70)
MI + other + other + other	9 (4.7%)	7 (3.7%)	0.78 (0.36-1.73)
MI + other + other + other +	4 (2.1%)	3 (1.6%)	0.76 (0.31-1.92)
MI + other + other + other + other	3 (1.5%)	2 (1.1%)	0.74 (0.28-2.00)

**Figure 3. Subgroup Analysis of the Primary Outcome.**

Shown is a forest plot of the relative risk of death from any cause at 30 days (the primary outcome) in prespecified subgroups and in one post hoc subgroup (cardiopulmonary resuscitation [CPR] before randomization). The widths of the confidence intervals were not adjusted for multiplicity and may not be used in place of hypothesis testing.

**Safety outcomes**

Outcome	Extracorporeal Life Support	Control	Relative Risk (95% CI)
Peripheral ischemic vascular complications (wasting limb or interventional therapy) — no. (%)	23 (11.0)	8 (4.2)	Relative risk, 2.86 (1.31 to 6.25)
Stroke or systemic embolization — no. (%)	8 (4.0)	6 (3.0)	Relative risk, 1.33 (0.47 to 3.62)
Moderate or severe bleeding — no. (%)	49 (24.6)	20 (10.4)	Relative risk, 2.44 (1.50 to 3.95)

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**ORIGINAL RESEARCH ARTICLE**

### Extracorporeal Membrane Oxygenation in the Therapy of Cardiogenic Shock: Results of the ECMO-CS Randomized Clinical Trial

Peter Dondos, MD, PhD, Richard Rihal, MD, PhD, Jin Kaneko, MD, PhD, Andreas Kruger, MD, PhD, Dagnir Vondruska, MD, PhD, Marek Jankovik, MD, Jan Nahr, MD, PhD, Jana Smolcova, MD, Marketa Hudobivna, MD, Milan Homolka, MD, PhD, Stefan Halvax, MD, Mircea Stajfulescu, MD, Jiri Jankovsky, PhD, Michael Sobotka, MD, Alex Lehner, MD, PhD, Jan Bechtle, MD, PhD, for the ECMO-CS Investigators

**Figure 3. Cumulative Incidence of All-Cause Death.**

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

Bartley P. Grubb, MD, Mark B. Anderson, MD, Louis E. Samuels, MD, Walter E. Pac, Jr, MD, Yoshifumi Nakai, MD, PhD, and G. Howard Francis, MD

**Objective:** Cardiogenic shock after cardiac surgery is accompanied by a high mortality rate. Early institution of hemodynamic support with a ventricular assist device (VAD) may help bridge patients to recovery or to the next therapy, and improve the outcomes.

**Methods:** Patients developing cardiogenic shock on low cardiac output syndrome after being weaned off cardiopulmonary bypass were enrolled in a prospective single-arm feasibility study (RECOVER). The primary safety endpoint was the frequency of major adverse events (stroke, renal, and/or bleeding) at 30 days or discharge, whichever was longer. The primary efficacy endpoint was survival at the primary or replacement right ventricular therapy, which is shared recovery at 30 days after device removal and bridge-to-other therapy.

**Results:** Device recovery provided hemodynamic support and was successful in the study. Hemodynamics improved immediately after the initiation of mechanical support; cardiac index, 1.65 versus 2.7 L/min/m<sup>2</sup> (P < .0001); mean arterial pressure, 77.4 versus 81.3 mm Hg (P = .01); and laboratory assay diagnostic pressure, 268 versus 19.8 mm Hg (P < .0001). The primary endpoint was achieved in 40 of 61 patients (66%) at an average duration of 7.7 ± 2.6 days (range, 1-17 days). The primary safety endpoint occurred in 2 patients (3.3%), stroke and 1 death. For the primary efficacy endpoint, recovery of the native heart function was obtained in 75% of the patients discharged, with bridge-to-other therapy in 7%. Survival at 30 days, 1 month, and 1 year was 84%, 51%, and 37%, respectively.

**Conclusions:** The use of the Impella 5.0/LD device is safe and feasible in patients presenting with postcardiotomy cardiogenic shock. The device was rapidly inserted, enabled early support, and yielded favorable outcomes. © 2020 American College of Cardiology.

**FIGURE 2. Average cardiac index and patient's individual cardiac index.**

**FIGURE 3. Average mean arterial pressure (MAP) and patient's individual MAP.**

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**Impella support as a bridge to heart surgery in patients with cardiogenic shock**

Shumata Saha D<sup>1</sup>, Aude-Silviana Gal-Hernandez, Karthikeyan Shivan Prasad, Yashraj Karm, Yash Karmava, Madhavi Tanaka, Yasuhiro Takai, On Tsuchiya, Yasuko Kuroki, Koji Ogata and Hirotsugu Fukuda

**Abstract**  
 Impella support as a bridge to heart surgery in patients with cardiogenic shock.  
 Impella improved end-organ function, organoprotection, and 30-day mortality (P=0.03) after surgery.  
 Impella is comparable to ECMO for bridge patients with cardiogenic shock to heart surgery.

**Survival Analysis**  
 Comparison with ECMO support (n=38) (P=0.03)

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**Survival after refractory cardiogenic shock is comparable in patients with Impella and veno-arterial extracorporeal membrane oxygenation when adjusted for SAVE score**

Peter Schiller, Laila Helgren and Per Viholm

**Abstract**  
 Survival after refractory cardiogenic shock is comparable in patients with Impella and veno-arterial extracorporeal membrane oxygenation when adjusted for SAVE score.

Characteristic	Impella (n=16)	ECMO (n=16)	P-value
Female	10	10	0.9
Male	6	6	
Age (years)	66	66	0.9
ECMO days	21	21	0.9
Impella days	12	12	0.9
Impella days	12	12	0.9

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**Mechanical circulatory support in cardiogenic shock from acute myocardial infarction: Impella CP/5.0 versus ECMO**

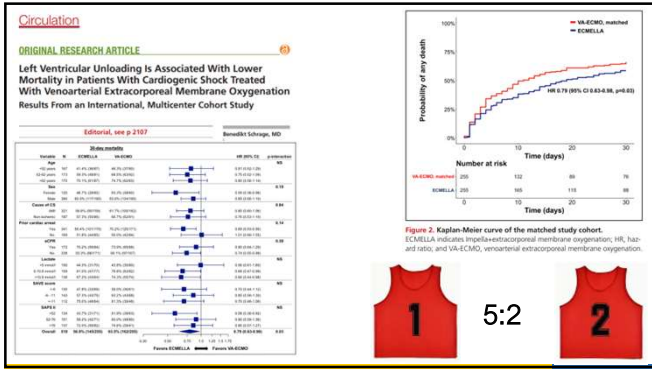
Mina Karami<sup>1</sup>, Corstiaan A den Uijf<sup>2</sup>, Dagmar M Ouweneel<sup>1</sup>, Niels TB Scholte<sup>1</sup>, Annonmarie E Engertsen<sup>1,2</sup>, Sakir Akinci<sup>1</sup>, Wim K Lagrand<sup>1</sup>, Alexander PJ Vissar<sup>1</sup>, Lucia S Jewbali<sup>1,2</sup> and José PS Henriques<sup>1</sup>

**Abstract**  
 Short-term mechanical circulatory support devices are increasingly used in cardiogenic shock after acute myocardial infarction. As no randomized evidence is available, the choice between Impella or extra-corporeal membrane oxygenation (ECMO) is still a matter of debate. Real-life data are necessary to assess adverse outcomes and to help guide the treatment decision between the different devices. The purpose of this study was to compare characteristics and clinical outcomes of Impella CP/5.0 with ECMO support in patients with cardiogenic shock from myocardial infarction. **Methods:** A retrospective, non-interventive study was performed on all cardiogenic shock from myocardial infarction patients with Impella CP/5.0 or ECMO support, from 2006 until 2018. The primary outcome was 30-day mortality. Potential baseline imbalances between the groups was adjusted using inverse probability treatment weighting, and survival analysis was performed with an adjusted log-rank test. Secondly, the occurrence of device-related complications (limb ischaemia, access site-related bleeding, access site-related infection) was evaluated. **Results:** A total of 128 patients were included (Impella, n=90; ECMO, n=38). The 30-day mortality was similar for both groups (33% vs. 49%, P=0.36), also after adjustment for potential baseline imbalances between the groups (weighted log-ratio P=0.16). Patients with Impella support had significantly fewer device-related complications than patients treated with ECMO (impella: 17% vs. 46%, P=0.01). **Conclusions:** Patients treated with Impella CP/5.0 or ECMO for cardiogenic shock after myocardial infarction did not differ in 30-day mortality. Fewer device-related complications occurred with ECMO compared to Impella support.

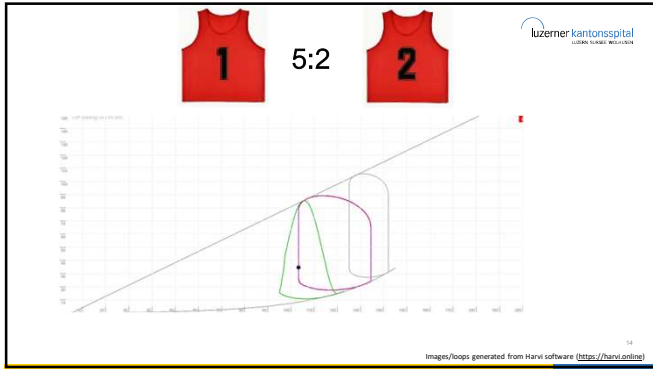
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	Impella (n=90)	ECMO (n=38)	P value
Renal replacement therapy, n (%)	36 (41.9)	10 (26.3)	0.10
Peak CK-MB	641 ± 507	637 ± 401	0.96
Blood products, n (%)	54 (62.8)	37 (97.4)	<0.01
Haemolysis, n (%)	6 (6.7)	0 (-)	0.18
Duration of device support, days	3 (2-6)	6 (3-8)	<0.01
Intensive care unit admission, days	6 (3-14)	16 (9-30)	<0.01
Device-related vascular complications, n (%)	15 (16.7)	15 (39.5)	<0.01
Limb ischaemia	2 (2.2)	2 (5.3)	
Access site-related bleeding	12 (13.3)	7 (18.4)	
Access site-related infection	1 (1.1)	6 (15.8)	

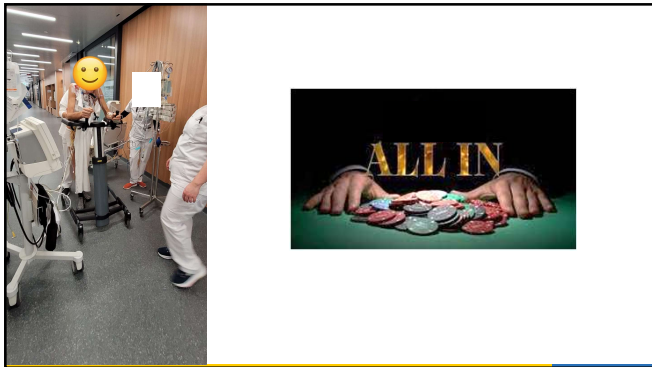
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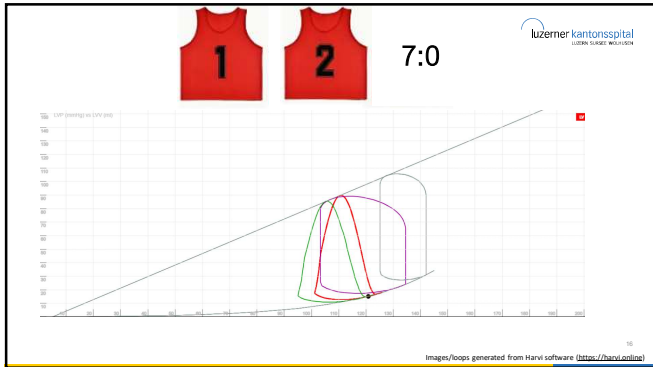
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thank you for your attention

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questions?