# AER 2019

AER

ACTUALITÉS EN RÉANIMATION

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# Assistances circulatoires « légères »

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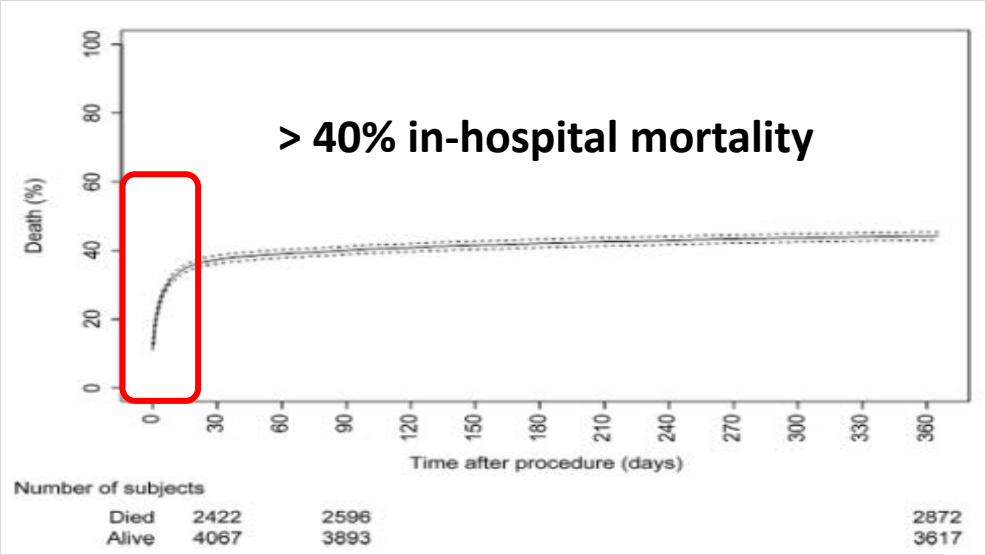
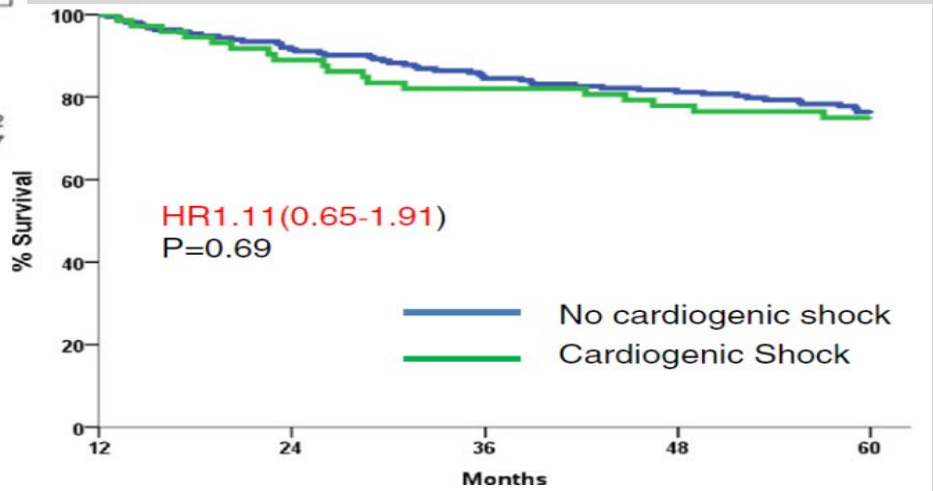
# High and early mortality: active management +++




*Kunadian et al, JACC Cardiovasc Intervention 2014*

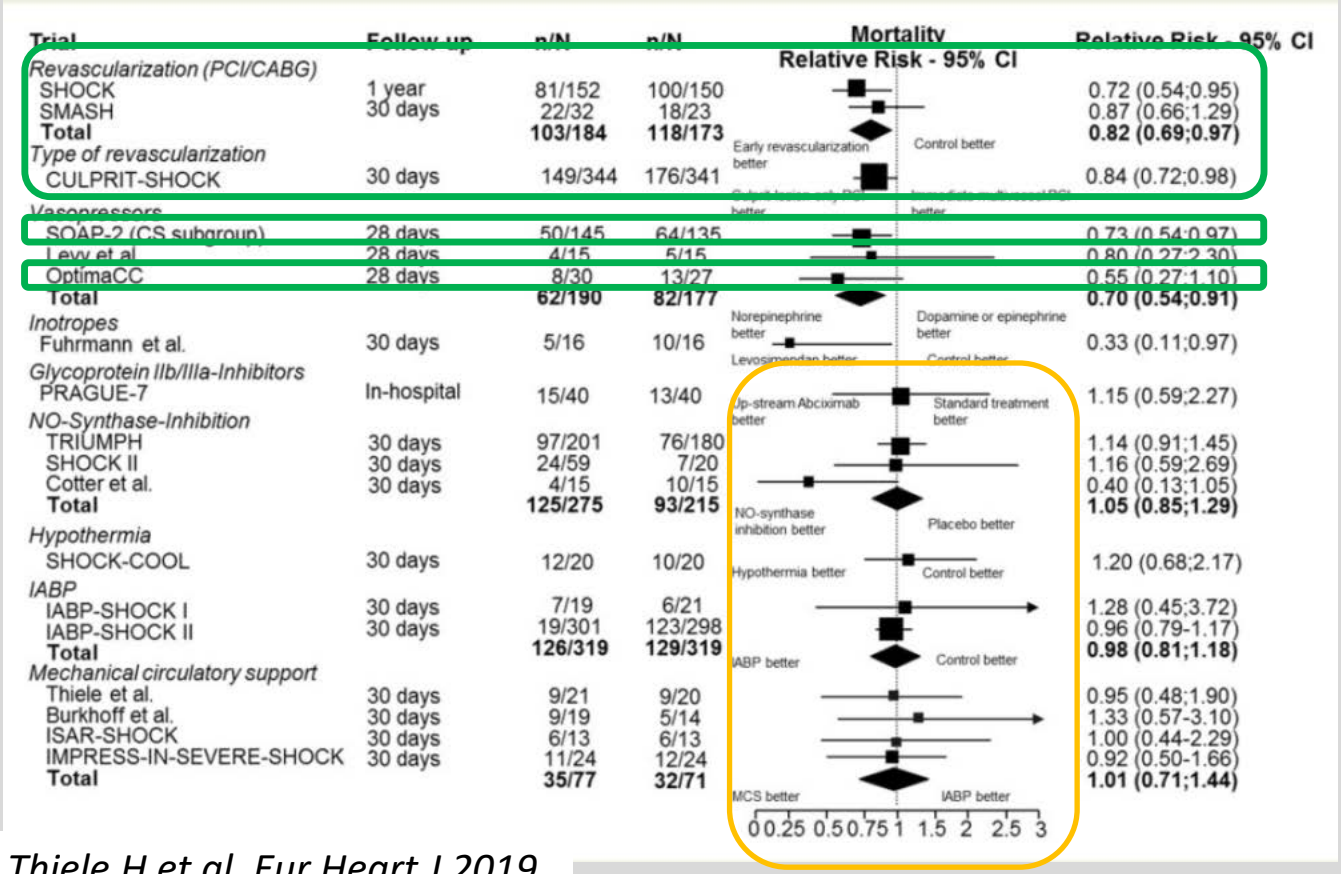
- High mortality during the first 48h
- Prognosis seems good after




*Aissaoui et al , Crit Care Med 2014*

**Place of early diagnosis + stratification + treatement**

# Poor current evidences in CS



| Trial | Follow-up | n/N | n/N | Relative Risk - 95% CI |
|---|---|---|---|---|
| *Revascularization (PCI/CABG)* | | | | |
| SHOCK | 1 year | 81/152 | 100/150 | 0.72 (0.54;0.95) |
| SMASH | 30 days | 22/32 | 18/23 | 0.87 (0.66;1.29) |
| **Total** | | **103/184** | **118/173** | **0.82 (0.69;0.97)** |
| *Type of revascularization* | | | | |
| CULPRIT-SHOCK | 30 days | 149/344 | 176/341 | 0.84 (0.72;0.98) |
| *Vasopressors* | | | | |
| SOAP-2 (CS subgroup) | 28 days | 50/145 | 64/135 | 0.73 (0.54;0.97) |
| Levy et al. | 28 days | 4/15 | 5/15 | 0.80 (0.27;2.30) |
| OptimaCC | 28 days | 8/30 | 13/27 | 0.55 (0.27;1.10) |
| **Total** | | **62/190** | **82/177** | **0.70 (0.54;0.91)** |
| *Inotropes* | | | | |
| Fuhrmann et al. | 30 days | 5/16 | 10/16 | 0.33 (0.11;0.97) |
| *Glycoprotein IIb/IIIa-Inhibitors* | | | | |
| PRAGUE-7 | In-hospital | 15/40 | 13/40 | 1.15 (0.59;2.27) |
| *NO-Synthase-Inhibition* | | | | |
| TRIUMPH | 30 days | 97/201 | 76/180 | 1.14 (0.91;1.45) |
| SHOCK II | 30 days | 24/59 | 7/20 | 1.16 (0.59;2.69) |
| Cotter et al. | 30 days | 4/15 | 10/15 | 0.40 (0.13;1.05) |
| **Total** | | **125/275** | **93/215** | **1.05 (0.85;1.29)** |
| *Hypothermia* | | | | |
| SHOCK-COOL | 30 days | 12/20 | 10/20 | 1.20 (0.68;2.17) |
| *IABP* | | | | |
| IABP-SHOCK I | 30 days | 7/19 | 6/21 | 1.28 (0.45;3.72) |
| IABP-SHOCK II | 30 days | 19/301 | 123/298 | 0.96 (0.79-1.17) |
| **Total** | | **126/319** | **129/319** | **0.98 (0.81;1.18)** |
| *Mechanical circulatory support* | | | | |
| Thiele et al. | 30 days | 9/21 | 9/20 | 0.95 (0.48;1.90) |
| Burkhoff et al. | 30 days | 9/19 | 5/14 | 1.33 (0.57-3.10) |
| ISAR-SHOCK | 30 days | 6/13 | 6/13 | 1.00 (0.44-2.29) |
| IMPRESS-IN-SEVERE-SHOCK | 30 days | 11/24 | 12/24 | 0.92 (0.50-1.66) |
| **Total** | | **35/77** | **32/71** | **1.01 (0.71;1.44)** |



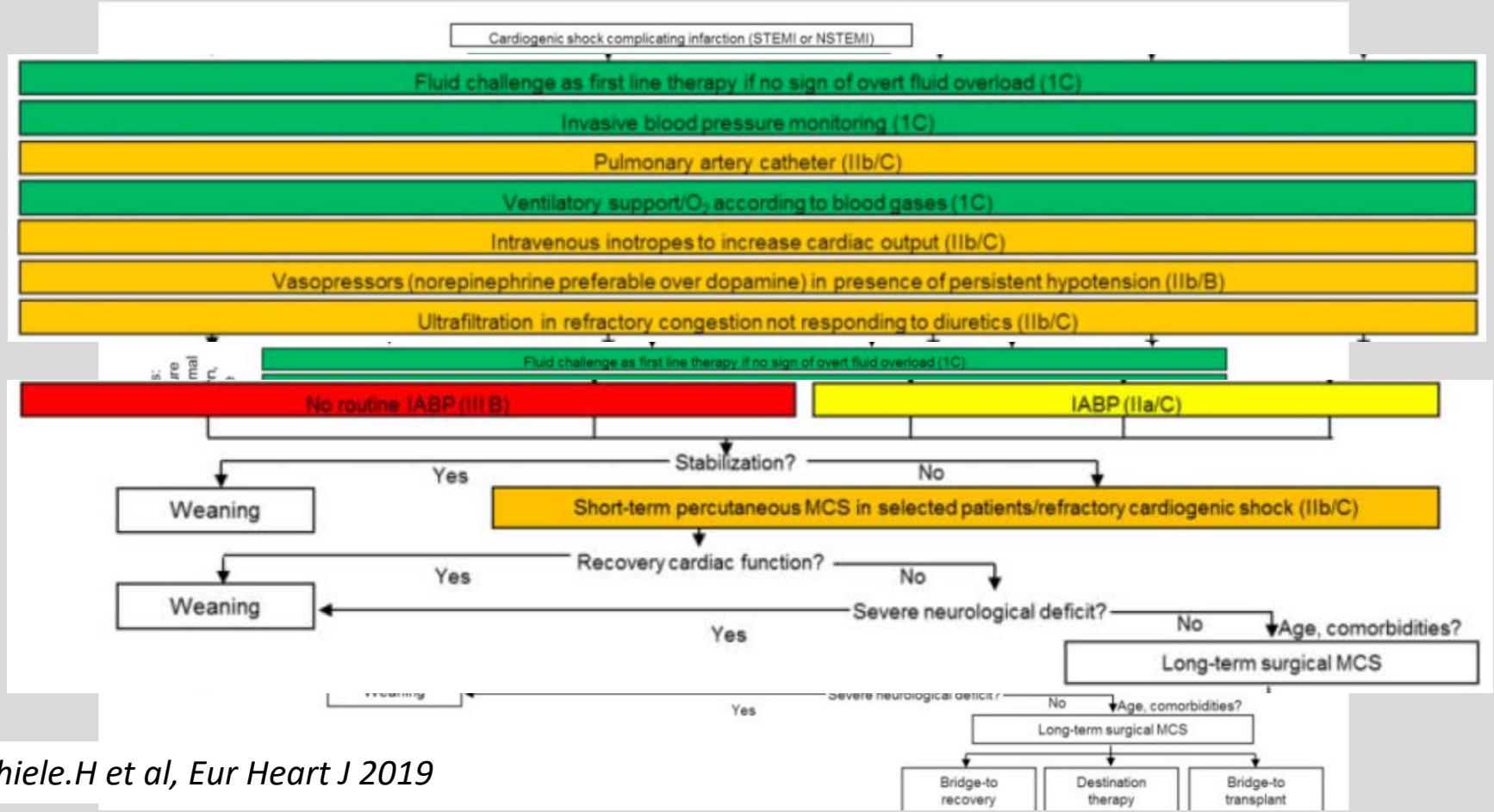
- Revascularization
- Culprit lesion only

Norepinephrine

Only randomized studies were reported

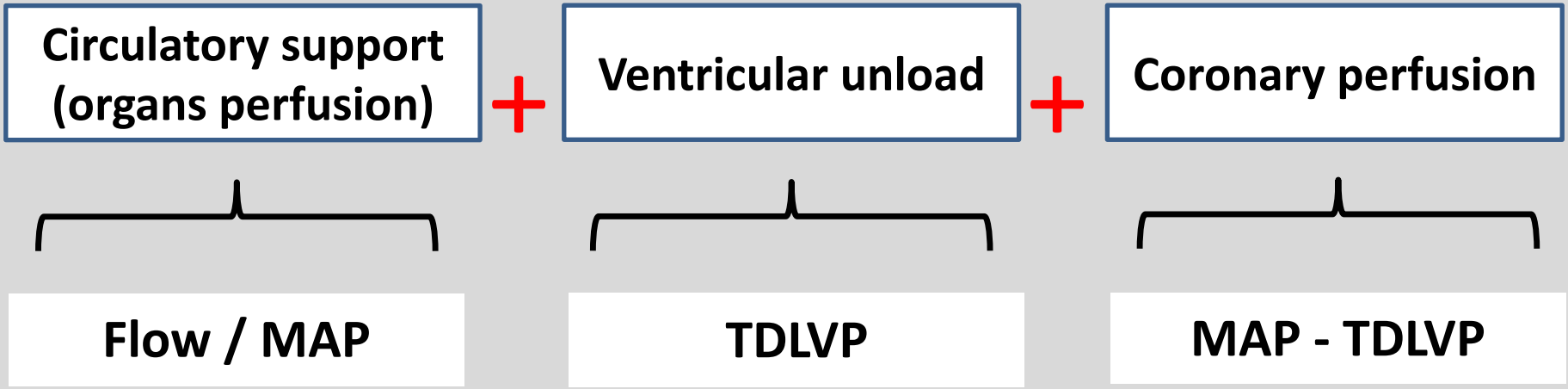
*Thiele.H et al, Eur Heart J 2019*

# CS management: ESC Guidelines




*Thiele.H et al, Eur Heart J 2019*

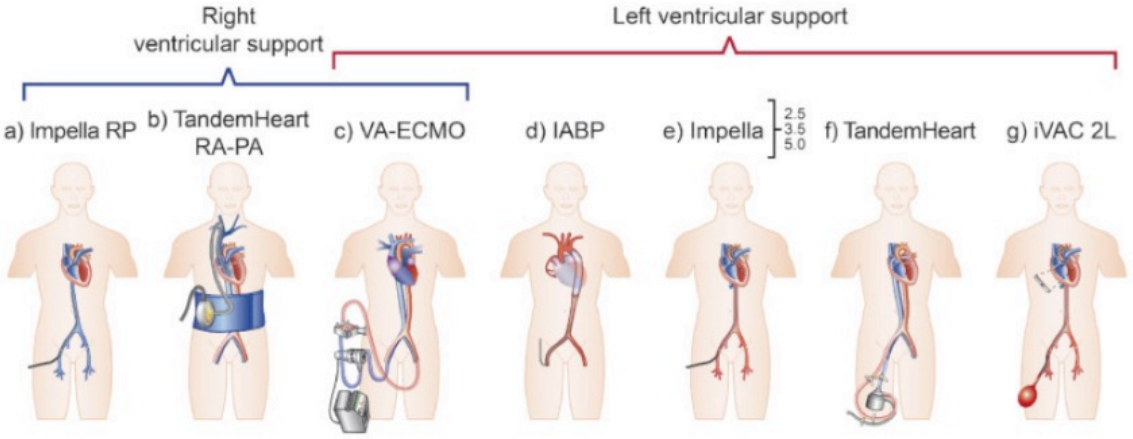
# Determinants of hemodynamic support




**Objectifs:** Mettre le cœur au repos pour favoriser la récupération
Et Eviter ou corriger la défaillance multiviscérale

*Kapur NK et al, Eurointervention 2016*

# What is a « light » circulatory support?



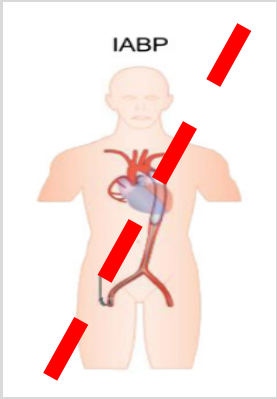

| | a) Impella RP | b) TandemHeart RA-PA | c) VA-ECMO | d) IABP | e) Impella 2.5 3.5 5.0 | f) TandemHeart | g) iVAC 2L |
|---|---|---|---|---|---|---|---|
| Flow: | max. 4.0 L | max. 4.0 L | max. 7.0 L | | 2.5-5.0 L | max. 4.0 L | max. 2.8 L |
| Pump speed: | 33.000 rpm | max. 7.500 rpm | max. 5000 rpm | | 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/ Placement | Femoral vein | Internal jugular vein | Femoral artery<br>Femoral vein | Femoral artery | Femoral artery | Femoral artery<br>Femoral vein for LA access | Femoral artery |
| LV Unloading | - | - | - | (+) | + - ++ | ++ | + |
| RV Unloading | + | + | ++ | - | - | - | - |

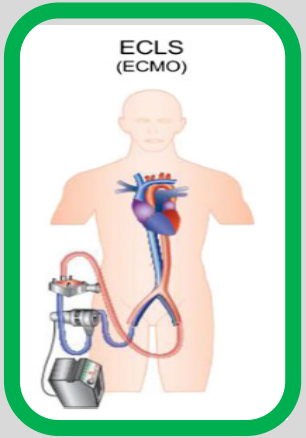
- Percutaneous ?
- W/o oxygenator?
- Flow ?
- Canula size?
- Implantation by interventional cardiologist?
- W/o complications?
- …

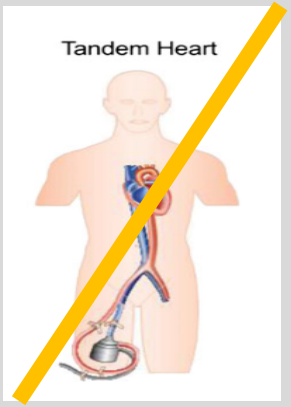
*Thiele.H et al, Eur Heart J 2019*

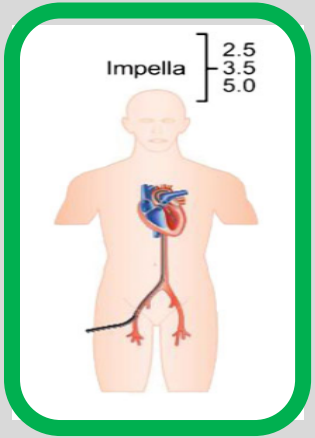
# Short –term MCS

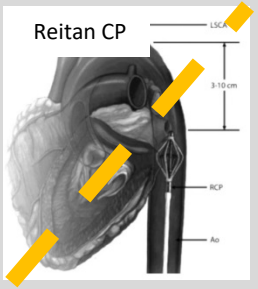
## LV support

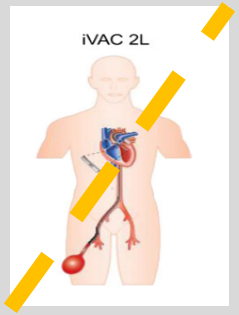


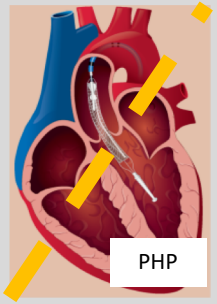



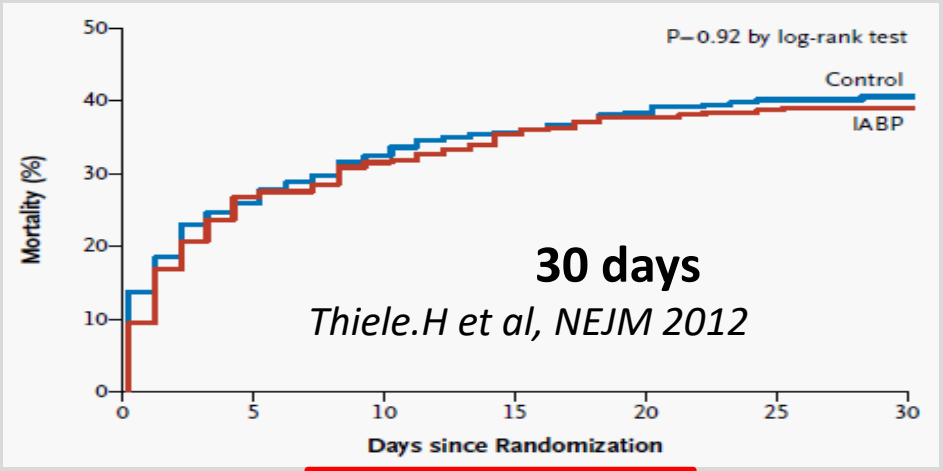




1970 1990 2000 2004-2005 2015

*Adapted from Thiele et al, EHJ 2015*

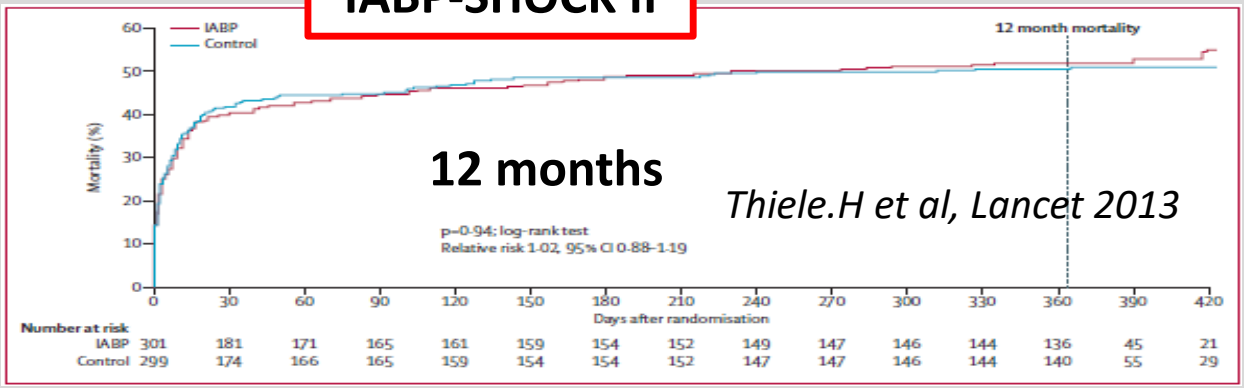
# IABP place in ischemic CS?

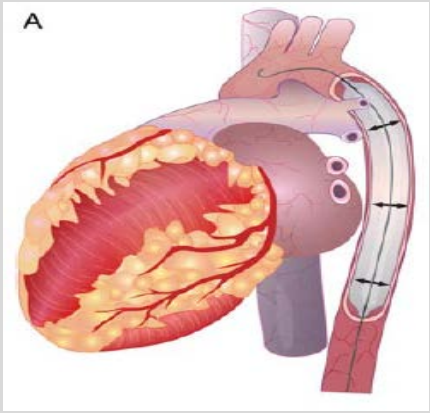



- **No difference vs medical treatment**
- **No difference by subgroups analysis**

Routine use of IABPs in patients with cardiogenic shock due to ACS is not recommended.[260–262] | III | B

**IABP-SHOCK II**



# IABP Shock 2 and after ?

**French datas**

CLINICAL RESEARCH

## Current indications for the intra-aortic balloon pump: The CP-GARO registry

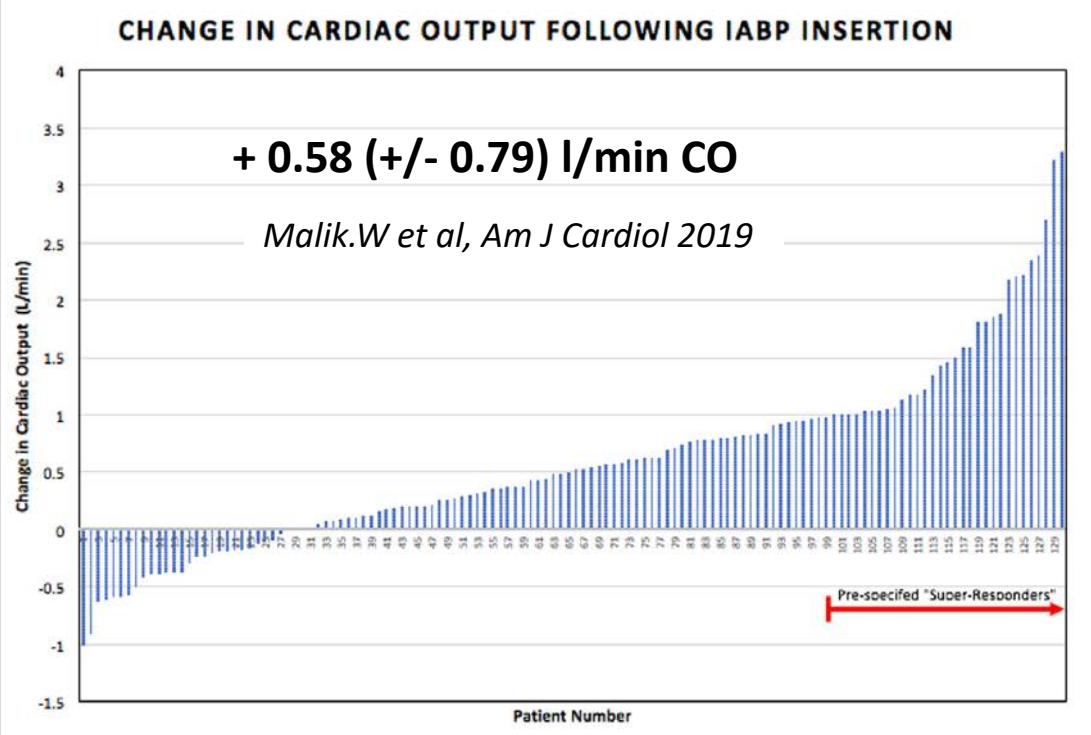
*Helleu.B et al, Arch Cardiovasc Diseases 2018*

172 patients in a multicentre (19 french centers) prospective registry in 2015

| | Total ($n$ = 172) | Haemodynamic indication ($n$ = 107) | Bridge to revascularization indication ($n$ = 34) | Coronary perfusion – related indication ($n$ = 11) | Prophylactic indication ($n$ = 18) |
|---|---|---|---|---|---|
| *Primary endpoints* | | | | | |
| In-hospital mortality | 70/172 (40.7) | 57/107 (53.3) | 5/34 (14.7) | 2/11 (18.2) | 4/18 (22.2) |
| Cardiac mortality | 51/61 (83.6) | 41/50 (82.0) | 4/5 (80.0) | Missing | 4/4 (100) |
| *Secondary endpoints* | | | | | |
| 1-year mortality | 76/166 (45.8) | 61/107 (57.0) | 6/30 (20.0) | 2/10 (20.0) | 5/17 (29.4) |
| In-hospital stroke | 6/172 (3.5) | 5/107 (4.7) | 0/34 (0.0) | 0/11 (0.0) | 0/18 (0.0) |

**62%**

# Is there still a place for IABP in CS?: ADCHF ?

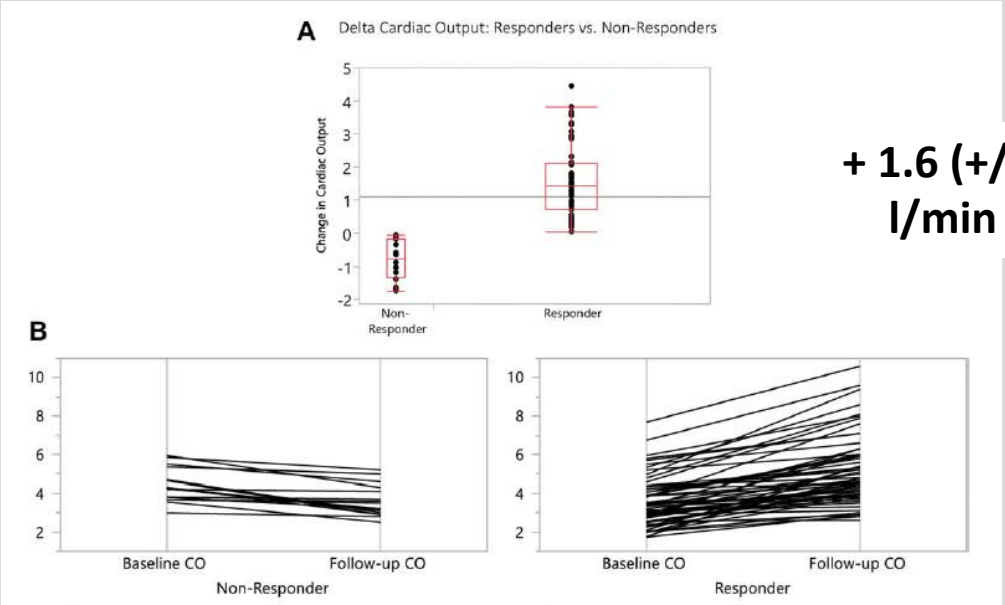



*Fried.JA et al, J Heart Lung Transplant 2018*

- **132 ADCHF patients**
- **84% 30-days survival** / 78% bridge to LVAD or HTx w/o escalation to other AMCS
- **Complication rate = 2.3%**
- **PAPi < 2**(OR 5.04 [1.86-13.03]) and **ICM** (OR 3.24 [1.16-9.06]) = predictive of clinical deterioration

# Differential responses to larger volume intra-aortic balloon counterpulsation: Hemodynamic and clinical outcomes

*Baran.DA et al, Catheter Cardiovasc Interv 2018*



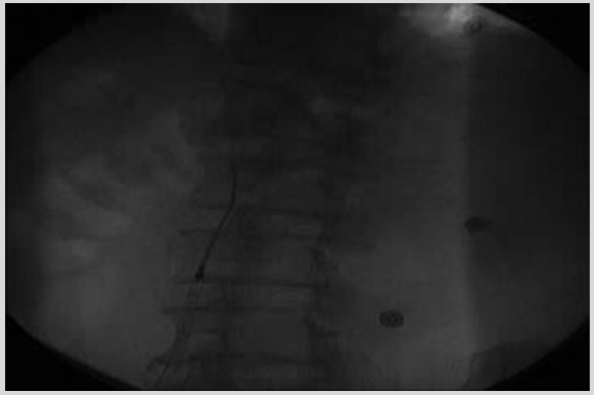

**+ 1.6 (+/- 1.1) l/min CO**

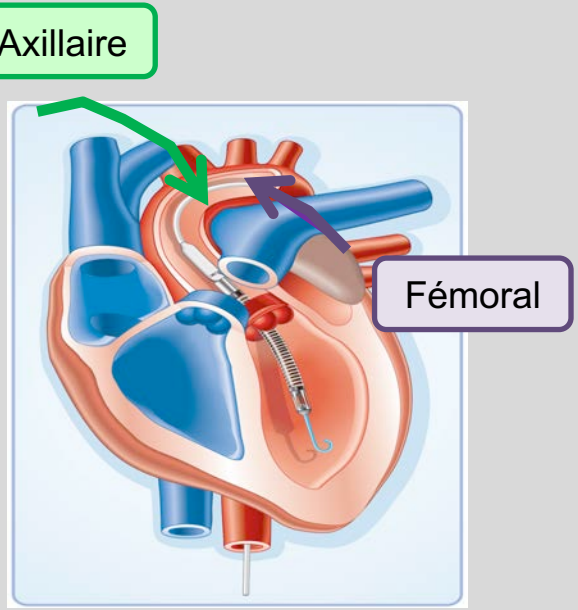
- 76 patients
- 60% non ICM, LVEF 20%
- **18% IABP implantation at the bedside**
- 65% > +1l/min CO

**IABP place in non ischemic CS ??**

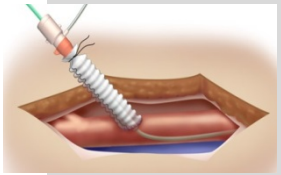
- Low cost (400 euros)
- Large availability
- Vascular access 8Fr
- Easy to implant and to use

# Impella devices

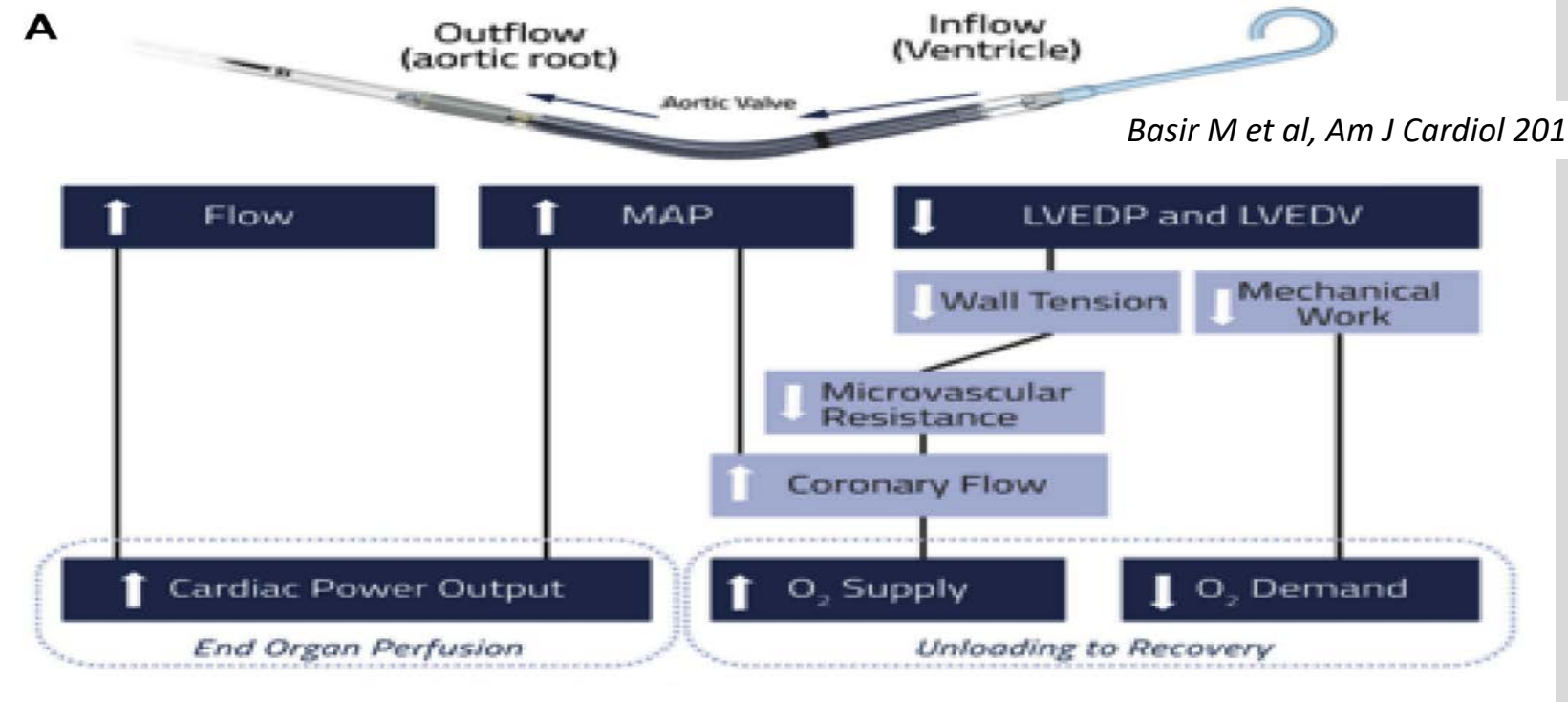





- Assistance mono-ventriculaire gauche
- Pompe axiale rotative (20-50000 trs/min)
- Placée à travers la Vao
- **2 types de pompes:**
  - **Abord percutané**
    - Impella 2.5 (12 Fr; 5j)
    - **Impella CP ou 3.5 (14 Fr; 5j)**
  - **Abord Chirurgical**
    - **Impella 5.0 (21 Fr; 10j) =** tube en dacron



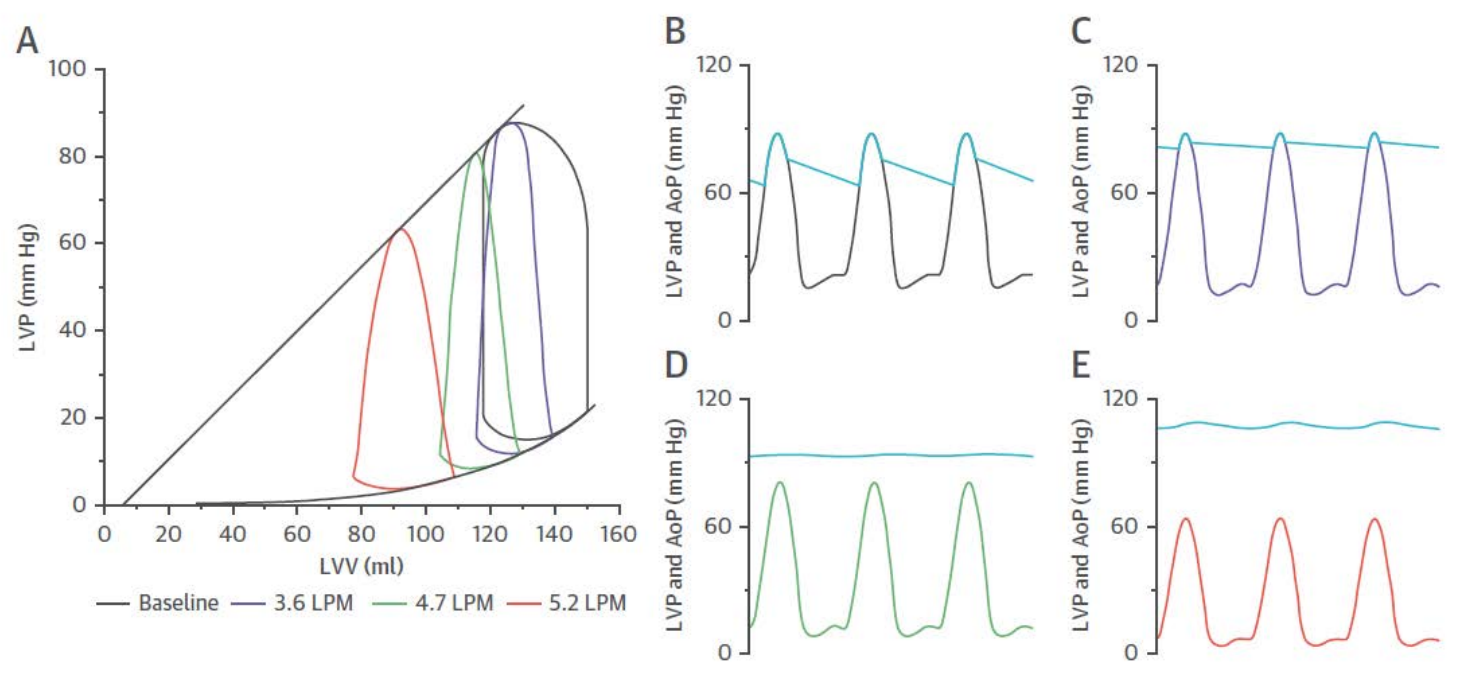
# Hemodynamic and clinical effects of Impella




*Basir M et al, Am J Cardiol 2017*

*Sauren LD, Artif organs 2007; Meyns B JACC 2003; Remmelink M Catheter Cardiovasc Interv 2007; Agel RA, J Nucl Cardiol 2009; Lam K Clin Res Cardiol 2009*

# Impella = acute LV assist device




*Uriel.N, JACC 2018 / Burkhoff.D et al, JACC 2015*

- **LV unloading** // No oxygenation and decarboxylation
- **Gradual LV- Ao pressure gradient decoupling**= Impella support

# Associated complications

| | MI and shock (*n*=79) | AHF and shock (*n*=16) |
|---|---|---|
| Impella CP | 73 (92%) | 15 (94%) |
| Impella 5.0 | 7 (9%) | 1 (6%) |
| Impella RP | 2 (3%) | 2 (13%) |
| Pre-admission cardiac arrest (%) | 29 (37%) | 6 (38%) |
| BMI, kg/m² | 29±5 | 27±6 |
| Lactate at placement, mmol/L | 7.6±6.0 | 8.6±4.9 |
| pH at placement | 7.19±0.18 | 7.14±0.18 |
| Systolic BP at placement, mmHg | 78±17 | 75±13 |
| One or more suction events (%) | 27 (34%) | 6 (38%) |
| Echo guided reposition (%) | 46 (58%) | 10 (63%) |
| ≥3 Repositions | 18 (23%) | 4 (25%) |
| Haemolysis (%) | 8 (10%) | 3 (19%) |
| Limb ischaemia | | |
| Limb ischaemia without intervention (%) | 3 (4%) | 1 (6%) |
| Limb ischaemia with intervention (%) | 4 (5%) | 0 (0%) |
| Limb ischaemia with amputation (%) | 1 (1%) | 0 (0%) |
| Bleeding* | | |
| Minor (%) | 23 (29%) | 6 (38%) |
| Moderate (%) | 15 (19%) | 2 (13%) |
| Severe (%) | 4 (5%) | 2 (13%) |
| Significant groin bleeding (%) | 10 (13%) | 2 (13%) |
| Confirmed heparin-induced thrombocytopaenia (%) | 0 (0%) | 0 (0%) |
| Significant aortic regurgitation (%) | 2 (3%) | 1 (6%) |
| Stroke during support (%) | 0 (0%) | 0 (0%) |
| Impella pump stop (%) | 2 (3%) | 1 (6%) |

*Jensen PB et al, Eur Heart J ACC 2018*

- Usual complications 4-35%
- More than IABP

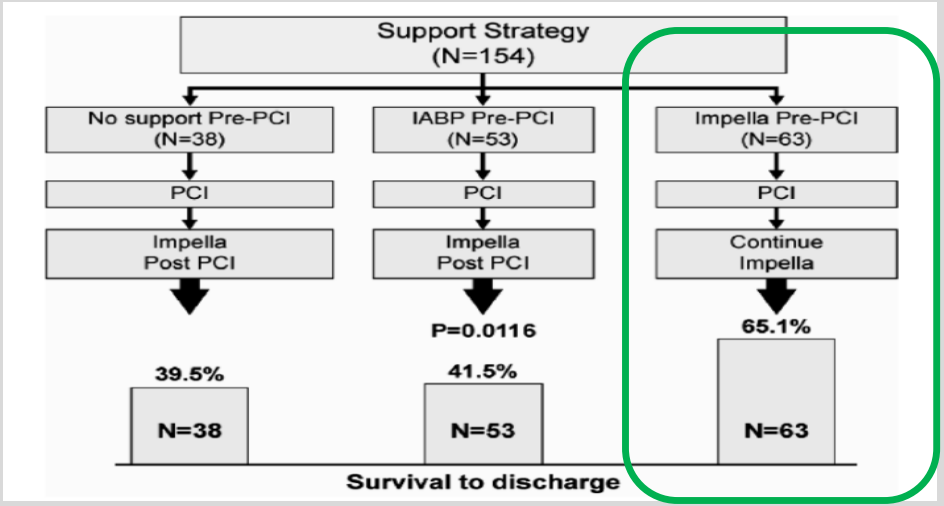
*Cheng.M et al, EHJ 2009*

**Expected complications**

**Expected benefits**

**What timing for implantation and what type of support ?**

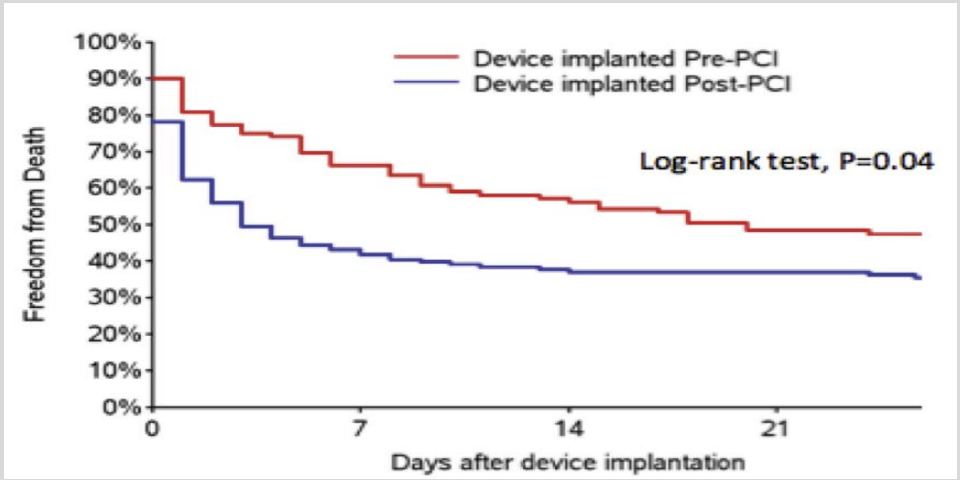
# Timing of implantation ?




*O Neill.WW, J Interv Cardiol 2014*

**Before PCI in case of ischemic CS**

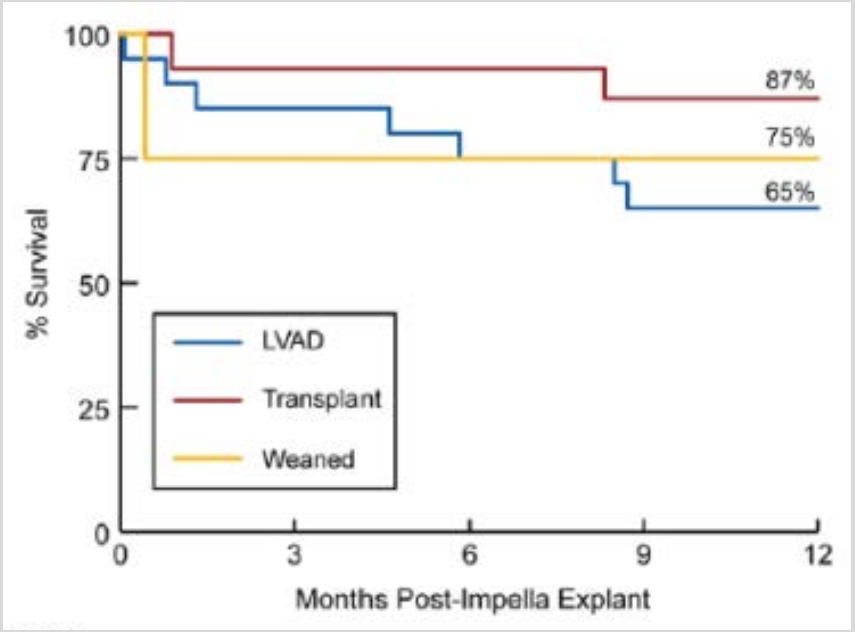
- cVAD registry = 287 patients with ischemic CS
- **Laying time = 17 min**

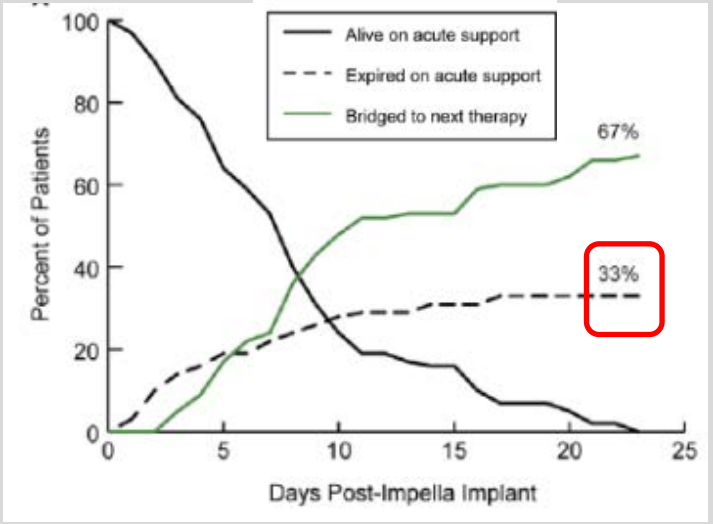


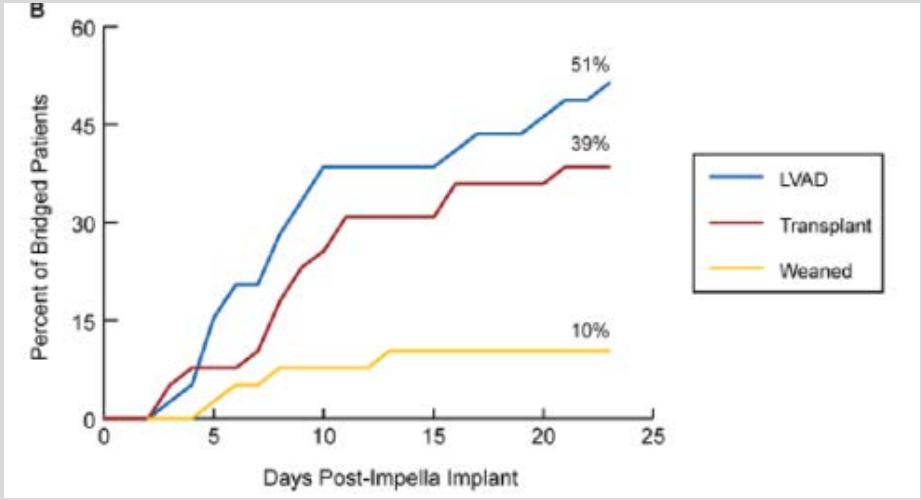

*Basir M et al, Am J Cardiol 2017*

# Use of a percutaneous temporary circulatory support device as a bridge to decision during acute decompensation of advanced heart failure

Hall.SA et al, J Heart Lung Transplant 2018

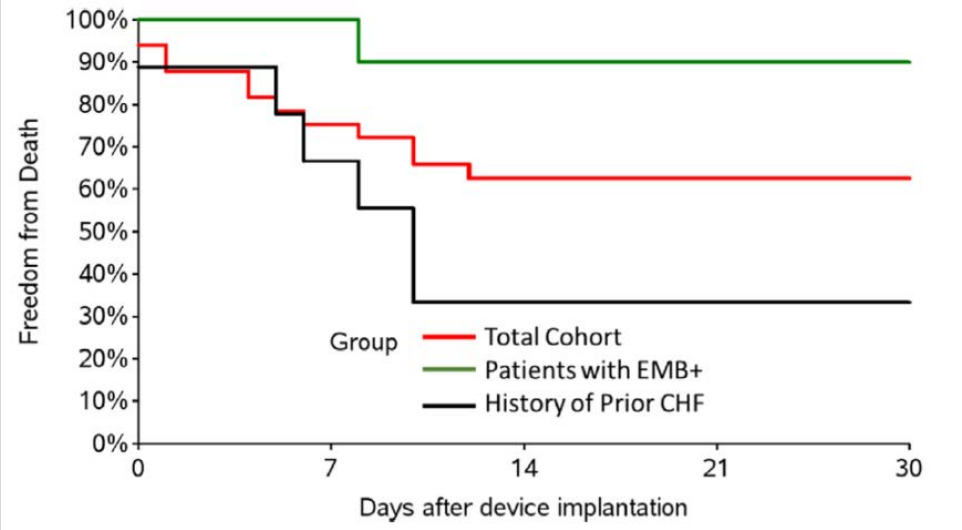


# The Impella Microaxial Flow Catheter Is Safe and Effective for Treatment of Myocarditis Complicated by Cardiogenic Shock: An Analysis From the Global cVAD Registry

*Annamalai.SK et al, J Card Fail 2018*

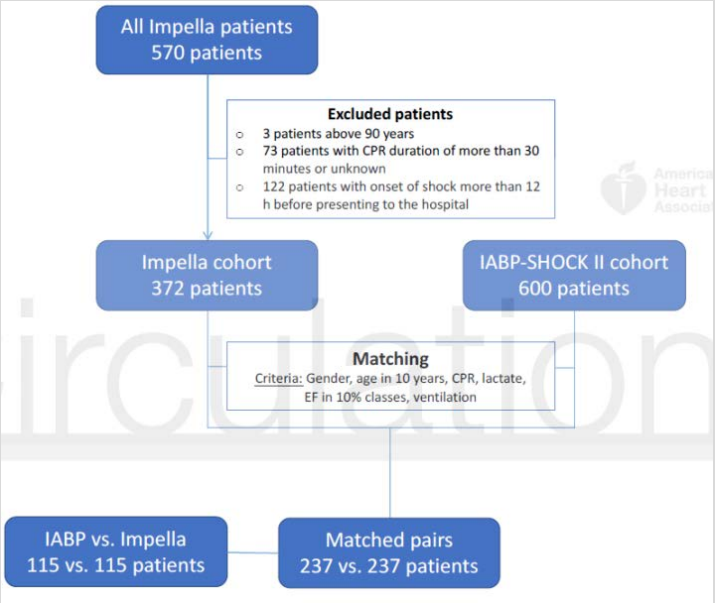



- 34 patients /cVAD registry / 88 sites US and Europe
- Mean age 42 yo
- 26% with previous congestive HF
- Mean LVEF 18 +/- 10%
- 85% inotrops and vasopressors, 22% IABP
- Impella 2.5 (41%), CP (35%) and 5.0 (24%)

In-hospital survival 62%
LVEF at discharge 37%

Stroke 5.88%, 21% Transfusion, Limb ischemia 9%, Hemolysis 12%, RRT 33%

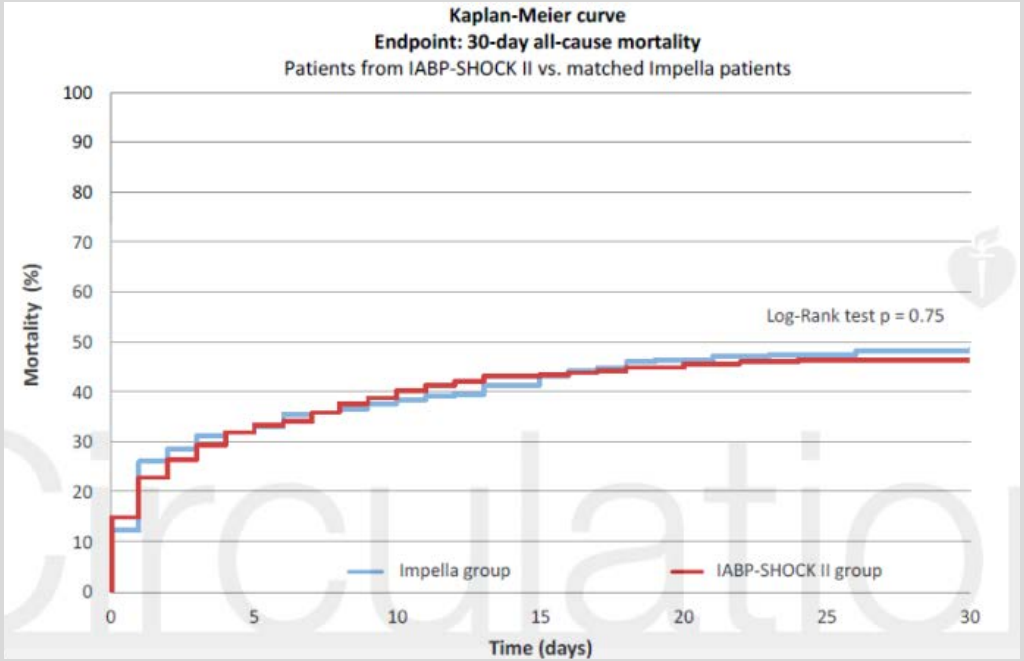
# But



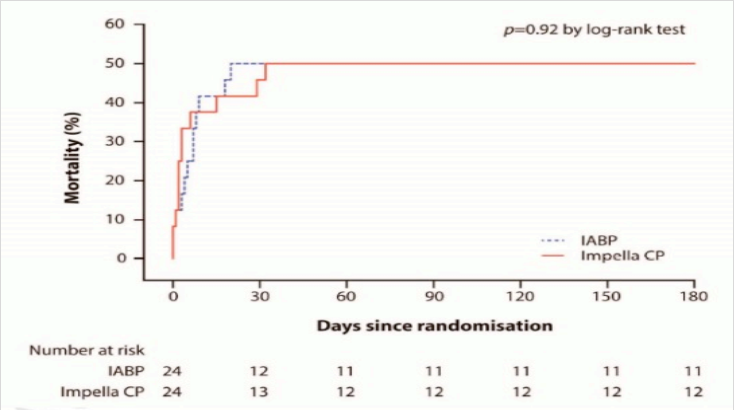

- 237 patients EUROSHOCK registry matched with 237 patients from IABP Shock 2 study

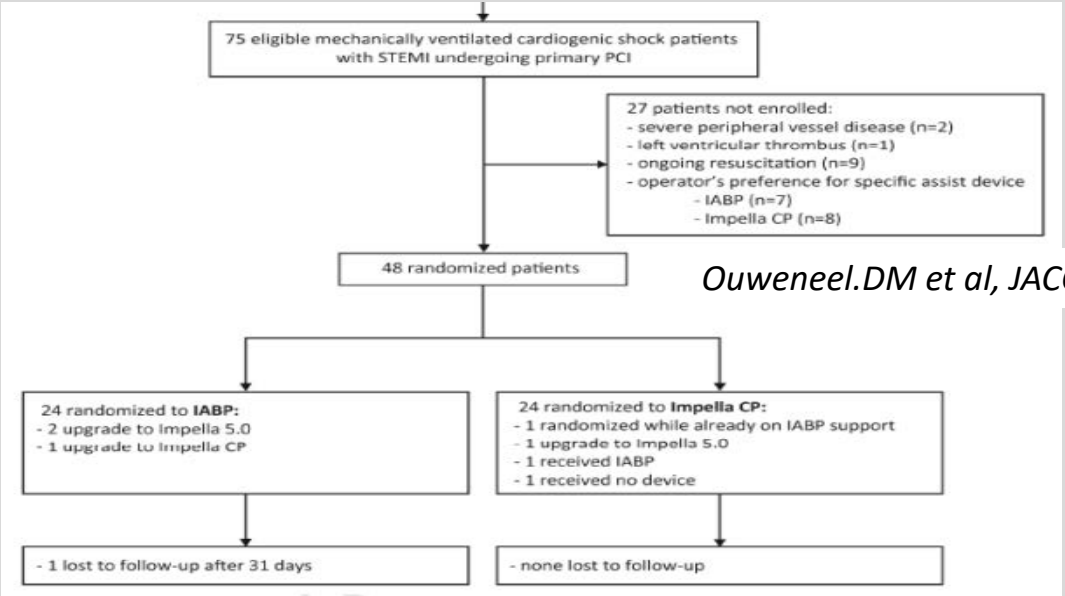
**Impella Support for Acute Myocardial Infarction Complicated by Cardiogenic Shock: A Matched-Pair IABP-SHOCK II Trial 30-Day Mortality Analysis**

*Schrage.B et al, Circulation 2018*



# IMPRESS study: gaps and limits




*Ouweneel.DM et al, JACC 2016*

**Very severe patients:**

- 100 vs 83% prior CA
- 100% ETI and MV
- 100% vs 92% under inotrops
- Traumatic lesion = 21% vs 8%
- Lactates 7.5 vs 8.9mmol/l
- pH 7.14 vs 7.17

**Non optimal management**

- 21 vs 13% before PCI
- Time under support 49 vs 48h

**Crossover**:

- 4.2 vs 12.5%

**<u>Conclusion</u>: For post CA CS during ACS, Impella CP is not better than IABP**

# Lack of randomized datas!

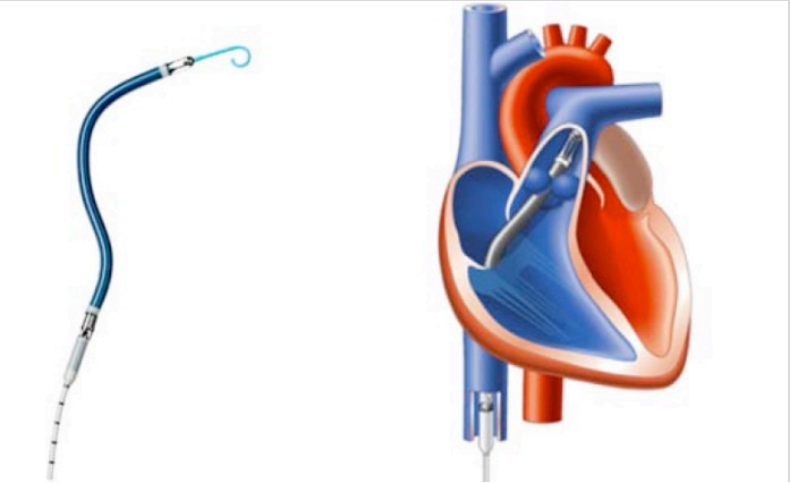
Prospective studies to evaluate the efficacy of Impella in ischemic cardiogenic shock

Table 2 Trials performed using the Impella®[a] device; most were stopped because of poor inclusion rate.

| Study | Registry number | Condition | Patients required (*n*) | Patients enrolled (*n*) | Duration (months) | Status | Reason for discontinuation |
|---|---|---|---|---|---|---|---|
| FRENCH TRIAL (2006) | NCT00314847 | AMI CS | 200 | 19 | 52 | Discontinued | Low enrolment |
| ISAR-SHOCK (2006) | NCT00417378 | AMI CS | 26 | 26 | 19 | Completed | N/A |
| IMPRESS in STEMI trial (2007) | NTR1079[b] | STEMI pre-CS | 130 | 21 | 22 | Discontinued | Low enrolment |
| RECOVER I FDA (2008) | NCT00596726 | PCCS | Up to 20 | 17 | 28 | Completed | N/A |
| RECOVER II FDA (2009) | NCT00972270 | AMI CS | 384 | 1 | 18 | Discontinued | Low enrolment |
| RELIEF I (2010) | NCT01185691 | ADHF | 20 | 1 | 33 | Discontinued | Low enrolment |
| DANSHOCK (2012) | NCT01633502 | AMI CS | 360 | ~50 | 40 | Enrolling | N/A |

*Delmas C et al, ACVD 2017*

# What about RV support?



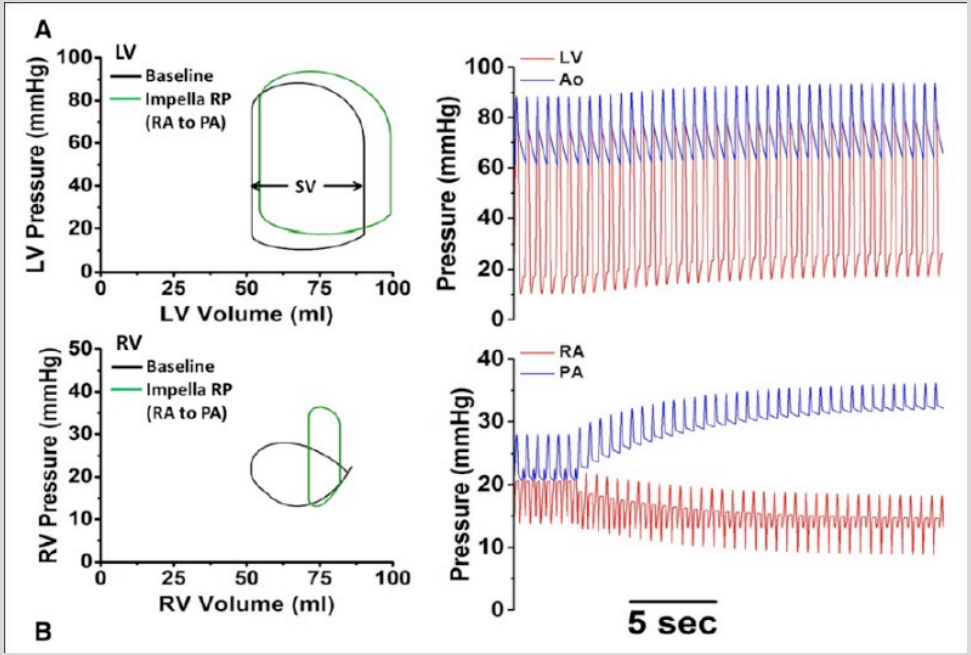
*Cheung AW et al J Heart Lung Transplant 2014*

**Impella RP**

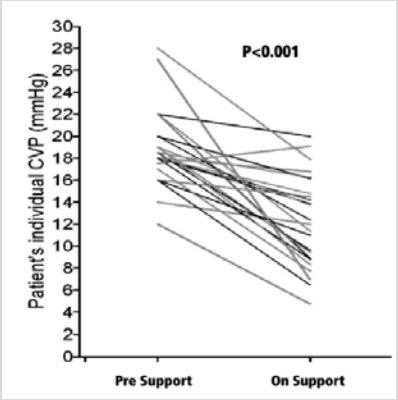
- **Percutaneous 22F microaxial pump munted on a 11 F catheter**
- Aspirate on the IVC and expels it into the PA
- **33000 rpm = 4.0L/min**
- ACT 160-180
- **Up to 14 days**

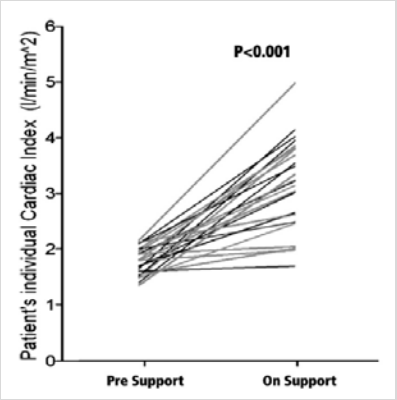
*Anderson et al, J Heart Lung Transplant 2015*

# Impella RP : Hemodynamic effects

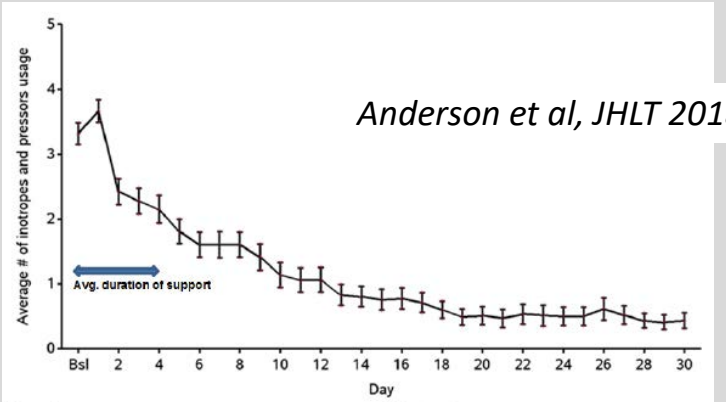



*Kapur NK et al, Circulation 2017*



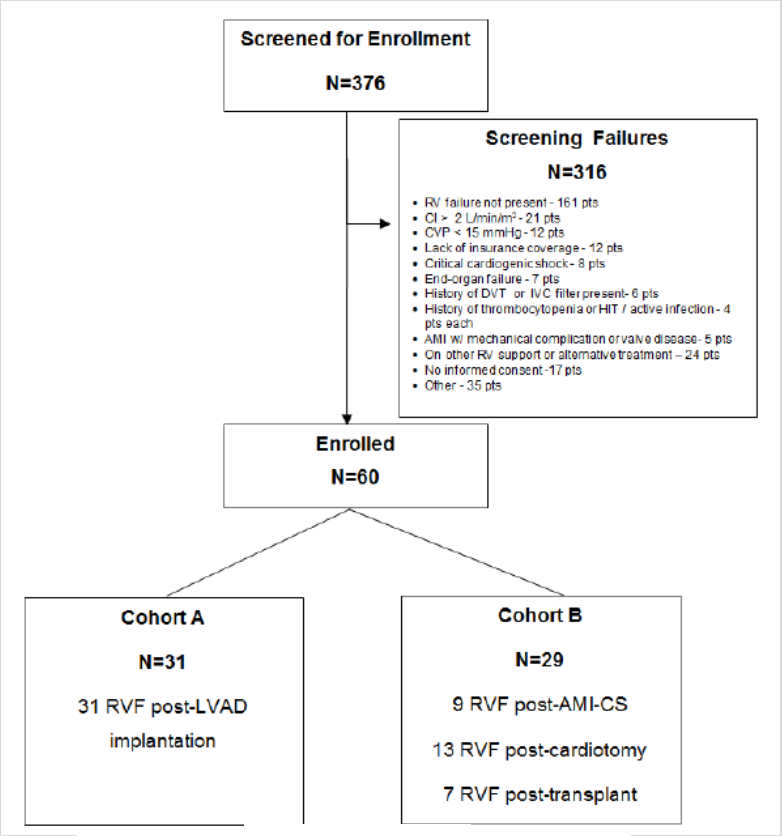




*Anderson et al, J Heart Lung Transplant 2015*




*Anderson et al, JHLT 2018*

# Impella RP: Clinical results




77.4% 30-days survival 69%

*Anderson et al, J Heart Lung Transplant 2018*

| Safety Endpoints | All Patients (N=60 patients) | Cohort A (N=31patients) | Cohort B (N=29 patients) | P-value |
|---|---|---|---|---|
| Death | 26.7% (16/60) | 22.6% (7/31) | 31.0% (9/29) | 0.563 |
| Major Bleeding | 48.3% (29/60) | 54.8% (17/31) | 41.4% (12/29) | 0.316 |
| Device access site bleeding | 1.7% (1/60) | - | 3.4% (1/29) | 0.297 |
| Postoperative bleeding | 43.3% (26/60) | 54.8% (17/31) | 31.4% (9/29) | 0.063 |
| Transfusion with no overt bleeding | 1.7% (1/60) | = | 3.4% (1/29) | 0.329 |
| Other | 1.7% (1/60) | - | 3.4% (1/29) | 0.329 |
| Hemolysis | 21.7% (13/60) | 25.8% (8/31) | 17.2% (5/29) | 0.421 |
| Pulmonary Embolism | 0.0% (0/60) | 0.0% (0/31) | 0.0% (0/29) | -- |
| Tricuspid and Pulmonary Valve Dysfunction* | 2.9% (1/34) | 2.9% (1/34) | 2.9% (1/34) | 2.9% (1/34) |

*based on echocardiographic core lab analysis

**Increased Rate of Mortality in Patients Receiving Abiomed Impella RP System - Letter to Health Care Providers**

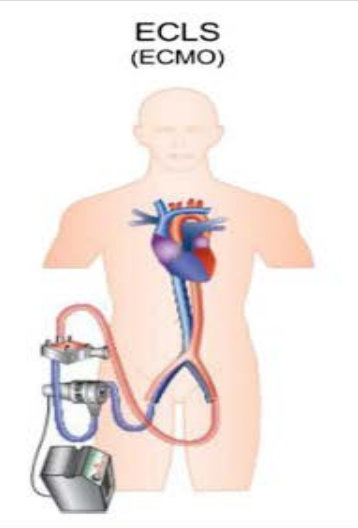
May 21, 2019 UPDATE: The FDA issued an updated Letter to Health Care Providers to provide the most recent, interim post-approval study results for Abiomed's Impella RP System.

*Khalid.N et al, Cardiovasc Revasc Med 2019*

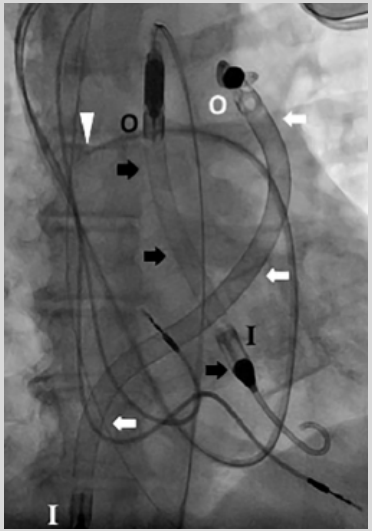
# Short –term MCS

## Biventricular support

## +/- respiratory support




**VA ECMO**




**BiPELLA**

# Percutaneous versus surgical femoro-femoral veno-arterial ECMO: a propensity score matched study

*Danial.P et al, Int Care Med 2018*

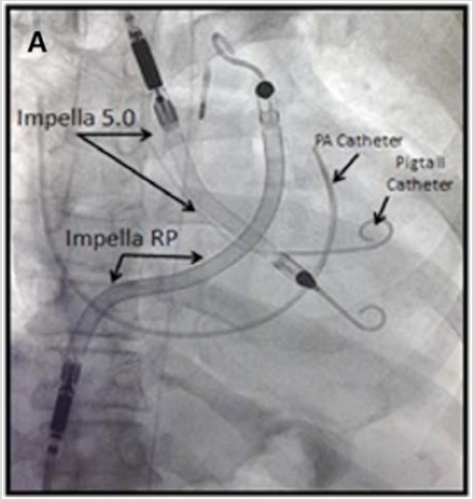
| | Surgical group $n = 266$ (%) | Percutaneous group $n = 266$ (%) | $p$ value |
|---|---|---|---|
| 30-Day overall survival | 150 (56.3) | 170 (63.8) | 0.034 |
| Cannulation site infection | 74 (27.8) | 44 (16.5) | 0.001 |
| Infection requiring surgical revision[a] | 40 (15.0) | 14 (5.3) | < 0.001 |
| Vascular complications at cannulation[b] | 7 (2.6) | 10 (3.8) | 0.663 |
| Limb ischemia | 33 (12.4) | 23 (8.6) | 0.347 |
| Cannula relocation or removal | 25 (9.4) | 15 (5.6) | 0.258 |
| Limb fasciotomy | 10 (3.8) | 6 (2.3) | 0.310 |
| Amputation | 2 (0.8) | 2 (0.8) | 1.000 |
| Vascular complications after cannula removal | 9 (3.4) | 39 (14.7) | < 0.001 |
| Surgical revision for persistent bleeding early after decannulation | 4 (1.5) | 25 (9.4) | < 0.001 |
| Surgical revision in the days after decannulation[c] | 5 (1.9) | 14 (5.3) | 0.035 |
| Lower limb sensory-motor deficit | 6 (2.3) | 7 (2.6) | 0.779 |

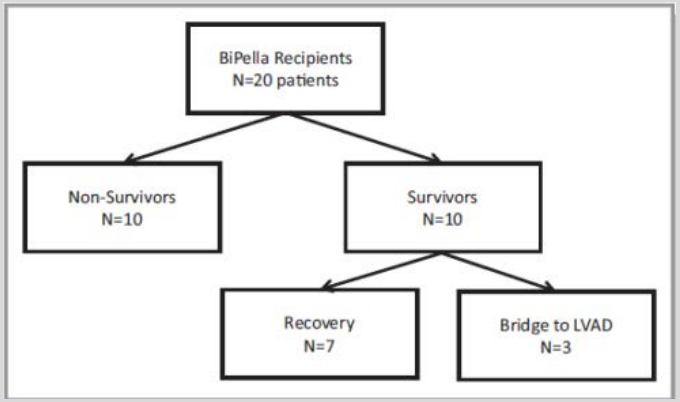
**Is it time to implant in cathlab ?**

*De Waha S et al, Eurointervention 2016*

- **Larger availability**
- **↘ « time to support» ?**
- **Need specialized ICCU +++**

# Double Impella: BiPELLA???




- 14 Fr arterial + 11 Fr venous catheter
- **BiPella**=
  - No respiratory support
  - LV and RV unloading / possible evaluation of RV function
  - Possible bridge to LVAD with initial RV support

*Kapur et al, Circ Heart Fail 2015*

20 patients / **50% mortality**
Majors complications: acute limb ischemia (5%); hemolysis (30%); TIMI major bleeding (35%)

**Right flow 3.2 L/min and LV flow 3.5 L/min**
↗ CI and ↘ RAP, sPAP, PCWP

Kuchibhotla S et al, J Am Heart Assoc 2017

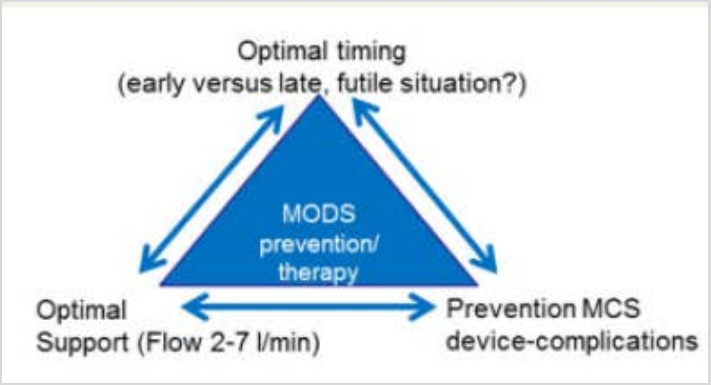
# What recommendations for (cardio)-circulatory support in CS ?

| Assistance | ESC/EACTS guidelines (2012 et 2016) | ACCF/AHA/SCAI guidelines (2013) | Experts SRLF (2015) | HFA ESC/SEM /SAEM consensus (2015) |
|---|---|---|---|---|
| CPIA | Classe IIIa (level of evidence B) | Classe IIa C | Ne doit pas être utilisée (accord faible) | Non recommandé |
| Impella | Classe IIb C ou IIa C | Classe IIaB | Impella 5.0 si expertise (accord faible) | Peut être utilisée |
| ECLS | | Néant | ECLS est préférée (accord fort) | Peut être utilisée |

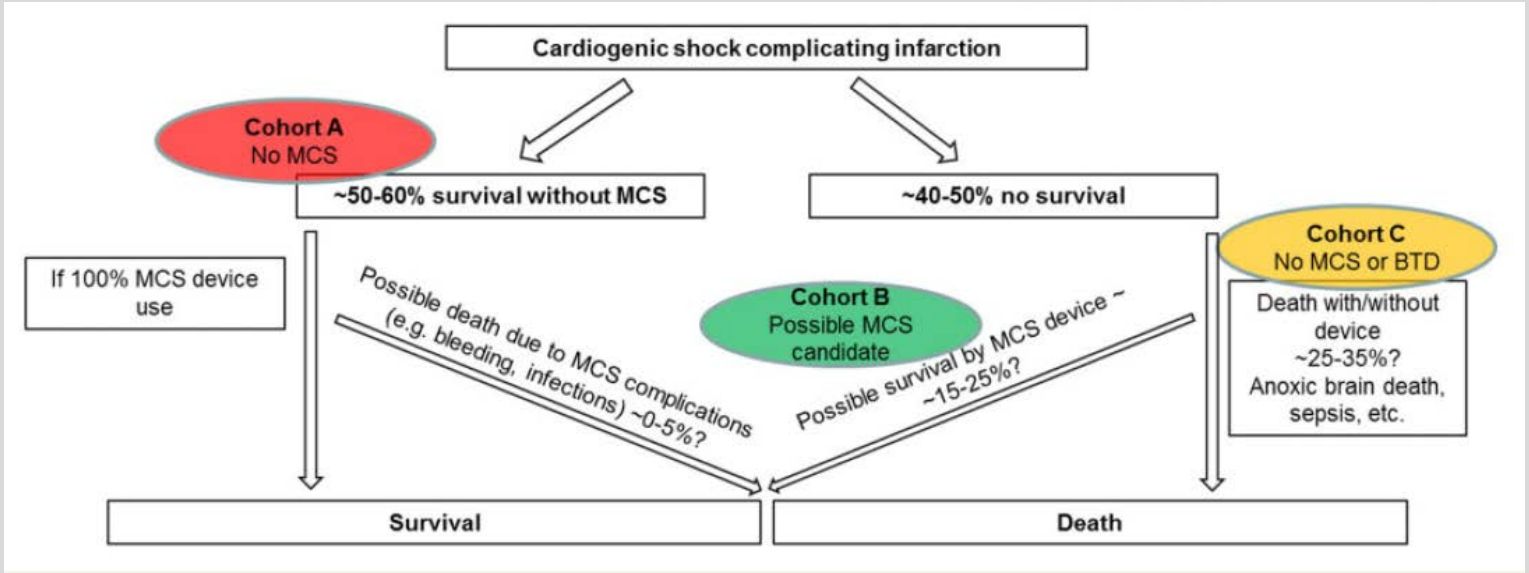
**Des niveaux de recommandations de faible niveau mais qui se précisent …**

*Delmas C et al, MIR 2017*

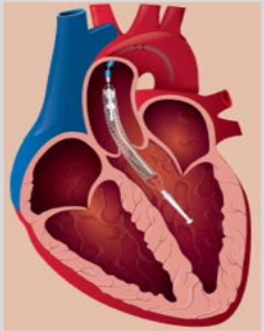
# Considerations on use in MCS in CS patients




**MCS = Only Flow !!**

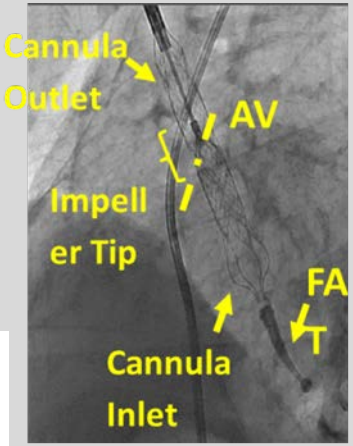



*Thiele.H et al, Eur Heart J 2019*



# PHP = percutaneous heart pump (Thoratec®)

- **14 Fr sheath (femoral artery > 5 mm)**
- **Expansible to 24Fr**
- **16000 – 20500 rpm / > 4.0L/min** support




| | Design | Condition | n | Trial n°* | Status |
|---|---|---|---|---|---|
| HeartMate PHP CE Mark Clinical Investigation Plan | Prospective registry | High risk PCI | 50 | NCT02156609 | Complete |
| Coronary InterventionS in HIgh-Risk PatiEnts Using a Novel Percutaneous Left Ventricular Support Device (SHIELDS-II) | Randomized trial 2:1 PHP vs. Impella LP 2.5 | | 425 | NCT02468778 | **Stop** |
| Thoratec Corporation HeartMate PHP cardiogenic Shock Trial | Prospective registry | Cardiogenic shock | 25 | NCT02279979 | **5 patients** |

*Van Mieghem et al, Eurointervention 2016*

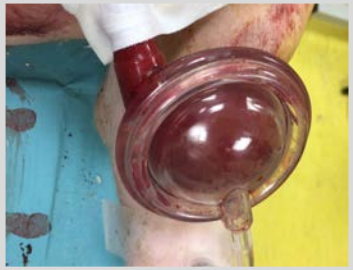
SHIELD 1 trial

- **↗ CO = 1.2-2.2L/min**
- ↗ MAP and CPO
- **No change in PCWP**

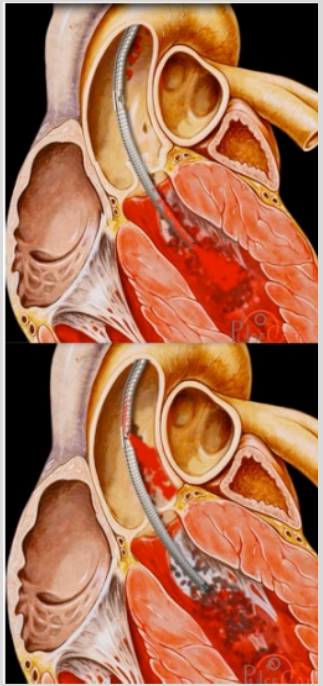
Dudek.D et al, Am J Cardiol 2018

**BUT**
Trial **enrollment was stopped in 01.2017** due to mechanical issues …

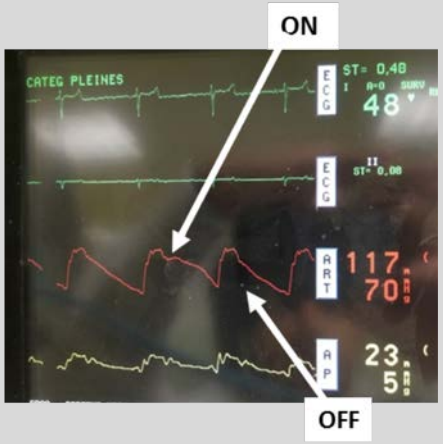
*Maly J et al, JHLT 2017*



# iVAC 2.0L (Terumo®)



- **13.5 / 17 Fr**
- **Same consol as IABP**
- Same principle as IABP but with **real unloading of LV**
- Synchronization with AP or EKG
- Up to **2L/min** for 24h (pulsatile)



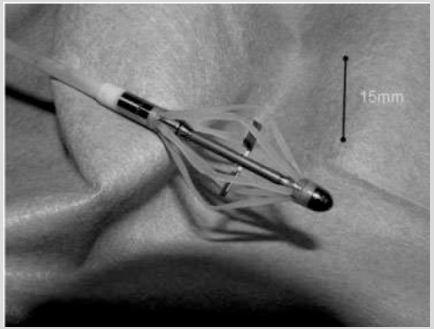

*Van Mieghem et al, Eurointervention 2015*

| | Baseline | During support | *p*-value |
|---|---|---|---|
| MAP | 66 [52-82] | 83 [71-102]*** | <0.001 |
| HR | 71 [51-100] | 72 [56-98] | ns |
| MPAP | 22 [12-44] | 17 [10-39]* | <0.05 |
| Wedge | 12 [3-25] | 9 [5-21] | ns |
| CO | 3.7 [2.3-6.9] | 5.0 [3.1-8.1]*** | <0.001 |
| CI | 1.8 [1.3-3.6] | 2.5 [1.7-4.3]*** | <0.001 |
| CPI | 0.29 [0.16-0.51] | 0.48 [0.27-0.87]*** | <0.001 |
| iVAC output, L/min | – | 1.4 [1.2-2.0] | – |
| $SvO_2$ | 64 [33-72] | 67 [40-76]** | <0.05 |

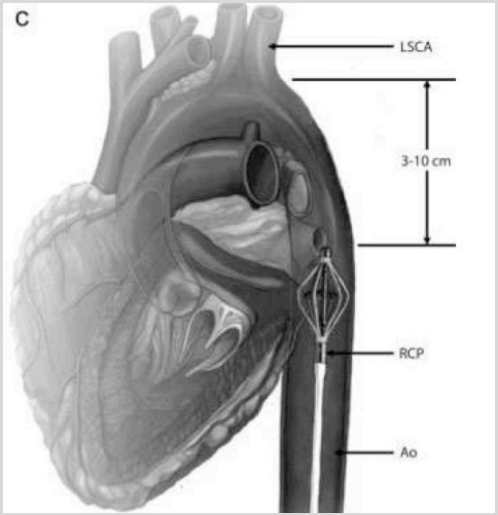
- 14 high risk PCI patients
- 1 iliac arterial dissection during sheath insertion
- Total support time: 67 (23-147) min

*Den Uil CA et al, Eurointervention 2017*

# Reitan catheter pump




*Smith EJ et al, Cath Card Int 2009*




- **14 fr** femoral sheath/ descending aorta > 22mm
- **Continuous non phasic** pump: 8000 – 13000 rpm/min

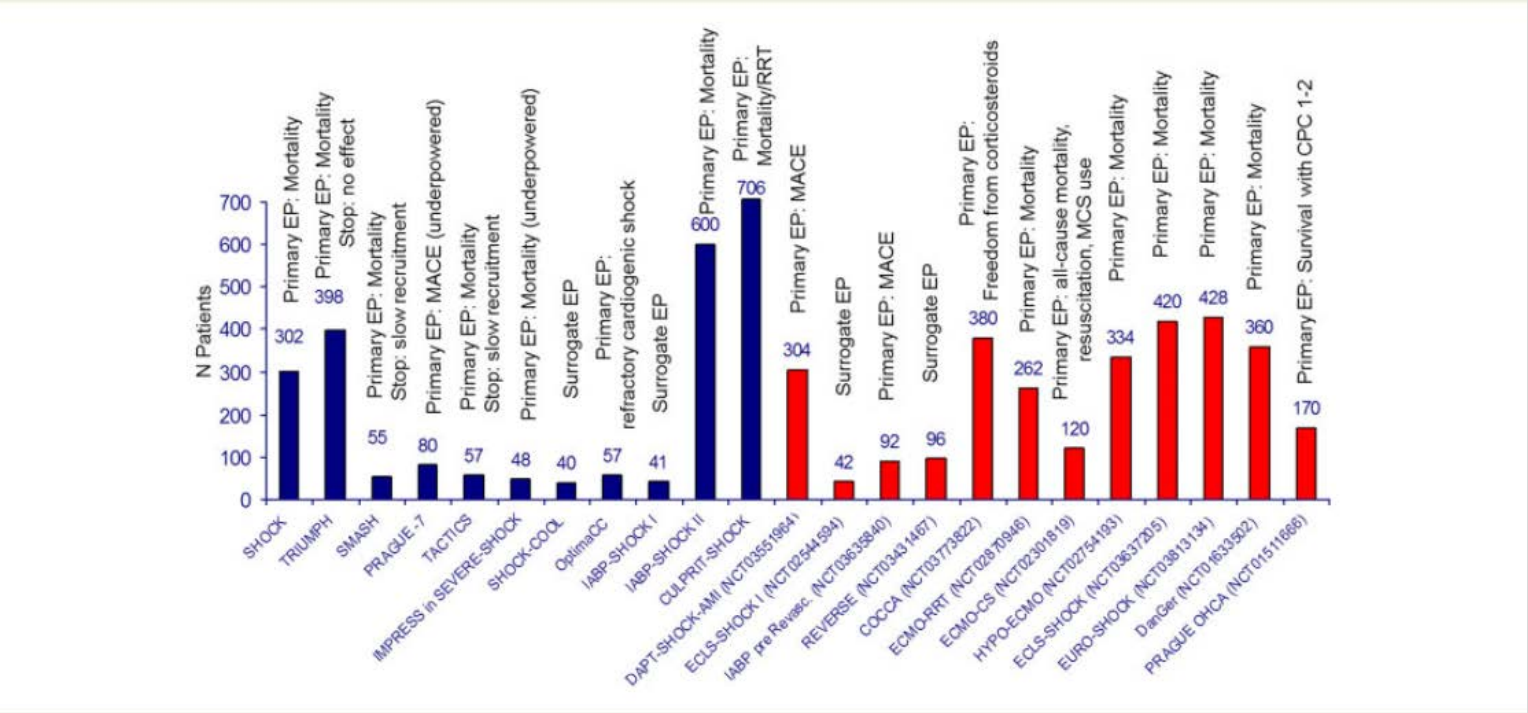
  => ↘ LV afterload and ↗ organ perfusion (lower part of the body+++)
- **Not contraindicated in case of LV thrombus or aortic regurgitation**

*Reitan O et al, ASAIO 1999 / Reitan O et al, ASAIO 2003*

- 20 ADCHF patients in 4 european centers
- LVEF 20%; CI 1.79L/min/m2; eGFR 37.8ml/min; inotrops 45%
- Support time 18.3h
- **↗ CI (0.57 l/min/m2 / + 31%), ↘CVP (- 6mmHg)**
- Trends ↘ PCWP et PAPm
- 20% 30-days mortality; **10% vascular complications**

*Keeble.TR et al, Int J Cardiol 2019*

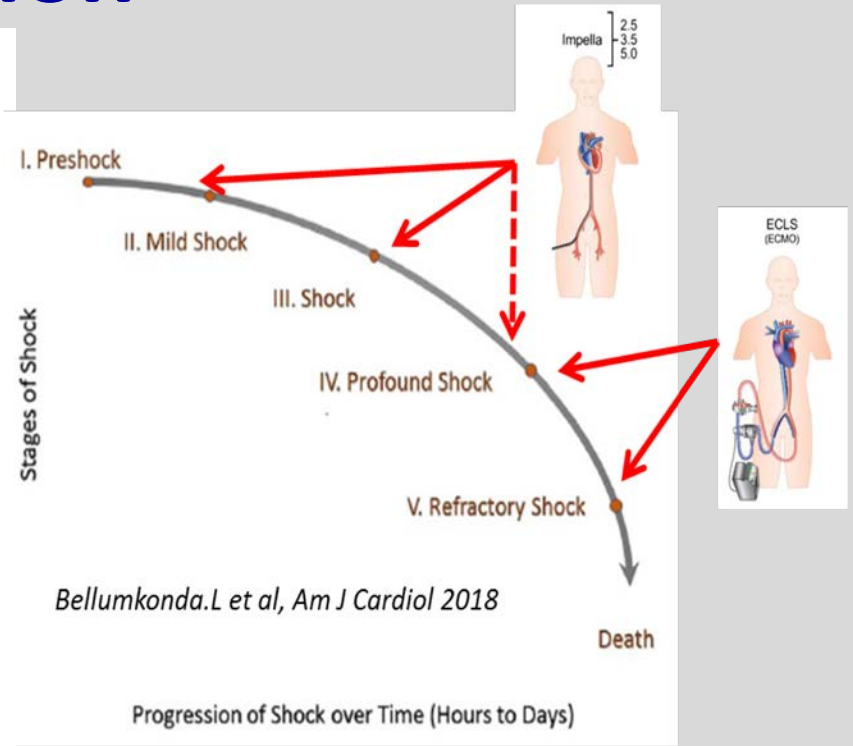
# Perspectives in CS trials




*Thiele.H et al, Eur Heart J 2019*

# Conclusion

- **CS is a continuum**
- Several possible supports = No solid data !!
  - Left: **Impella CP,** VA-ECMO vs Impella 5.0, VA-ECMO
  - Right: Impella RP**, VA-ECMO,** RA-PA ECMO
  - Biventricular: **VA-ECMO,** BiPella (??)
- **Type and Timing of implantation**
  - **Initial severity of CS** (MOF, RV function, respiratory status)
  - **Available device**
  - **Local experiences and capacities**
  - **Ischemic CS: pre-PCI?**
- Non exclusive and evolutive
  - **Monitoring** (TTE, PAC?)
  - Association / upgrading




Randomized datas during CS are needed …

Lyon, AER 22.11.2019

# Assistances circulatoires « légères »

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