Universitätsmedizin Essen
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Klinik für Thorax- und Kardiovaskuläre Chirurgie

Universitätsmedizin Essen
Universitätsklinikum

Cardiac Procedures under (temporary) mechanical support – Where do we stand?

Bastian Schmack

COI

- Proctor / Speaker für Abiomed
- Proctor / Speaker für Abbott
- Proctor / Speaker für Berlin Heart GmbH

Cardiogenic Schock and Mechanical Circulatory Support

ECLS Guidelines

Recommendations for the use of short-term mechanical circulatory support in patients with cardiogenic shock

Recommendations	Class[a]	Level[b]
Short-term MCS should be considered in patients with cardiogenic shock as a BTR, BTD, BTB. Further indications include treatment of the cause of cardiogenic shock or long-term MCS or transplantation.	IIa	C
IABP may be considered in patients with cardiogenic shock as a BTR, BTD, BTB, including treatment of the cause of cardiogenic shock (i.e. mechanical complication of acute MI) or long-term MCS or transplantation.[450]	IIb	C
IABP is not routinely recommended in post-MI cardiogenic shock.[500–502]	III	B

BTB = bridge to bridge; BTD = bridge to decision; BTR = bridge to recovery; IABP = intra-aortic balloon pump; MCS = mechanical circulatory support; MI = myocardial infarction.
[a]Class of recommendation.
[b]Level of evidence.

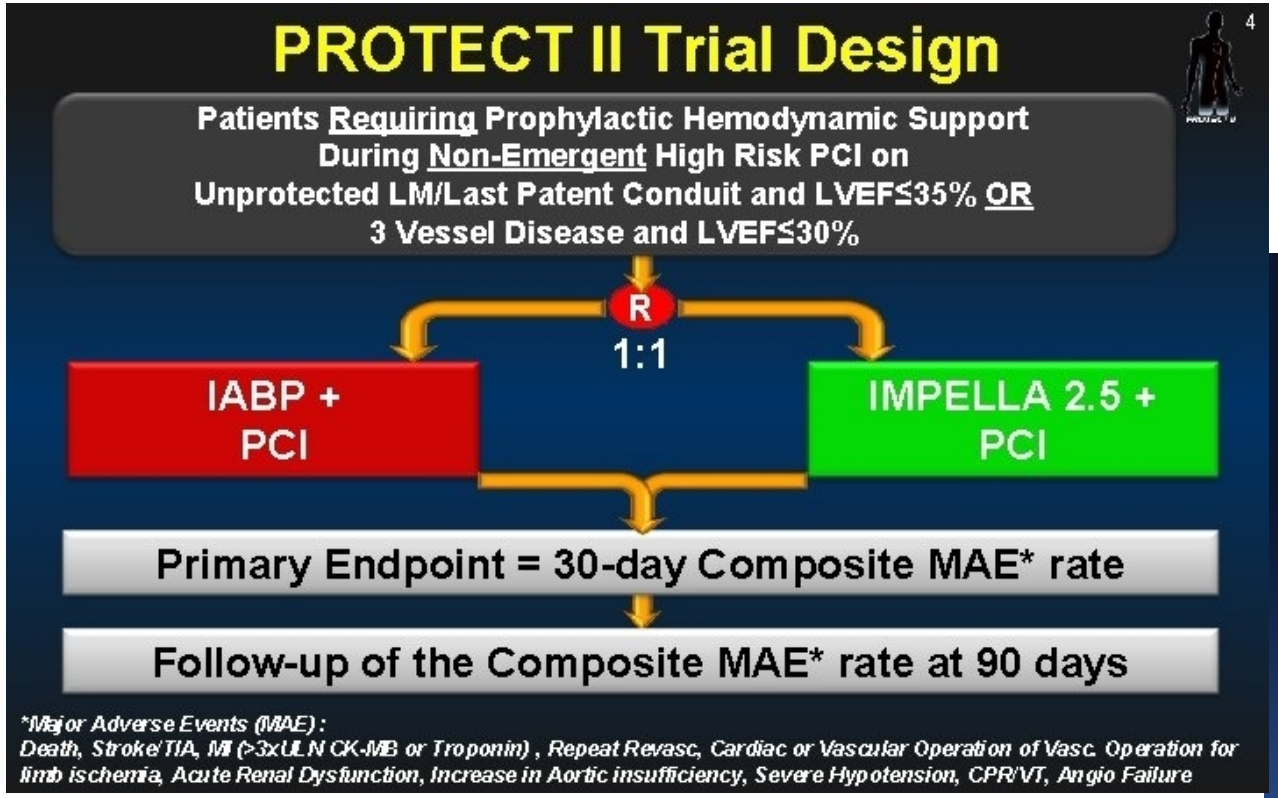
Simply and hands-on ECLS/ECMO devices available

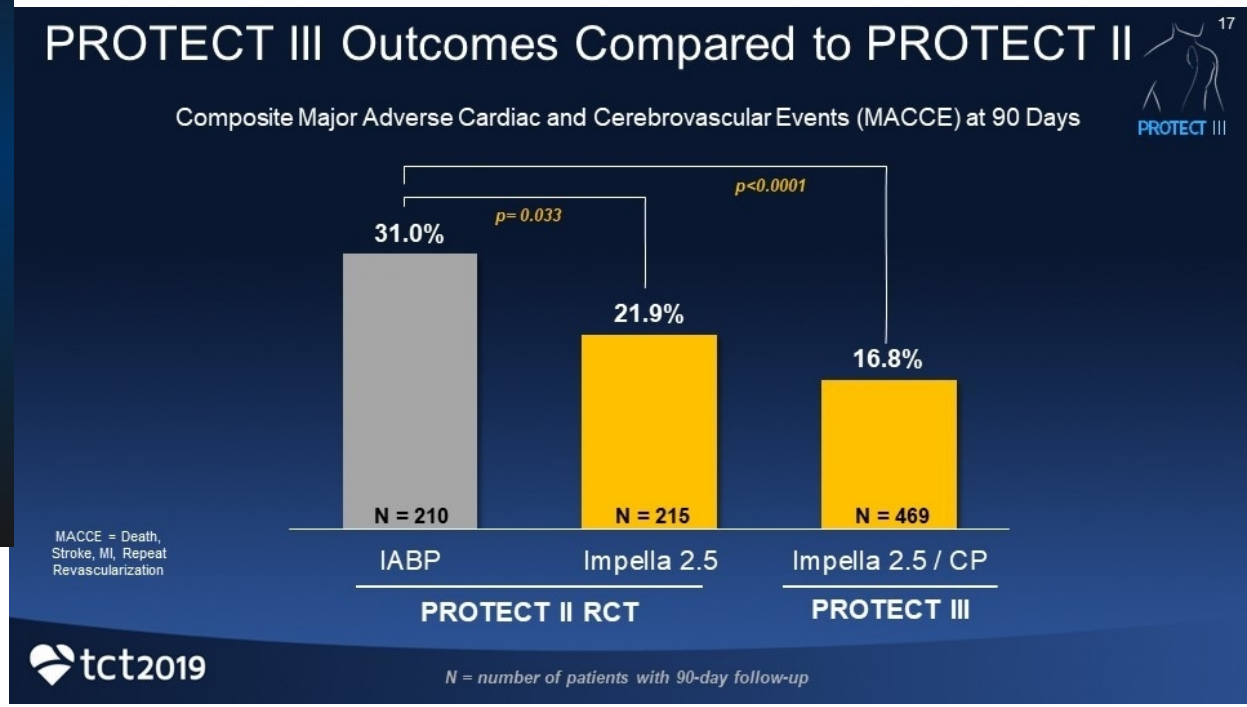
Bildquelle: Maquet GmbH, Rastatt

„Tailored“ mechanical circulatory support

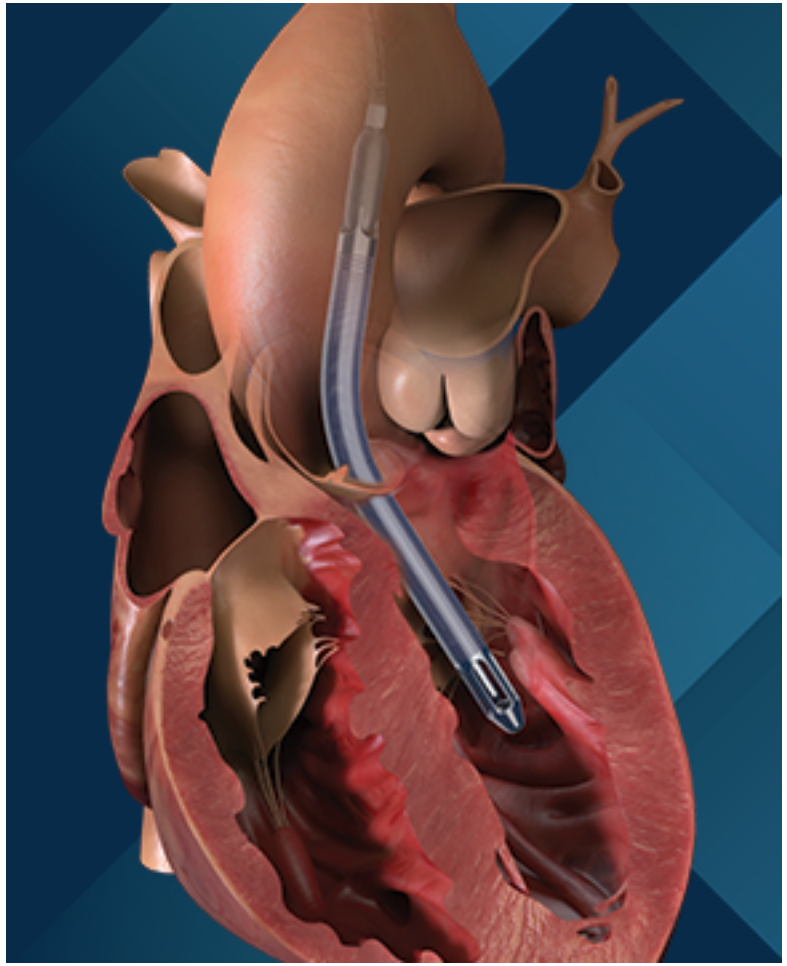
- Tailored mechanical circulatory support
  - temporary LVAD, temporary RVAD, lung replacement/support only vs. ECLS
- Ongoing und flexible adjustment to the actual demand of support
  - Escalation vs. de-escalation
- Avoid femoral approach whenever possible !
  - Improve mobilization, early recovery,
  - less vascular complications, reduce risk for limb ischemia
- Absolute avoidance of left ventricular distension
  - LV-Unloading prevents lung congestion and allows for LV recovery
- Avoid retrograde blood flow during ECLS by peripheral cannulation
  - Reduce risk for cerebral insult and (unilateral) hypoxemia
  - Decrease LV afterload, allow for LV recovery
- ECLS with mandatory use of oxygenator only, if inevitable
  - Decrease/Avoid SIRS

Role model – Protected PCI





Microaxial temporary LVAD



Feature	Impella 5.0®	Impella 5.5 with SmartAssist	Benefit
Flow	5.0 L/min	5.5 L/min	Full Hemodynamic Support
Catheter Length	135cm	70cm* *55cm insertable length	Ambulation
Catheter Construction	Nitinol Wire	Steel Coil	Kink Resistance
Cannula Rigidity	-	3.5x More Rigid	Deliverability & Torque Response
Cannula Diameter*	21Fr	21Fr	Maintains High Flow
Motor Diameter	21Fr	18Fr	Deliverability
Rigid Length (Motor Housing & Outlet)	42mm	27mm	Deliverability
Motor Bearings	Stainless Steel	Ceramic	Durability
Pigtail	Yes	No	Torque Response; in-dwell without adhesion
Sensor	Differential Pressure	Fiber-Optic	Placement Accuracy

Indications for pre-emptive surgical microaxial pMCS – innovative approaches to extend therapy scope

- High-risk CABG (EF< 25%) or Impella supported OPCAB (PRIME Trial)
- Surgery for long-standing aortic regurgitation with severe LV dysfunction plus LV dilatation
- High-risk mitral valve procedures (LVEF< 30% or less?)
- Explantation of durable VADs
- All other complex cardiac surgery procedures…….

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The dilemma of LVEF in severe Mitral regurgitation

Forward Ejection Fraction in Mitral Regurgitation *Dupuis et al*

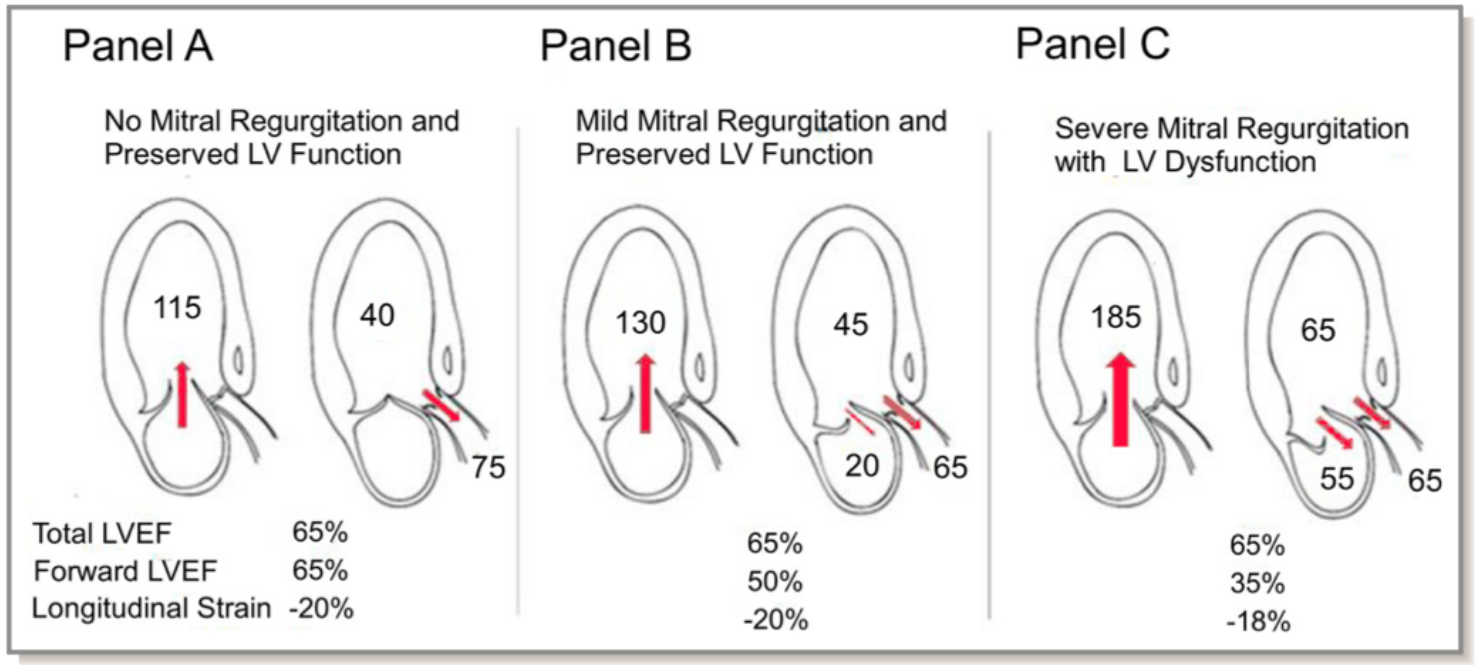


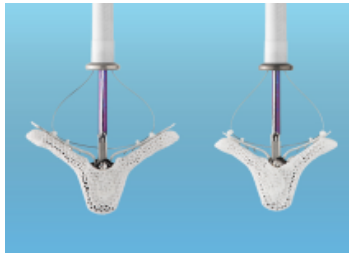
Figure 4. Comparison between total LVEF, forward LVEF and global longitudinal strain according to MR severity and associated LV dysfunction. This figure shows the comparison of Total LVEF, Forward LVEF and Global Longitudinal Strain when there is no mitral regurgitation (A), a mild mitral regurgitation with preserved LV systolic function (B), and a severe mitral regurgitation with a LV systolic dysfunction (C). LV indicates left ventricular; LVEF, left ventricular ejection fraction; MR, mitral regurgitation.

Forward Ejection Fraction in Mitral Regurgitation; Dupuis et al.; J Am Heart Assoc. 2017;6:e006309

2021 ESC/EACTS Guidelines Valvular Heart Disease Indication for TEER

Recommendations on indications for intervention in severe **primary** mitral regurgitation

TEER may be considered in symptomatic patients who fulfil the echocardiographic criteria of eligibility, are judged inoperable or at high surgical risk by the Heart Team and for whom the procedure is not considered futile.[299–302]	IIb	B



Courtesy of Abbott Inc. & Edwards Lifescience Corp.

Recommendations on indications for mitral valve intervention in chronic severe **secondary** mitral regurgitation

In high-risk symptomatic patients not eligible for surgery and not fulfilling the criteria suggesting an increased chance of responding to TEER, the Heart Team may consider in selected cases a TEER procedure or other transcatheter valve therapy if applicable, after careful evaluation for ventricular assist device or heart transplant.[e]	IIb	C
In symptomatic patients, who are judged not appropriate for surgery by the Heart Team on the basis of their individual characteristics,[d] PCI (and/or TAVI) possibly followed by TEER (in case of persisting severe SMR) should be considered.	IIa	C

PRO for mitral valve surgery in LV Failure

- Individual and precise treatment
  - Full and comprehensive service !!
  - Annuloplasty plus leaflet / subvalvular [illegible] atment
  - Respect, Resect, Neochords, Loop[illegible]sty, Augmentation.....
- Concomitant surgery [illegible]ion is present
  - Causal treatment

WE GET DOWN TO THE ROOT OF TROUBLE

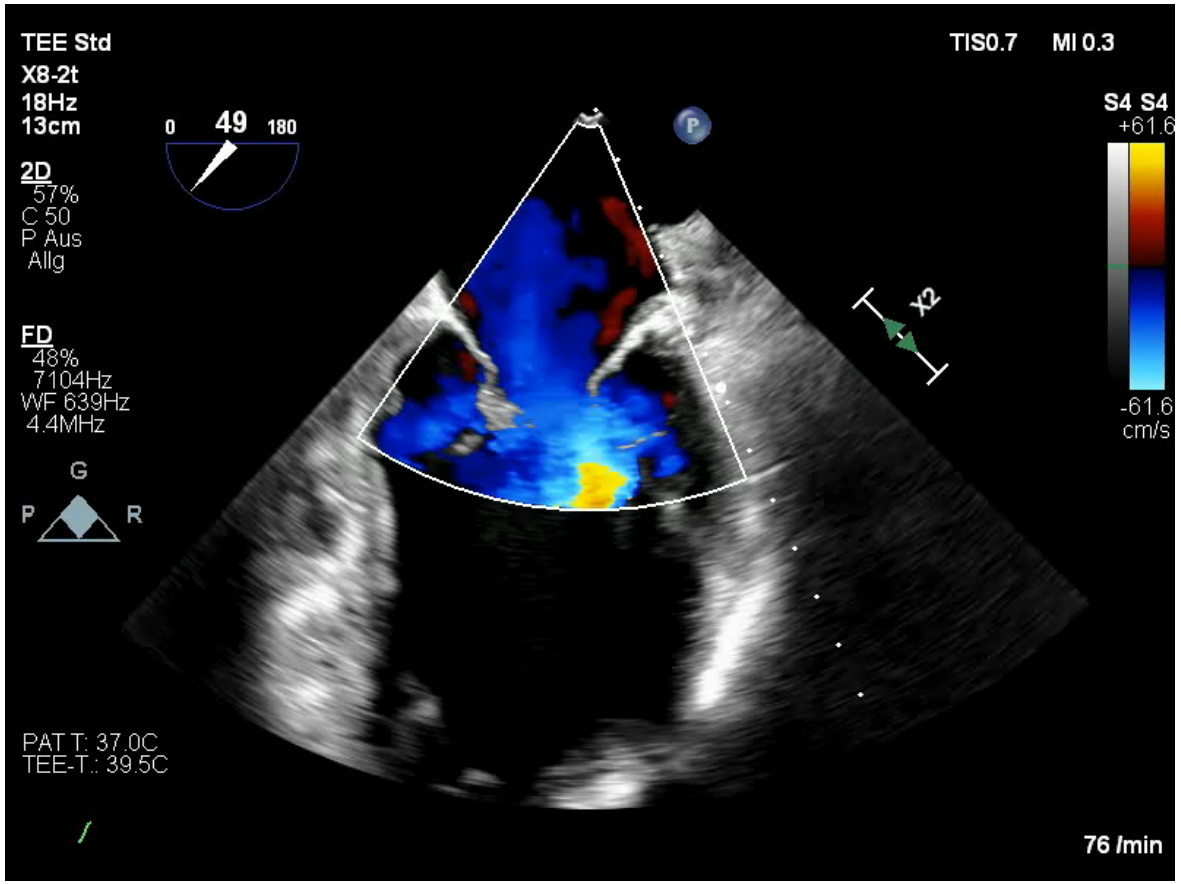
Con for mitral valve surgery in LV Failure

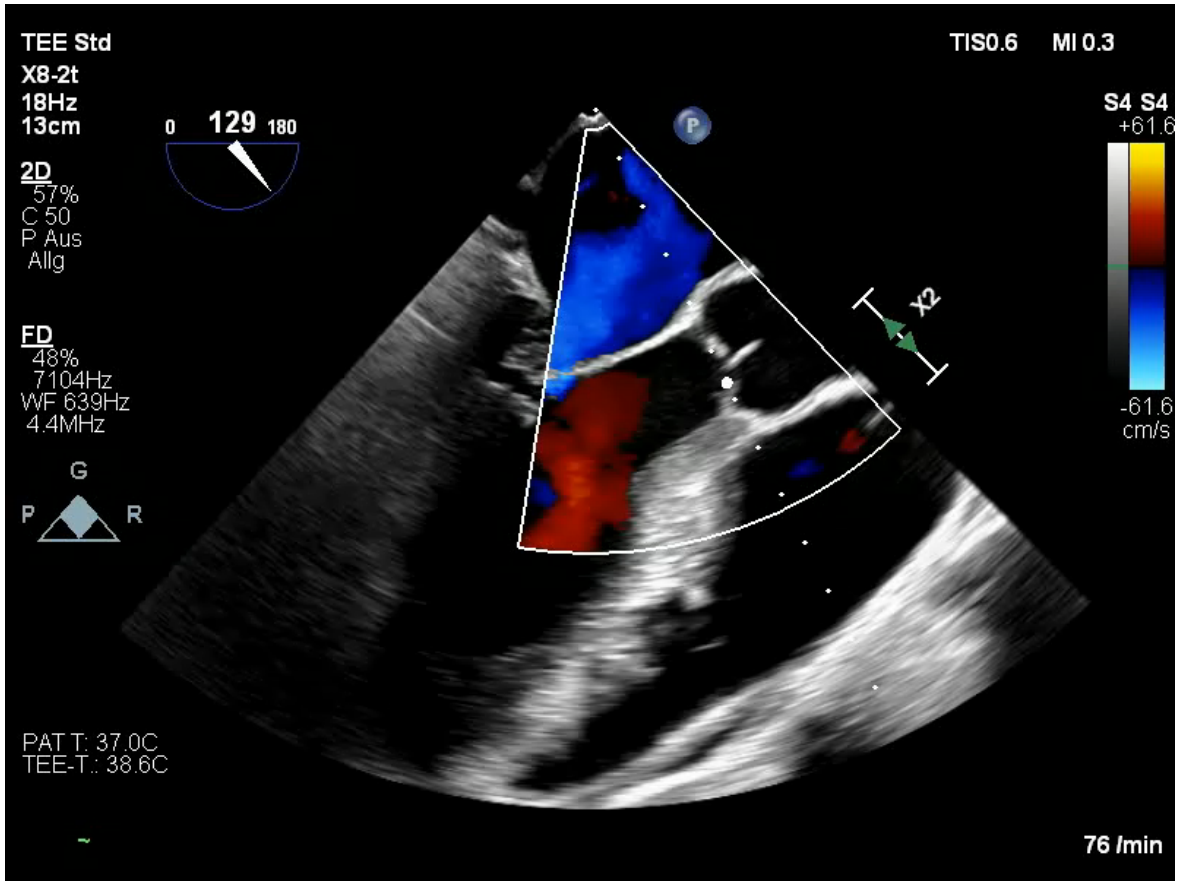
- Operative and procedural trauma
  - Surgery
  - CPB, haemodialatiation, blood loss etc.
  - SIRS
  - General anesthesia
- ? Restoration of **full** mitral valve competence ?

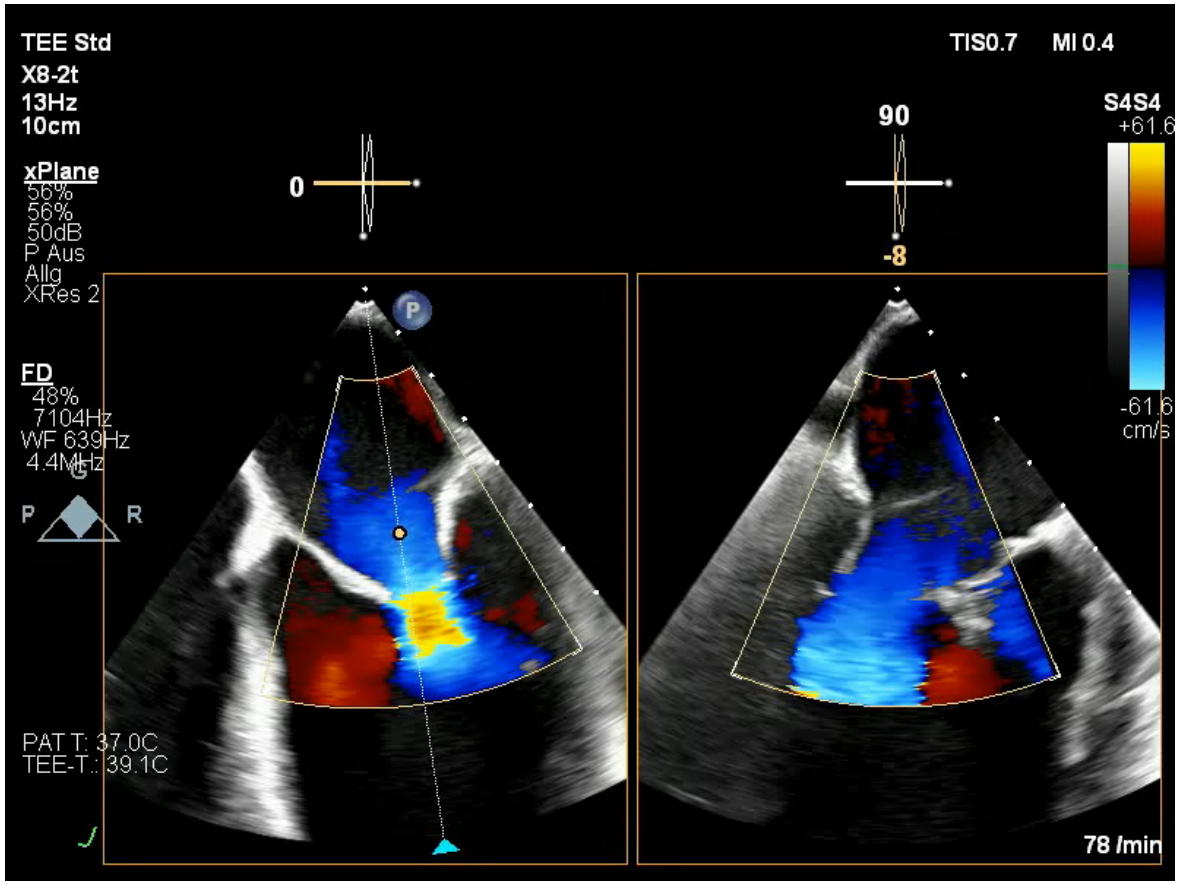
High risk for peri/early-postoperative Low Cardiac Output Syndrome

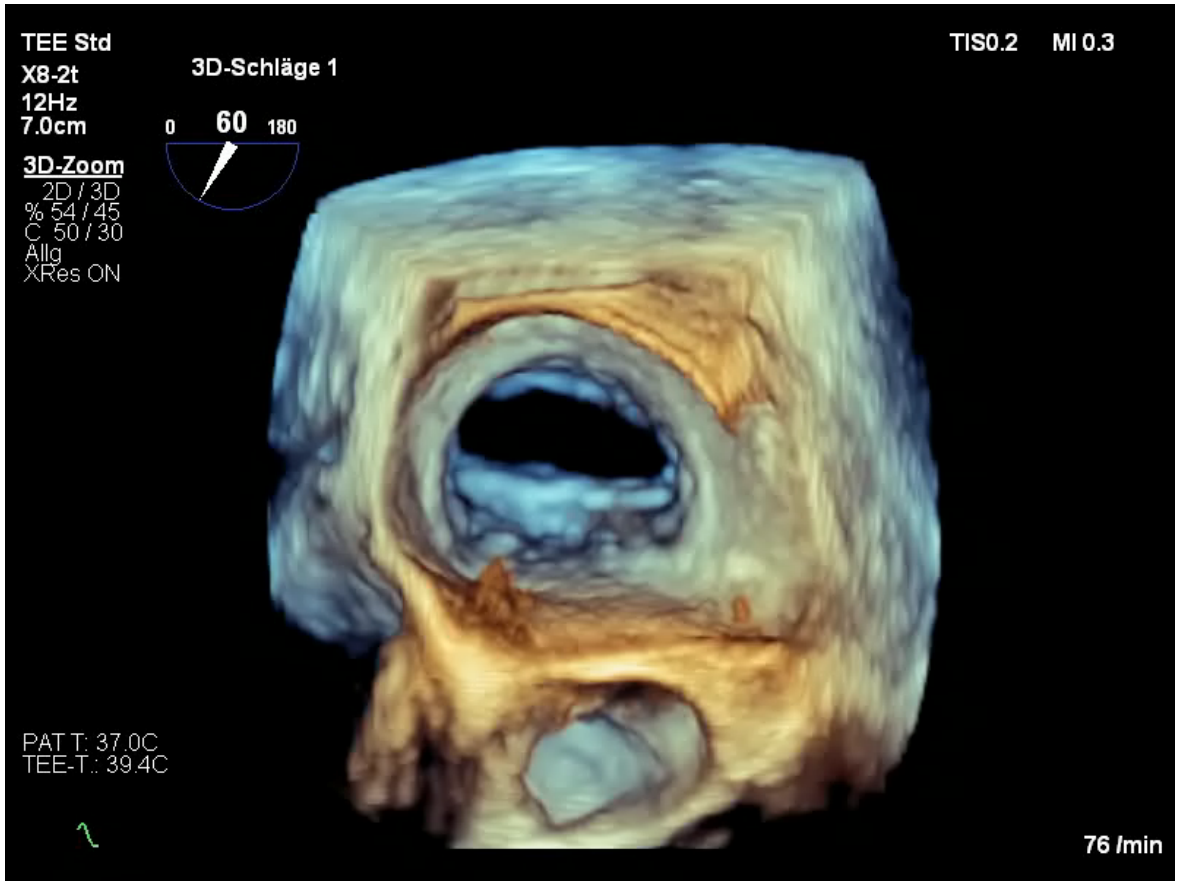
Case presentation of mitral repair and concomitant tricuspid repair plus CABG

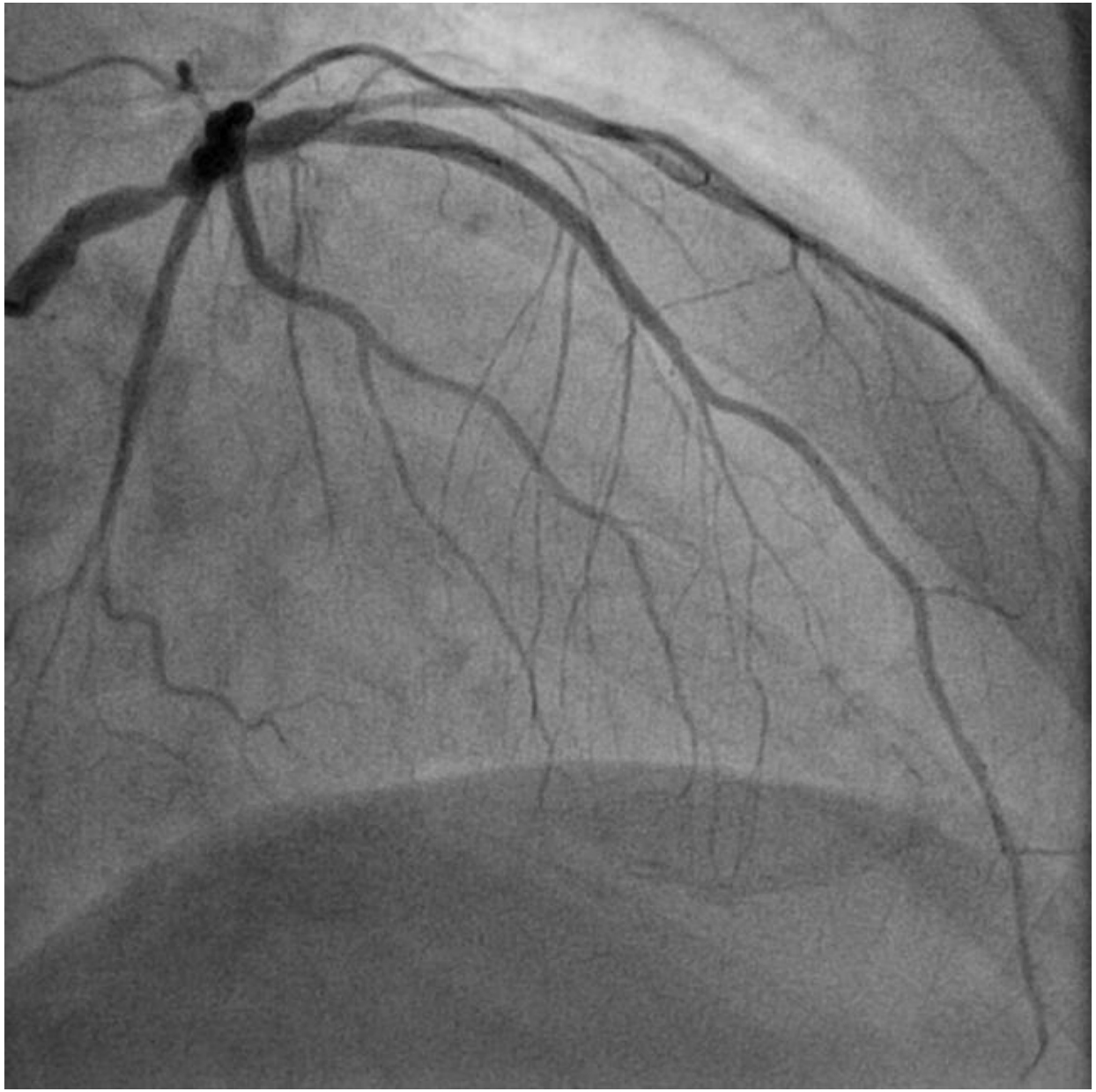
- 56y female patient
- Combined valvular and ischemic CMP LVEF: 20-25%, NYHA IV+
- Functional MR IV° with severe annular dilatation
- (dynamic) Tricuspid regurgitation II-III°, elevated PAPsys pressure
- CAD with severe LCA (main stem) stenosis

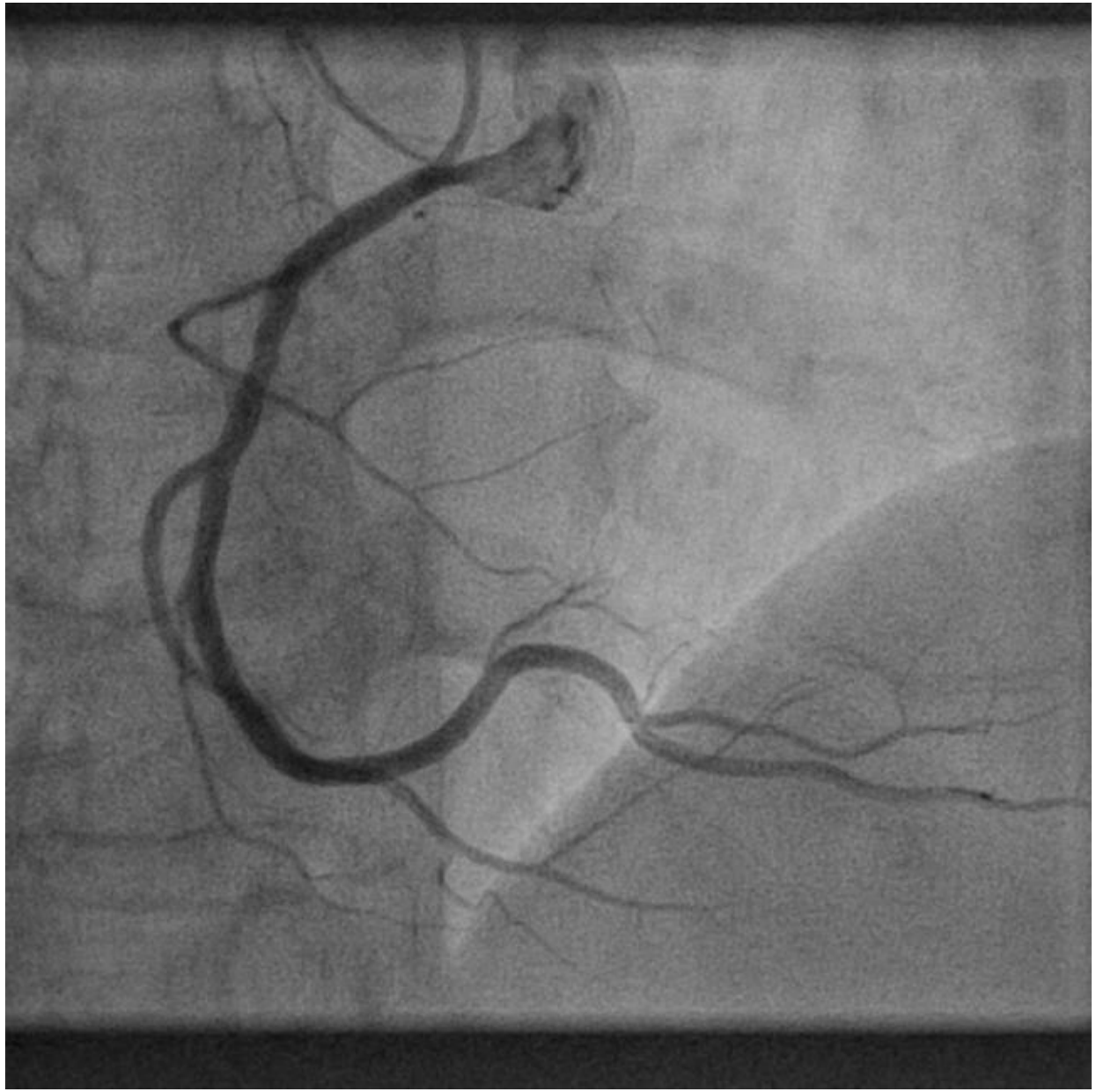












Surgical Procedure after Heart Team decision

- Mitral valve repair, annuloplasty (CorCym 28mm 4D Memo ring)
- Tricuspid valve repair (31mm Duran AnCore band)
- 2x CABG (LIMA-LAD, CABG-OM1)
- Impella® 5.5 Implantation via right axillary artery

Intraoperative / early postoperative result

- Residual MR I°, MV pressure gradient of <3mmHg
- Competent TV with preserved RV-function
- Good competency for both CABG
- Uneventful Impella 5.5 implantation and support, successful weaning from CPB
- Extubation 5h after surgery, low/none inotropic and vasopressor support
- Impella support for 6 days with gradual decrease of support
- Discharge POD 11 in excellent clinical condition

Follow Up 3 month after surgery

- Decrease in symptoms (NYHA II) with increase in excercise capacity
- LVEF increase to 40% (true 40% !! → forward LVEF)
- Residual MR I°, trivial TR

Make a HFrEF patient "appropriate" for surgery according to ESC/EATCS Guidelines and the heart team´s decision

Inoperable ☹

Make a HFrEF patient "appropriate" for surgery according to ESC/EATCS Guidelines and the heart team´s decision

~~Inoperable~~ ☹→ appropriate ☺*

* In terms of LV dysfunctio/function

Summary

- Think beyond the treatment of CS in terms of MCS and Impella
- Enrich your toolbox in terms of pMCS devices
- Apply contemporary devices and aim for a tailored MCS
- Reach out for heart failure patients and put them on your scope for expedient surgery treatments
- Let TEER and PCI become second-line & bail-out treatment options in those cases you feel you can treat comprehensively and appropriately by surgery

Allow the patient to benefit most from your optimal and long lasting surgical treatment !!
….Even in the circumstance of pre-existing heart failure

Thank you so much for your attention

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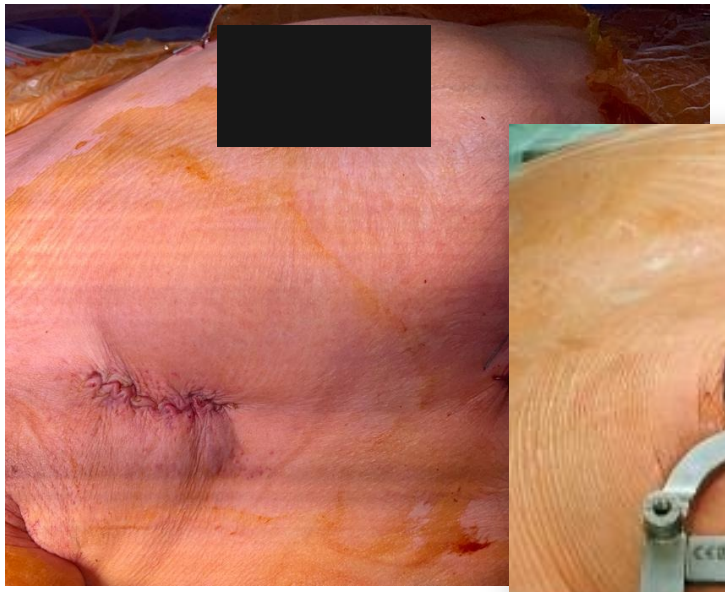
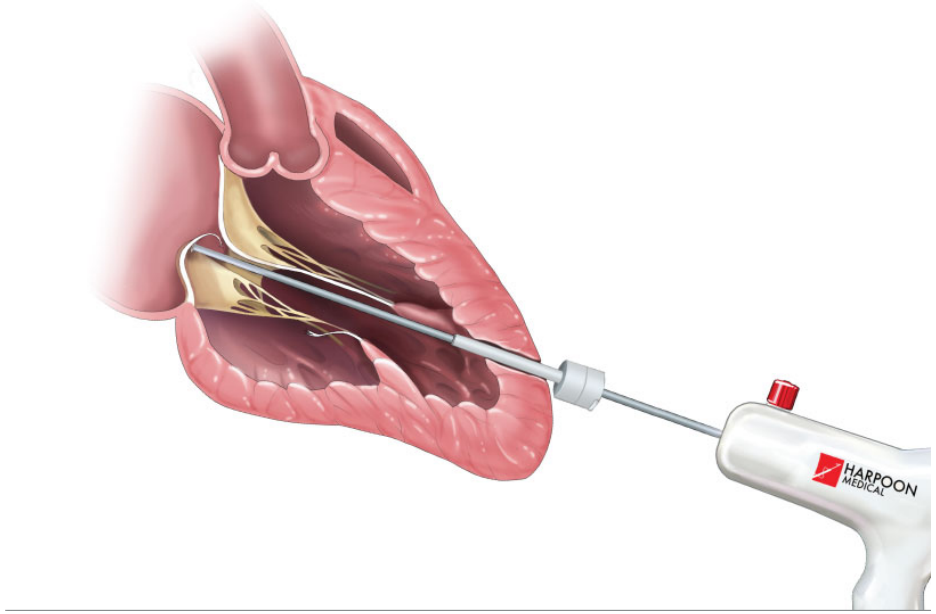
MIC Mitral surgery in Heart Failure and pMCS – It is a MATCH



- Use ECMELLA approach
- Reduce surgical trauma
- Enhance rehabilitation

What about modern MV devices without the need for CPB and cardiac arrest ??



….more of less the same in the setting of heart failure !!
„Abrupt closure of the backdoor“

Courtesy of Abbott Inc. & Edwards Lifescience Corp.