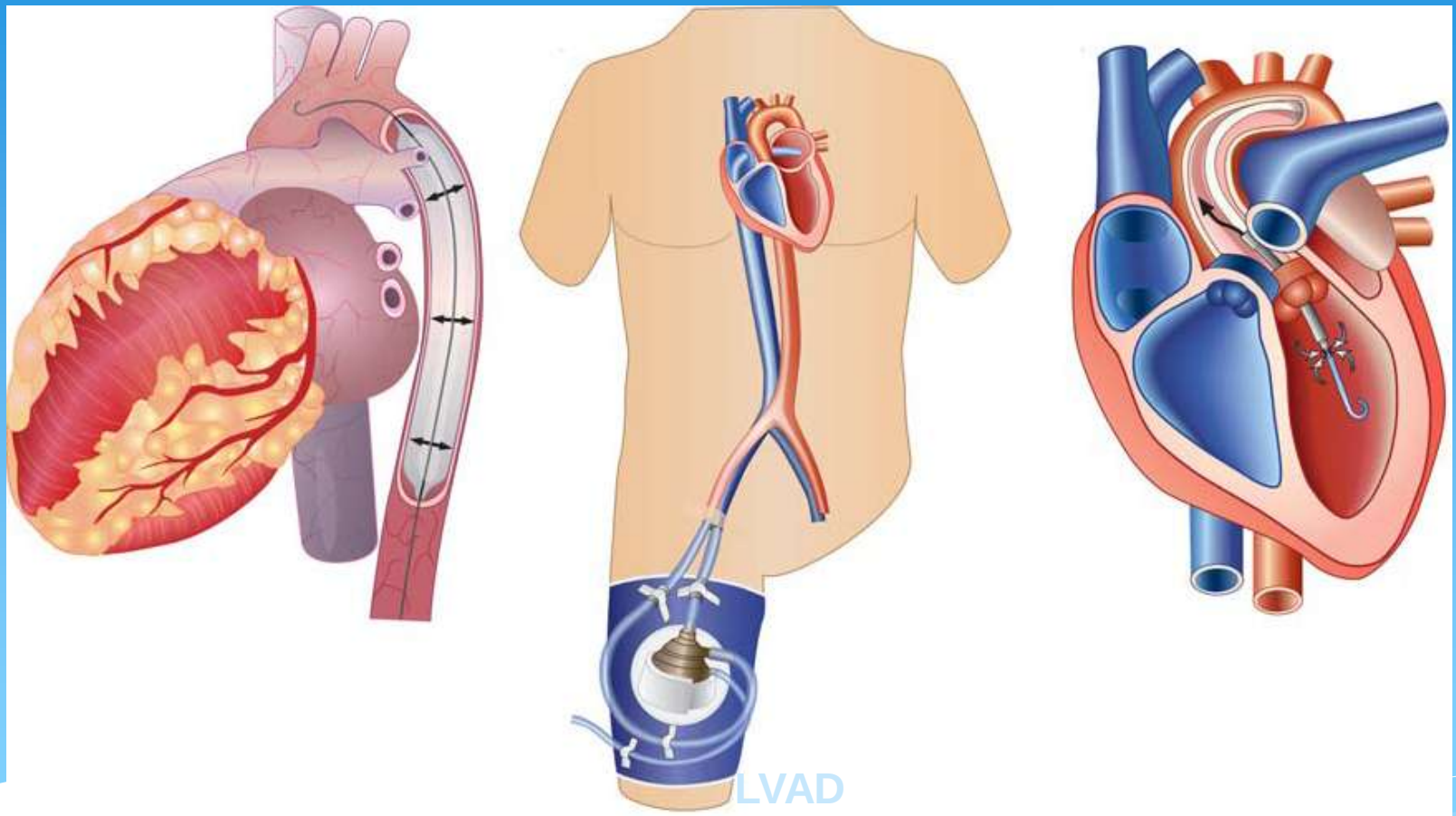
ECLS Systems –
Endikasyonlar ve Uygulamalar

Doç. Dr. Kıvanç Metin

DEÜ Kalp ve Damar Cerrahisi Anabilim Dalı

Tanım
Extra Corporeal Life Support

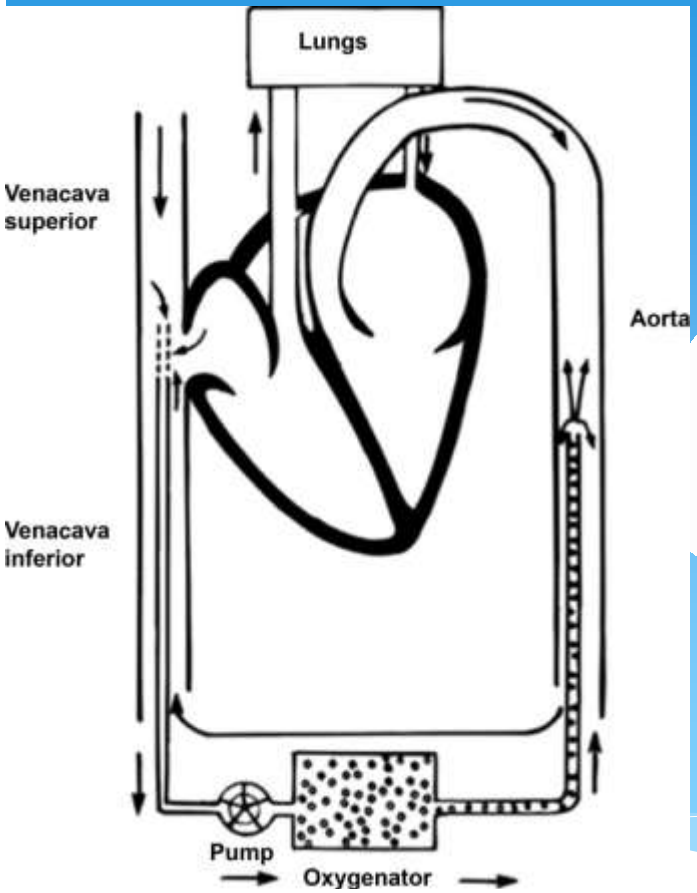


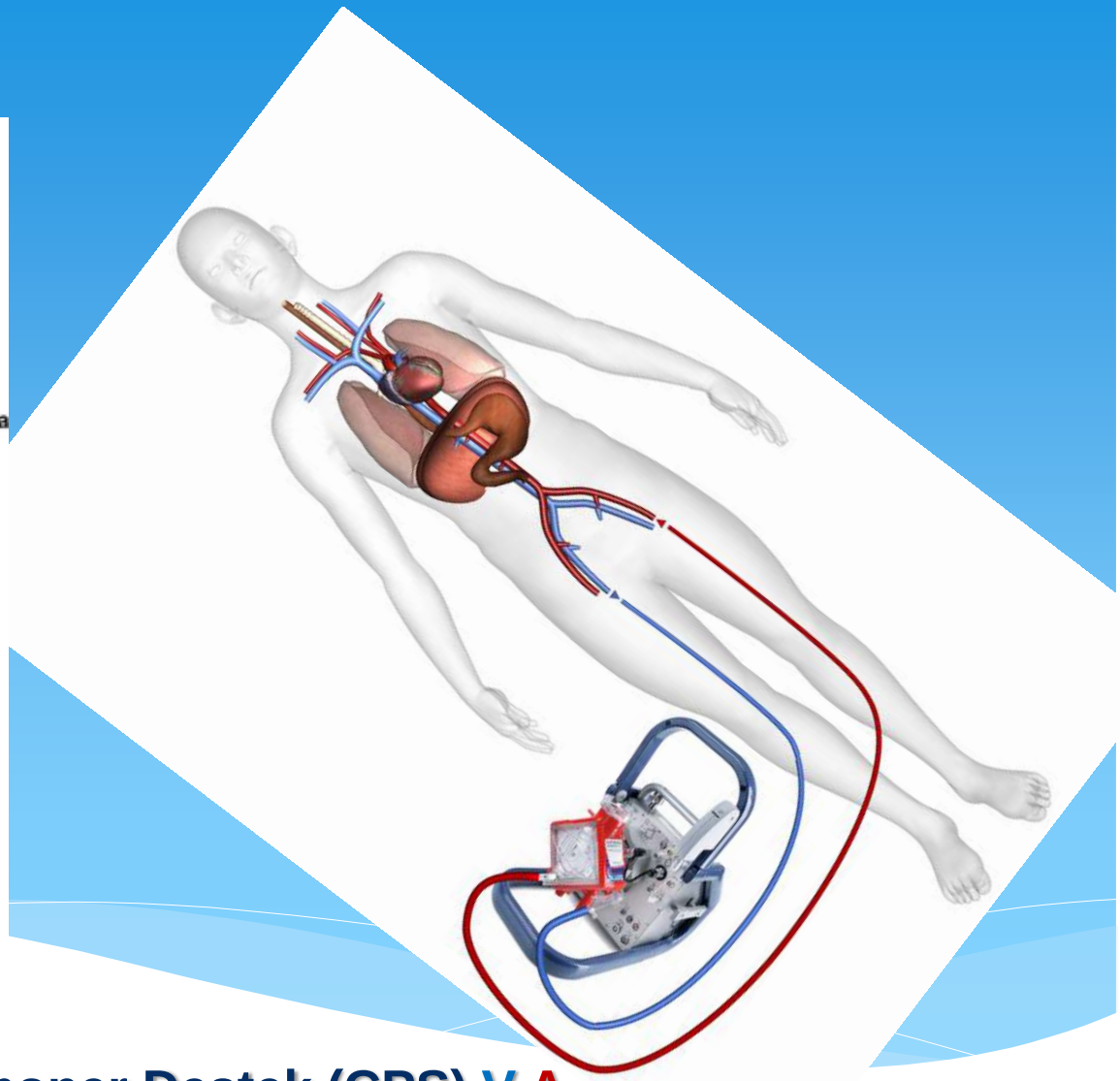
LVAD
Left Ventricular Assist Device

IABP
Intraaortic Ballonpump

Transluminal LVAD

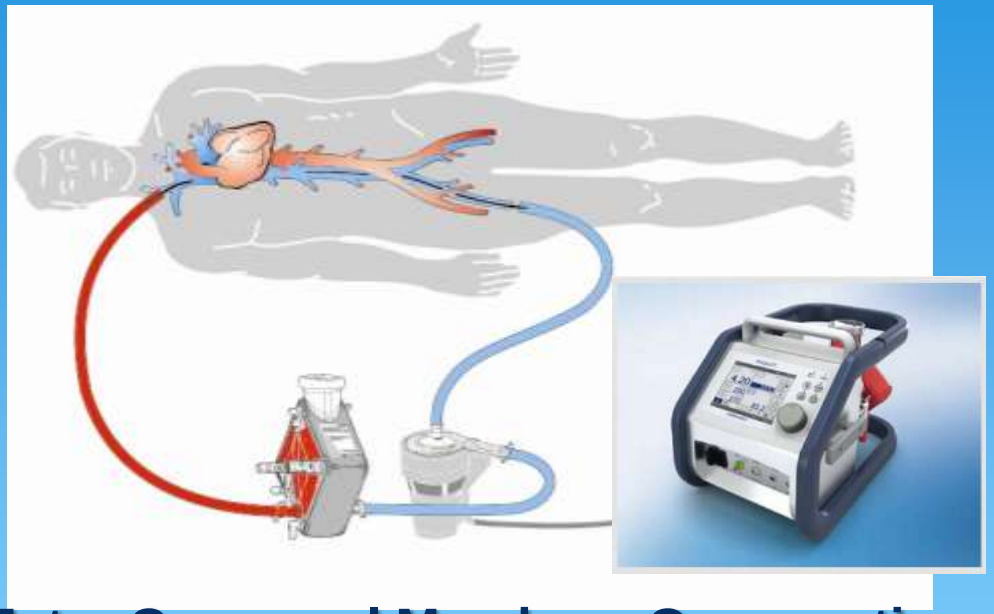
Kardiyak Destek



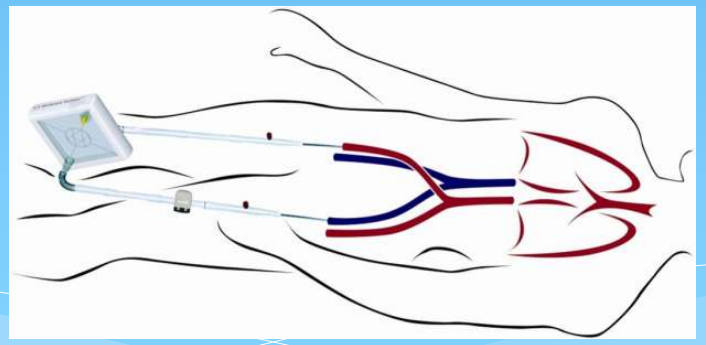


Kardiyopulmoner Destek (CPS) V A

Akciğer desteği

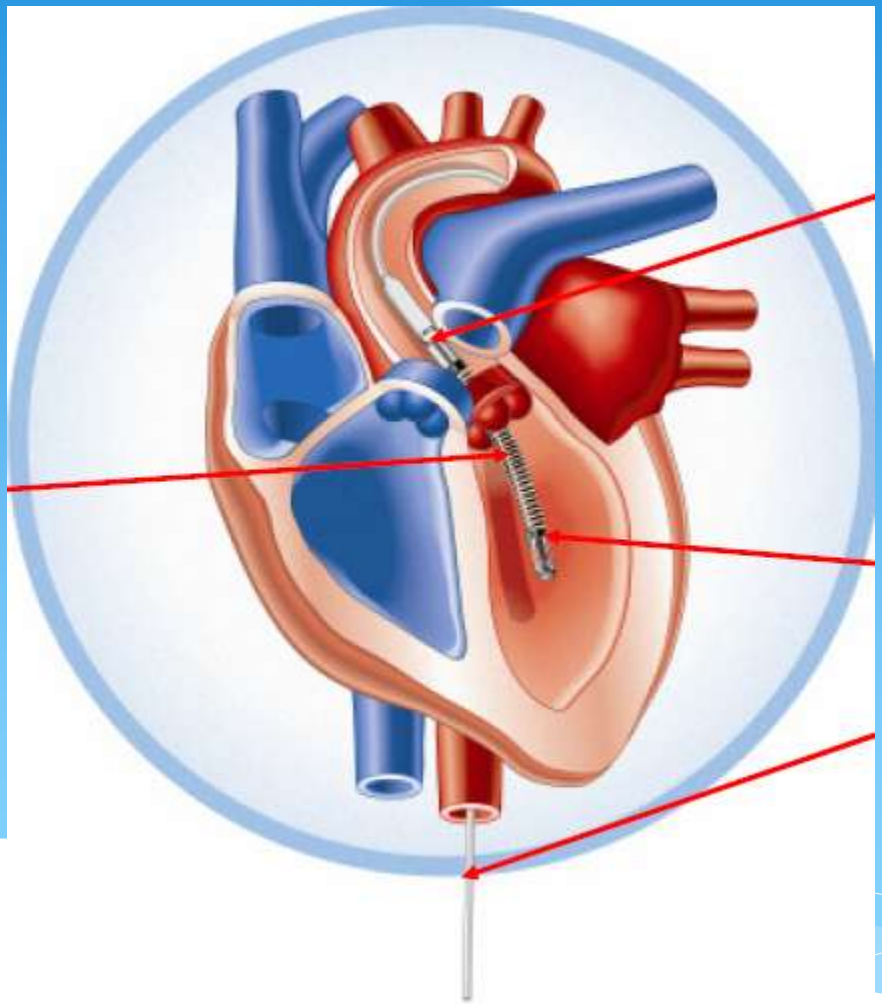


Extra Corporeal Membran Oxygenation
ECMO V V



Invasive Lung Assist ILA A V

Transluminal LVAD



canula

Blood outflow

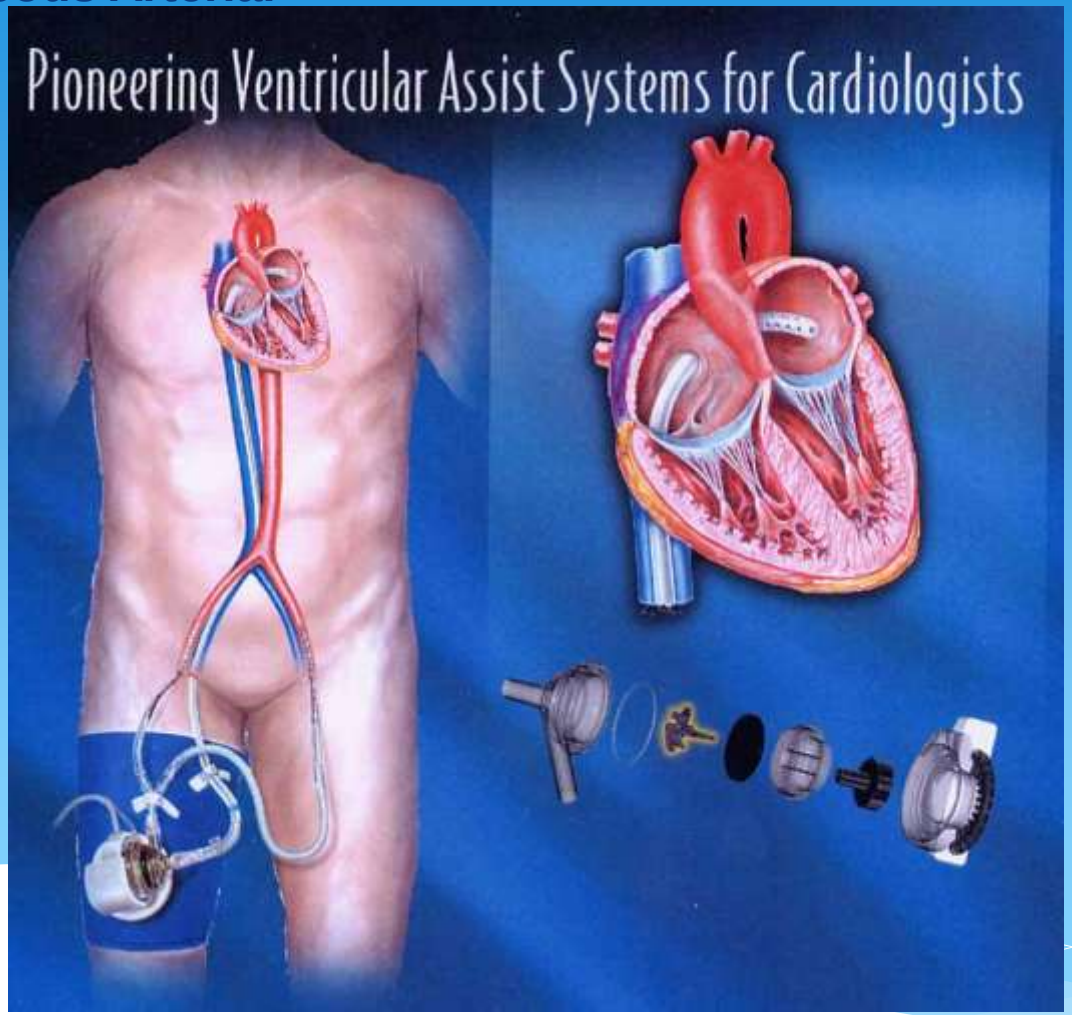
Blood suction

catheter

Transluminal LVAD

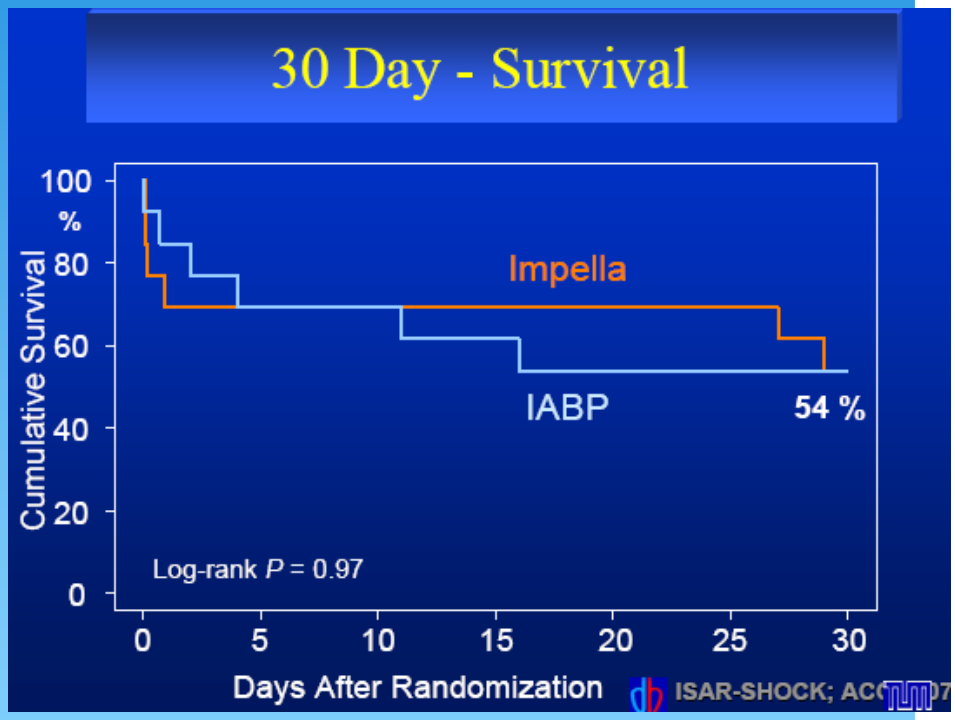
	RECOVER*	ACUTE**
Pump Size	20 F	12 F
Catheter Size	9 Fr	9 Fr
Flow (L/min)	5	2,5
RPM	33.000	50.000
Introduction	Cut Down	Percutaneous
	Transthoracal	
Cannula Length	75 mm / 50 mm	75 mm

Left Ventricular Assist Device VAD
Percutaneous transvenous (RA-PFO-LA)
To
Percutaneous Arterial



Tandem Heart

Klinik Kanıtlar
Impella LP 2.5 and TandemHeart



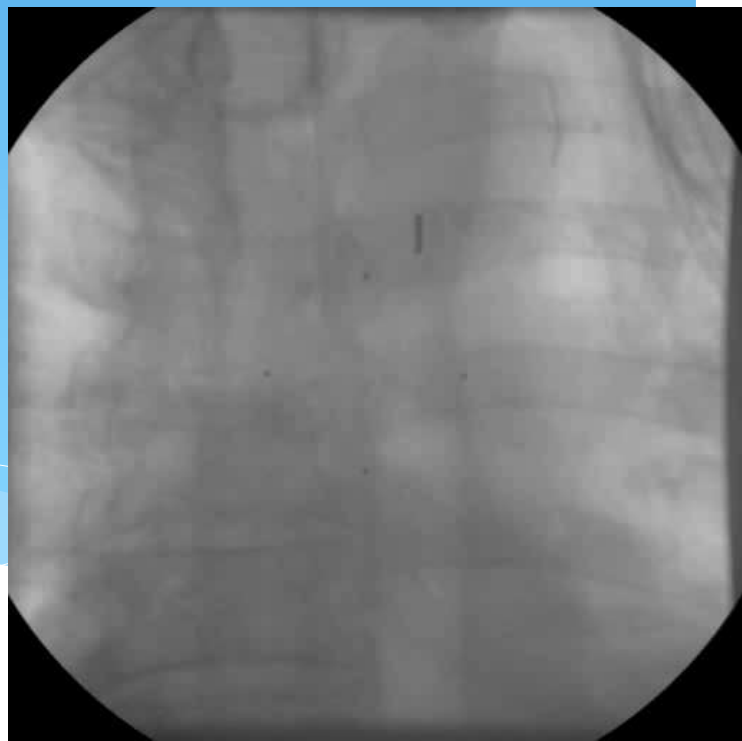
No current evidence of mortality benefit
of pVADs (Impella / TandemHeart) versus IABP

Kardiyak destek

intra-aortic balloon pump (IABP)

INTRA-AORTIC BALLOON PUMP (IABP)

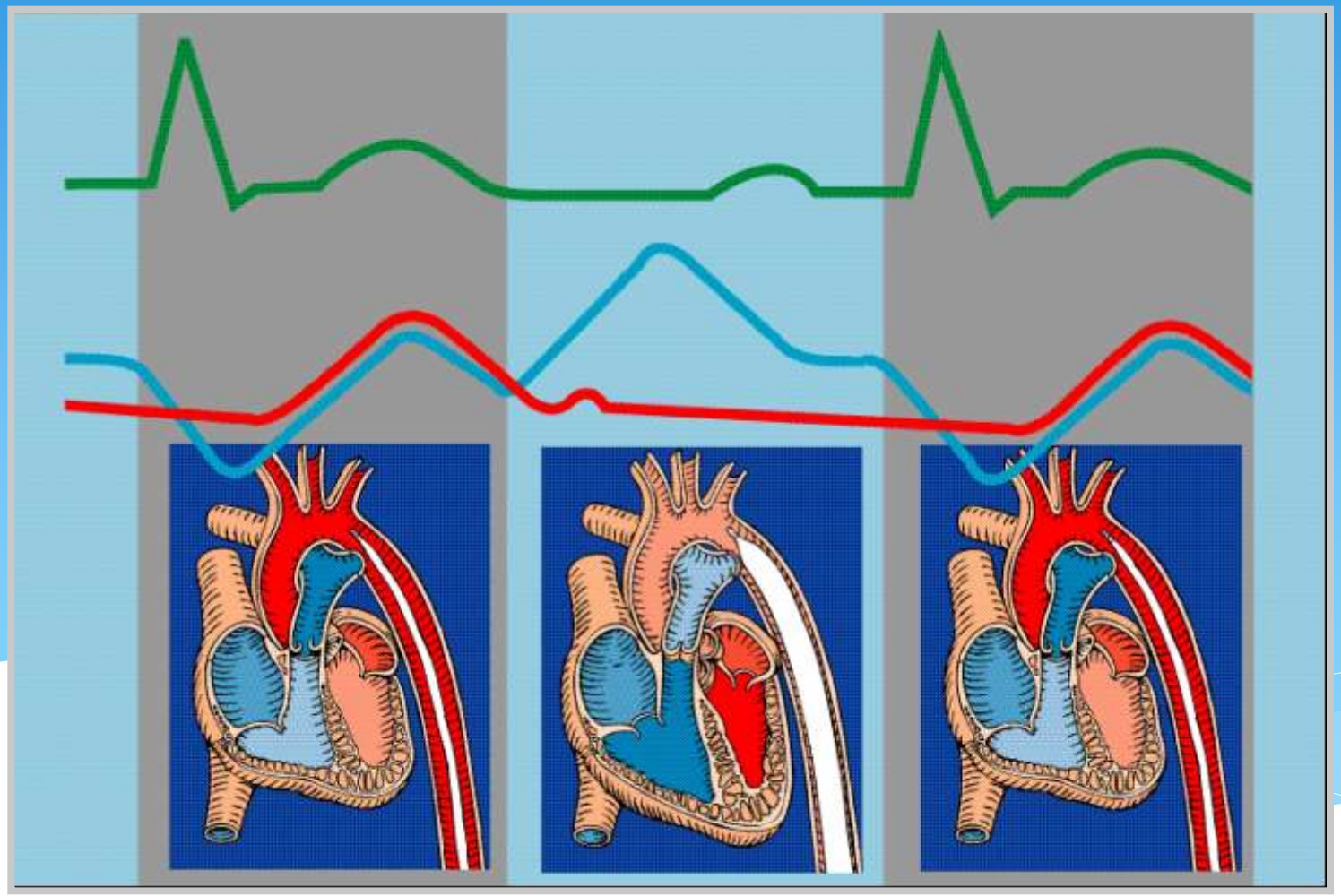
- Sistolik afterload azalır
- Diyastolik perfüzyon basıncı desteklenir
- > 10% -40% kardiyak output
- Diyastolik koroner kan akımı artar > 65%



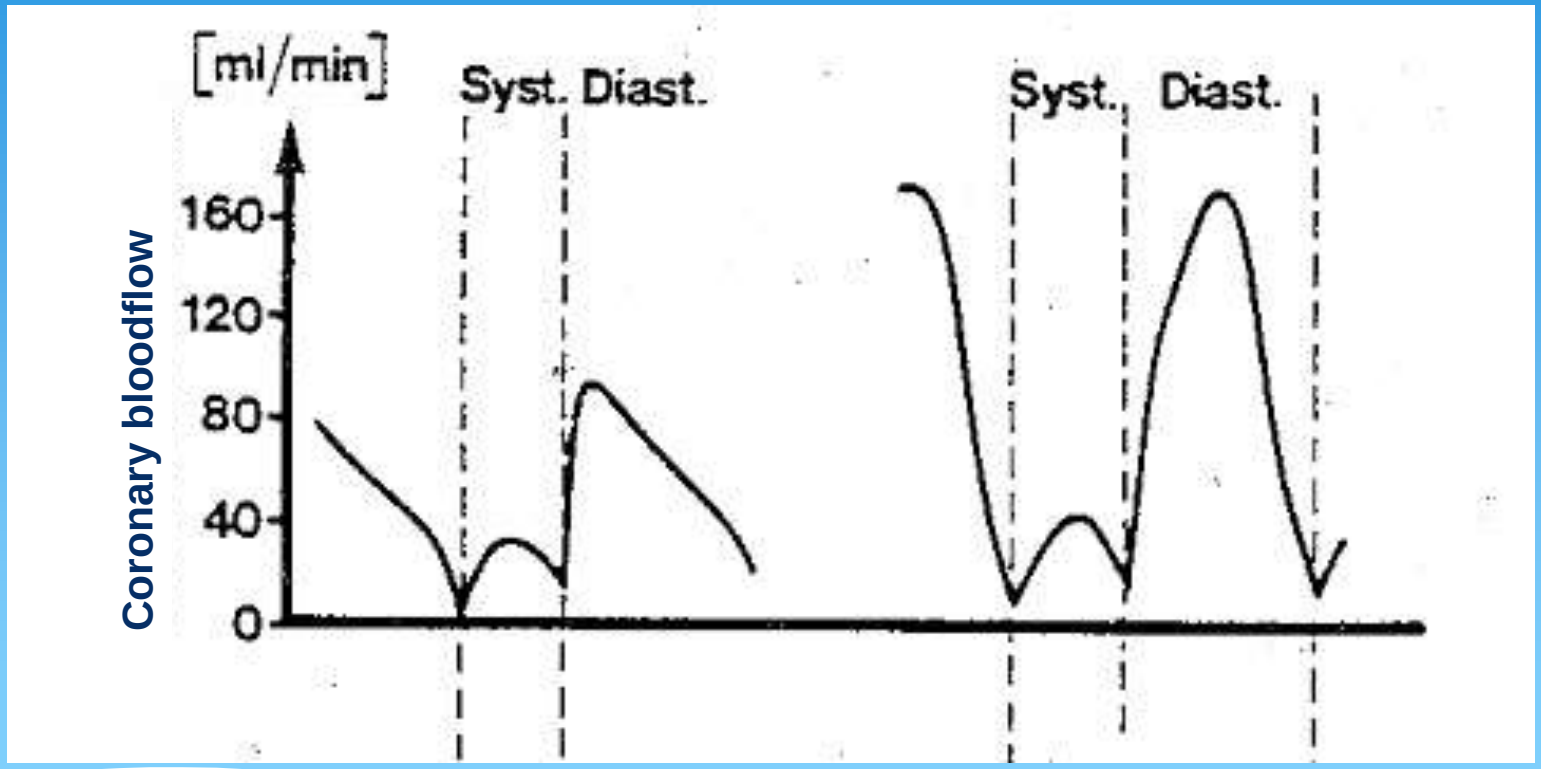
Mueller H et al. J Clin Invest 1971;50:1885
Scheidt S et al N Engl J Med 1973;288:979

INTRA-AORTIC BALLOON PUMP (IABP)

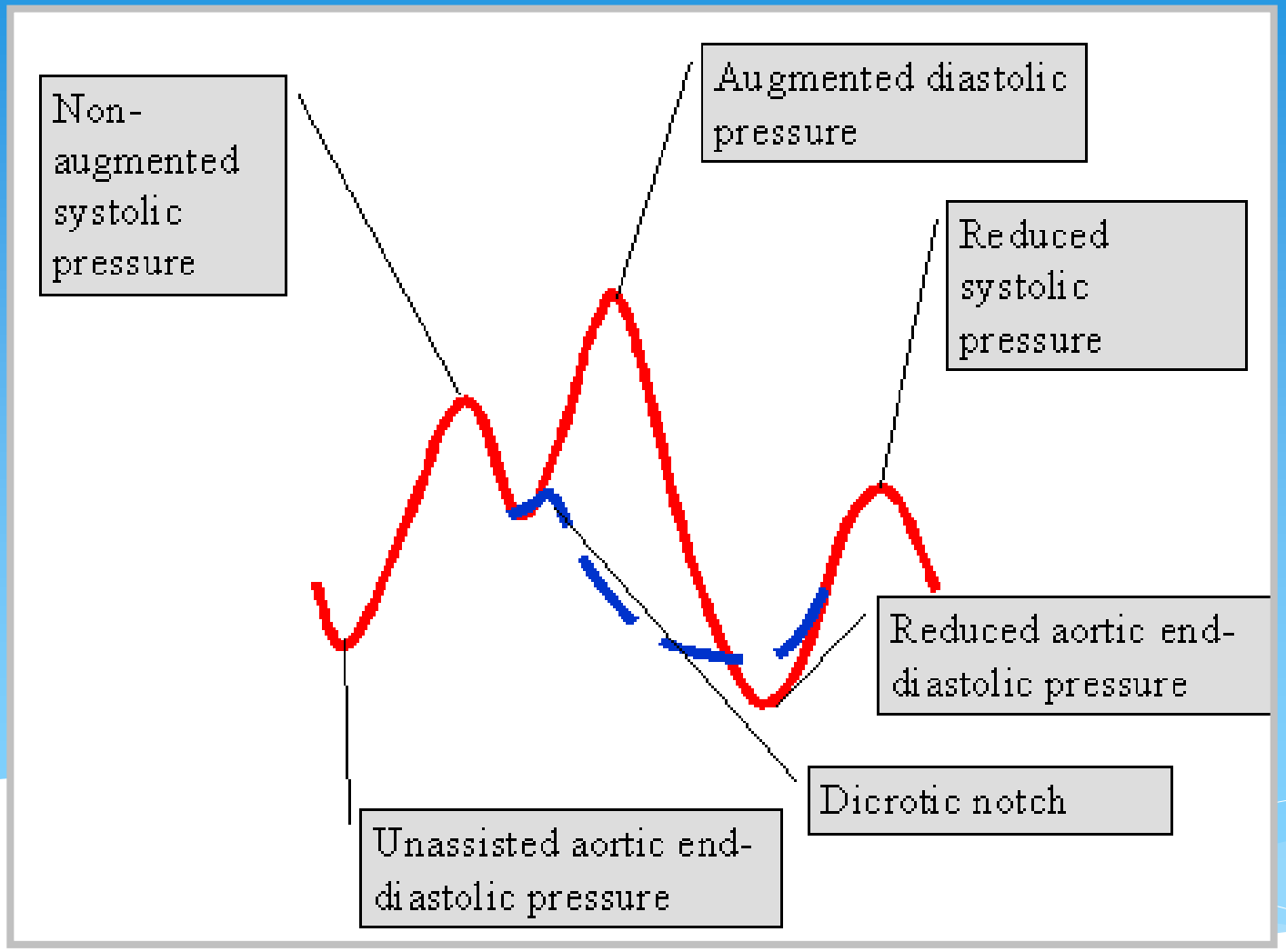
Systole / Deflation Diastole / Inflation Systole / Deflation



CORONARY PERFUSION



IABP-WAVEFORM



intra-aortic balloon pump (IABP) / cardiopulmonary support (CPS):

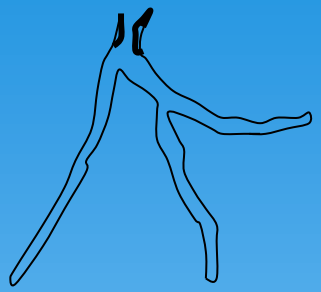
- **Elektif yüksek riskli PCI, IABP / CPC kullanılmadan yapılabilir.**
- **Acil yüksek riskli PCI (örn: akut MI'da direlt PCI) genellikle IABP / CPS desteği kullanılmadan yapılabilir.**
- **CPS, kardiyojenik şok gibi yüksek riskli hastalarda PCI uygulaması için gereklidir.**
- **Hemodinamik olarak sınırda olan hastalarda (devam eden iskemi veya kardiyojenik şok gibi) , IABP desteği sonuçları olumlu yönde etkiler.**

Briguori, et al. Am Heart J 2003; 145:700-7

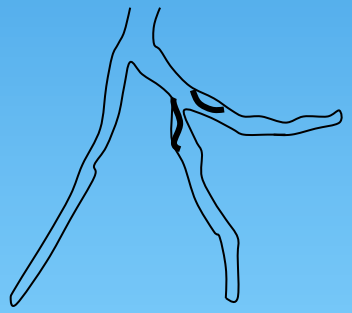
Mishra S., Chu W., Torguson R, et al. Am J Card. September 2006;5:608-612

HIGH RISK PCI

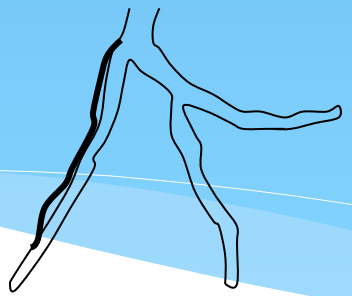
Main vessel interventions

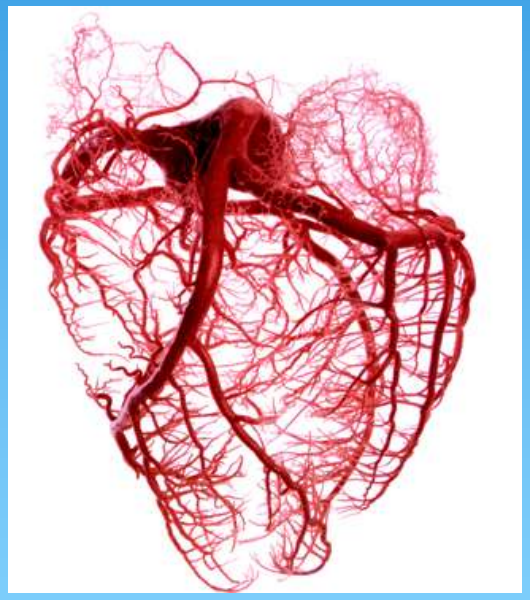


Kissing Intervention

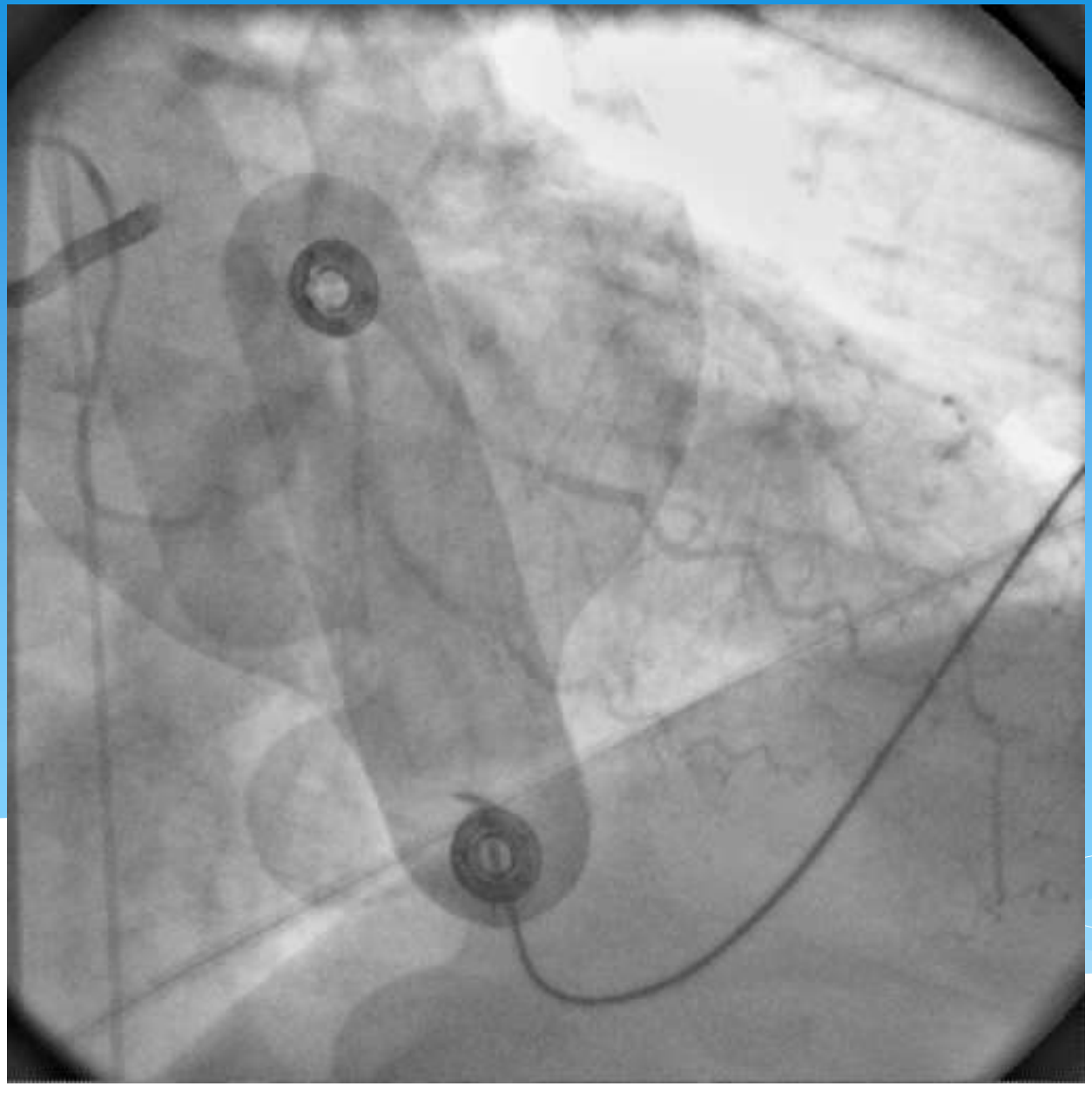


Reconstruction interventions

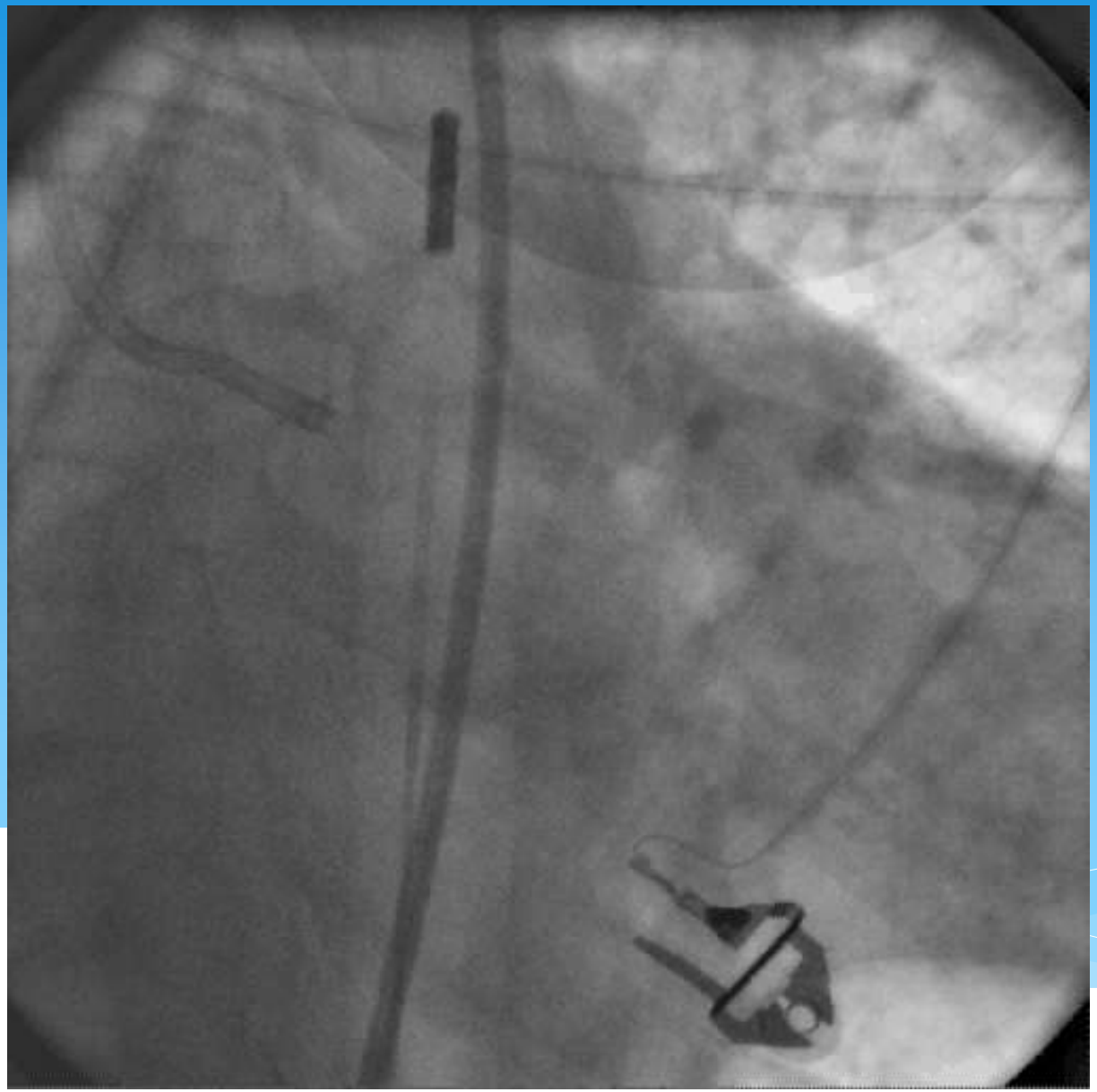




LEFT MAIN VESSEL



LEFT MAIN VESSEL



IABP Limitasyonları

Sınırlı destek

Kendi başına akım sağlamaz, kardiyak arrestte destek yok

Malign aritmilerde destek ?

Vasküler limitasyonlar

„Bridge to bridging“

Step1 mekanik destek

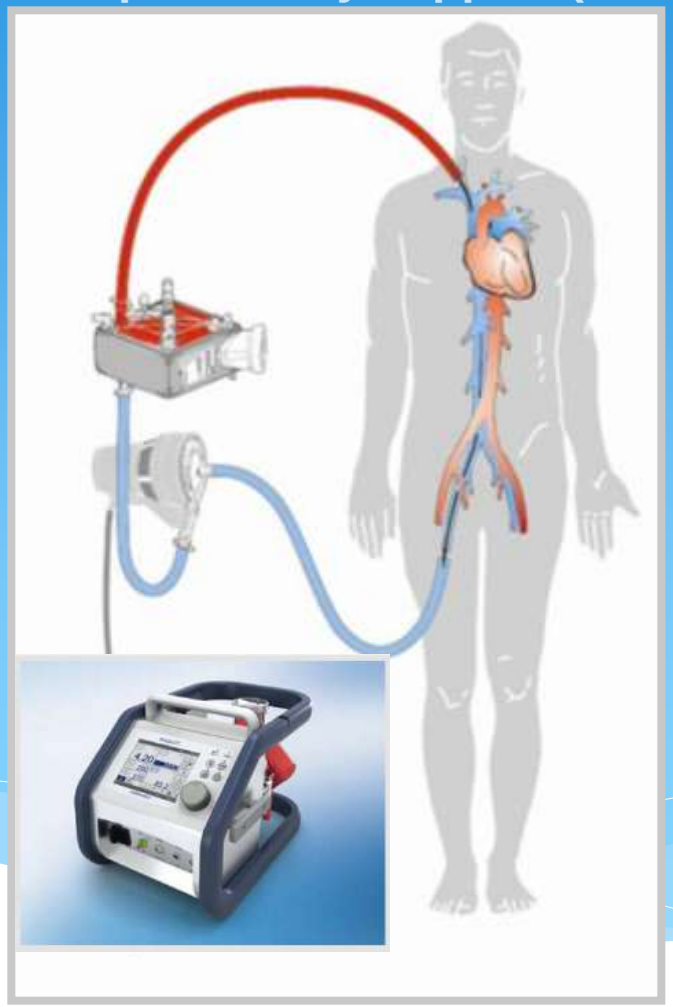
Ya sonra?

Bridging to…:

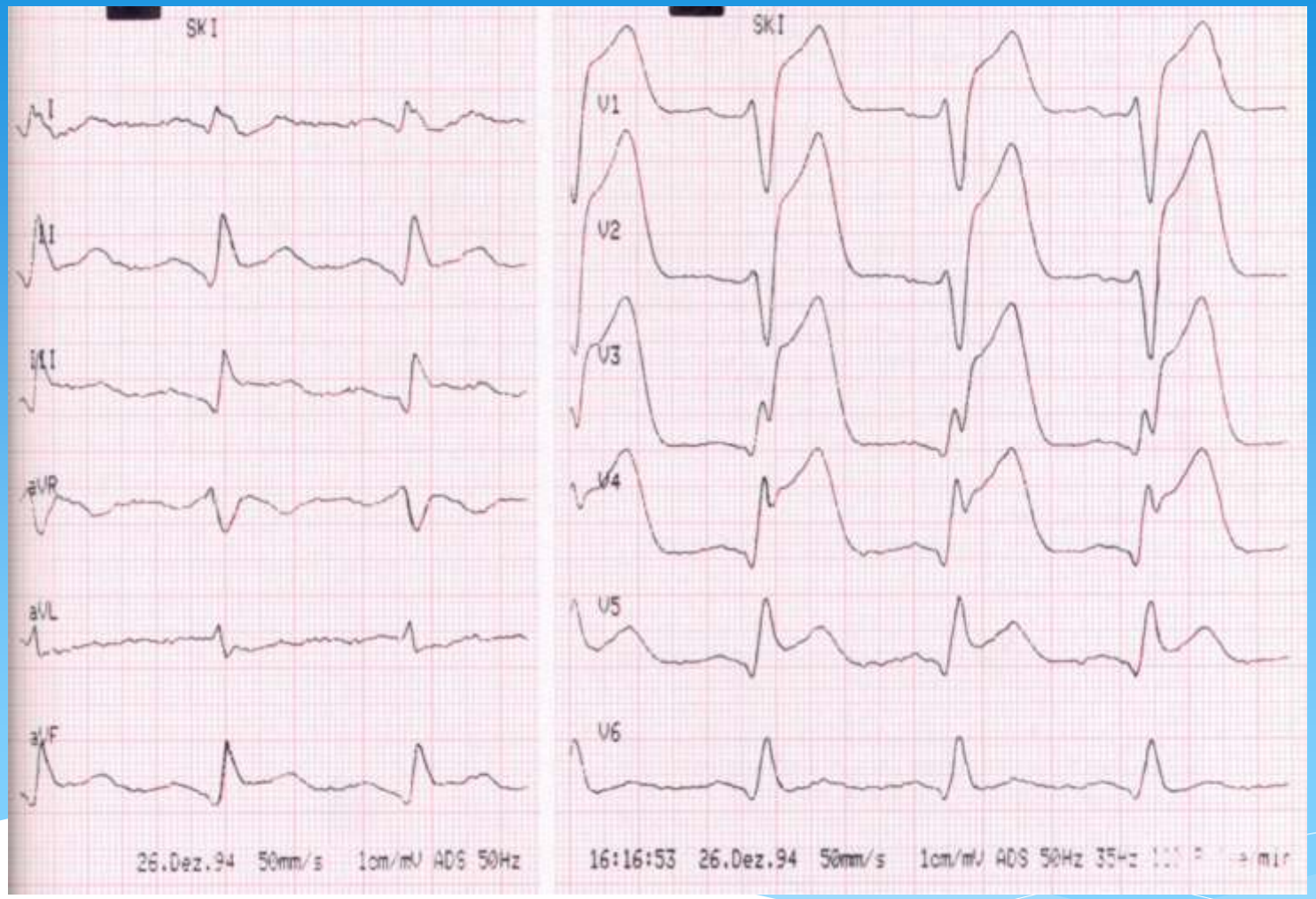
CARDIAC SUPPORT

intra-aortic balloon pump (IABP)

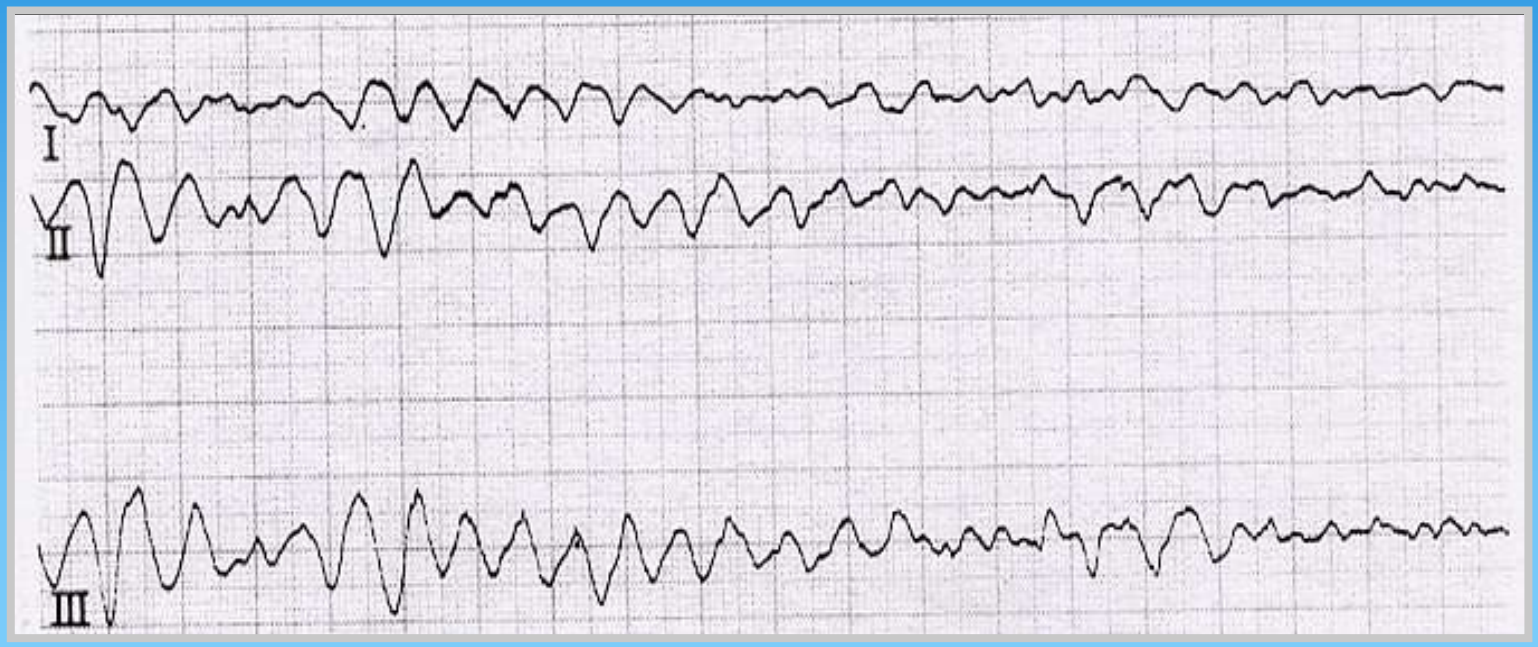
cardiopulmonary support (CPS)



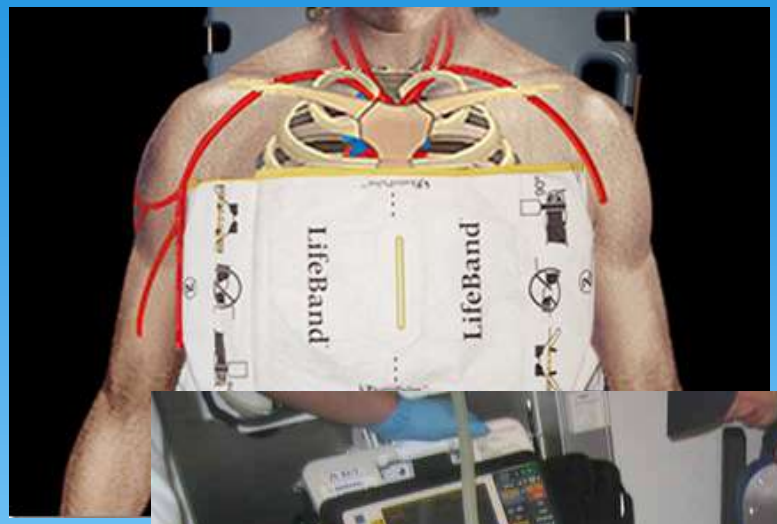
CASE


SKI
I
II
III
aVR
aVL
aVF
26.Dez.94 50mm/s 1cm/mV ADS 50Hz
SKI
V1
V2
V3
V4
V5
V6
16:16:53 26.Dez.94 50mm/s 1cm/mV ADS 50Hz

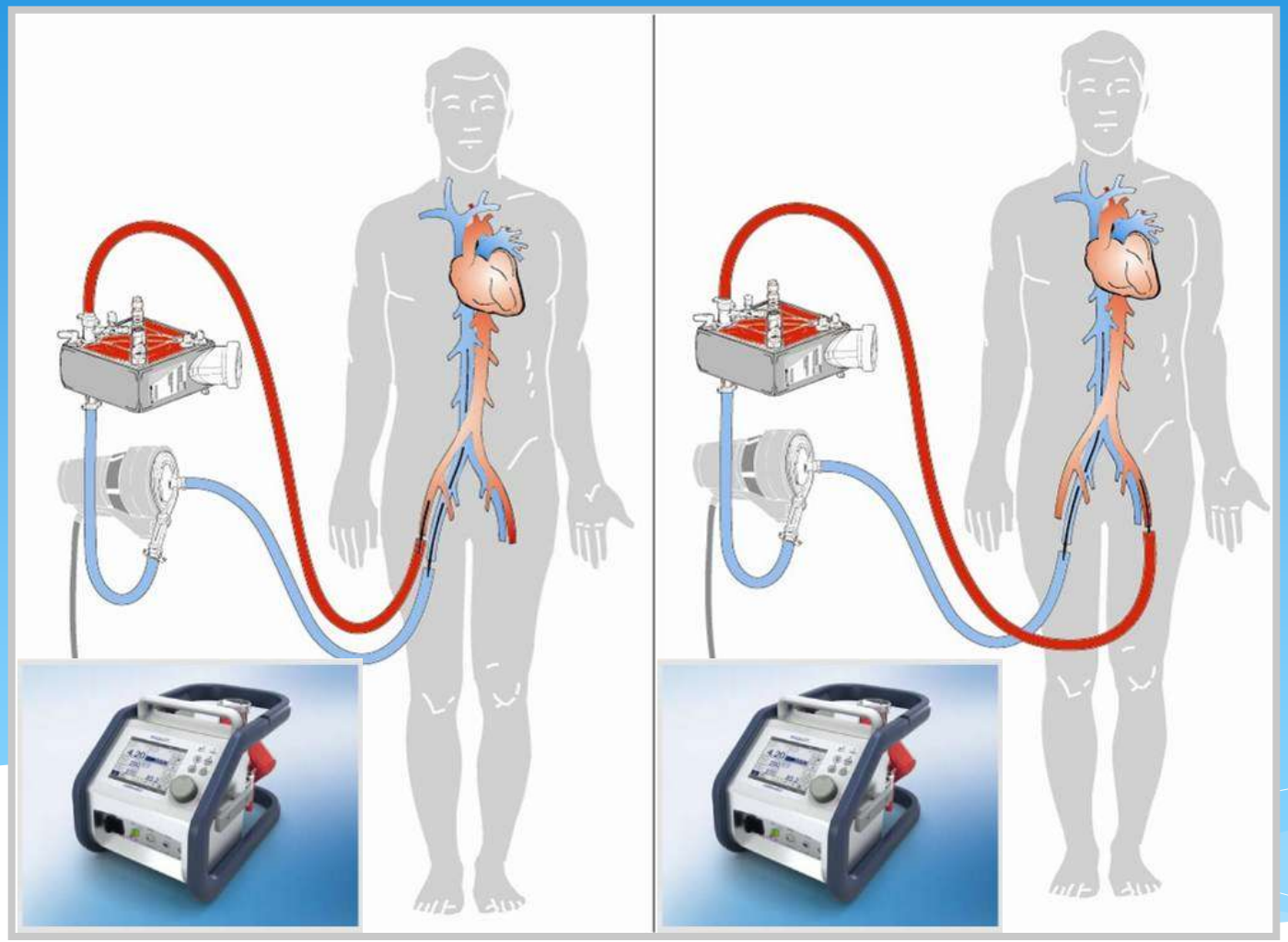
SUDDENLY



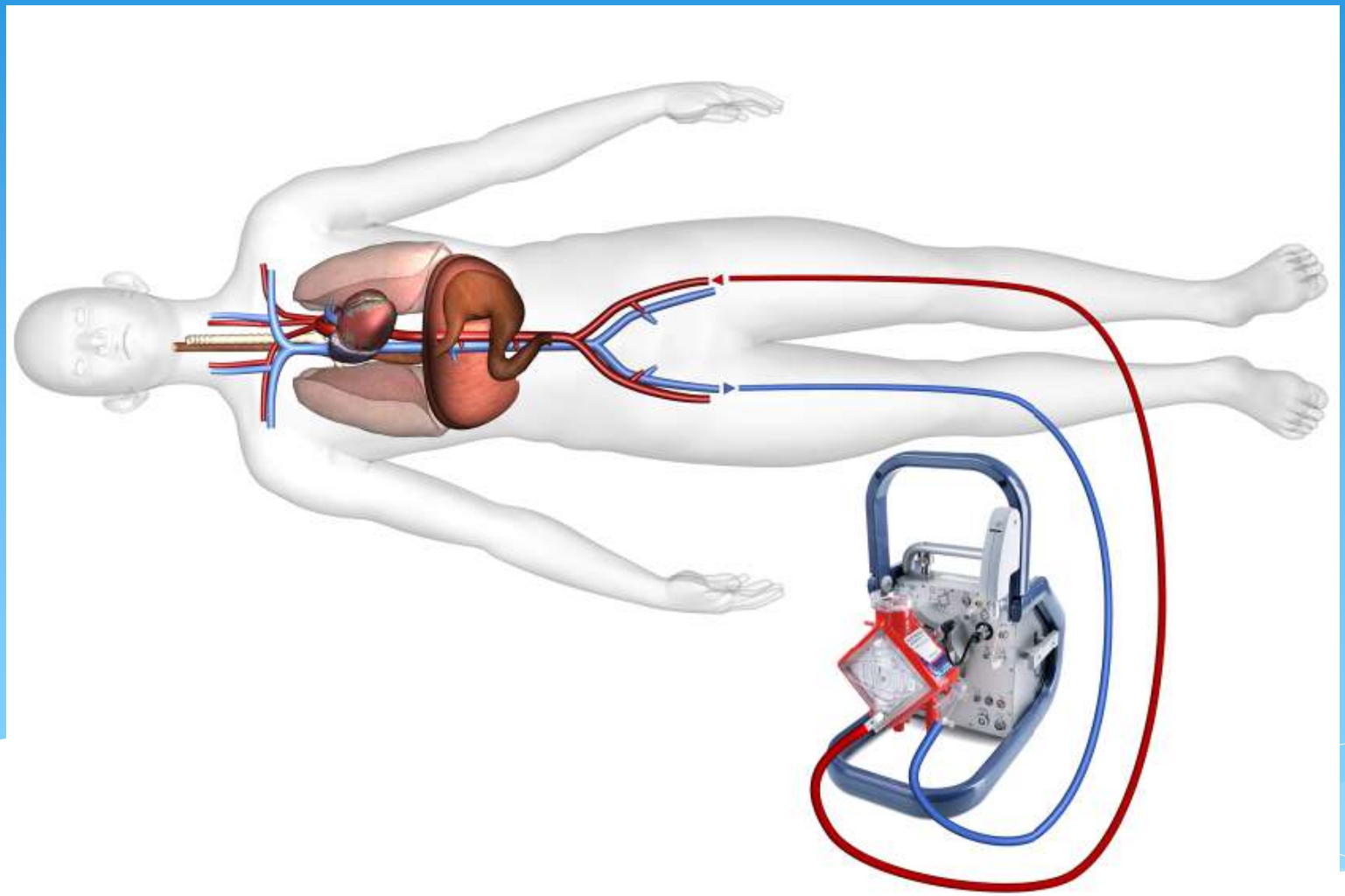
- VF, CPR, Defibrilasyon
- No return of spontaneous circulation (ROSC)
- CPR altında kateter laboratuarına transfer


LifeBand
LifeBand

İlk endikasyon
Acil dolaşım desteği



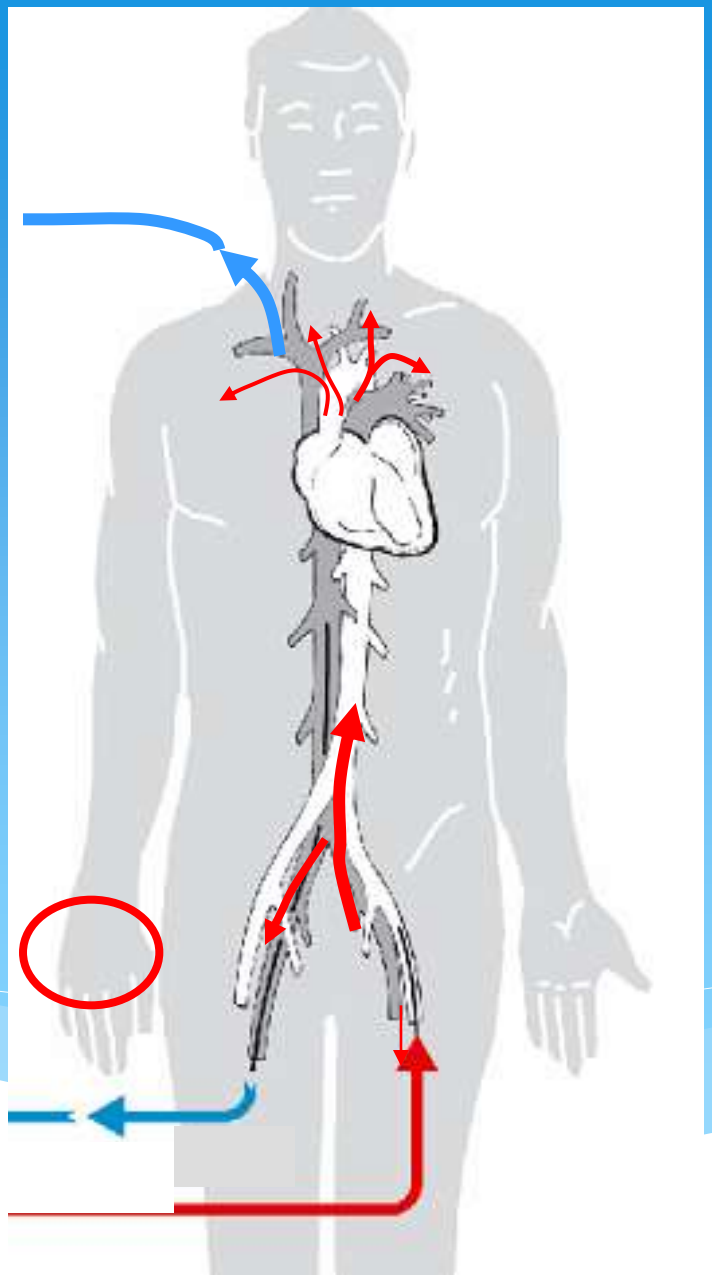
Cardiohelp



Cardiohelp ECLS V A

O2 Saturation

bloodgases
right a. radialis



BRIDGE TO THERAPY

Kat. Lab.da CPR

ECMO takımı

CPR altında ECLS sisteminin yerleştirilmesi

15 min

Kateterizasyona başlama

Cardiohelp

Tedaviye köprü

Reperfüzyon sağlanana kadar

Reperfüzyon için

Miyokardiyal stabilizasyon

Destination

Step2 mekanik destek

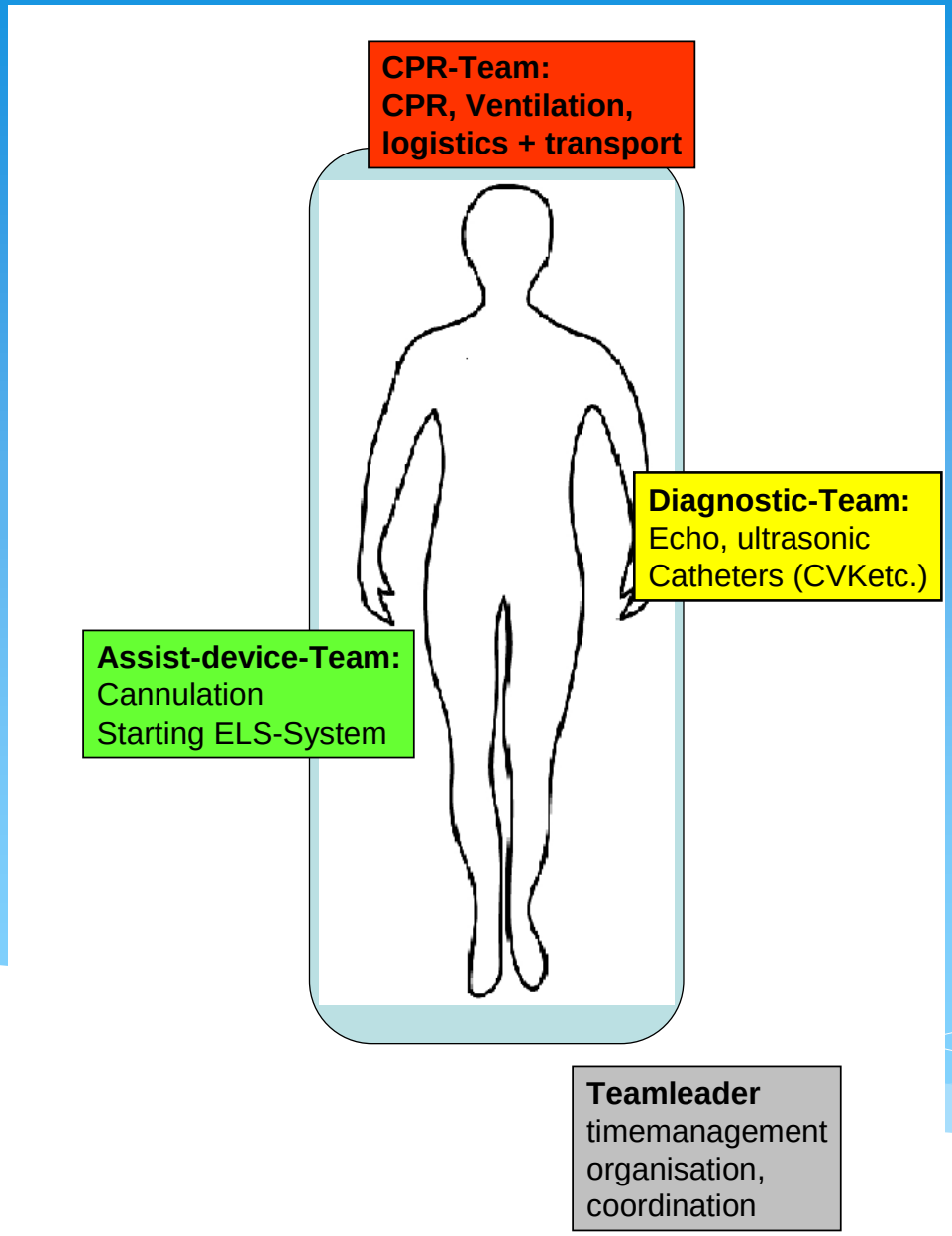
Ön hazırlık

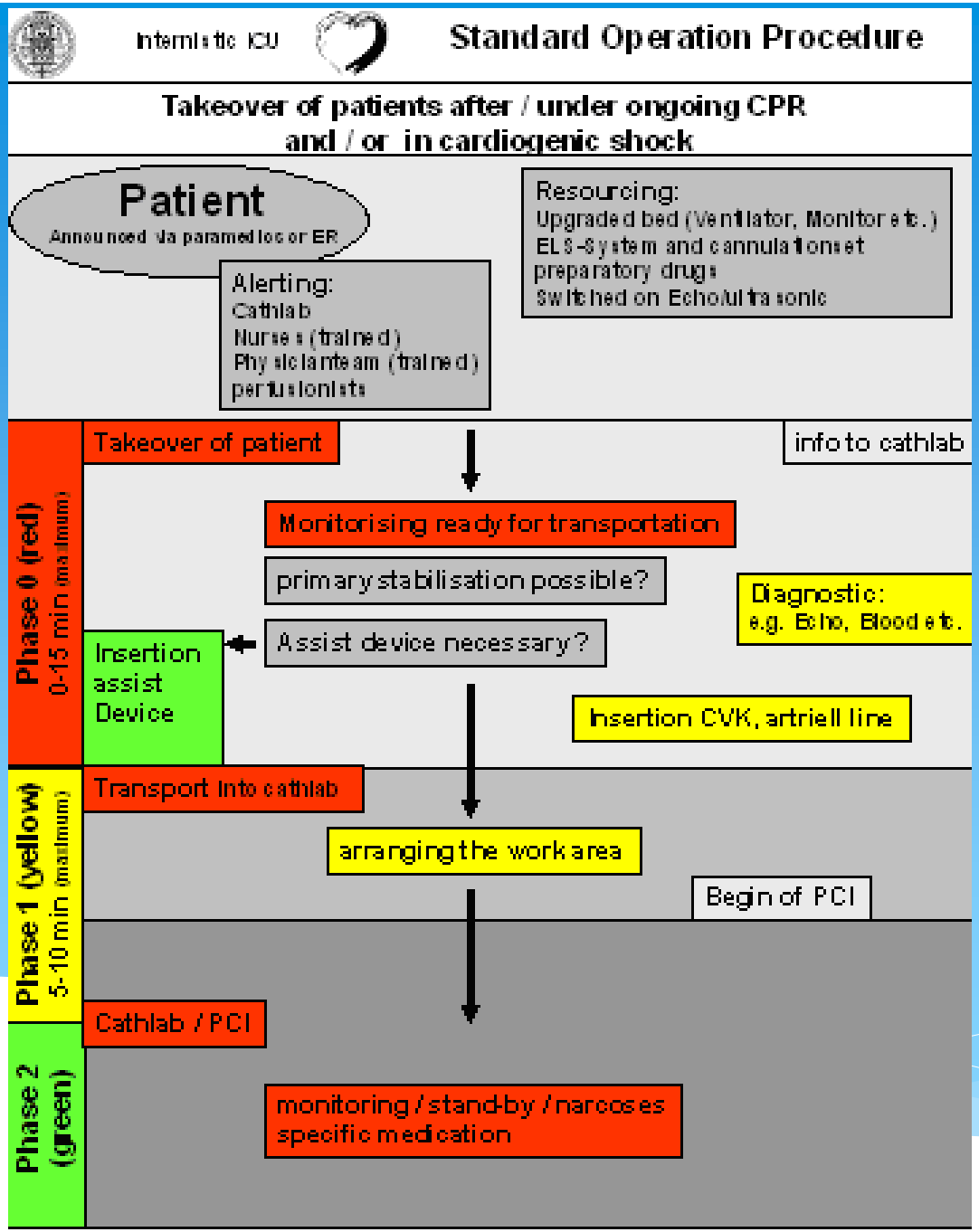
Akut kullanım için:

Deneyimli ekip:

- **CPR-Team**
- **ultrasonic**
- **interventionists (+ surgeons)**
- **perfusionists**

Operasyon Prosedürleri




Internistic ICU
Standard Operation Procedure
Takeover of patients after / under ongoing CPR
and / or in cardiogenic shock
Patient
Announced via paramedic or ER
Alerting:
Cathlab
Nurses (trained)
Physicianteam (trained)
perfusionists
Resourcing:
Upgraded bed (Ventilator, Monitor etc.)
ELS-System and cannulationset
preparatory drugs
Switched on Echo/ultrasonic
Phase 0 (red)
0-15 min (maximum)
Takeover of patient
info to cathlab
Monitorising ready for transportation
primary stabilisation possible?
Diagnostic:
e.g. Echo, Blood etc.
Assist device necessary?
Insertion
assist
Device
Insertion CVK, artriell line
Phase 1 (yellow)
5-10 min (maximum)
Transport into cathlab
arranging the work area
Begin of PCI
Phase 2
(green)
Cathlab / PCI
monitoring / stand-by / narcoses
specific medication

Ön hazırlık

…elektif kullanım

Önce aklına getir!

Yüksek riskli girişimler öncesiolası risk için arteriyel ve venöz giriş yollarını baştan hazırla

→ Hızlı kanülasyon durumunda kullanabilirsin!

IABP Standby

(prime edilmiş) CPS-Device Standby

Standby-Stratejileri

IABP

CPS

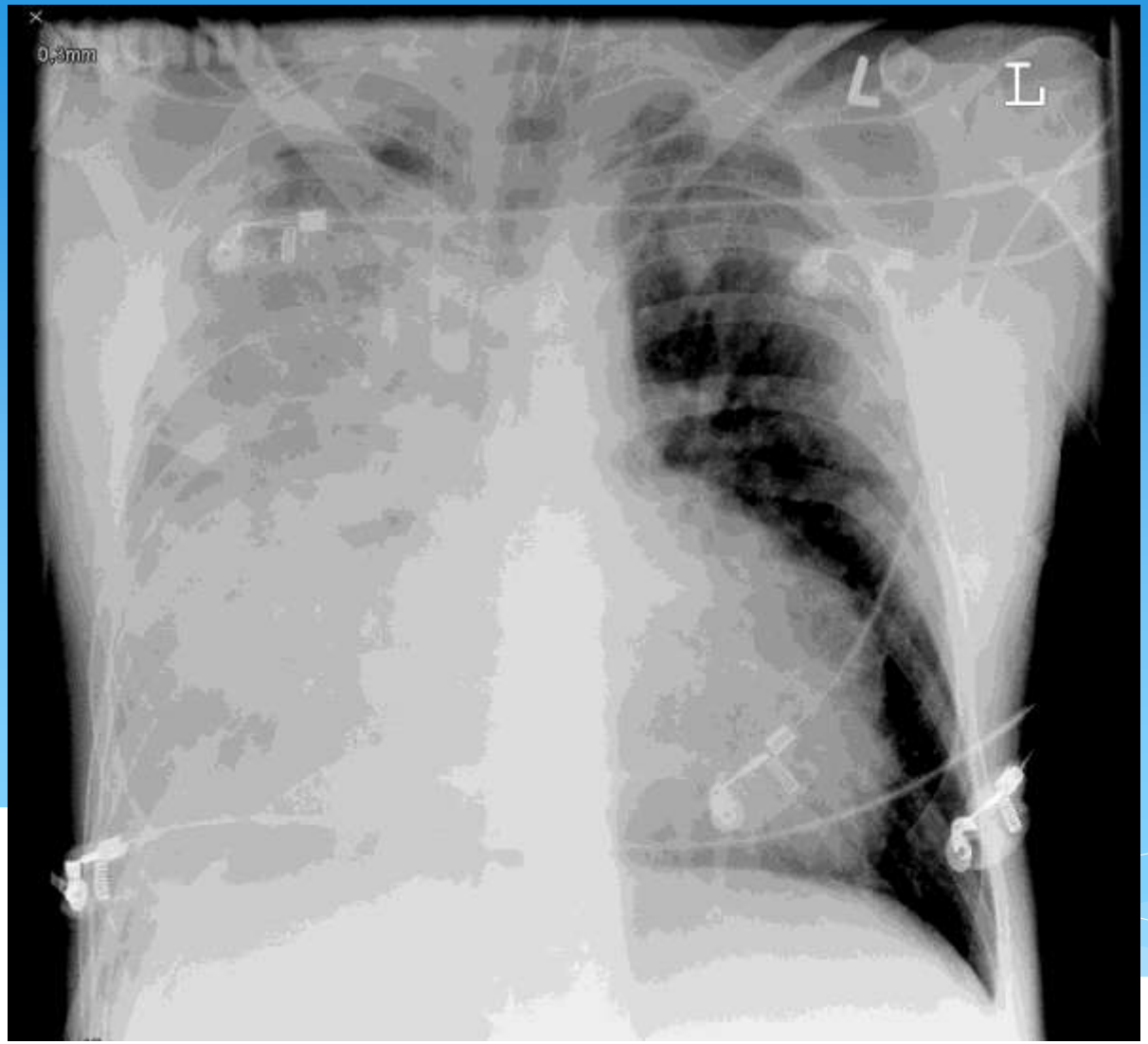
OLGU: BRIDGE TO DESTINATION

- 23 y, erkek
- Kız arkadaşı tarafında bulunmuş, nabız yok
- Yerinde CPR'a başlanmış
- VF, defibrilasyon, kardiyak kontraksiyon aktivitesi başlamış
- 112, hastane
- Transport 15 min, ancak 7 kez VF atağı
- Kat. Lab: Koroner sorun yok
- 5 min aralar ile fatal ritm ve defibrilasyon

OLGU: BRIDGE TO DESTINATION

- İlk TTE (EF 55%)
- Tekrar ve tekrar VF
- ECLS
- Ventriküler stabilizasyon
- Diğer tanısal girişimler (Biopsy vb.)
- 2. gün TTE (EF 20%)
- Myocarditis (Parvo B19)
- LVAD'e geçilmiş
- 6 ay içinde weaning
- 1 ½ yıl sonra total recovery (EF 50%)

Akciğer desteği



Şiddetli AC Yetmezliği

Akut AC Hasarı & ARDS

- Pneumonia
- Trauma
- Septic Shock Syndrome
- Multiple Organ System Failure
- Aspiration
- Pancreatitis

Life-threatening acute lung injury is associated with high mortality

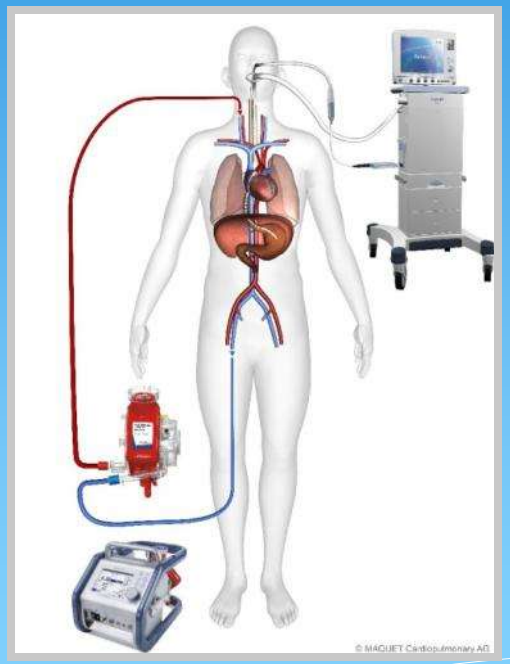
Extracorporeal Life Support (ECLS) ile protektif ventilasyon:

Spontan solunum

Düşük tidal volume: (4 - 6 ml/kg predicted body weight)

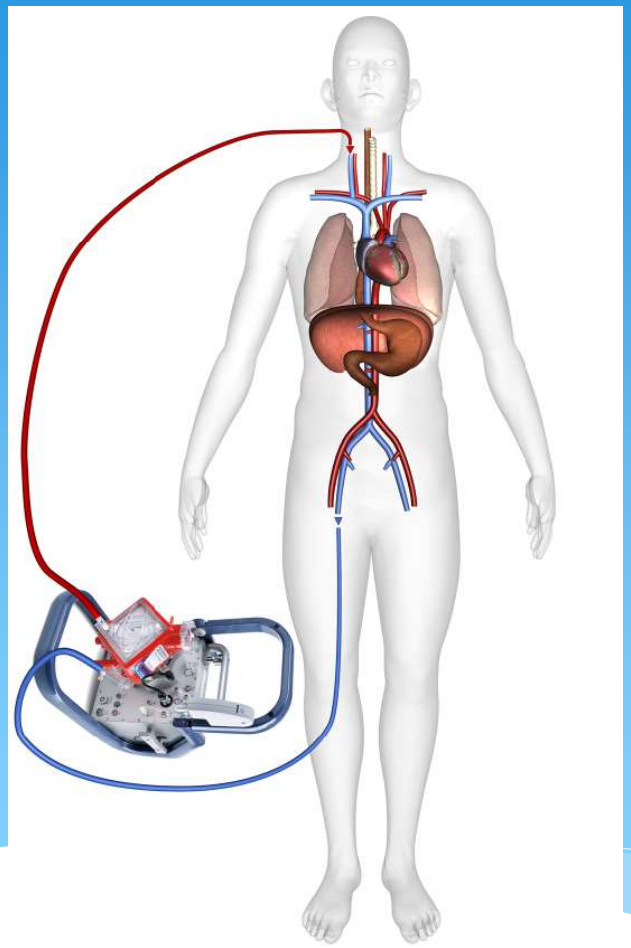
Best PEEP – individual best level

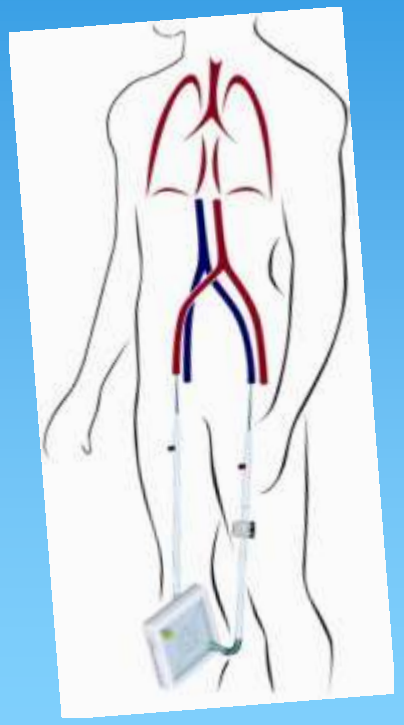
Low Peak Inspiratory Pressure



Katekolamin yükselmesi sınırlı

Sıvı tedavisin düzenlenmesi





Invasive Lung Assist ILA

Extracorporeal Membran Oxigenation Vv-ECMO

Olgu

- 31 y, erkek
- Ateş, öksürük, dispne
- TA sistolik 90 mmHg HR 120 bpm
- SaO2 91% ,10l/min O2
- Vücut sıcaklığı 39.1˚ C
- X-ray: Sağ tarafta opasite
- SaO2'da hızla düşme
- Bilinç kapanması
- İnotrop destek (Norepinephrin+Dobutamin)
- Merkeze alınıyor

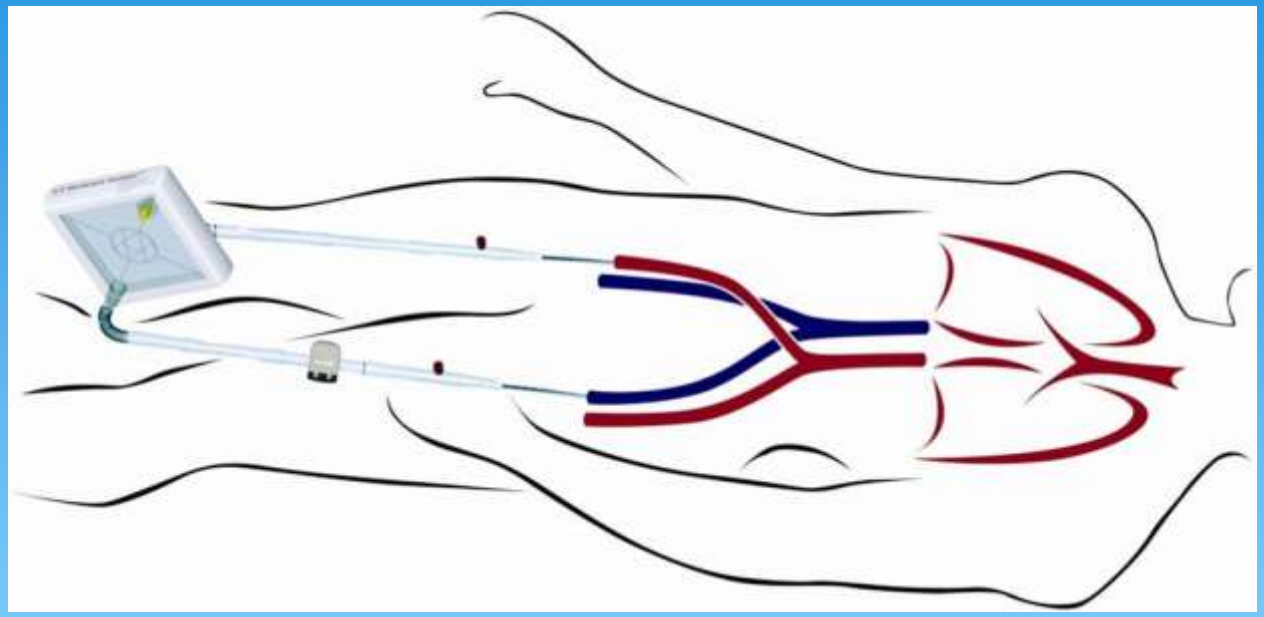
Case

pH	7,28
pCO2 (mmHg)	64
pO2 (mmHg)	55
HCO3 (mmol/l)	21
BE (mmol/l)	-3
Hb (g/dl)	14,4
Na (mmol/l)	138
K (mmol/l)	4,1
Lactat (mmol/l)	1,8

position	flat
FiO2	0,8
Form	IPPV
I : E	2:1
Pmax / PEEP	40/8
TVol	690
AF	20

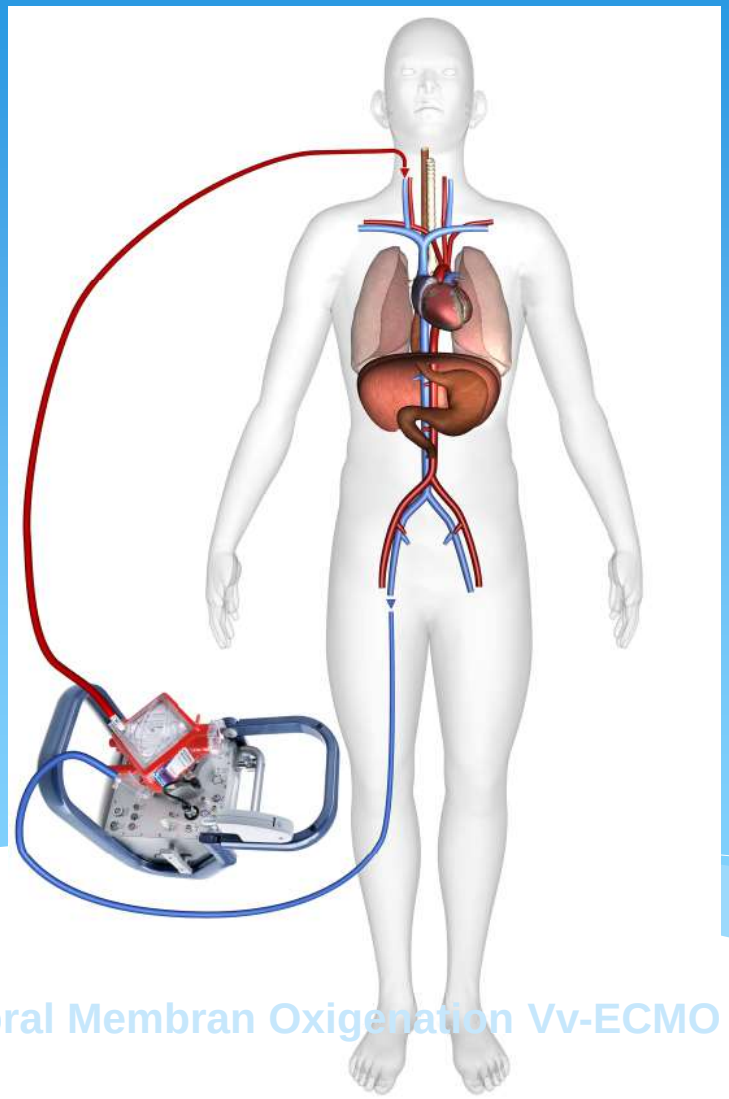
MAP 60 mmHg
HR 110 bpm

ILA (Invasive Lung Assist) ?



- Pompasız
- Arteriyel kanülasyon!
- Oksijenasyon yok

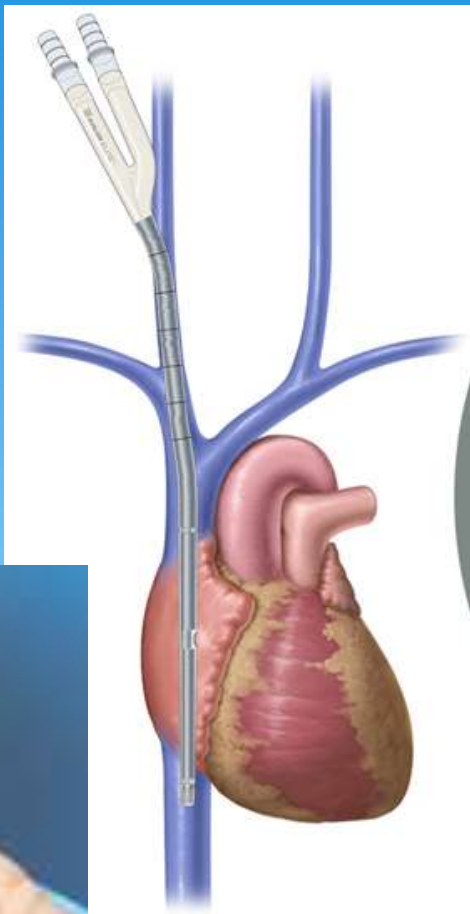
Vv-ECMO

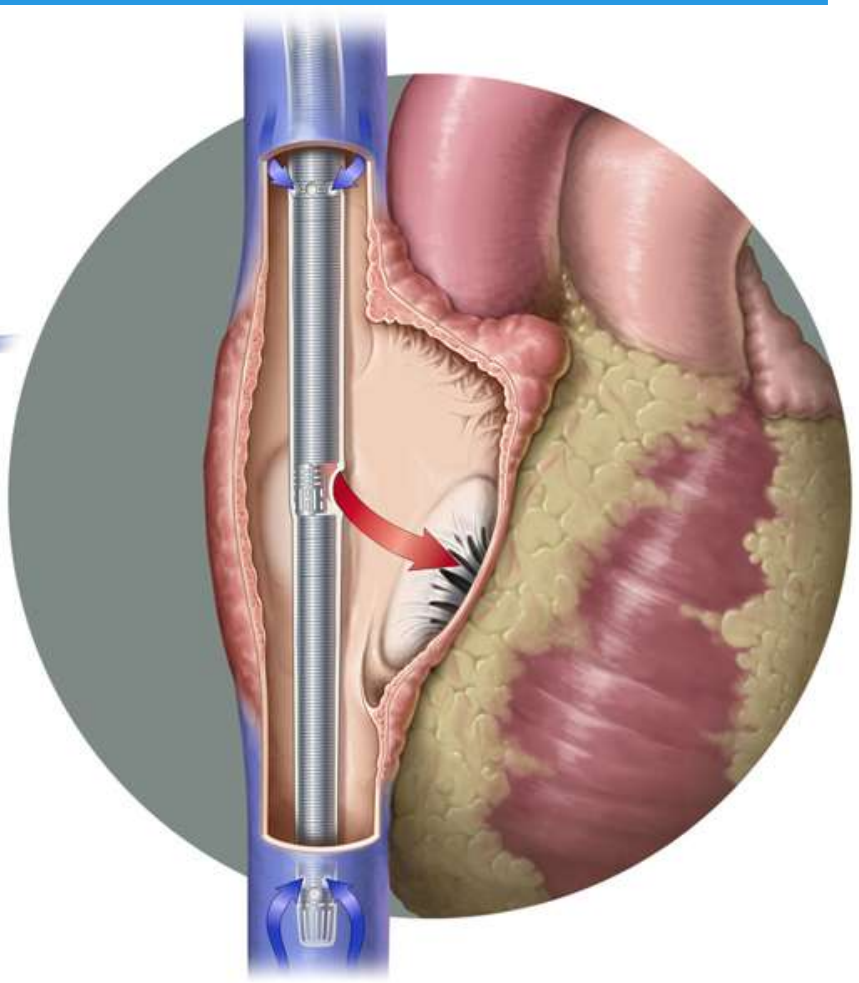


- Pumpdriven
- Veno-venous
- Oxygenation
- Co2-Removal

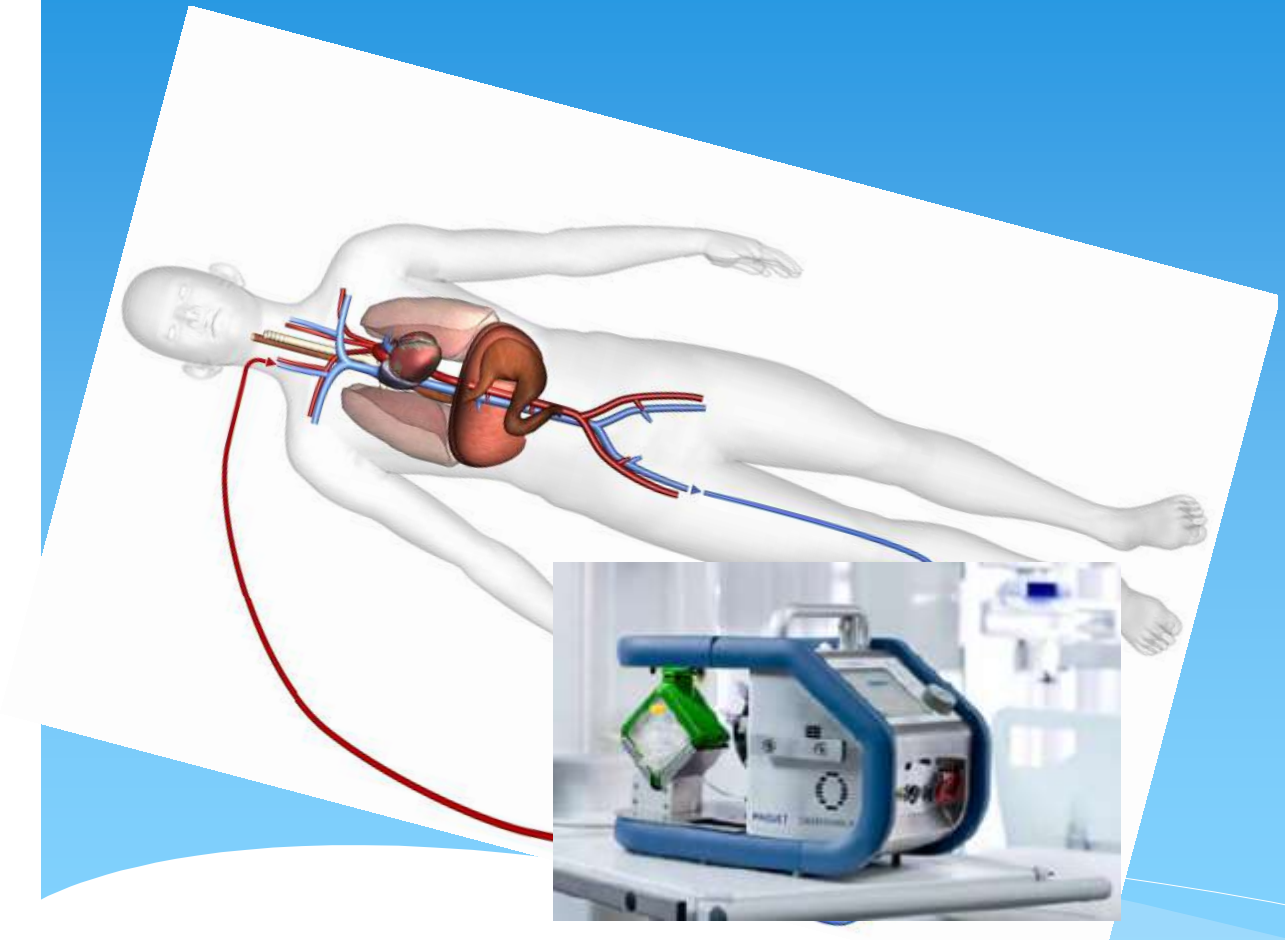
Extracorporal Membran Oxigenation Vv-ECMO

Double-lumen Catheters





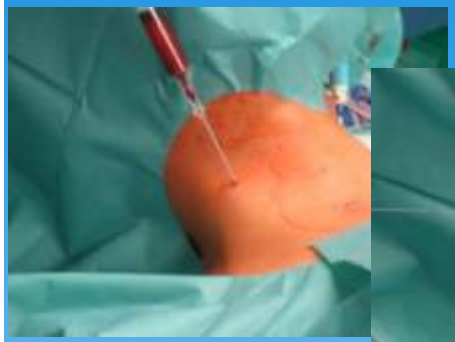
THE FUTURE THEME
CO2-Removal

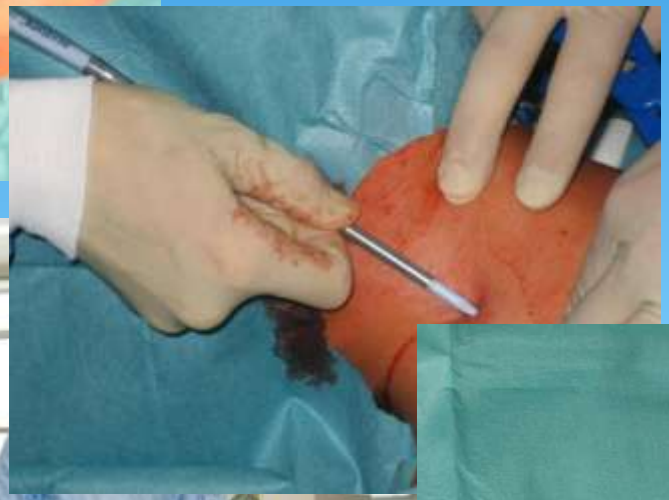


- Pumpdriven
- Veno-venous
- Co2-Removal
- Lowflow < 1l/min
- Smallsize canula

Pump Assisted Lung Protection PALP V V
Lowflow-technic

Percutan canulating





THE FUTURE THEME
Ventricle assist device VAD

ROTASSIST VAD
version 2.8 or 9.9

+

CARDIOHELP
with ROTASSIST VAD ,
Drive Adapter Unit and
Venous Probe

THE FUTURE THEMES

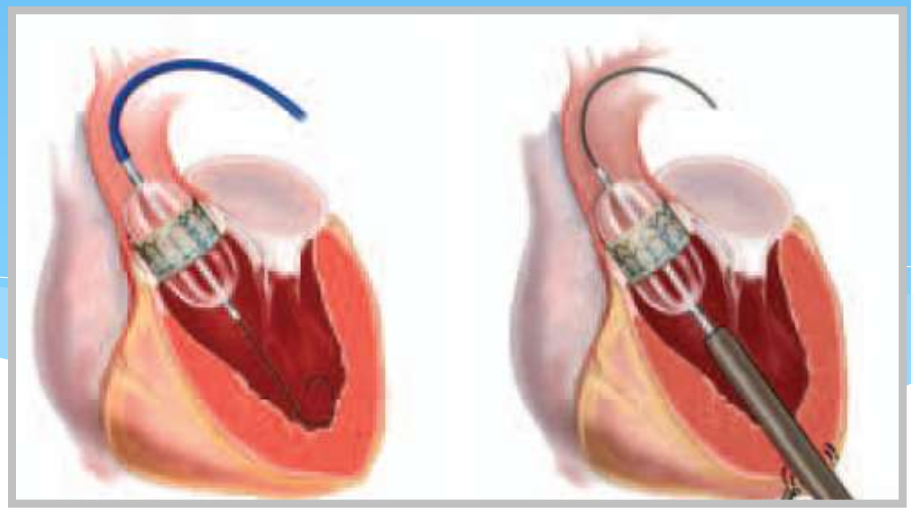
- Transports
- Other interventions
- Go to the scene, devices for preclinical use

TRANSPORTS

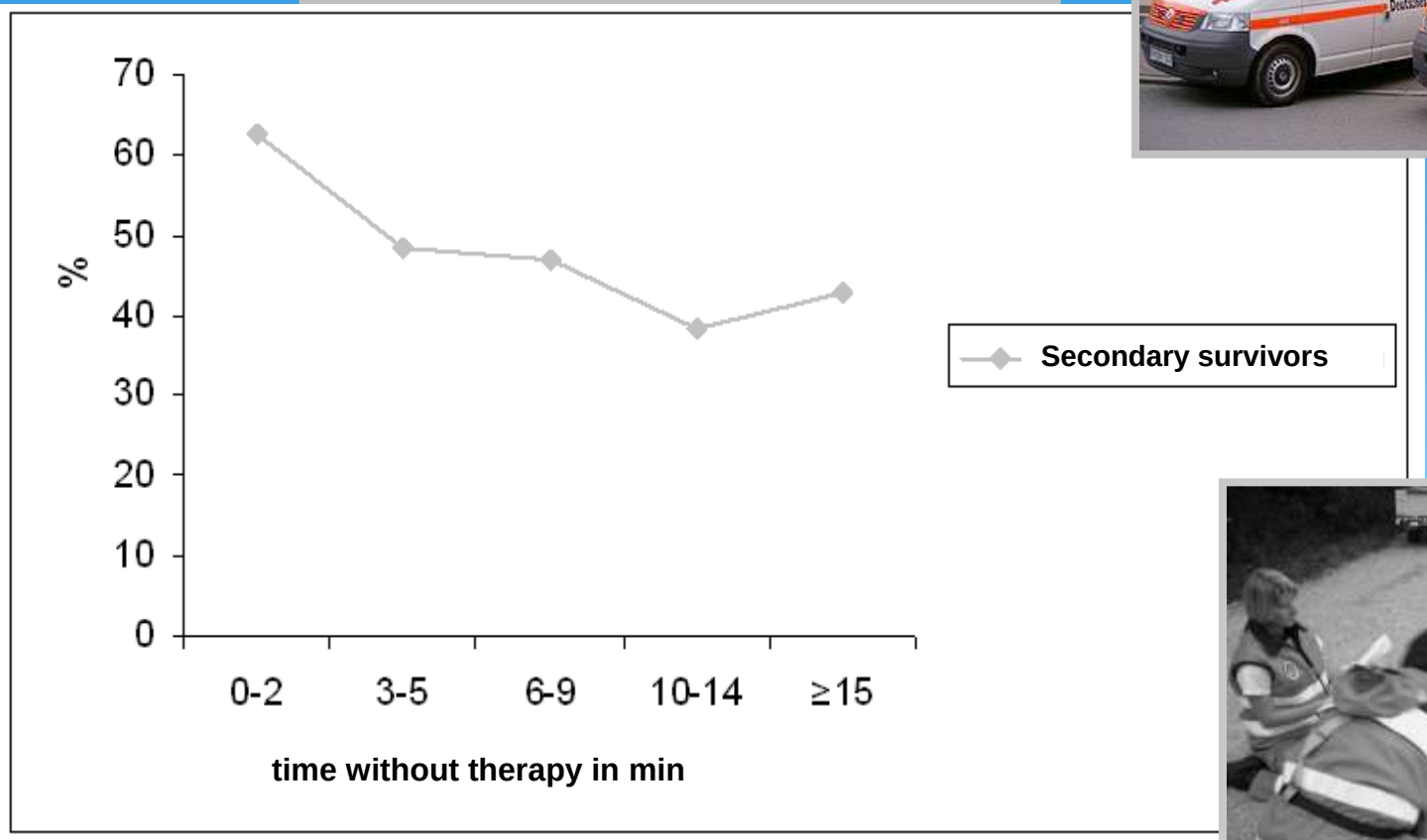
TRANSPORTS

OTHER INTERVENTIONS

Valves and minimal invasive reconstruction:



FUTURE THEMES
PRECLINICAL USE



FUTURE THEMES
PRECLINICAL USE

CONCLUSION
ECLS-Treatment with Cardiohelp

- Staged therapy
- Complete supportconcepts
- Emergency treatments
- Transports
- Highrisk PCI and other interventions
- Lungassist
- CO2-Removal
- Bridging to decisions (recovery, Tx .....)

EXTRACORPOREAL LIFE SUPPORT

Now and in future

OVERVIEW THERAP

	REVASC	v-v ECLS	v-a ECLS	VAD	PALP
Adult	●	●	●	●	●
Pediatric	●	●	●	●	●

● available in future