

Cardiac surgery - CAD

University of Pecs, Medical Faculty
Heart Institute

<http://aok.pte.hu/en/egyseg/dokumentumok/290>

Treatment strategies for CAD

medical

nitrate, anti-TCT, (lysis), beta-blocker...

interventional

PTCA, stent, rotablator, laser
revascularization

surgical

coronary artery bypass grafting, (aneurysm
resection or plication)

Diagnostic procedures

anamnesis, physical exam

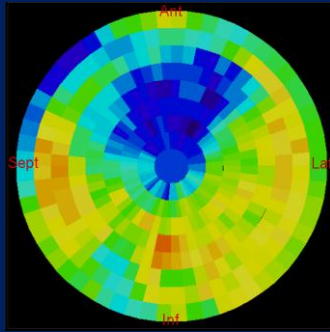
ECG, ergometry

echo, stress echo

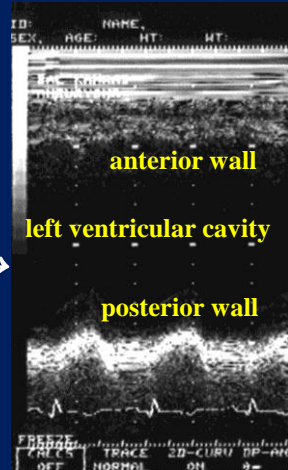
(isotope scan)

coronarography

PET, MRI, coronCT

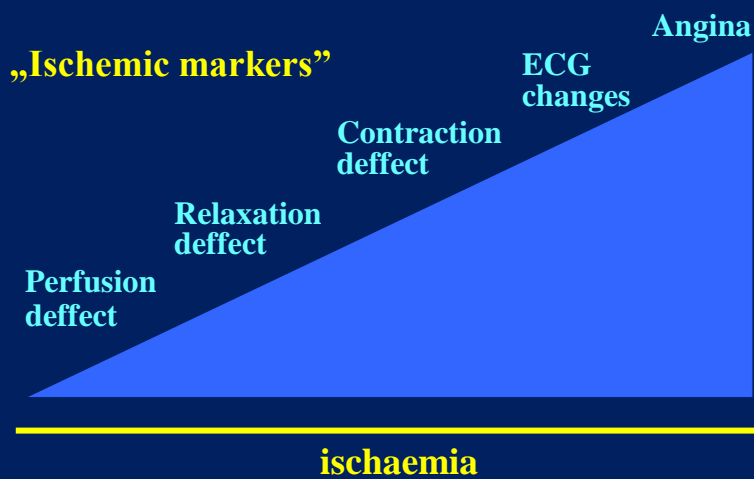


M-mode echo →
anterior akinesis

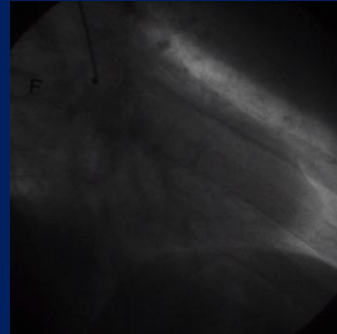
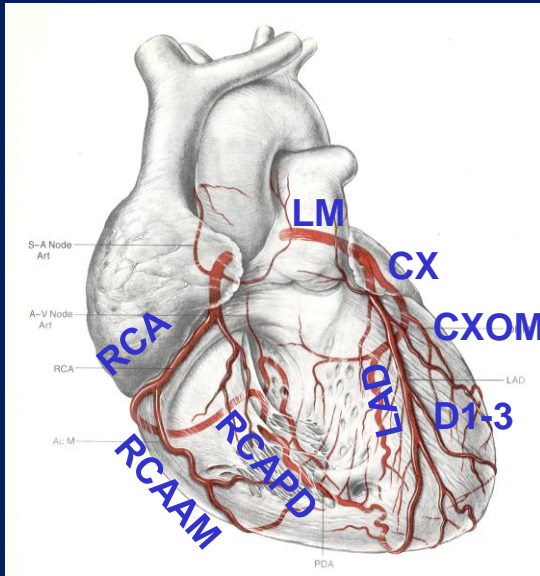


← *FDG-PET scan*
(bull's eye projection)

The ischemic cascade



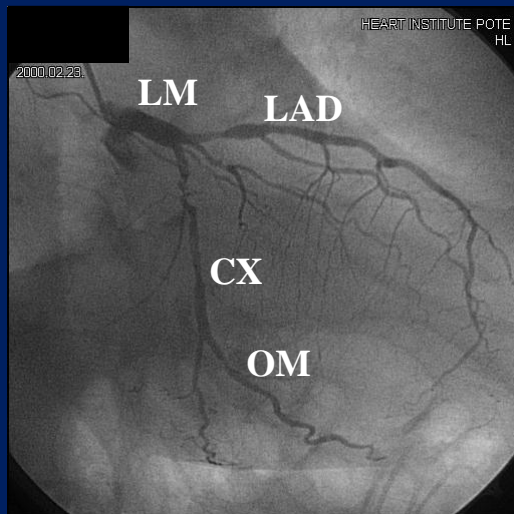
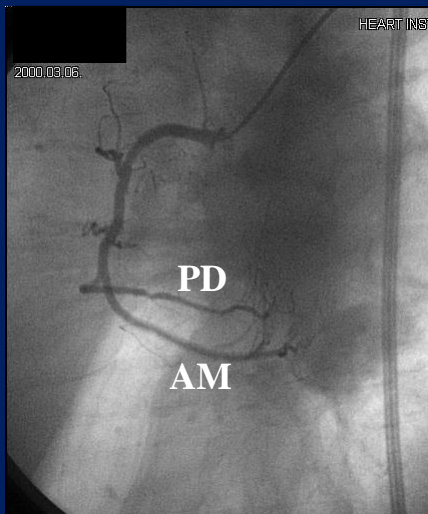
Coronary anatomy



Coronary angiogramm

right coronary system

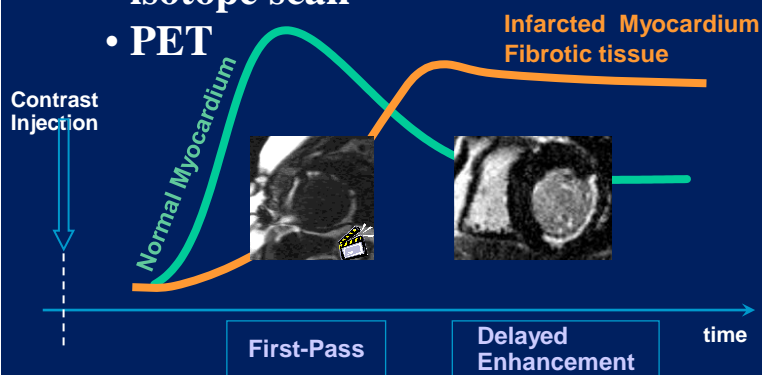
left coronary system



Viability tests

akinesis: infarction scar or *hibernated* myocardium?

- stress echo
- **cardiac MRI**
- isotope scan
- PET



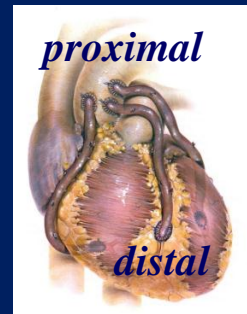
Prof. Simor Tamás anyagából

Indications for CABG

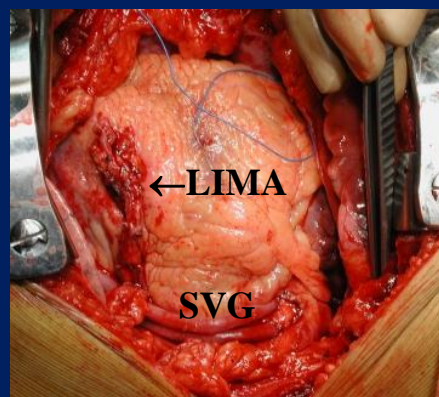
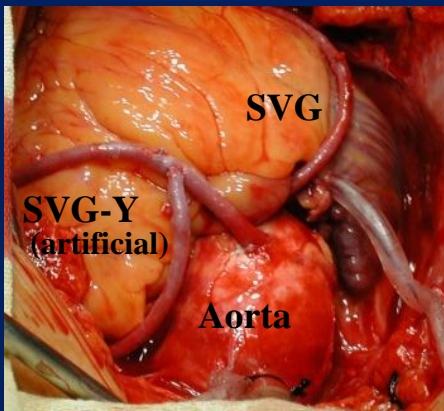
- Actual AHA/ACC guidelines
- SYNTAX-score
- **improving complaints (>50% stenosis)**
- **improving prognosis (survival)**
- **significant stenosis (>75%, LM and prox. LAD>50%)**
- **considerable supply area**
- **one-vessel disease: LM, proximal LAD involved**
- **multivessel disease**
- **reduced EF, proved ischemia**
- **stenosis not suitable for PCI (branching, tortuous, long, etc.)**
- **based on the individual cost-benefit ratio**

Possible grafts for CABG

- great (small) saphenous vein
- internal thoracic artery pedicle (LIMA, RIMA)
- gastroepiploic artery
- radial artery free graft
- (cadaver homograft)
- (teflon prostheses)



CABG operation



Results of CABG

- **operative mortality below 3 % (elective)**
- **significant improvement of surviving and quality of life**
- **90 % patency rate at 10 years for arterial grafts**
- **80 % patency rate at 1 year and 75 % at 5 years, 60% at 10 years for venous conduits**

Acute coronary operation

High mortality (5-15%)

-longer time until reperfusion, bigger load,
no time for correct preparation (foci, carotid Doppler),
bleeding (ASA, clopidogrel, etc.)

Primarily PCI recommended – opening the culprit lesion

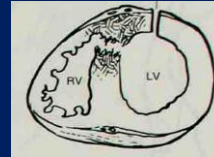
Mechanical complication → urgent operation ASAP

Not suitable for PCI → acute CABG

If possible, delayed acute operation after discontinuing anti-TCT drugs (3-7 days), until then observation, LMWH, nitrate

Treatment of acute mechanical complications of AMI

- **Free wall rupture** (tamponade, cardiogenic shock)
- **Ventricular septal rupture** (pulmonary edema, cardiogenic shock)
- **Papillary muscle rupture, chorda rupture** (acute MR, pulmonary edema, cardiogenic shock)



Life-threatening conditions

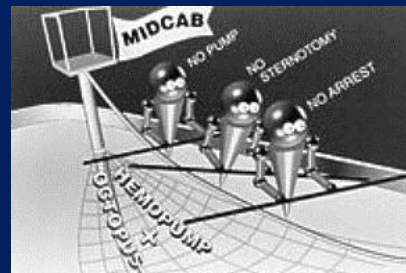
(~100% mortality), urgent operation is life saving !

Circulatory support (inotropes, IABP in acute MR, VAD)

Operation: correcting the mechanical complication + CABG

Minimally (less) invasive CABG

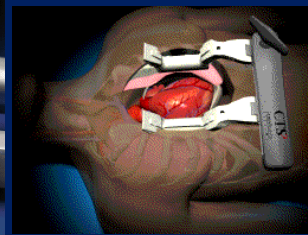
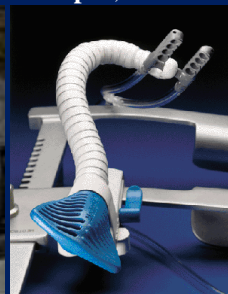
- „off-pump”
- **MIDCAB** (small incision)
- **robot-assisted CABG**



stabilizing LAD



Octopus, Medtronic, Inc.



Summary

- CABG efficient in preventing angina and improves survival
- Better than PCI in multivessel disease, LM-LAD involvement, low EF
- Better survival with mammary artery
- ACS → PCI
- Anti-TCT drugs (TAG) and statin life-long



Cardiac surgery – HTX,
mechanical circulatory
assist

University of Pecs, Medical Faculty
Heart Institute

Treatment for heart failure

Medical:

inotropes, digitalis, diuretics, beta-blocker...

CRT, multisite pacing

Conventional surgical or interventional treatment of CAD, valvular disease

Acute mechanical circulatory support (<2 weeks)

Permanent mechanical circulatory support (>2 weeks)
„bridge to transplantation”, „bridge to recovery”,
„bridge to bridge”, „destination therapy”

Heart transplantation

Mechanical circulatory support

Indication: serious reversible or irreversible heart failure in spite of maximal medical therapy

Aims:

Reversible: 1. assuring adequate tissue perfusion
2. unloading the heart until recovery

Irreversible: assuring adequate perfusion until HTX

Short range (<2 weeks) ↔ Long-range (>2 weeks)

Extracorporeal ↔ Intracorporeal

TAH ↔ VAD (LVAD, RVAD, BiVAD)

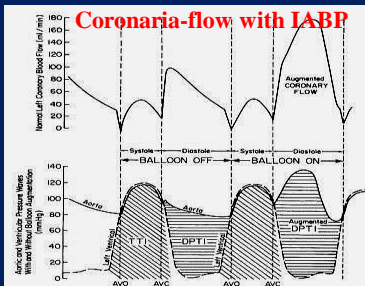
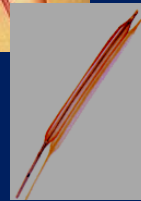
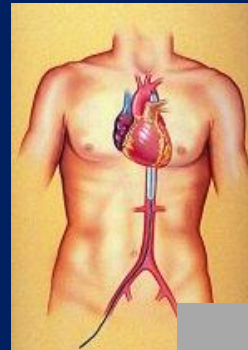
Pulsatile ↔ Continuous flow

(TAH – total artificial heart, VAD – ventricular assist device)

Acute mechanical circulatory support

Intraaortic balloon pump (IABP)

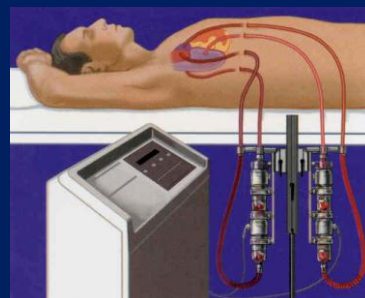
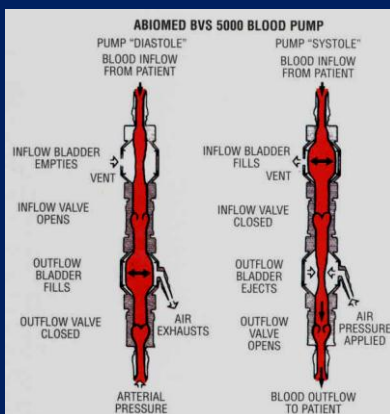
- failure of inotropic treatment
 - threatening! cardiogenic shock
- improving coronary perfusion
➤(reducing afterload)



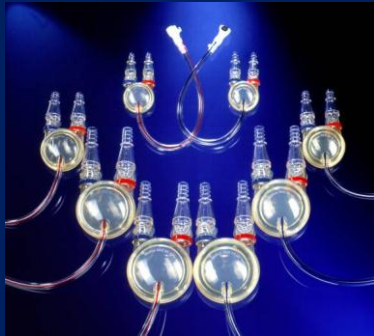
Acute mechanical circulatory support

Abiomed BVS 5000

Univentricular or biventricular assist.



Mechanical circulatory support



**RVAD LVAD
BiVAD**

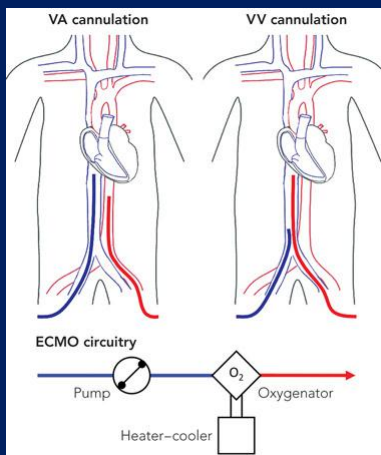
MEDOS
Medizintechnik AG

Pulsatile flow, paracorporeal,
mid-term

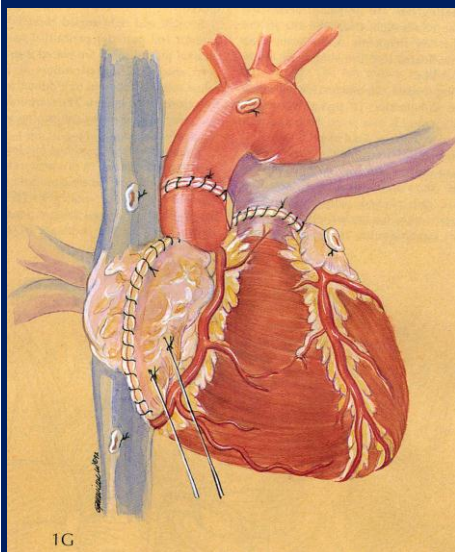


ECMO – extracorporeal membrane oxygenator

Respiratory, cardiorespiratory insufficiency



The evolution of HTX



- 1905. Carrel, Guthrie
vascular suture, organ tx
- 1960. Lower, Shumway
present technique, cooling
- 1964. Hardy et al.
chimpanzee heart to human
- 1967. Barnard
human to human
- 1980s
cyclosporin

Admission to the HTX program

Indications:

- NYHA IV in spite of maximal medical therapy
- EF<30%, LVEDP>27 Hgmm, LVEDD>70 mm
- syncope, ventricular ectopies
- bad quality of life
- high risk for cardiac mortality within 1 year

Contraindications:

- > 60-65 years
- active infection, or GI ulcer, diabetes mellitus, serious peripheral vascular disease, pulmonary disease, malignancy
- pulmonary hypertension (>60 Hgmm)
- psychological instability, alcohol or drug abuse
- loss of compliance, impossible follow-up

Donor selection

- **brain death**
- **matching ABO with the recipient**
- **age less than 40-45 years**
- **similar body weight (size) to the recipient**
- **loss of cardiovascular disease**
- **loss of pulmonary disease**
- **no malignancy (except brain tumor)**
- **no infection (HIV, CMV, Hepatitis)**
- **no sepsis**
- **expected ischemic time < 4-6 hours**

Special complications of HTX

- **infection (transmission, susceptibility)**
- **rejection**
- **graft coronariasclerosis**
- **secondary malignancies (lymphomas)**
- **nephrotoxicity (of cyclosporin)**
- **death**

Immunosuppression after HTX

- **MMF (mycophenolate mofetil, Cellcept)**
- **tacrolimus (calcineurine inhibitor)**
- **corticosteroid (prednisolone)**
- /cyclosporine (earlier)/

Rejection:

- **corticosteroid**
- **ATG (anti-thymocyte-globuline)**
- **ALG (anti-lymphocyte-globuline)**

Regular endomyocardial biopsy

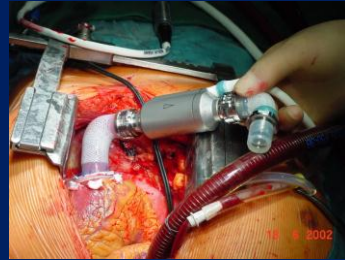
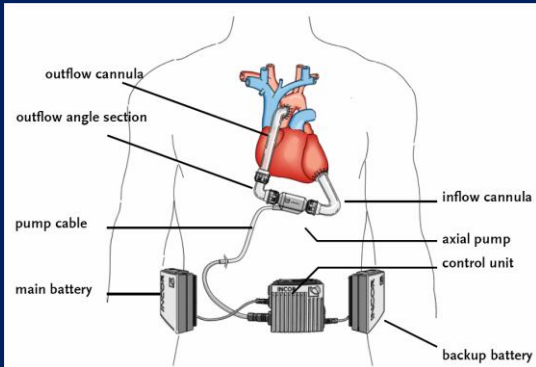
Problems of HTX

- **complications → new immunosuppressives**
- **donor shortage → networks (UNOS, Eurotransplant), alternatives**
- **etical concerns (abating)**
- **legal concerns (abating)**
(definition of brain death, need for consent)
- **expenses**

90 % one-year and 50 % 5-year survival, annually about 3000 HTX all over the world, whereas emerging need for several ten-thousand

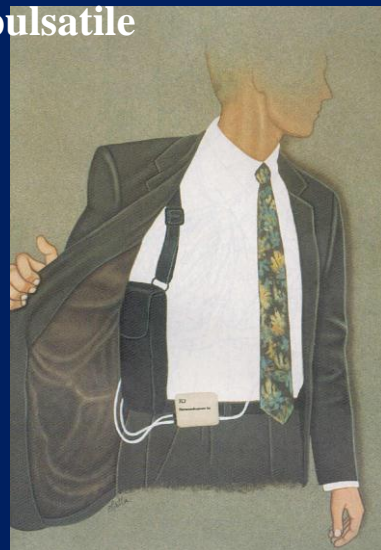
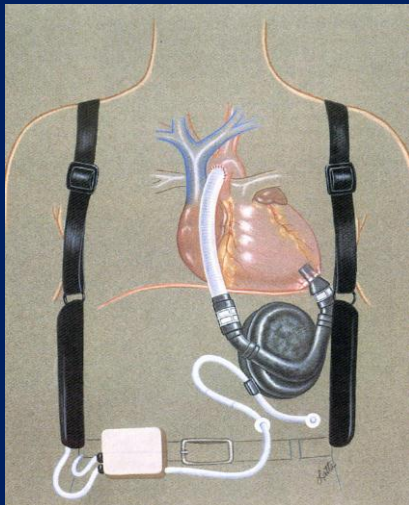
Berlin Heart Incor (LVAD)

- Intracorporal, continuous flow, permanent
- INR: 2,8-3,2
- APTI: 70-90 s
- Efficient anti-TCT therapy

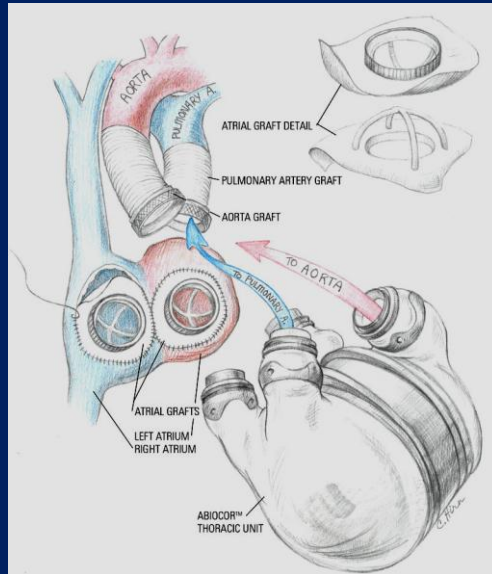
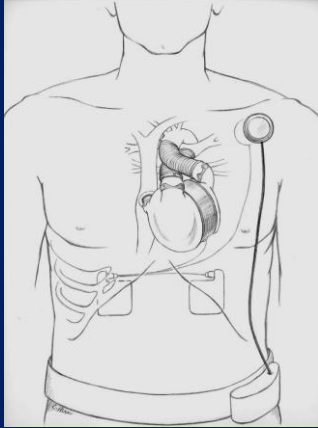


Mechanical circulatory support - Univentricular assist (HeartMate)

Intracorporal, long-term, pulsatile

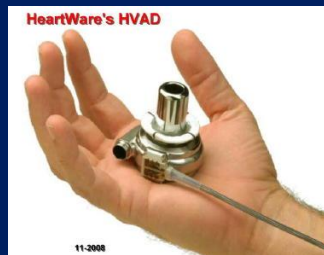


Total artificial heart – the Abiocror



Summary

- HTX – gold standard
- Efficient mechanical circulatory support avail.
- The timing of mechanical assist is crucial !
- Choosing the appropriate device (availabilities)
- Bridge to HTX reduces mortality and costs
- Fast technical development – future ?
- Expenses



Thank you for your attention !

“Hybrid OR” = OR + Cath Lab



*DeWall-Lillehei
bubble oxygenator
around 1955-56,
University of
Minnesota*

