UMC Utrecht

“Rechts-catheterisaties”

CNE Interventie Cardiologie
26 januari 2016

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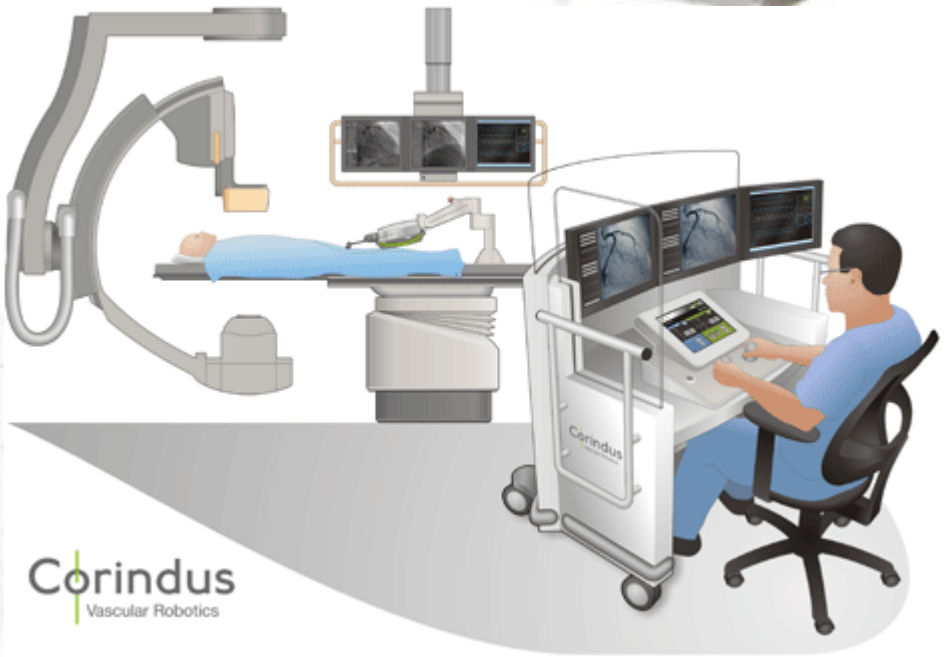
Catheterisatie Lab

- Jaren 50/60: hemodynamica
- Jaren 80/90: 2D echo/doppler neemt hemodynamica over
- PCI's/Interventies

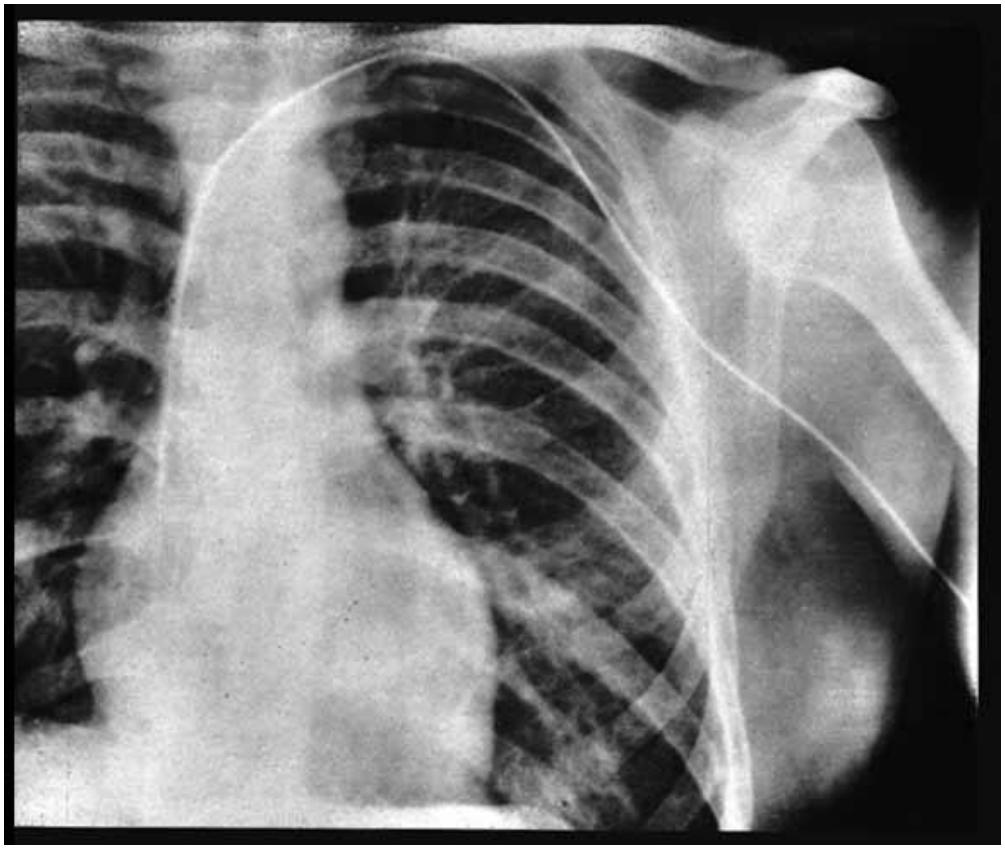


What makes an ordinary interventional cardiologist extraordinary is . . . the ability to create a dramatic complication and successfully tackling it too !

Cath lab quotes - Dr .Venkatesan sangareddi, India

Werner Forssmann 1929, Berlijn

Dr. Werner Forssmann performs the first cardiac catheterization – on himself! After first anesthetizing his lower arm, he threaded a catheter to his heart, then walked some distance to the X-ray department to document his daring experiment.



Rechts-catheterisatie

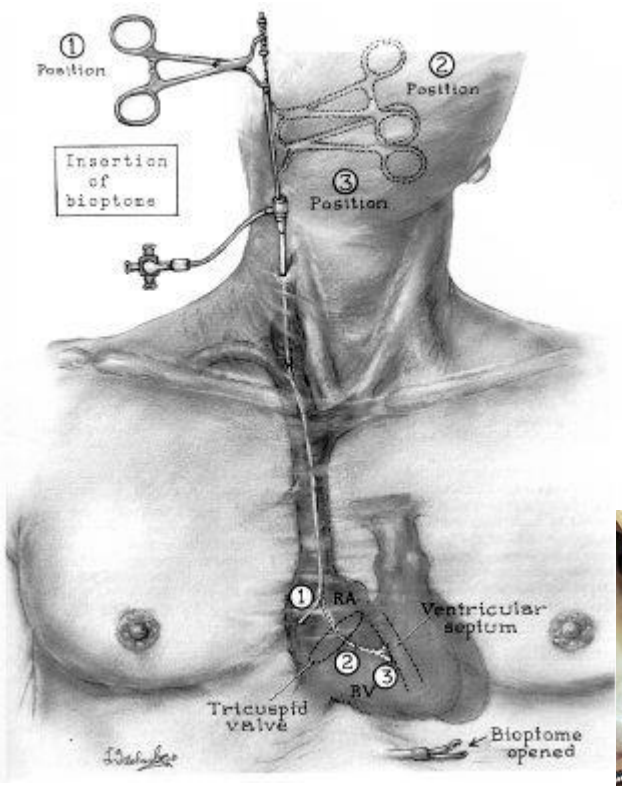
- Is géén “R-CAG”
- Hoeft niet via de rechter lies

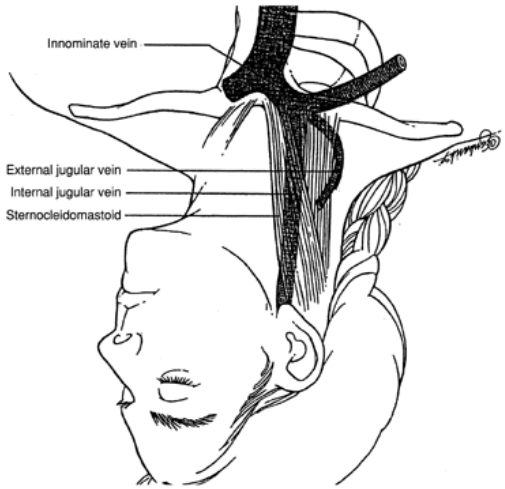
- Via het veneuze systeem wordt rechter ventrikel benaderd voor diagnostiek

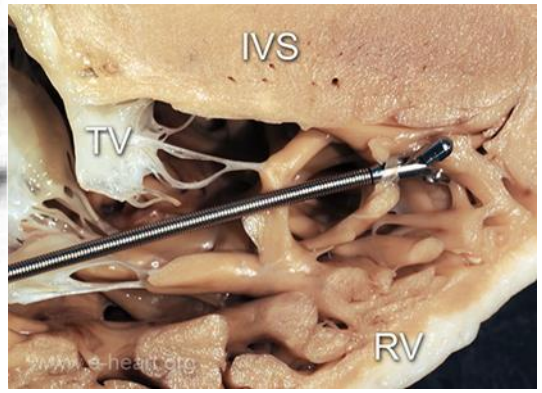
Wat is er nog meer naast interventies ?

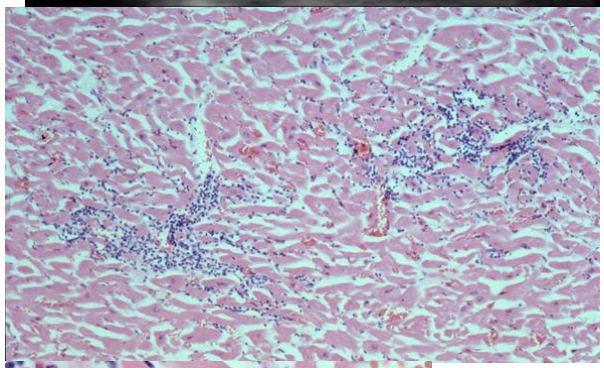
- Hemodynamische monitoring bij hartfalen (screening HTx)
- Hemodynamische monitoring bij shock/longoedeem
- Diagnostiek bij recent ontstaan hartfalen
- Diagnostiek bij onbegrepen ventrikel hypertrofie
- Patienten na harttransplantatie
- Patienten voor en na LVAD implantatie
- Diversen: PH, Pericarditis Constrictiva, Congenitale vitia, Shunts (“postzegels”)

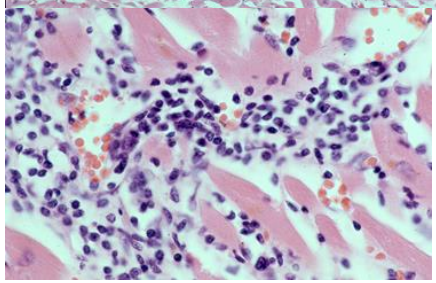
Diagnostisch Myocardbiopt





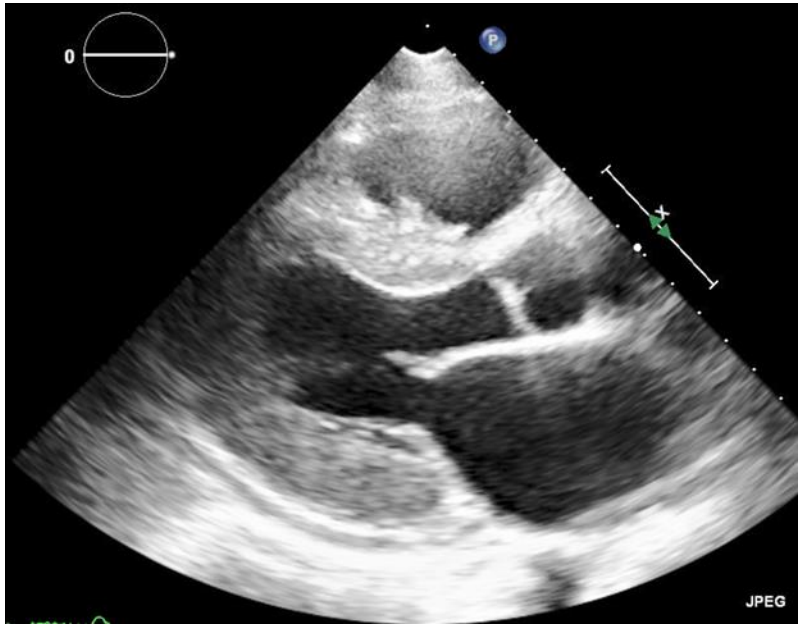


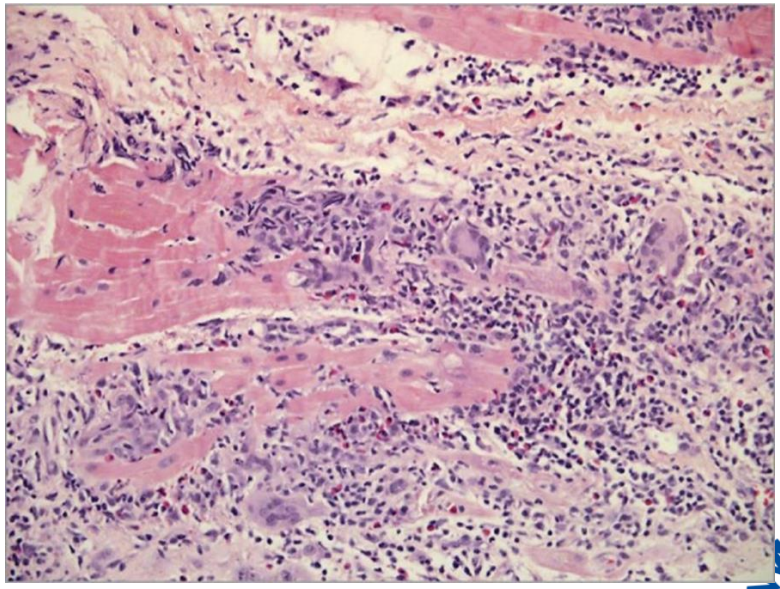




Indicaties voor myocardbiopt

- Monitoring rejectie na harttransplantatie
- Diagnostiek onbegrepen cardiomyopathieen
  - Myocarditis (viraal, reuscel)
  - Infiltratieve cardiomyopathie (amyloidose)
- Research

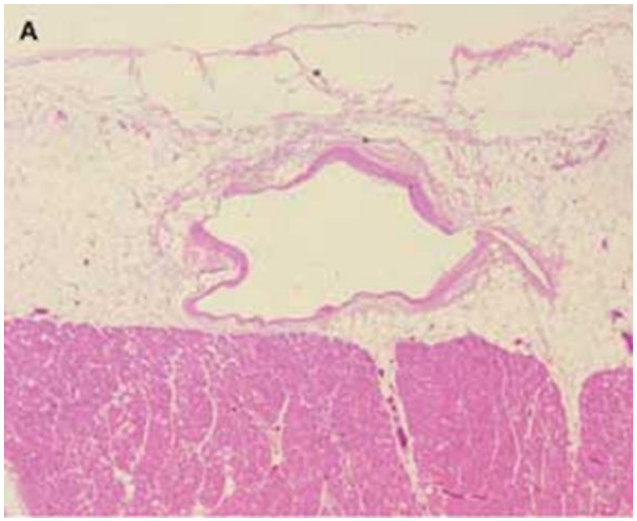




Complicaties myocardbiopt

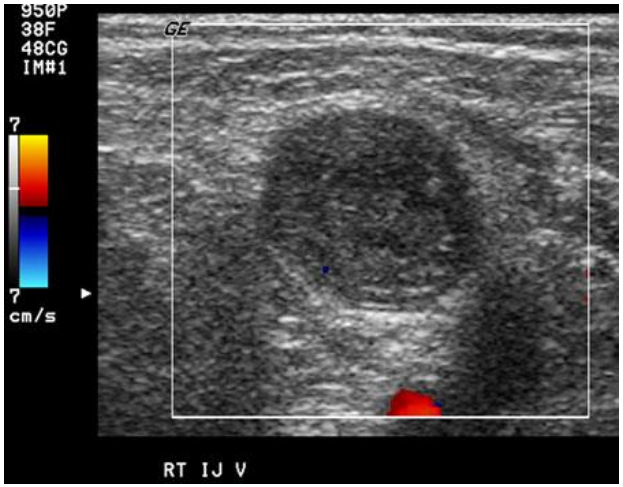
- Hematoom
- AV-fistel
- Vagale reactie
- Pneumothorax
- Ritmestoornissen, AV-block (cave LBTB)
- Infectie
- T-klep beschadiging
- Long-of systeem embolie
- Perforatie (0.4%)

Beetnemers

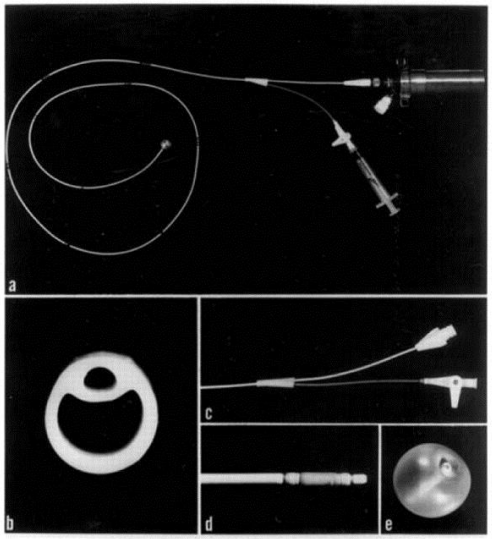


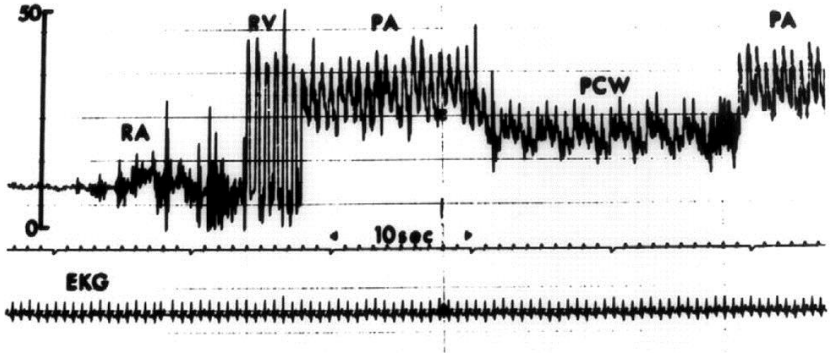
Epicardiaal vet

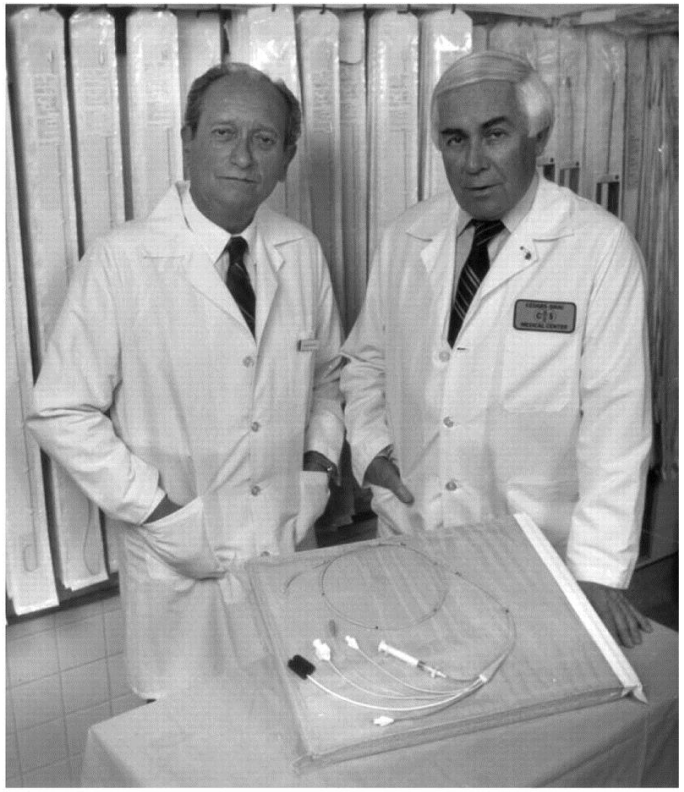
Venous trombosis



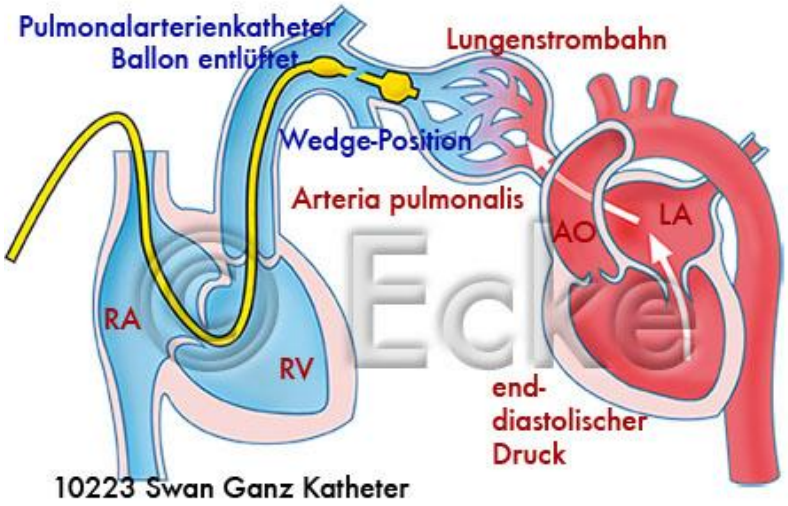
The Pulmonary Artery Catheter



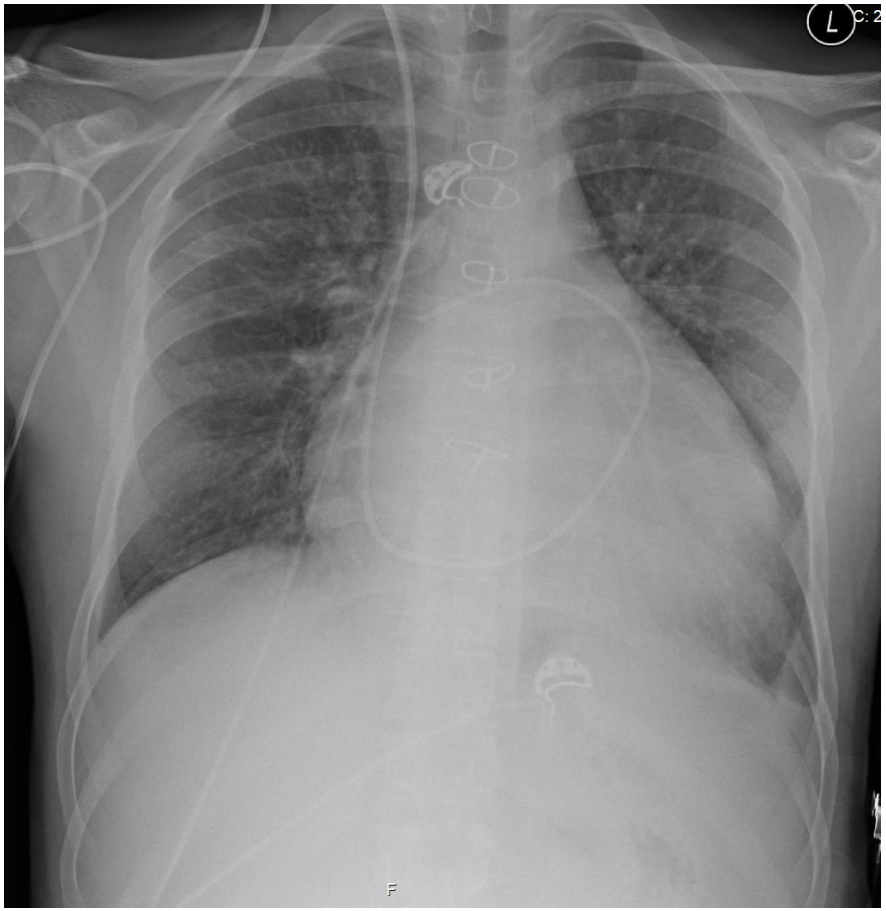




William Ganz and H.J.C. Swan



10223 Swan Ganz Katheter

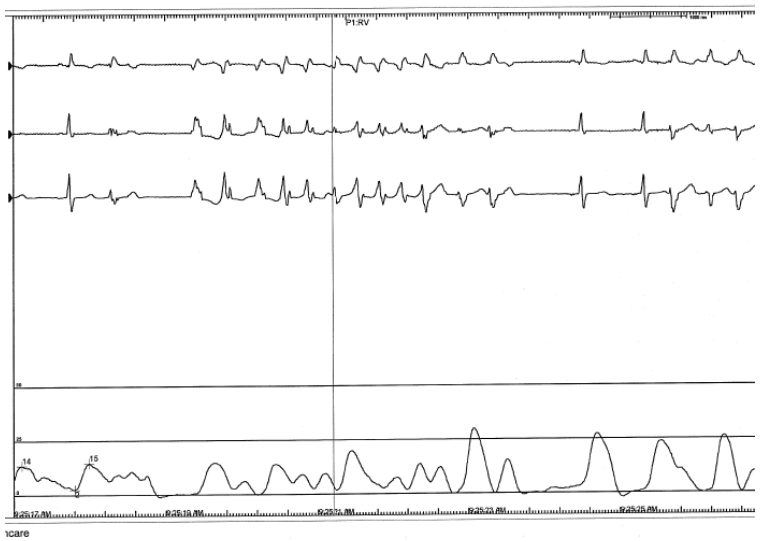


Mogelijkheden

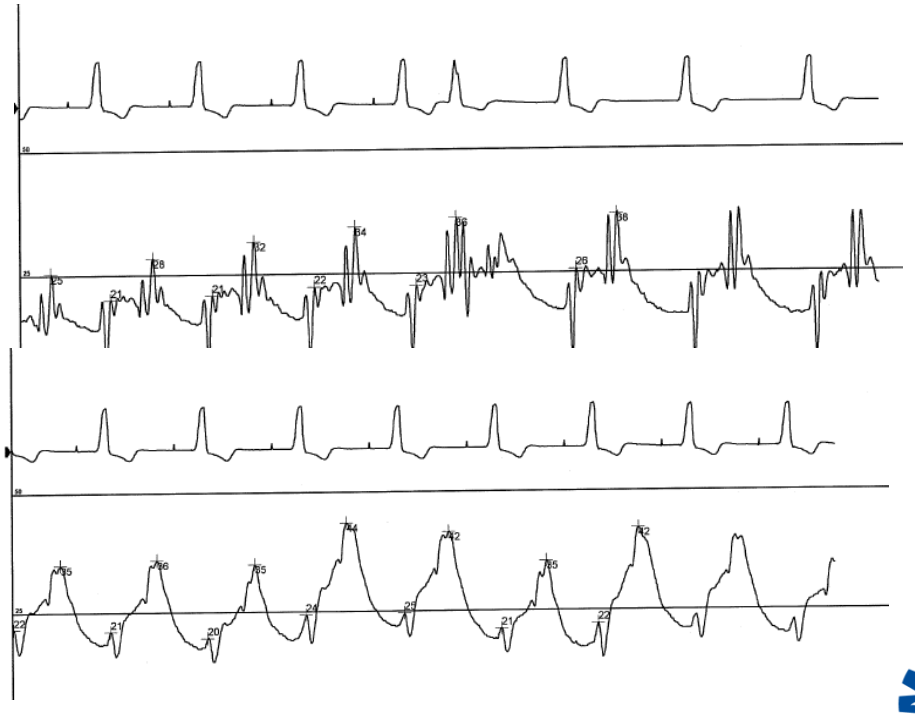
- Intracardiale/pulmonale drukken
- Cardiac output
- O_2 saturaties
  - Shunts berekenen
  - Vaatweerstand
  - Drukgradiënten

Practische aspecten

- Stolsels in catheter (flushen)
- Drukkop op goede hoogte en nullen
- Catheters met meerdere openingen
- Overshoot



Ectopie tijdens terugtrekcurve

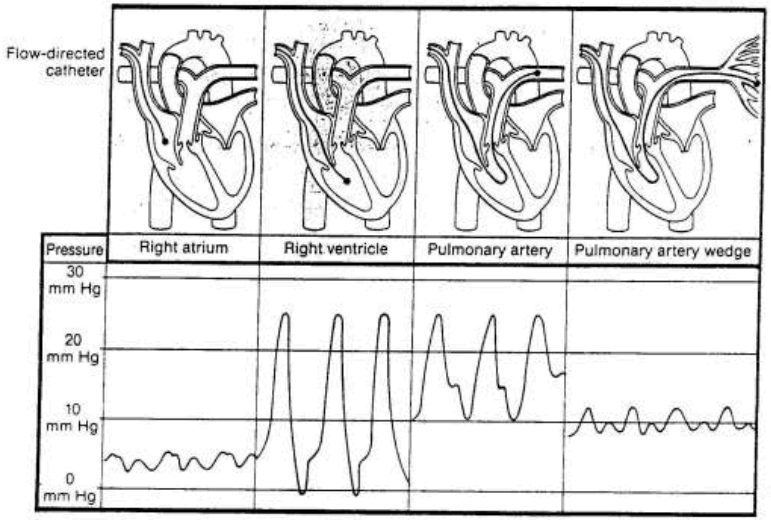


PCW

PCW

Normaal waarden

- RA: 5±2; gemiddeld
- RV: 25±5, ED 5±2; systolisch, (eind-diastolisch)
- PA: 25±5/10±2; systolisch, diastolisch en gemiddeld
- PCW: 10±2; gemiddeld



Cardiac output

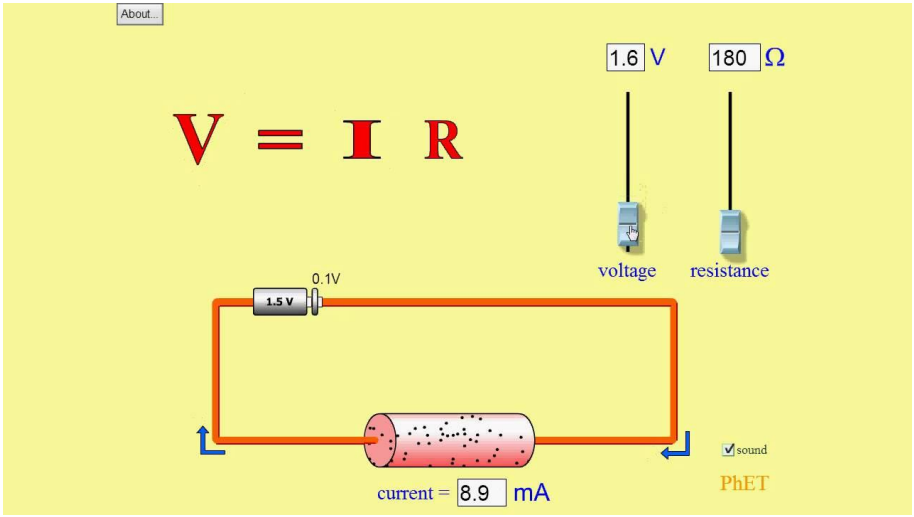
- Fick CO= $\frac{\text{O2 opname}}{\text{A-VO2xHbxC}}$

  Vaak aanname voor O2 consumptie; daardoor onnauwkeurig

- Thermodilutie; redelijk betrouwbaar; fout 5-10%
  - *Shunts*
  - *Lage CO*
  - *Belangrijke TI*
  - *Irregulair hartritme*

Pulmonale vaatweerstand (PVR)

- R = V: I
- PVR=$\frac{\text{gem PA-PCW}}{\text{CO}}$
  - Wood Units (WU)
  - x 80= D.sec.cm^{-5}



normaal: ± 2 WU of 160 Dscm-5

Gebruik UMCU

- Ernstig hartfalen
- Twijfel over circulatie (rejectie, LVAD dysfunctie, onbegrepen shock, onbegrepen longoedeem)
- Screening hart transplantatie-PVR
- Pre-LVAD: PVR, RVSWI
- PAH

Pulmonale hypertensie / verhoogde PVR bij harttransplantatie kandidaat/LVAD

- Verhoogt perioperatieve mortaliteit door acuut RV falen
- Geen absolute getallen
- PVR > 400 D.cm.s-5
- TPG (mean PA-PCW) > 15
- PA > 60 mm Hg

CONTRA-INDICATIES

Absoluut

Infectie op de punctieplaats

Aanwezigheid RVAD

Inbrengen tijdens cardiopulmonale bypass

Relatief:

coagulopathy, thrombocytopenie

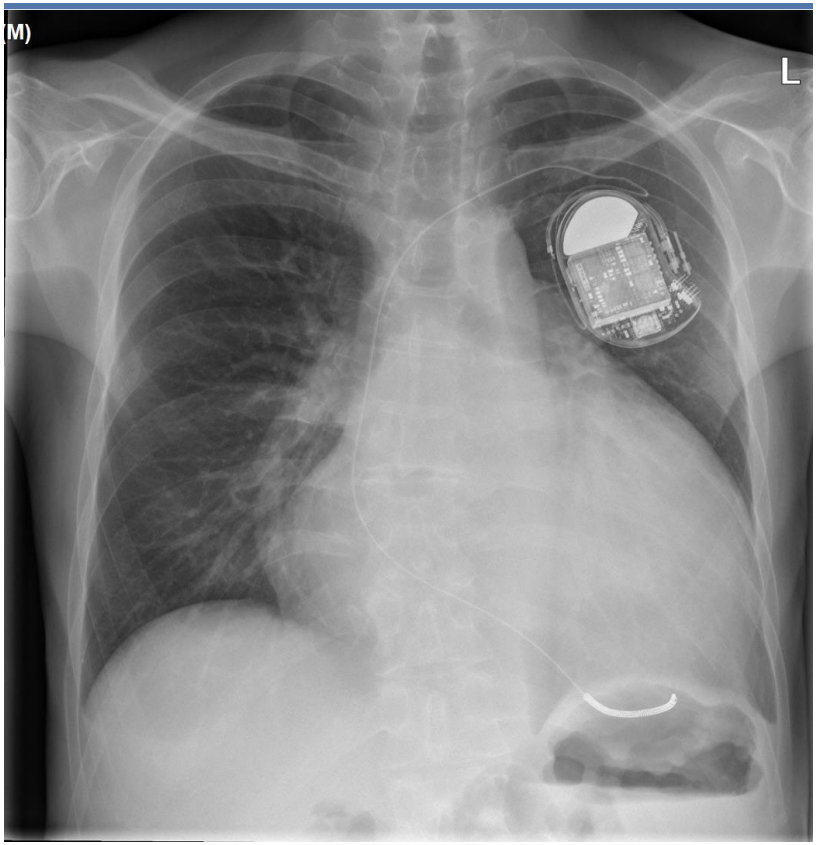
Ernstige pulmonale hypertensie met Eisenmenger's syndrome (vanwege risico op arteria pulmonalis ruptuur).

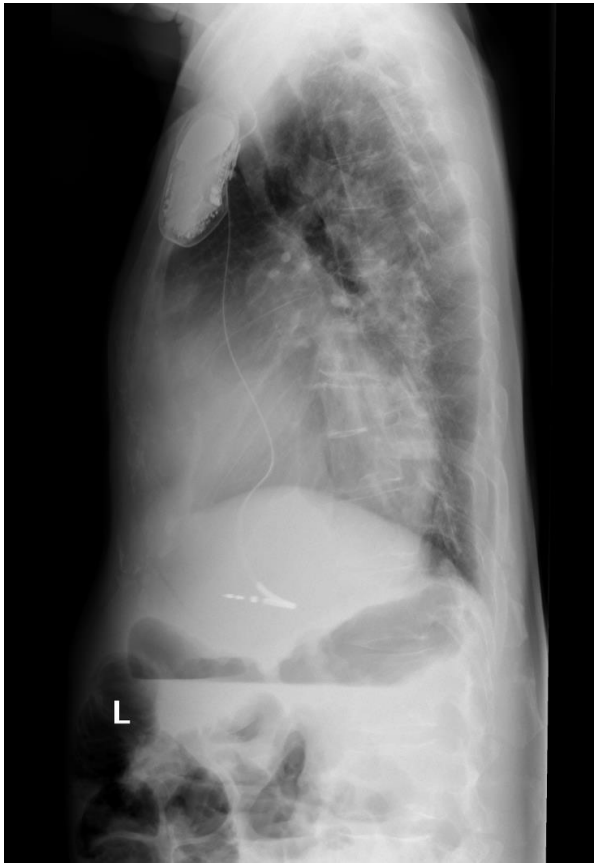
Geleidingsstoornissen,

ICD of pacemaker in situ,

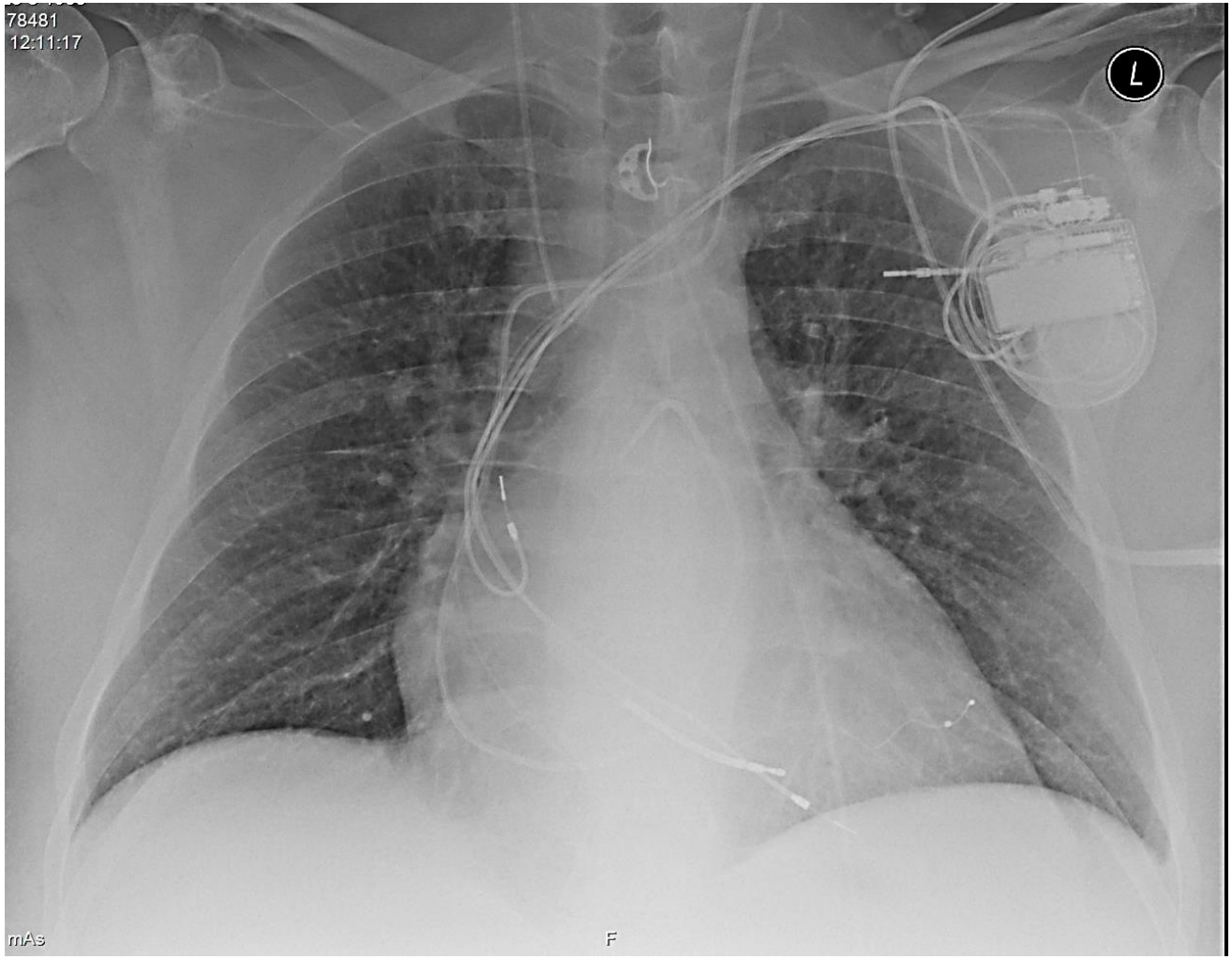
tricuspidalis of pulmonalis prothese of stenose.

Anatomie bij hartfalen kan lastig zijn



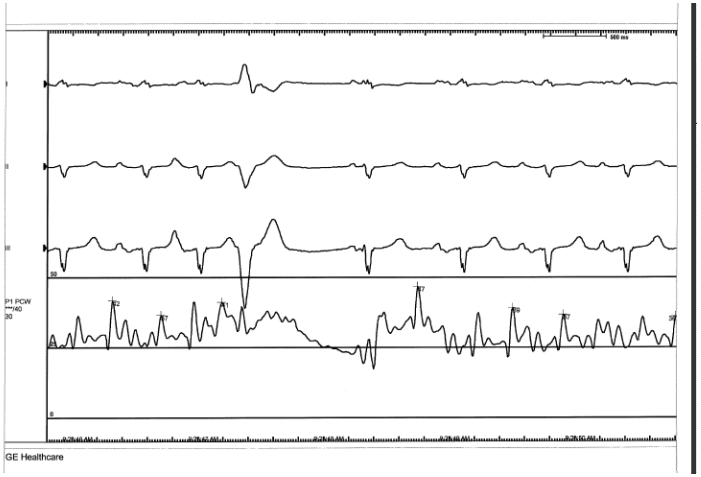


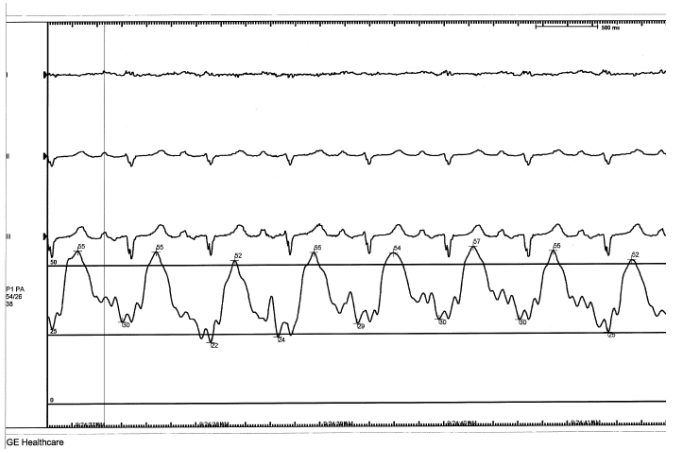
Soms is het wat “vol”



Screening HTx

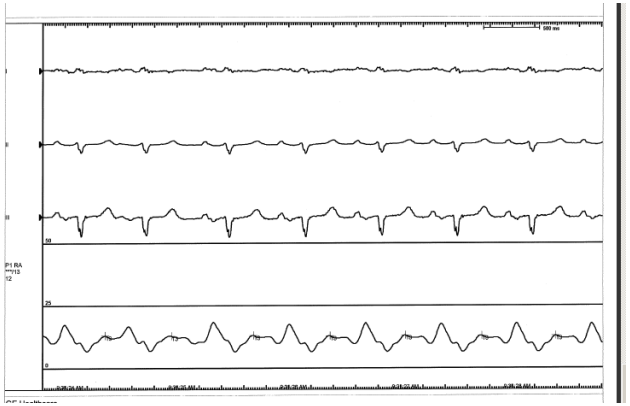
PCW
26

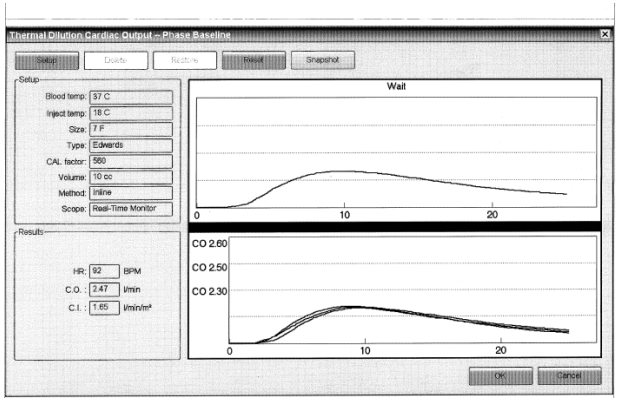




PA
55/26,
mean 38

RA
12





CO
2.5

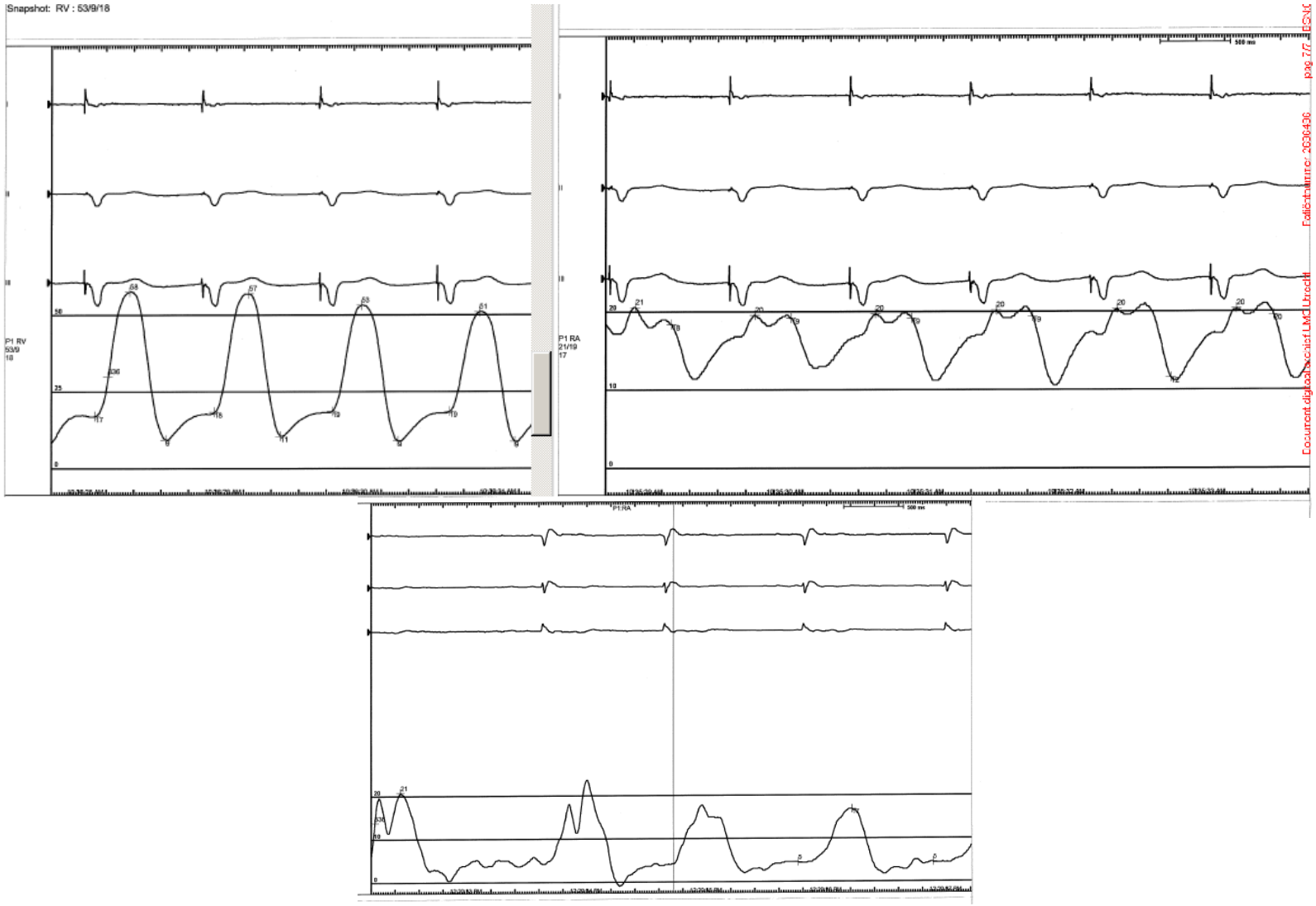
PVR?

PVR: (12/2.5)x80=380 D.S.cm-5

Reversibiliteit pulmonale vaatweerstand

- Optimalisatie behandeling (diuretica, dobutamine)
- Nitroglycerine
- Prostacycline (Flolan)
- Cave te forse RR daling

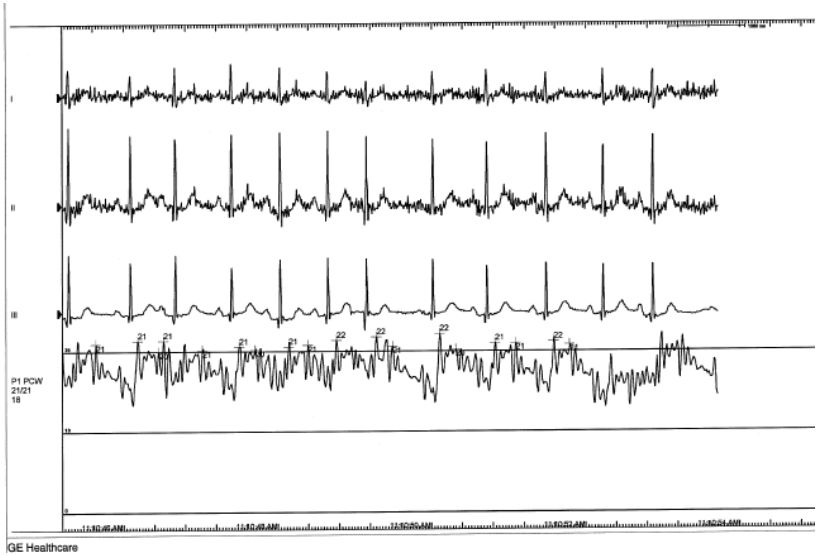
Ernstige TI: geventriculariseerde curve

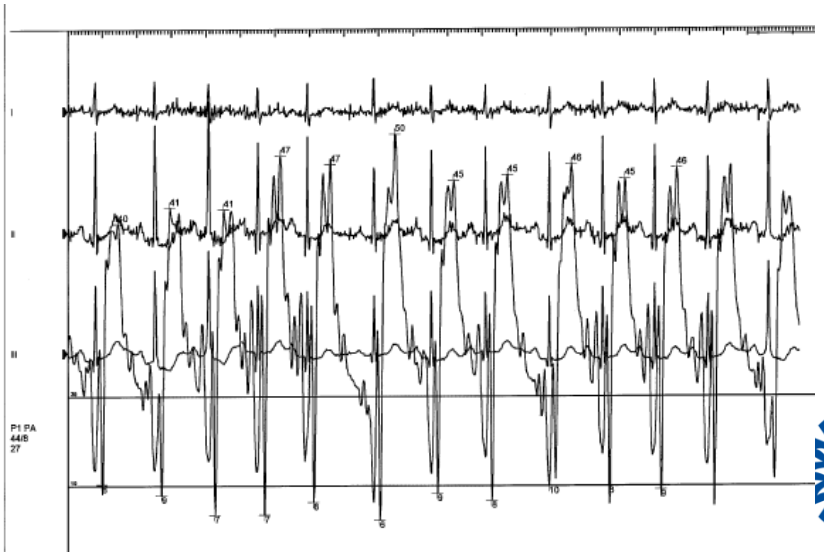


F, 71 yr. Ernstige COPD, status na longembolieen en chron. hypoxemie

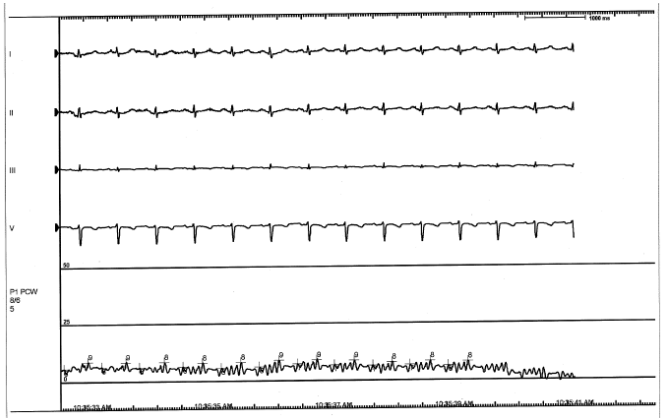
Rechtscatheterisatie
Punctie: v jug rechts met echo
Drukken:
RA: 4
RV: 43, einddiastolisch 3
PAP: 44/8 gemiddeld: 27
PCWP: 18
C.O:5.17
C.I: 3.32
TPG:9
PVR: 139

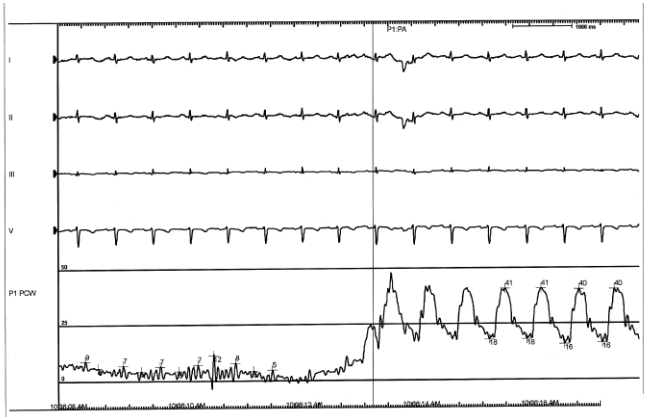
Uitslag??

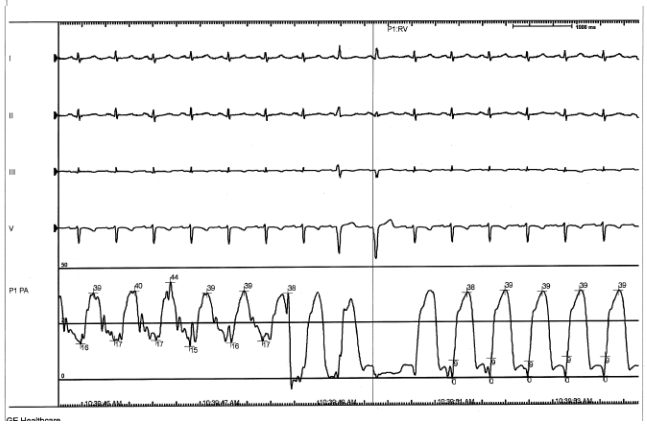


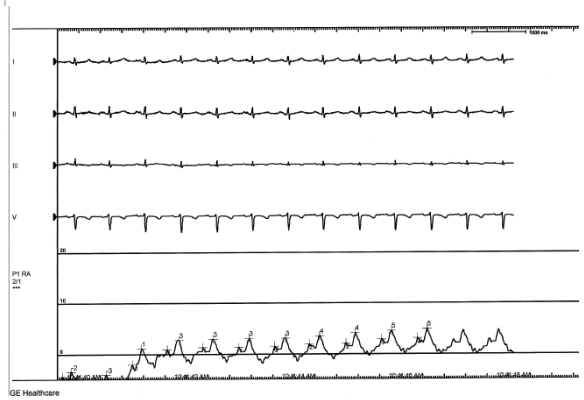


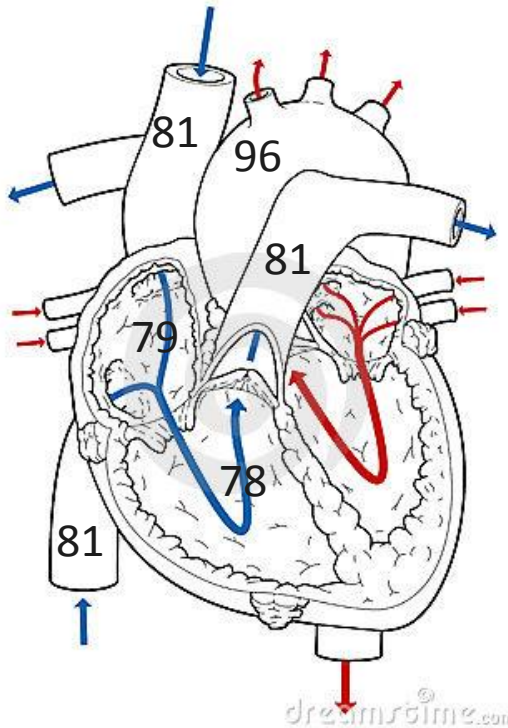
F, 64 jr slerodermie, diffusiestoornissen





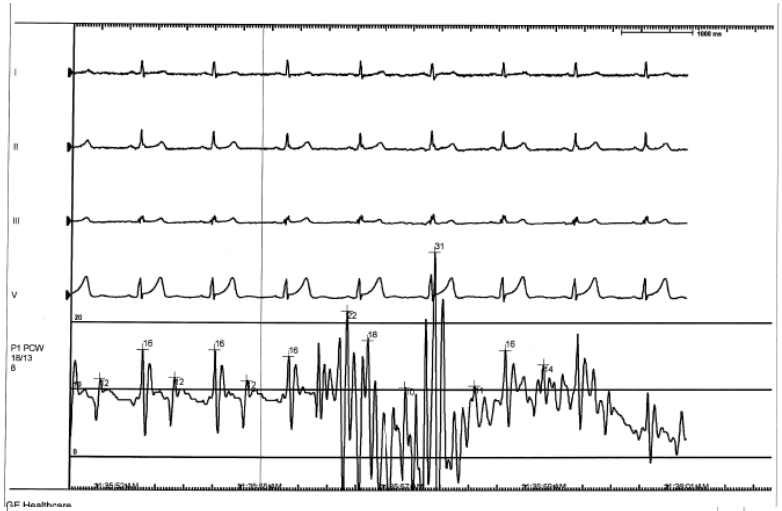


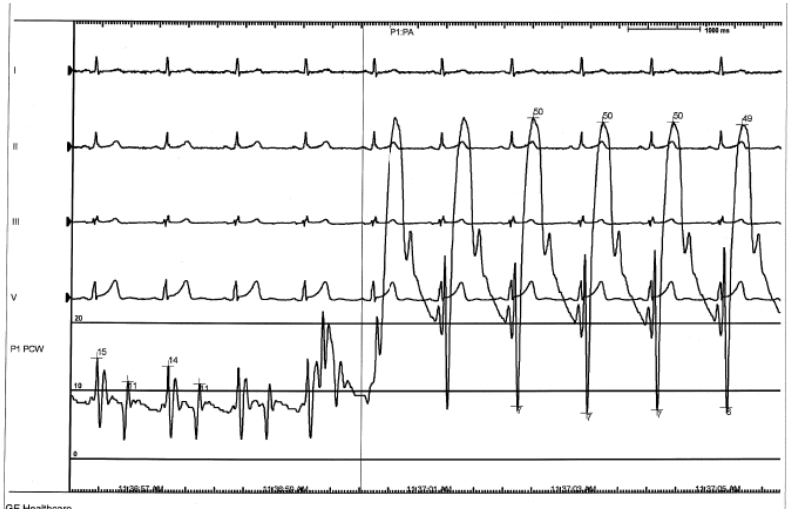


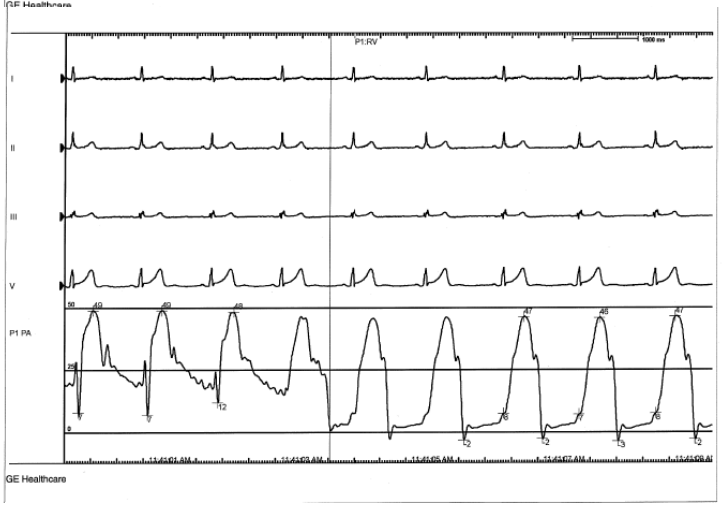


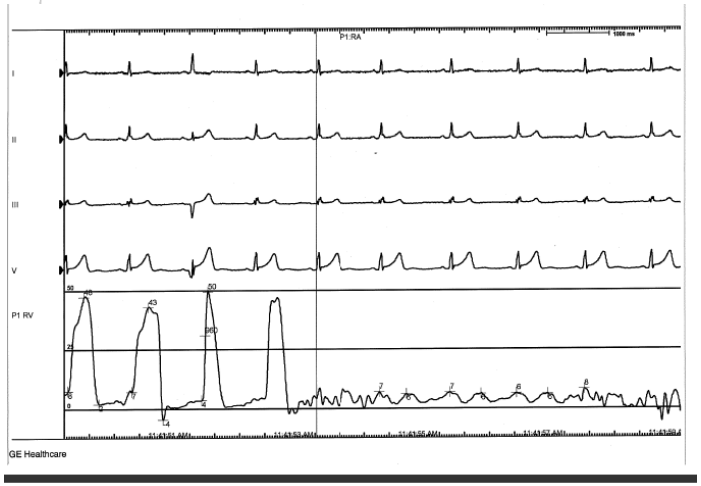
PCW 5, PA 38/16, gem 27
RA 1, CO 5.8, TPG 22, PVR 300

M 54 jr, MCTD, PAH follow-up





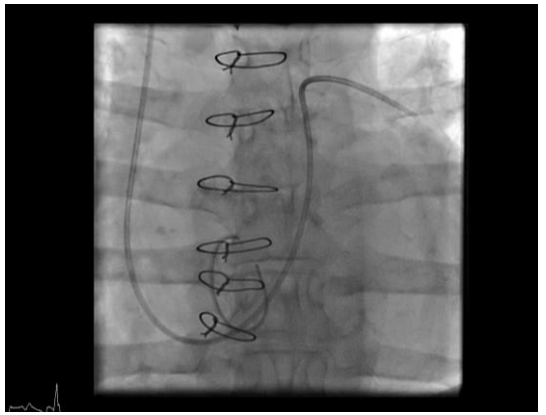


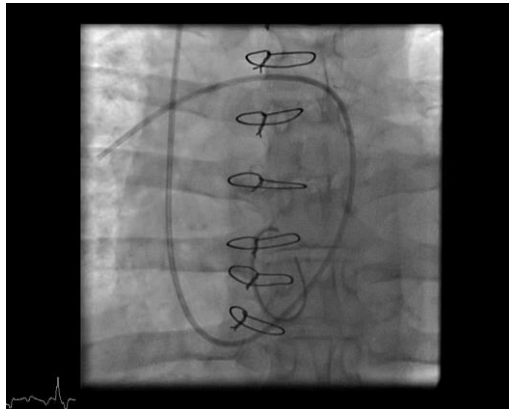


RA:4
RV: 50
PAP:50/15
gemiddeld:30
PCWP:8
C.O:5.0
C.I:2.6
TPG:22
PVR:350

Congenitale casuistiek

- V 30 jr geopereerde Fallot met pulmonalis conduit en T plastiek.
- Decompensatio cordis;
  Welke vraag moet beantwoord worden bij R-cath? Hoe moet het benaderd worden?
- Eerste *routine*-catheterisatie: "geen stenose"

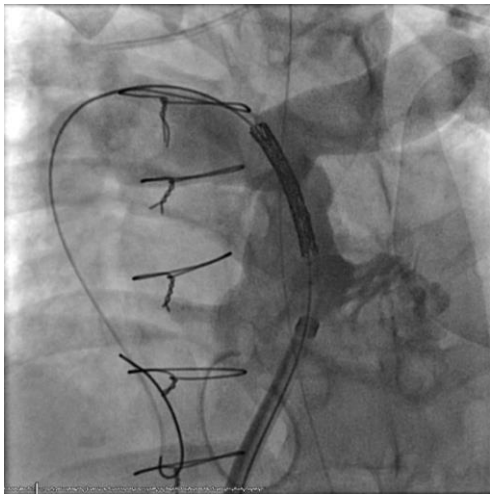




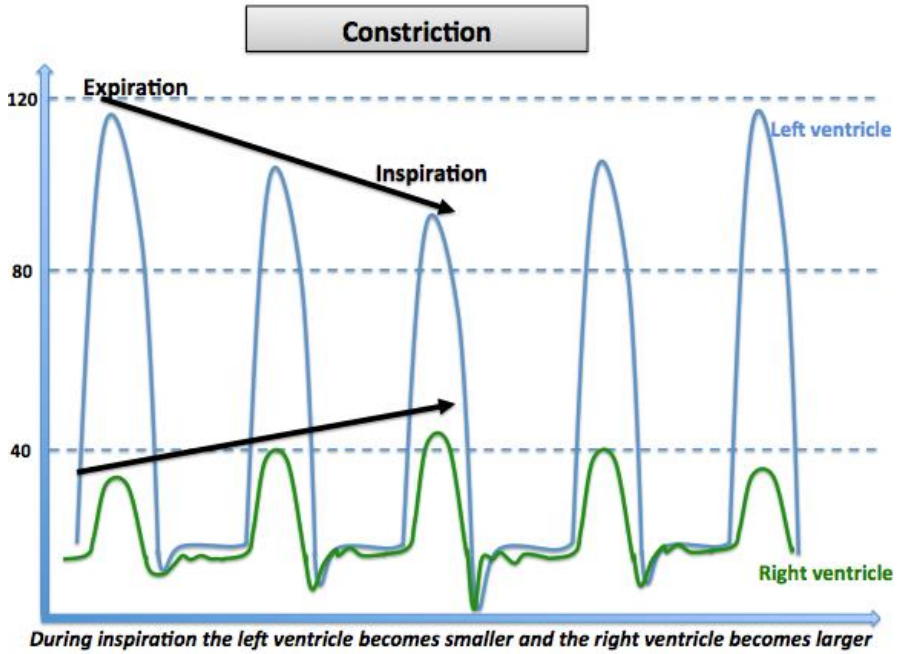
Nieuwe catheterisatie:

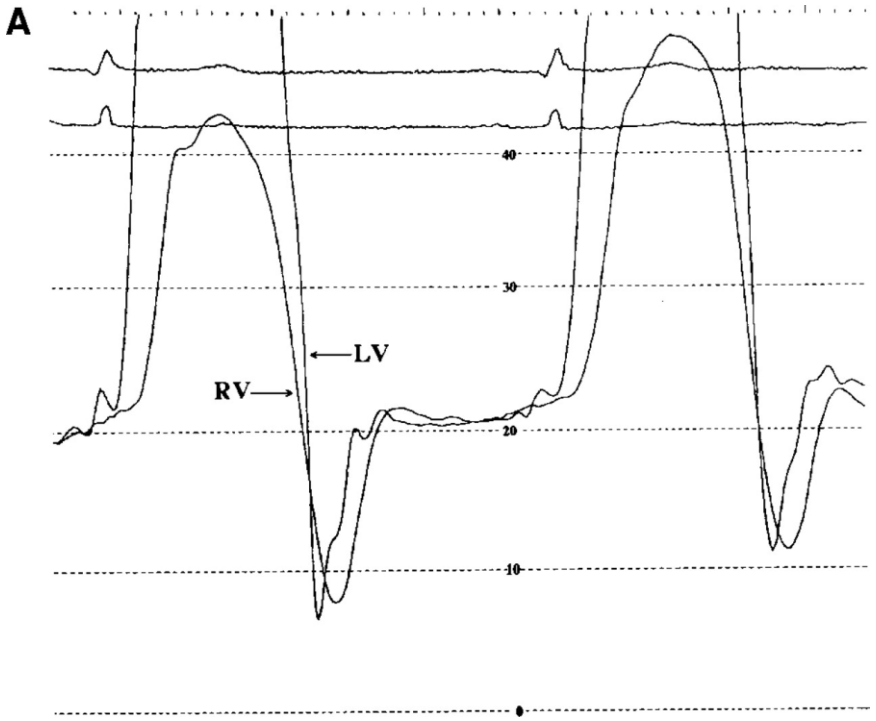
Wedge 20 mm Hg
a.pulmonalis: Rechts: 35/20. Links 32/20
Rechter ventrikel: 85/4
Rechter atrium: 20 mm Hg

Conclusie: Drukgradient 50 mm Hg over Pulmonalis conduit !

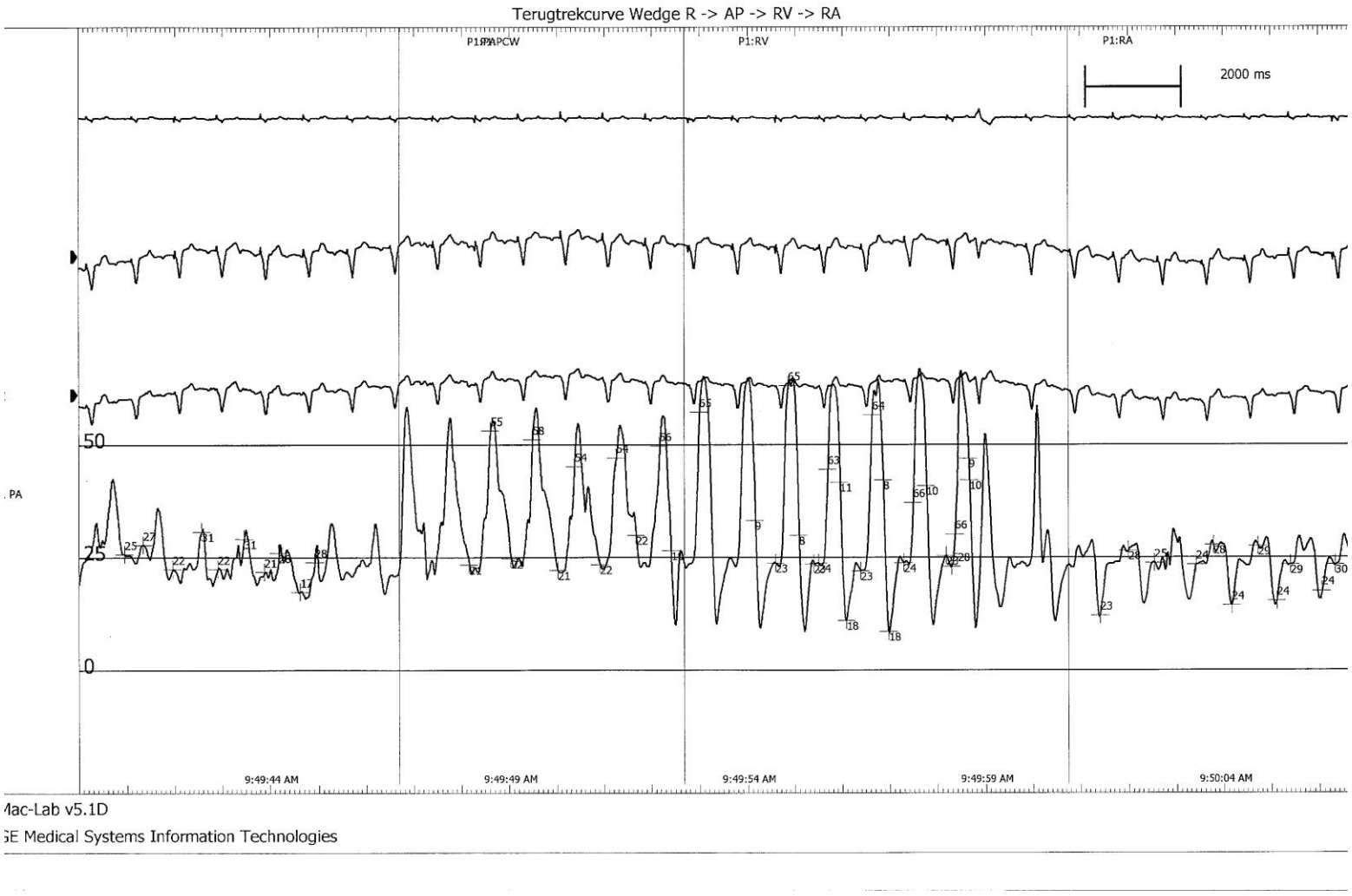


Pericarditis constrictiva

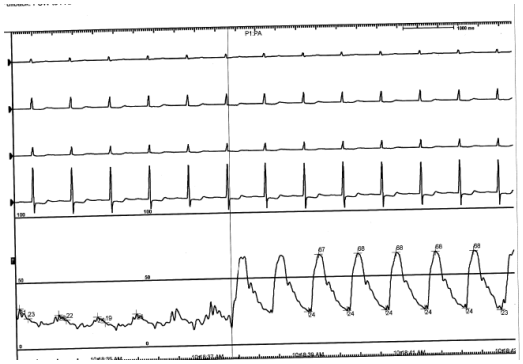


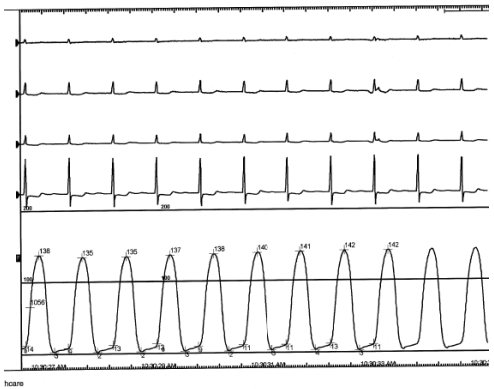


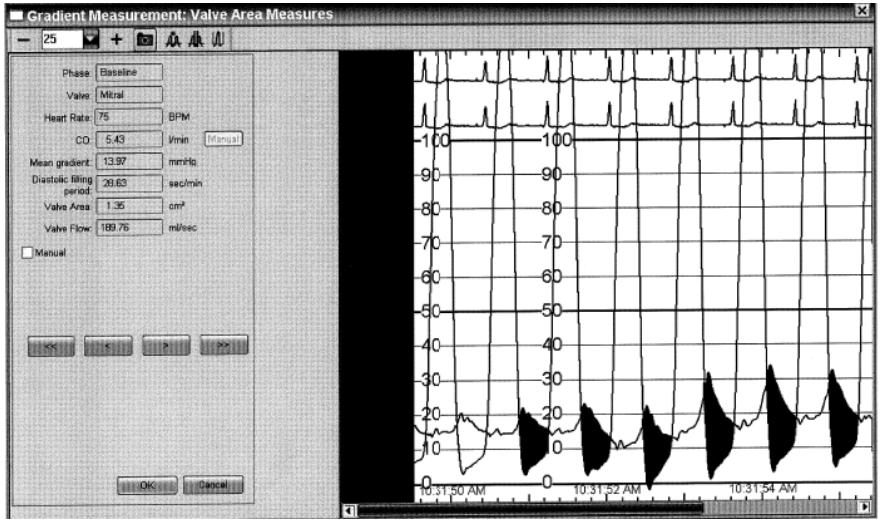
Pericarditis constrictiva



F, 74 jr. 5 jr na MVP, TVP, Maze, DDD-PM, AF. Dyspnoe III/IV, PH op echo.



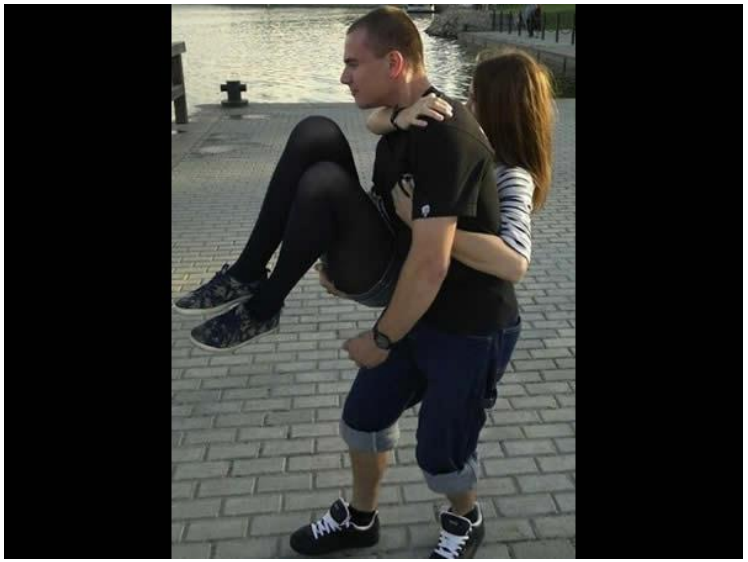




PA 65/23, mean 42
PCW 20
CO 5.4
PVR 325
M-gradient 14 mm Hg

Conclusie

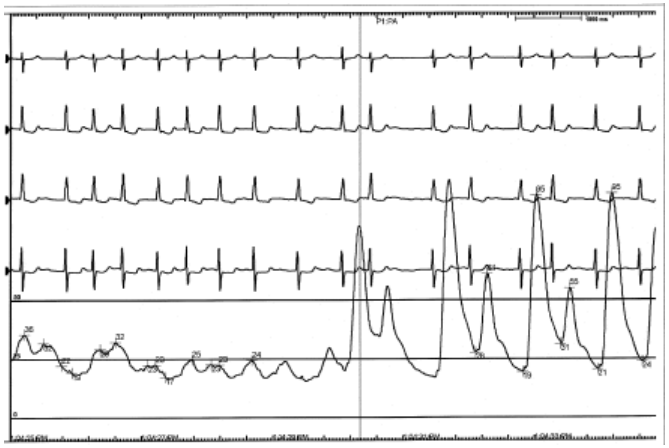
- Non-invasief onderzoek heeft belangrijk deel van de vroegere hemodynamische onderzoeken overgenomen
- Er bestaan geen routine-catheterisaties meer
- Correcte invasieve diagnostiek nu vereist nauwkeurige voorbereiding en planning en oog voor detail en potentiele “beetnemers”



- Dit vereist de juiste scholing en training

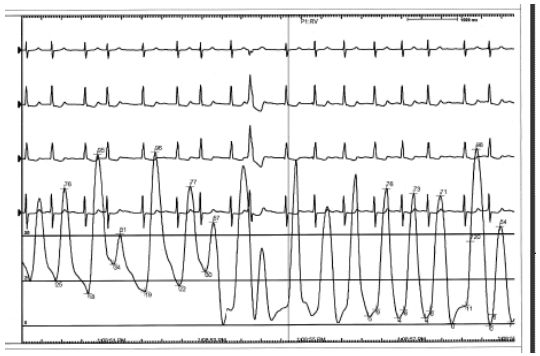
Vrouw, 60 jr M Takayasu

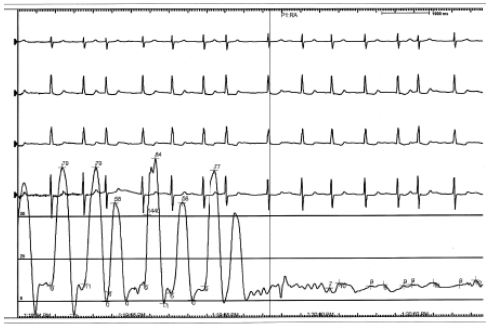
PCW 21



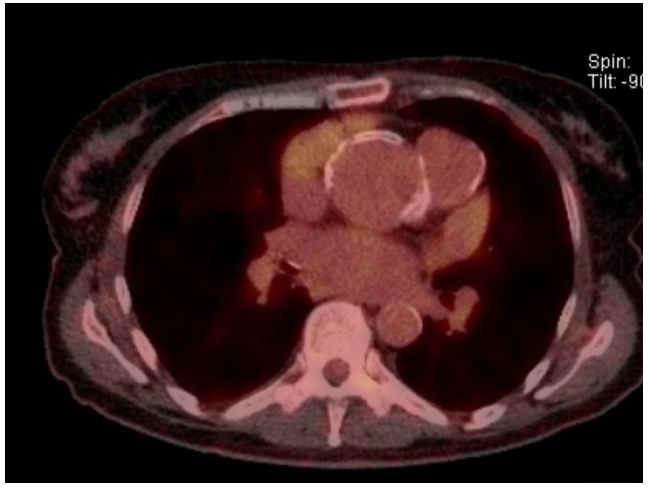
PA 80/21, mean 43

RV 80

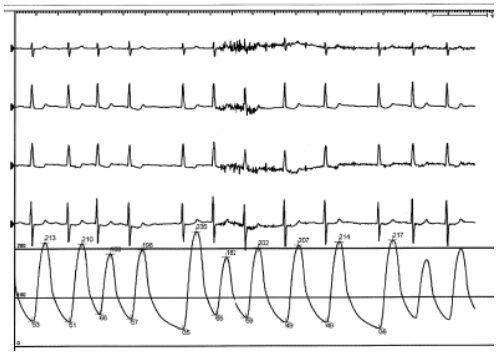


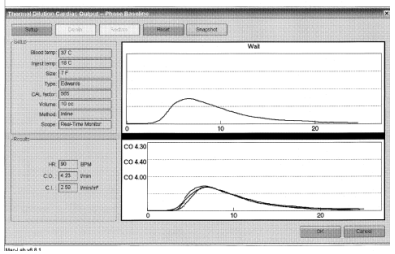


RA 8



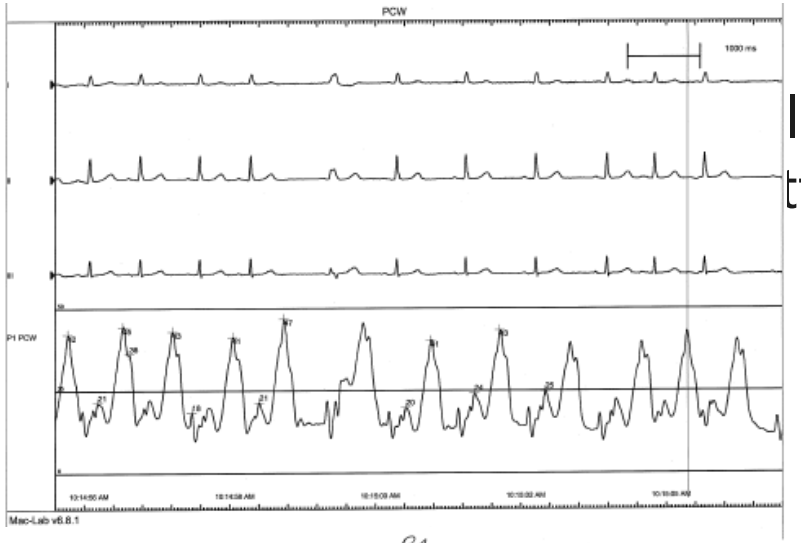
RR 210/50

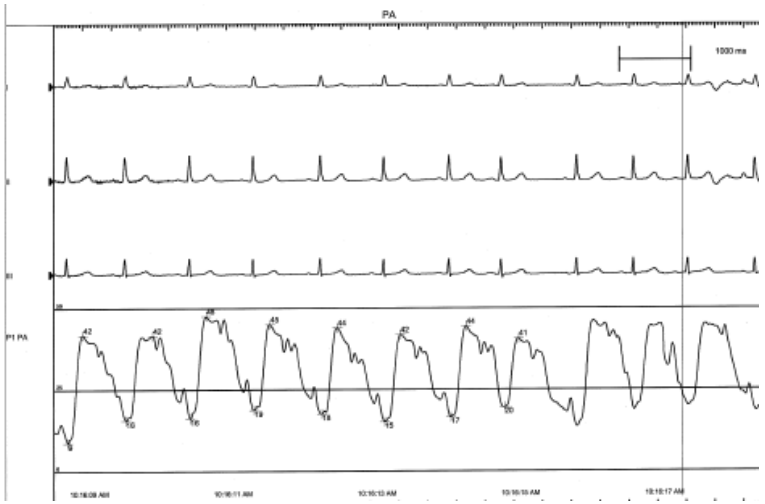


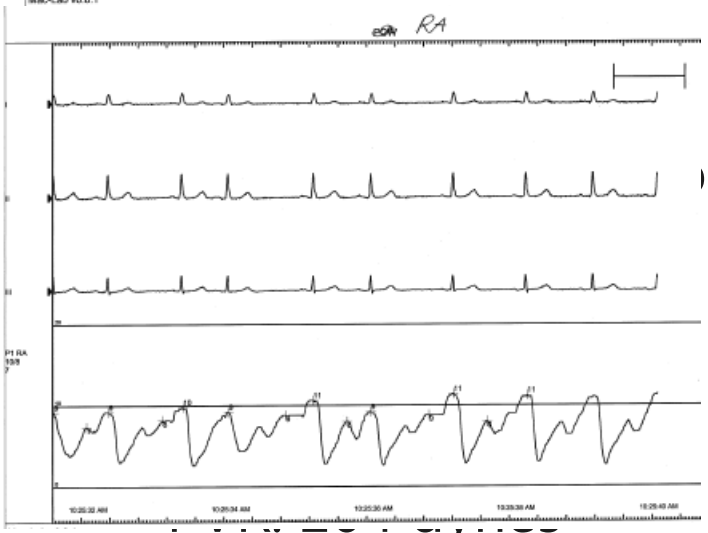


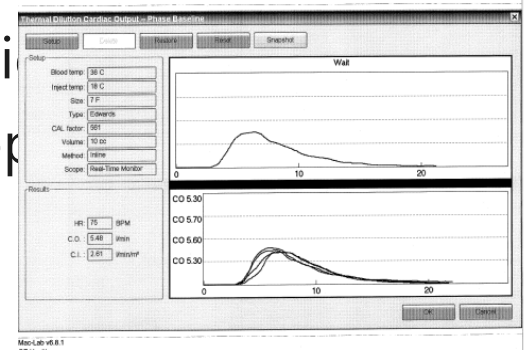
CO 4.2

F 76 jr, HT, longlijden, dilatatie AP, MI



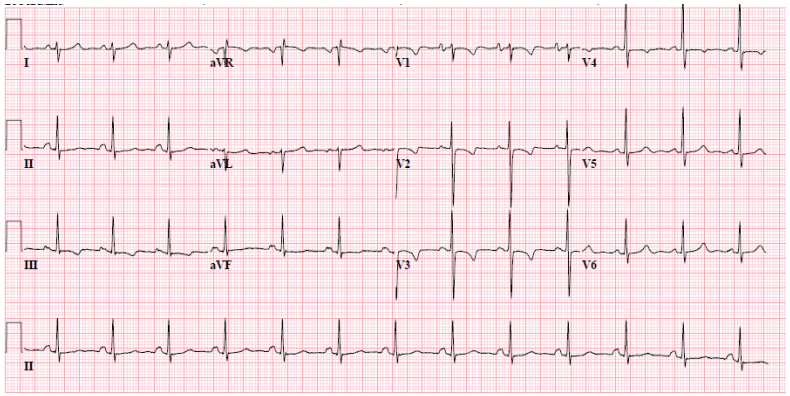






RA: 7
RV: 45/3 (EDP 10)
PAP: 45/20, mean 33
PCWP: 19, hoge V-top 43 mmHg
C.O: 5.5
C.I: 2.61
TPG: 14
PVR: 204 dynes

Casus(1): F, 23 yr, MCTD, oedeem, hepatomegalie en dyspnoe sinds ½ jaar.



O/, HV gestuwd, tachycard, massaal oedeem, hepatomegalie, 3/6 TI en zacht diastolisch roulement apex
C:

AP 90/36, mean57 mmHg,
PCW 20 mmHg,
RA 10 mmHg,
CO 4,4 l/min, De gemiddelde gradiënt over de mitralisklep bedroeg 10 mmHg bij een hartfrequentie van 80/min.
Het berekende klepoppervlak: 1,3 cm2.
Beleid:

Casus (2)

- Ballondilatatie M-klep: gradient 14-5 mm Hg
- Poli: gradient 10 mm Hg (echo); PA 75 mm Hg; toename MI
- Diagnostische catheterisatie: PCW: 21; PA: 95/27,gemiddeld 57; RV: 95/0; RA: gemiddeld 7; Aorta: 130/85, gemiddeld 105. Cardiac output 4,7 l/min. Cardiac index 2,9 l/min/m2. Gemiddelde gradiënt over de mitralisklep: 13 mm Hg. Berekend klepoppervlak: 1,17 cm^2. CAG normaal
- MVR 29 mm carbomedics; subvalvulaire apparaat gefuseerd
- 3 mnd post-op PA 48 mm Hg
- 1 ½ jr post-op PA 36 mm Hg

Casus (3)

- 3 jr post-op: groot CVA (INR 3.3): embolus in a cerebri media: trombectomie.
- Echo: trombus op M-prothese
- Neurologisch herstel
- Re-MVR bioprothese. Chronisch OAC
- 3 jr later: progressie MCTD; verdikking/degeneratie bioprothese met ontstaan MI
- Opname: hoge koorts, ernstige lupus nefritis: Pred/endoxan
- Pneumonie

Casus (4)

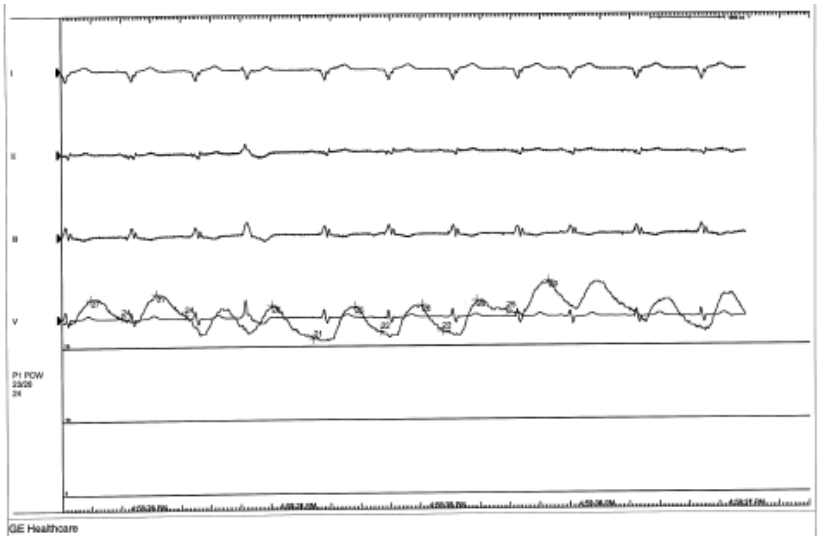
- Progressieve rechts decompensatie
- PCW 35, PA 90/35, RA 17
- Therapie resistent, overleden

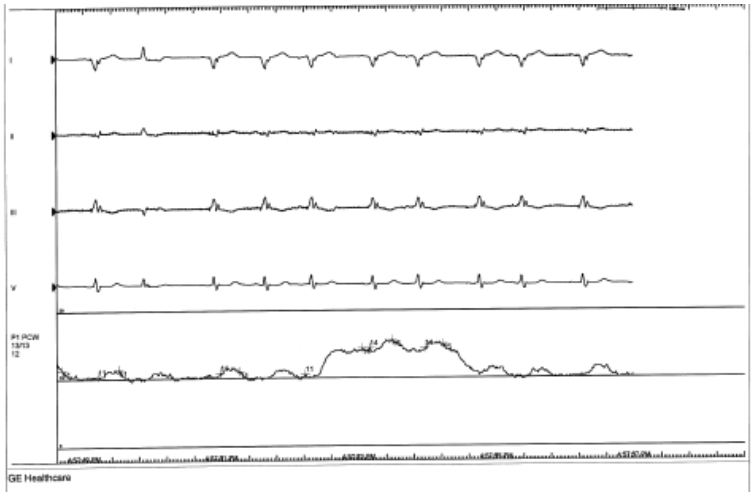
F 57 jr COPD LoTx kandidaat ?
Ook HTx ??

- Elders: PA 46/19, mean 27. Na inspanning: PA 97/52, mean 65.
- PCW 12; na inspanning 30. C: diastolische dysfunctie
- **Drukken voor fluid challenge:**
- RA: 5
- RV: 37
- PAP: 36/14 gemiddeld: 22
- PCWP: 8
- C.O: 3.5
- C.I: 1.8
- TPG: 14
- PVR: 320

- **Drukken na fluid challenge 1L NaCl snel:**
- RA: 6
- RV: 48
- PAP: 45/18 gemiddeld: 28
- PCWP: 13
- C.O: 4.9
- C.I: 2.4
- TPG: 15
- PVR: 240

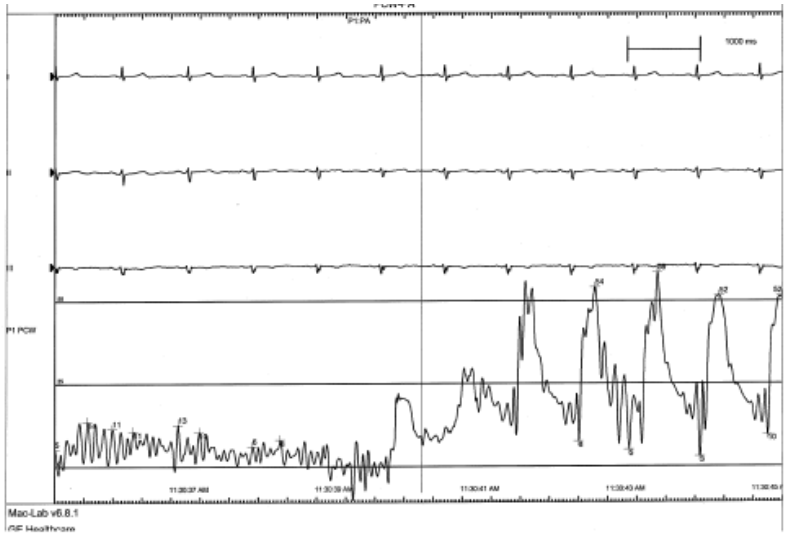
F 36 jr HCM, dubbelzijdige centrimag, onbegrepen “longoedeem”

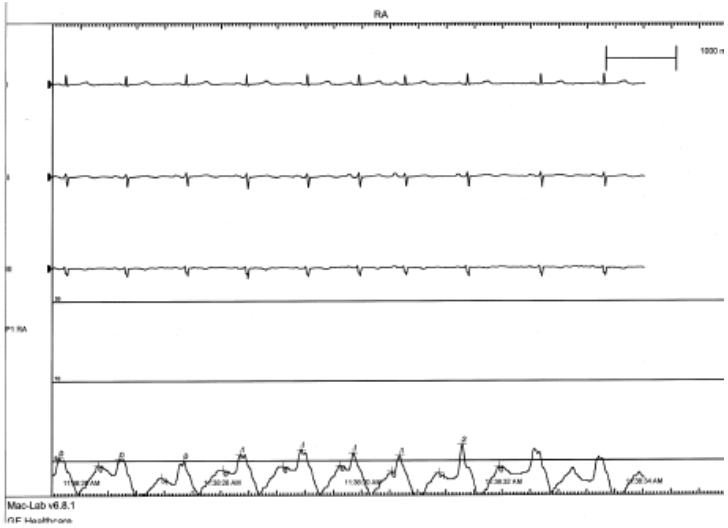




RVAD lager gezet

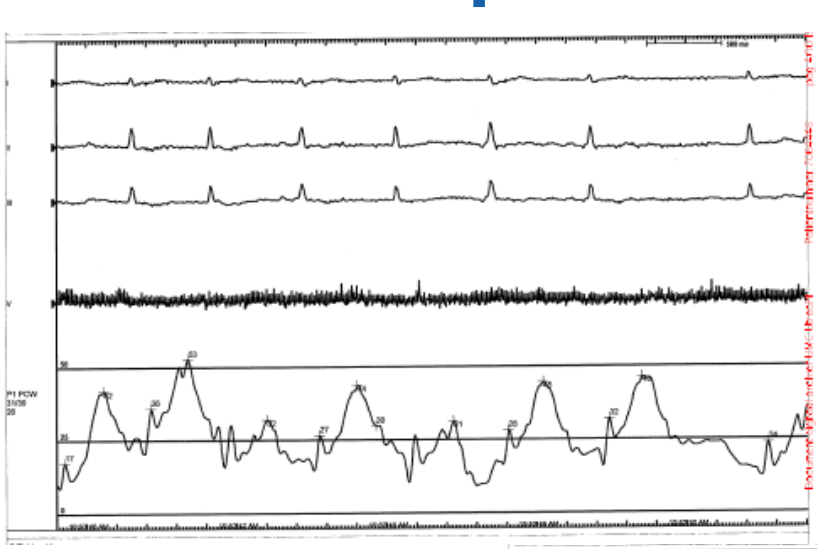
F 65, stamceltransplantatie, longembolieën, dyspnoe, PAH?

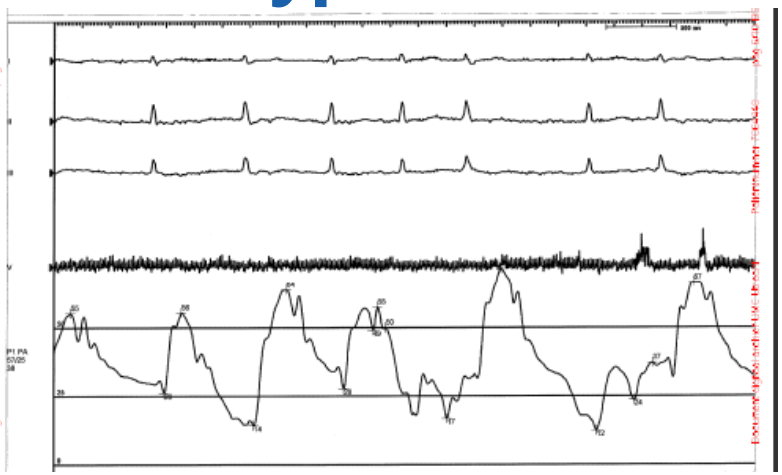


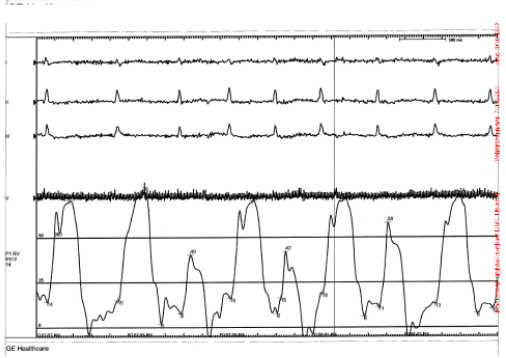


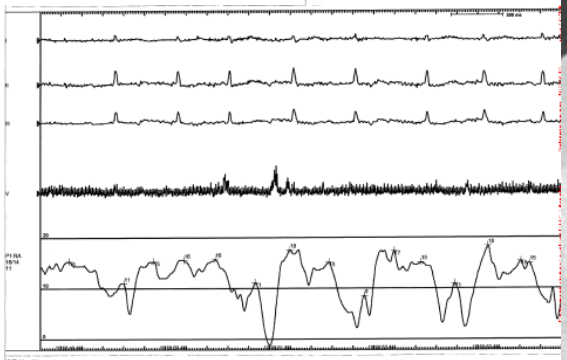
- RA: 0
- RV: 50/0, edp 4
- PAP: 50/12 gemiddeld: 28
- PCWP: 2
- C.O: 4.63
- C.I: 2.54
- TPG: 26
- PVR: 450 dynes

M 77 jr, ernstige interstitiele longziekte, O2 thuis, adipositas, atr fibr, hypertensie









500 ml Fluid challenge in 30 gezonde vrouwen.