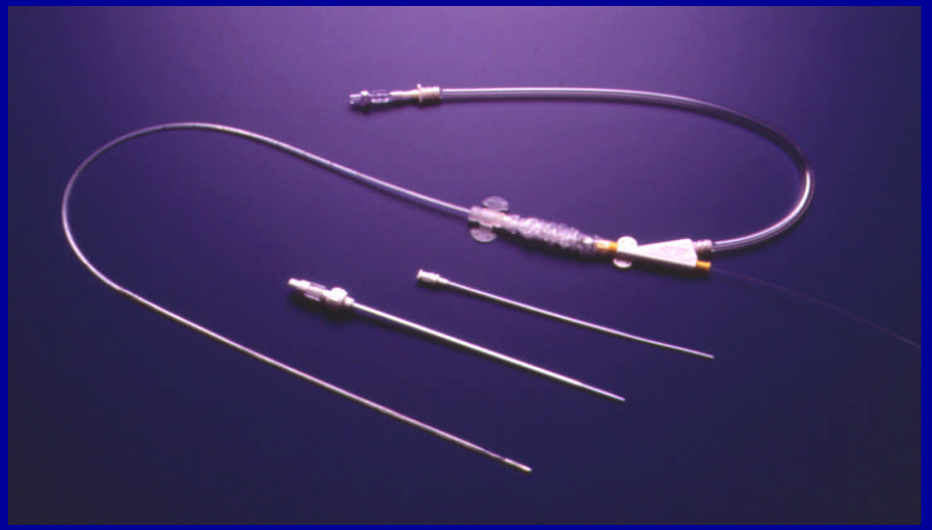
# Intra-Aortic Balloon Pumping





Sherry Mulder

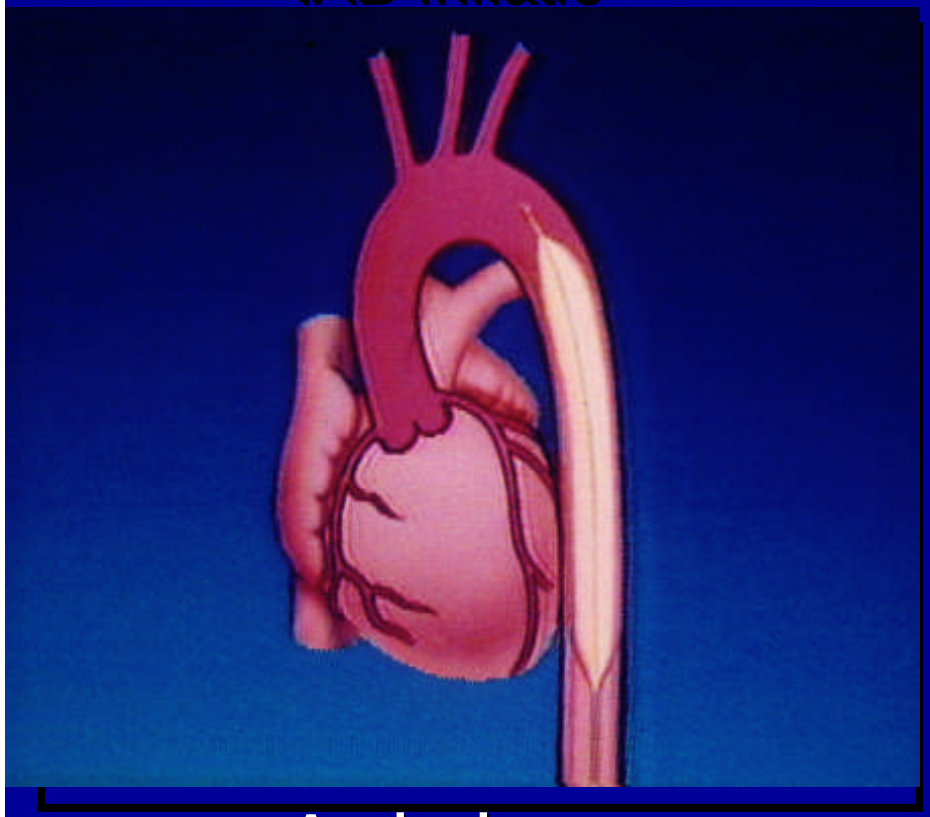
# De Theorie



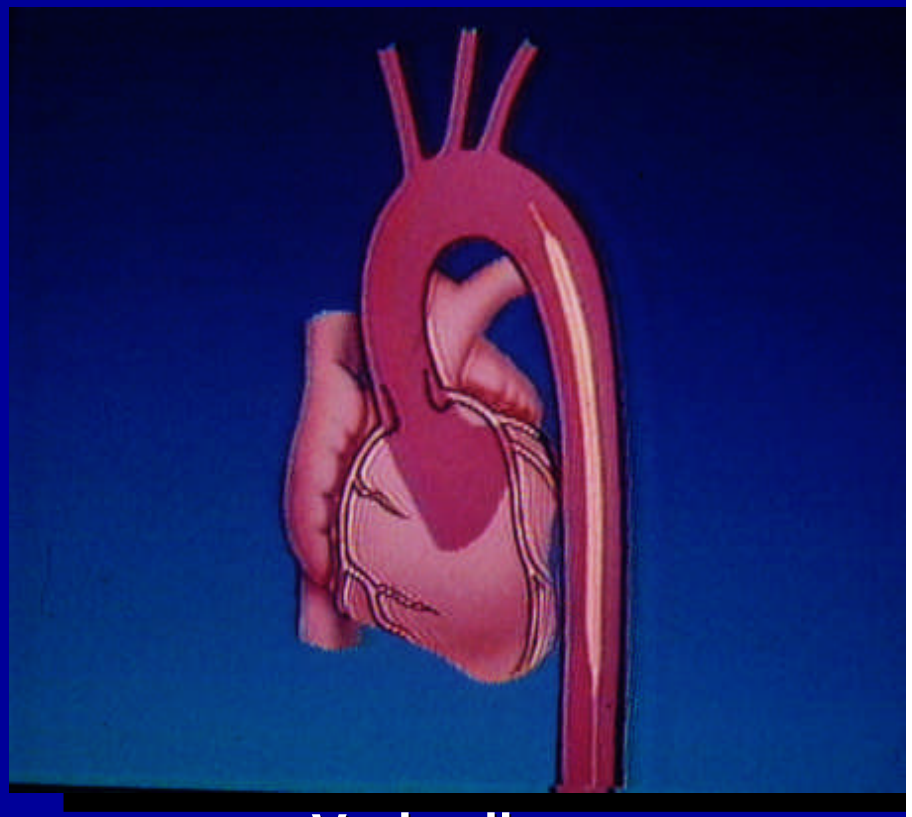
**Counterpulsation therapy is a CLASS I indication for patients in “cardiogenic shock, not quickly reversed with pharmacological therapy…”**

**ACC/AHA guidelines for management of patients with AMI**

IAB Inflatie



IAB Deflatie



**Aanbod**

**Verbruik**

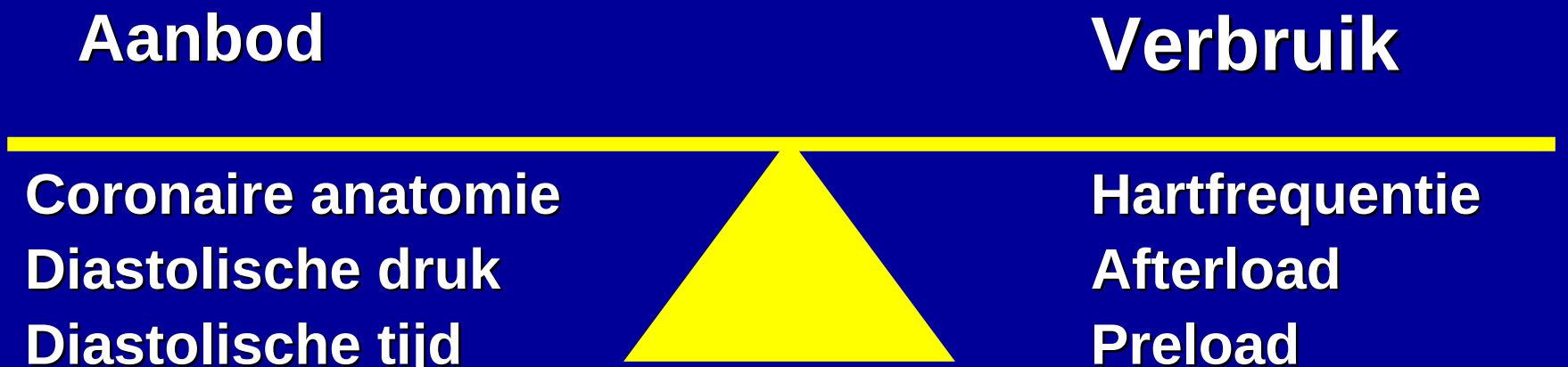
**$MVO_2$**

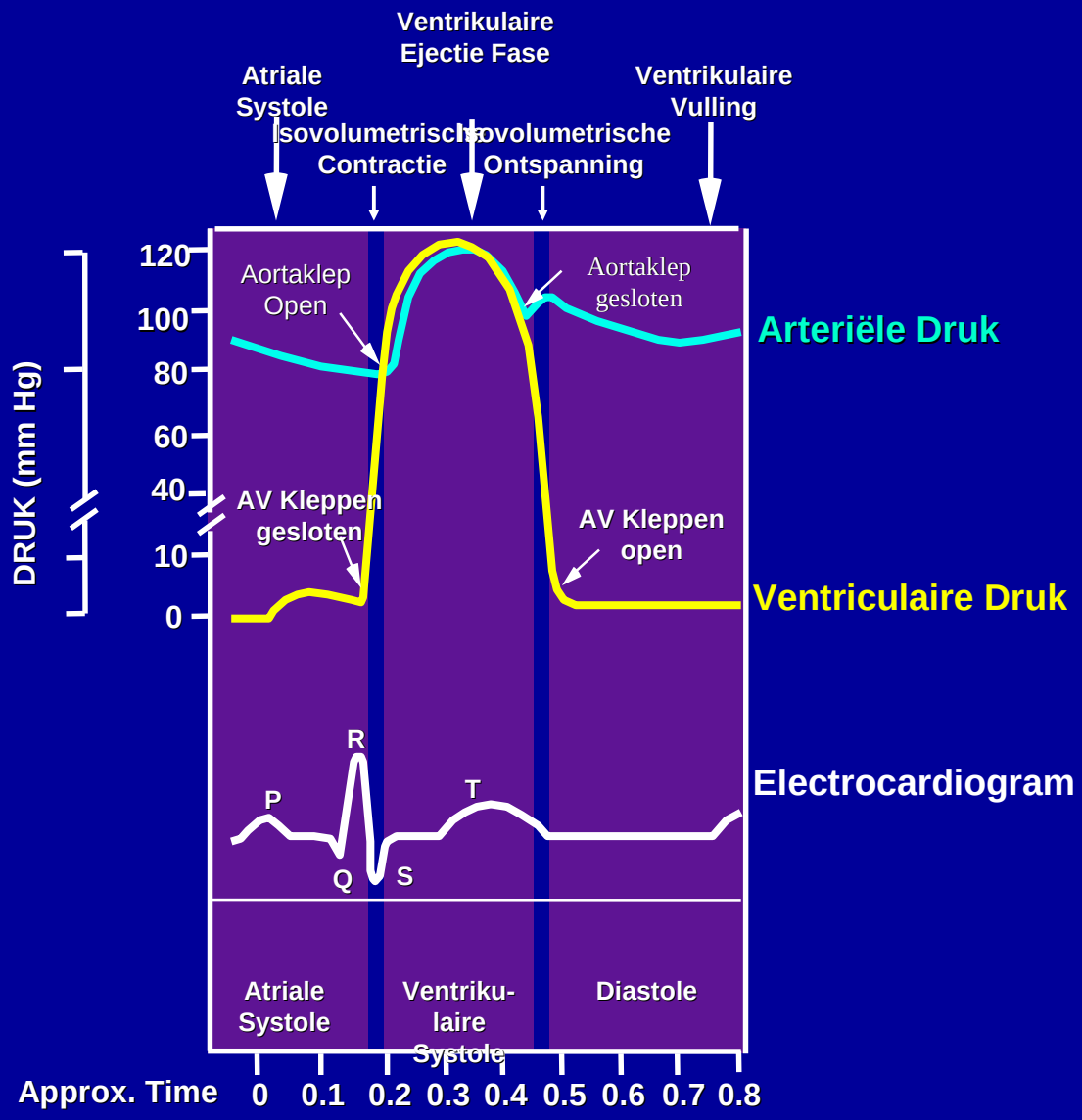
**Primaire effecten**

↑ Aanbod - IAB inflatie

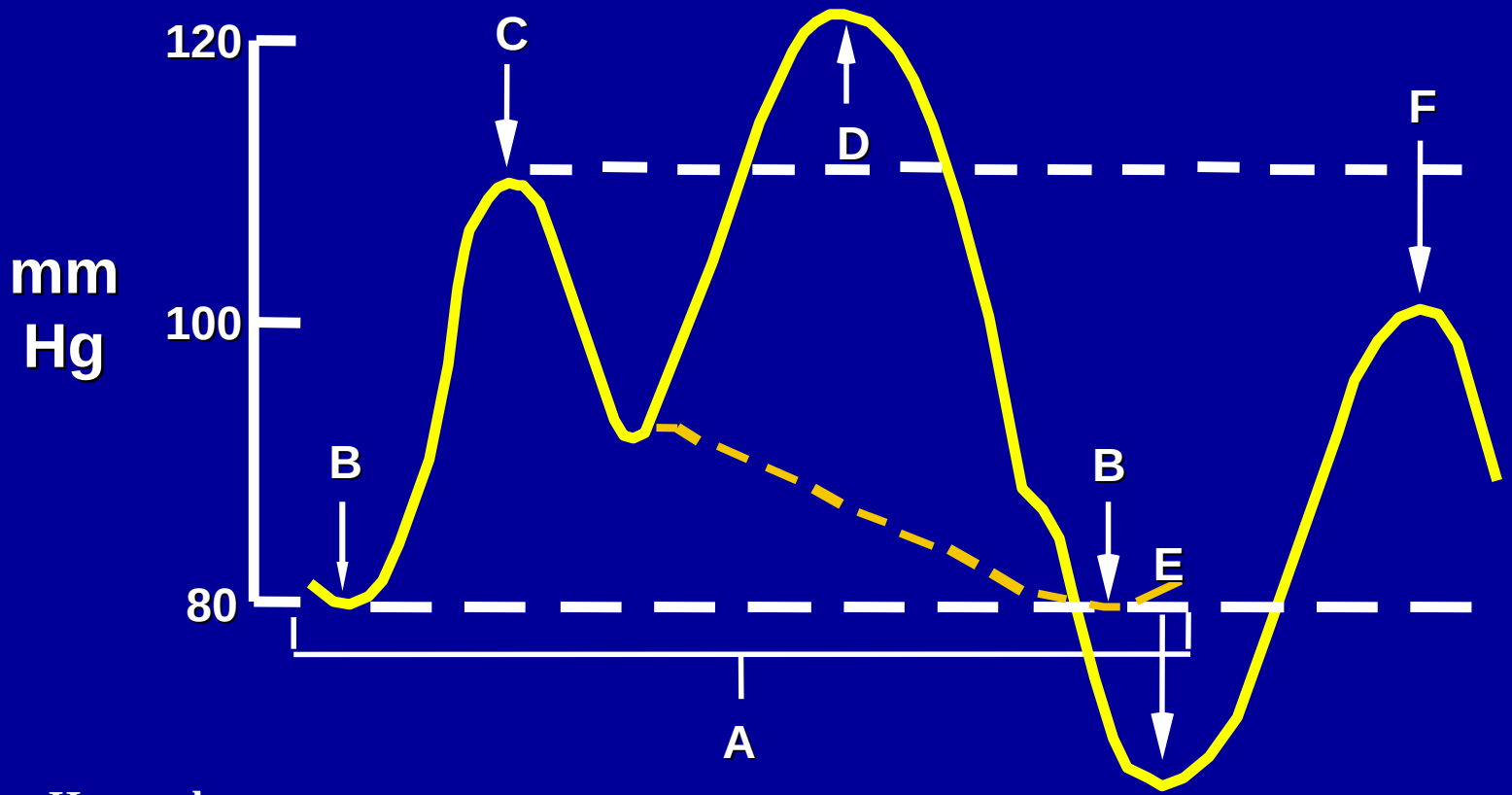
↓ Verbruik - IAB deflatie

# MYOCARDIAAL ZUURSTOF AANBOD EN VERBRUIK






# Arteriële Druk Curve




**A. Een Hartcyclus**

**B. Niet geassisteerde eind-diastolische druk**

**C. Niet geassisteerde systolische druk**

**D. Diastolische AUGMENTATIE**

**E. Verlaging Aorta einddiastolische druk**

**F. Verlaging systolische druk**

**Verlaagd Myocardiaal $O_2$ verbruik**

# Indicaties

1. Refractaire instabiele angina
2. Acuut myocardinfarct
3. Refractaire ventrikelinsufficiëntie
4. Mechanische complicatie wegens acute myocardinfarct

5. Cardiogene shock

6. Profilactische ondersteuning bij hoog risico patienten tijdens een PCI

7. Intraoperatieve pulsatiele flow

8. Ontwenning van cardiopulmonaire bypass

10. Cardiale ondersteuning voor niet-cardiale chirurgie

11. Profylactische ondersteuning ter voorbereiding van cardiale chirurgie

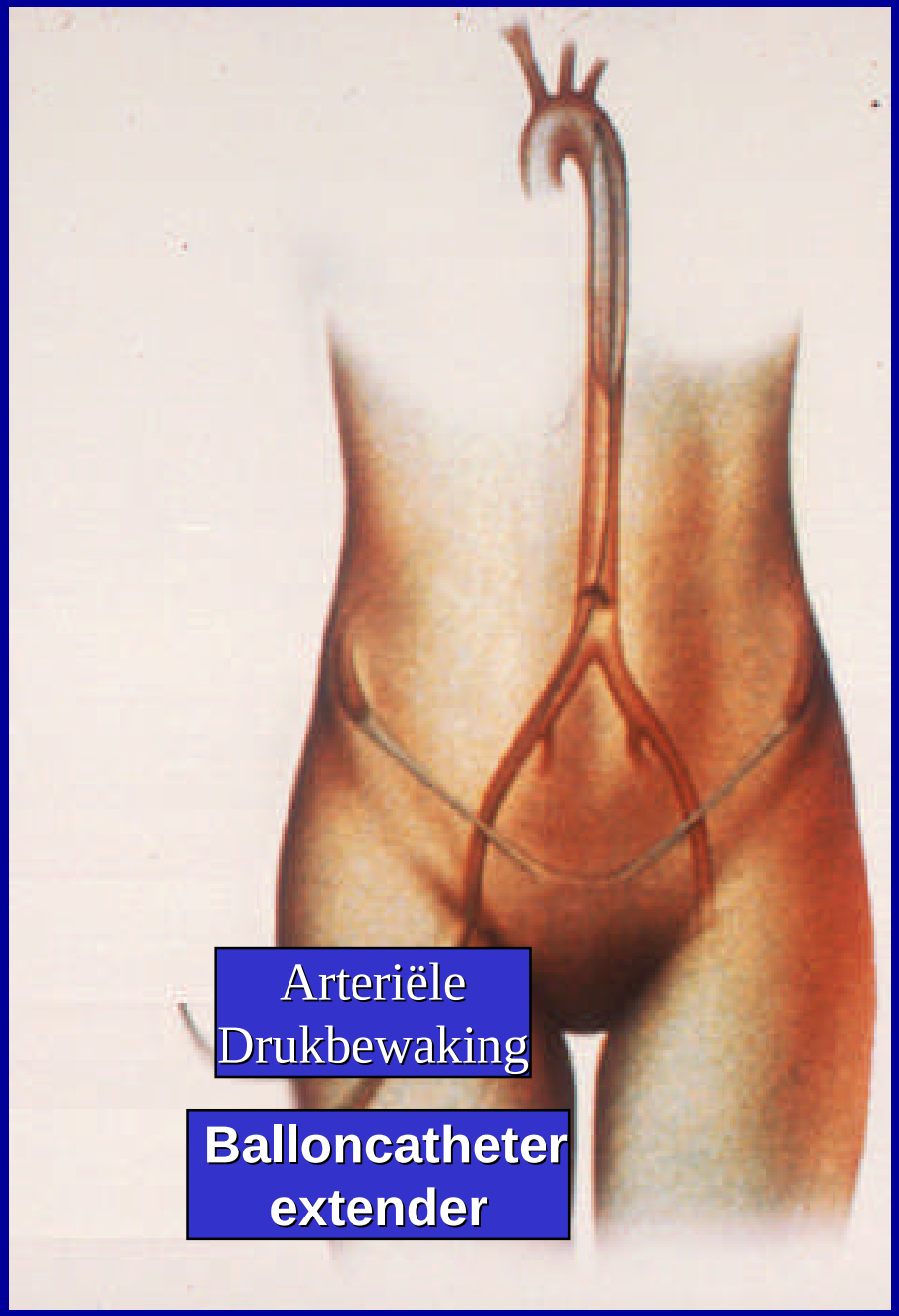
12. Postoperatieve myocardiale dysfunctie of een laag hartminuutvolume na chirurgische ingreep

# Contra indicaties

1. Aortaklep insufficiëntie
2. Dissectie of aneurysma van de aorta
3. Perifere vaatziekten
4. “Sheathless insertion” (obesity, litteken weefsel!)

# De intra-aortale ballon






**Een ballon kan het beste onder doorlichting worden ingebracht**

**De tip van de IAB moet 2 cm distaal van de L. art. subclavia liggen**

50 cc

**> 6’ [183 cms]**

40 cc

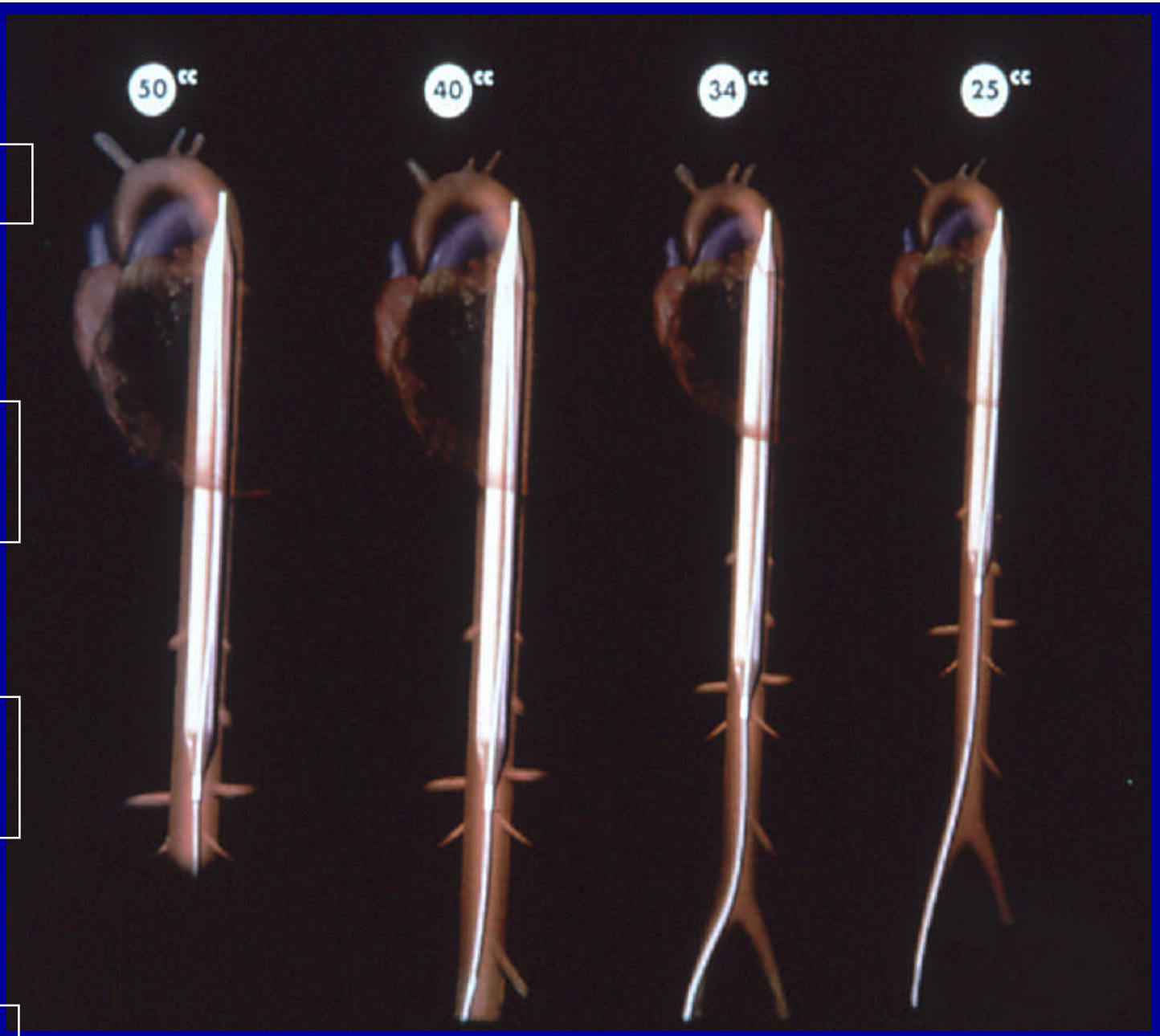
**5’4”- 6’ [163 - 183 cms]**

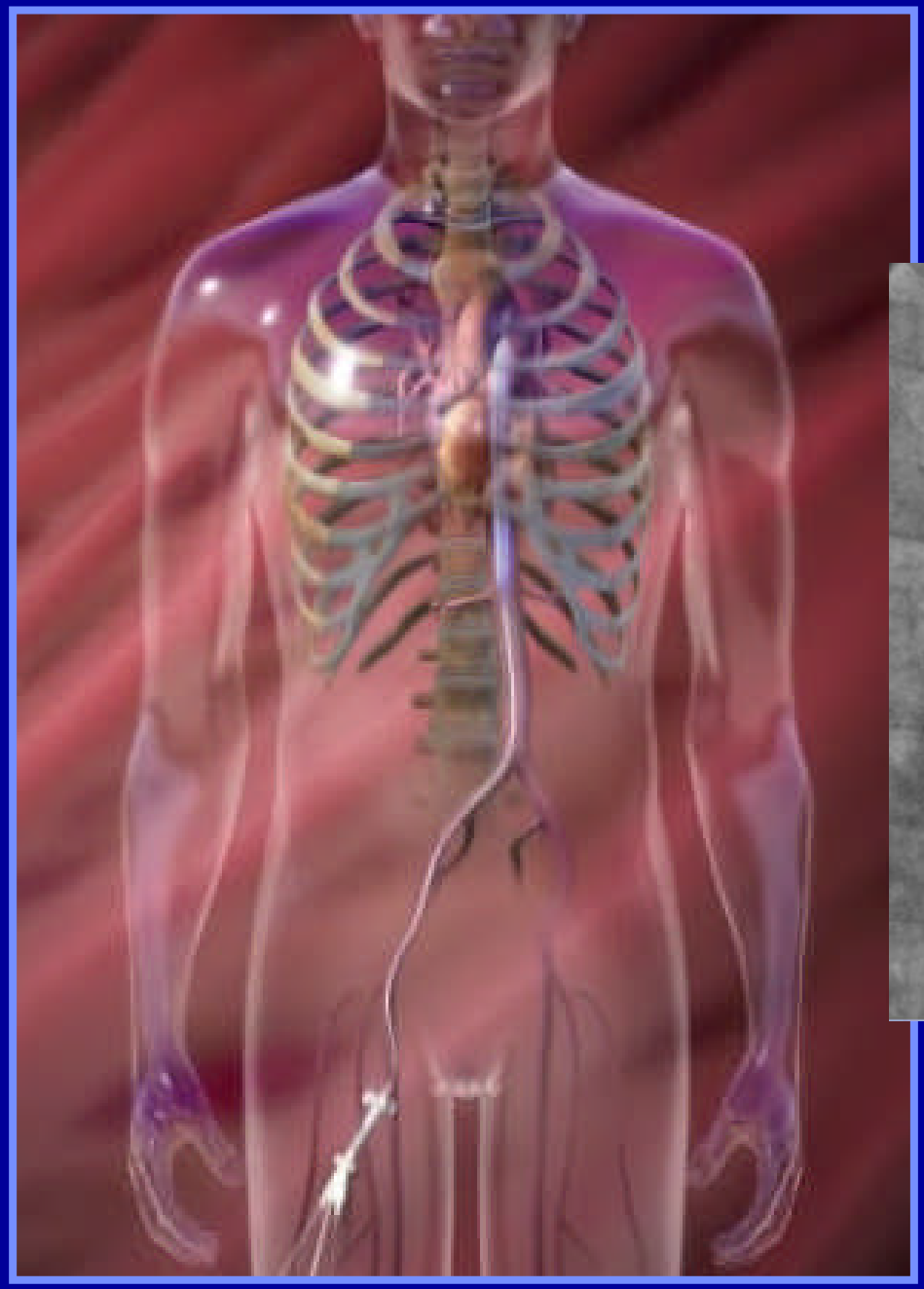
34 cc

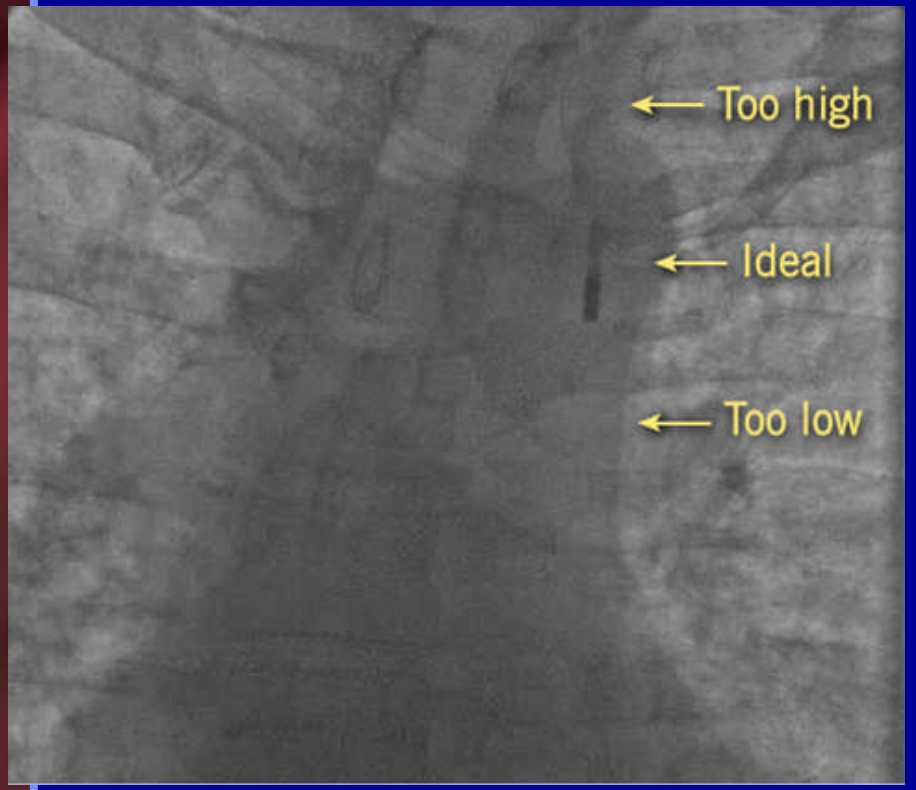
**5’- 5’4” [152 - 163 cms]**

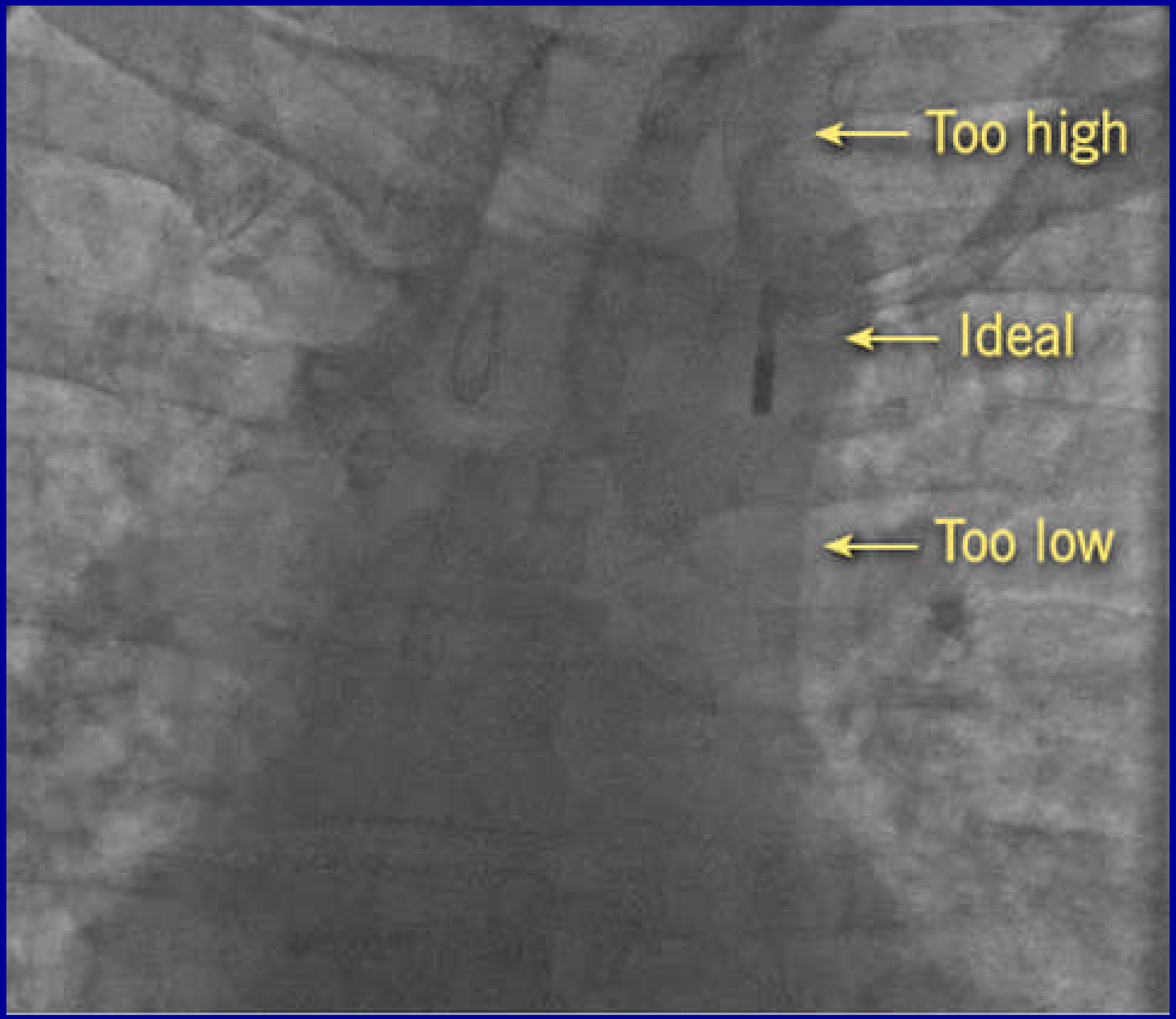
25 cc

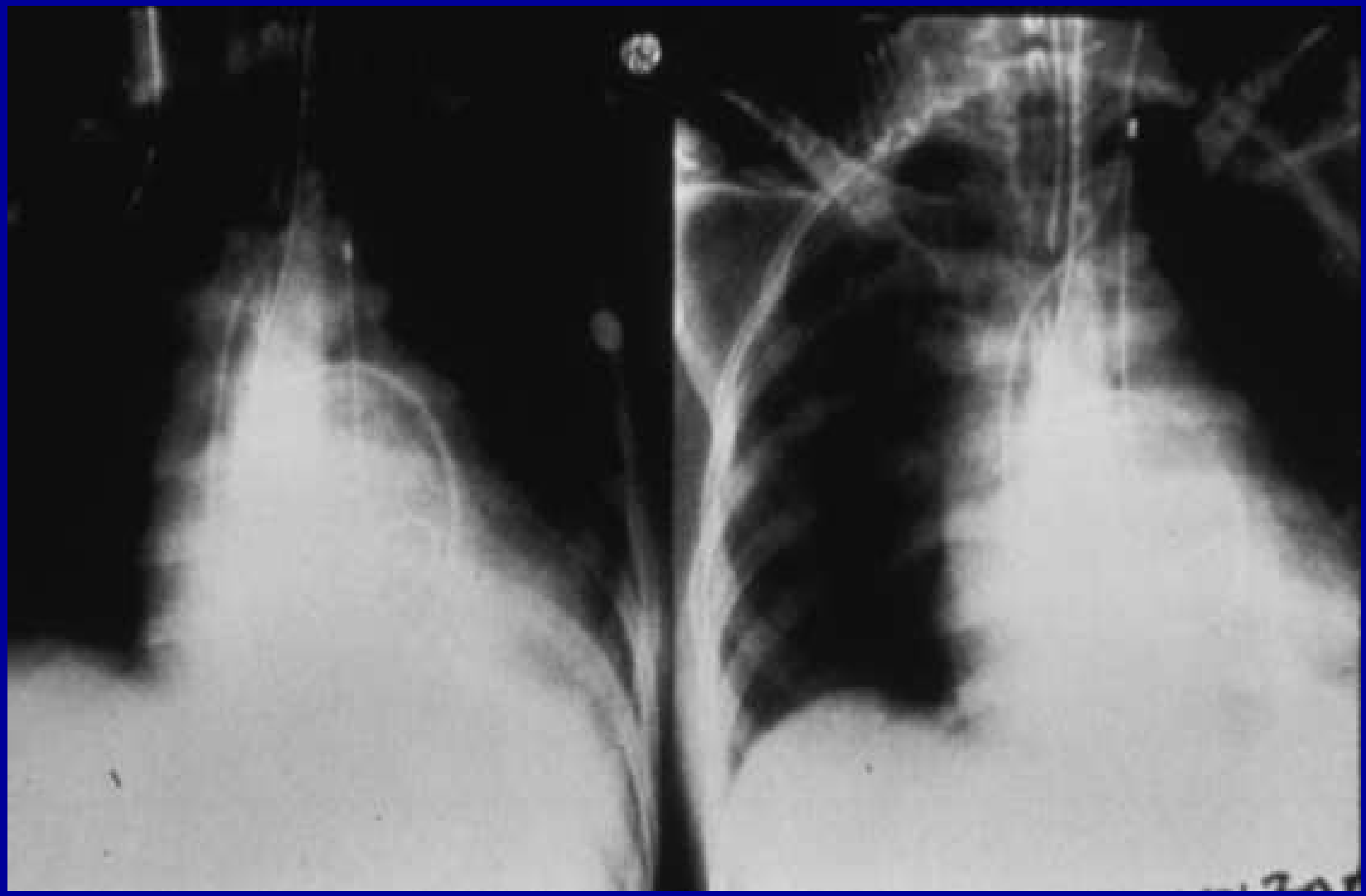
**< 5’ [152 cms]**

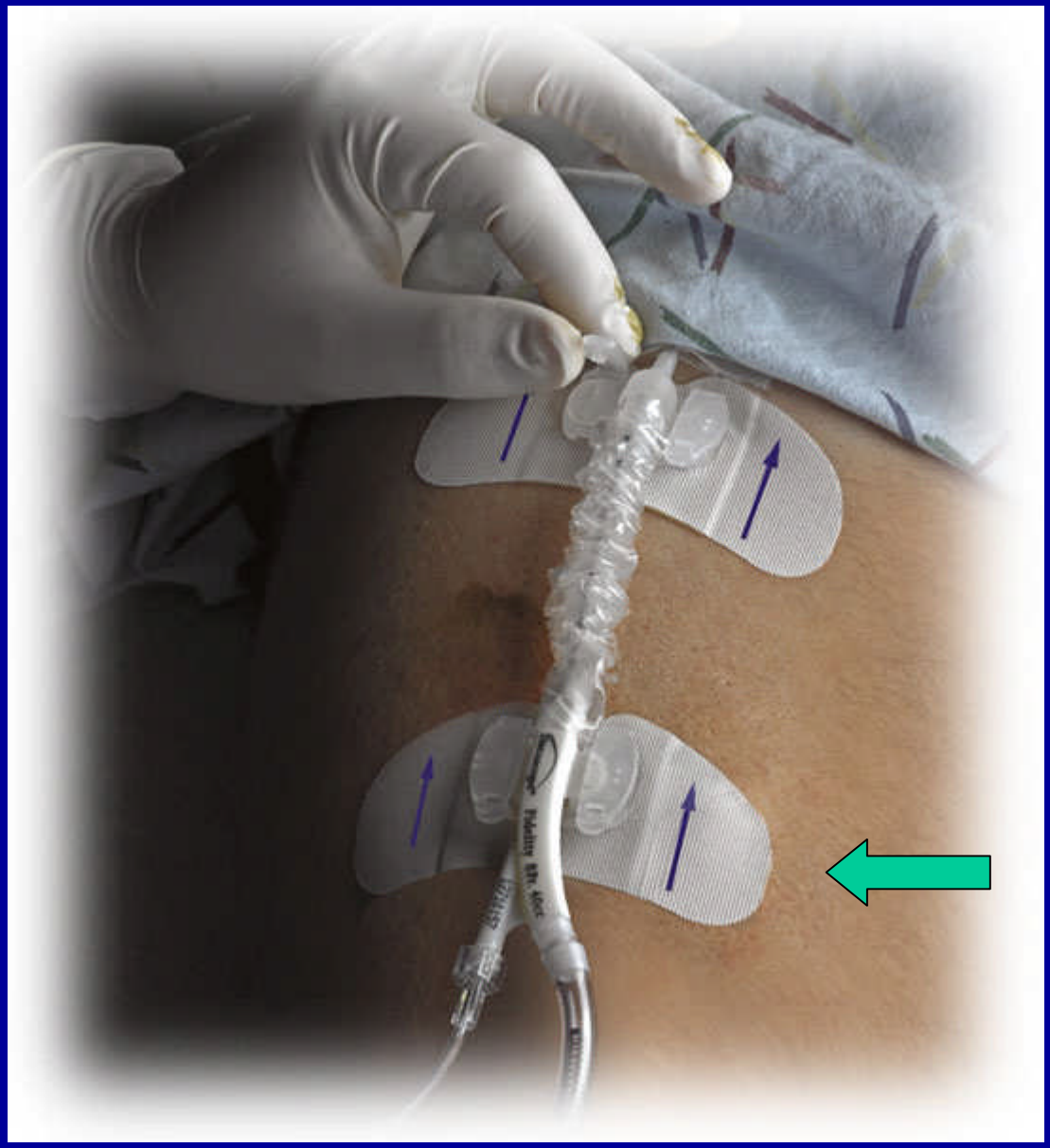





Too high
Ideal
Too low

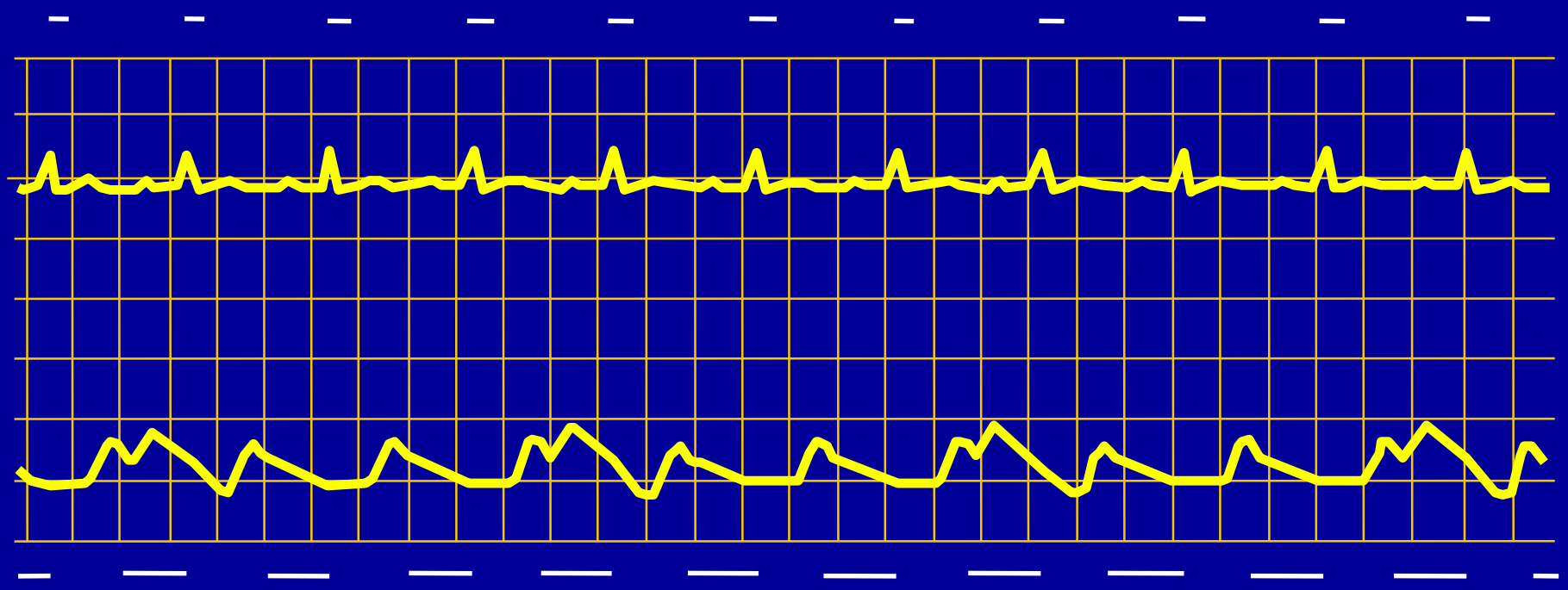

Too high
Ideal
Too low





StatLock

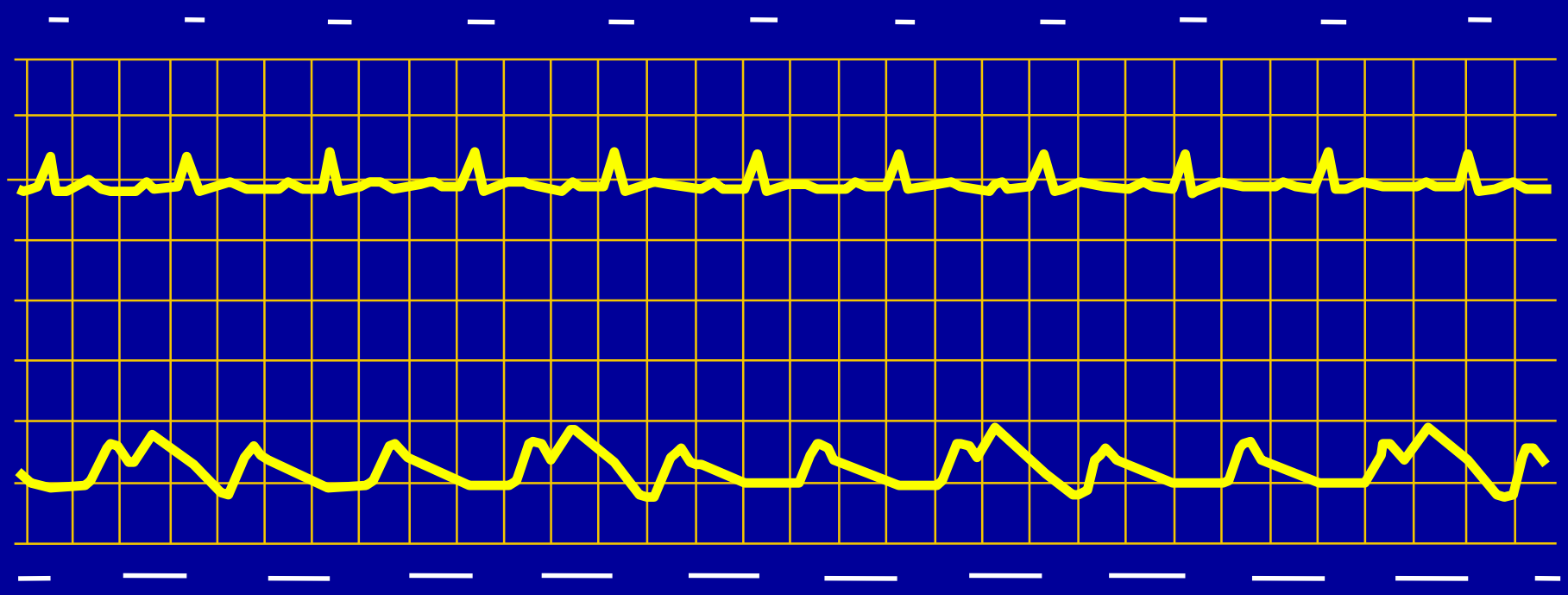
# TIMING



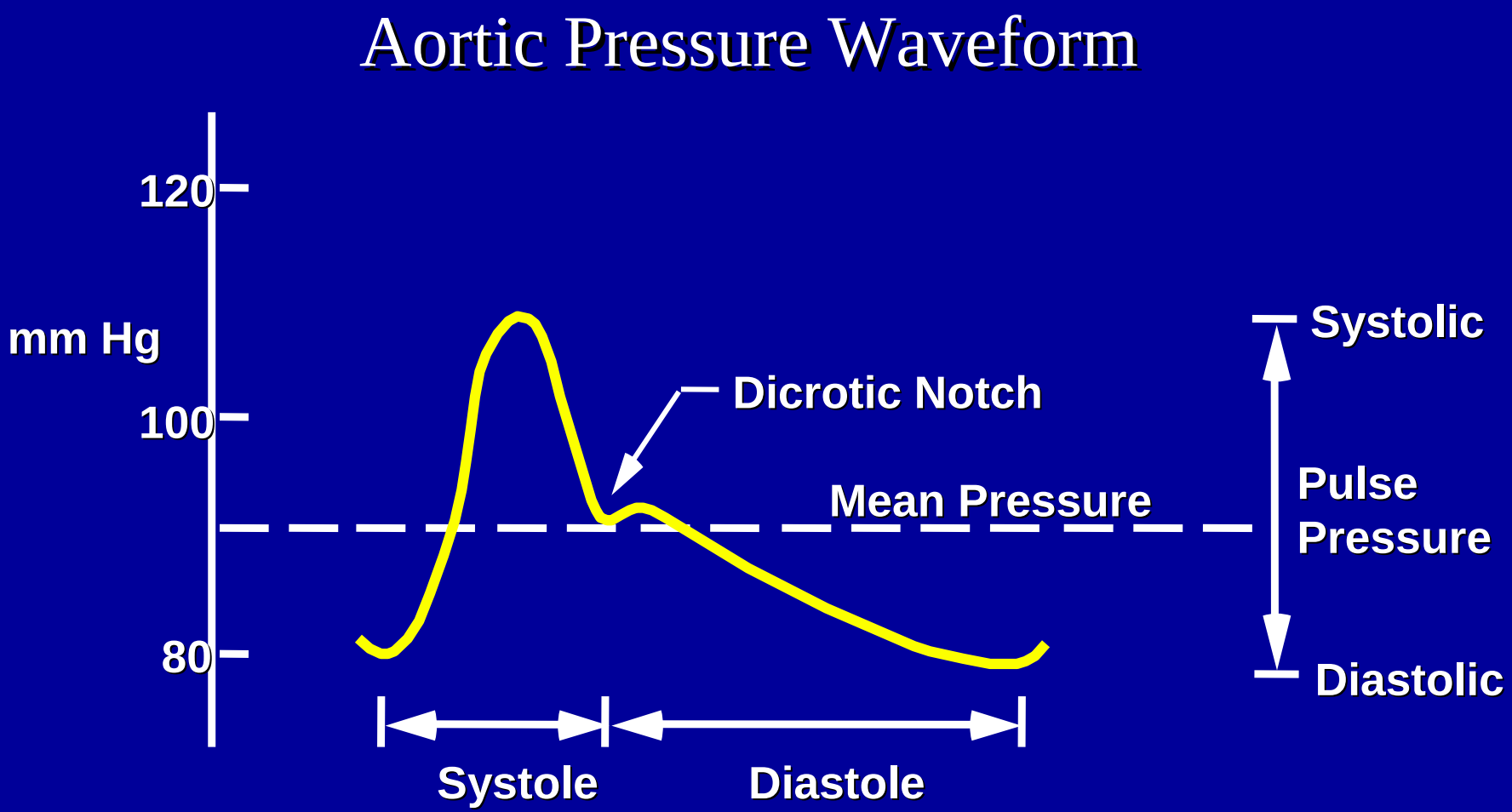
# **Timing** van de intra-aortale ballon

-Conventional timing

-R-Wave deflate timing

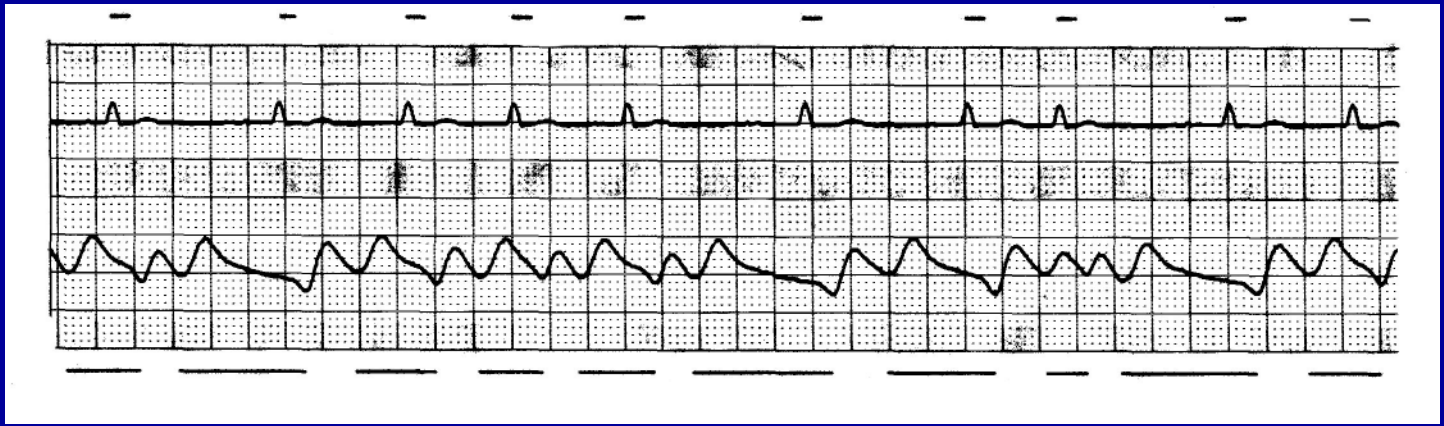


# Conventional timing: conventioneel timing is de lengte van de inflatie tijdens diastole

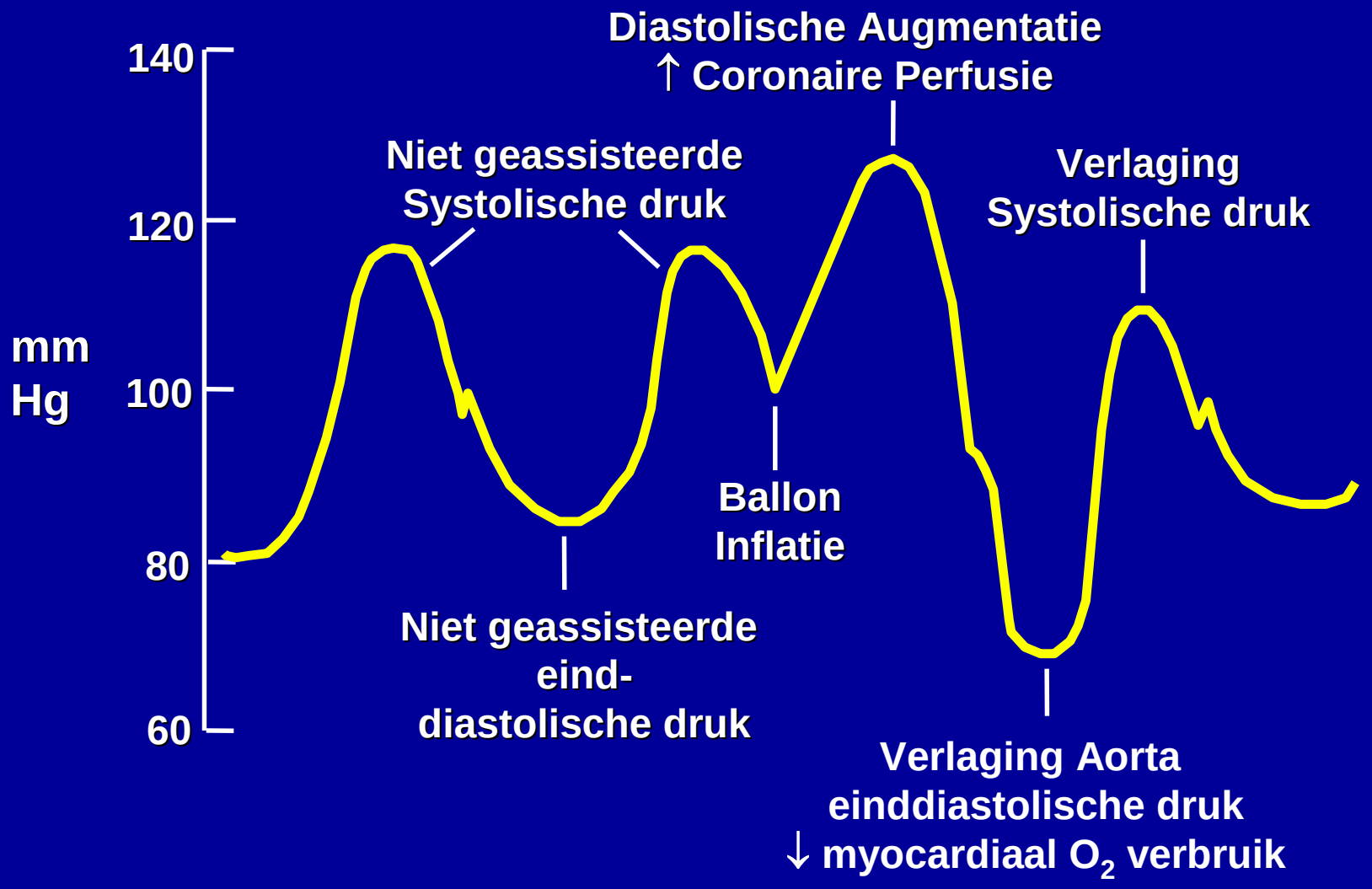


# R-Wave deflate:

R-Top deflatie timing is deflatie tijdens systole



# Arteriële Drukcurve Tijdens IABP Ondersteuning



# Factoren Diastolische Augmentatie beïnvloeden

1. Patiënt
   - Hartfrequentie
   - Slagvolume
   - Gemiddelde Arteriele Druk
   - SVR

2. IAB
   - IAB in sheath
   - IAB niet ontplooid
   - IAB positie
   - Knik in IAB catheter
   - IAB lek
   - Helium concentratie laag

3. IABP
   - Timing
   - Positie IAB
     augmentatie controle

# Onjuiste instelling - Vroege Inflatie

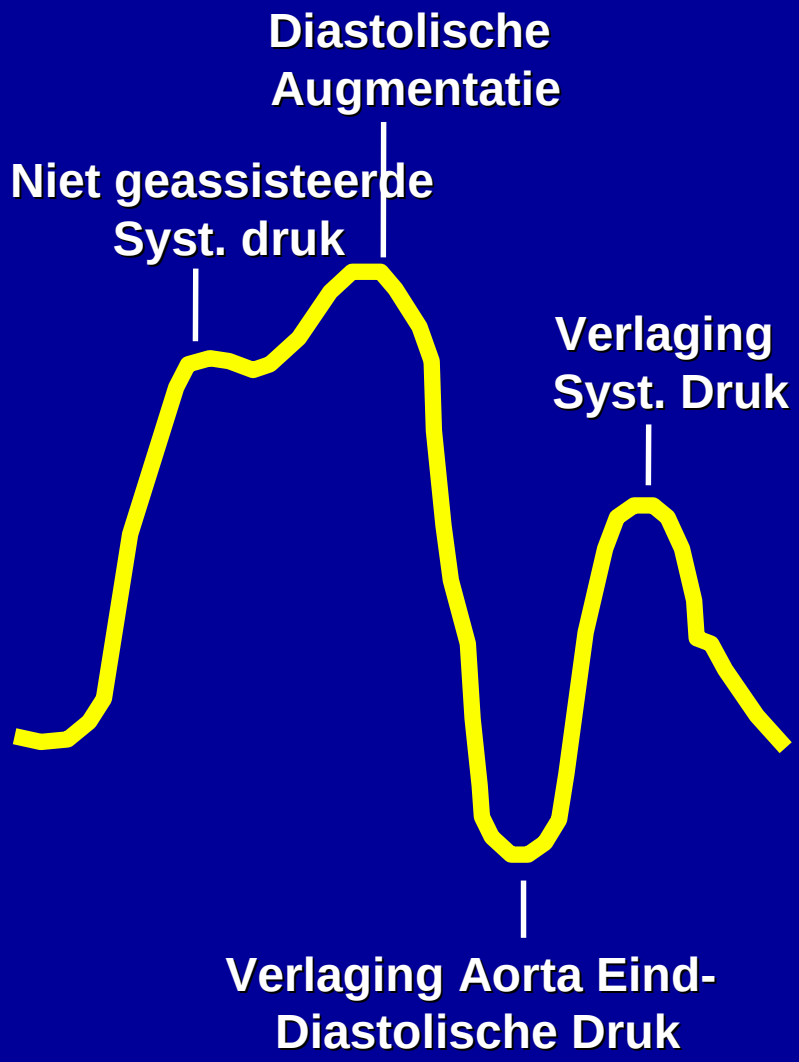
Inflatie van IAB voor sluiten van de aorta klep

**Invloed arteriële drukcurve:**

- Inflatie  IAB voor dicrotic notch
- Diastolische augmentatie begint in systole

**Physiologische Effecten:**

- Potentieel voortijdig sluiten  aortic klep
- Potentieel verhoging  LVEDV en LVEDP of PCWP
- verhoging afterload
- Aortic regurgitation
- verhoging $MVO_2$ verbruik



# Inflatie te laat

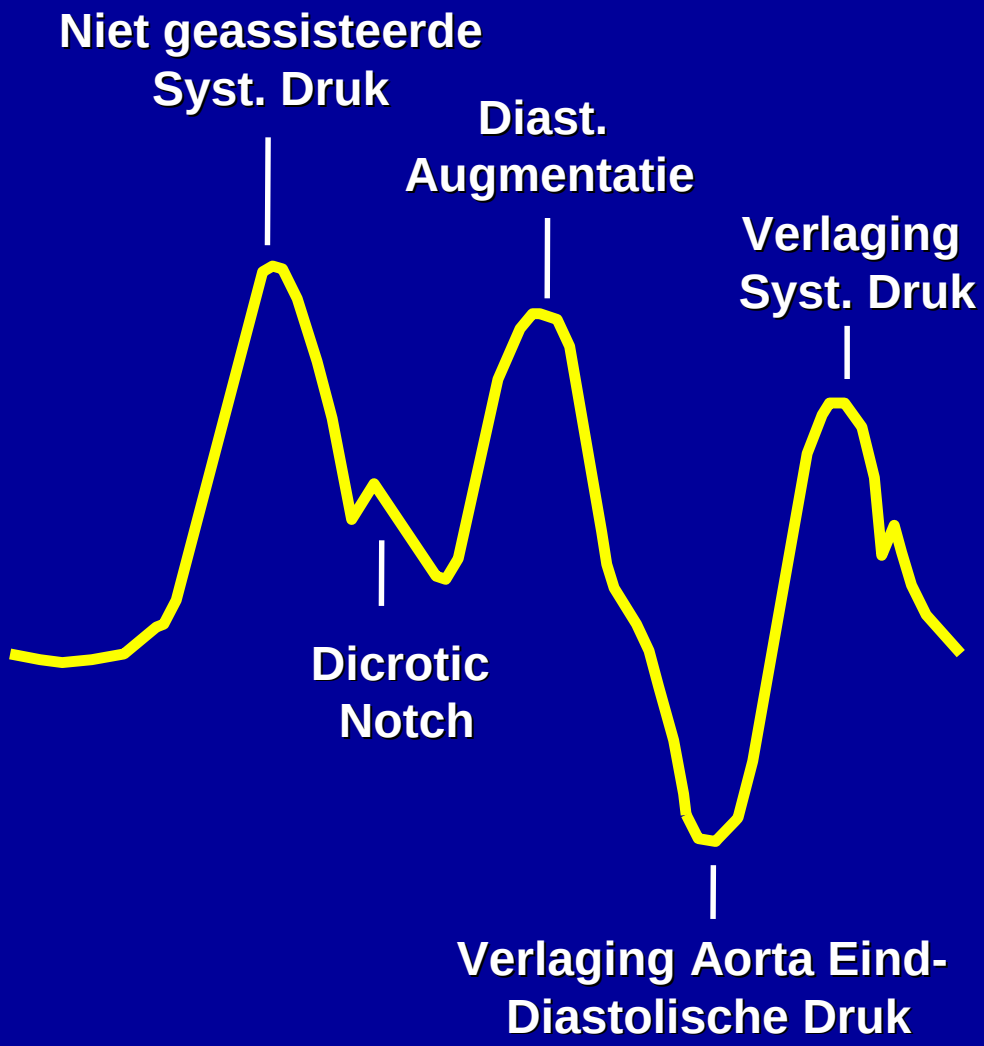
Inflatie IAB naar sluiting aorta klep

**Invloed arteriële drukcurve:**

- Inflatie IAB na de dicrotic notch
- Geen scherp V
- lage augmentatiedruk

**Physiologische Effecten:**

- verlaging coronaire perfusiedruk



# Onjuiste instelling - Vroeg Deflatie

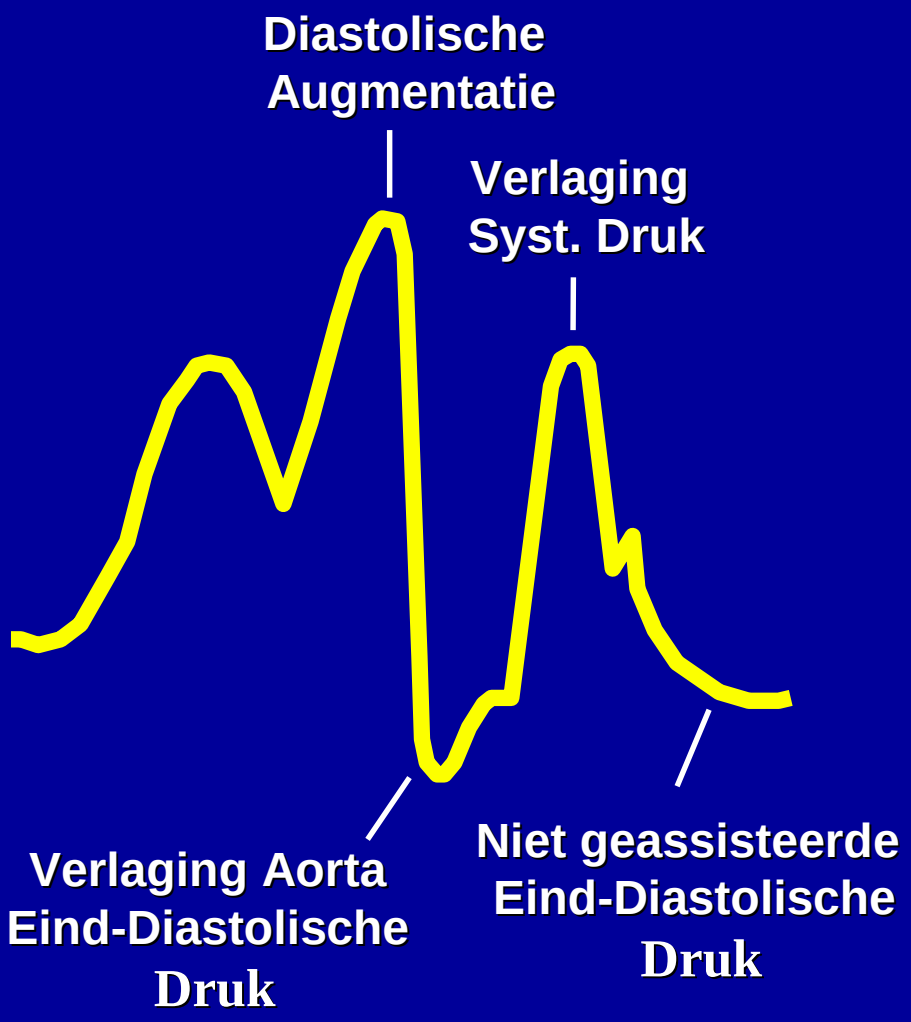
Te vroeg deflatie tijdens diastole

**Invloed arteriële drukcurve:**

- Deflatie IAB gezien als scherpe daling na diastolische augmentatie
- Niet-optimaal diastolische augmentatie
- Geassisteerde aorta eind-diastolische druk zelfde of lager dan niet-geassisteerde aorta eind-diastolische druk.
- Geassisteerde systolische druk kan stijgen

**Physiologische Effecten:**

- Niet-optimale coronaire perfusie
- Potentiëel risico voor retrograde flow (coronaire en carotis)
- Angina als resultaat van retrograde coronaire flow
- Niet-optimaal afterloadreductie



# Deflatie te laat

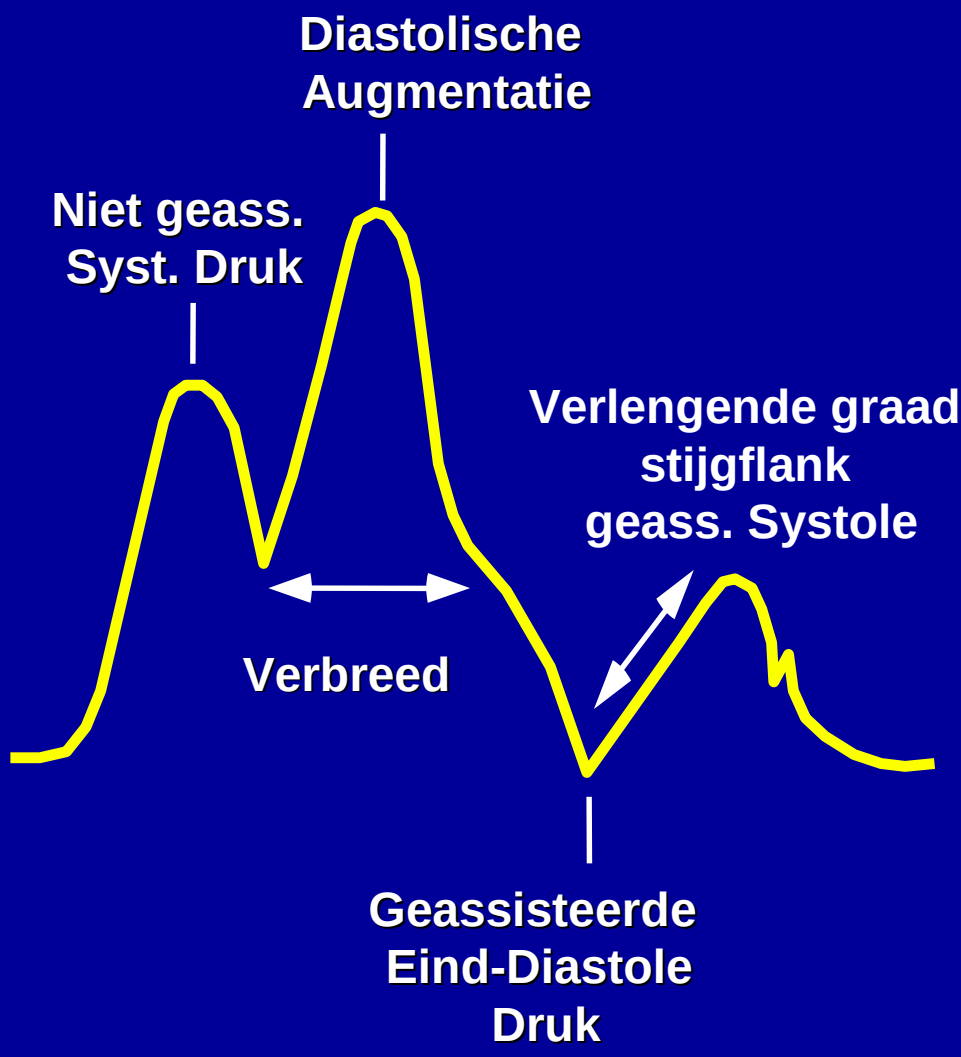
Deflatie IAB tijdens opening aorta klep

**Invloed op arteriële drukcurve:**

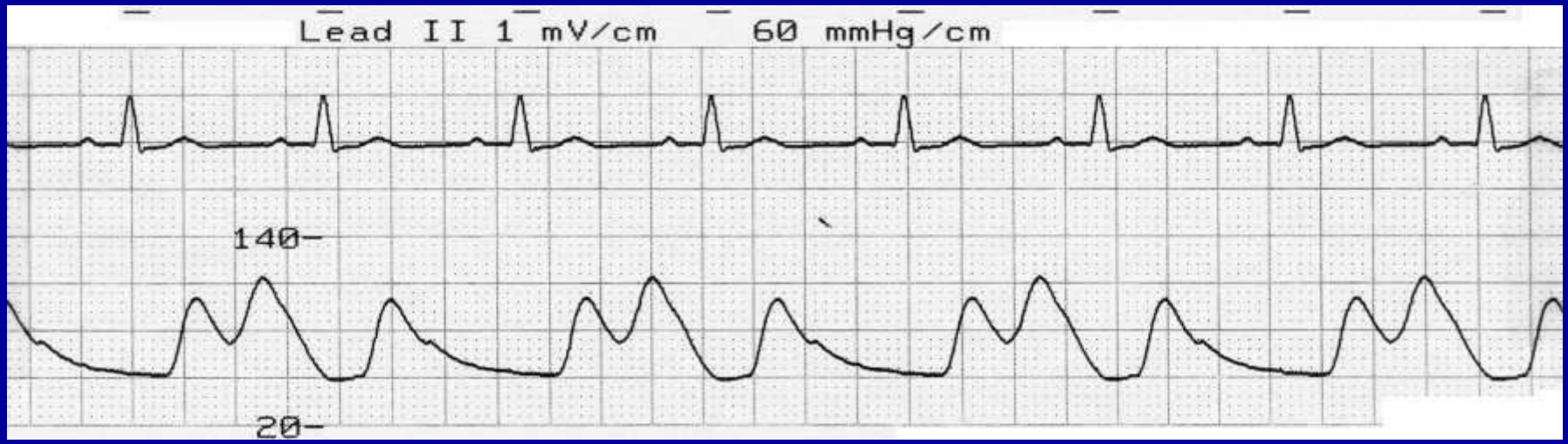
- geassisteerde eind-diastolische druk het zelfde of hoger als niet geassisteerde eind-diastolische druk
- Diastolische augmentatie verbreed

**Physiologische Effecten:**

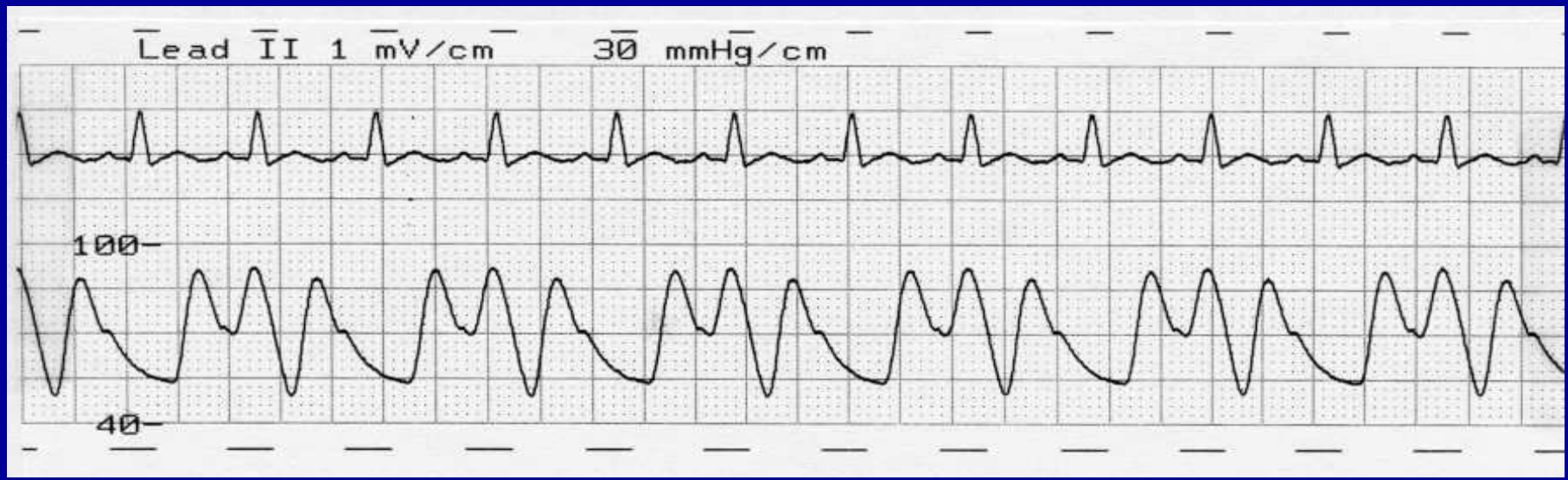
- Geen afterloadreductie
- Verhoging $MVO_2$ verbruik
- IAB verhinderd ventrikel ejectie



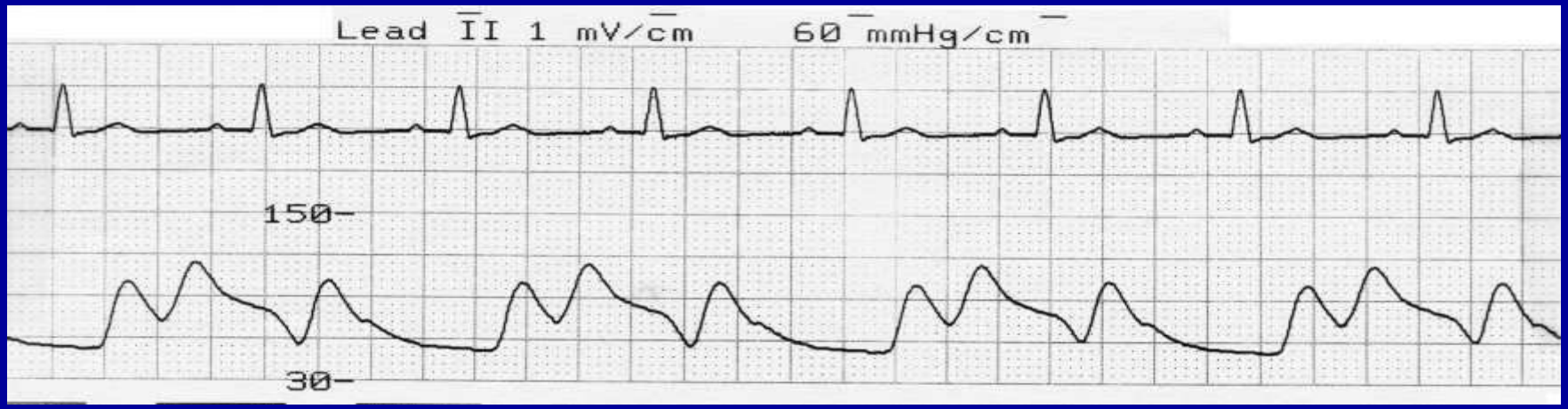
**A**



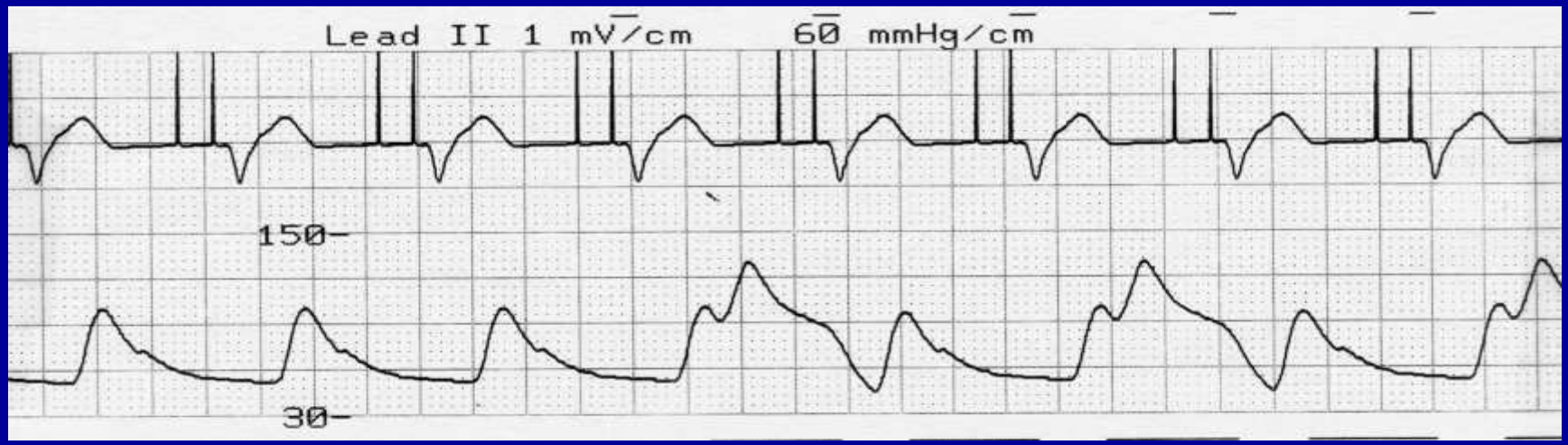

**B**



C




D



# Verpleegkundige Zorg



# Complicaties

- Been ischemie
- Bloeding vanuit de insteekopening
- Thrombocytopenie
- Immobiliteit van de IAB
- Ballonlek
- Infectie
- Dissectie van de aorta
- Interstitiëel oedeem

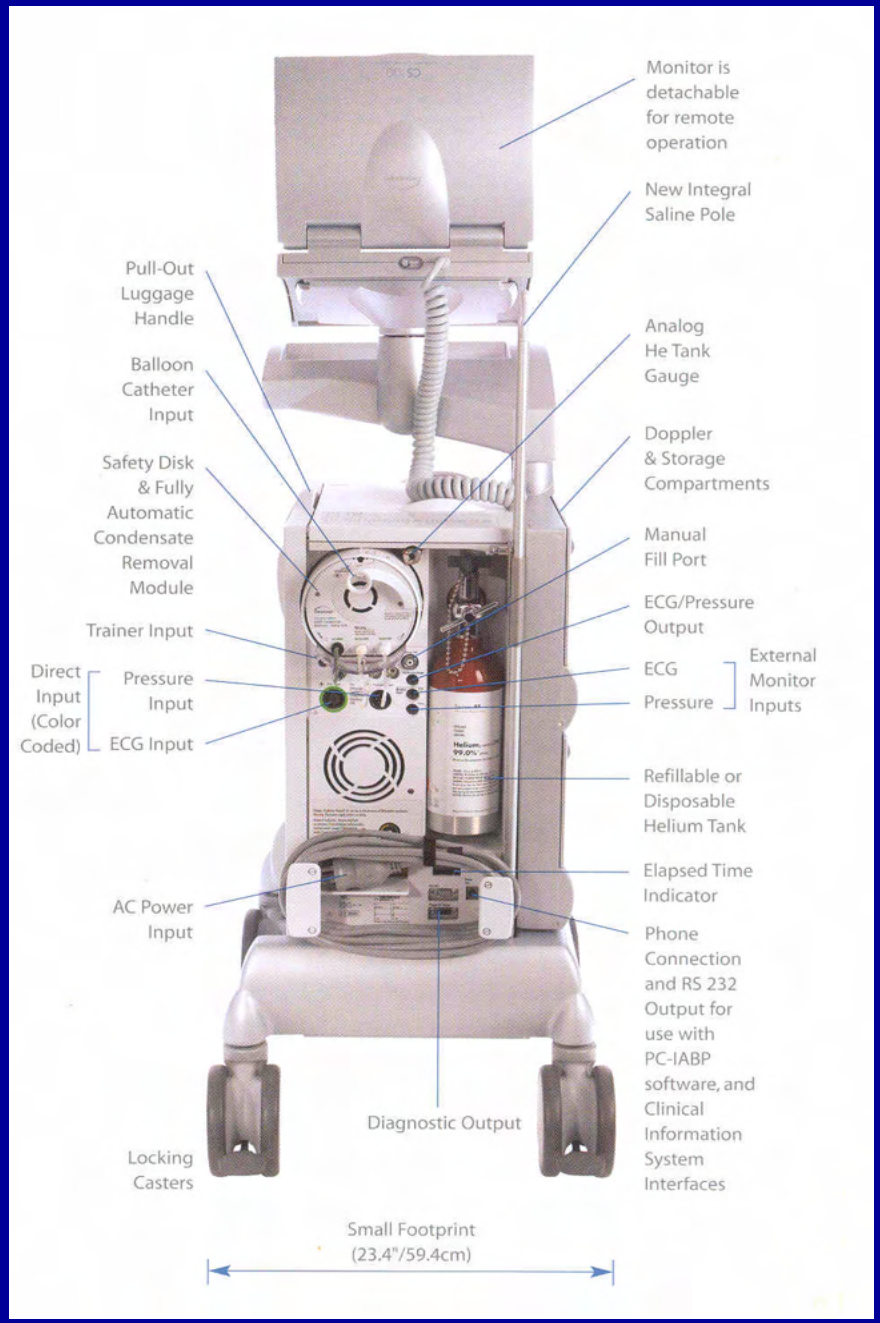
# TECHNISCHE

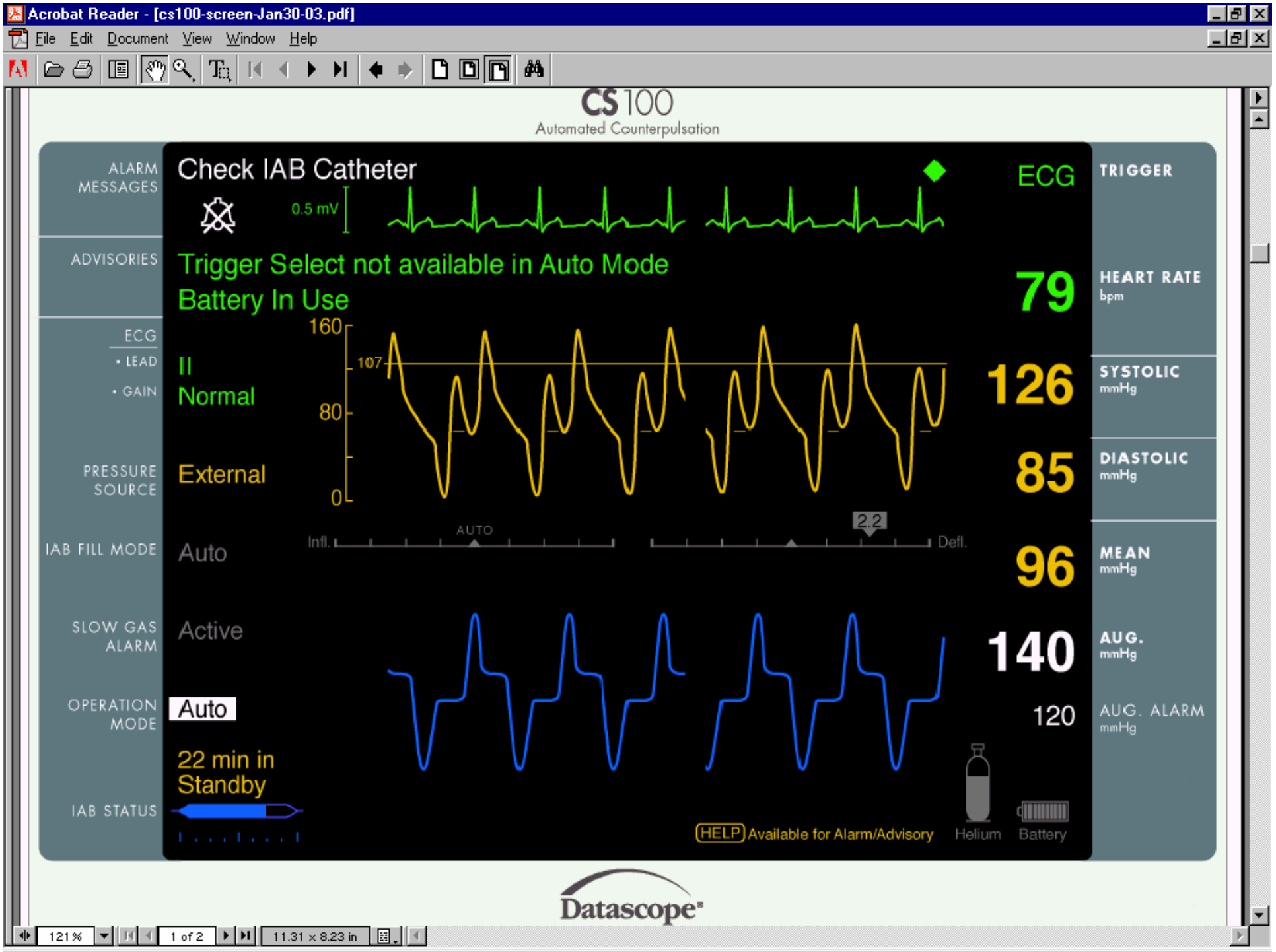
# ASPECTEN

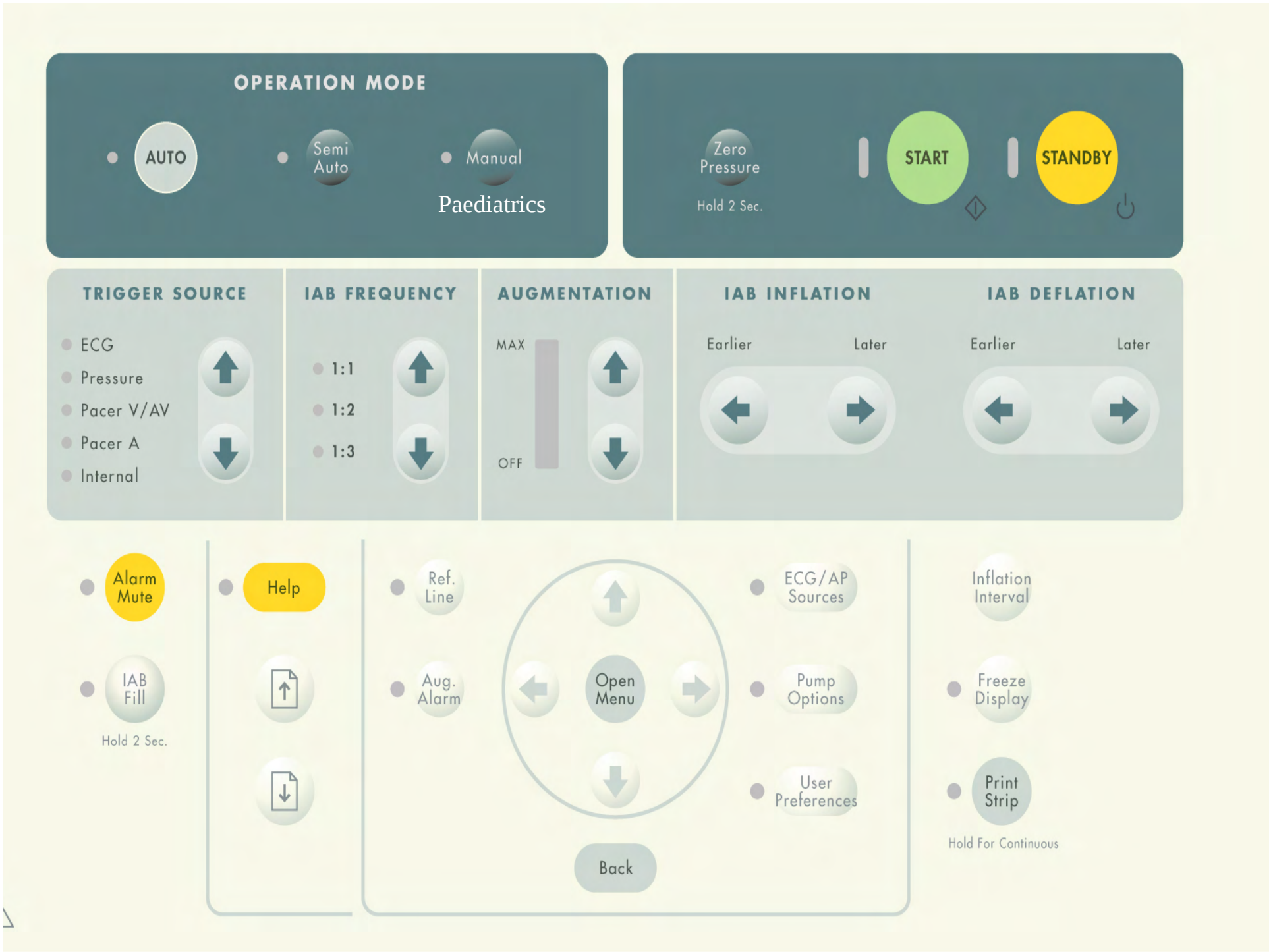




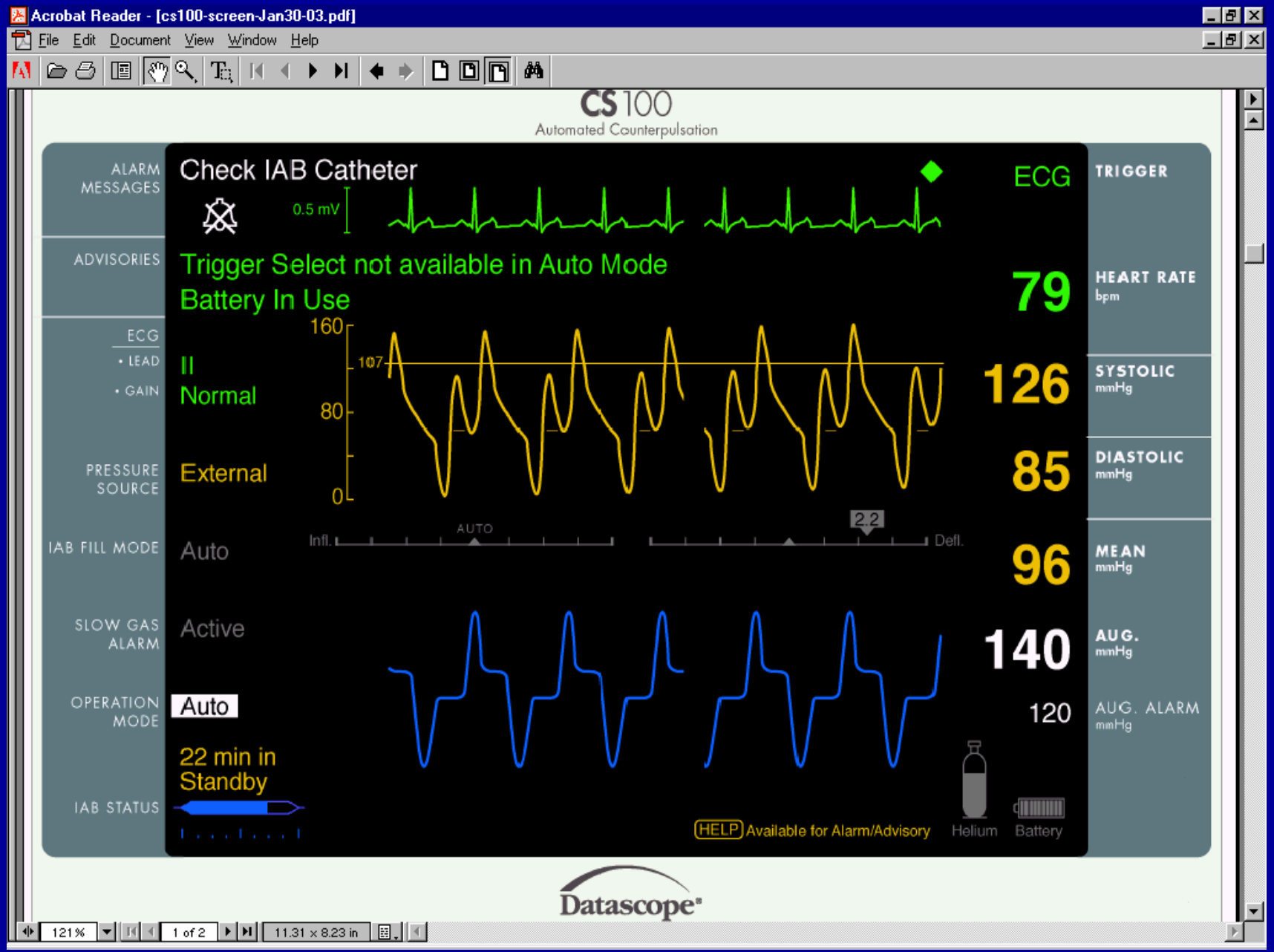



Monitor is detachable for remote operation
New Integral Saline Pole
Pull-Out Luggage Handle
Balloon Catheter Input
Analog He Tank Gauge
Safety Disk & Fully Automatic Condensate Removal Module
Doppler & Storage Compartments
Manual Fill Port
ECG/Pressure Output
Trainer Input
Direct Input (Color Coded)
Pressure Input
ECG Input
ECG
Pressure
External Monitor Inputs
Refillable or Disposable Helium Tank
Elapsed Time Indicator
AC Power Input
Phone Connection and RS 232 Output for use with PC-IABP software, and Clinical Information System Interfaces
Diagnostic Output
Locking Casters
Small Footprint (23.4"/59.4cm)


Acrobat Reader - [cs100-screen-Jan30-03.pdf]
File Edit Document View Window Help
CS 100
Automated Counterpulsation
ALARM MESSAGES
Check IAB Catheter
0.5 mV
ECG
TRIGGER
ADVISORIES
Trigger Select not available in Auto Mode
Battery In Use
79
HEART RATE
bpm
ECG
• LEAD
II
• GAIN
Normal
160
107
80
0
126
SYSTOLIC
mmHg
PRESSURE SOURCE
External
85
DIASTOLIC
mmHg
IAB FILL MODE
Auto
AUTO
2.2
Infl.
Defl.
96
MEAN
mmHg
SLOW GAS ALARM
Active
140
AUG.
mmHg
OPERATION MODE
Auto
120
AUG. ALARM
mmHg
22 min in Standby
IAB STATUS
HELP Available for Alarm/Advisory
Helium
Battery
Datascope
121 %
1 of 2
11.31 x 8.23 in


OPERATION MODE
AUTO
Semi Auto
Manual
Paediatrics
Zero Pressure
Hold 2 Sec.
START
STANDBY
TRIGGER SOURCE
ECG
Pressure
Pacer V/AV
Pacer A
Internal
IAB FREQUENCY
1:1
1:2
1:3
AUGMENTATION
MAX
OFF
IAB INFLATION
Earlier
Later
IAB DEFLATION
Earlier
Later
Alarm Mute
IAB Fill
Hold 2 Sec.
Help
Ref. Line
Aug. Alarm
Open Menu
Back
ECG/AP Sources
Pump Options
User Preferences
Inflation Interval
Freeze Display
Print Strip
Hold For Continuous

# ALARMERINGEN



## ALARM MESSAGES:

### 1. Trigger Alarms

### AUTO MODE

- No Trigger
- Poor Signal Persists

### SEMI-AUTO or MANUAL MODE

- No Trigger / ECG triggering loss
- No Pressure Trigger / Pressure triggering loss
- Check Pacer Timing
- Trigger Interference

## 2. Catheter Alarms

- Leak in IAB Circuit / possible Helium leak
- Rapid Gas Loss / large helium leak
- IAB Disconnected / purge failure
- Check IAB Catheter / high pressure
- Blood Detected
- AutoFill Failure – No Helium / purge failure
- AutoFill Failure / purge failure
-AutoFill Required

## 3. Pneumatic Alarms and System Surveillance Alarms

**ADVISORY MESSAGES:**

**AUTO MODE**

**- Poor Signal Quality**

**- No Pressure Source Available**

**- Unable to update Timing**

**-IAB Optical Sensor Failure**

**- Drain Failure (all modes)**

**SEMI-AUTO or MANUAL**

**- Irregular pressure Trigger**

**- Verify Proper Timing**

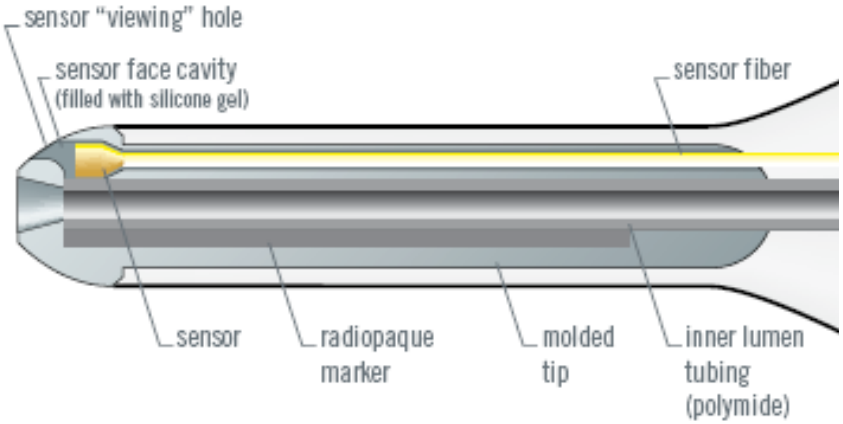
**- ECG Detected**

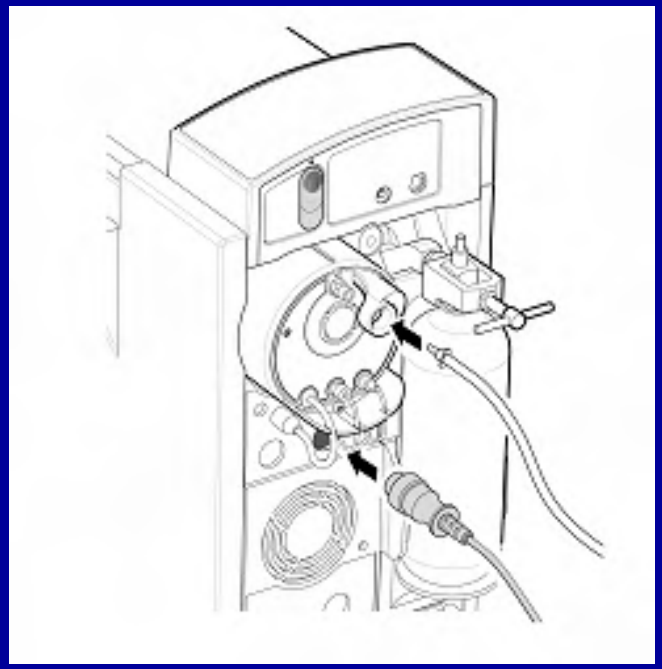

FERNO
OXY-CLIP



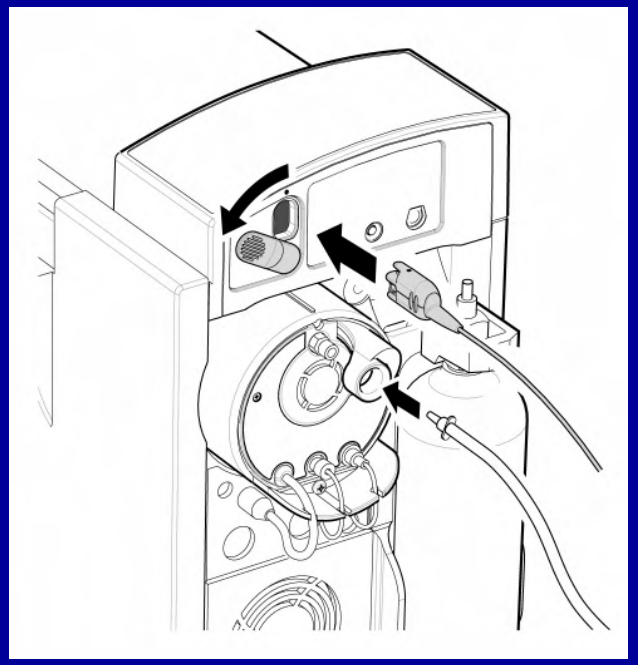


# IAB Fiber Optic Technology

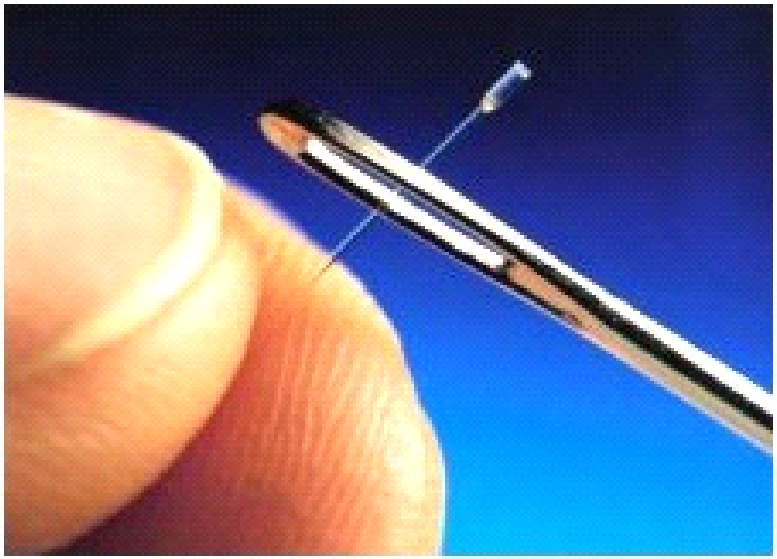


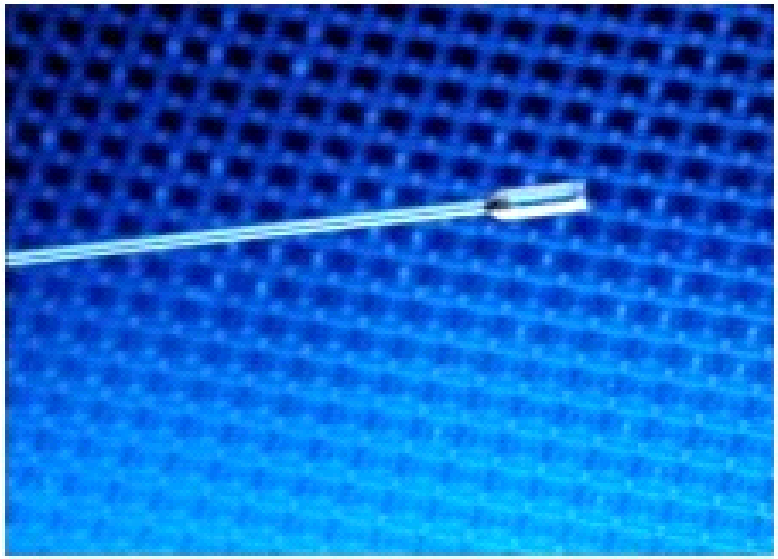


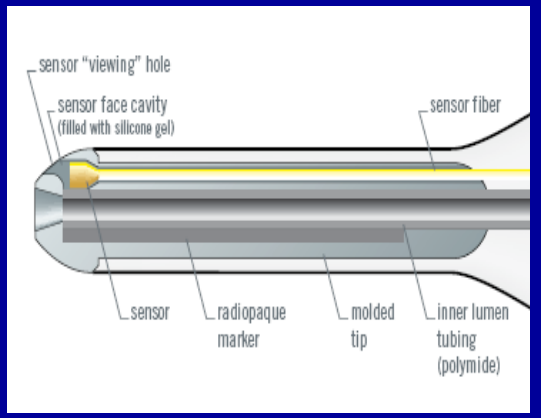
Conventional IAB



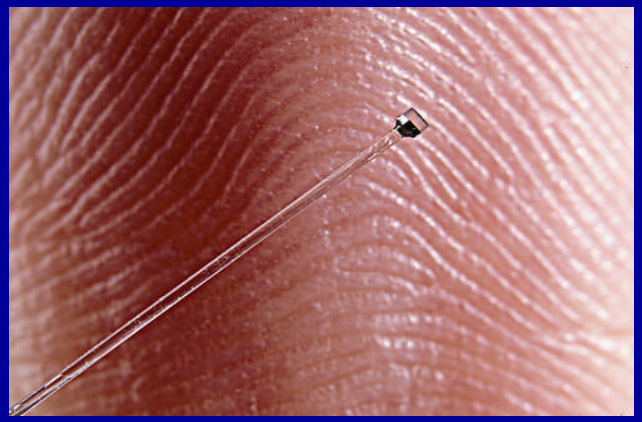
Sensation 7Fr. IAB






sensor "viewing" hole
sensor face cavity
(filled with silicone gel)
sensor fiber
sensor
radiopaque
marker
molded
tip
inner lumen
tubing
(polymide)







- Gebruik de KLEINSTE Intra-Aortale Ballon, 7Fr fiber optic balloon
- Niet nodig om de fiber optic ballon te nullen
- “Low level pressure output” direct verbinding met patient monitor
- Automatisch afleiding & Trigger Keuze
- Automatisch instelling van Inflatie and Deflatie Timing
- SNEL pneumatiek

- “Condensate Removal Module” verwijden van condensaat AUTOMATISCH
- Doppler
- “Help Screens”

*"In hospitals without direct angioplasty capabilities, stabilization with IABP and thrombolysis followed by transfer to a tertiary care facility may be the best management option"*

*(Hollenberg, et al, Ann. Intern. Med. 1999)*

***"Availability and use of the IABP is an important adjunct to heart attack care, and its appropriate usage is an important prerequisite for the transfer of hemodynamically unstable patients and for performing high-risk PCI safely and effectively on site"***

*Sinclair McNamara, Critical Pathways in Cardiology 2002*

