MONITORING IN A&ICM

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MONITORING

= observation and evaluation

- *Clinical* examination pt by inspection, palpation, percussion, auscultation
- *Laboratory*
- *By machine*, bedside, central, printing...

GLASGOW COMA SCALE

recording the conscious state

EYE OPENING:

Spontaneous	4
To voice	3
To pain	2
None	1

MOTOR RESPONSE:

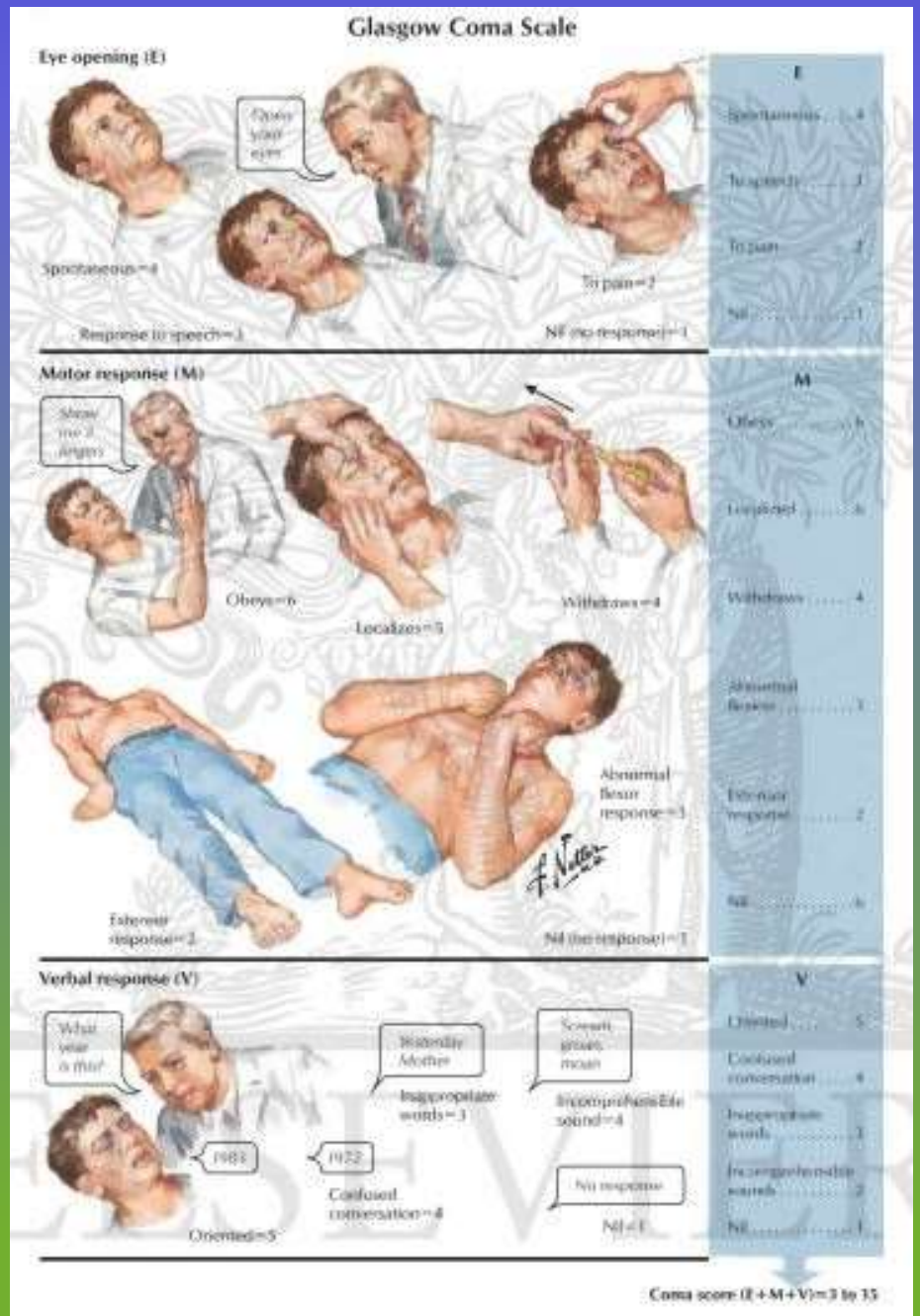
Obeys commands	6
Localizes pain	5
Withdraws (pain)	4
Flexion (pain)	3
Extension (pain)	2
None	1

VERBAL REPONSE:

Oriented	5
Confused	4
Inappropriate words	3
Incomprehensive w.	2
None	1

www.netterimages.com/image/7003.htm

Summa
max. 15 pts
min. 3 pts
cutt-of
concious-coma = 8



RAMSAY SEDATION SCALE

Awake:

1. Anxious and agitated or restless or both
2. Patient co-operative, orientated and tranquil
3. **Patient responds to commands only**

Asleep:

4. **Brisk response to a light glabellar tap or auditory stimulus**
5. Sluggish response to a light glabellar tap or auditory stimulus
6. No response to stimulus mentioned in items 4 & 5.

Ramsay MAE, Savege TM, Simpson BRJ, Goodwin R: Controlled Sedation with Alphaxalone-Alphadolone. *Br Med J 1974;2:656-659*

STEP 1 Sedation Assessment

RICHMOND AGITATION-SEDATION SCALE (RASS)

Scale	Label	Description
+4	COMBATIVE	Combative, violent, immediate danger to staff
+3	VERY AGITATED	Pulls to remove tubes or catheters; aggressive
+2	AGITATED	Frequent non-purposeful movement, fights ventilator
+1	RESTLESS	Anxious, apprehensive, movements not aggressive
0	ALERT & CALM	Spontaneously pays attention to caregiver
-1	DROWSY	Not fully alert, but has sustained awakening to voice (eye opening & contact >10 sec)
-2	LIGHT SEDATION	Briefly awakens to voice (eyes open & contact <10 sec)
-3	MODERATE SEDATION	Movement or eye opening to voice (no eye contact)

VOICE

If RASS is ≥ -3 proceed to CAM-ICU (Is patient CAM-ICU positive or negative?)

-4	DEEP SEDATION	No response to voice, but movement or eye opening to physical stimulation
-5	UNAROUSEABLE	No response to voice or physical stimulation

TOUCH

If RASS is -4 or -5 → STOP (patient unconscious), RECHECK later

Sessler, et al., Am J Repir Crit Care Med 2002, 166: 1338-1344 Ely, et al., JAMA 2003; 286, 2983-2991

VAS - SEVERITY OF PAIN EVALUATION

MAKE PAIN VISIBLE !

Acute pain ≤3
Chronic pain ≤2

- monitoring VAS (Husskison) (0 - 10)
- monitoring BP, P, RR
- dermatom level
- sedation Ramsay (1 - 6)
- motor resp. (Bromage)
- pt satisfaction control

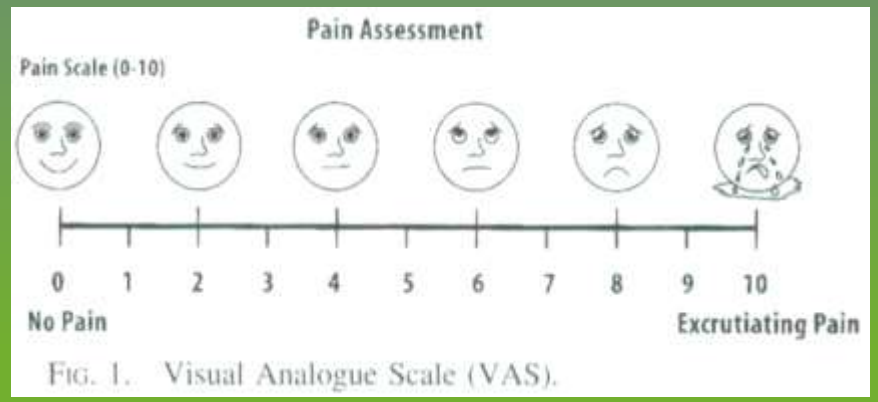
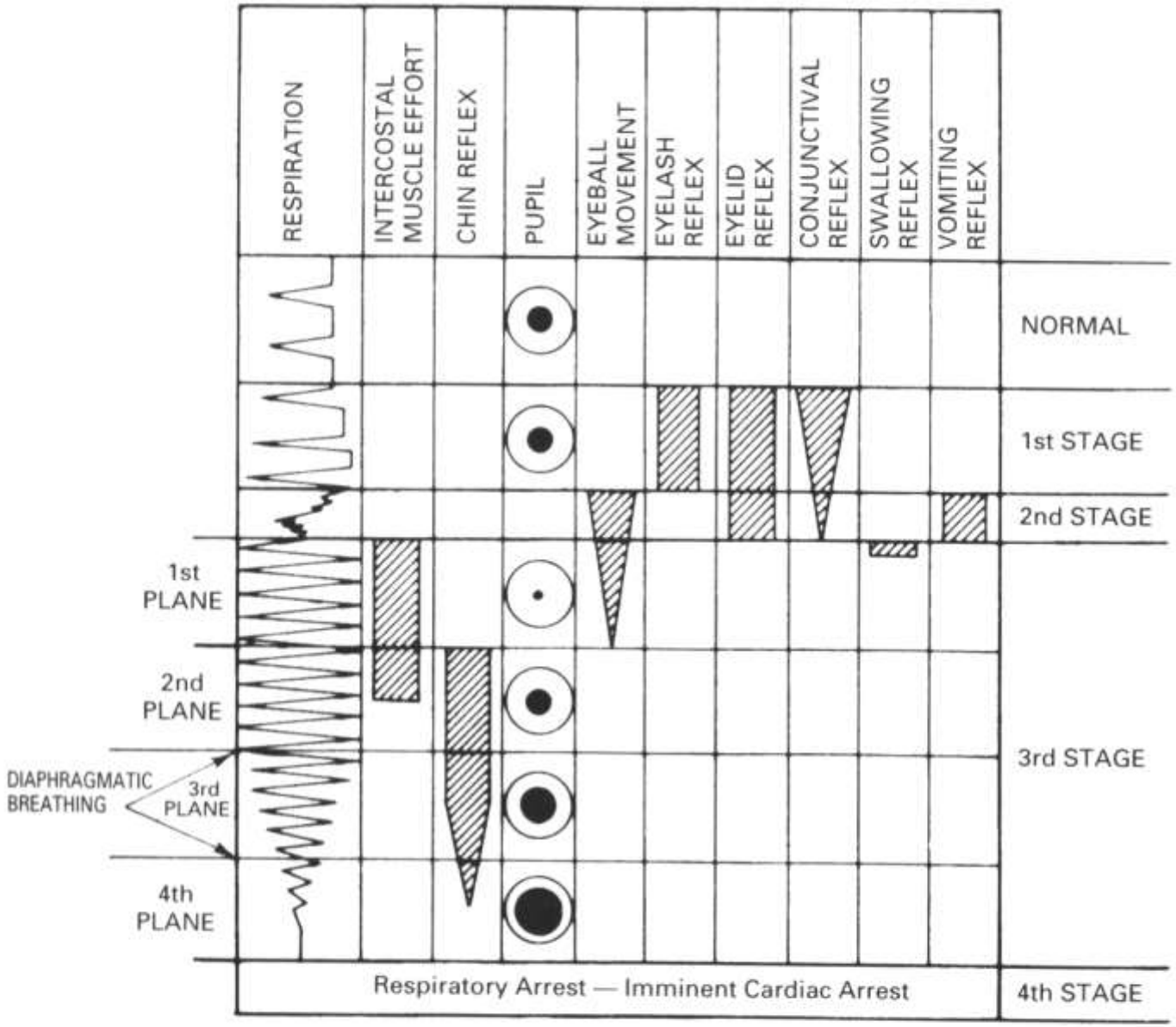


FIG. 1. Visual Analogue Scale (VAS).

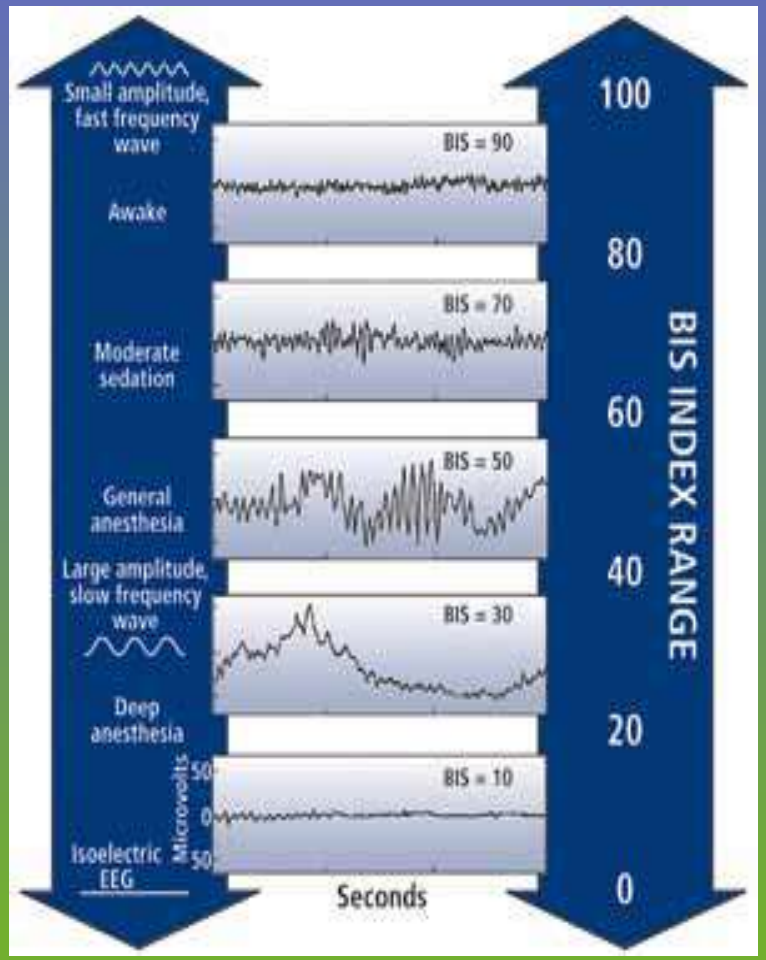
GUEDEL 1937



Stages and planes of anaesthesia (after Guedel 1937). Many of these signs may be used to estimate the depth of unconsciousness resulting from other causes, e.g. head injuries.

Campbell

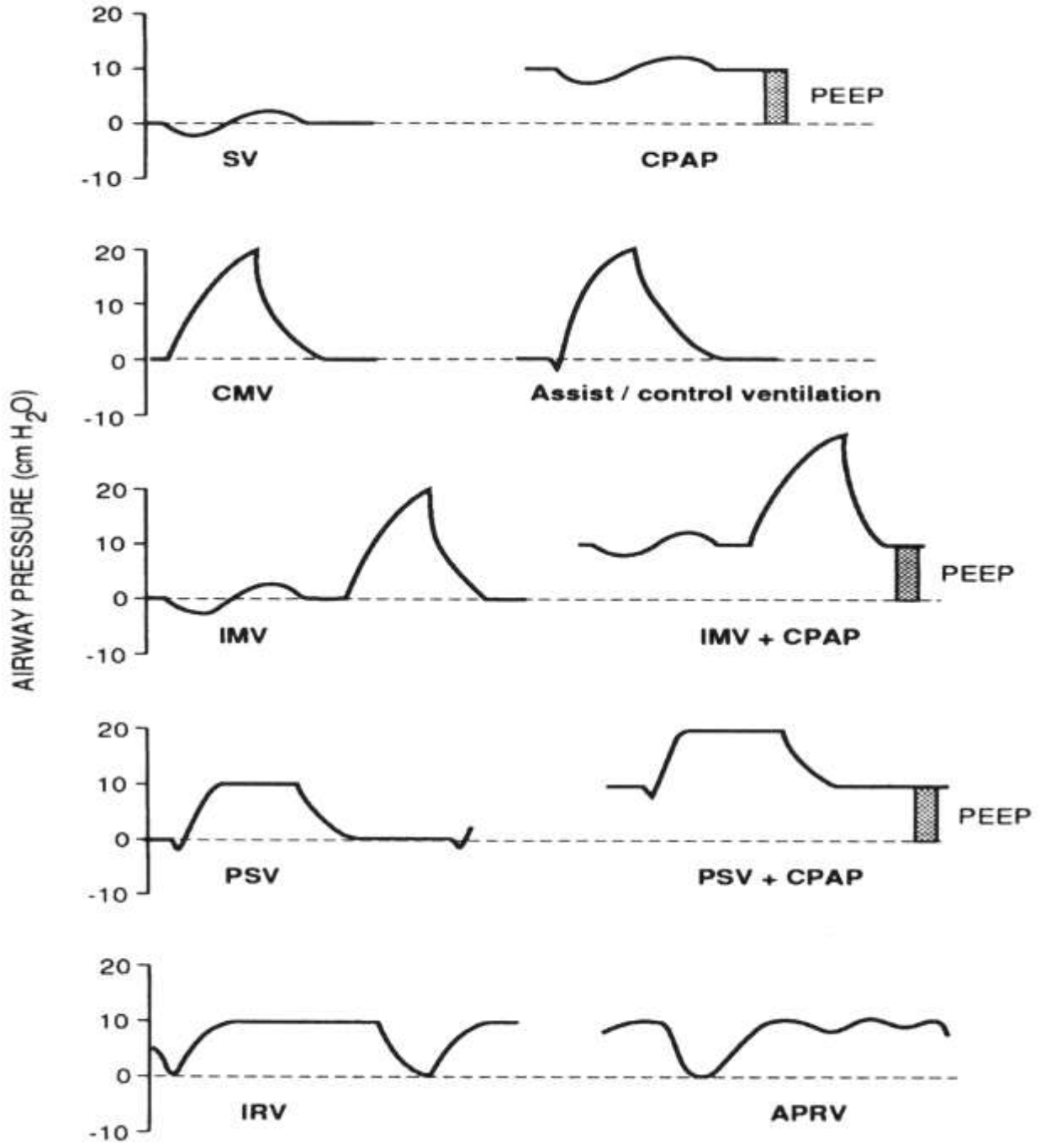
BISPECTRL INDEX Range (BIS)



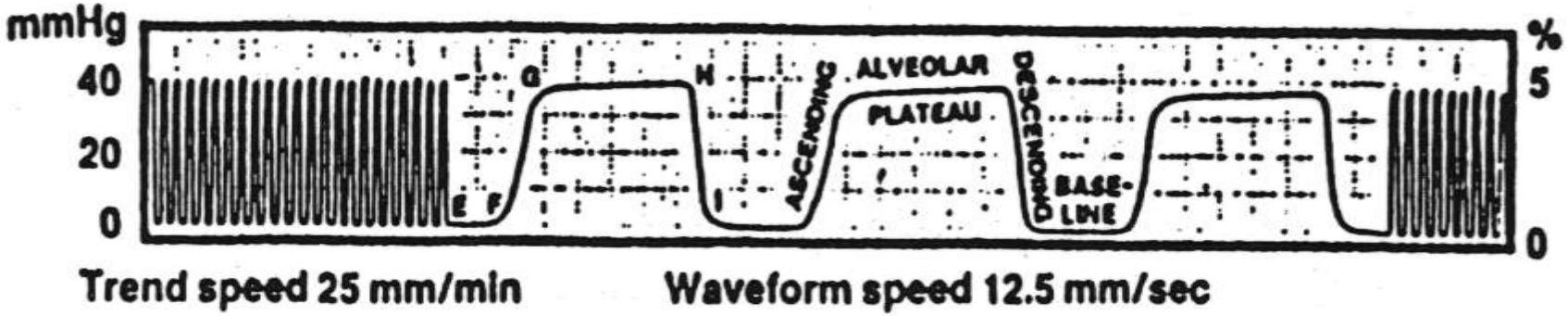
BIS	*Clinical status*
100	**Awake** • Responds to normal voice
80	Light/Moderate Sedation • May respond to loud commands
60	General Anesthesia • Low probability of explicit recall •Unresponsive to verbal stimulus
40	Deep Hypnotic State
20	Burst Suppression
0	Flat Line EEG

BREATHING

- f, V_t,
- V_{min}, P_{insp}, P_{exp},
- FiO_2, $EtCO_2$, (capnography),
- respir. curves and loops (V-P...)


AIRWAY PRESSURE (cm H_2O)
20
10
0
-10
SV
CPAP
PEEP
CMV
Assist / control ventilation
IMV
IMV + CPAP
PEEP
PSV
PSV + CPAP
PEEP
IRV
APRV

THE NORMAL CAPNOGRAM



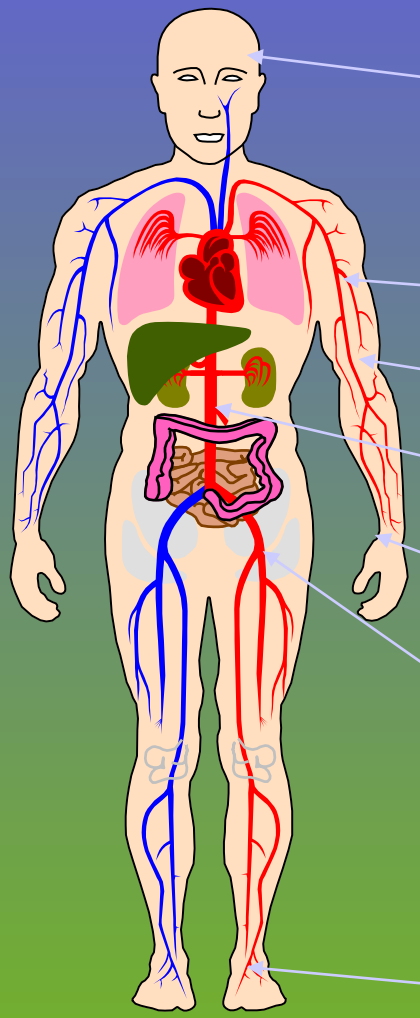
CAPNOGRAPHY = CO_2 in inspir. - expir. gases

- **ventilation**
- **circulation**
- **metabolism**

CIRCULATION

- ECG (arrhythmias, shape), arterial BP syst. diast, mean, non-invasive, invasive.
- Haemodynamics monitoring (S-G catheter, termodilution): CVP, AP, PA, PCWP, LAP,
- CO, SV, LVSW, SVR, PVR, indexes...
- Arrhythmia monitoring, Holter, telemetry, pulse palpation (sites a quality).
- S_aO_2, S_vO_2, $S_{vc}O_2$, S_pO_2, $p_{tc}O_2$,

SITES OF ARTERY CANNULATION



temporal
superficial a.

axillar a.

brachial a.

umbilical a.

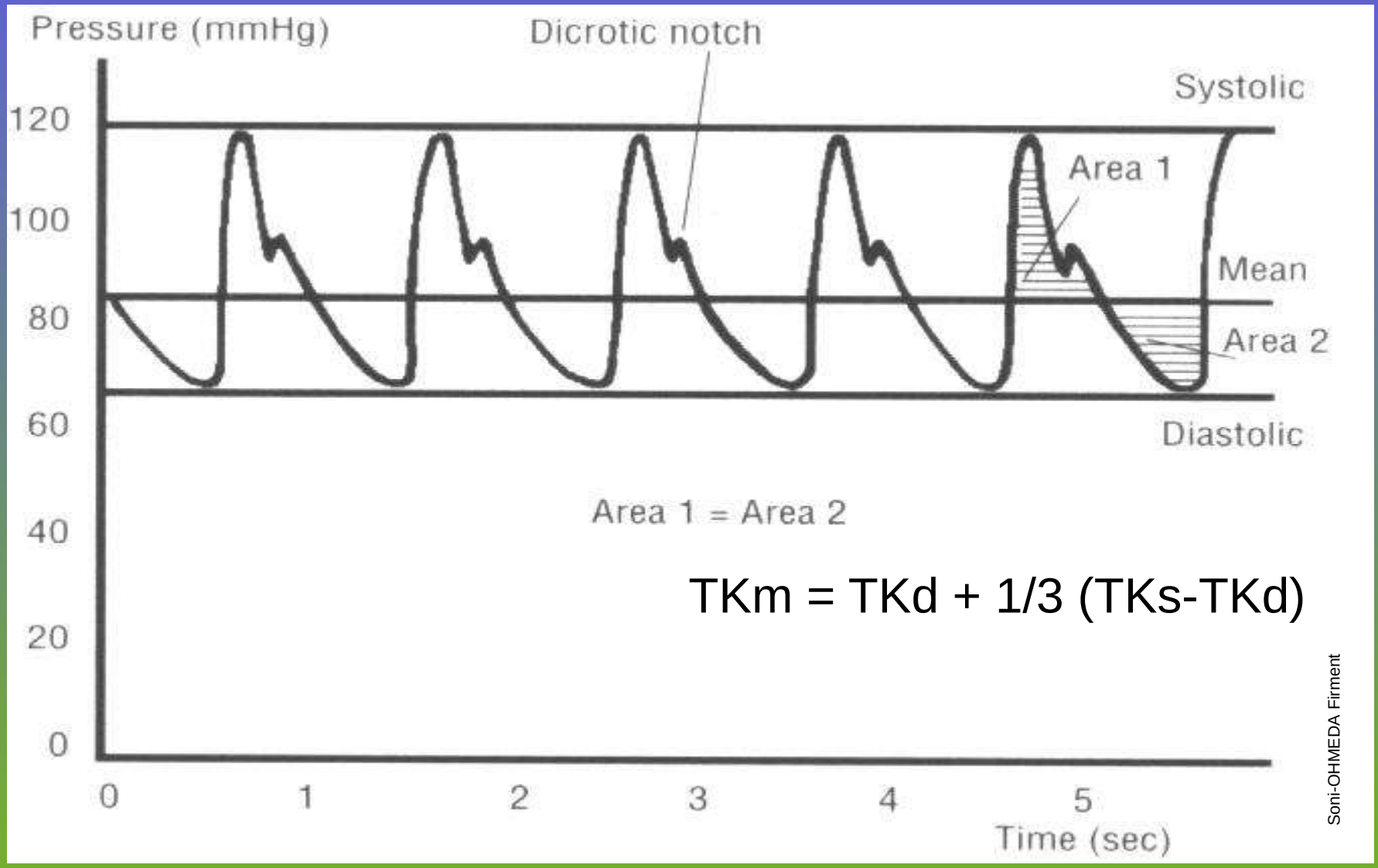
radial a.

ulnar a.

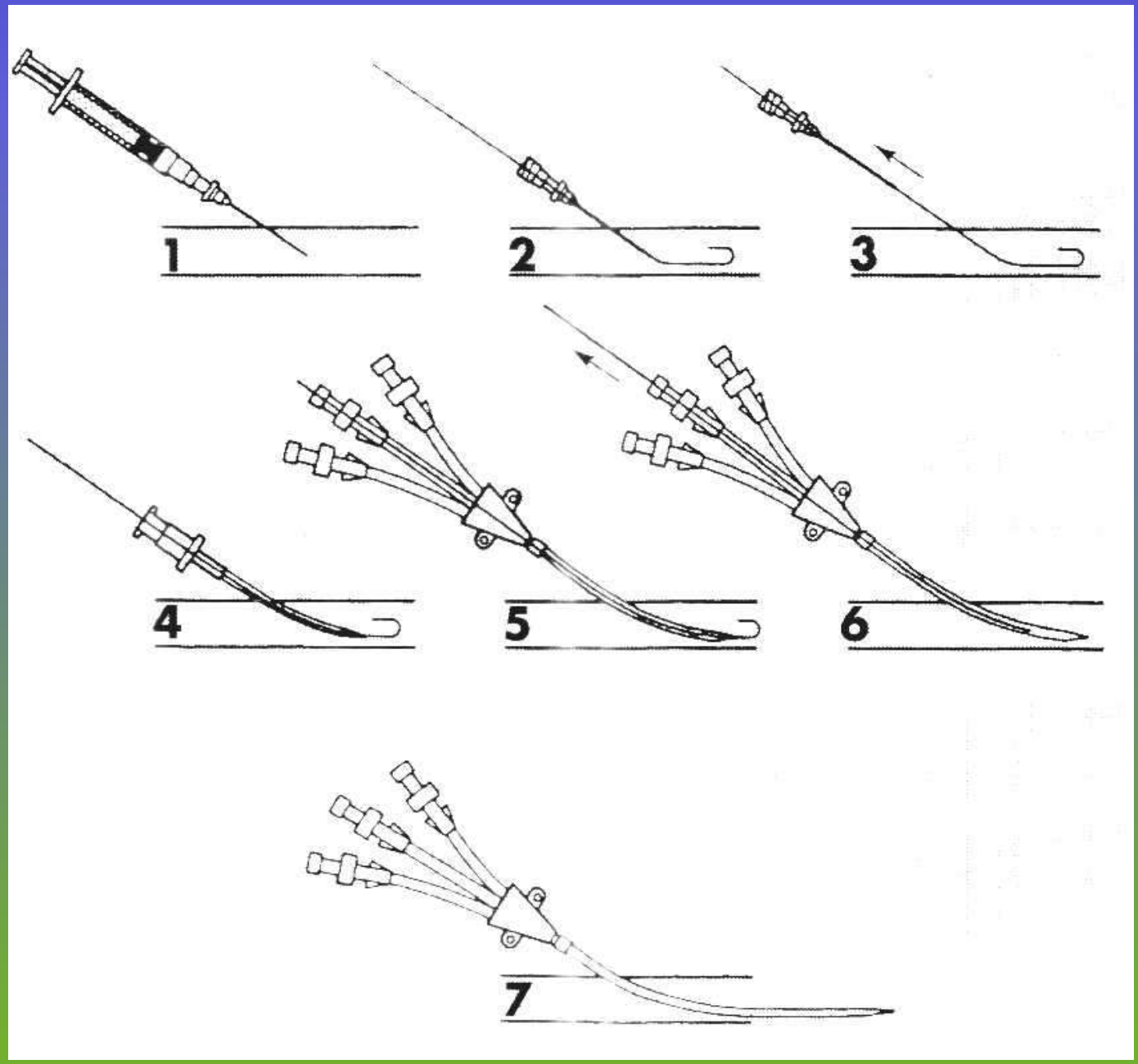
femoral a.

dorsal foot a.

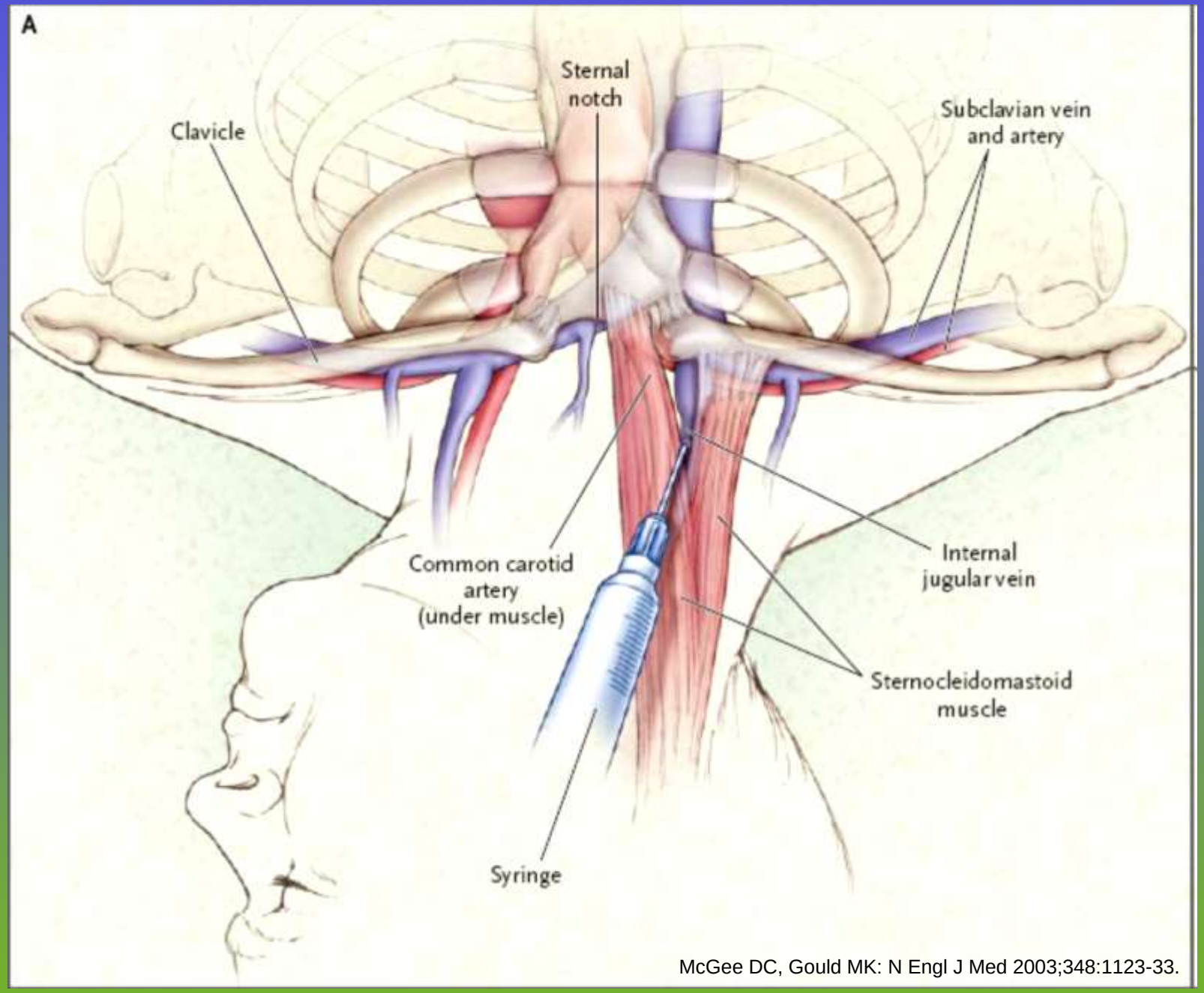
MEAN ARTERIAL PRESSURE



Seldinger technique

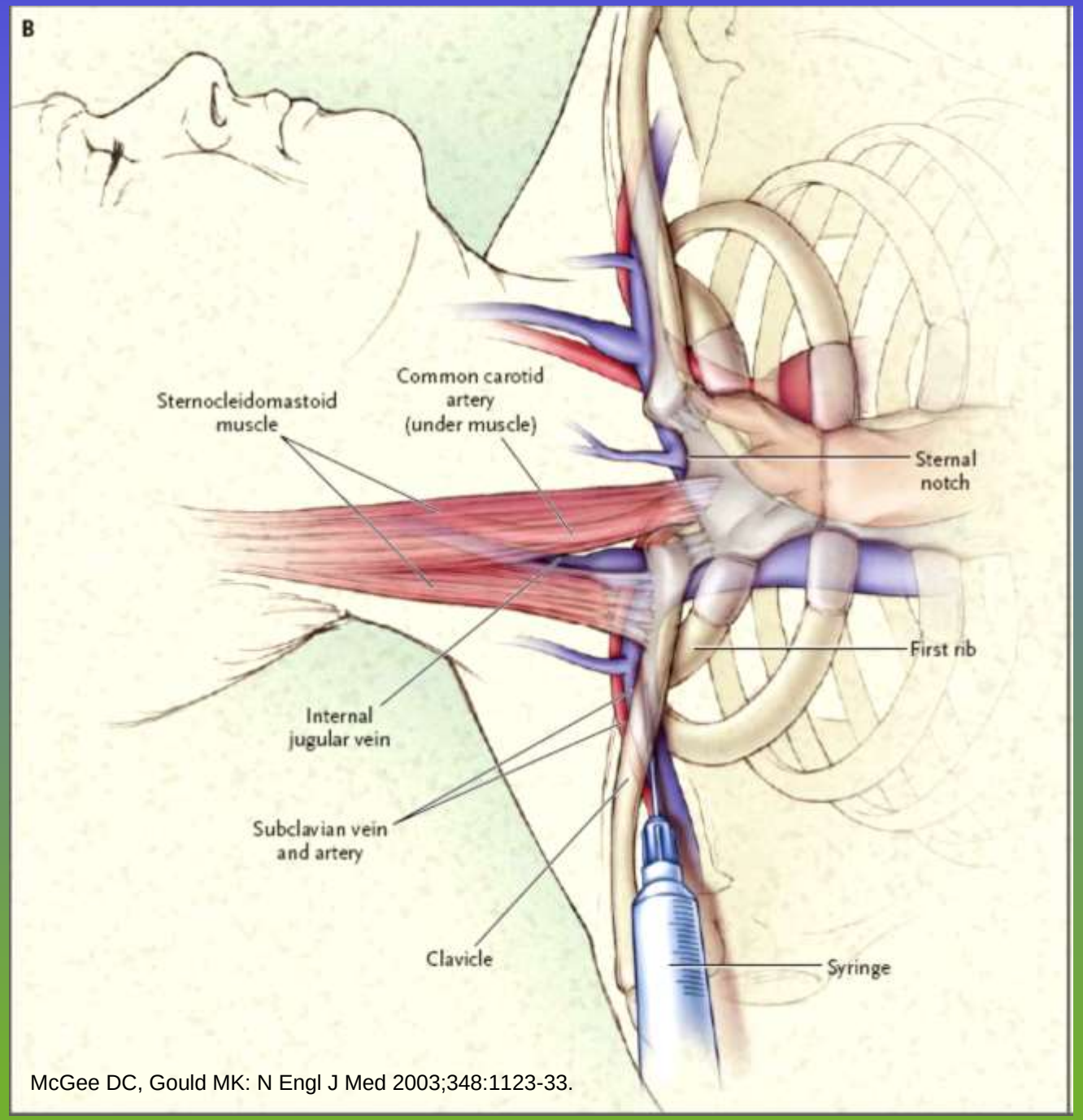


CENTRAL VEINS

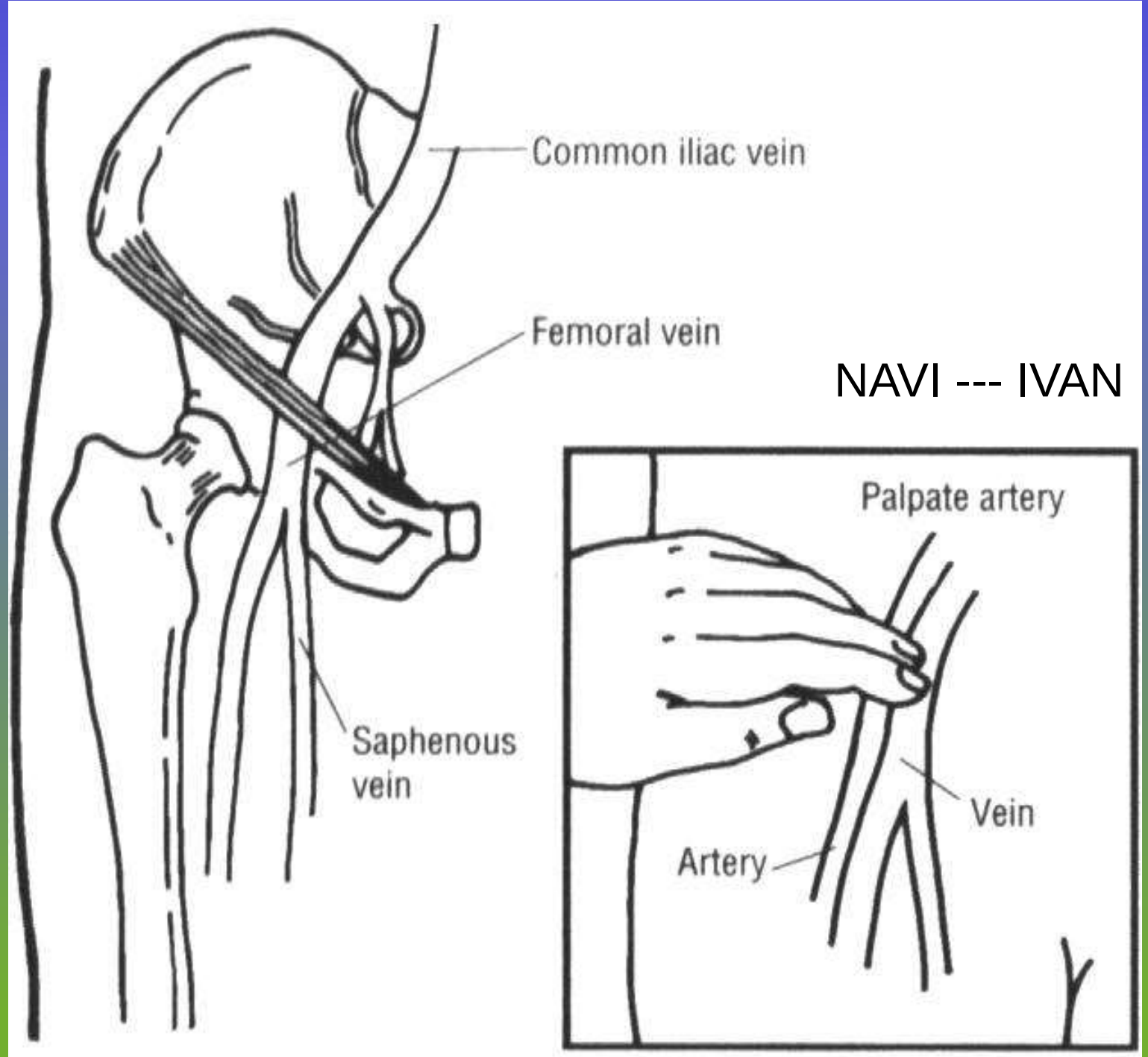


McGee DC, Gould MK: N Engl J Med 2003;348:1123-33.

CENTRAL VEINS



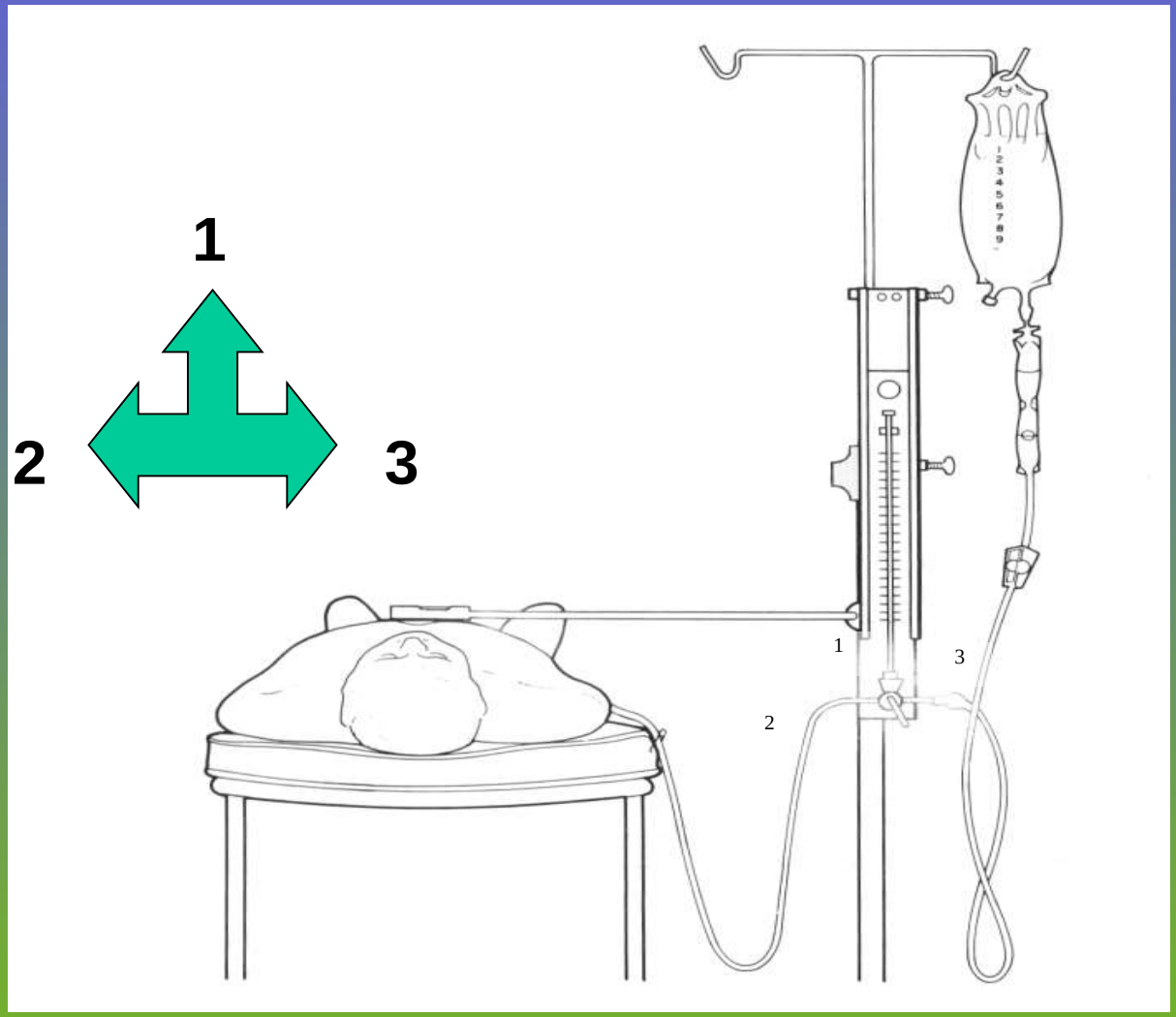
McGee DC, Gould MK: N Engl J Med 2003;348:1123-33.



NAVI --- IVAN

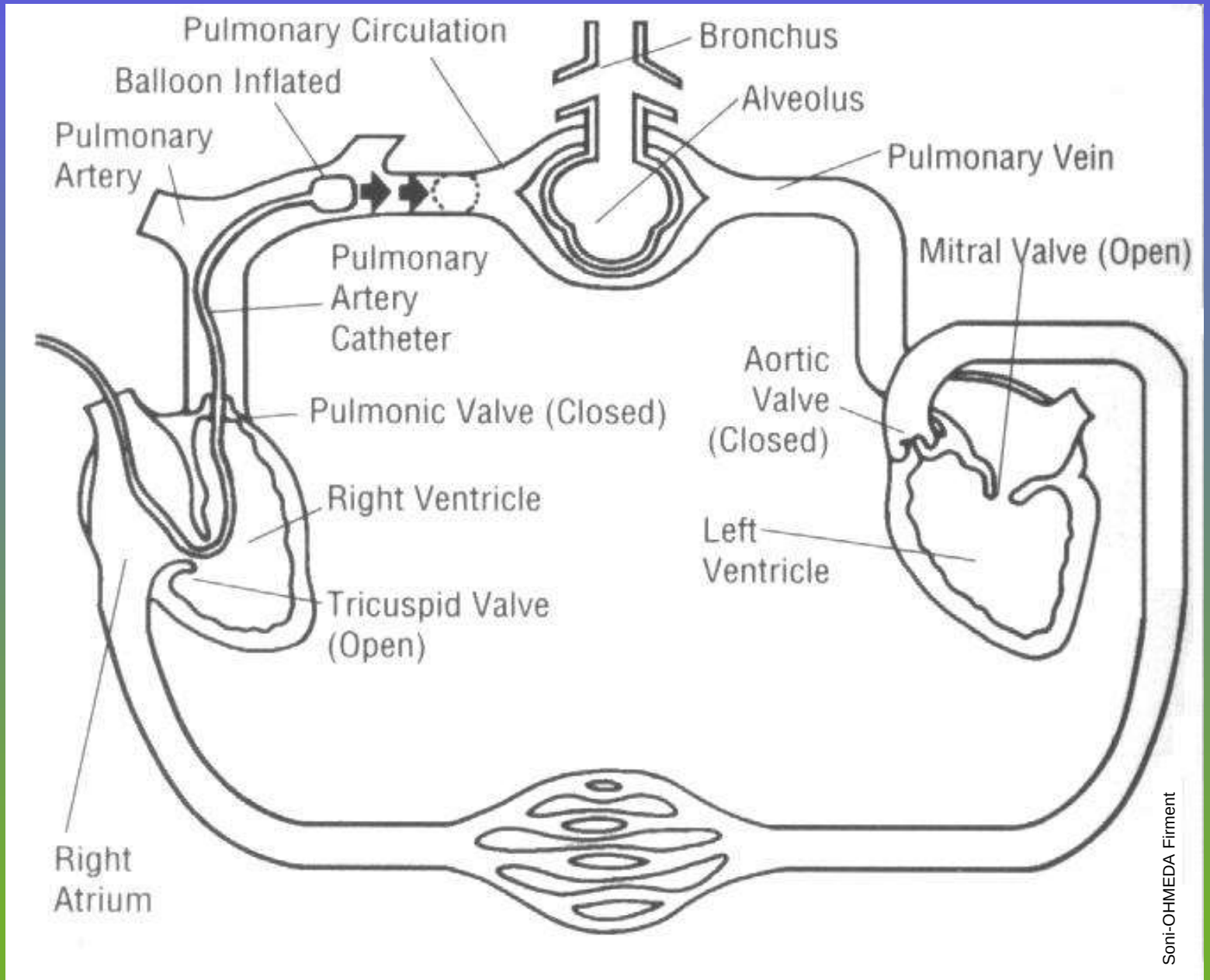
INGUINAL CANAL

CVP MEASUREMENT



cmH_2O

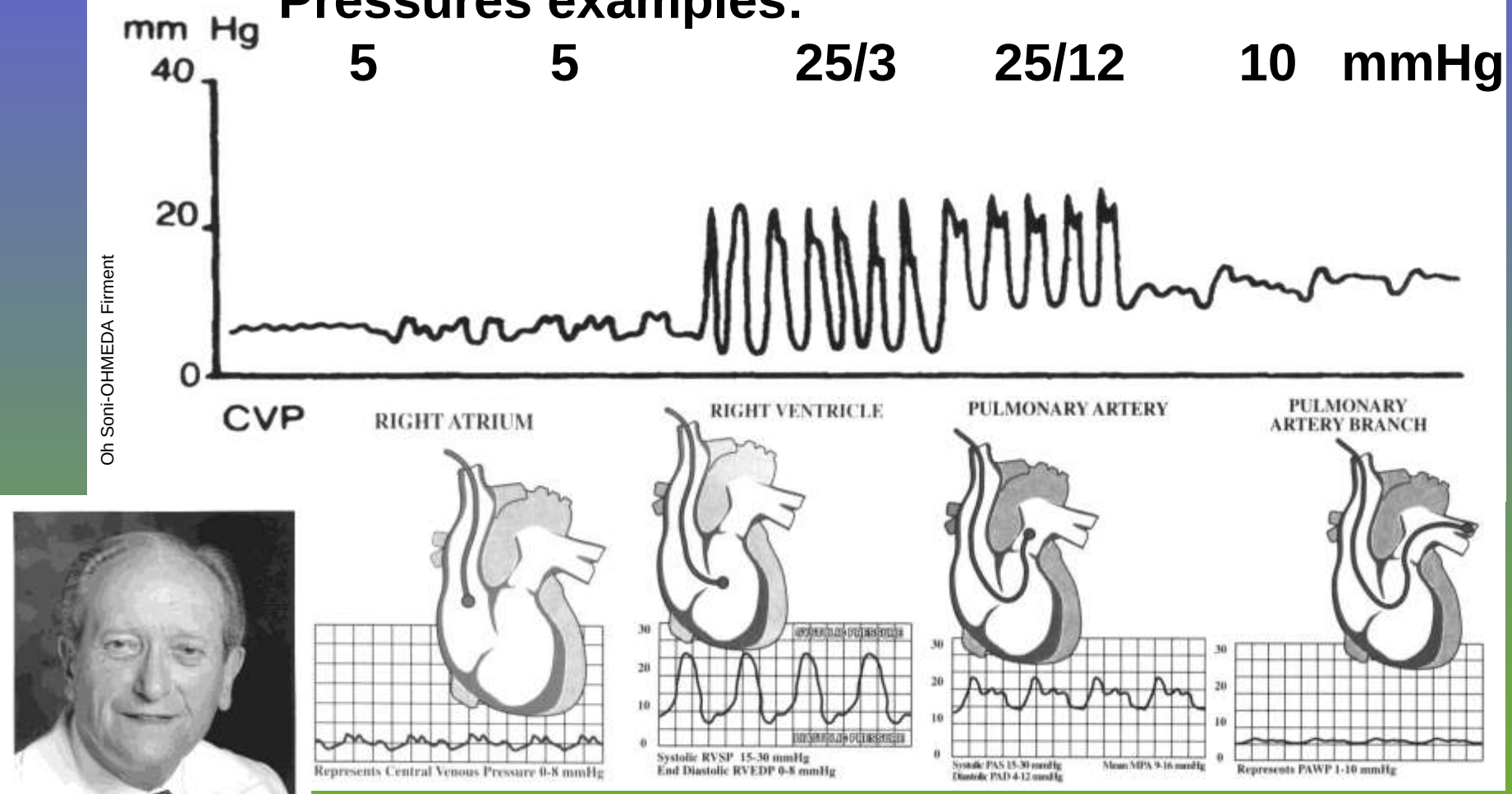
S-G CATHETER POSITION



SWAN - GANZ CATHETER

Pressures examples:

5 5 25/3 25/12 10 mmHg



Oh Soni-OHMEDA Firment

THE HEART IN DIASTOLE

THE HEART IN ATRIAL SYSTOLE

Soni-OHMEDA Firment

PRELOAD The force that stretches the ventricle during diastole

- How far the ventricles stretch will depend on how much blood empties into them. Thus, preload can also be described as End Diastolic Ventricular Volume.
- CVP ia an indicator of right ventricular preload.
- PAWP is an indicator of left ventricular preload.

PRELOAD

= CVP, PAWP

Soni-OHMEDA Firment

AFTERLOAD

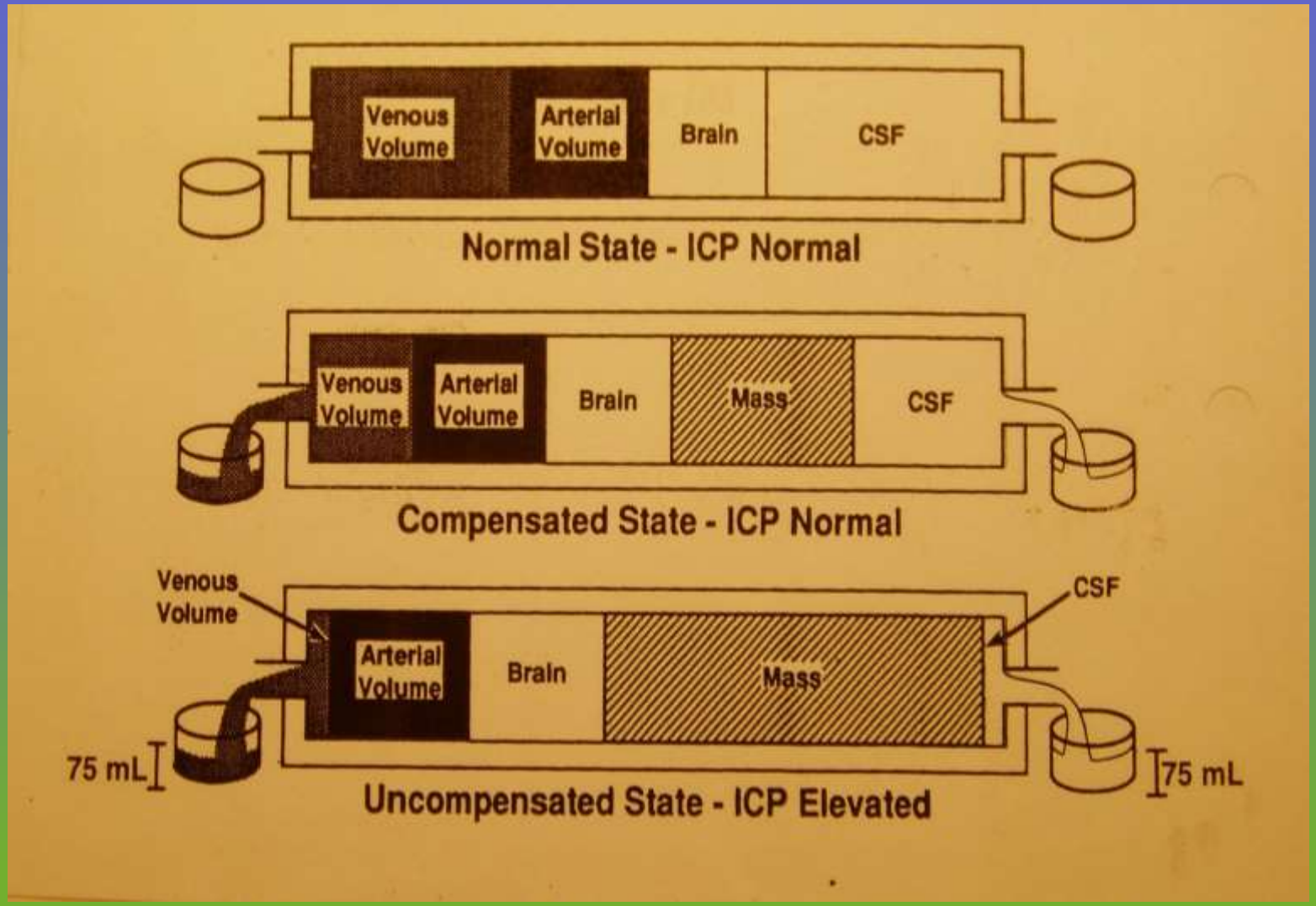
The impedance or resistance the ventricles must overcome before they can contract.

- The opposing pressure is a combination of pressures in the pulmonary vasculature, aorta, systemic arteries and veins, and peripheral vessels.
- Afterload is primarily determined by derived haemodynamic parameters called Pulmonary Vascular Resistance (PVR) and Systemic Vascular Resistance (SVR)
- PVR refers to right ventricular afterload
- SVR refers to left ventricular afterload

AFTERLOAD

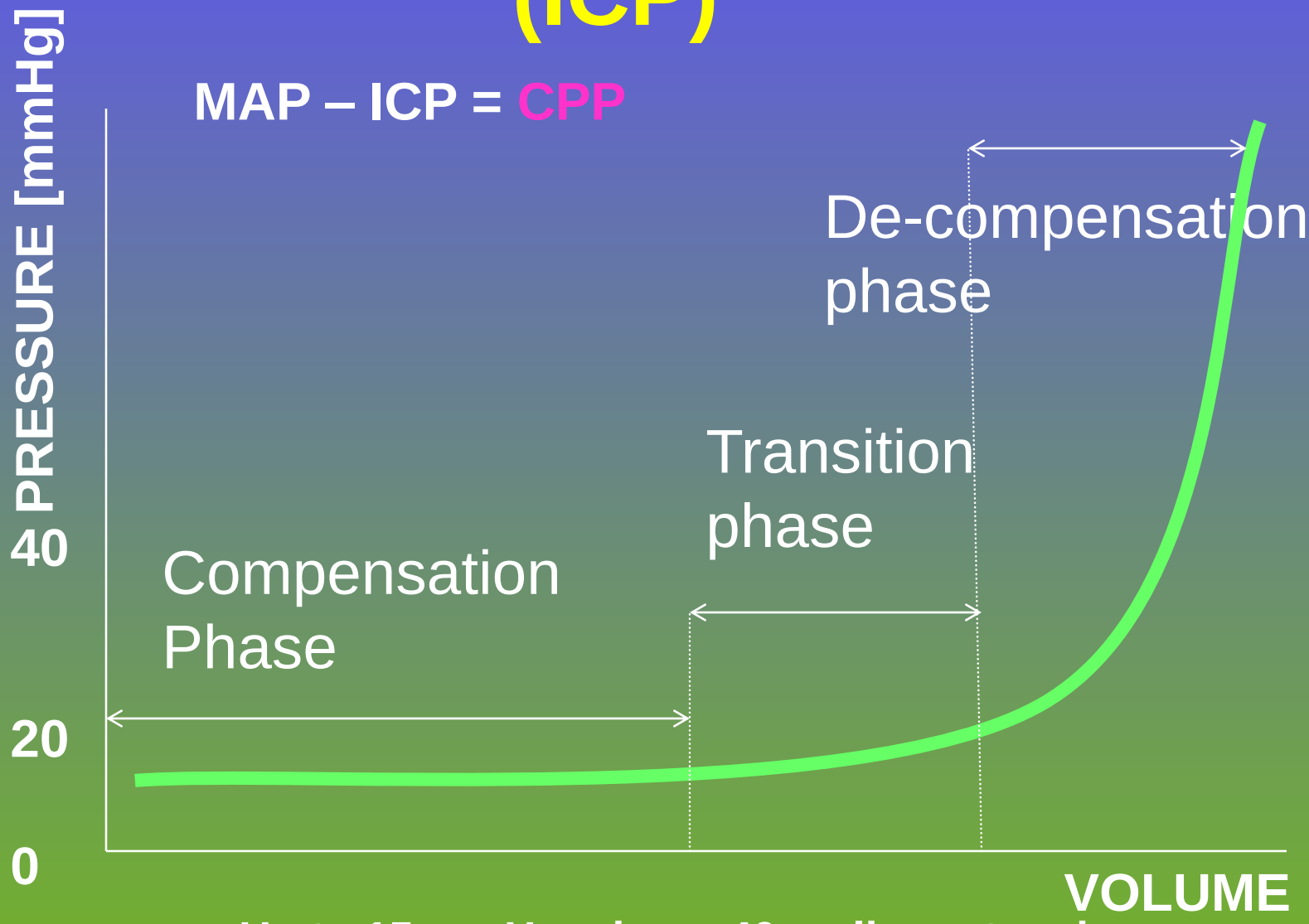
= PVR, SVR

INTRACRANIAL COMPENSATION FOR EXPANDING MASS



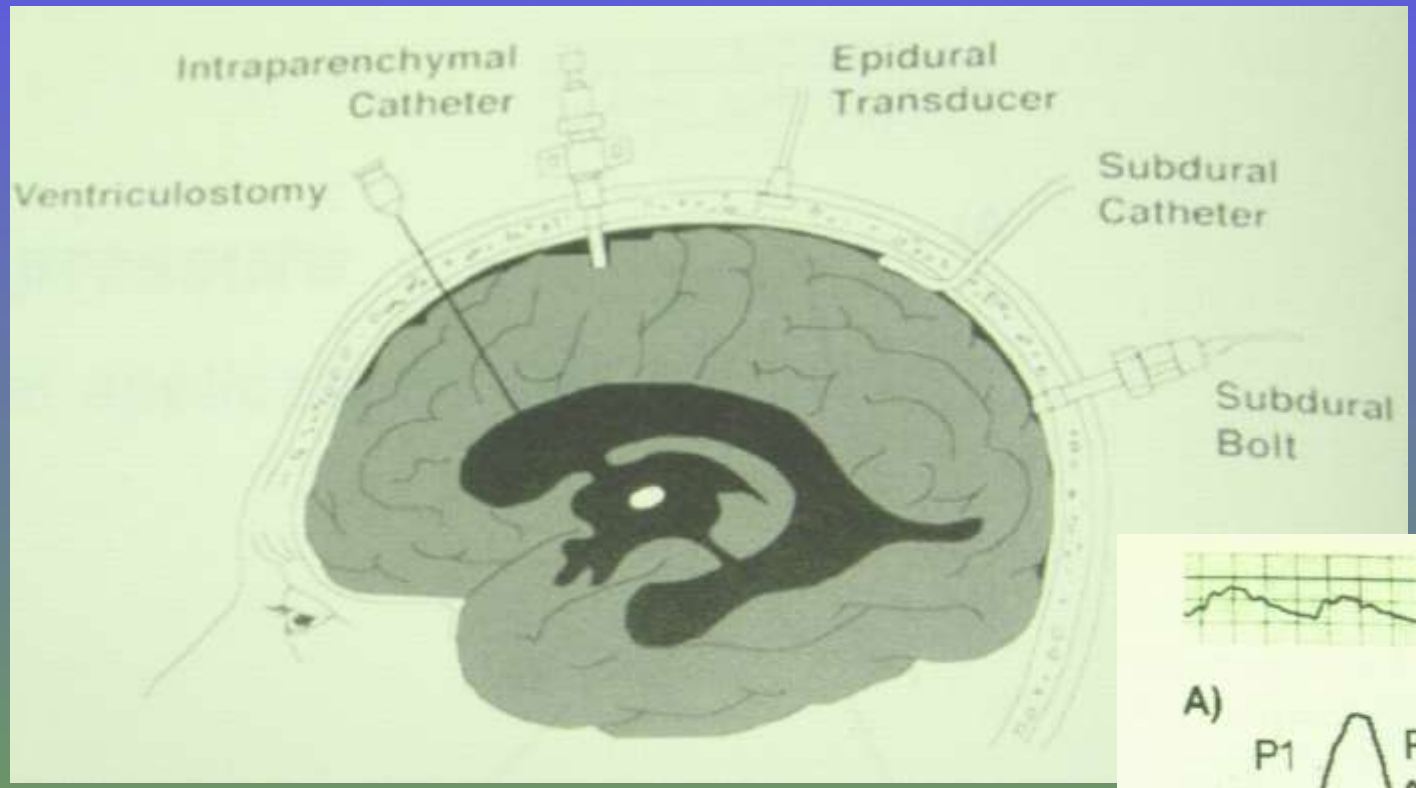
INTRACRANIAL PRESSURE (ICP)

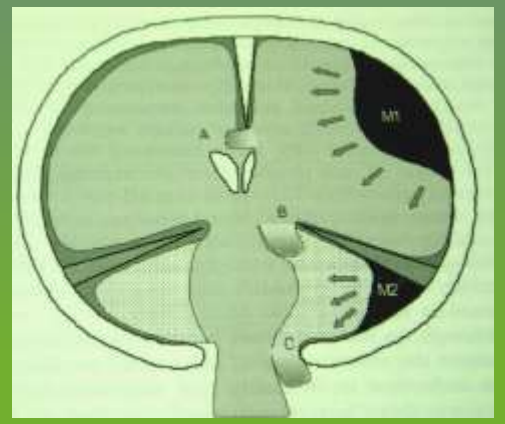
MAP – ICP = CPP



Up to 15 mmHg, above 40 malignant oedema

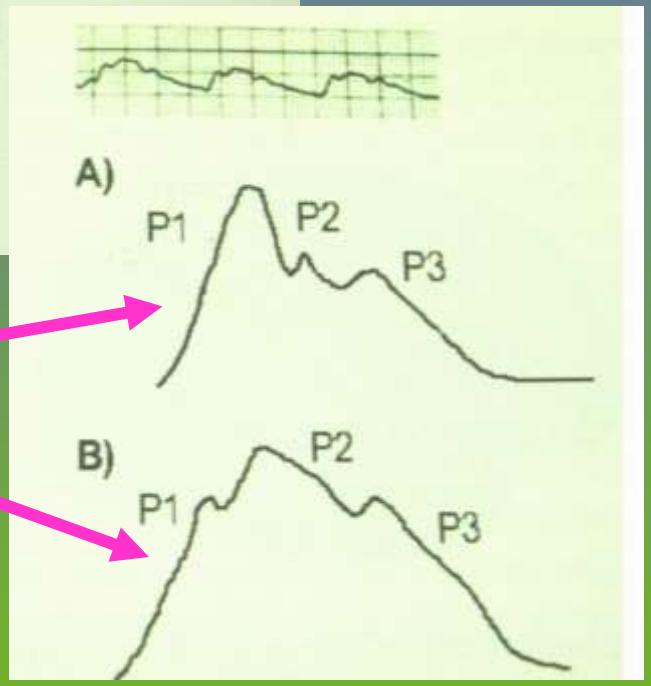
INTRACRANIAL PRESSURE



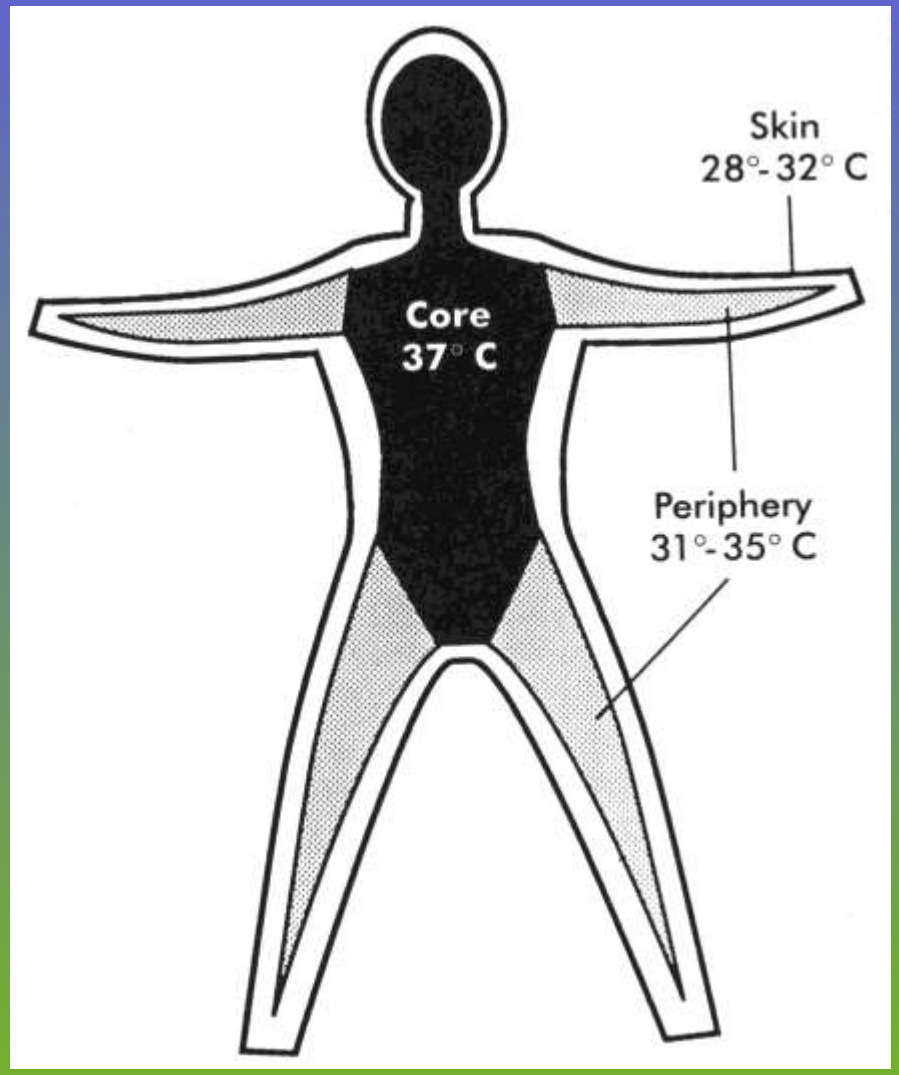


Normal curve shape

Low compliance

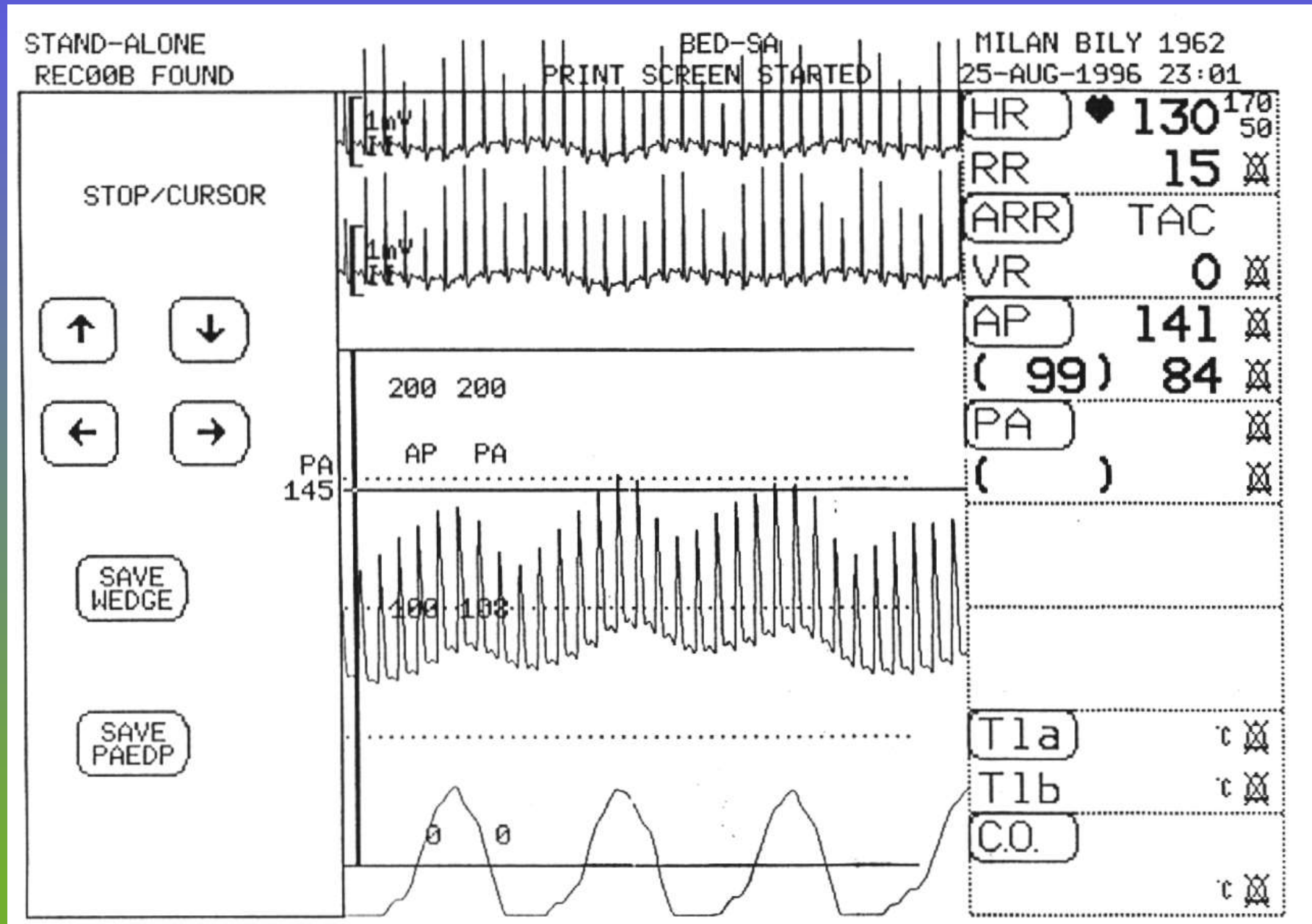


BODY TEMPERATURE



- Periphery (below 35 ^{o}C too)
- Central TB (core)
- Δ body temp

VITAL FUNCTIONS MONITOR



RELAXOMETRY

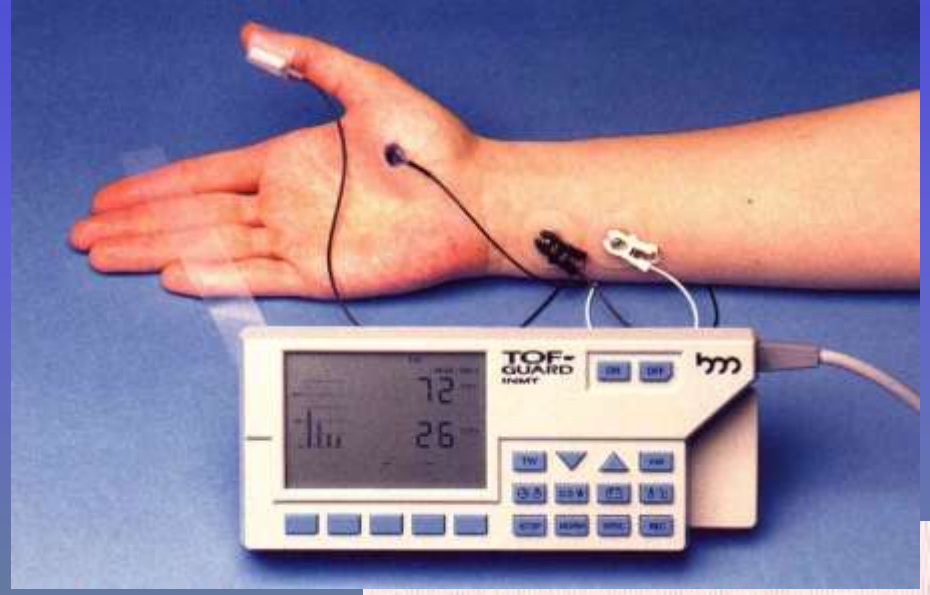
- Electrostimul. device, TOF
- Depol. & undepol. myorelaxants
- Correlations with clinical manifestation of recovery:

  - head elevation for 5 s (5+5 test)

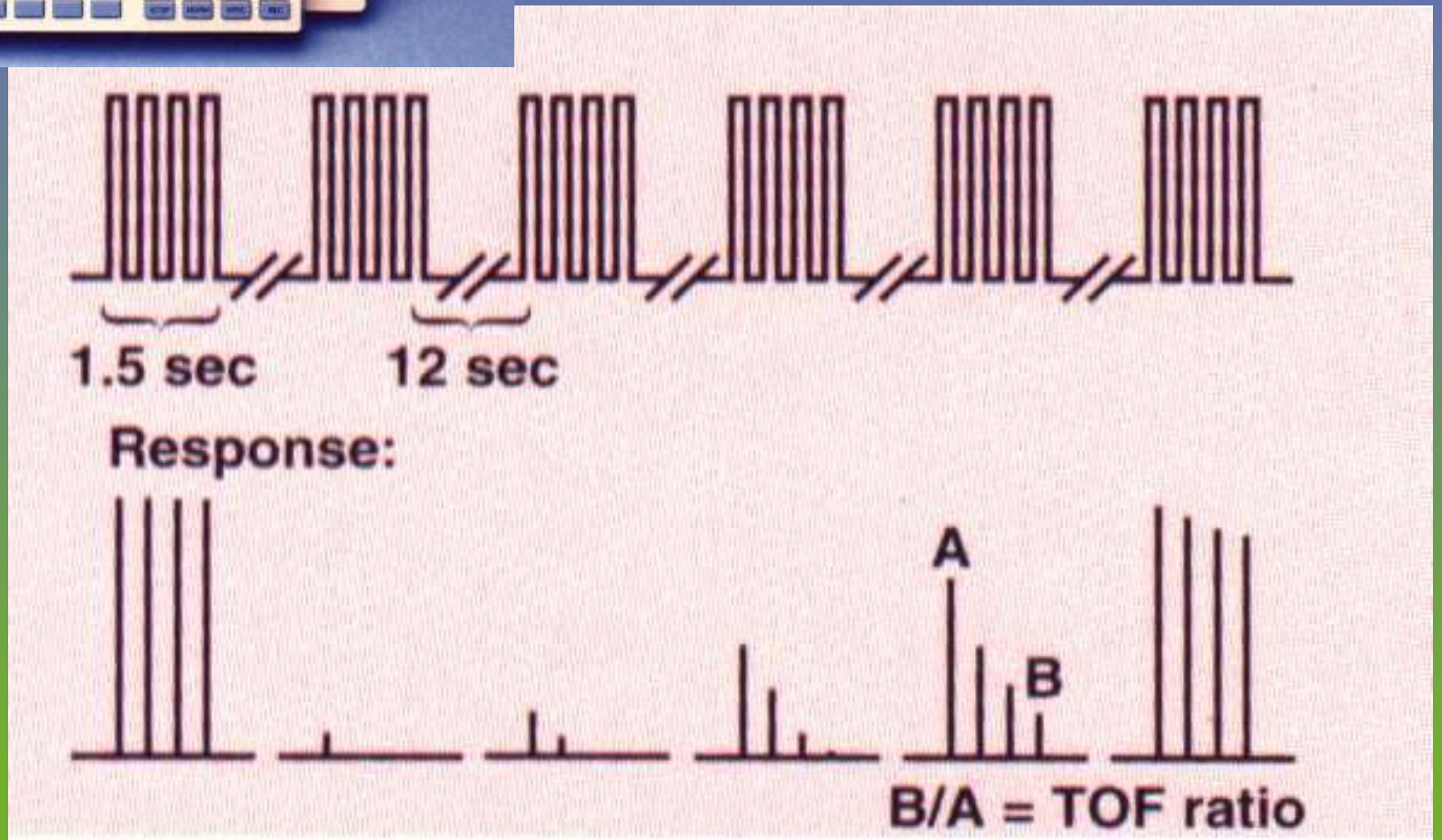
  If pt uplifts head, TOF ratio is usually > 0,8

  - stick out tongue,

  - eyes open and cough



Train-of-four = TOF



LABORATORY TESTS

- Respiratory functions: ABG (pH, pCO_2, pO_2, BE, HCO_3, standard & actual, BB), continual bedside measurement.
- Shock: Lactate, gastric mucosal pH,
- Hepatic funcions: bilirubine, transaminase, albumine, Quick, INR, Cholinestherase, Tr

LABORATORY TESTS cont.

- Pancreatic functions: Glycaemia, insulinaemia, AMS, AMS pancreatic,
- Renal functions: urea, creatinine, ions, clearance, osmolality, cystatín-C, NGAL.
- Myocardial enzymes: CK, CK-MB, LDH, HBDH, NTpro-BNP, troponine-I, -T.
- Inflammatory indicators: (FW), CRP, PCT, IL-6, presespsin, neopterin, Ne/Ly
- Rhabdomyolysis: myoglobin,

HAEMATOLOGICAL

- Coagulation screening (platelets, APTT, PTT, Fg, FDP, D-dimer...).

IMAGING METHODS

- CT, HRCT, USG, TEE, TCD, MRI…

BALANCES

- Incomes vs. looses
- Water, ions, energy...
- Patient weighting
- Diuresis (volume), sp gravity, food intake, gastric content...
- Bandages

NUTRITION

- Anthropometrical (TSF, MAC, WT)
- Biochemical (Alb, Tf, Palb, CHE)
- DH tests, Ly
- Energy - RQ. O_2 consumption, CO_2 production
- N looses

MICROBIOLOGICAL MONITORING

- MIC, MBC, colonisation, infection.
- Maki semiquantitative method for catheter sepsis assessment
- BAL (FBS)

Maki DG, Weise CE, Sarafin HW: A semiquantitative culture method... N Engl J Med 1977; 296:1305

BASIC MONITORING DURING GENERAL ANAESTHESIA

During **general anaesthesia** with muscle relaxation:

Pressure **R**ate **S**weating **T**ears

Monitoring Anaesthesia Care

- NIBP (á 5 min)
- PR
- SpO_2
- Consciousness level

- Pulse oximetry

ASA STANDARDS OF SAFETY ANESTHESIA