

MONITORAGE CHOC HEMORRAGIQUE

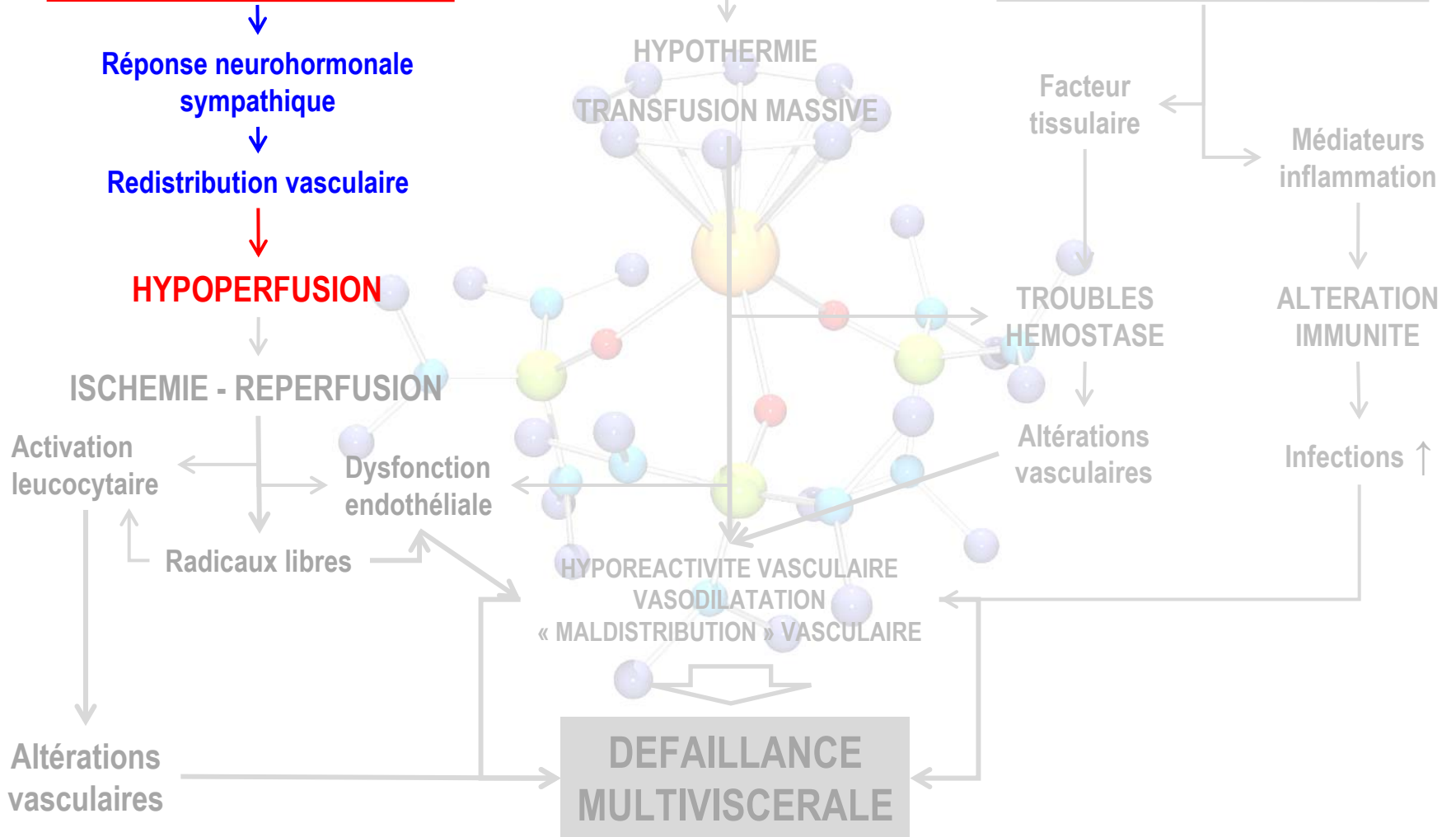


SERVICE D'**A**NESTHESIE **R**EANIMATION **1**

SEGUIN P

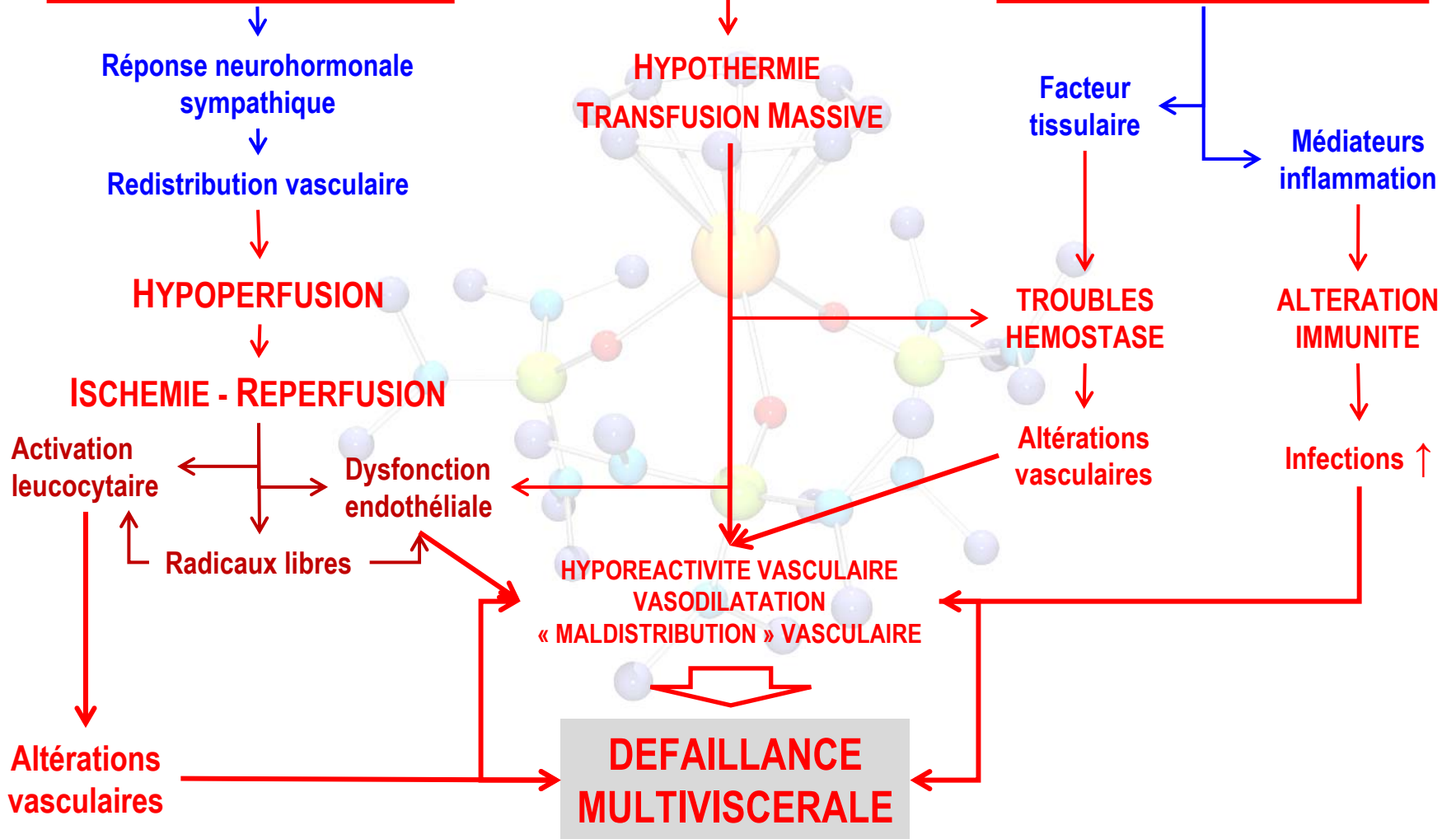
CHOC HEMORRAGIQUE

LESIONS TRAUMATIQUES



CHOC HEMORRAGIQUE

LESIONS TRAUMATIQUES



MONITORAGE

DETECTION PRECOCE DU CHOC « POST TRAUMATIQUE »

CORRECTION
RAPIDE

~~MORT PHASE
AIGUE~~

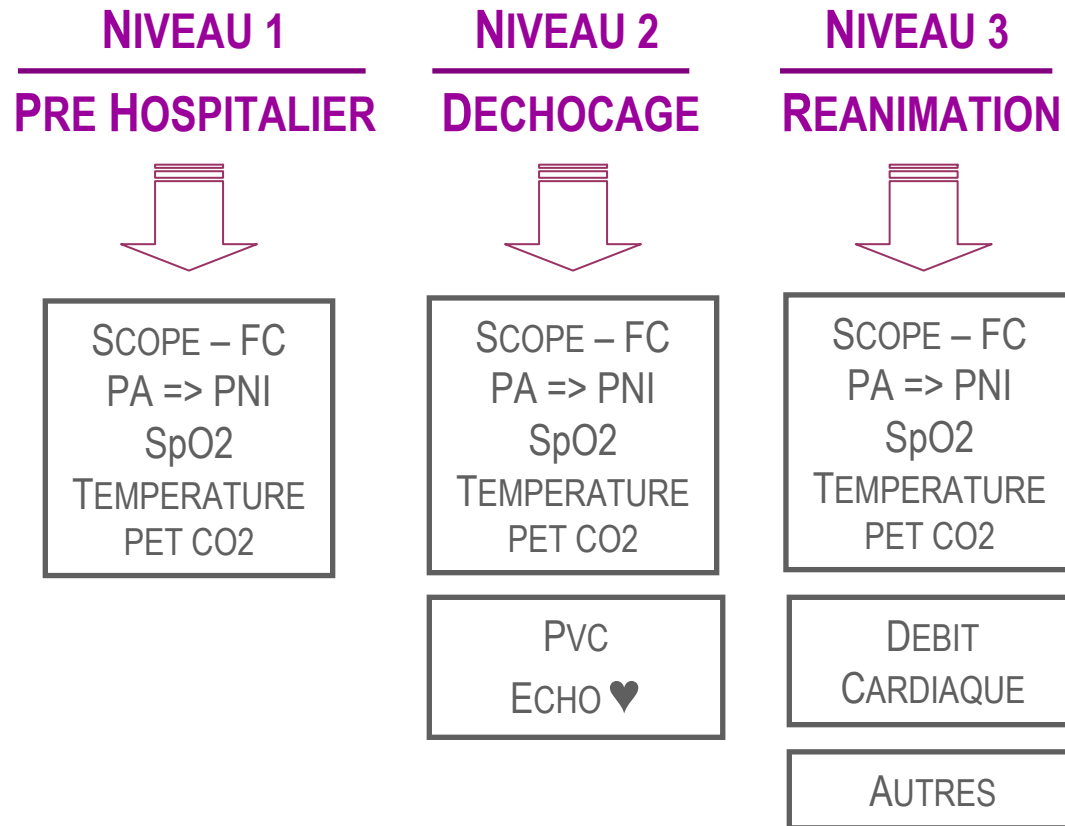
~~DEFAILLANCE
MULTIVISCERALE~~

MONITORAGE

CAHIER DES CHARGES

- FIABLE
- FACILE A METTRE EN PLACE
- OBJECTIFS
 - DETECTION PRECOCE
 - CHIFFRES
- SUIVI EVOLUTIF
- PEU ONEREUX
- ADAPTE

MONITORAGE



CLINIQUE ?

TEMPS DE RECOLORATION CUTANEE



CLINIQUE ?

TEMPS DE RECOLORATION CUTANEE



**FIABILITE ? DIAGNOSTIC ?
PRISE DE DECISION ?**

IS THIS PATIENT HYPOVOLEMIC ?

RECHERCHE MEDLINE 1966 - 1997

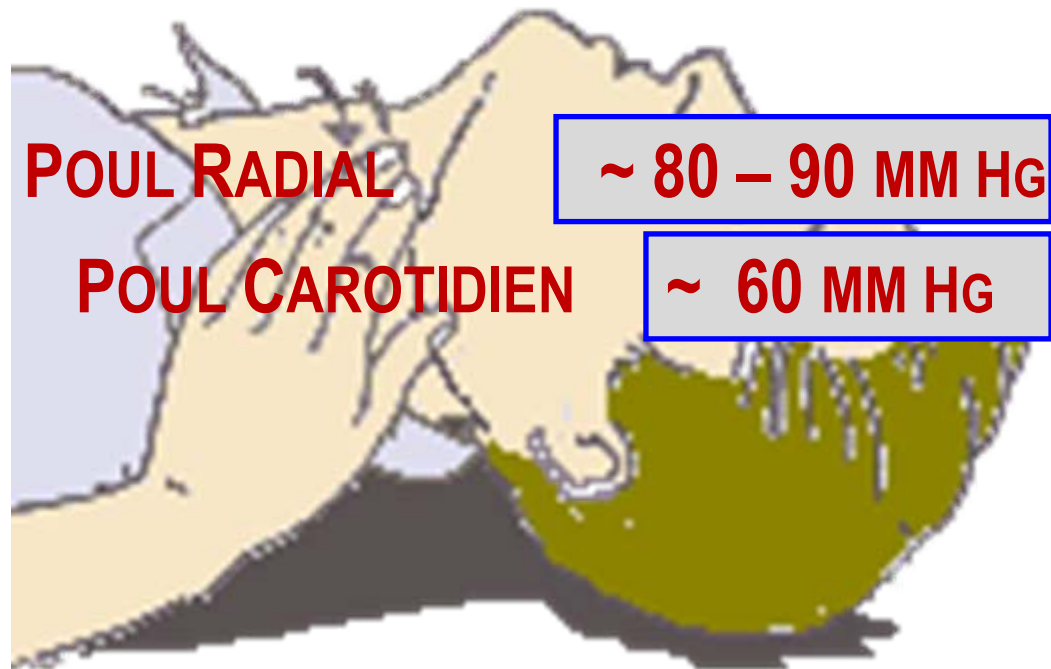
TEMPS DE RECOLORATION CUTANEE = AUCUNE VALEUR

« **Conclusions** : a large postural pulse change (30 beats/min) or severe postural dizziness is required to clinically diagnose hypovolemia due to blood loss.. »

JAMA 1999; 281: 1022

CLINIQUE

PERCEPTION



FREQUENCE CARDIAQUE - PRESSION ARTERIELLE



CLASSIFICATION OF HEMORRHAGIC SHOCK

	Compensated	Mild	Moderate	Severe
Blood Loss (mL)	≤1000 < 15%	1000–1500 15-30%	1500–2000 30-40%	>2000 ≥40%
Heart rate (bpm)	<100	>100	>120	>140
Blood pressure	Normal	Orthostatic change	Marked fall	Profound fall
Capillary refill	Normal	May be delayed	Usually delayed	Always delayed
Respiration	Normal	Mild increase	Moderate tachypnea	Marked tachypnea: respiratory collapse
Urinary output (mL/h)	>30	20–30	5–20	Anuria
Mental status	Normal or agitated	Agitated	Confused	Lethargic, obtunded



BRADYCARDIE PARADOXALE - RELATIVE

DEFINITION

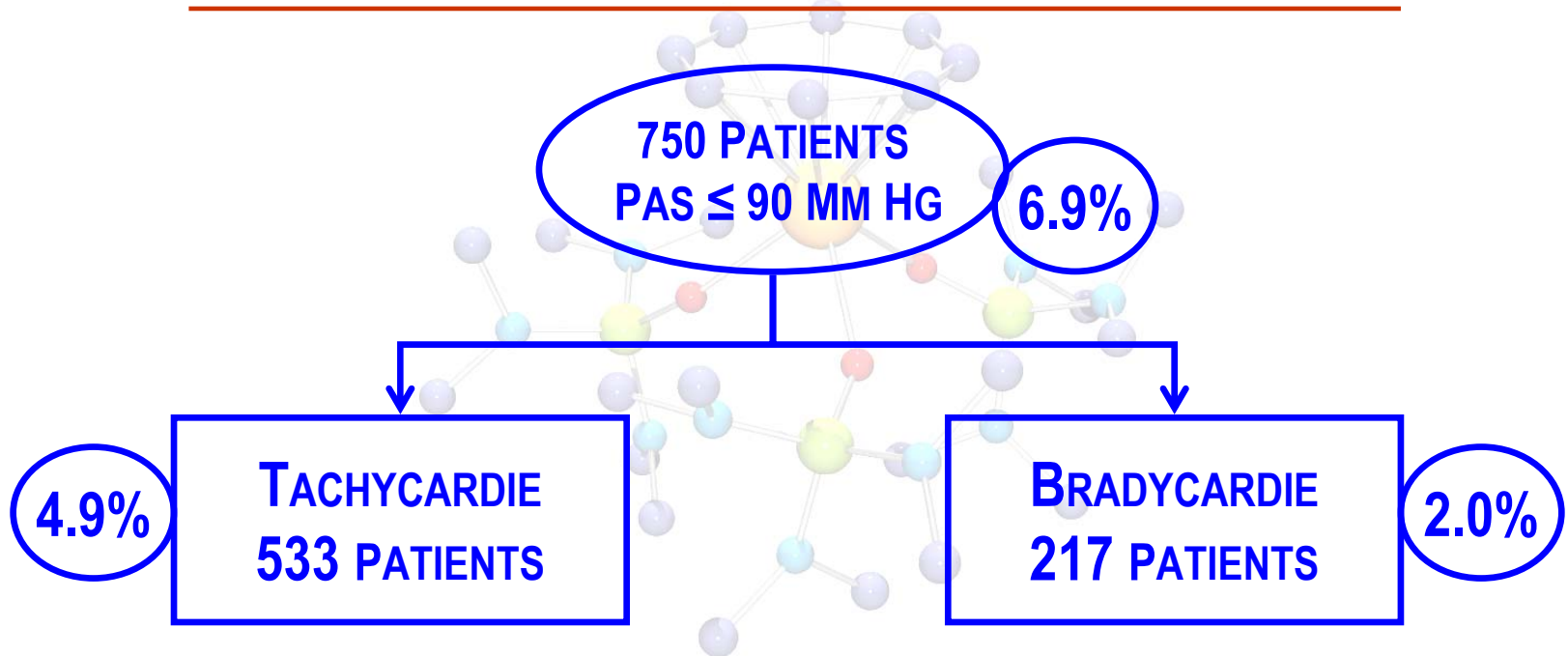
$P_{AS} < 100 \text{ MM HG}$ et $FC < 100 / \text{MIN}$

$P_{AS} < 90 \text{ MM HG}$ et $FC < 90 / \text{MIN}$

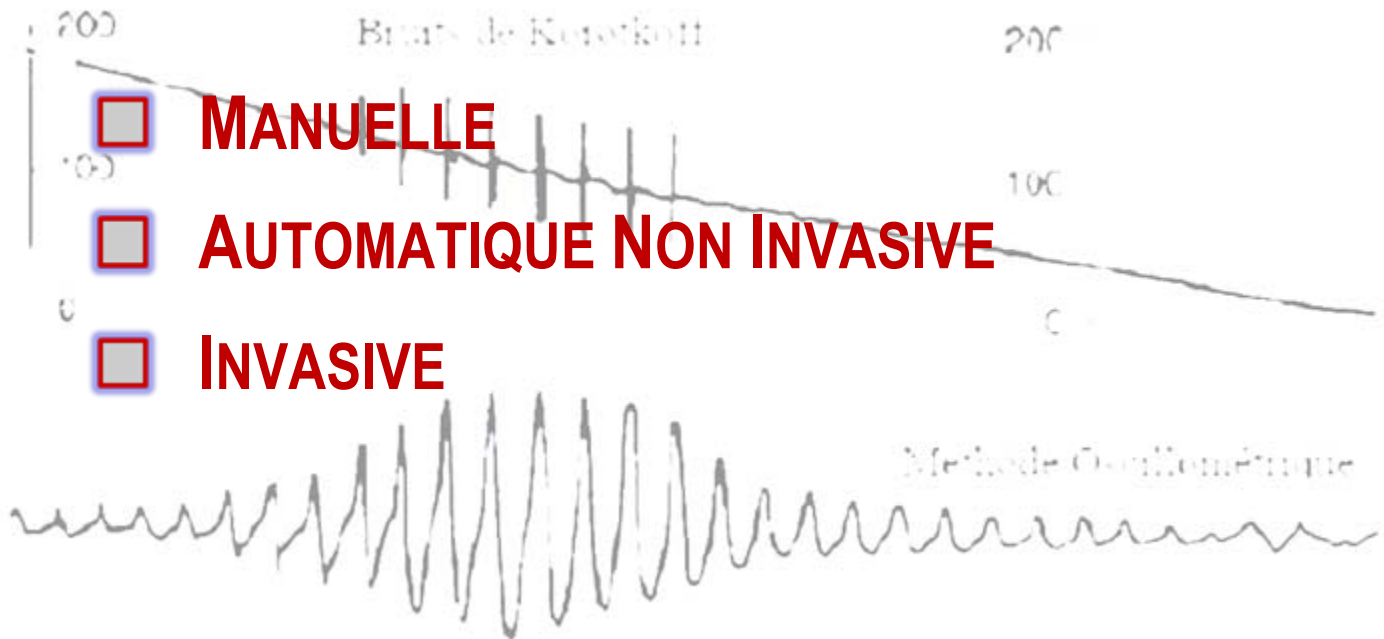
$P_{AS} < 90 \text{ MM HG}$ et $FC < 60 / \text{MIN}^*$

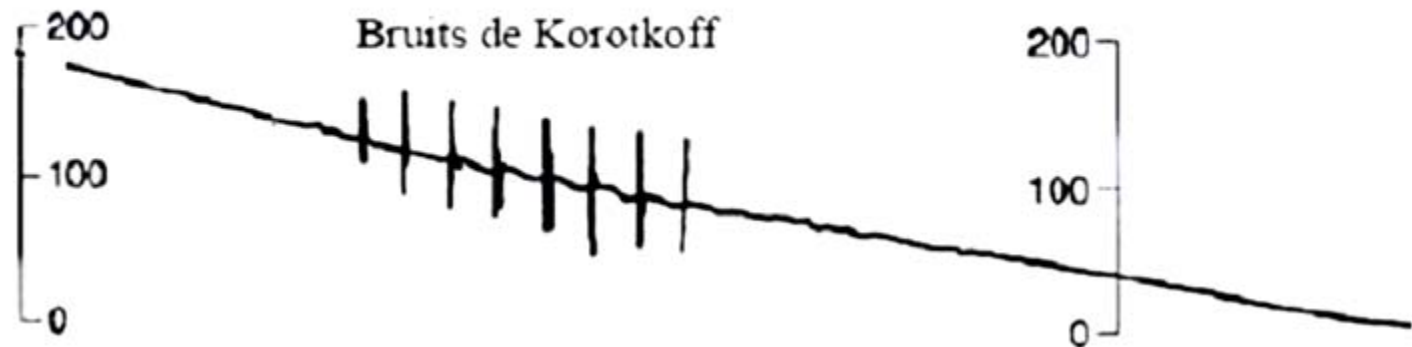
BRADYCARDIE PARADOXALE - RELATIVE

ETUDE RETROSPECTIVE 10 833 PATIENTS – « TRAUMA CENTER »



PRESSION ARTERIELLE





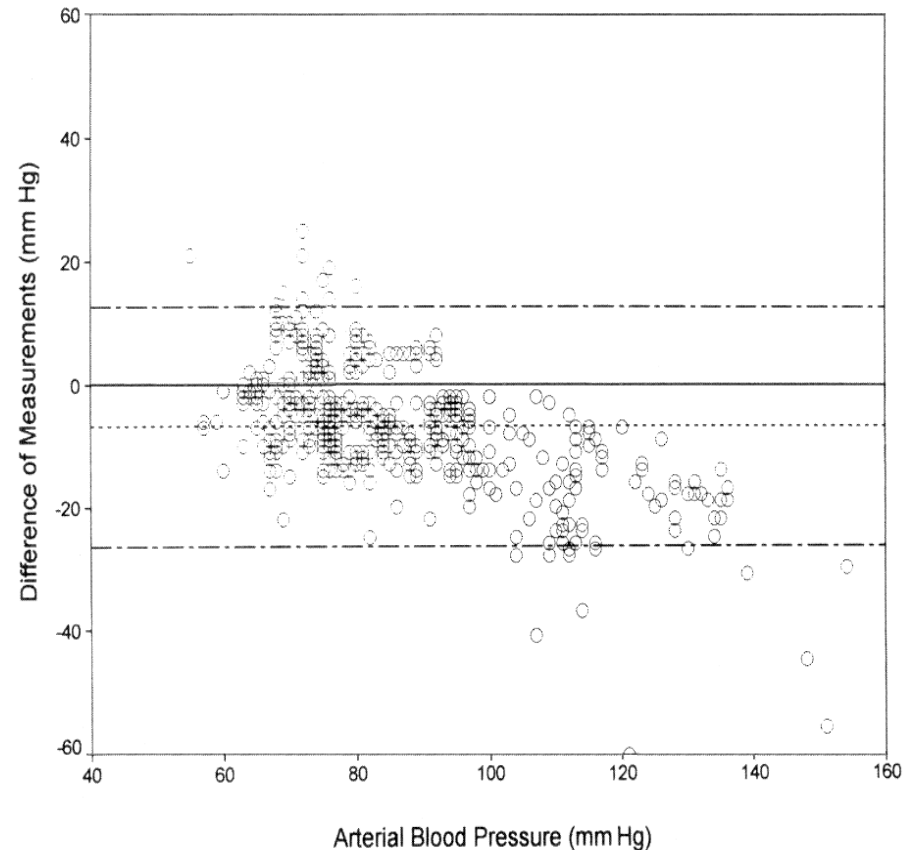
PRESSION NON INVASIVE

- MESURE DISCONTINUE
- FIABLE ... OUI MAIS



PRESSION ARTERIELLE INVASIVE / NON INVASIVE?

- SOUS ESTIMATION PRESSION BRASSARD
- NOMBRE ELEVEE DE MESURES « INACCEPTABLES »
- RELATION TAILLE DU BRASSARD /CIRCONFERENCE DU BRAS



PRESSION ARTERIELLE INVASIVE

« Élément indispensable de la prise en charge des états de choc post-traumatique »

Conférence d'experts, Sfar SRLF 2006

PRESSION ARTERIELLE INVASIVE / RADIALE OU FÉMORALE ?

COMPLICATIONS

	Permanent ischaemic damage (n)	Temporary occlusion (n)	Sepsis (n)	Local infection (n)	Pseudoaneurysm (n)	Haematoma (n)	Bleeding (n)
Radiale	0.09 (4/4217)	19.7 (831/4217)	0.13 (8/6245)	0.72 (45/6245)	0.09 (14/15,623)	14.40 (418/2903)	0.53 (2/375)
Fémorale	0.18 (3/1664)	1.45 (10/688)	0.44 (13/2923)	0.78 (5/642)	0.3 (6/2100)	6.1 (28/461)	1.58 (5/316)

PRESSION ARTERIELLE INVASIVE

CATECHOLAMINES

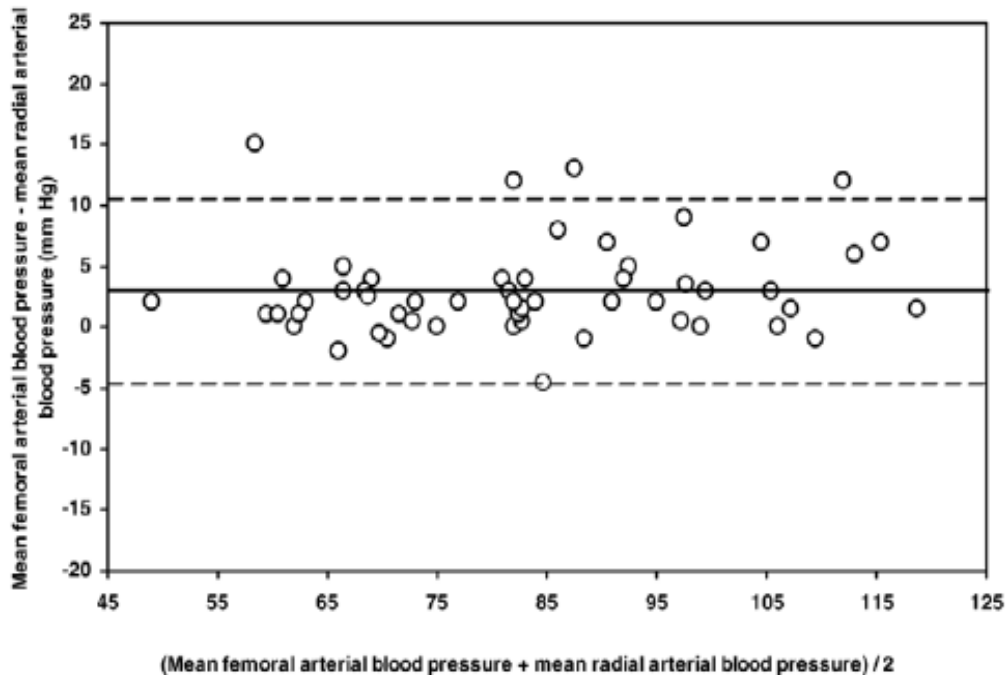
40 PATIENTS – NORADRENALINE $85.6 \pm 25 \mu\text{g} / \text{MIN}$

CATHETER RADIAL ET FEMORAL

PA	FEMORAL	RADIAL
SYSTOLIQUE	143	86
DIASTOLIQUE	60	55
MOYENNE	81	66

PRESSION ARTERIELLE INVASIVE

CATECHOLAMINES



55 PATIENTS

**FORTE
DOSE**

40

**FAIBLE
DOSE**

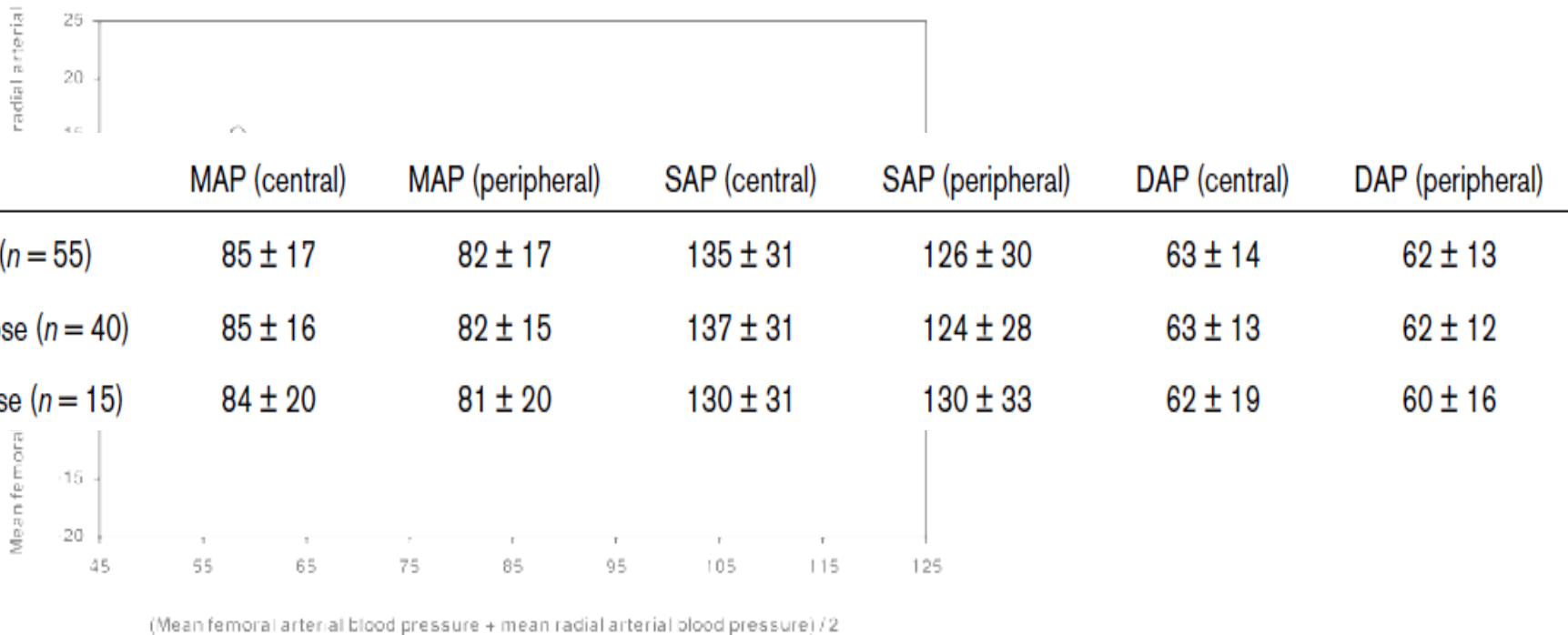
15

BIAIS = 3 MM HG

PRECISION = 4 MM HG

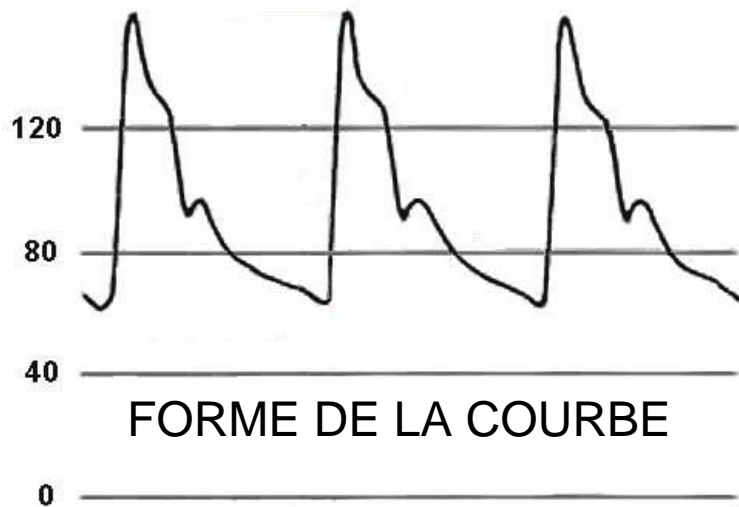
LIMITES D'AGREMENT : 5 à 11 MM HG

PRESSION ARTERIELLE INVASIVE



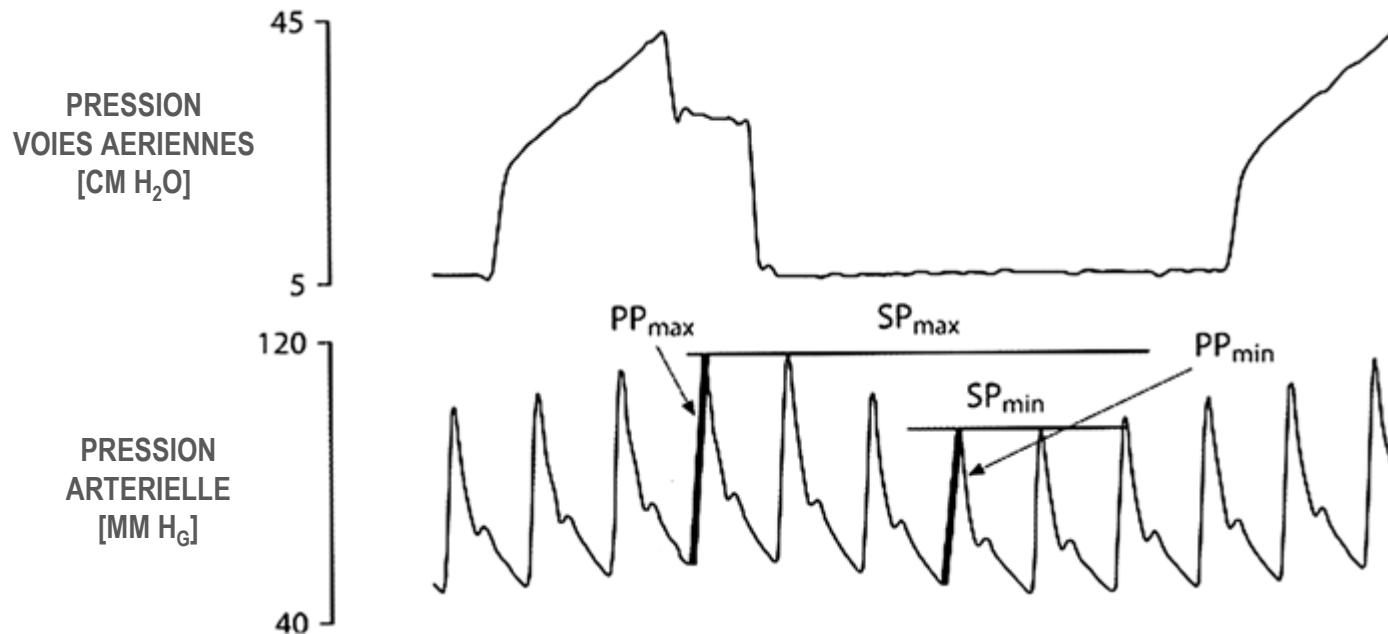
PRESSION ARTERIELLE INVASIVE

PRECAUTIONS



- LE « ZERO »
- LA POSITION DU CAPTEUR

PRESSION ARTERIELLE INVASIVE – REPOSE REEMPLISSAGE

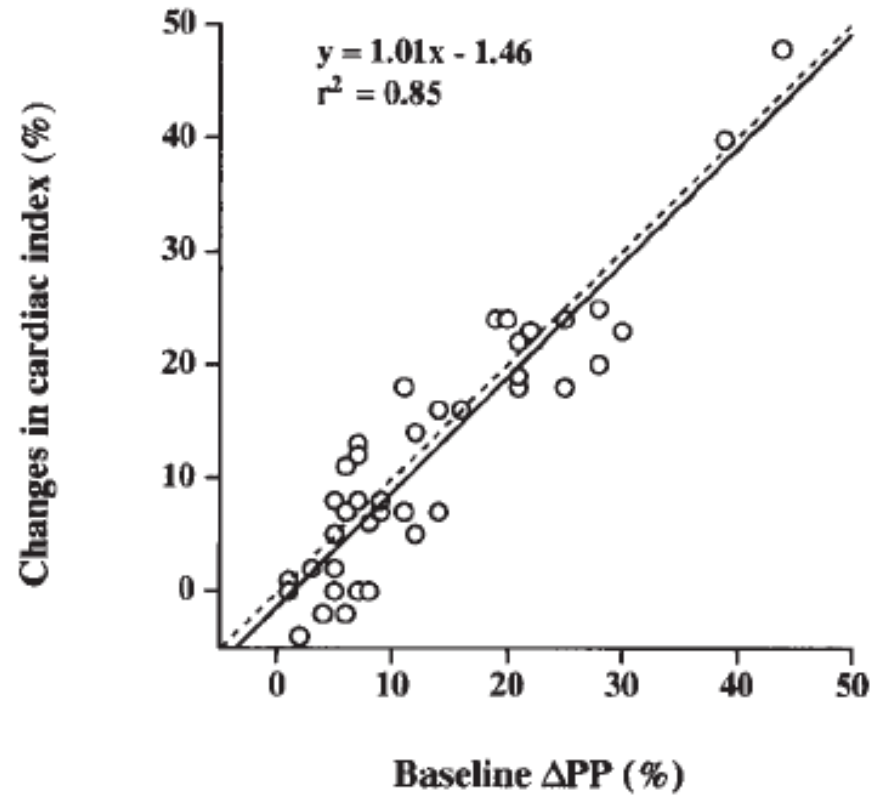


$$\Delta PP = \frac{PP_{max} - PP_{min}}{(PP_{max} + PP_{min})/2}$$

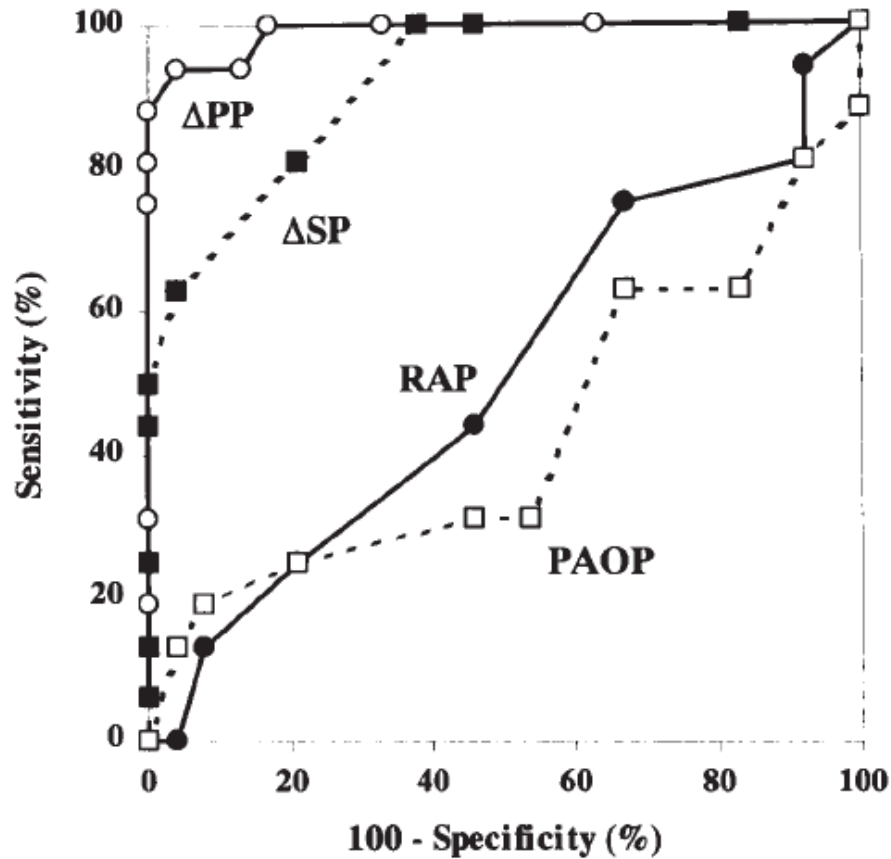
$$\Delta PP \geq 13\%$$

SENSIBILITE = 94%
SPECIFICITE = 94%

PRESSION ARTERIELLE INVASIVE – REPONSE REEMPLISSAGE



PRESSION ARTERIELLE INVASIVE – REPONSE REMPLISSAGE

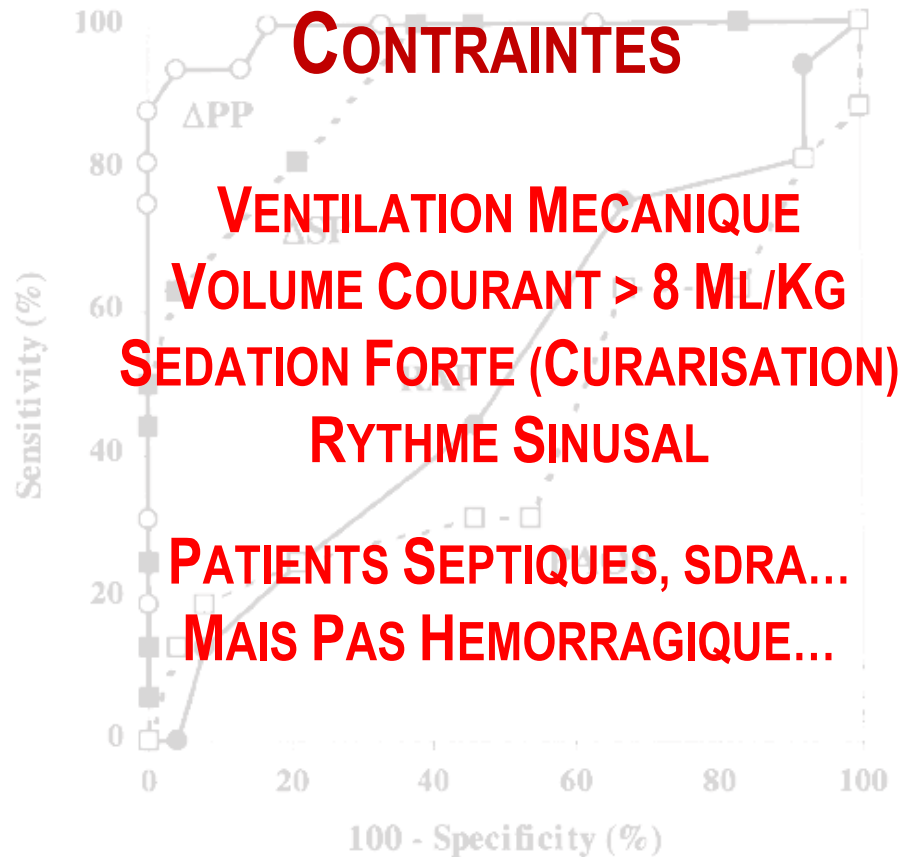


ΔSP = VARIATION PRESSION SYSTOLIQUE

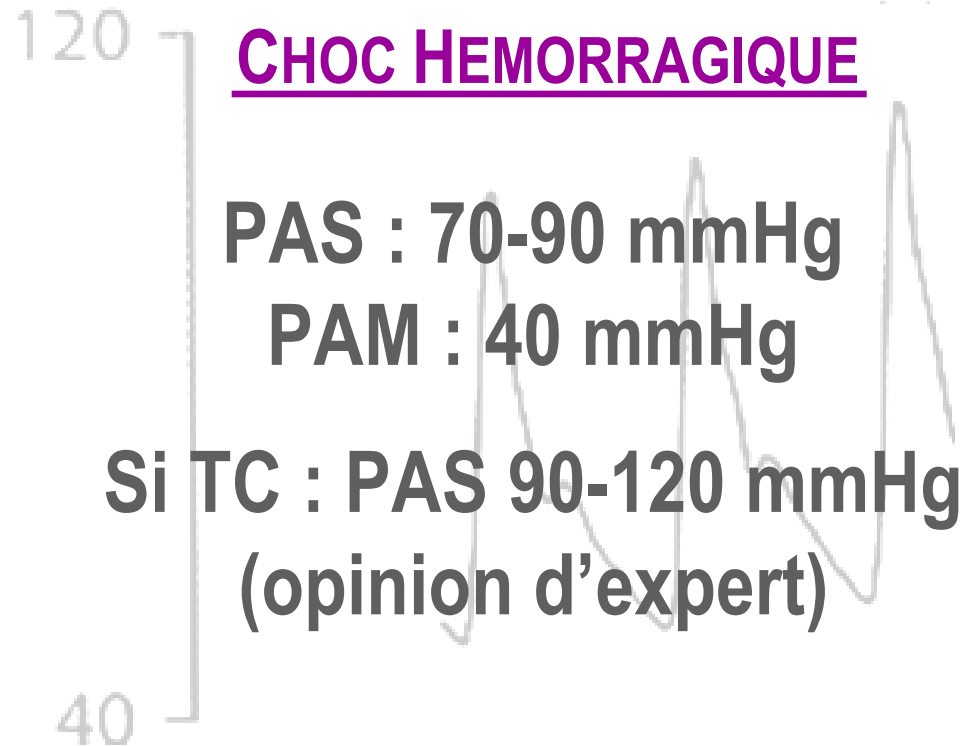
RAP= PRESSION OREILLETTE DROITE

PAOP= PRESSION CAPILLAIRE

PRESSION ARTERIELLE INVASIVE – REPONSE REEMPLISSAGE



PRESSION ARTERIELLE - OBJECTIFS



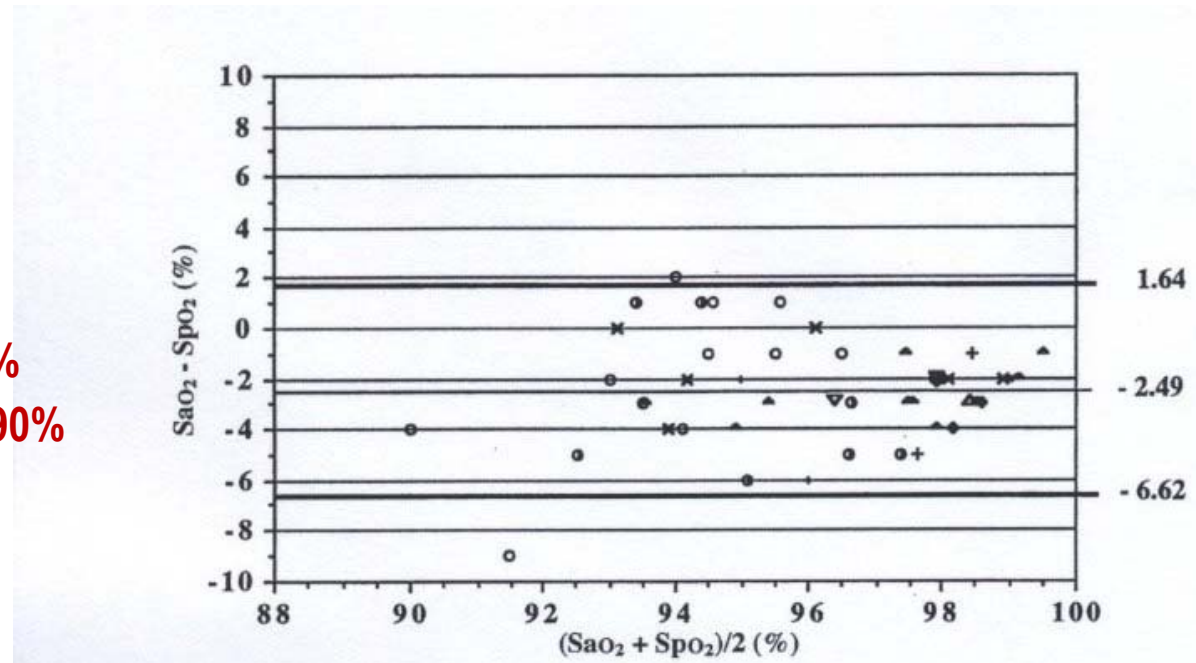
SpO₂

- INDISPENSABLE
- VALEUR PRONOSTIQUE
- SOUVENT DIFFICILE
- OBJECTIFS ..



SpO₂

- CONTRÔLE GDS
- MAINTENIR SpO₂ > 96%
POUR EVITER SaO₂ < 90%



SpO₂: REPONSE AU REMPLISSAGE

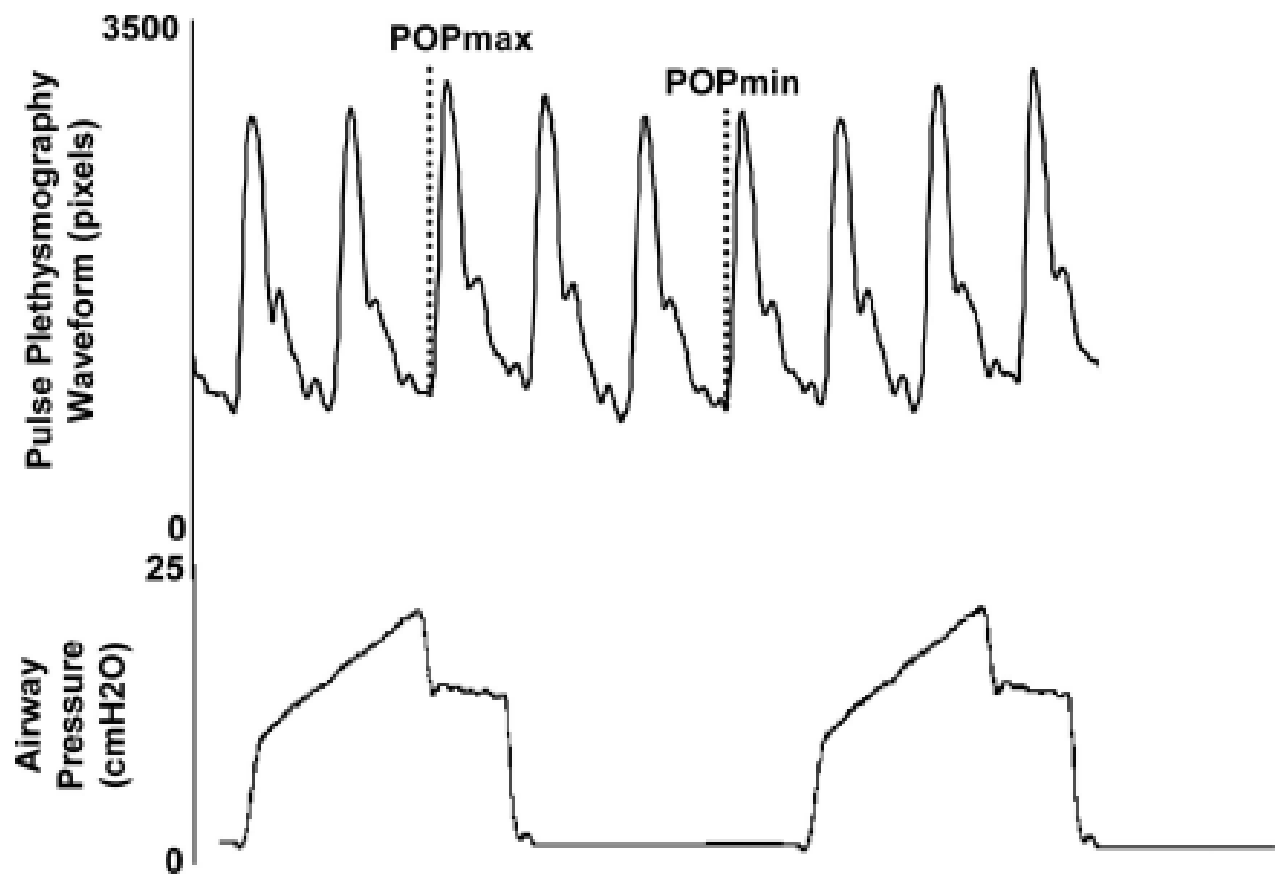
23 PATIENTS SEPTIQUES

[PARAMETRES VENTILATOIRES – CATECHOLAMINES] = IDEM

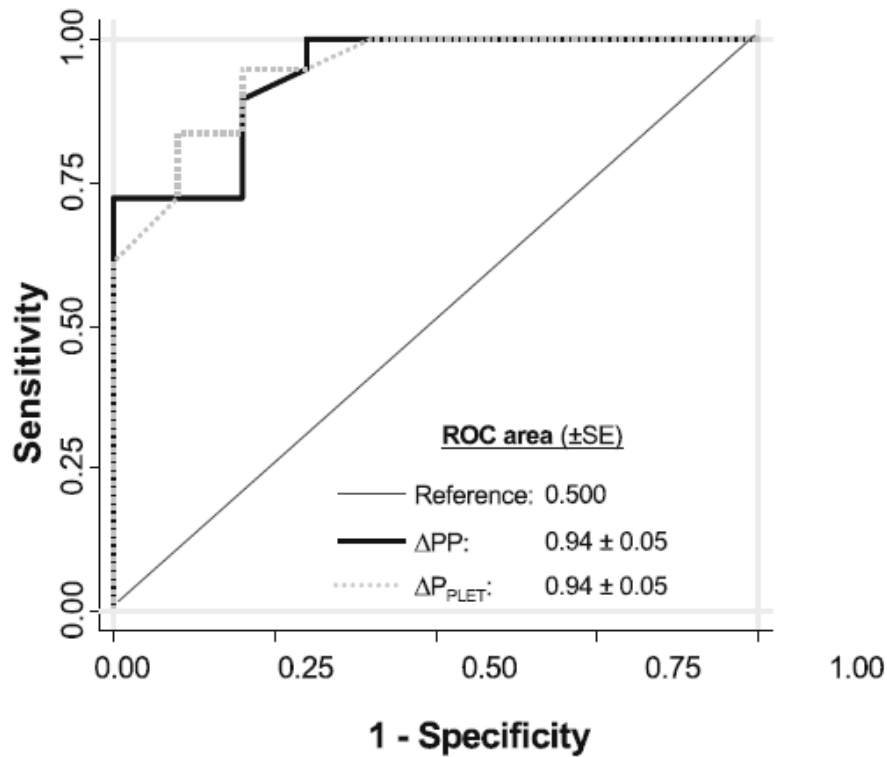


FC
PAM
DC
ΔPP
ΔSpO₂

FC
PAM
DC
ΔPP
ΔSpO₂



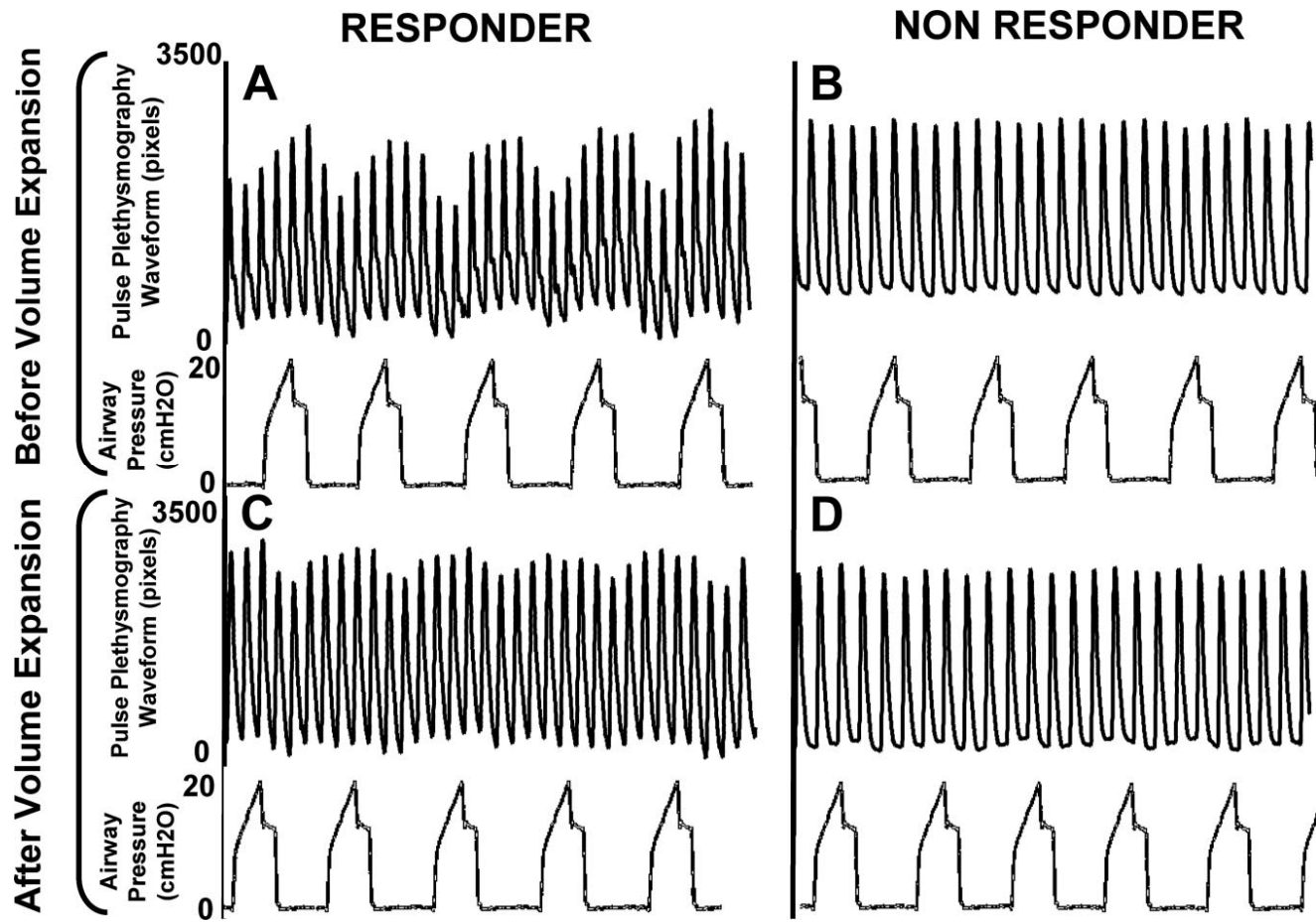
SpO₂: REPONSE AU REMPLISSAGE



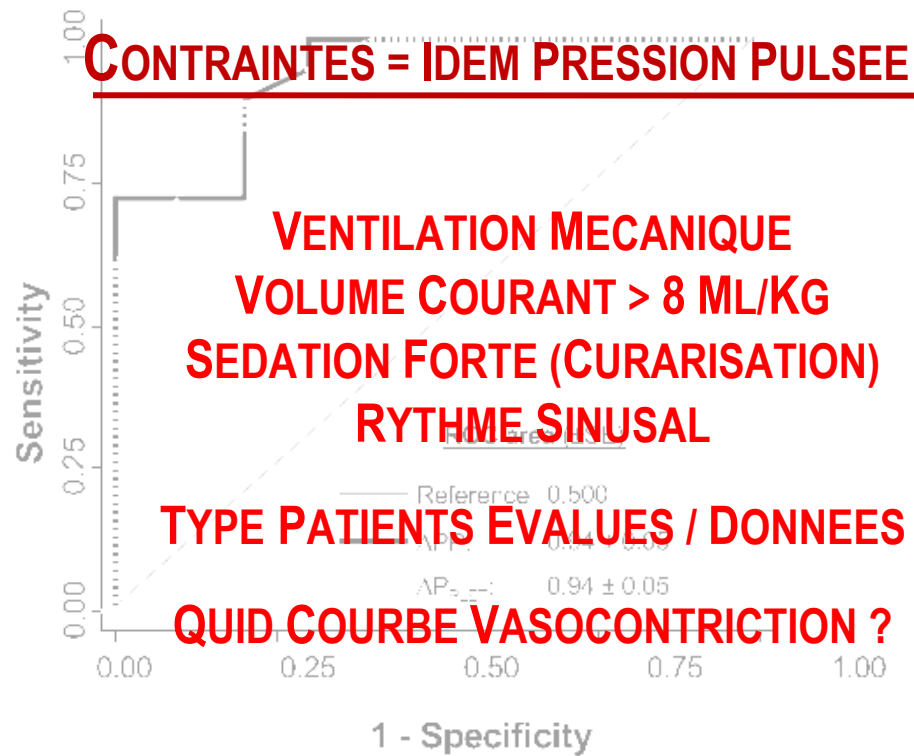
VARIATIONS

PRESSION PULSEE \geq 12%

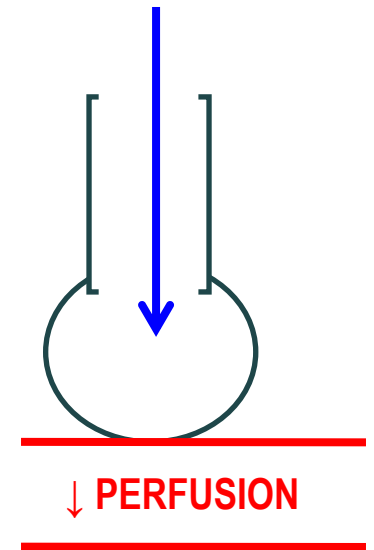
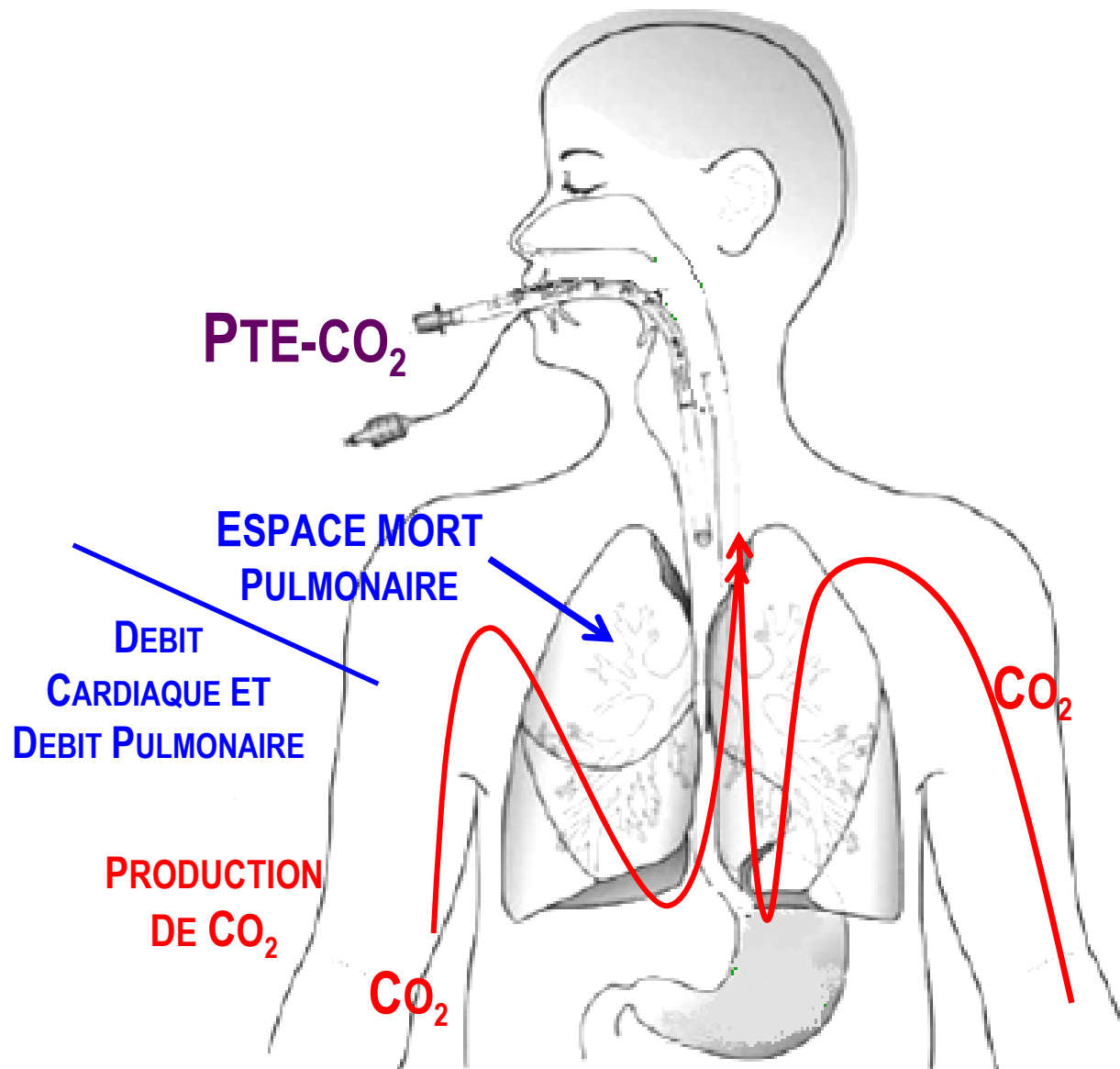
SpO₂ \geq 14%

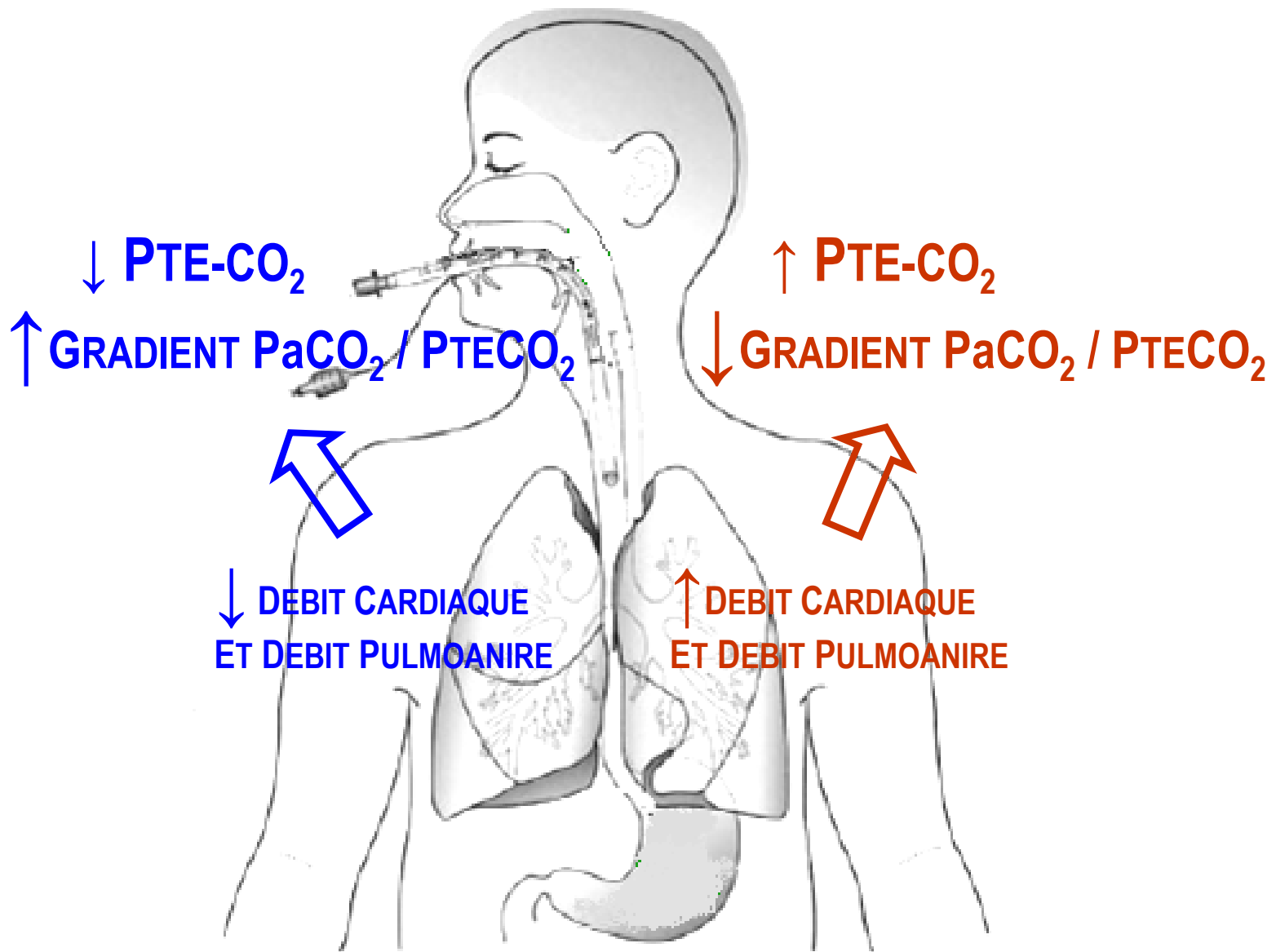


SpO₂: REPONSE AU REMPLISSAGE



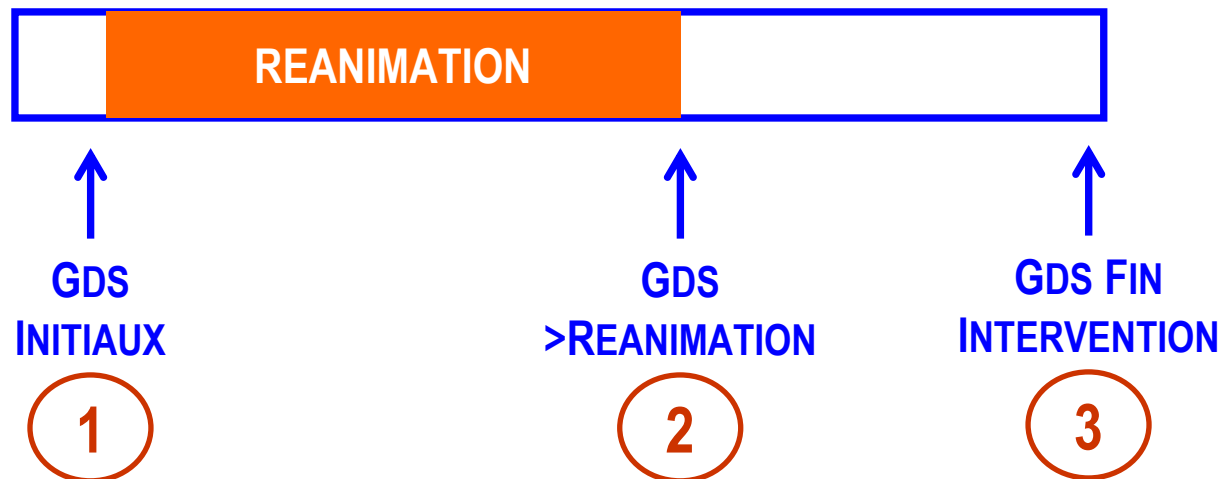
PRESSION TELEEXPIRATOIRE EN CO₂ ??





PRESSION TELEEXPIRATOIRE EN CO₂

106 PATIENTS – EVALUATION DE LA PTE CO₂ / REANIMATION INITIALE



PRESSION TELEEXPIRATOIRE EN CO₂

PTECO₂

	VIVANT [N+83]	DECEDE [N=23]
1	32	29
2	30	25
3	30	24

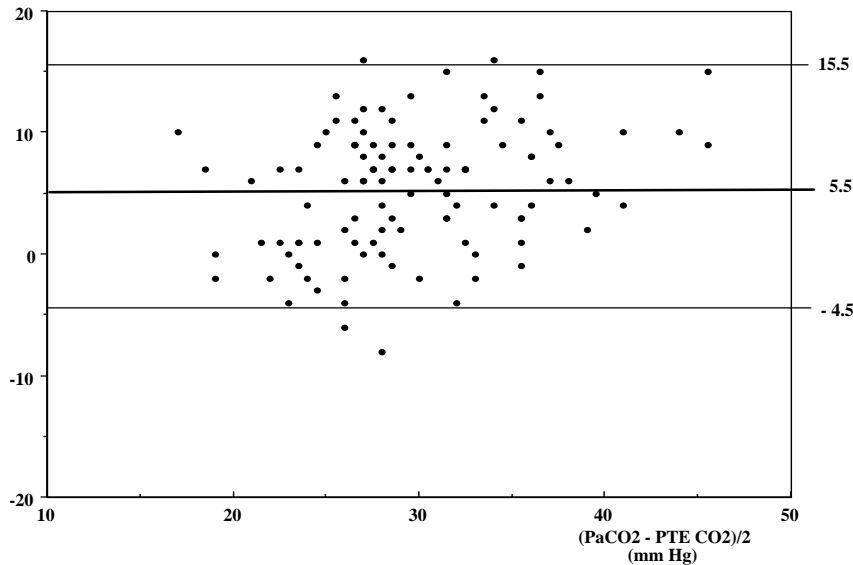
GRADIENT PaCO₂ - PTECO₂

	VIVANT [N+83]	DECEDE [N=23]
1	7	12
2	6	16
3	6	16

La pression télé expira- toire en CO₂ n'est pas un paramètre pertinent de surveillance d'un traumatisme crânien grave

Philippe Seguin MD,*
Jean Paul Bleichner MD,*
Bernard Branger MD,†
Yves Marie Guillou MD,*
Alain Feuillu PhD,‡
Yannick Mallédant MD*

PaCO₂ - PTE CO₂ (mm Hg)



111 PAIRES DE DONNEES

BIAIS = +5,5 MM HG

PRECISION = 5,1 MM HG

LIMITES DE CONCORDANCE

- 4 à +15,5 MM HG

DANS 20% DES CAS VARIATIONS

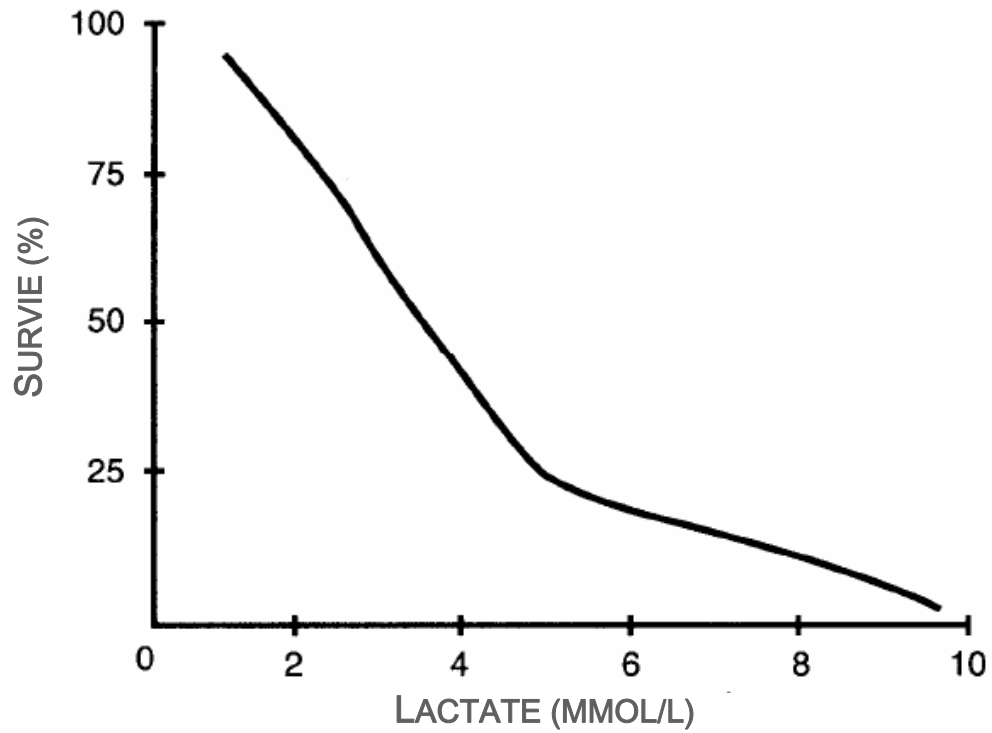
PaCO₂ ET PTE CO₂

EN SENS OPPOSEES

LACTATE

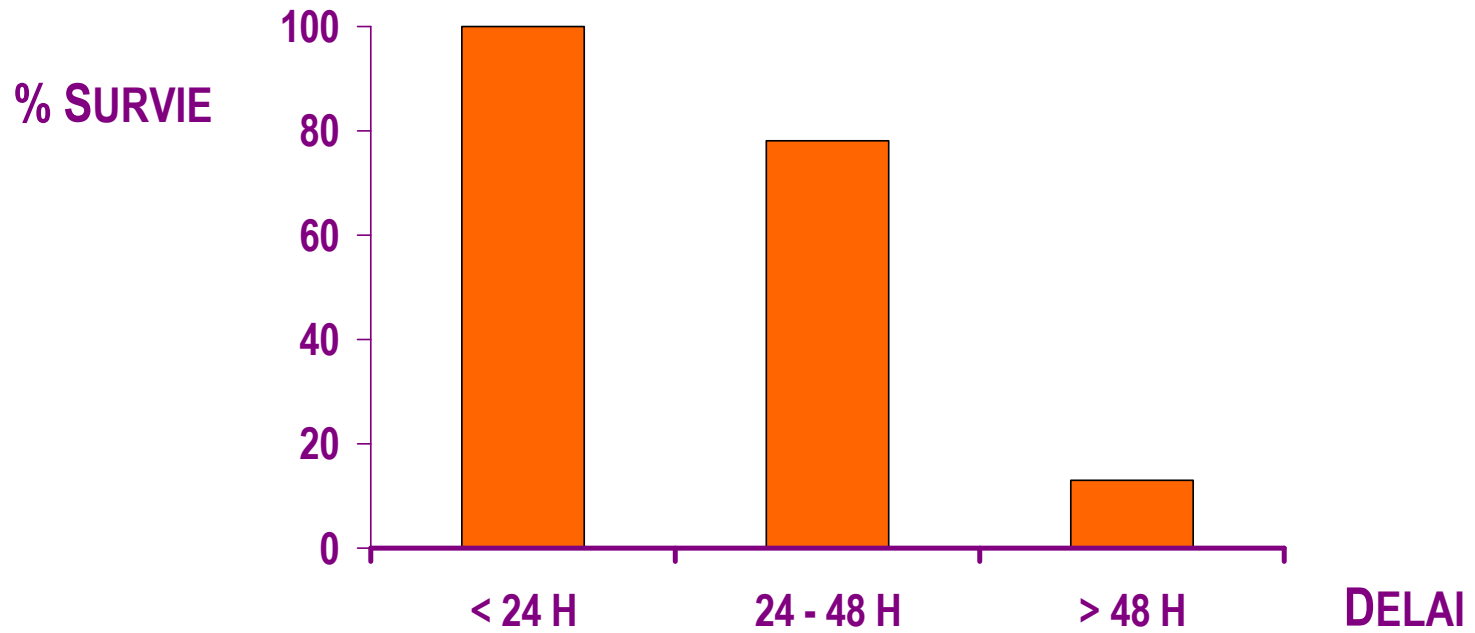
- MARQUEUR D'UN METABOLISME ANAEROBIE**
- LA QUANTITE DE LACTATE PRODUIT EST LE REFLET**
 - ⇒ D'UNE DETTE EN OXYGENE**
 - ⇒ DE L'AMPLEUR DE L'HYPOPERFUSION**
 - ⇒ DE LA SEVERITE DU CHOC**

LACTATE



CIRCULATION 1970;16: 989

LACTATE



BASE DEFICIT

Volume requirements (RL and blood) in base deficit groups (values expressed as cc \pm SEM)

BD Group	N	Hours after Admission			
		1	2	4	24
Mild (2 to -5)	70	2,966 \pm 335	4,030 \pm 520	5,881 \pm 817	7,475 \pm 766
Moderate (-6 to -14)	110	3,893 \pm 322	7,522 \pm 642	8,120 \pm 718	13,007 \pm 1,078
Severe (<-15)	29	6,110 \pm 589	9,800 \pm 982	10,909 \pm 1,435	16,396 \pm 3,252
		<i>p</i> < 0.001	<i>p</i> < 0.001	<i>p</i> < 0.008	<i>p</i> < 0.001

J Trauma 1988;28:1464-1467

MESURE DE L'HEMOGLOBINE



MESURE DE L'HEMOGLOBINE: HEMOCUE®

PRINCIPE

REACTIFS DANS MICROCUVETTE

TRANSFORMATION DE L'HB EN AZOTURE DE METHB

ANALYSE PAR SPECTROPHOTOMETRE

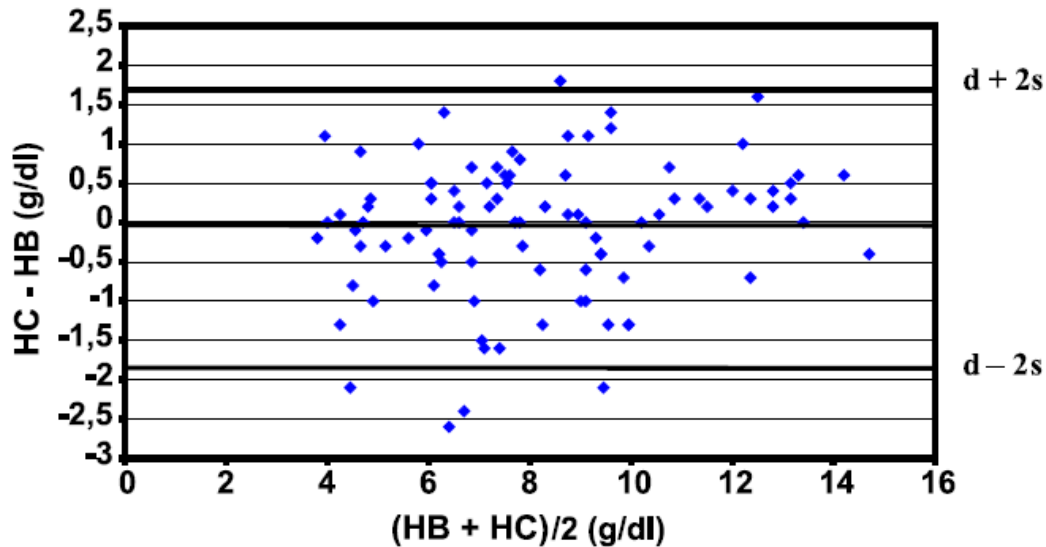
CUVETTE DE CONTROLE

MESURE DE L'HEMOGLOBINE: HEMOCUE®



MESURE DE L'HEMOGLOBINE: HEMOCUE®

SAIGNEMENT GASTROINTESTINAL



94 PATIENTS

REA = 62

URG = 32

HEMATEMESE

MELENA

BIAIS = - 0,06 g/dl

PRECISION = 0,87 g/dl

LIMITES D'AGREMENT **+ 1,68 à - 1,80 g/dl**

MESURE DE L'HEMOGLOBINE: HEMOCUE®

	Bias (g/dl)	<i>p</i>	Precision (g/dl)
Impaired vital signs			
Yes (<i>n</i> = 37)	−0.16	0.42	0.94
No (<i>n</i> = 57)	−0.01		0.81
Hospital unit			
ICU (<i>n</i> = 66)	−0.02	0.45	0.89
ED (<i>n</i> = 28)	−0.17		0.80
HB < 9 g/dl			
Yes (<i>n</i> = 61)	−0.05	0.81	0.91
No (<i>n</i> = 33)	−0.09		0.79
HB < 7 g/dl			
Yes (<i>n</i> = 33)	−0.02	0.67	0.69
No (<i>n</i> = 61)	−0.09		0.95

COAGULOPATHIE

EFFECT DIRECT DE L'HEMORRAGIE

HEMODILUTION

HYPOTHERMIE

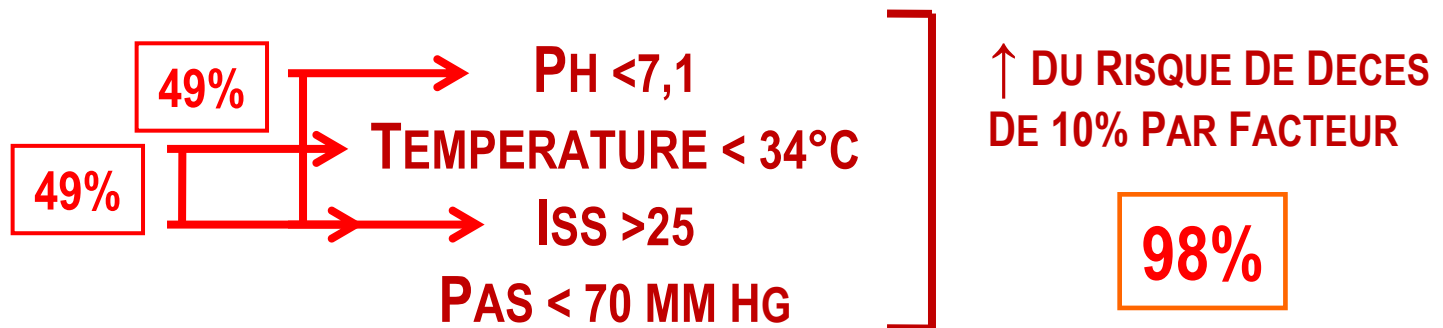
ACIDOSE

TESTS CLASSIQUES NECESSAIRES MAIS INADAPTES

FACTEURS DE RISQUE DE COAGULOPATHIE

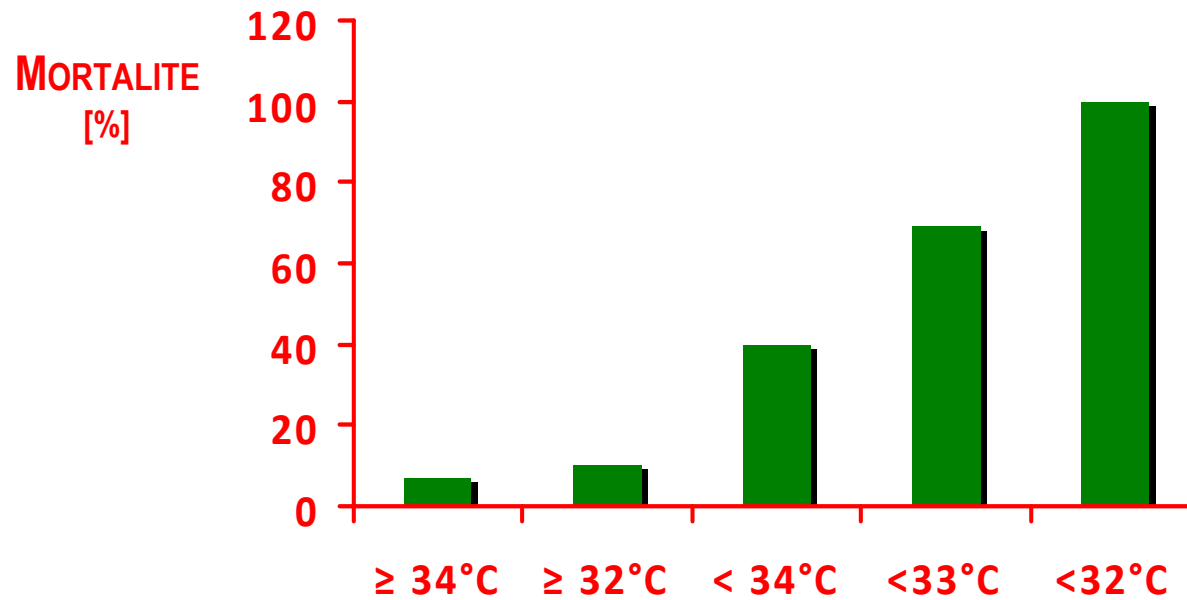
TRANSFUSION MASSIVE (> 10 U C.E/24 H) – DEUX ANS
58 PATIENTS

4 FACTEURS DE RISQUES INDEPENDANTS



TEMPERATURE

71 PATIENTS TRAUMATISES GRAVES – ISS \geq 25



TEMPERATURE

Table 1 Traditional classification of hypothermia and revised definitions for the trauma patient

Degree of hypothermia	Traditional classification (°C)	Trauma classification (°C)
Mild	32–35	34–36
Moderate	28–32	32–34
Severe	20–28	<32
Profound	14–20	
Deep	<14	

« FONCTION » RENALE

POSE SONDE VESICALE



SURVEILLANCE DE LA DIURESE



OBJECTIF > 0,5 ML/KG

AVENIR PROCHE ??



Cl^oser to the Heart™

HEMOGLOBIN

Noninvasive > Continuous > Immediate



JUSQU'EN 2005 DEUX LONGUEURS D'ONDES
2005 => HUIT LONGUEURS D'ONDES

HEMOGLOBIN

Noninvasive > Continuous > Immediate



→ 2005 (2) LONGUEURS D'ONDES

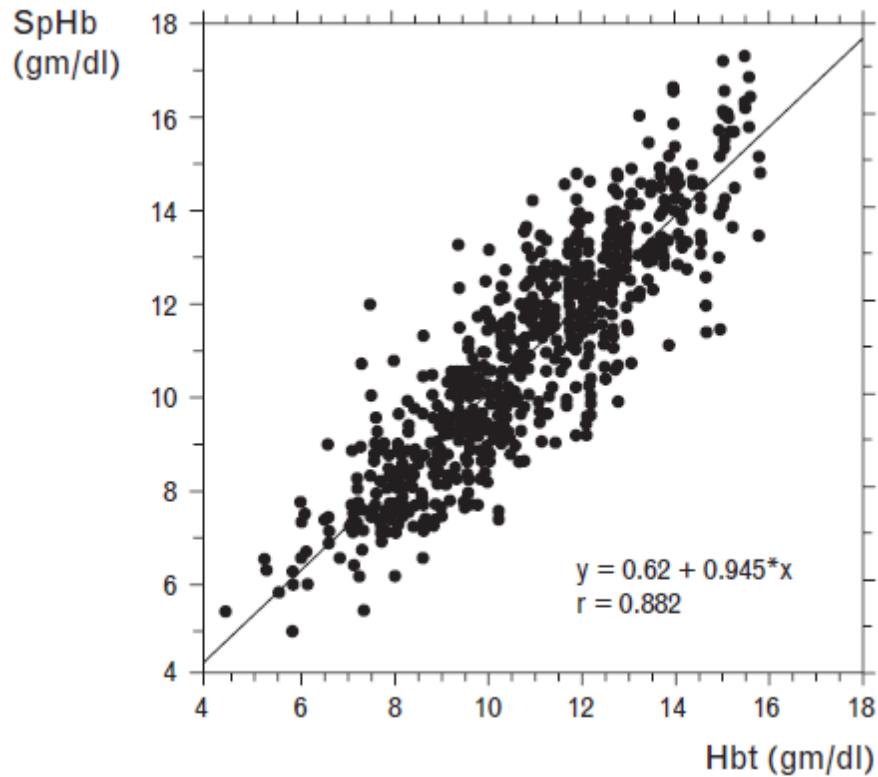
2005 => (8) LONGUEURS D'ONDES

CO
METHb

2008 => (12) LONGUEURS D'ONDES

CO
MET-Hb
Hb totale

MESURE DE L'HEMOGLOBINE:®



**30 PATIENTS CHIRURGICAUX
ET
18 VOLONTAIRES SAINS**

Hb 4,4 – 15,8 g/dl

BIAIS = 0,03 g/dl

PRECISION = 1,12 g/dl

THROMBOELASTOGRAMME



NORMAL



HEMOPHILIE



THROMBOPENIE

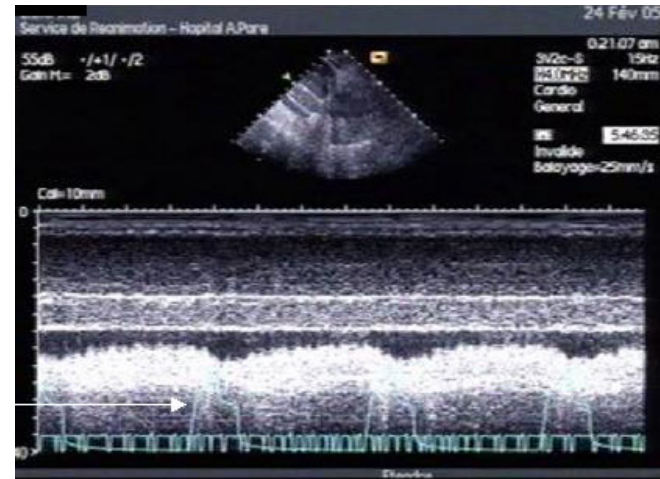


FIBRINOLYSE



HYPERCOAGULOPATHIE

ECHOGRAPHIE



$$\Delta VCI = [VCI_{max} - VCI_{min} / (VCI_{max} + VCI_{min}) / 2] \times 100$$

>12% (VPP de 93% et VPN de 92%)

$$\text{INDEX DE DISTENSIBILITE VCI} = (D_{max} - D_{min}) / D_{min}$$

>18% (Se et Spe de 90%)

ECHOGRAPHIE

LIMITES

ANATOMIQUE

VENTILATION MECANIQUE /ADAPTATION
RESPIRATEUR

PRESSION ABDOMINALE

ABSENCE D'HTAp

>18% (Se et Spe de 90%)

VIGILEO



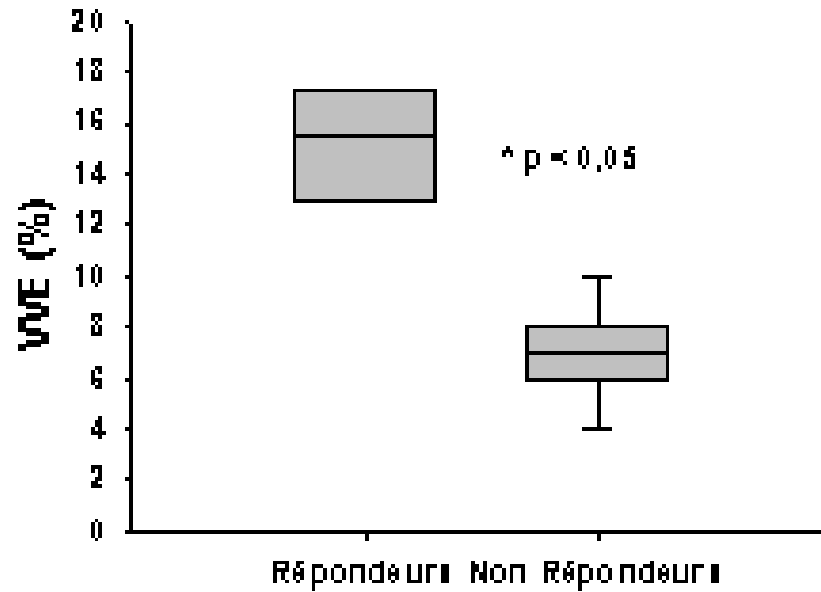
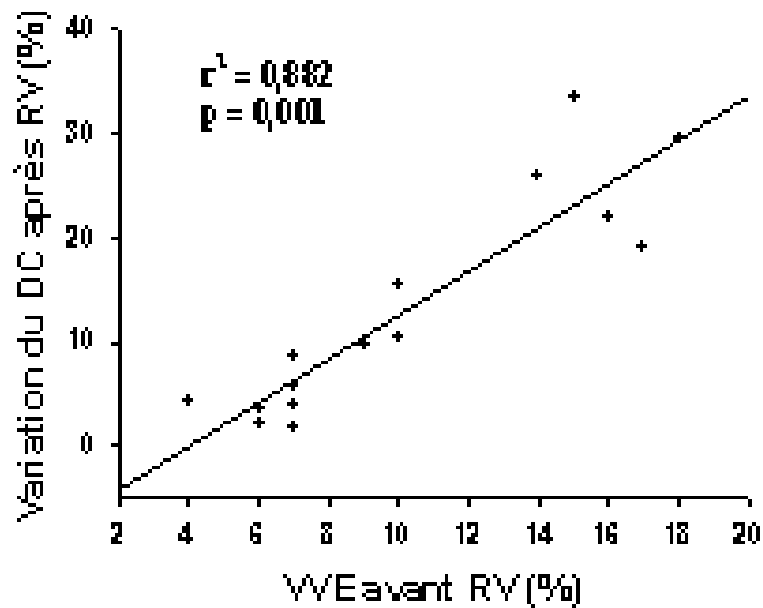
A PARTIR DE LA COURBE PRESSION ARTERIELLE

⇒ DEBIT CARDIAQUE CONTINU

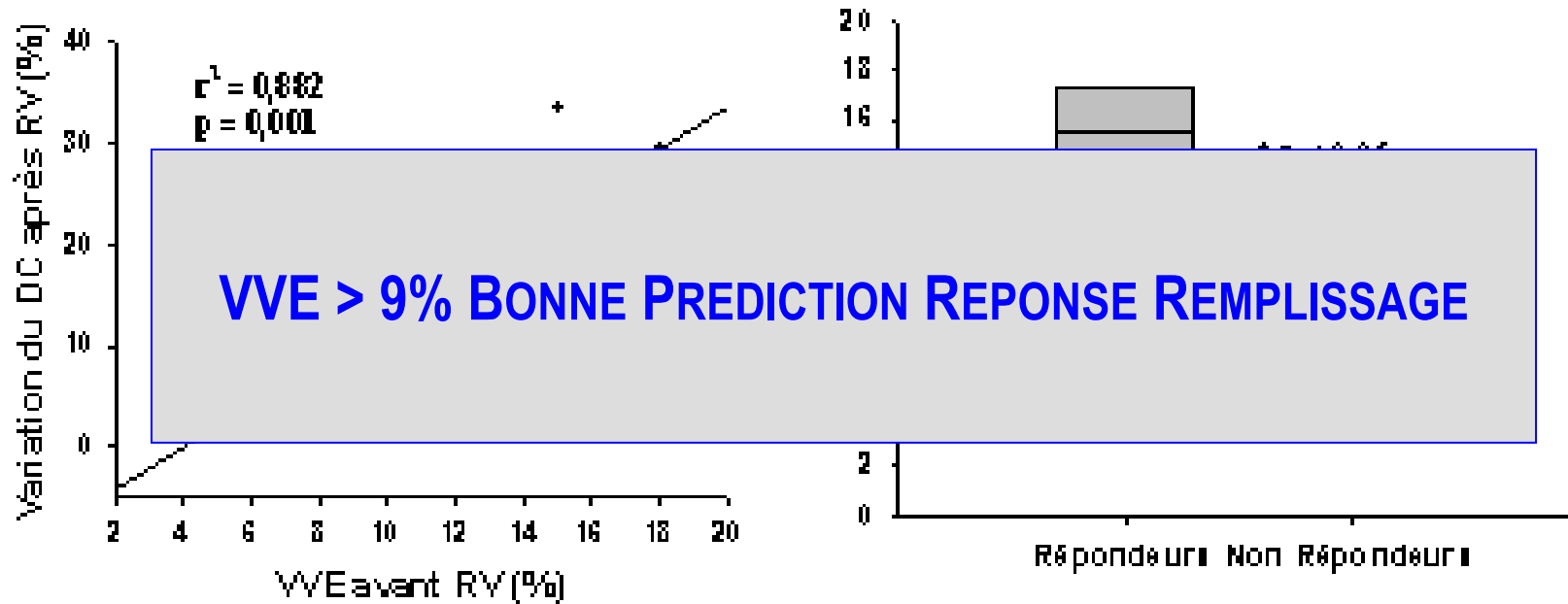
⇒ VARIATION VOLUME EJECTION SYSTOLIQUE

⇒ COUPLE K_{Tc} $SvCO_2$

VIGILEO



VIGILEO



..et ce nouveau système de monitoring
est d'une remarquable fiabilité

.. j'en perçois les
premiers bénéfices

