7ème symposium du GIAL | SIGA / FSIA | 7° simposio del GIAL

5 octobre 2019 Hôpital du Valais Sion 5 ottobre 2019

Quoi de neuf en 2019?

La buona pressione arteriosa

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R. Doureradjam

SIGA FSIA

Schweizerische Interessengemeinschaft für Anästhesiepflege
Fédération suisse des infirmières et infirmiers anesthésistes
Federazione svizzera infermiere e infermieri anestesisti

Groupe régional des Infirmiers-ères Anesthésistes Latins
Gruppo regionale degli Infermieri Anestesisti Latini

In pratica

Qual'é la pressione arteriosa minima tollerabile?

Per quanto tempo si possono tollerare ipotensioni?

L'ipotensione arteriosa: un problema frequente

Predictors of Hypotension After Induction of General Anesthesia

9% dei casi d'ipotensione tra 0 – 10 min post-induzione
PAM ≤ 60 mm Hg o PAM ≤ 70 mm Hg e PA ≤ 40 % valore abituale

D L. Reich et all, Anesth Analg 2005; 101: 622-8

Hypotension after induction of general anesthesia: occurrence, risk factors, and therapy. A prospective multicentre observational study

36.5 % d'ipotensione tra 0 e 10 min

O. Jor et all, Journal of Anaesthesia, 2018, 32:673-680

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Definizione

La pressione arteriosa è la pressione esercitata dalla circolazione del sangue sulla parete dell'arteria

Una pressione arteriosa elevata è superiore a 140/90 mm HG

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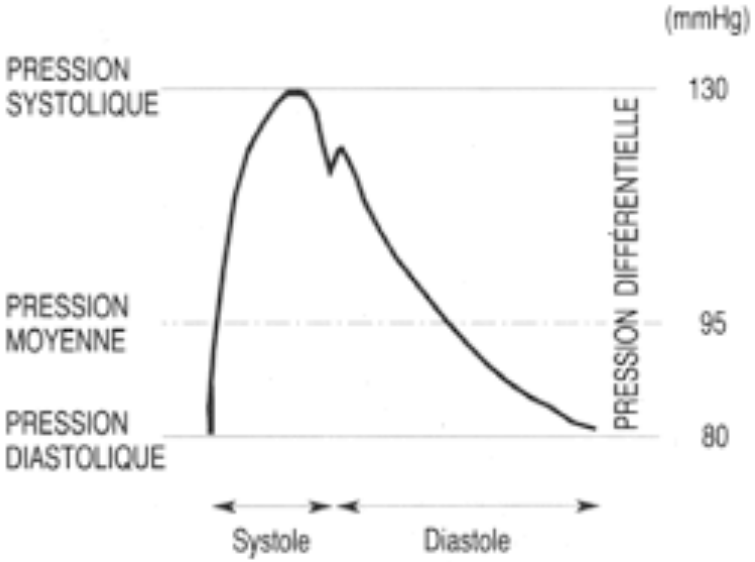
Fisiologia

PA : elemento determinante della perfusione del tessuto periferico

PAM = DC x RPT

PAM = VES x FC x 8 h L / p r_4

P.A.M. = (P.A.S. + 2 x P.A.D.) / 3



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Le norme dell'OMS

Pressione arteriosa omerale in millimetri di mercurio: mm Hg	Pressione sistolica (mm Hg)	Pressione diastolica (mm Hg)
PA ottimale	Inf o uguale a 120	Inf o uguale a 80
PA normale	Inf o uguale a 130	Inf o uguale a 85
PA normale alta	130 - 139	85 - 89
Stadio 1 HTA	140 - 159	90 - 99
Stadio 2 HTA	160 - 179	100 - 109
Stadio 3 HTA	Sup o uguale a180	Sup o uguale a 110
HTA sistolica isolata	Sup o uguale a 140	

Ipotensione arteriosa : PAS < 90 mm Hg - PAD < 60 mm Hg

Le norme in anestesia

Incidence of Intraoperative Hypotension as a Function of the Chosen Definition

140 definizioni

Soglie in valori assoluti

PAS ≤ 100, 90, 80, et 70 mm Hg
PAM ≤ 70, 60, 50 et 40 mm Hg

Soglie in valori relativi

PAM ou PAS ≤ 10, 20, 30, et 40 % del valore di base

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J B. Bijker et all, Anesthesiology 2007;107:213-20

Recommandations sur la réanimation du choc hémorragique☆

Raccomandazioni sulla rianimazione dello shock emorragico

PAS : 80 – 90 mm Hg

PAM : 60 – 65 mm Hg

Recommandation

Il faut probablement tolérer un certain degré d'hypotension artérielle pour minimiser les risques d'aggravation du saignement tant que l'hémostase chirurgicale et/ou radio-interventionnelle n'est pas réalisée avec un objectif de pression artérielle systolique entre 80–90 mmHg (ou pression artérielle moyenne entre 60–65 mmHg), en l'absence de traumatisme crânien grave, tant que le saignement n'est pas contrôlé (GRADE 2 +).

Pour les patients traumatisés crâniens graves (Coma Glasgow Score ≤ 8) en choc hémorragique, il est recommandé d'avoir un objectif de pression artérielle moyenne ≥ 80 mmHg, avant de disposer d'un monitorage cérébral, en dépit du risque d'aggravation du saignement (GRADE 1 +).

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J. Duranteau et all, Anesth Reanim. 2015; 1 :62-74

Storia

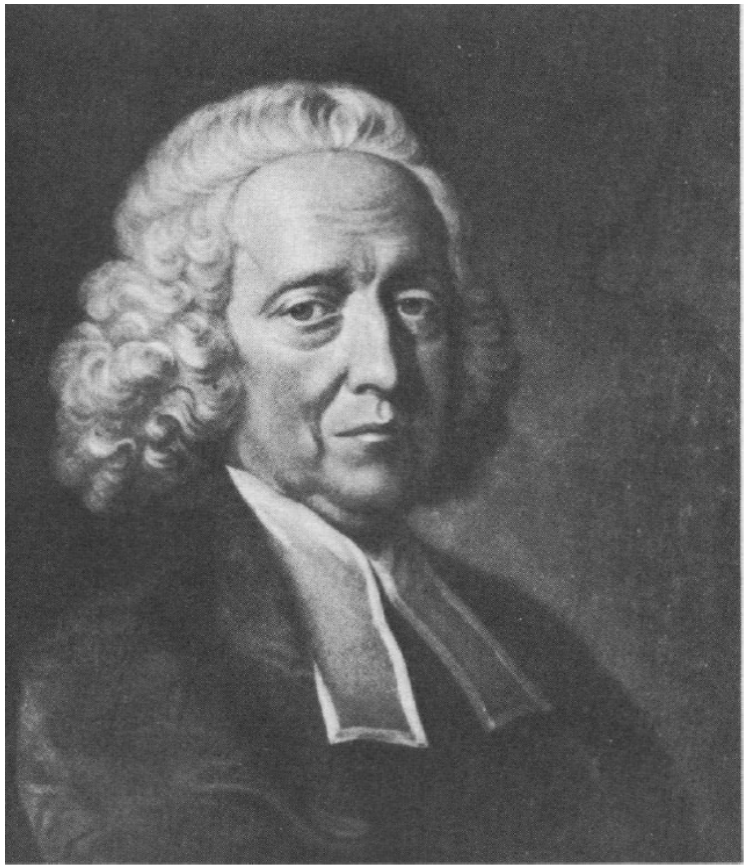

Fig 1 *Stephen Hales (1677–1761) (by courtesy of the Wellcome Trustees)*

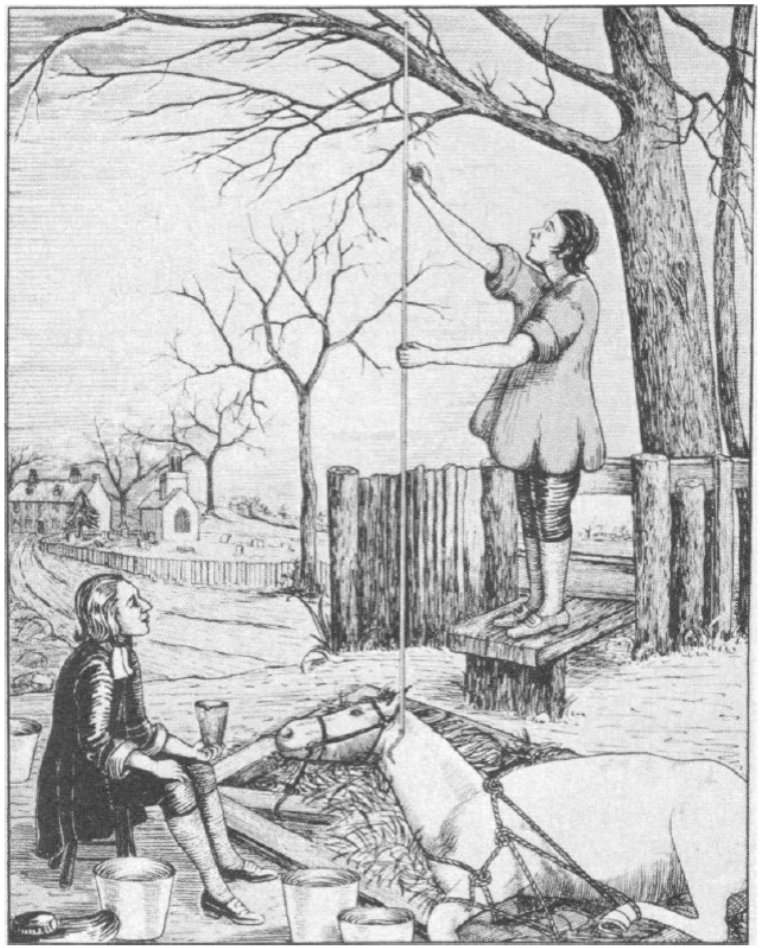

Fig 2 *Artist's impression of Hale's experiments to determine the blood pressure of a horse. (Reproduced from Medical Times 1944 by kind permission)*

Proc. roy,. Soc. Med. Vol 70. Nov 1977

Storia

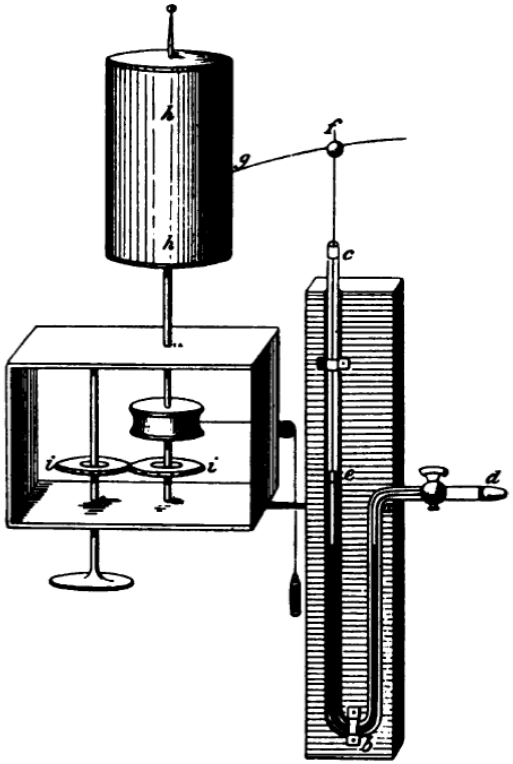

Fig 3 *Ludwig's kymograph, invented 1847. The bent glass tube, abc, contains mercury and connects by d with the artery. The slender upright rod, ef, swims on the surface of the mercury and bears at its free end, f, a brush, g, which registers the movements of the mercury on the revolving cylinder, hh. (Reproduced from Brunton 1908 by courtesy of the Wellcome Trustees)*

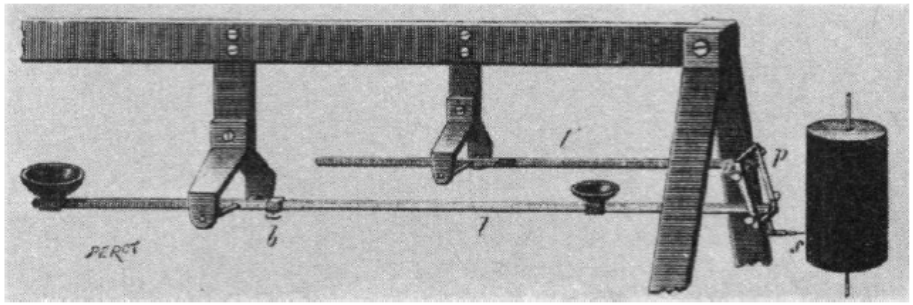

Fig 4 *Vierordt's sphygmograph, invented 1854. The pad, b, is applied over the radial artery. Weights are placed in the large cup until a pulse wave is traced out, then weights are placed in the smaller cup which acts as a fine adjuster (by courtesy of the Wellcome Trustees)*

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Storia

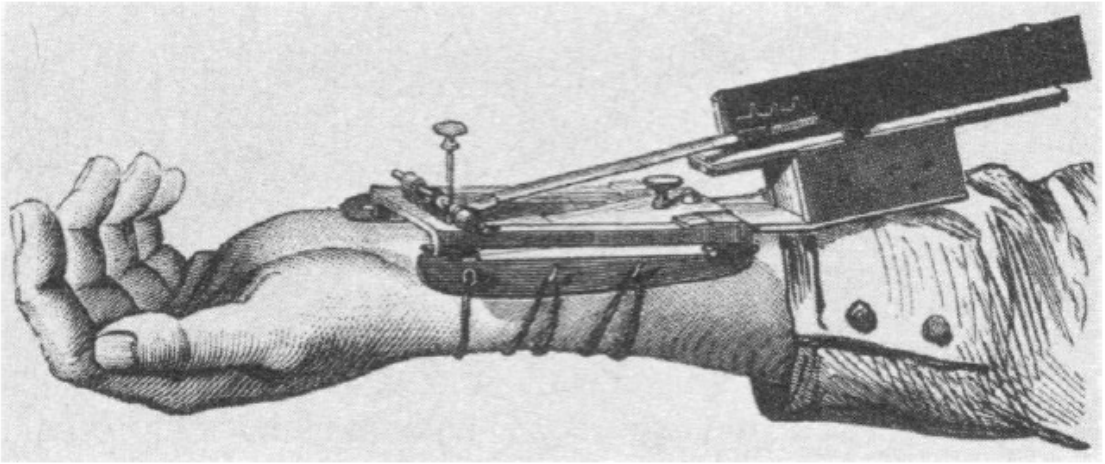

Fig 5 *A direct sphygmograph attributed to Marey, invented about 1881 (by courtesy of the Wellcome Trustees)*

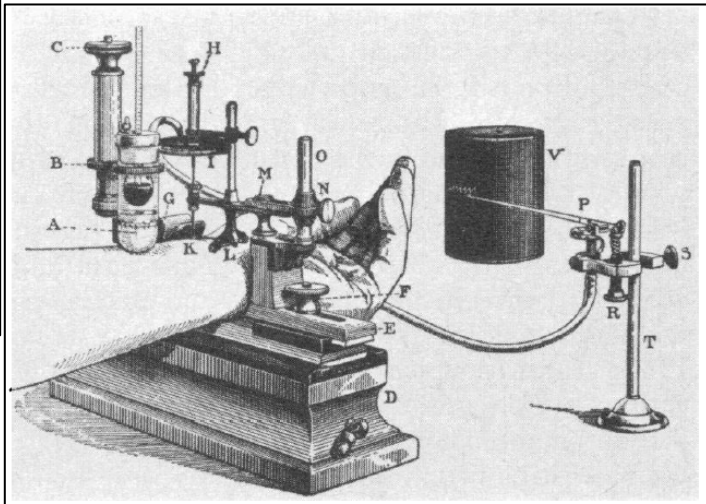

Fig 6 *Von Basch's sphygmomanometer and stand, invented about 1881. Despite its unwieldy appearance this is a simple device. The india rubber cap, A, rests on the radial artery and the arm is clamped between E and G. K is a fine pad which also rests against the artery. H is a fine screw by which the tambour of the sphygmograph can be adjusted and P is one of Marey's tambours which communicates by a piece of elastic tubing with the tambour of the sphygmograph (by courtesy of the Wellcome Trustees)*

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Proc. roy,. Soc. Med. Vol 70. Nov 1977

Storia

1896 Scipione Riva-Rocci, número 47 de la Gazzetta Medica di Torino (página 981),

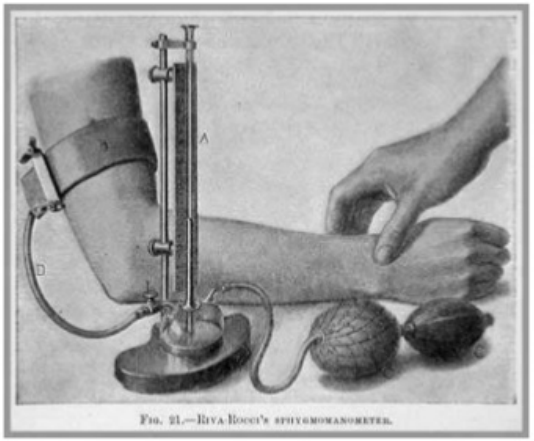
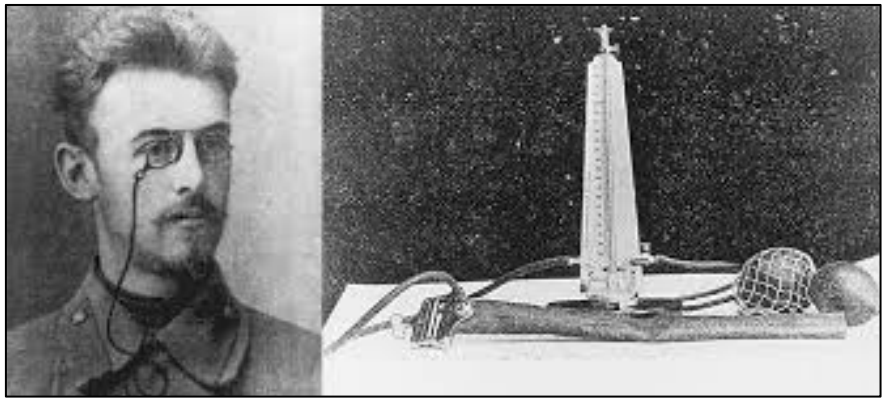


Fig. 21.—Riva-Rocci's sphygmomanometer.



N C Korotkoff, 1905

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Inoltre …

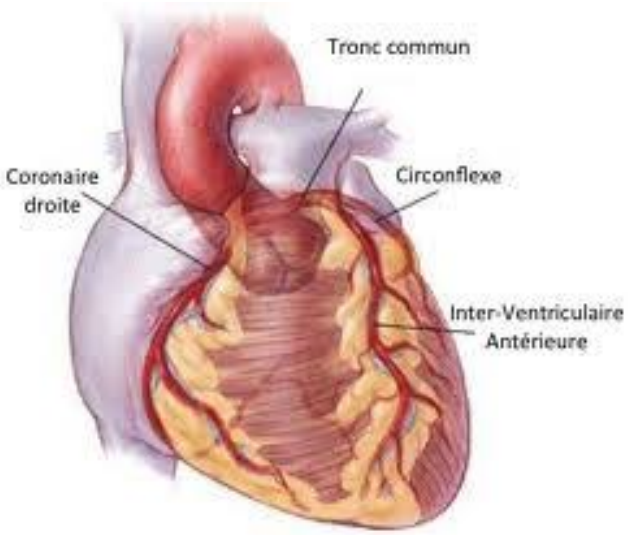
PA e circolazione coronarica

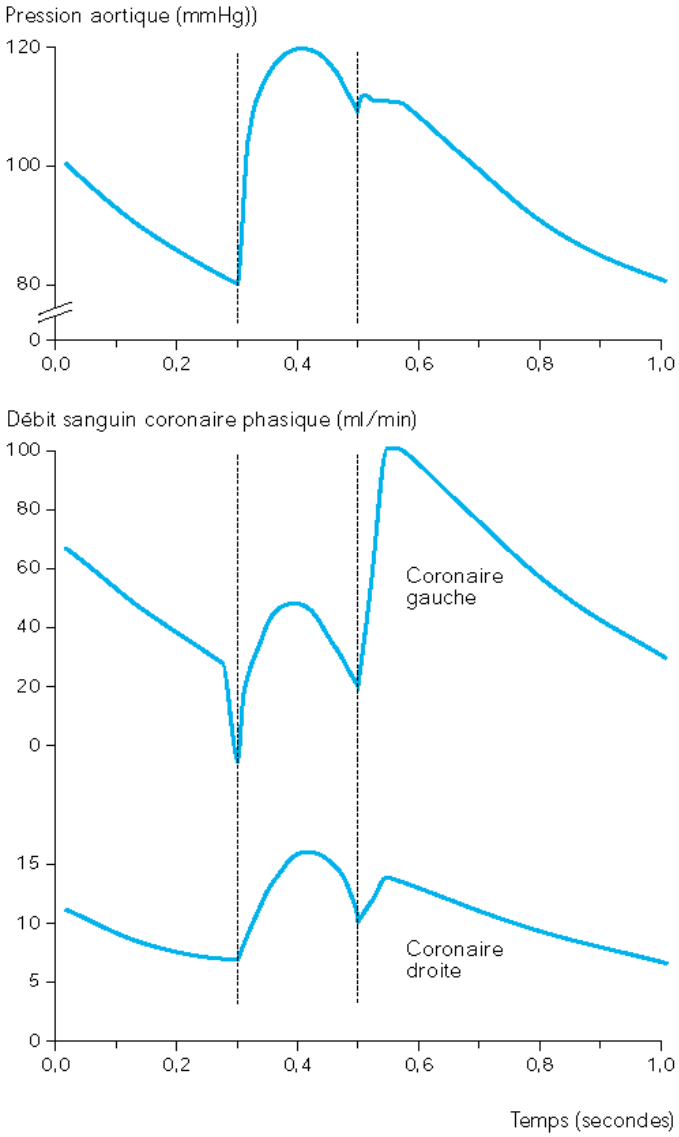
PA e circolazione renale

PA e circolazione cerebrale

Ipotensione e complicazioni

Circolazione coronarica e pressione





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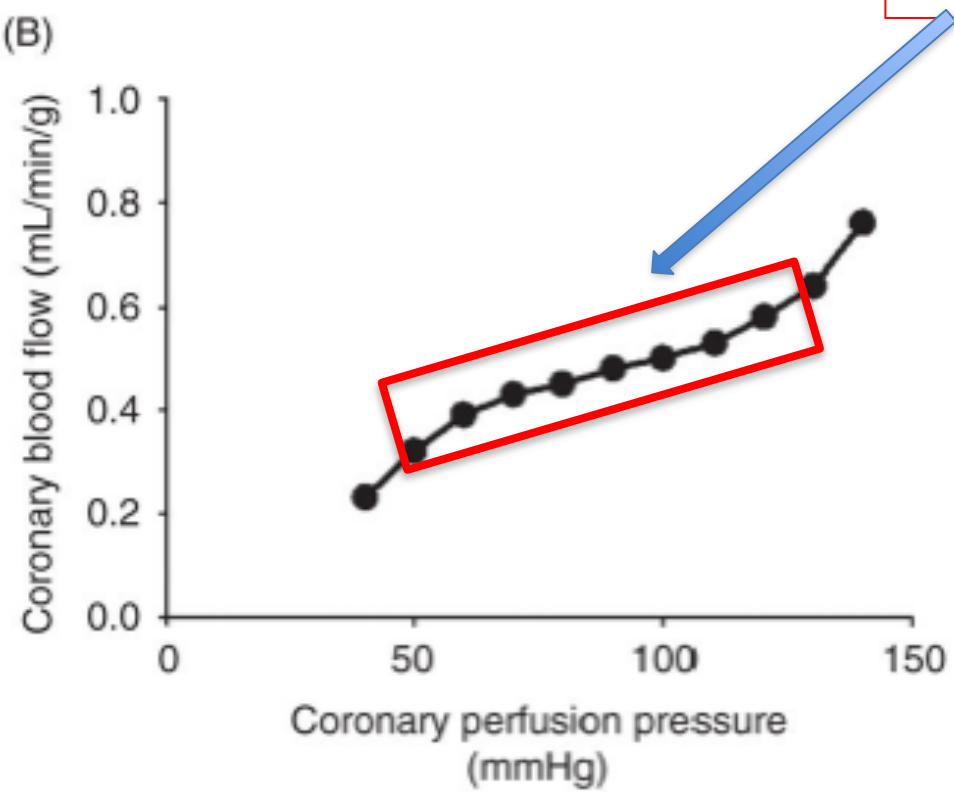
Circolazione coronarica e pressione arteriosa

PPC = PAM - PAPO

Flusso constante per:
PPC de 50 à 130 mm Hg
PAM de 60 à 160 mm Hg



Relazione tra pressione di perfusione coronarica e flusso sanguigno coronarico

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Regulation of coronary Blood Flow Adam G. Goodwill, 2018

Complicazioni miocardiche

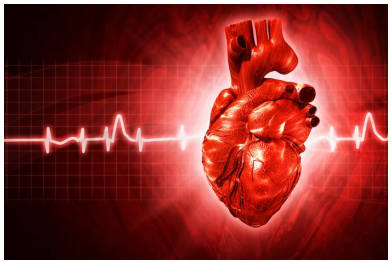
Patient and perioperative characteristics	
Sex, *n* (%)	Age
	Women
	BMI
	Smokers
ASA	1
	2
	3
	4
Comorbidity	Hypertension
	Atrial fibrillation
	Congestive heart failure
	Ischaemic heart disease
	Insulin-dependent diabetes mellitus
Chronic medication	ACE inhibitors
	β blockers
	Calcium channel blockers
Preoperative data	Creatinine ($\mu mol\ l^{-1}$)
	Abnormal ECG
Surgical procedure	Gastrointestinal surgery
	Urology
	Gynaecology
	Vascular surgery
	Plastic surgery
	Head and neck surgery
	Orthopaedics
Type of anaesthesia	General
	Regional
	General and regional
	Local
Intraoperative events	Hypotension[a]
	Hypotension > 40%
	Hypotension > 50%
	Tachycardia
	Hypoxia
	Intraoperative blood loss (ml)
	Intraoperative blood loss (%)
Postoperative data	Fluid balance
	AKI
Outcome	MI < 30 days
	Mortality < 30 days
	Mortality < 6 month

Intraoperative hypotension is associated with myocardial damage in noncardiac surgery

N : 300

PAS ≤ 50 % valore abituale / 5 min

Complicazioni cardiache tra giorno 1 e giorno 30



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Linn Hallqvist and all, Eur J Anaesthesiol 2016 ; 33:450-456

Complicazioni miocardiche

Relationship between Intraoperative Mean Arterial Pressure and Clinical Outcomes after Noncardiac Surgery

Analisi retrospettiva - USA
N : 33 000 - ASA 1 à 4

Obiettivi : determinare i fattori predittivi di mortalità e di morbidità

Esaminare la PAM peroperatoria - chirurgia non cardiaca

PAM ≤ 55 mm Hg → complicazioni renali e cardiache

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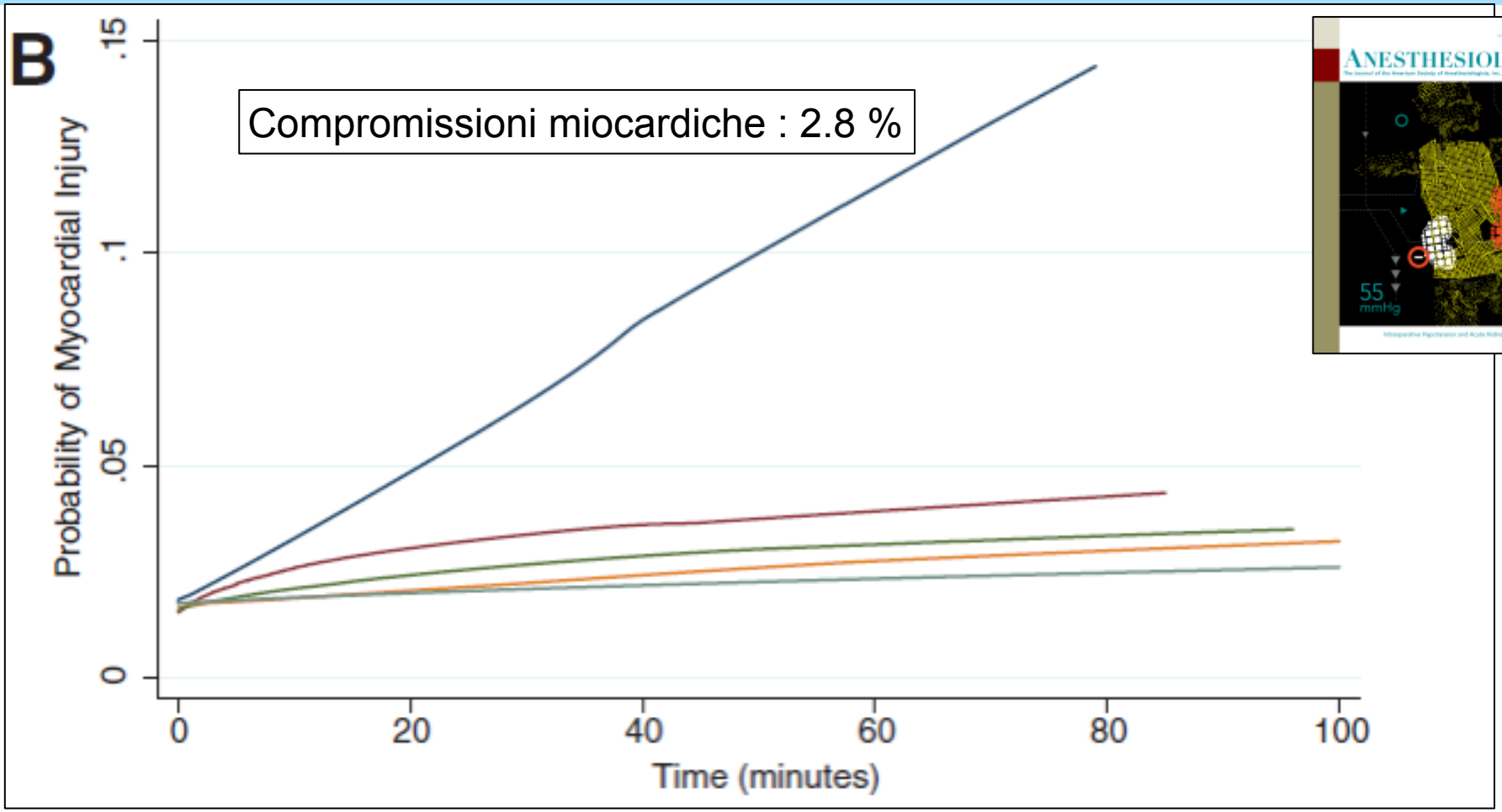
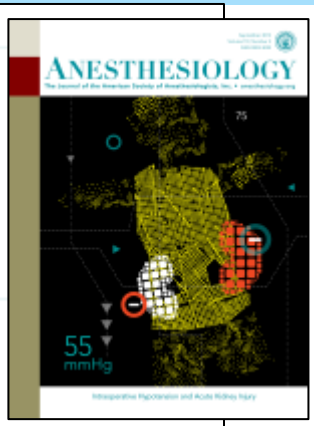
Walsh et al. 2013, Anesthesiology; 119:507-15

Complicazioni cardiache





Rischi di danni miocardici in funzione del tempo di esposizione a diverse PAM

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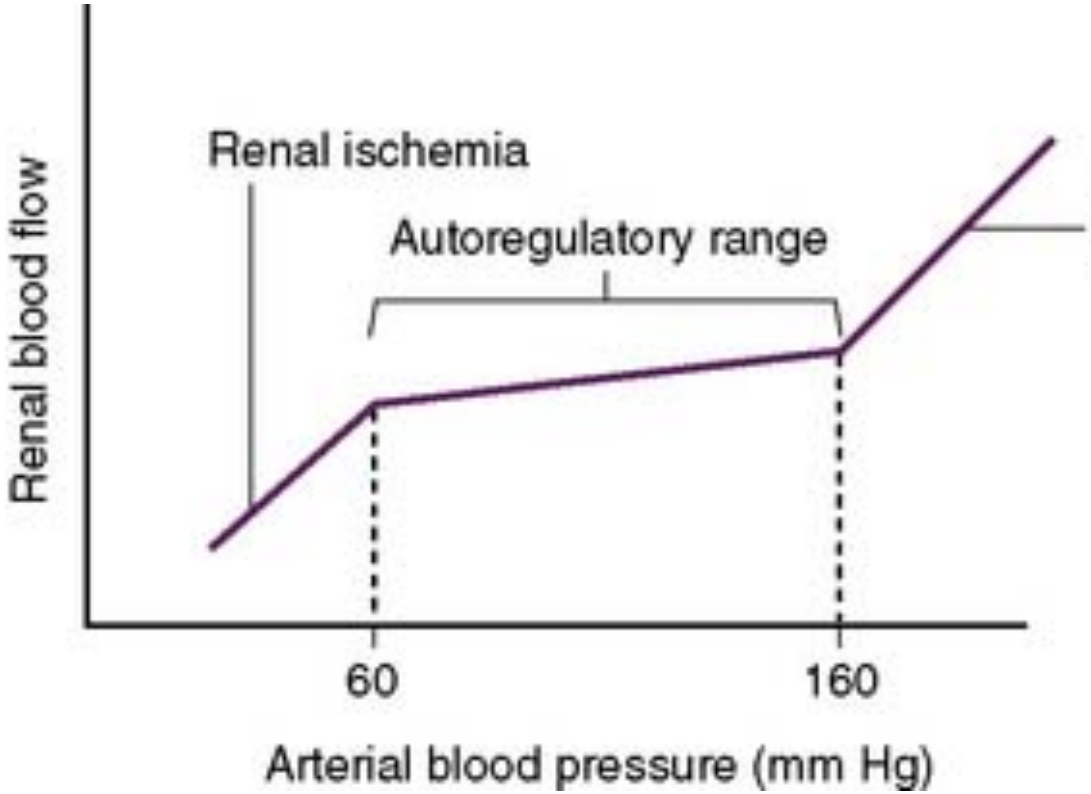
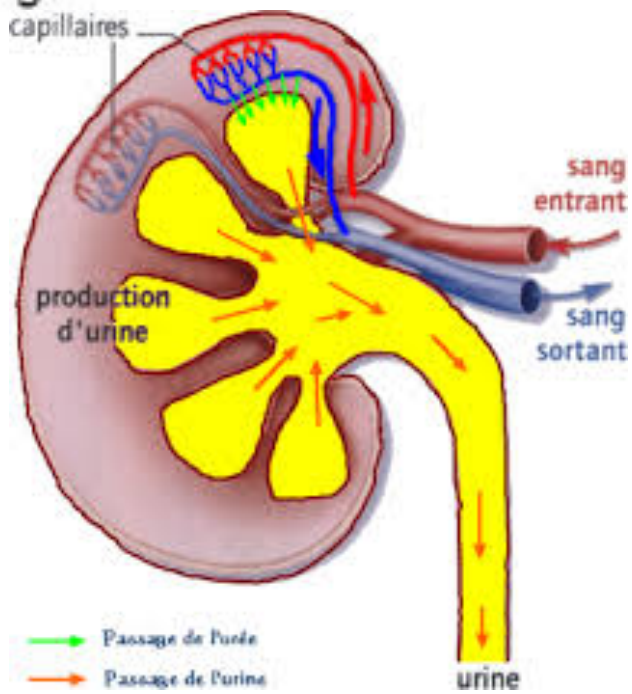
Walsh et al. 2013, Anesthesiology; 119:507-15

Circolazione renale e PA





Autoregolazione del flusso sanguigno renale

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B. Lacour, 2013 Physiologie du rein et bases physiopathologiques des maladies rénales. Revue Francophone des laboratoires – N° 451

Complicazioni renali

Intraoperative hypotension is associated with acute kidney injury in noncardiac surgery

Table 1 Characteristics of the cohort and the proportion of acute kidney injury

Patient and perioperative characteristics		Total $n = 470$
Age years (range)		67 (58 to 74)
Sex n (%)	Female	223 (47)
BMI (kg m^{-2})		25 (23 to 28)
	Smokers	60 (13)
ASA	1	47 (10)
	2	221 (45)
	3	208 (44)
	4	4 (0.009)
	>2	212 (45)
Comorbidity	Hypertension	206 (44)
	Atrial fibrillation	43 (9)
	Congestive heart failure	19 (4)
	Ischaemic heart disease	38 (8)
	Insulin-dependent diabetes mellitus	29 (6)
Chronic medication	ACE inhibitors	71 (15)
	β-blockers	115 (24)
	Calcium channel blockers	70 (15)
Preoperative data	Creatinine (μmol l^{-1})	75 (62 to 91)
Surgical procedure	Gastrointestinal surgery	238 (51)
	Urology	136 (29)
	Gynaecology	54 (11)
	Vascular surgery	8 (2)
	Plastic surgery	6 (1)
	Head and neck surgery	21 (4)
	Orthopaedics	7 (1)
Type of anaesthesia	General	148 (31)
	Regional	13 (3)
	General and regional	308 (66)
Intraoperative events	Hypotension[a]	43 (37 to 48)
	Hypotension >40%[a]	286 (61)
	Hypotension >50%[a]	68 (14)
	Tachycardia	50 (10)
	Hypoxaemia	4 (0.009)
	Intraoperative blood loss (ml)	500 (200 to 1200)
Postoperative data	Fluid balance	2825 (2045 to 3585)
	Hs-cTnT	11 (7 to 17)
Outcome	Myocardial damage[b]	156 (33)
	Mortality <30 days	9 (2)

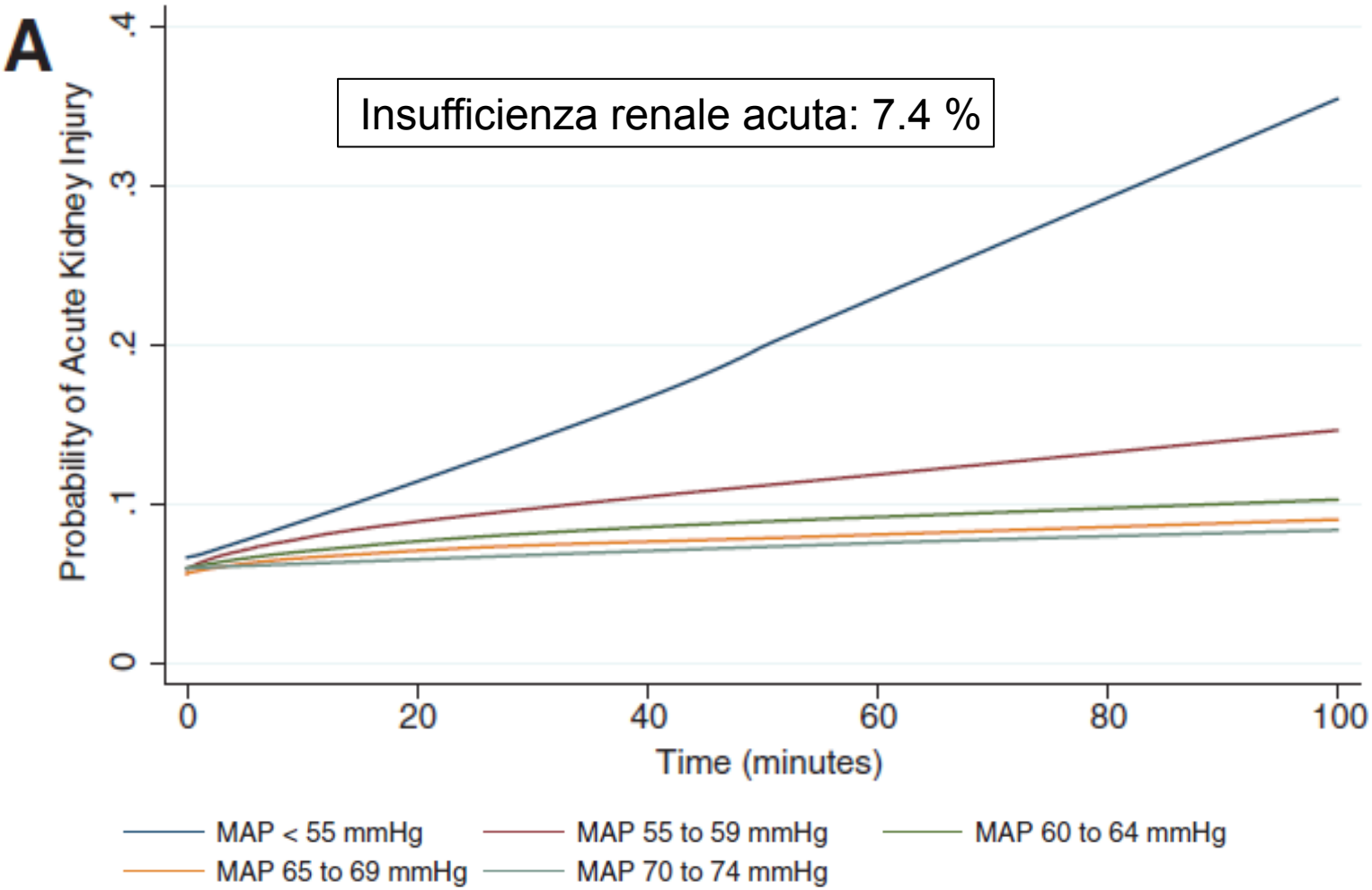
PAS ≤ 40 à 50 % valori di base durante 5 min

30 % dei pazienti in IRA nel post-operatorio di chirurgie pesanti non cardiache

Conclusioni : prevenzione delle ipotensioni peroperatorie permetterebbe di ridurre le IRA

Linn Hallqvist and all, Eur J Anaesthesiol 2018 ; 35:273-279

Complicazioni renali



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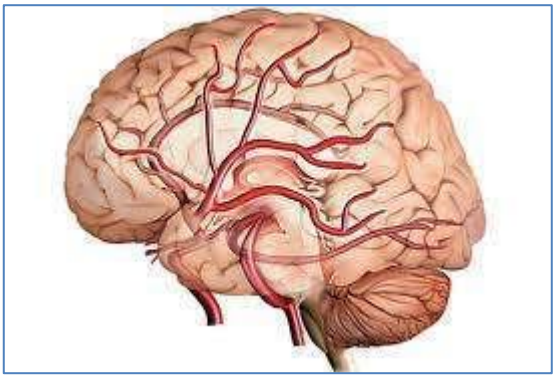
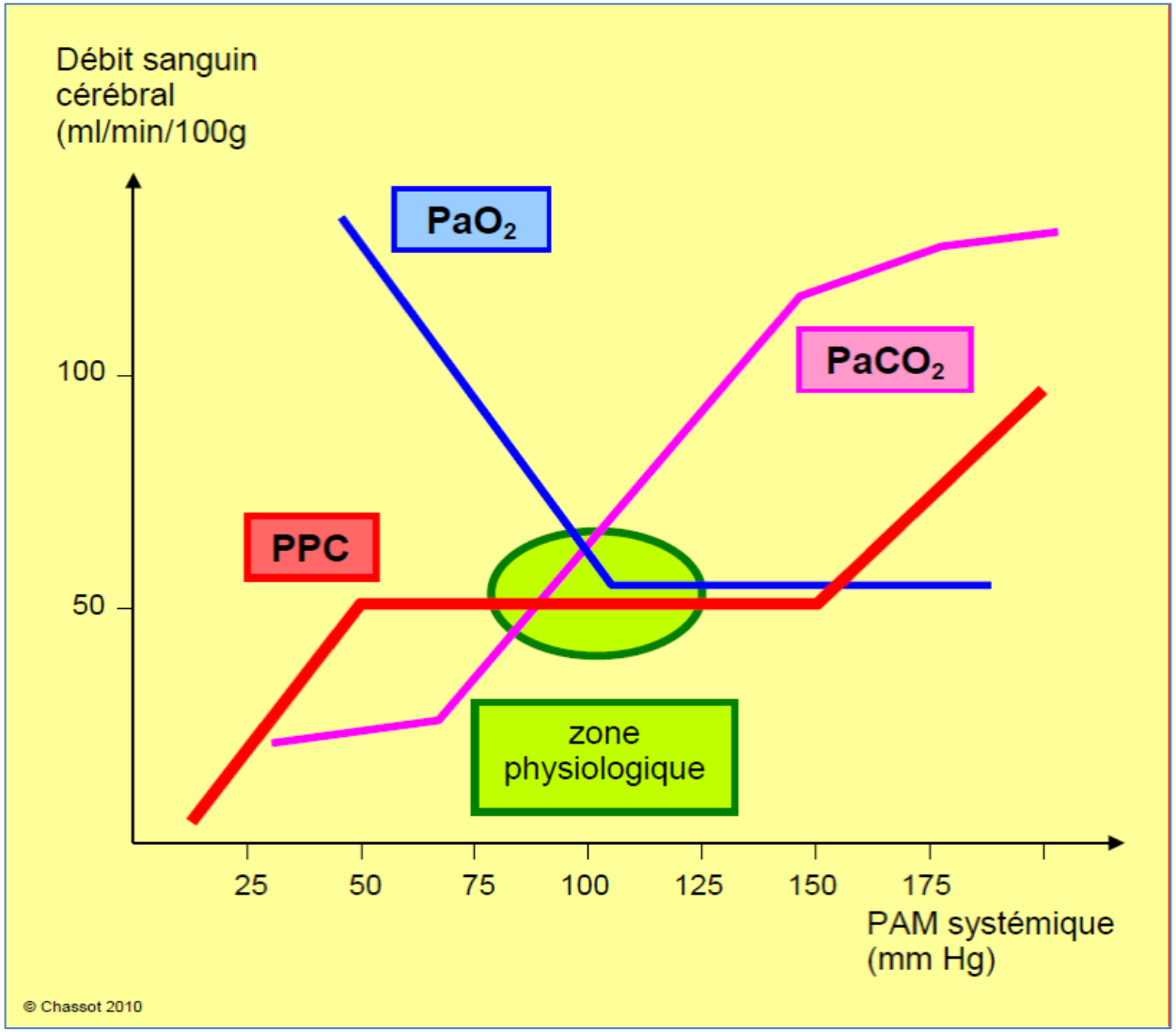
Walsh et al. 2013, Anesthesiology; 119:507-15

Circolazione cerebrale e PA



Autoregolazione del flusso sanguigno cerebrale



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P G. Barash 2006

Complicazioni cerebrali

CEREBRAL HEMODYNAMICS DURING CEREBRAL ISCHEMIA INDUCED BY ACUTE HYPOTENSION

N : 44 pazienti

4 Gruppi : giovani normotesi – anziani normotesi– Ipertensione essenziale – Ipertensione maligna

Esperienza : provocare un'ipotensione (ganglioplegica – proclive) fino a un'insufficienza circolatoria acuta.

Risultati : sospiri, sbadigli, stupore, confusione, emiplegia

Giovani normotesi : 26 à 44 mm Hg
Anziani normotesi : 23 à 54 mm Hg
ITA essenziale : 23 à 68 mm HG
ITA maligna : 64 à 114 mm HG

PAM inferiore a 44 mm Hg → la perfusione cerebrale é insufficiente

FRANK A. FINNERTY and all, 1954

Complicazioni cerebrali

Real-Time Continuous Monitoring of Cerebral Blood Flow Autoregulation Using Near-Infrared Spectroscopy in Patients Undergoing Cardiopulmonary Bypass

Contesto : 60 adulti – chirurgia cardiaca - CEC

Misure: NIRS – doppler transcranico delle arterie cerebrali - PAM

Risultati : l'autoregolazione del flusso sanguigno cerebrale è perturbato con delle PAM tra 45 et 80 mm Hg

Conclusioni : PAM a 60 mm Hg durante la CEC non è adatta a tutti

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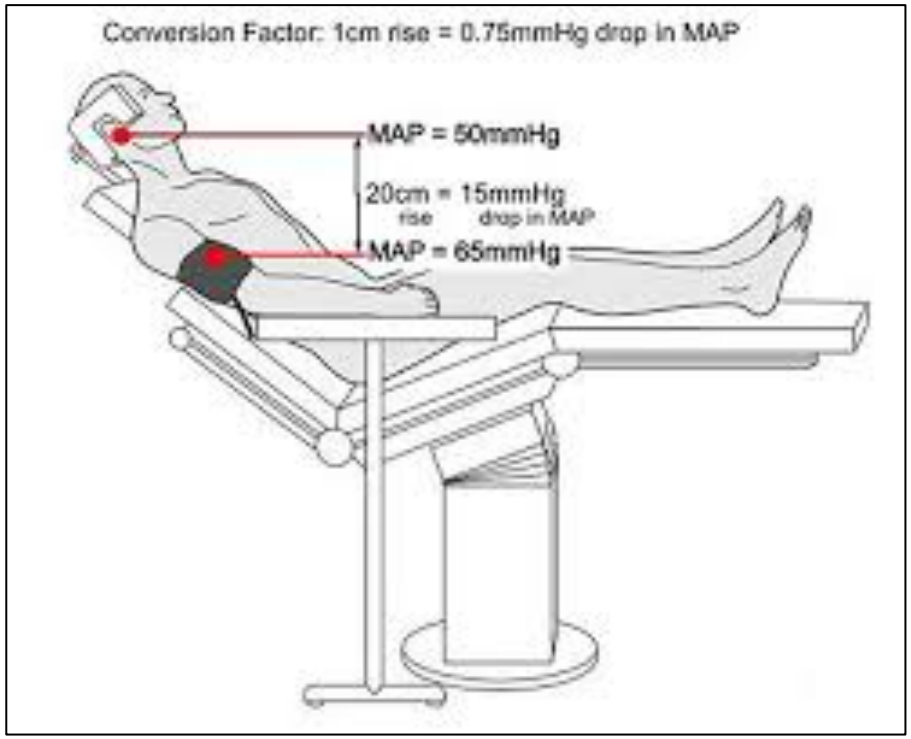
K. Brady and all, 2010. Stroke. 2010;41:1951-1956

Perfusione cerebrale e posizione seduta

Problematica della misura della PA



PA misurata al braccio
Distanza braccio – cervello = 20 cm !

PAM cuore-braccio = 65 mm HG
PAM cervello = 50 mm Hg

Perfusione cerebrale e posizione seduta

Differenza della PAM tra polpaccio e cervello

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L. Delaunay, 2012, MAPAR

PAM adattata al paziente

Automated Ambulatory Blood Pressure Measurements and Intraoperative Hypotension in Patients Having Noncardiac Surgery with General Anesthesia

Table 2. Ambulatory and Perioperative Mean Arterial Pressure

	Mean Arterial Pressure, mmHg		
	Median (25th–75th Percentile)	Minimum	Maximum
Ambulatory mean arterial pressure			
First measurement	109 (98–123)	56	176
Daytime, mean value	100 (94–108)	79	143
Daytime, lowest value	77 (69–85)	50	118
Nighttime, mean value	84 (78–92)	64	138
Nighttime, lowest value	70 (64–78)	50	123
Perioperative mean arterial pressure			
Preinduction, first measurement	100 (91–109)	55	154
Preinduction, lowest value	97 (88–105)	53	149
Early postinduction, lowest value	64 (58–71)	34	138
Late postinduction, lowest value	61 (56–68)	35	121
Early intraoperative, lowest value	64 (58–72)	39	101
Late intraoperative, lowest value	70 (63–77)	46	114
Postoperative, lowest value	75 (66–86)	29	137

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B. Saugel and all, Anesthesiology 2019 ; 131:74-83

Ipotensione controllata

PAS = 80-90 mm Hg

PAM = 50 – 65 mm Hg o 30 % del valore di base

M. Beaussier, 2009. JEPU

Riduzione delle perdite sanguigne in chirurgie maxillo facciale

Rare complicazioni neurologiche, cardiache e renali (PAM ≤ 50 mm Hg)

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Choi W., Samman N. - Risks and benefits of deliberate hypotension in anesthesia: a systematic review. *Int. J. Oral. Maxillofac. Surg.*, 2008 ; *37* : 687-703.

Conclusioni: qual'é la buona pressione?

Assenza di raccomandazioni

PAM ≤ 65 mm Hg → Complicazioni cardiache

Walsh, 2013

PAS ≤ 40 % valore abituale → complicazioni renali

Hallqvist 2018

PAM ≤ 44 mm Hg → perfusione cerebrale alterata

Finnerty, 1954

PAM à 60 mm Hg non è adatta a tutti.

Brady, 2010

Conclusioni : la buona pressione

I valori di base della PA del paziente non sono quelli misurati nel pre-operatorio immediato

B. Saugel, 2019

La PA del paziente durante il sonno profondo fisiologico

Saugel, 2019

PAS – PAM minima al 30 % dei valori abituali

PA e situazioni particolari (trauma cranico, ITA,…)

La buona pressione é …

… quella dell’amicizia

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Grazie per il vostro ascolto