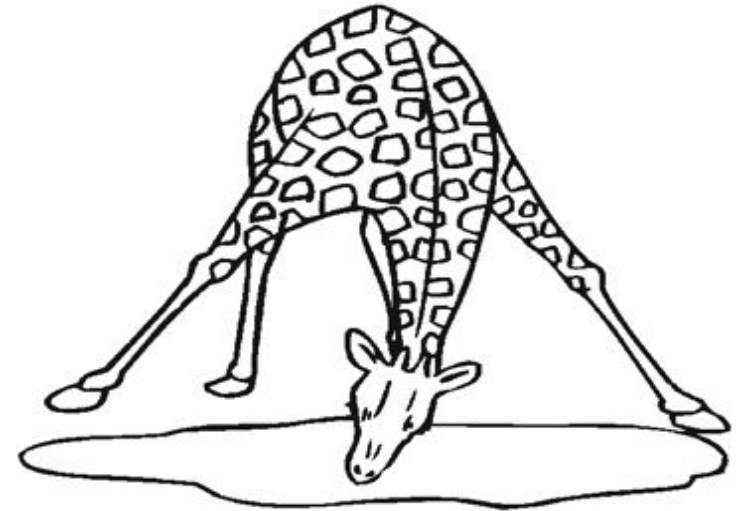

Chirurgie de l'épaule en position assise

Hervé Bouaziz,
Médecin conseil au cabinet Branchet



A propos de la chirurgie de l'épaule

J'induis volontiers une hypotension contrôlée

1 OUI

2 NON

A propos de la chirurgie de l'épaule

Mes patients sont plutôt positionnés en

1 Semi assis

2 Décubitus latéral

3 Les 2

A propos de la chirurgie de l'épaule

La pression artérielle en per opératoire est maintenue:

- 1 Dans les 90% de la valeur de base
- 2 Dans les 80% de la valeur de base
- 3 Dans les 70% de la valeur de base
- 4 En dessous de 70% de la valeur de base

A propos de la chirurgie de l'épaule

La pression artérielle est mesurée:

- 1** Au bras controlatéral quand c'est possible
- 2** A la jambe parfois
- 3** De manière invasive

A propos de la chirurgie de l'épaule

En pratique, je tiens compte de la hauteur entre le site de prise de pression artérielle et le cerveau pour connaître les valeurs de pression cérébrale:

1 Oui

2 Non

A propos de la chirurgie de l'épaule

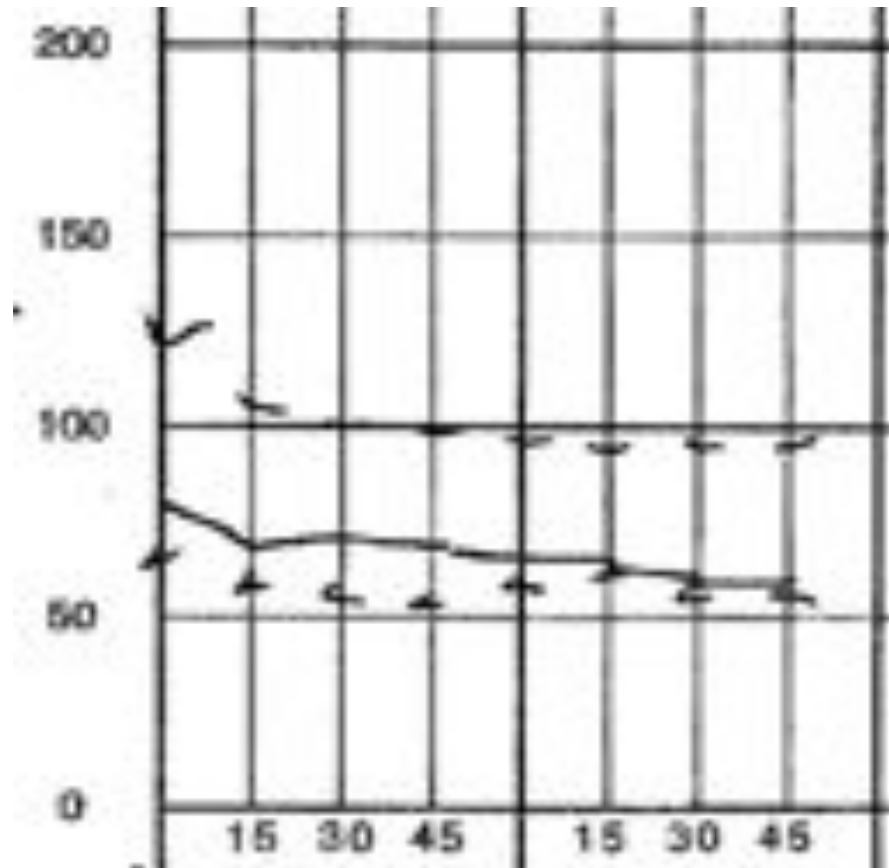
- 1** J'ai entendu parler de complications neurologiques centrales en postopératoire
- 2** J'ai eu moi-même à gérer une complication de ce type en postopératoire
- 3** Je n'ai ni entendu parler ni eu à gérer ce type de complication

-
- Homme la cinquantaine, sans ATCD particulier, qui présente une rupture de la coiffe des rotateurs
 - Une intervention chirurgicale sous arthroscopie est programmée

En peropérateur...

PA mesurée au mollet

EtCO₂ et SaO₂ = RAS



11h

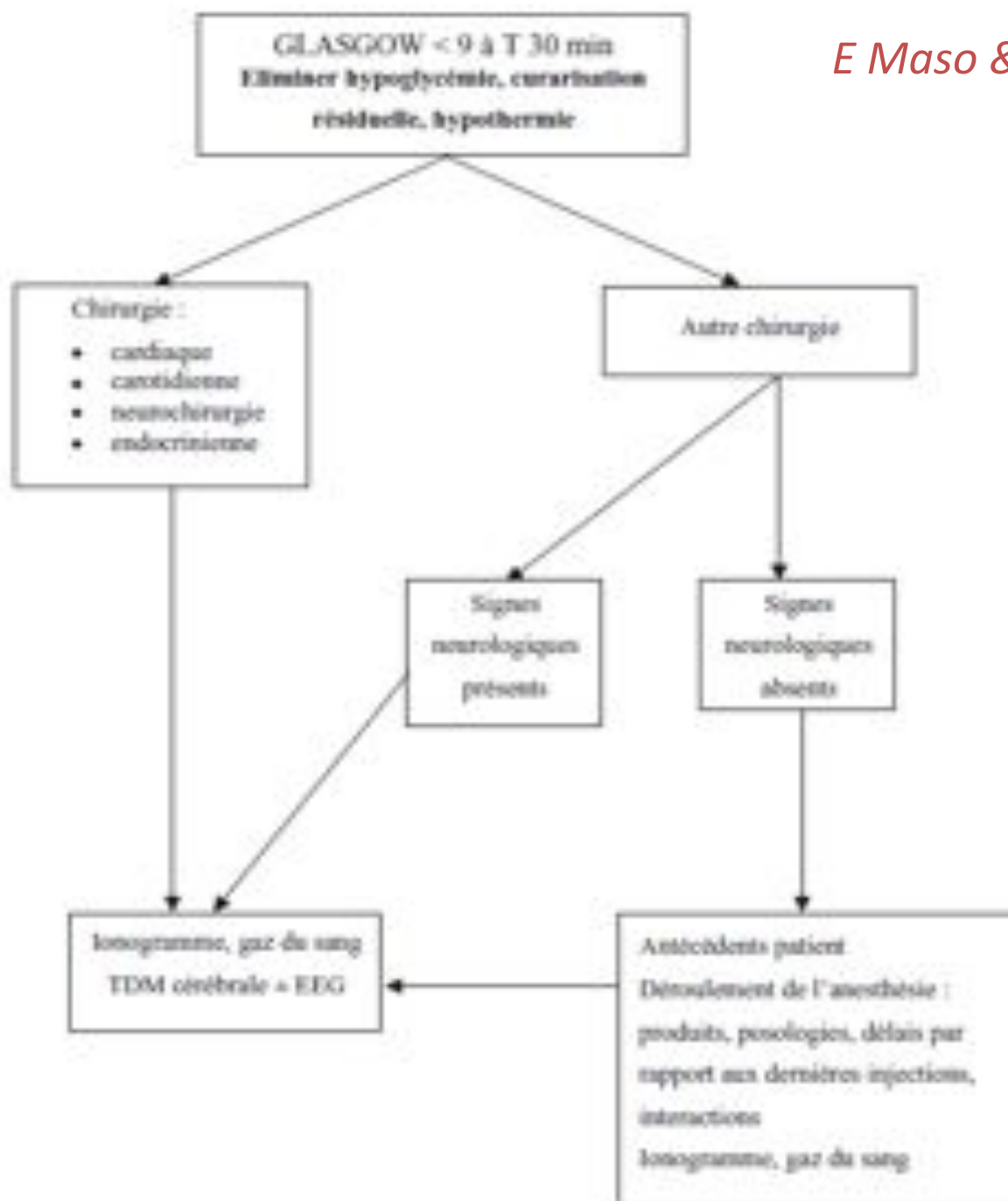
12h

13h

- Retard de réveil signalé plus d' une heure après l'arrivée en SSPI
 - PAS entre 85 et 128 mmHg en SSPI, score de Glasgow = 7, pupilles symétriques, mâchonnement
 - TDM réalisé = sans particularité
-

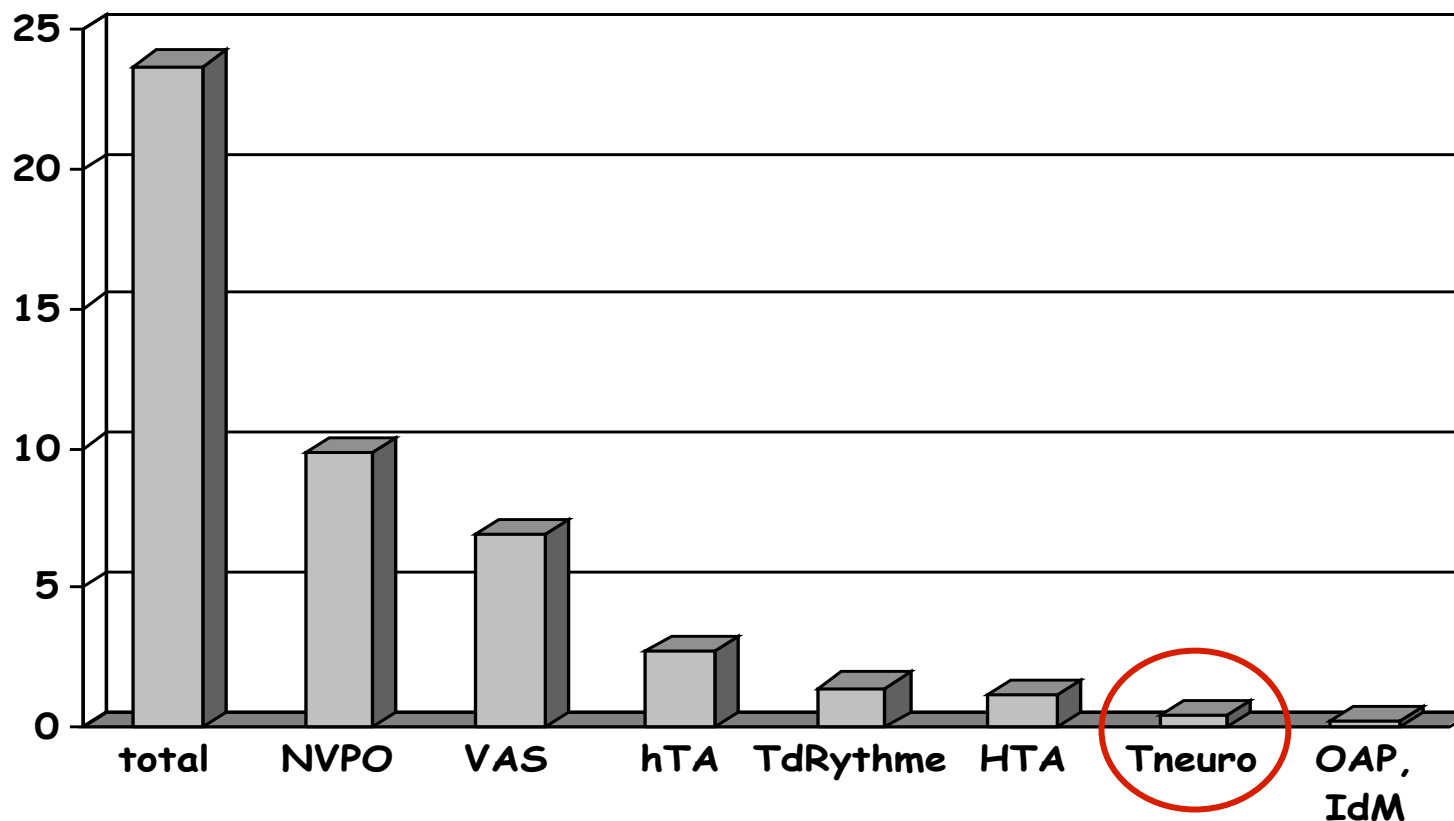
Arbre décisionnel correspondant à la conduite à tenir lors d'un retard de réveil

E Maso & JF Payen in JEPU 2006



Retard de réveil et complications en SPPI

Complications en SSPI (%)



Hines, *Anesth Analg*, 1992

-
- EEG lent et aréactif
 - IRM initiale normale
 - PEV, PES et PEA normaux
 - Clinique inchangée: ouverture des yeux, VS, pas de réaction adaptée aux ordres simples, le patient pousse des cris
 - A J+9 IRM pathologique: atteinte corticale diffuse, partie postérieure du corps calleux, tête des noyaux caudés, partie antérieure des noyaux lenticulaires
 - Après élimination de toutes les causes de coma (endogène, infectieuse, ionique, toxique, encéphalique...)??????
 - Décès du patient à distance

Risque et chirurgie de l'épaule en position assise

Safety of Shoulder Surgery in the Beach-chair Position Under Interscalene Nerve Block with Spontaneous Respiration: A Single Center Series

Max E. Ronbough, M.D., Steven L. Onobough, M.D., Brian A. Williams, M.D., M.B.A., Michael L. Kantor, M.D.
University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania, United States

13 512 cas sur 9 ans et 1/2 (avril 2001-octobre 2010)

- Preoperative interscalene block
- IV sedation with propofol
- Oxygen by facemask
- Spontaneous respiration

Traitement

- Si hypotension (PAS < 90 mmHg ou PAM < 60 mmHg)
- Si bradycardie < 40 bpm



A235, ASA 2011

15 014 cas
Période: 11 ans

RAPM 2012

TABLE 1. Serious Complications Occurring During Shoulder Surgery in the Beach-Chair Position

Adverse Event Type	n	Comments	Frequency, %	95% CI, %
Emergent intubation during case	5	2 Due to soft tissue swelling in neck; 2 related to laryngospasm and one to hypoxemia	0.033	0.012-0.081 (<1/10,000)
Apparent respiratory distress treated without intubation	2	1 Documented as "bronchospasm" and 1 as "laryngospasm"	0.013	-0.006-0.053 (<1/10,000)
Apnea during performance of nerve block	1	Due to excessive sedation	0.0067	-0.006-0.043 (<1/10,000)
Seizure (local anesthetic systemic toxicity)	8		0.053	0.025-0.11 (<1/10,000)
Persistent phrenic nerve injury	1	Diagnosed 3 mo after the case	0.0067	-0.006-0.043 (<1/10,000)
Minor but persistent nerve injury (>6 mo)	5	Sensory only	0.033	0.012-0.081 (<1/10,000)
Intraoperative CNS injury or stroke	0		0	-0.006-0.032 (<1/10,000)
CNS injury or stroke within 24 h	1	Focal middle cerebral artery ischemic stroke	0.0067	-0.006-0.043 (<1/10,000)
Cognitive Dysfunction in the context of dementia or persistent sedation	3	Gradual return to baseline	0.020	0.004-0.062 (<1/10,000)
Persistent headache or tinnitus	2		0.013	-0.006-0.053 (<1/10,000)
Cardiac arrest	0		0	-0.006-0.032 (<1/10,000)
Myocardial infarction within 48 h	1		0.0067	-0.006-0.043 (<1/10,000)
Dysrhythmias with hypotension	7	1 Atrial fibrillation, 1 brief VT, 1 Nigremy, 4 causing delay or vasopressor infusion	0.047	0.021-0.10 (<1/1000)
Other drug reaction	1		0.0067	-0.006-0.043 (<1/10,000)
Other unexpected admission or ER visit	10	8 Dyspnea or hypoxemia, 1 PE, 1 PONV	0.067	0.035-0.13 (<1/10,000)
Total adverse events	47		0.31	0.24-0.42 (<1/200)

VT indicates ventricular tachycardia; ER, emergency room; PE, pulmonary embolism; PONV, postoperative nausea and/or vomiting.

RAPM 2011

No patient had a stroke (95% CI 0-0.07)

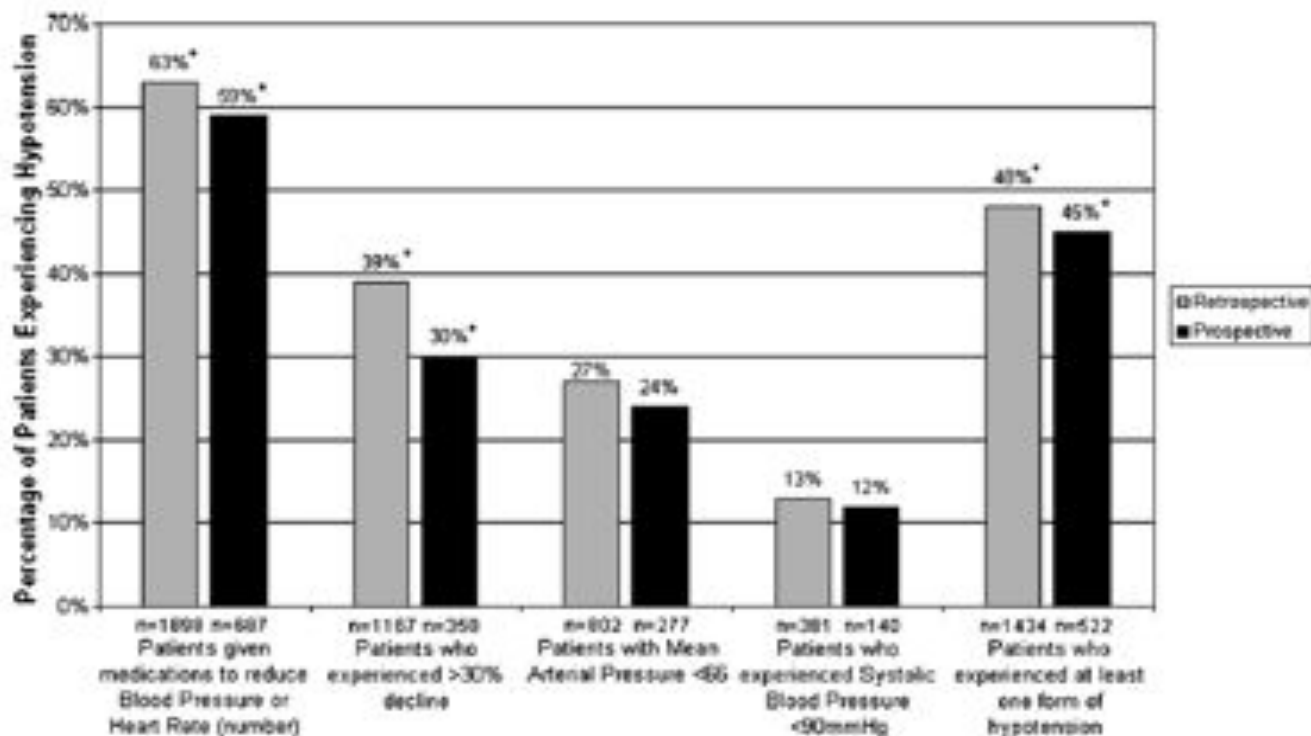


TABLE 2. Incidence of Risk Factors for Stroke

Risk Factor	Retrospective	Prospective
	n (%)	n (%)
Any risk factors noted	1198 (40)	470 (40)
Hypertension	686 (23)	187 (16)
Hyperlipidemia	604 (20)	186 (16)
Coronary artery disease	143 (5)	23 (2)
Valvular heart disease	76 (3)	8 (0.7)
Arrhythmia	68 (2)	8 (0.7)
Diabetes	113 (4)	94 (8)
Tobacco use	102 (3)	28 (2)
Congestive heart failure	13 (0.4)	3 (0.3)

Risque neurologique, anesthésie et position assise

Max E. Rohrbough, M.D., Steven L. Ortoyagh, M.D., Brian A. Williams, M.D., M.B.A., Mitchell L. Ferrier, M.D.
University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania, United States

Safety of Shoulder Surgery in the Beach-chair Position Under Interscalene Nerve Block with Spontaneous Respiration: A Single Center Series

In settings where general anesthesia and positive pressure ventilation are used, the combination of upright position, volatile anesthetic induced vasodilatation and cardioppression, and increased intrathoracic pressure could lead to decreased cerebral blood flow and more CNS morbidity than occurred in this series.

A238, ASA 2011

Cerebral ischemia during shoulder surgery in the upright position: a case series

Andrea Pohl, David J. Cullen

Journal of
Clinical
Anesthesia 2005

Abstract We report 4 cases of ischemic brain and spinal cord injury after shoulder surgery in the beach chair position, using data from medical legal case reviews. We argue that the correlation between cardiovascular risk factors and cerebral ischemic complications for this type of surgery is poor in these middle-aged patients. Rather, our analysis suggests that the sitting position and the head position create specific physiological conditions that may be conducive to cerebral and spinal cord ischemia during this type of surgery. Thromboembolic events may be an additional cause of adverse neurologic outcomes.

Blood pressure values less than 80% of preoperative resting values should be treated aggressively

Ce risque existe-t-il en France?

Annales Françaises d'Anesthésie et de Réanimation 31 (2012) 914–918



SFAR

Société Française d'Anesthésie et de Réanimation



Cas clinique

Chirurgie arthroscopique de l'épaule et complications ischémiques cérébrales

Arthroscopic shoulder surgery and ischemic cerebral complications

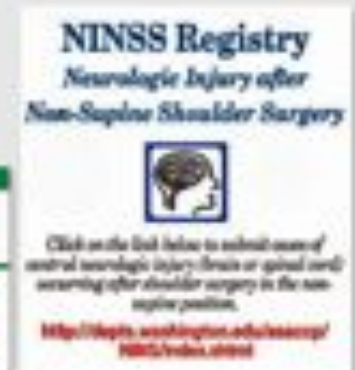
T. Villevieille^a, L. Delaunay^b, M. Gentili^c, D. Benhamou^{d,*}

Risque neurologique, anesthésie et position assise



The Anesthesia Patient Safety Foundation has established this Registry in collaboration with the ASA Closed Claims Project to investigate the mechanism of severe brain and spinal cord damage that has been reported after shoulder surgery in the sitting position. This complication has occurred in both the old and young patient populations. Several theories exist as to the etiology of these catastrophic neurologic injuries including:

- 1) The loss of venous return and decreased cardiac output in the upright position.
- 2) Loss of a compensatory sympathetic response to positional changes caused by anesthesia.
- 3) Failure to correct for the difference in height between the site of blood pressure measurement and the head level.
- 4) The use of deliberate or permissive hypotension.
- 5) Dynamic vertebral artery stenosis or occlusion with rotation of the head.
- 6) Air emboli.



Gestion de la TA et position assise

EDITORIALS

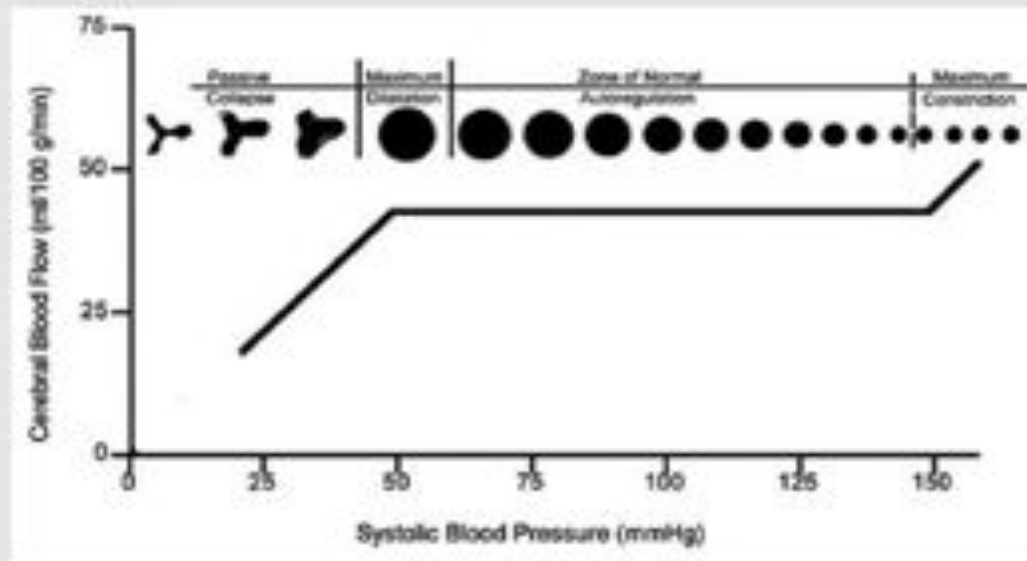
Blood pressure management during beach chair position shoulder surgery: What do we know?

Glenn S. Murphy, MD - Joseph W. Szokol, MD

The adverse neurologic events reported thus far were attributed most commonly to inadequate cerebral perfusion secondary to intraoperative hypotension. Significant hemodynamic changes occur when the patient's position is changed from supine to sitting. In awake subjects, upright positioning activates the sympathetic nervous system, producing increases in systemic vascular resistance (30-40%) and systemic blood pressure (10-15%) and reductions in cardiac output (15-20%). Under general anesthesia, baroreceptor responses are blunted, resulting in an attenuated increase in systemic vascular resistance, a decrease in mean arterial pressure, and a greater reduction in cardiac output compared with the awake state.

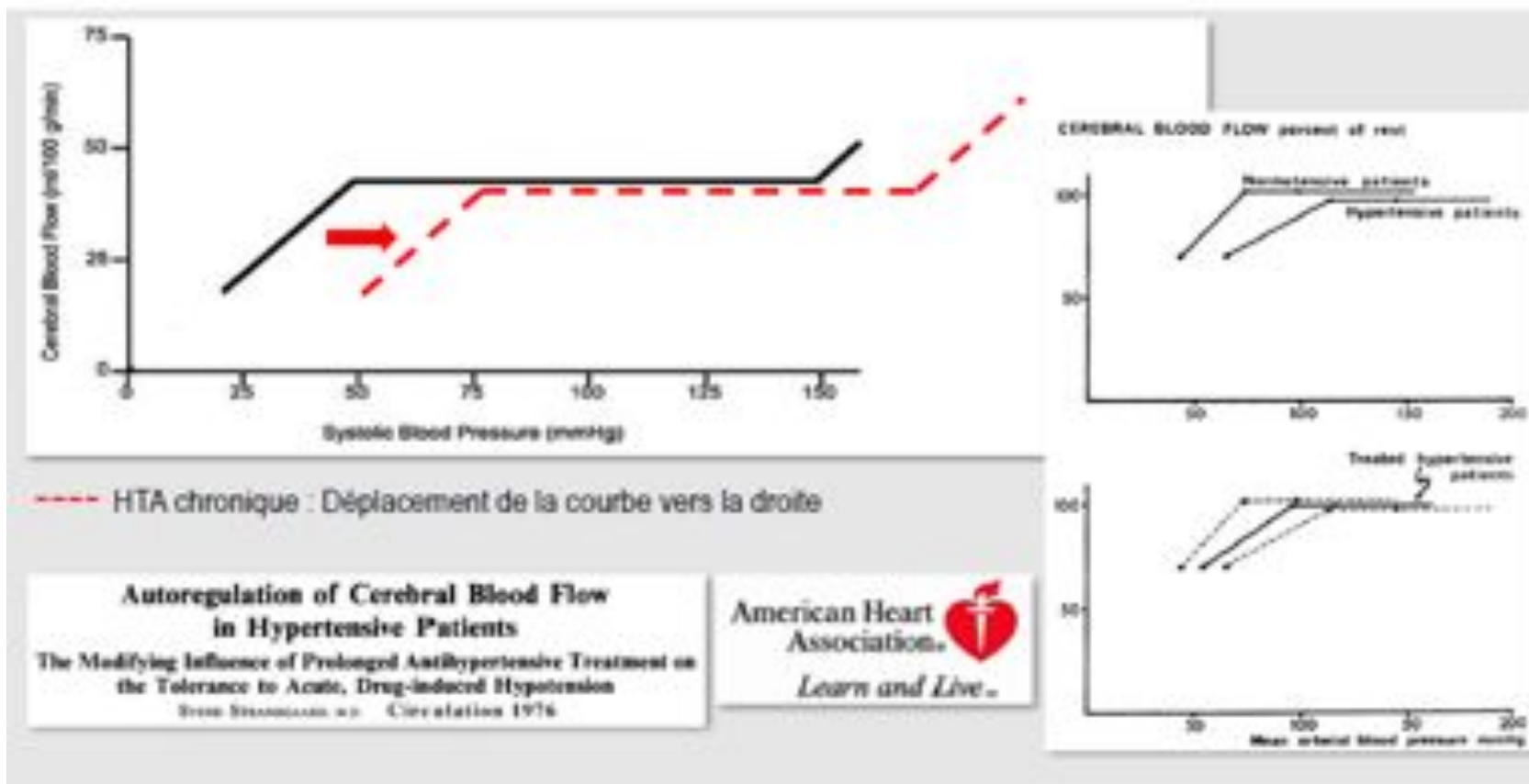
Can J Anesth 2011

Autorégulation du débit sanguin cérébral



PAM autour de 90 mmHg
PIC < 13 mmHg
PPC est normalement d'environ 80 mmHg
Modification de PPC lors de tout changement de PAM ou de PIC

Facteurs de risque et AVC



Diminution de la PPC en position assise (Beach chair position)

Polygone de Willis = système artériel anastomotique

- Entre le système carotidien et le système vertébro-basilaire.
- Entre les 2 systèmes carotidiens internes

Intérêt

- Dispositif de suppléance et de sécurité circulatoire palliant dans certains cas l'insuffisance d'irrigation d'une source vasculaire.
- Donne naissance à toutes les artères assurant la vascularisation du cerveau.

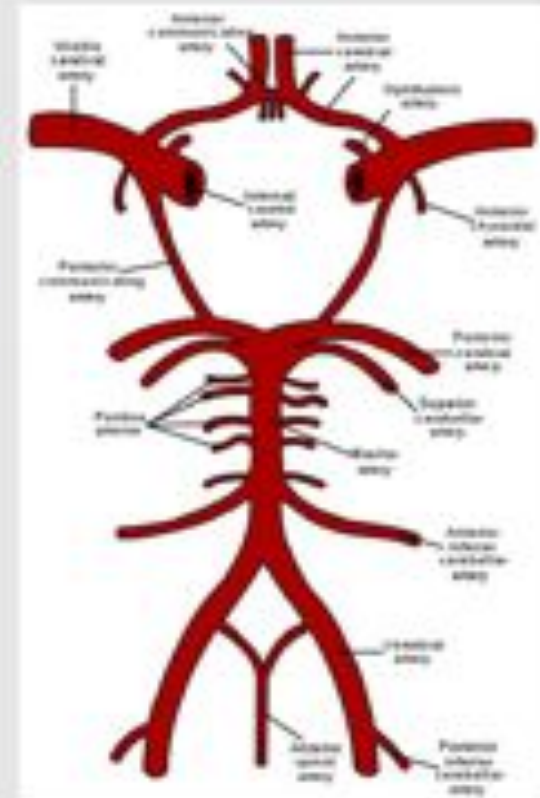
Concept simple

La tête est plus haute que le cœur.

Au niveau cérébral, la pression dans le polygone de Willis est plus basse en raison d'un gradient de pression.

Ajustement de la pression : 0,8 mm de Hg par cm de hauteur.

Exemple : pour 20 à 30 cm de différence de hauteur, diminution de 15 à > 20 mmHg au niveau du polygone de Willis.



Hypotension et position assise

Visual Loss and Ophthalmoplegia After Shoulder Surgery

M. Tariq Bhatti, MD*, and F. Kayser Enneking, MD* *Anesth Analg* 2003;96:899-902

Departments of *Ophthalmology, Neurology, and Neurological Surgery and †Anesthesiology, Orthopedics, and Rehabilitative Medicine, University of Florida College of Medicine, Gainesville

Hypotensive Technique and Sitting Position in Shoulder Surgery

Salvatore Sia, MD

ANESTH ANALG
2003;97:1195-1207

To the Editor:

the most likely cause was a severe and prolonged cerebral hypoperfusion. The gravitational effect of patient's position on arterial blood pressure (BP) has been overlooked. In fact, after placement in the sitting position (90 degrees upright), patient's head was at least 60 cm above the NiBP cuff placed at the ankle. BP is reduced by 0.77 mm Hg for each centimeter of gradient.

At the request of the surgeon, a value of 100 mm Hg systolic BP was maintained for 98 min. Therefore, the value of mean arterial pressure (MAP) at patient's head was lower than the lowest value of MAP at which the autoregulation of cerebral blood flow (CBF) is still in force, particularly in a patient with uncontrolled hypertension, which curve for autoregulation of CBF is shifted to the right.

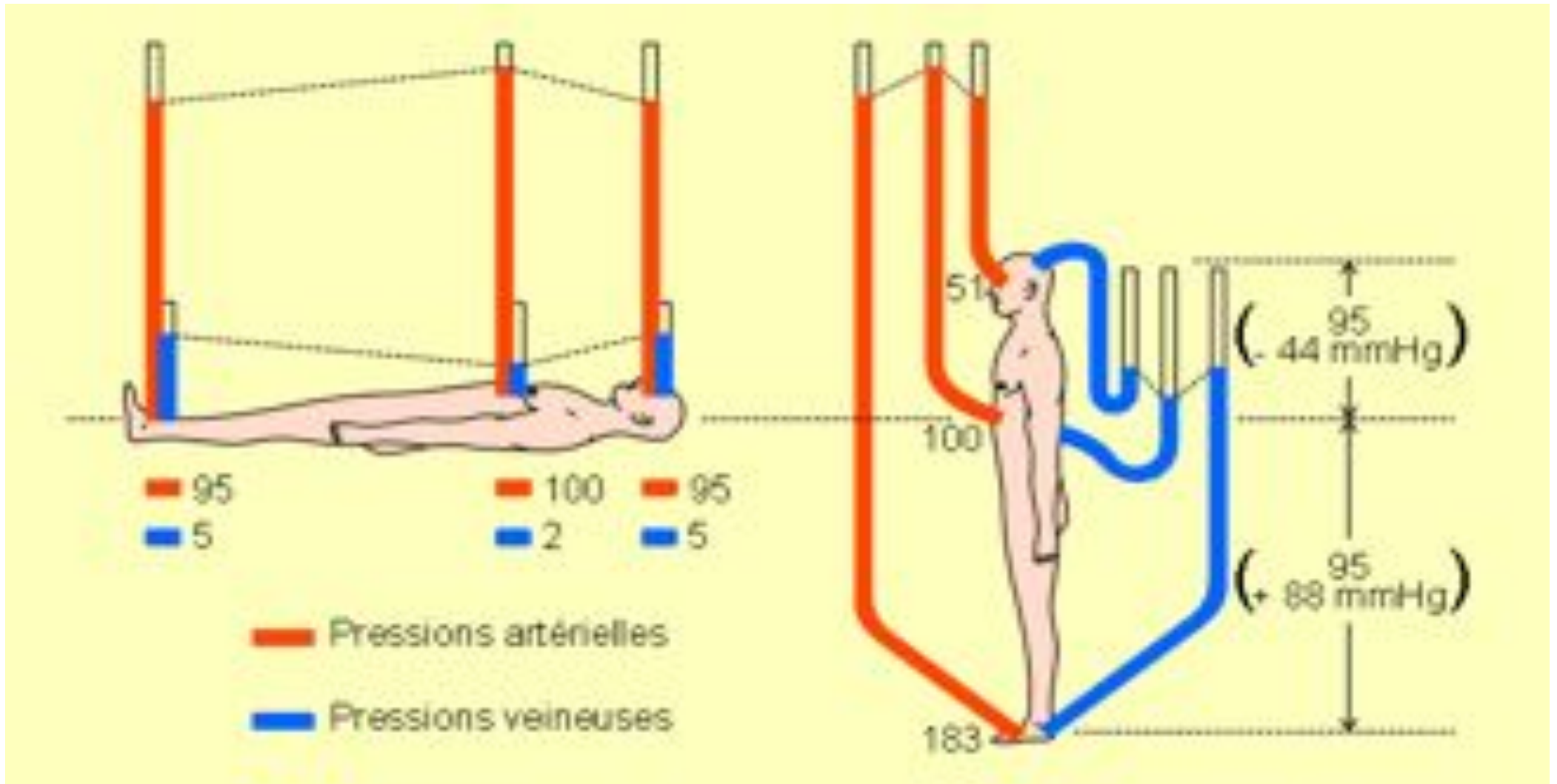
We shouldn't adjust BP at the surgeon's request, especially when a sitting position is used, without taking into account the adequacy of cerebral perfusion.



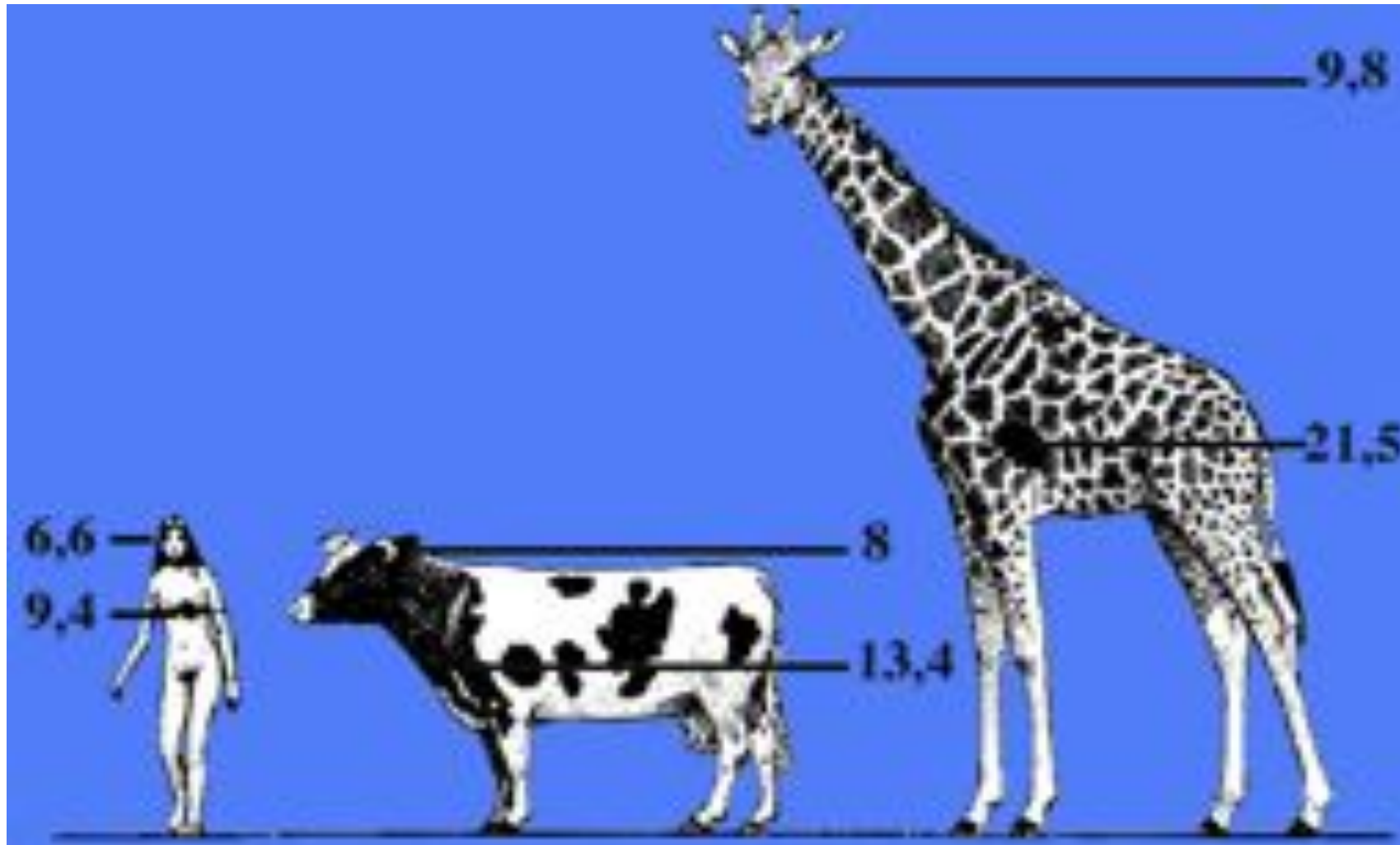
Anesth Analg 2003 ; 96 : 899-902

Anesth Analg 2003 ; 97 : 1195-1207

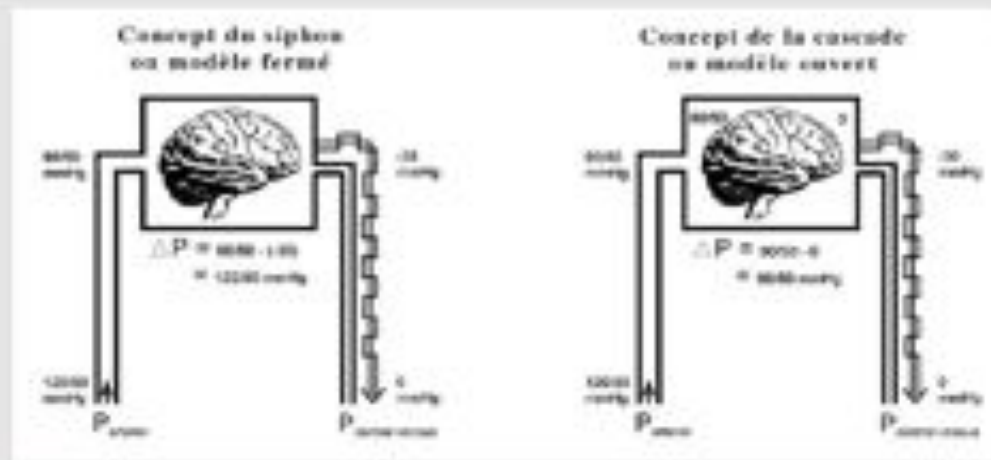
Gravitation et Pressions



« Anesthézoologie »



Prise en compte de la différence de hauteur entre l'emplacement de la mesure de PA et le cerveau



Concept du siphon

Colonne continue de sang entre systèmes artériels et veineux de la circulation cérébrale.

Effets gravitationnels identiques dans la boucle (réductions équivalentes de la PAM et de la PVC) → pas de coefficient de correction.

Concept de la cascade

En raison de la gravité, le sang veineux du côté cérébral « tombe ».

Le cœur doit pomper une colonne de sang vers le cerveau → coefficient de correction.

Monitoring cérébral

Loi de Beer-Lambert
Mesure de la concentration d'une substance selon son degré d'absorption de lumière

APSP NEWSLETTER Spring 2009

Cerebral Oximetry May Provide Helpful Information

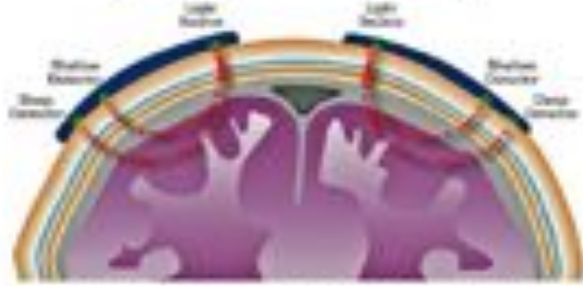
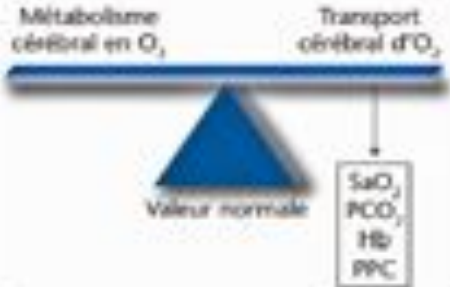
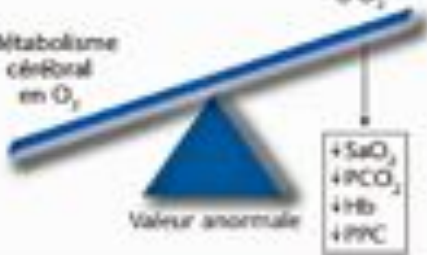


Diagram of cerebral oximetry showing light source and detector used to measure light absorption.

Modulateurs de la rSO₂

Métabolisme cérébral en O ₂	Transport cérébral d'O ₂
	
Valeur normale	
+SaO ₂ +PCO ₂ +Hb +PPC	

Désaturation cérébrale

Métabolisme cérébral en O ₂	↓ Transport cérébral d'O ₂
	
Valeur anormale	
+SaO ₂ +PCO ₂ +Hb +PPC	

Monitoring cérébral et chirurgie de l'épaule en position assise

Terrence L. Trentman, MD · Sharon L. Fassett, CRNA ·
Justin K. Thomas, MD · Eric N. Noble, BS ·
Kevin J. Roofros, MD · Steven J. Hattrop, MD



More hypotension in patients taking antihypertensives preoperatively during shoulder surgery in the beach chair position

Cerebral oximetry desaturation during shoulder surgery performed in a sitting position under regional anesthesia

Jacques T. Valdes, MD, PhD · Spencer S. Liu, MD ·
Hongjoo Bang, PhD · Pamela M. Shaw, BS · Sarah E. McFryd, BA ·
Teresa Shetty, MD · Michael Gordon, MD



Can J Anesth / Can Anesth (2011)

Results Hypotension occurred in 76% of observations (mean duration 4.261 sec), but cerebral desaturation was seen in only 0.77% of observations (mean duration 426 sec). Ninety-nine percent of patients experienced hypotension, but cerebral desaturation occurred in only 10%.

Conclusions Despite frequent hypotension in the sitting position, rSO₂ desaturation was uncommon during shoulder arthroscopy performed in the sitting position with regional anesthesia.

Odds ratios for association between cerebral desaturation (endpoint) and hypotension

Factor	Estimate	95% CI	P value
a) Univariate analysis			
Hypotension	3.21	1.18 to 8.71	0.02
b) Time trend-adjusted analysis			
Hypotension	2.18	0.77 to 6.17	0.14
Time from baseline (per 30 seconds)	1.008	1.005 to 1.01	< 0.0001
c) Baseline factors-adjusted analysis			
Hypotension	2.68	0.35 to 20.6	0.34
Female (vs Male)	0.5	0.69 to 1.58	0.99
Age (per 1 yr)	0.98	0.91 to 1.04	0.47
BMI	0.98	0.91 to 1.04	0.34
Presence of risk factor(s) for cerebrovascular disease (vs absence)	0.4	2.66 to 4.109	0.01

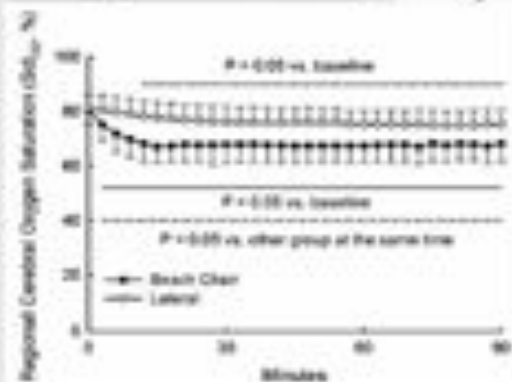
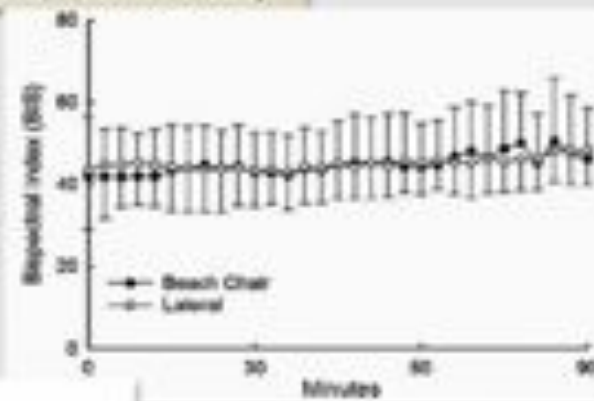
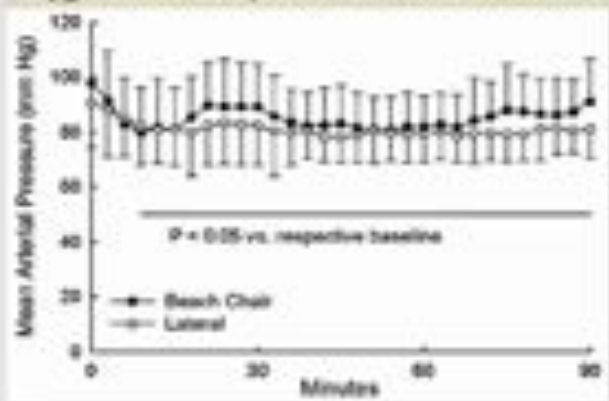
J Can Anesth 2011

Monitoring cérébral et chirurgie de l'épaule

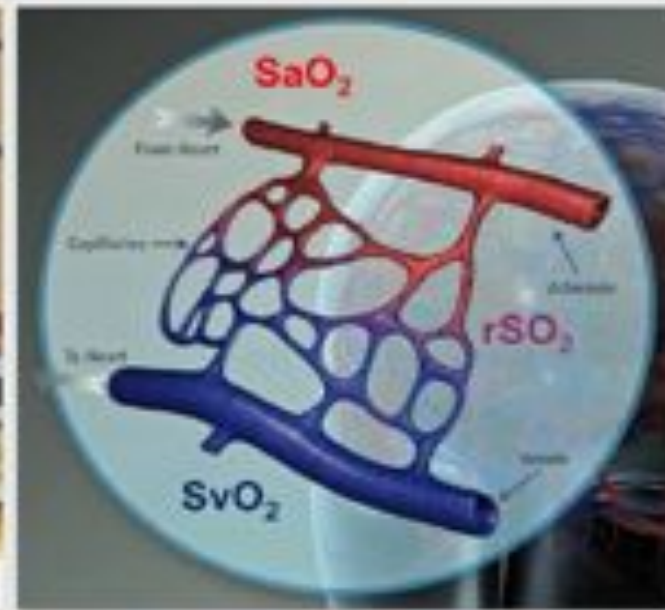
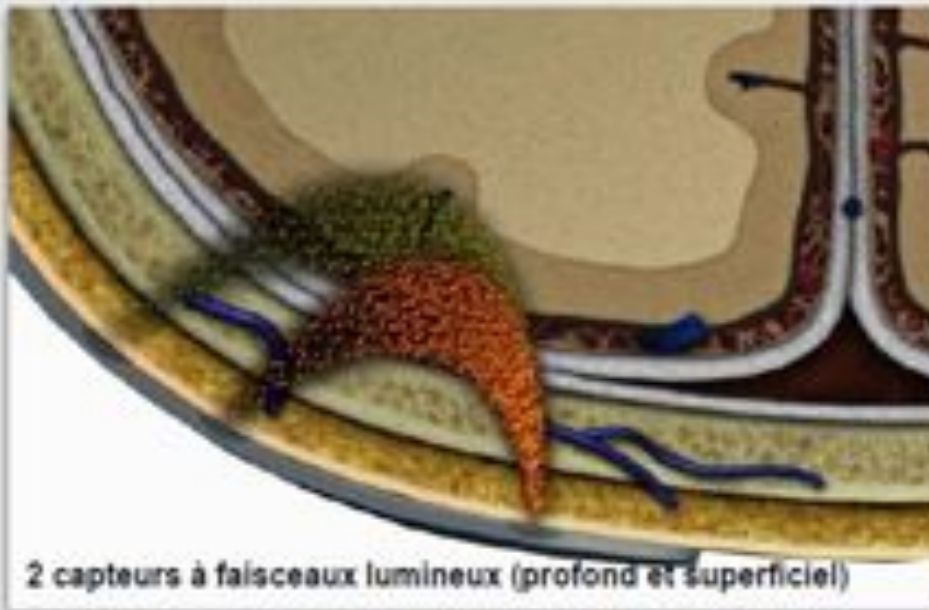
Cerebral Oxygen Desaturation Events Assessed by Near-Infrared Spectroscopy During Shoulder Arthroscopy in the Beach Chair and Lateral Decubitus Positions

Clarr S. Mayhew, MD,* Joseph W. Tobias, MD,* Jesse R. Mayhew, MD,* Steven S. Greenberg, MD,* Michael J. Narain, PhD,* Jeffrey S. Vander, MD,* Jessica Vaughn, BA,* and Virginia Norman, BA*

CONCLUSIONS: Shoulder surgery in the BCP is associated with significant reductions in cerebral oxygenation compared with values obtained in the LDP. (Anesth Analg 2010;111:496-505)



rSO₂ cérébrale



Le compartiment cérébral contient 75% de sang veineux et 25% de sang artériel.

Soustraction des données parasites (os, peau, etc.)

En temps réel, balance entre apport et consommation en O₂

Conclusion

**Hydrostatic Gradient is Important
Blood Pressure Should be Corrected
Too High Likely Safer Than Too Low**



- 1) Il n'existe pas de méthode non invasive qui permette de définir une limite inférieure de pression artérielle chez un patient donné
- 2) La pression artérielle en position assise devrait être ajustée pour tenir compte d'un gradient hydrostatique
- 3) Il faut éviter une hypotension délibérée en position assise
- 4) La réduction maximale de la pression artérielle par rapport aux valeurs de base devrait être de 30% après avoir pris en considération un gradient hydrostatique en position assise

-
- 1) Informer les patients de cet événement très rare mais imprévisible et de la possibilité d'associer un BIS à une sédation comme solution alternative +++
 - 2) La position semi assise ($\leq 45^\circ$) sera plutôt proposée aux patients sans ATCD
 - 3) Positionner le brassard pour prise de PNI au bras
 - 4) Eviter l'hypotension délibérée
 - 5) Traiter de façon « agressive » les hypotensions dès lors que les chiffres de PA sont sous le seuil de 80% des chiffres mesurés en préopératoire au repos
 - 6) Tenir compte de la distance entre le site de mesure de la PA et le cerveau ainsi que de l'existence d'une HTA dans les ATCD dans la prise en charge peropératoire du patient
-