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# ESRA MEETING ANNUAL UPDATE

1 day, 1 programme, 3 cities

**ROMA, 13 APRILE 2024**

Responsabili scientifici:

Mario Bosco

Fabio Costa

Fabrizio Fattorini



## Chirurgia della spalla in beach chair position: che succede?



Fabio Gori



**Pinning Percutaneo**



**Osteosintesi con placca e viti**



**Chiodo Intramidollare**



**Emiartroprotesi**



**Protesi Inversa**



- ✓ Miglior approccio chirurgico
- ✓ ↓ rischio di sanguinamento intra-operatorio
- ✓ Agevole conversione del campo chirurgico



- ✓ ↓ stiramento del plesso brachiale
- ✓ Rapido accesso alle vie aeree

# Ipoperfusione cerebrale

- ✓ Ostruzione meccanica del flusso ematico cerebrale (CBF)
- ✓ IAS non controllata ( $\uparrow$  minima CPP con alterazione dell'autoregolazione)
- ✓ Malattia coronarica
- ✓ Fumo di sigaretta
- ✓ Elevato BMI  $>34$  kg/m<sup>2</sup>



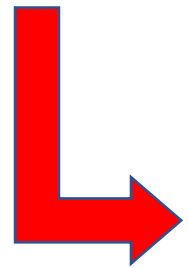
# Ossigenazione cerebrale

Dipende da:

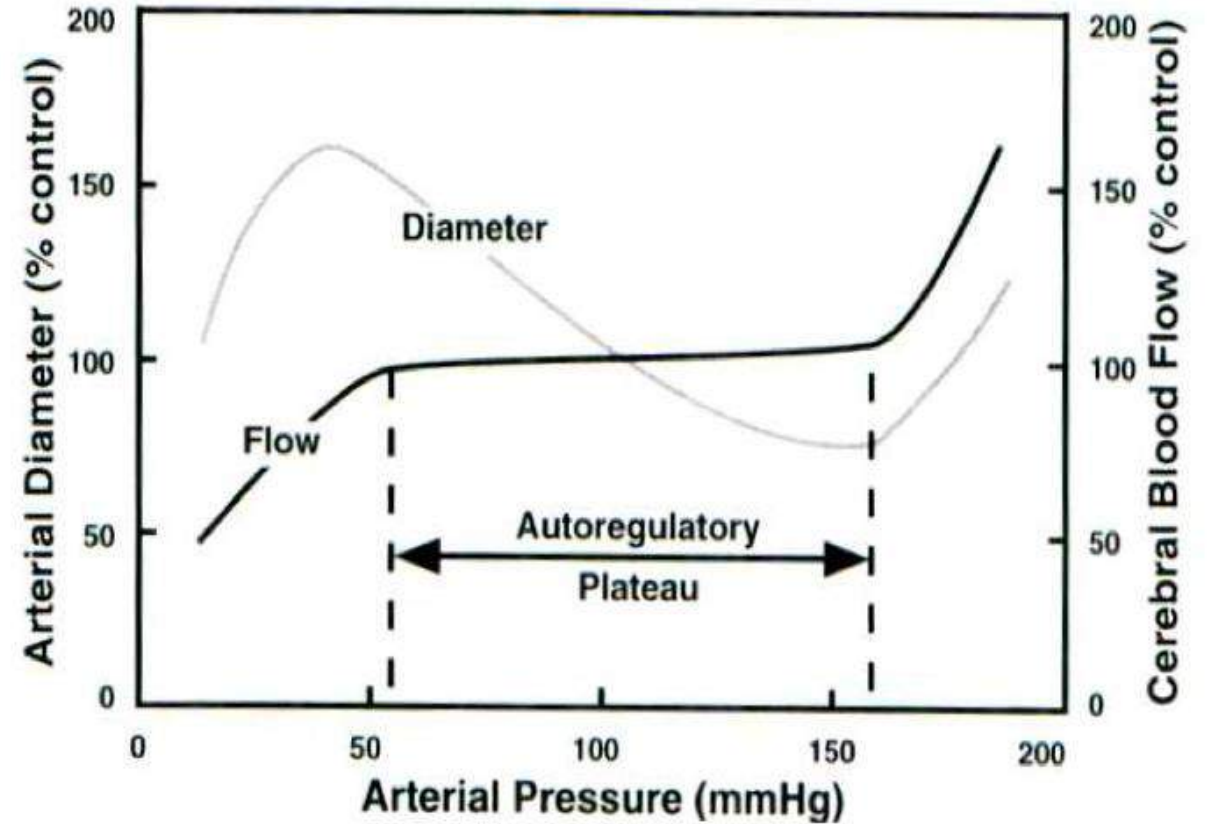
- ✓ Flusso ematico cerebrale (CBF)
- ✓ Pressione arteriosa media (MAP)
- ✓ Pressione parziale di ossigeno
- ✓ Cardiac output (CO)
- ✓ Livelli Hb



- ✓  $CBF = CCP/R$
- ✓  $CPP = MAP - CVP$
- ✓  $CVP = ICP$



$$CBF = SAP - ICP / R$$



↓ R arteriolar cerebral (vasodilatazione) se ↓ SAP o se ↑ CVP o ICP

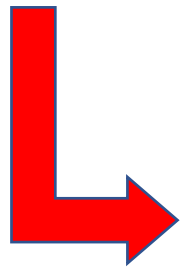
# Cerebral oxygenation in the beach chair position for shoulder surgery in regional anesthesia: impact on cerebral blood flow and neurobehavioral outcome<sup>☆</sup>

José A. Aguirre MD, MSc<sup>a,\*</sup>, Olivia Märzendorfer MMed<sup>a</sup>,  
Muriel Brada MMed<sup>a</sup>, Andrea Saporito MD, MHA<sup>b</sup>,  
Alain Borgeat MD (Professor for Anesthesiology)<sup>a</sup>, Philipp Bühler MD<sup>a</sup>

CPP= MAP-PVC

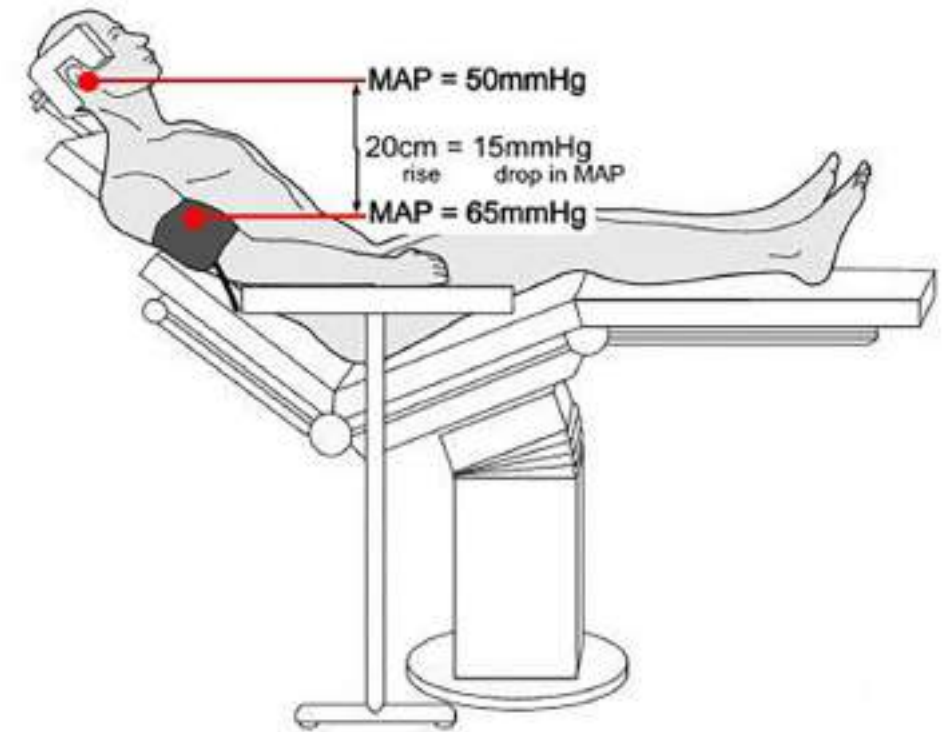
↓ in BCP

Sottostimata a causa della pressione idrostatica differenziale cuore/braccio e testa



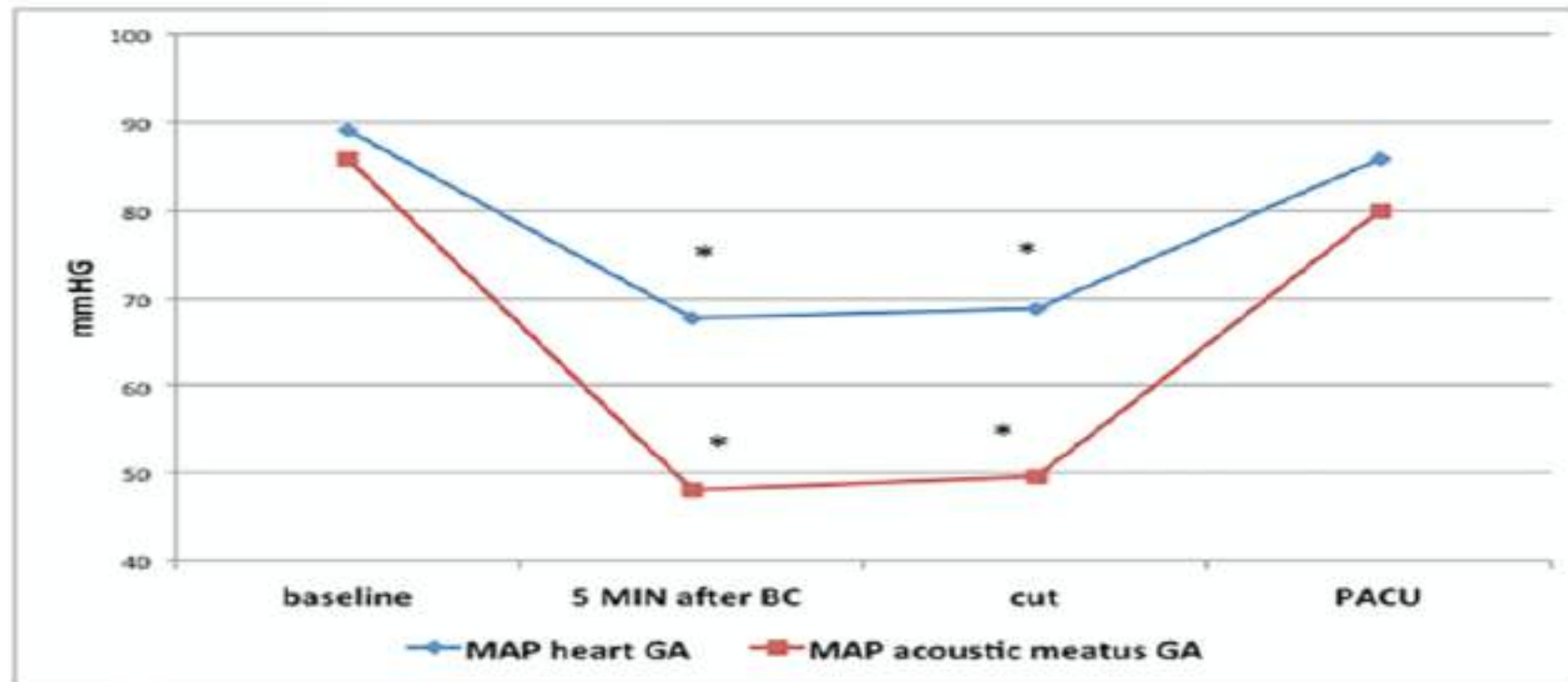
Ipoperfusione e ipossia  
Desaturazione cerebrale

Conversion Factor: 1cm rise = 0.75mmHg drop in MAP



## The beach chair position for shoulder surgery in intravenous general anesthesia and controlled hypotension: Impact on cerebral oxygenation, cerebral blood flow and neurobehavioral outcome

José A. Aguirre, MD, MSc<sup>a</sup>, Fabian Etzensperger, MD<sup>a</sup>, Muriel Brada, MMed<sup>a</sup>,  
Sandra Guzzella, MMed<sup>a</sup>, Andrea Saporito, MD, MHA<sup>b</sup>, Stephan Blumenthal, MD<sup>a</sup>,  
Philipp Bühler, MD<sup>a</sup>, Alain Borgeat, MD<sup>a,\*</sup>







65 mmHg

MAP



Rileva la probabilità di un evento ipotensivo prima che si verifichi



- ✓ Fornisce informazioni sulle cause originarie dell'evento
- ✓ Aiuta a individuare la migliore linea di condotta

# L'ipotensione intraoperatoria è associata ad aumentato rischio di complicanze:



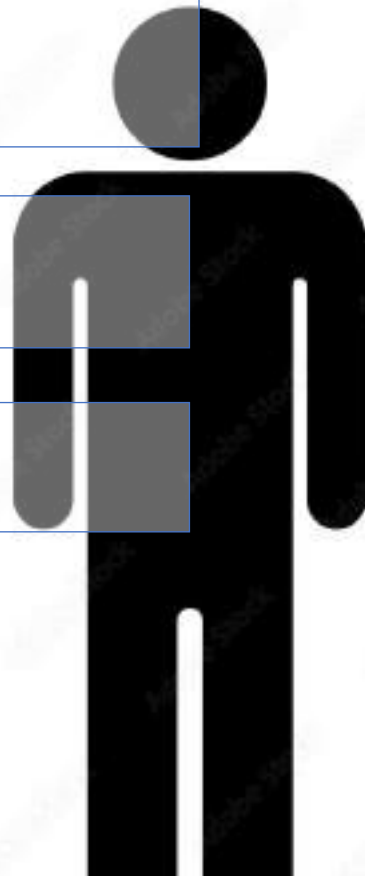
**Neurologiche**



**Cardiache**



**Renali**



**Mortalità**

Walsh M et al;..Anesthesiology2013.  
Sun LY, et al. Anesthesiology 2015;123(3):515-23  
Maska EJ et al. Anesthesiology 2015;123(1):79-91  
Monk TG, et al. Anesthesiology 2015;123(2);307-319  
Salmasi V, et al. Anesthesiology 2017;146(1):47-65  
Bjiker JB,et al. Anesthesiology 2012;;116(3):658-64  
Maheshwari K,et al. Anaeth Analg 2019; Nov 11

# Desaturazione cerebrale

Riduzione della saturazione cerebrale del 20% rispetto al basale

o

< 55% del valore assoluto per più di 15''

# Desaturazione cerebrale (CDE)

- ✓ Ischemia cerebrale e midollare
- ✓ Disfunzione cognitiva
- ✓ Perdita temporanea visus, oftalmoplegia
- ✓ PONV
- ✓ Stato di coma e morte

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

Glenn S. Murphy, MD,\* Joseph W. Szokol, MD,\* Jesse H. Marymont, MD,\* Steven B. Greenberg, MD,\* Michael J. Avram, PhD,† Jeffery S. Vender, MD,\* Jessica Vaughn, BA,\* and Margarita Nisman, BA\*

when position was changed from supine to sitting.<sup>11,12</sup> Prolonged reductions in systemic pressures and CPP that exceed critical thresholds (severity and time) may result in permanent neurologic injury.

Near-infrared spectroscopy (NIRS) is a noninvasive technology that provides continuous monitoring of regional cerebral tissue oxygen saturation (Sct<sub>o2</sub>). NIRS technology allows for the immediate recognition and treatment of cerebral desaturation events (CDEs) that would otherwise be undetected with conventional intraoperative monitoring. NIRS has been used to assess the incidence of CDEs in patients undergoing procedures at high risk for adverse neurologic outcomes (cardiac, vascular, liver transplant, and major abdominal surgery).<sup>13</sup> Although orthopedic patients in the BCP are at risk for cerebral hypoperfusion, no previous clinical trials have assessed changes in Sct<sub>o2</sub> in this patient population. The aim of this prospective cohort study was to determine the incidence of CDEs in the BCP and compare this cohort to subjects undergoing shoulder surgery in the lateral decubitus position (LDP). In addition, the relationship between CDEs and early clinical recovery was examined.

## METHODS

### Patients and Anesthesia

This study was approved by the IRB of NorthShore University HealthSystem and written informed consent was obtained from all subjects. Seventy consecutive patients scheduled to undergo elective arthroscopic shoulder sur-

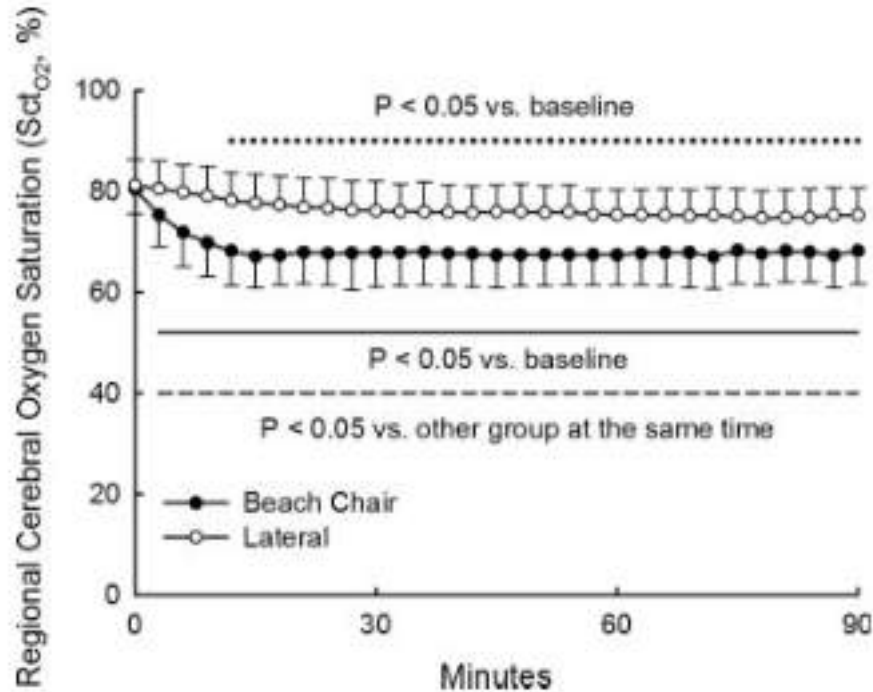
BIS values between 40 and 60. In addition, patients received 1 to 2  $\mu\text{g} \cdot \text{kg}^{-1} \cdot \text{h}^{-1}$  fentanyl throughout the surgical procedure. If required, rocuronium (10-mg boluses) was administered to maintain a train-of-four count of 2 to 3. Ventilation was controlled to maintain end-tidal carbon dioxide (EtCO<sub>2</sub>) between 30 and 34 mm Hg. Lower body forced-air warming devices (Bair Hugger®; Augustine Medical, Minneapolis, MN) were used to maintain core temperature above 35.0°C. Ondansetron 4 mg was given to all patients within 30 minutes of tracheal extubation. Neostigmine 50  $\mu\text{g}/\text{kg}$  and glycopyrrolate 10  $\mu\text{g}/\text{kg}$  were administered at a train-of-four count of at least 2 to reverse neuromuscular blockade at the conclusion of surgical closure.

Clinicians were instructed to maintain MAP within 20% of baseline values throughout the intraoperative period, as per standard practice involving surgery in the sitting position at our institution. Baseline MAP was determined in the sedated patient in the supine position. MAPs below this threshold were treated with phenylephrine (80  $\mu\text{g}$ ), ephedrine (5 mg), or a fluid bolus, as required clinically. Patients undergoing surgery in the LDP were treated with the same MAP protocol.

### Cerebral Oxygenation Measurements and Perioperative Data Collection

Cerebral oxygen saturation was measured continuously using the FORE-SIGHT system (CAS Medical Systems, Inc., Branford, CT). The FORE-SIGHT device is a continuous wave, spatially resolved cerebral oximeter that uses 4

	Beach chair group	Lateral group	Difference or median difference (95% CI)	P value
No. of patients	61	63	—	—
Patients with cerebral desaturation events	49 (80.3%)	0 (0%)	80.3% (68.7%–88.4%)	<0.0001
Interventions for Sct <sub>o2</sub> decreases	2 (0–11)	0 (0–0)	2 (2–3)	<0.0001
Interventions for MAP decreases	1 (0–6)	0 (0–9)	0 (0–1)	0.008
Episodes Sct <sub>o2</sub> ≤55	0 (0–4)	0 (0–0)	0 (0–0)	0.003
Episodes ≥20% decrease Sct <sub>o2</sub>	4 (0–38)	0 (0–0)	4 (2–5)	<0.0001



- ✓ Alterazioni significative dell'ossigenazione cerebrale in BCP
- ✓ I CDE sono associati a maggior incidenza di PONV in PACU

# Incidenza CDE AG vs ALR

Rev Esp Anestesiol Reanim. 2014;61(2):64-72



## Revista Española de Anestesiología y Reanimación

[www.elsevier.es/redar](http://www.elsevier.es/redar)



ORIGINAL ARTICLE

### Cerebral oxygenation in patients undergoing shoulder surgery in beach chair position: Comparing general to regional anesthesia and the impact on neurobehavioral outcome

J. Aguirre<sup>a,\*</sup>, A. Borgeat<sup>a</sup>, T. Trachsel<sup>a</sup>, I. Cobo del Prado<sup>b</sup>, J. De Andrés<sup>b,c</sup>, P. Bühler<sup>a</sup>

**71% vs 2,2%**

J Shoulder Elbow Surg (2013) 22, 1325-1331



[www.elsevier.com/locate/ynse](http://www.elsevier.com/locate/ynse)

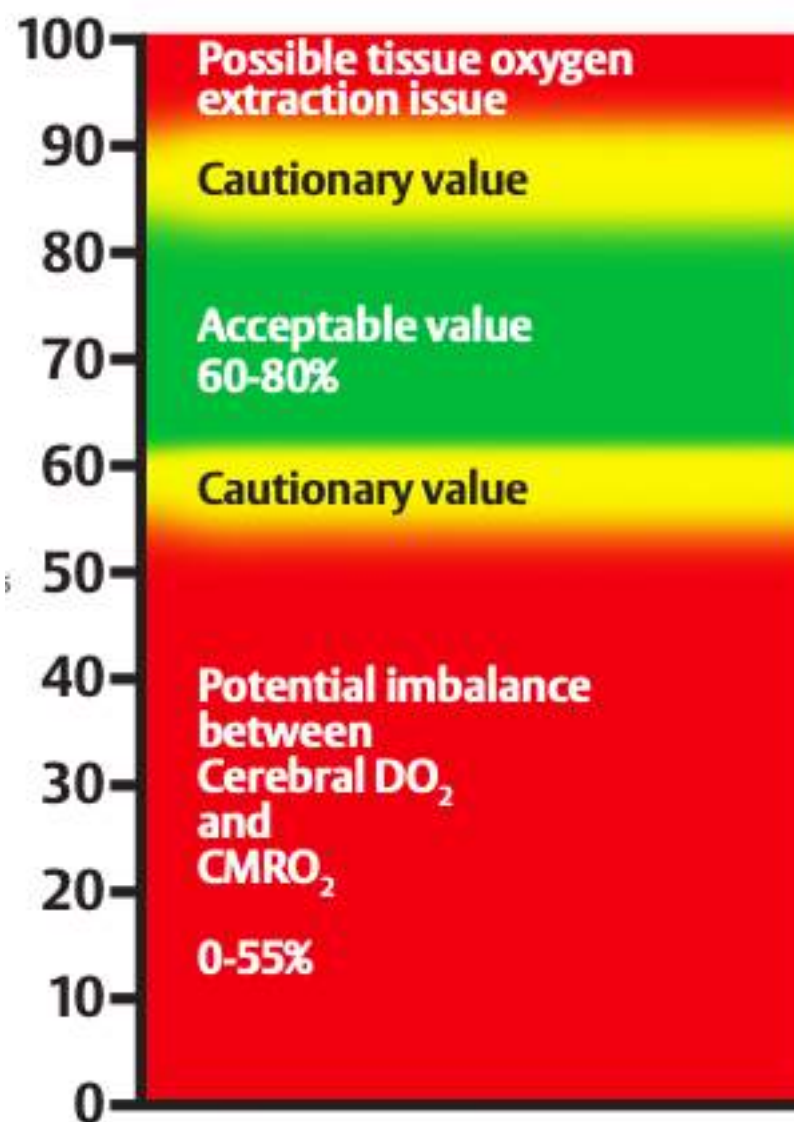
**80% vs 3,3%**

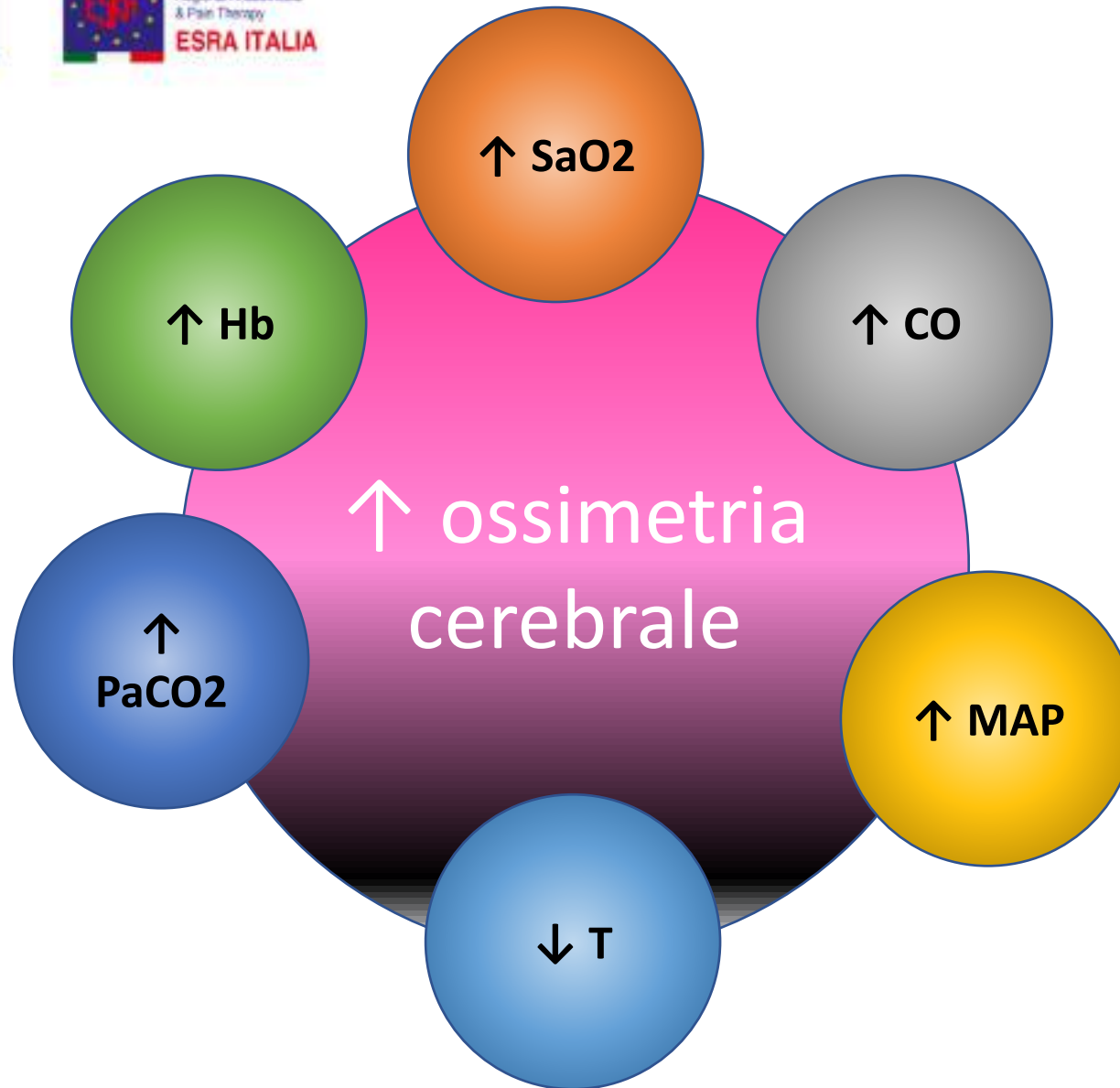
### Neer Award 2012: Cerebral oxygenation in the beach chair position: a prospective study on the effect of general anesthesia compared with regional anesthesia and sedation

Jason L. Koh, MD<sup>a,\*</sup>, Steven D. Levin, MD<sup>a</sup>, Eric L. Chehab, MD<sup>a</sup>, Glenn S. Murphy, MD<sup>b</sup>









# Quale anestesia?



- ✓ ↓ ritorno venoso
- ✓ ↓ output cardiaco
- ✓ ↓ stroke volume

## Anestesia loco-regionale

Attivazione del sistema nervoso simpatico:

- ✓ ↑ resistenze vascolari periferiche
- ✓ ↑ frequenza cardiaca
- ✓ ↑ pressione arteriosa sistemica

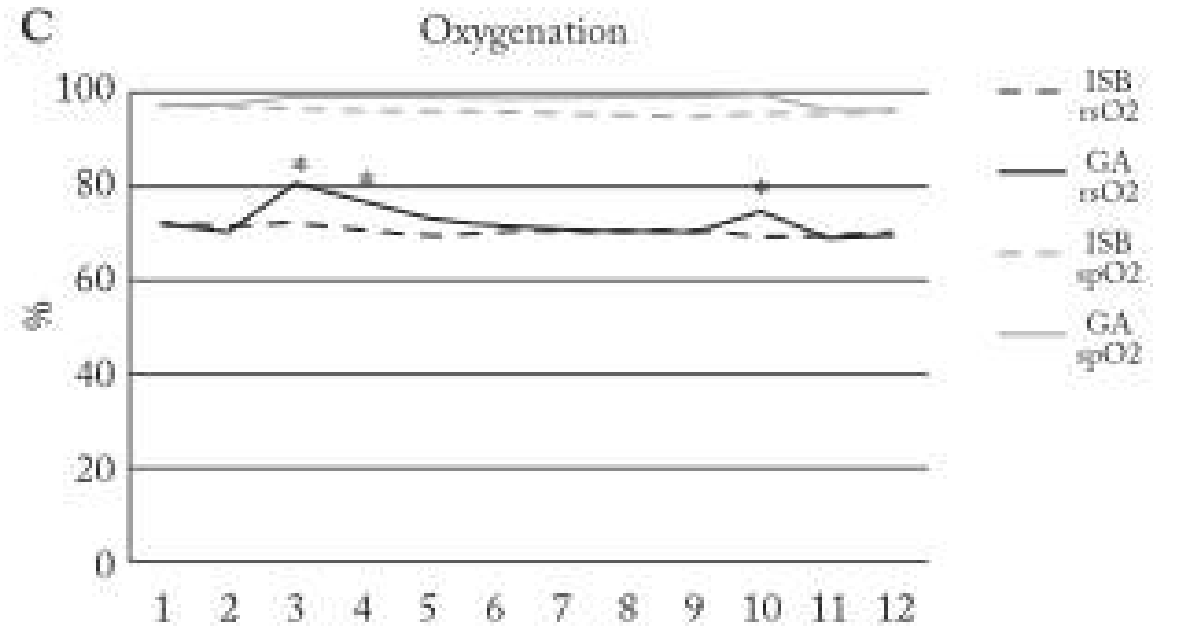
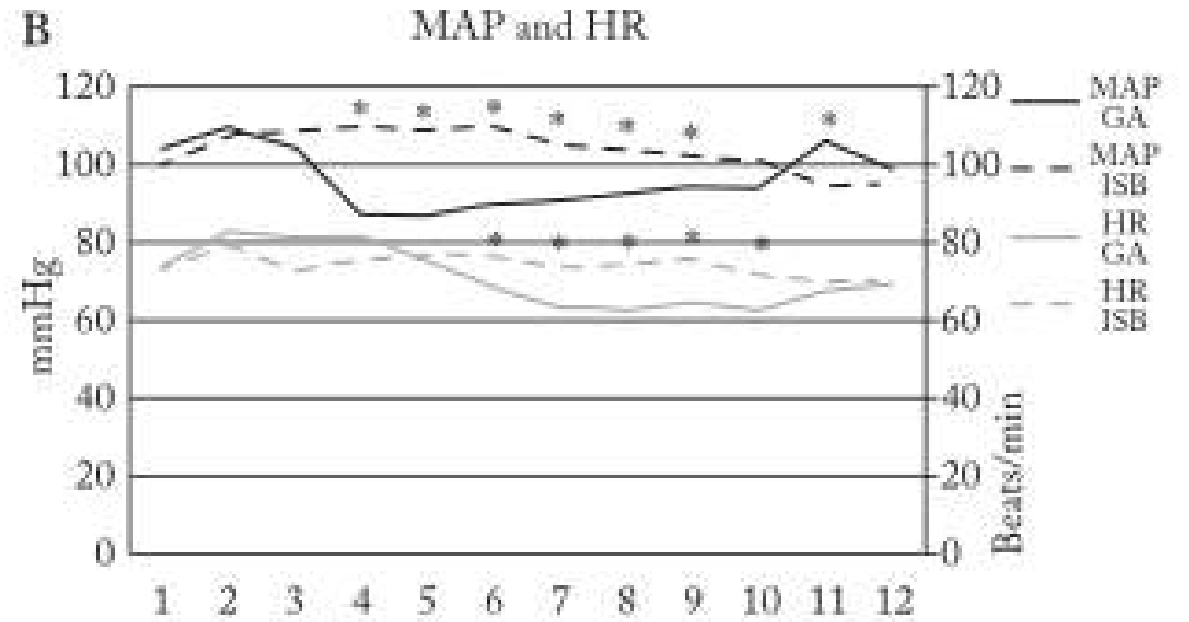
## Anestesia generale

Inibizione risposta autonoma da vasodilatazione indotta dagli anestetici con disregolazione dei barocettori:

- ✓ ipotensione
  - ✓ bradicardia
  - ✓ ipo-perfusione cerebrale
- } Ipossia cerebrale

DOES THE ANESTHESIA TECHNIQUE AFFECT  
 ARTERIAL PRESSURE AND REGIONAL CEREBRAL  
 OXYGEN SATURATION DURING SHOULDER  
 ARTHROSCOPY IN THE BEACH CHAIR POSITION?

Drenjancevic et al. Acta Clin Croat. 2018; 57: 473-479.



# Cerebral oxygenation in patients undergoing shoulder surgery in beach chair position: Comparing general to regional anesthesia and the impact on neurobehavioral outcome

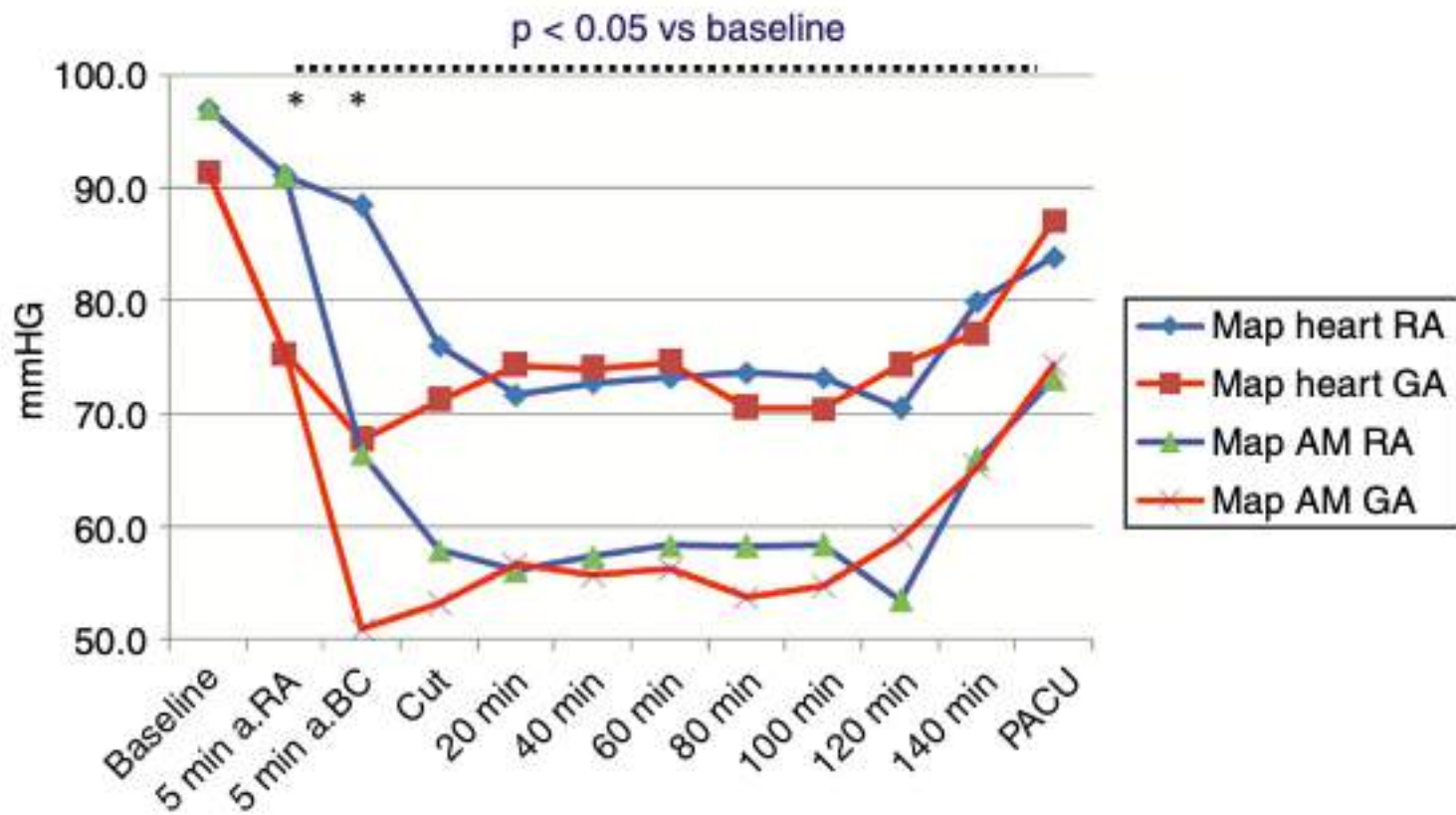
Rev Esp Anest Rean. 2014. 61(2):64-72

J. Aguirre<sup>a,\*</sup>, A. Borgeat<sup>a</sup>, T. Trachsel<sup>a</sup>, I. Cobo del Prado<sup>b</sup>, J. De Andrés<sup>b,c</sup>, P. Bühler<sup>a</sup>

**Table 2** Surgical/perioperative characteristics.

Variables	G-group (n = 45)	95% CI	R-group (n = 45)	95% CI	P
Surgery	7 Rotator cuff repair 20 shoulder prosthesis 10 Latarjet 5 Latissimus dorsi transfer 3 Osteosynthesis	-	30 Rotator cuff repair 6 Arthroscopies 4 Shoulder prosthesis 5 Osteosynthesis	-	-
Surgery time (min)	84.7 ± 32.7	74.9/94.5	72.6 ± 30.5	63.4/81.7	0.119
Cristalloid infusion (ml)	1005.6 ± 341.5	902/1108	771.8 ± 363.5	662/881	<0.001
Colloid infusion (ml)	538.9 ± 106.0	507.7/570.7	516.7 ± 63.1	497.7/535.6	0.284
PONV	8 (17.8%)	-	0	-	0.003
Treatment for SAP he <80 mmHg	15 (33.3%)	-	5 (11.1%)	-	0.011
Treatment for SAP he >100 mmHg	4 (8.9%)	-	31 (68.9%)	-	<0.001
CDEs with rScO <sub>2</sub> drops >20% of BL	23 (51.1%)	-	0 (0%)	-	<0.001
CDEs with absolute rScO <sub>2</sub> value <55% for 15s	9 (20.0%)	-	1 (2.2%)	-	0.007
MAP he BL/5 min after BC (mmHg)	91.47 ± 11.6/67.67 ± 12.7	88.0/94.9/63.9/71.5	97.07 ± 12.1/88.47 ± 12.5	93.4/100.7/84.7/92.2	<0.001
MAP am BL/5 min after BC (mmHg)	91.47 ± 11.6/50.93 ± 13.9	88.0/94.9/46.7/55.1	97.07 ± 12.1/66.53 ± 14.4	93.4/100.7/62.2/70.9	0.001
rScO <sub>2</sub> left BL/left 5 min after BC (%)	66.02 ± 3.6/64.04 ± 5.8	64.9/67.1/62.3/65.8	67.02 ± 7.1/68.33 ± 7.1	64.9/69.2/66.2/70.5	0.001
rScO <sub>2</sub> right BL/right 5 min after BC (%)	66.82 ± 4.0/64.24 ± 6.5	65.6/68.0/62.2/66.2	66.91 ± 7.5/68.18 ± 8.2	64.67/69.2/65.7/70.7	<0.001
TMT A BL/24 h after surgery (s)	30.51 ± 2.0/46.09 ± 6.2	29.9/31.1/44.2/47.9	31.24 ± 1.2/32.09 ± 1.2	30.9/31.6/31.7/32.5	<0.001
TMT B BL/24 h after surgery (s)	77.31 ± 3.4/95.69 ± 5.6	76.3/78.4/94.0/97.4	79.0 ± 3.6/81.0 ± 3.3	78.0/80.1/80.0/82.0	<0.001

Data expressed as number (%) or mean ± standard deviation. 95% confidence interval (CI) calculated where appropriated. Am: acustical meatus; BC: beach chair; BL: baseline; CDE: cerebral desaturation event; G/R-group: general/regional anesthesia group; he: heart level; MAP: mean arterial pressure; PONV: postoperative nausea and vomiting; rScO<sub>2</sub>: regional cerebral oxygen saturation; SAP: systolic arterial pressure; TMT A/B: trail making test A/B.

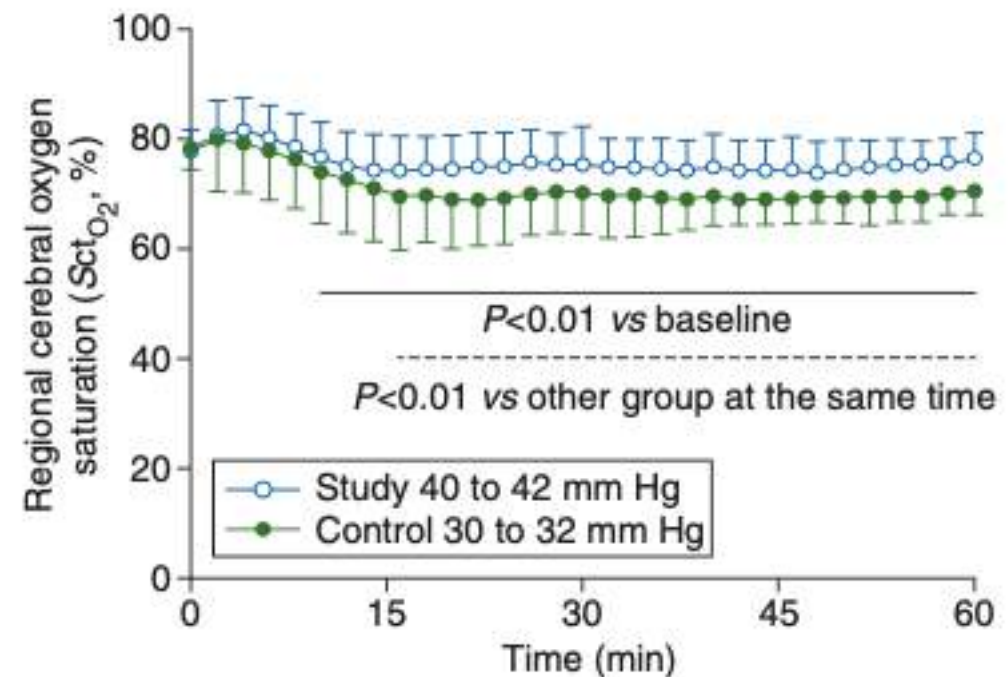


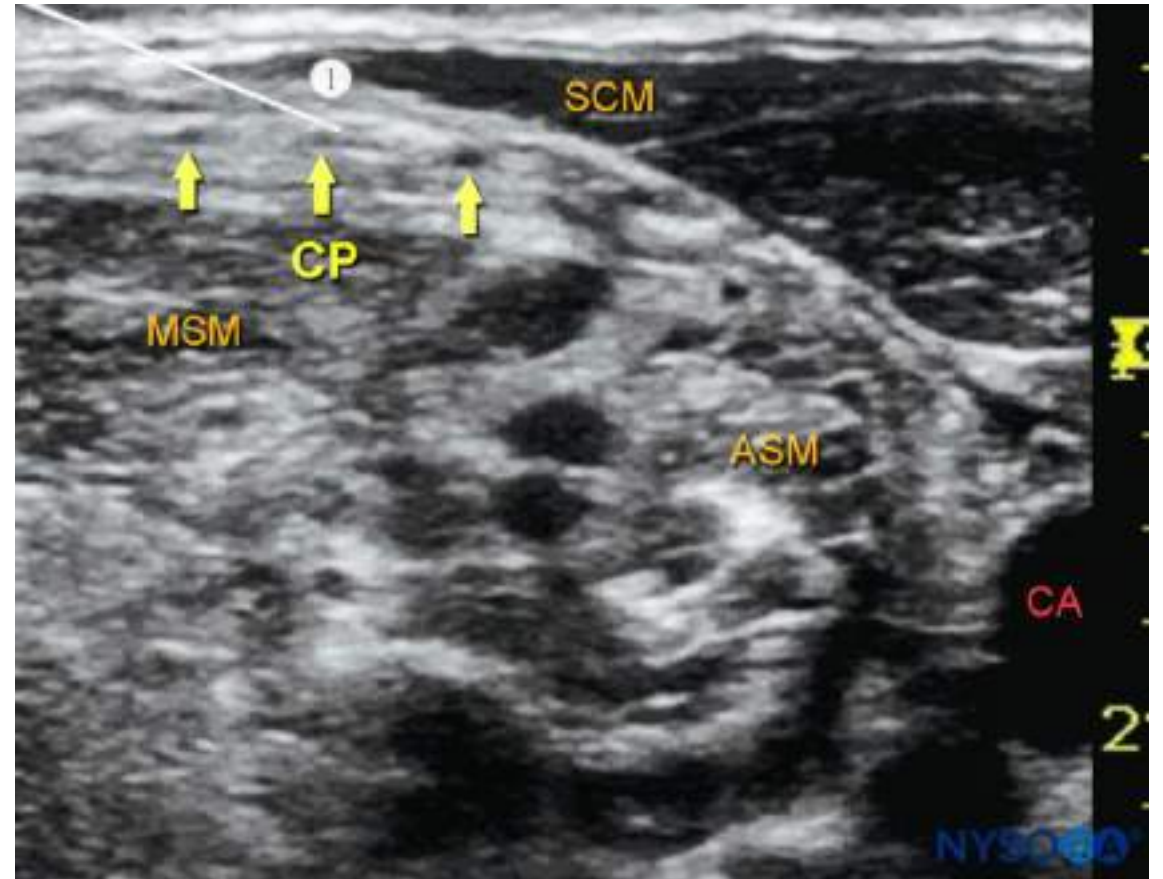


## Effect of ventilation on cerebral oxygenation in patients undergoing surgery in the beach chair position: a randomized controlled trial

G. S. Murphy<sup>1\*</sup>, J. W. Szokol<sup>1</sup>, M. J. Avram<sup>3</sup>, S. B. Greenberg<sup>1</sup>, T. D. Shear<sup>1</sup>, J. S. Vender<sup>1</sup>, S. D. Levin<sup>2</sup>, J. L. Koh<sup>2</sup>, K. N. Parikh<sup>1</sup> and S. S. Patel<sup>1</sup>

	Study 40–42 group	Control 30–32 group	Difference (99% CI)	P-value
Number	34	31	—	—
Patients with cerebral desaturation events	3 (8.8%)	20 (55.6%)	-46.7% (-58.1 to -19.0%)	<0.0001
Phenylephrine interventions for Sct <sub>O<sub>2</sub></sub> drops (n)	3 (0–36)	4 (0–19)	0 (-3 to 2)	0.794
Phenylephrine dose (μg)	240 (0–2,880)	320 (0–1,500)	0 (-240 to 160)	0.644
Episodes Sct <sub>O<sub>2</sub></sub> ≤55%	0 (0–3)	0 (0–18)	0 (0–0)	0.097
	Events n	Events n		
	0 33	0 31		
	1 1	1–4 4		
		18 1		
Episodes Sct <sub>O<sub>2</sub></sub> ≤60%	0 (0–8)	0 (0–18)	0 (-1–0)	0.0045
	Events n	Events n		
	0 32	0 24		
	1 1	1–5 10		
	8 1	12–18 2		
Episodes ≥20% decrease Sct <sub>O<sub>2</sub></sub>	0 (0–21)	1 (0–30)	-1 (-3 to 0)	<0.0001
	Events n	Events n		
	0 31	0 16		
	2–4 2	1–3 8		
	21 1	6–10 6		
		14–18 5		
		30 1		
Episodes ≥20% decrease Sct <sub>O<sub>2</sub></sub> and MAP	0 (0–15)	0.5 (0–19)	0 (-3 to 0)	0.0003
	Events n	Events n		
	0 31	0 18		
	2–4 2	1–5 11		
	15 1	6–8 3		
		12–19 4		







**LINEE GUIDA DELLA SOCIETÀ EUROPEA  
DI ANESTESIA E TERAPIA INTENSIVA (ESAIC)  
SULL'USO PERI-OPERATORIO DELL'ECOGRAFIA  
PER L'ANESTESIA LOCO-REGIONALE (PERSEUS-RA)**

**Anestesia per blocco di nervi periferici e anestesia neurassiale**

Si suggerisce l'impiego dell'**ecoguida** per il blocco del plesso brachiale **interscalenico (2C)**, **sovraclaveare e ascellare (1C)** per **minor tentativi di puntura e volumi inferiori di anestetico locale**.

**% minima di successo/complicanze per definire operatore esperto**

<b>Blocco</b>	<b>% minima</b>	<b>Complicanze</b>
Interscalenico	95%	< 7%
Sovraclaveare	86%	PNX < 1%
Ascellare	87%	< 7%



# Riflesso di Bezold-Jarisch

Riflesso vagale di tipo inibitorio per attivazione dei chemocettori  
trasmesso al nucleo solitario

La stimolazione dei recettori del seno carotideo provoca una eccitazione  
impropria dei barocettori a livello del ventricolo sinistro (meccanocettori)  
che provoca

**reazione paradossa con bradicardia e ↓ contrattilità tali da aggravare  
l'ipotensione**



***Grazie per la cortese attenzione***