Anesthesia challenges in the obese undergoing:
General anesthesia, regional anesthesia,
airway management and ventilation

Pr Philippe CUVILLON

Département Anesthésie Douleur, CHU Nîmes, France
Obese patient

Pre oxygenation

Air Way management

Vascular access

Regional Anesthesia
Poumons sains

PaO$_2$ (mmHg) : 100 → 400

Before preoxygenation

End (3-4 min)

Pre oxygenation
Stored oxygene after pre oxygenation

Variation of stored oxygene over time

Campbell IT et al Br J Anesth 1994
Obese + FRC + Atelectasis

Obese

Obese and GA
Pulmonary Capacity and obese

↓ FRC

Jones RL et al. Chest 2006
Effect of supine position on FRC

Postural changes in TLC and subdivisions

Fig. 1. Postural changes in total lung capacity (TLC) and subdivisions as measured by multibreath helium dilution. See text for further details of volume changes. FRC, functional residual capacity; RV, residual volume.
In obese patient, resistance increased in supine position.

Fig. 2. Postural changes in mean total respiratory conductance (Grs) plotted against the midtidal lung volume (MTLV) in 10 obese subjects and 13 control subjects both sitting and supine. Symbols on horizontal axis indicate mean values of RV in control (♦) and obese (△) subjects. MTLV in control subjects was from records of tidal volume and inspiratory capacity, assuming that TLC measured by body plethysmography in the seated position fell by 200 ml when supine. In the obese subjects, TLC measured by multibreath helium dilution in both postures was used as the reference volume to derive MTLV.
Pre-oxygenation: 3-5 L/min

- ↓ FRC
- ↑ VO2 and resistance

Time to < SpO2 90%

BMI

196 s: obese patients

595 s: non-obese patient

Time to < 90%

Berthoud et al. BJA 1991

Fig. 1. Times to 90% saturation compared with BMI.
Atélectasis

(parties dépendantes des poumons)

L. Magnusson. BJA 2003
Postoperative atelectasis

Non obese: BMI < 30, cholecystectomy / coelioscopy

Obese: BMI > 35, gastroplasty / coelioscopy

Eichenberger, Anesth Analg 2002
Difficult intubation in obese patients: incidence, risk factors, and complications in the operating theatre and in intensive care units

A. De Jong¹, N. Molinari², Y. Pouzeratte¹, D. Verzilli¹, G. Chanques¹, B. Jung¹,³, E. Futier¹, P.-F. Perrigault⁶, P. Colson⁴, X. Capdevila⁵ and S. Jaber¹,³*
How to increase intra pulmonary (O$_2$)

1. Fraction alveolar of O$_2$

FiO$_2$ (max=1) denitrogenation
Noninvasive Ventilation Improves Preoxygenation before Intubation of Hypoxic Patients

Christophe Baillard, Jean-Philippe Fosse, Mustapha Sebbane, Gérald Chanques, François Vincent, Patricia Courouble, Yves Cohen, Jean-Jacques Eledjam, Frédéric Adnet, and Samir Jaber


Standard (ballon) versus VNI (AI+PEP)-préOxy

FiO2 = 1

5 < AI < 15 cmH2O
5 < PEP < 10 cmH2O
How to increase intra pulmonary ($O_2$)

1. Fraction alveolar of $O_2$

2. FRC

$FiO2$ (max=1) dénitrogénation
Effets de la position sur la Capacité Résiduelle Fonctionnelle
Pre oxygenation

Head up vs supine position

35 patients, BMI=27

Time to \(\text{SpO}_2<95\%)\)

- 20 degrees Head-Up: 386 (343–429) s
- Supine: 283 (243–322) s

Lane S et al. Anaesthesia 2005
Preoxygenation

Effect of position (90°)

38 patients, BMI = 43

Preoxygenation

Effect of position (25°)

42 patients, BMI >40

Dixon BJ et al. Anesthesiology 2005
Induction: head up

Preoxygenation is more effective in the 25° head-up position than in the supine position in severely obese patients

A Randomized Controlled Study

A prospective, randomised controlled trial comparing the efficacy of pre-oxygenation in the 20° head-up vs supine position*

S. Lane,† D. Saunders,‡ A. Schofield,‡ R. Padmanabhan,‡ A. Hildreth‡ and D. Laws‡

Proclive improved preoxygenation
And increased time to (SpO2 < 90%)
Preoxygenation and intubation
How to increase intra pulmonary (O$_2$)

1. Fraction alveolar of O$_2$

   FiO$_2$ (max=1) dénitrogénéation

2. CRF

   Inspiratory Pressure (volume ou pression)
   « Open the lung »

   Expiratory (PEP)
   « Stay open »

   « RECRUITMENT »

   « Stay with RECRUITMENT »
Recruitment and (atélectasis) during preoxygenation

Before induction

Standard Pre oxygenation

Atelectasis +

After intubation

40 < IMC < 45

PaO₂ = 80±7 mmHg

Control
n = 9

PaO₂ = 315±100 mmHg

PEP 10
n = 9

PaO₂ = 457±130 mmHg

Coussa M et al. Anesth Analg 2004
Preoxygenation

Effect of the PEEP

IMC = 45

- Control group
- PEEP group

<table>
<thead>
<tr>
<th>Apnea duration (90%)</th>
<th>PaO2 prior to apnea</th>
</tr>
</thead>
<tbody>
<tr>
<td>127 ±43</td>
<td>243 ±136</td>
</tr>
<tr>
<td>188 ±46</td>
<td>376 ±145</td>
</tr>
</tbody>
</table>

The Effectiveness of Noninvasive Positive Pressure Ventilation to Enhance Preoxygenation in Morbidly Obese Patients: A Randomized Controlled Study

The Effectiveness of Noninvasive Positive Pressure Ventilation to Enhance Preoxygenation in Morbidly Obese Patients: A Randomized Controlled Study

Preoxygenation with VNI (AI 8-10 +PEP 5) improved preoxygenation in MO patients
Performance Characteristics of Five New Anesthesia Ventilators and Four Intensive Care Ventilators in Pressure-support Mode

A Comparative Bench Study

Samir Jaber, M.D., Ph.D., *Didier Tassaux, M.D.,† Mustapha Sebbane, M.D.,‡ Yvan Pouzeratte, M.D.,§ Anne Battisti,§ Xavier Capdevila, M.D., Ph.D.,∥ Jean-Jacques Eledjam, M.D., Ph.D., # Philippe Jolliet, M.D.**

Conclusion: Performances comparables ventilateurs bloc vs réa

A prospective study on the user-friendliness of four anaesthesia workstations


*Hôpital Saint-Eloi, Department of Anesthesia; †Hôpital Arnaud de Villeneuve, Department of Anesthesia; ‡Hôpital Lapeyronie, Department of Anesthesia, CHU Montpellier, Montpellier, France

Conclusions: Convivialité plus importante qu’avant
CON group, spontaneous breathing at an inspired oxygen concentration (FiO2) of 100% was performed using the main circuit of the ventilator with 15 l/min fresh gas flow noninvasive positive pressure ventilation (NPPV): pressure support ventilation (PSV) was adjusted to attain an expiratory tidal volume (VTe) of 8 ml/kg predicted body weight, a PEEP level of 6–8 cm H2 O, and an airway pressure (pressure support level + PEEP) of no more than 18 cm H2 O
Noninvasive Ventilation and Alveolar Recruitment Maneuver Improve Respiratory Function during and after Intubation of Morbidly Obese Patients: A Randomized Controlled Study

Emmanuel Futier, Jean-Michel Constantin, Paolo Pelosi, Gerald Chanques, Alexandre Massone, Antoine Petit, Fabrice Kwiatkowski, Jean-Etienne Bazin, Samir Jaber

Volume pulmonaire

Oxygénation
Obese patient

Pre oxygenation (Head up, FiO2 1, AI + PEEP)

Air Way management : intubation

Vascular access

Regional Anesthesia
High Body Mass Index Is a Weak Predictor for Difficult and Failed Tracheal Intubation

A Cohort Study of 91,332 Consecutive Patients Scheduled for Direct Laryngoscopy Registered in the Danish Anesthesia Database

Lars H. Lundstrøm, M.D.,* Ann M. Møller, M.D., Dr.Med.Sci.,† Charlotte Rosenstock, M.D., Ph.D.,‡ Grethe Astrup, M.D.,§ Jørn Wetterslev, M.D., Ph.D.¶

Table 4. Multivariate Model for the Prediction of Difficult Intubation (> 2 attempts)

<table>
<thead>
<tr>
<th></th>
<th>OR</th>
<th>95 % CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>35 ≤ BMI</td>
<td>1.34</td>
<td>1.19–1.51</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>25 ≤ BMI &lt; 35</td>
<td>1.11</td>
<td>1.04–1.18</td>
<td>&lt; 0.0016</td>
</tr>
<tr>
<td>Mallampati III and IV</td>
<td>3.70</td>
<td>3.41–4.00</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Male</td>
<td>1.35</td>
<td>1.27–1.44</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Age, year</td>
<td>1.01</td>
<td>1.01–1.01</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Surgical Priority = Scheduled</td>
<td>1.34</td>
<td>1.24–1.44</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Previous difficult intubation = Yes</td>
<td>6.32</td>
<td>5.11–7.84</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Previous difficult intubation = Unknown</td>
<td>1.26</td>
<td>1.15–1.39</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>NMBA = No relaxation</td>
<td>1.59</td>
<td>1.49–1.70</td>
<td>&lt; 0.0001</td>
</tr>
</tbody>
</table>
Difficult intubation in obese patients: incidence, risk factors, and complications in the operating theatre and in intensive care units

A. De Jong\textsuperscript{1}, N. Molinari\textsuperscript{2}, Y. Pouzeratte\textsuperscript{1}, D. Verzilli\textsuperscript{1}, G. Chanques\textsuperscript{1}, B. Jung\textsuperscript{1,3}, E. Futier\textsuperscript{1}, P.-F. Perrigault\textsuperscript{6}, P. Colson\textsuperscript{4}, X. Capdevila\textsuperscript{5} and S. Jaber\textsuperscript{1,3*}

**Figure 2.** Percentage of severe life-threatening complications according to theatre of intubation, difficult intubation and obese status
Table 3. Factors Associated with Improvement in Glottic Visualization Obtained by the Sniffing Position

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Sniffing Position with Improved Laryngoscopic View (n = 84) (%)</th>
<th>All Others (n = 372) (%)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mouth opening &lt; 35 mm</td>
<td>0</td>
<td>0</td>
<td>NS</td>
</tr>
<tr>
<td>Thyromental distance &lt; 65 mm</td>
<td>1</td>
<td>3</td>
<td>NS</td>
</tr>
<tr>
<td>Mallampati class III-IV</td>
<td>14</td>
<td>10</td>
<td>NS</td>
</tr>
<tr>
<td>Neck movement &lt; 80°</td>
<td>14</td>
<td>6</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>BMI &gt; 30 kg/m²</td>
<td>29</td>
<td>16</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Others anatomic factors</td>
<td>0</td>
<td>1</td>
<td>NS</td>
</tr>
<tr>
<td>Presence of at least one factor</td>
<td>47</td>
<td>33</td>
<td>&lt; 0.05</td>
</tr>
</tbody>
</table>

Adnet F et al. Anesthesiology 2001
Tracheal intubation of morbidly obese patients: a randomized trial comparing performance of Macintosh and Airtraq™ laryngoscopes

S. K. Ndoko¹, R. Amathieu¹ ³, L. Tual¹, C. Polliand², W. Kamoun¹, L. El Housseini¹, G. Champault² ³ and G. Dhonneur¹ ³

<table>
<thead>
<tr>
<th>IMC=43</th>
<th>Macintosh laryngoscope group, n=53</th>
<th>Airtraq™ laryngoscope group, n=53</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Visual analogue scale of facemask ventilation difficulty</strong></td>
<td>26 (0–80)</td>
<td>23 (0–80)</td>
</tr>
<tr>
<td><strong>Duration of tracheal intubation (s)</strong></td>
<td>56 (23)</td>
<td>24 (16)*</td>
</tr>
<tr>
<td><strong>Cormack and Lehane grade 1,2,3,4</strong></td>
<td>18/24/10/1</td>
<td>53/0/0/0</td>
</tr>
<tr>
<td><strong>Intubation difficulty score</strong></td>
<td>5 (2–10)</td>
<td>0 (0–2)*</td>
</tr>
<tr>
<td><strong>Intubation difficulty score &gt;5</strong></td>
<td>11</td>
<td>0*</td>
</tr>
</tbody>
</table>
Vigilant and ready for the crisis

<table>
<thead>
<tr>
<th>Safety and efficiency of upper airway management</th>
<th>Obese Group (n = 50)</th>
<th>Lean Group (n = 50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success rate (%) of:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ventilation through the ILMA</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Tracheal intubation through the ILMA</td>
<td>96</td>
<td>94</td>
</tr>
<tr>
<td>Minimum oxygen saturation, %, mean (SD)</td>
<td>96 (3)</td>
<td>98 (2)</td>
</tr>
<tr>
<td>Quality of upper airway management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of patients requiring:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than one ILMA insertion</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Airway adjusting maneuvers (Chandy)</td>
<td>13</td>
<td>23*</td>
</tr>
<tr>
<td>Number of failed blind tracheal tube insertion attempts</td>
<td>14</td>
<td>27†</td>
</tr>
<tr>
<td>Total duration of airway management, s, mean (SD)</td>
<td>160 (51)</td>
<td>187 (114)</td>
</tr>
<tr>
<td>Overall difficulty scale (VAS: 0–100), median (IQR 25–75%)</td>
<td>29 (10–40)</td>
<td>38 (15–60)</td>
</tr>
</tbody>
</table>
Intubation: be ready!
BMI: 62.3 kg/m², 180 kg, and 170 cm,

Intravenous premedication:
- atropine 0.5 mg
- midazolam 2 mg
- ondansetron 4 mg
- Dex: 1 μg/kg IBW loading dose over 10 minutes.
Obese patient

Pre oxygenation

Air Way management : intubation

Ventilation

Vascular access

Regional Anesthesia
Who will be the winner? 

volume OR pressure?
### Ventilation strategies in obese patients undergoing surgery: a quantitative systematic review and meta-analysis

M. Aldenkortt, C. Lysakowski, N. Elia, L. Brochard and M. R. Tramèr

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#### Volume or pressure mode: ns

---

#### Figure 3: VCV vs PCV

(a) Impact on intraoperative $P_{aO_2}/F_{IaO_2}$ ratio (kPa).
(b) Impact on intraoperative tidal volume (mL).
(c) Impact on intraoperative mean airway pressure (cm H$_2$O).

---

<table>
<thead>
<tr>
<th>A</th>
<th>Study or Subgroup</th>
<th>PCV Mean</th>
<th>SD</th>
<th>Total</th>
<th>Mean</th>
<th>SD</th>
<th>Total</th>
<th>Mean difference IV, Random, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadi 2008</td>
<td>37.5</td>
<td>14.3</td>
<td>18</td>
<td>26.5</td>
<td>10.3</td>
<td>18</td>
<td>32.8%</td>
<td>11.00 [5.88, 19.14]</td>
</tr>
<tr>
<td>De Baeremaeker 2007</td>
<td>31.6</td>
<td>10.5</td>
<td>12</td>
<td>41.7</td>
<td>11.9</td>
<td>12</td>
<td>31.5%</td>
<td>-10.10 [-19.08, -1.12]</td>
</tr>
<tr>
<td>Hans 2007</td>
<td>36.4</td>
<td>13.5</td>
<td>9</td>
<td>35.5</td>
<td>14.4</td>
<td>40</td>
<td>36.7%</td>
<td>0.90 [-5.25, 7.05]</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>69</td>
<td>70</td>
<td>100.0%</td>
<td>0.75 [-9.99, 11.48]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Heterogeneity: $\chi^2 = 74.21$, $P = 0.003$, $I^2 = 83$

Test for overall effect: $Z = 0.14 (P = 0.89)$

<table>
<thead>
<tr>
<th>B</th>
<th>Study or Subgroup</th>
<th>PCV Mean</th>
<th>SD</th>
<th>Total</th>
<th>Mean</th>
<th>SD</th>
<th>Total</th>
<th>Mean difference IV, Fixed, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadi 2008</td>
<td>613</td>
<td>91</td>
<td>18</td>
<td>573</td>
<td>81</td>
<td>18</td>
<td>36.1%</td>
<td>40.00 [-16.88, 96.28]</td>
</tr>
<tr>
<td>De Baeremaeker 2007</td>
<td>612</td>
<td>170</td>
<td>12</td>
<td>645</td>
<td>138</td>
<td>12</td>
<td>7.5%</td>
<td>-33.00 [-156.89, 90.89]</td>
</tr>
<tr>
<td>Hans 2007</td>
<td>650</td>
<td>104</td>
<td>39</td>
<td>643</td>
<td>100</td>
<td>40</td>
<td>56.4%</td>
<td>7.00 [-38.01, 52.01]</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>69</td>
<td>70</td>
<td>100.0%</td>
<td>15.93 [-17.88, 49.75]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Heterogeneity: $\chi^2 = 1.45$, $P = 0.48$, $I^2 = 0$

Test for overall effect: $Z = 0.92 (P = 0.36)$

<table>
<thead>
<tr>
<th>C</th>
<th>Study or Subgroup</th>
<th>PCV Mean</th>
<th>SD</th>
<th>Total</th>
<th>Mean</th>
<th>SD</th>
<th>Total</th>
<th>Mean difference IV, Fixed, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadi 2008</td>
<td>12</td>
<td>1</td>
<td>18</td>
<td>12</td>
<td>2</td>
<td>18</td>
<td>25.4%</td>
<td>0.00 [-1.03, 1.03]</td>
</tr>
<tr>
<td>De Baeremaeker 2007</td>
<td>11.6</td>
<td>0.6</td>
<td>12</td>
<td>12</td>
<td>1.2</td>
<td>12</td>
<td>47.1%</td>
<td>-0.40 [-1.18, 0.38]</td>
</tr>
<tr>
<td>Hans 2007</td>
<td>7</td>
<td>2.2</td>
<td>39</td>
<td>7.3</td>
<td>2.3</td>
<td>40</td>
<td>27.5%</td>
<td>-0.30 [-1.29, 0.69]</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>69</td>
<td>70</td>
<td>100.0%</td>
<td>-0.27 [-0.79, 0.25]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Heterogeneity: $\chi^2 = 0.38$, $P = 0.83$, $I^2 = 0$

Test for overall effect: $Z = 1.02 (P = 0.31)$
Marie-Thérèse S.  
53 ans  
162 cm 132 kg  

Julia R.  
49 ans  
161 cm 47 kg
Tidal volume for Marie-Thérèse?

- 300-350 ml
- 400-450 ml
- 550-600 ml
- 800-900 ml

Is it your last response? OK!
Marie-Thérèse S.
53 ans
162 cm 132 kg

Julia R.
49 ans
161 cm 47 kg
Protective Ventilation Influences Systemic Inflammation after Esophagectomy

A Randomized Controlled Study

Pierre Michelet, M.D.,* Xavier-Benoît D’Journo, M.D.,† Antoine Roch, M.D., Ph.D.,‡ Christophe Doddoli, M.D.,§ Valerie Marin, M.D.‖ Laurent Papazian, M.D., Ph.D.,# Isabelle Decamps, M.D.,* Fabienne Bregeon, M.D., Ph.D.,** Pascal Thomas, M.D.,†† Jean-Pierre Auffray, M.D.‡‡

** PROTECTIVE **
VT= 9 ml/kg two lung
VT= 5 ml/kg one lung
+ PEEP (5 cmH2O)

** CONVENTIONAL **
VT= 9 ml/kg two lung and one lung
+ No PEEP (ZEEP)

ANOVA:
Temps : p < 0.001
Ventilation : p = 0.028
Interaction : p < 0.001

Graphs showing changes in Pao2/FO2 and IL-1β levels over time for different ventilation strategies.
PEP improves respiratory function in obese but not in normal subjects during anesthesia and paralysis  

*Pelosi et coll. Anesthesiology 99*

**Intérêt de PEP 10 cm H₂O**

- 10 obese, BMI 43 – 66 :
  - ↤ compliance
  - ↨ resistances
  - Amélioration oxygénation corrélée au recrutement alvéolaire

Recrutement alvéolaire induit par la PEP 
chez l’obèse : 150 ± 168 ml

**Diagram:**
- Normal vs Obese 
- Syst.resp 
- Poumon 
- Thorax
Dynamics of re-expansion of atelectasis during general anesthesia
Rothen H, Neumann P, Berglund J, Valtysson J, Magnusson A, Hendenstierna G
BJA 1999. 82; 551-556

- ZEEP, FiO2: 40%
- TDM x 10 de 1-26 s pendant la manœuvre de recrutement
- Paw: 40 cmH2O x 7-8s

La réversibilité du collapsus est immédiate après la manœuvre de recrutement

Fig 2 CT scan during the VC manoeuvre. A—At start of VC manoeuvre; B—1 s after the start of the VC manoeuvre; C—1.5 s after the start of the VC manoeuvre; and D—3.5 s after the start of the VC manoeuvre.
The Effects of the Alveolar Recruitment Maneuver and Positive End-Expiratory Pressure on Arterial Oxygenation During Laparoscopic Bariatric Surgery

Francis X. Whalen, MD*, Ognjen Gajic, MD†, Geoffrey B. Thompson, MD‡, Michael L. Kendrick, MD‡, Florencia L. Que, MD‡, Brent A. Williams, MS§, Michael J. Joyner, MD†, Rolf D. Hubmayr, MD†, David O. Warner, MD*, and Juraj Sprung, MD, PhD*

*Departments of Anesthesiology and †Surgery, ‡Division of Pulmonary and Critical Care Medicine, and §Department of Health Sciences Research, Mayo Clinic College of Medicine, Mayo Clinic, Rochester, Minnesota

L’ajout d’une manoeuvre de recrutement à de la PEP comparée à de la PEP seule améliore l’oxygénation intraopératoire et la compliance sans effets secondaires.
Lung protective ventilation with a tidal volume of 6 to 8 ml per kilogram of predicted body weight, a PEEP of 6 to 8 cm of water, and recruitment maneuvers repeated every 30 minutes after tracheal intubation (the protective-ventilation group). Each recruitment maneuver consisted of applying a continuous positive airway pressure of 30 cm of water for 30 seconds. During anesthesia, a plateau pressure of no more than 30 cm of water was targeted in each group. All other ventilation procedures were identical in the two study groups.
TAKE HOME MESSAGE

Treat the lungs gently!

For « volume settings »

6 < VT < 10 ml/kg (IBM)
Peep 4-10 mmHg
Recruitment maneuvers
Neuromuscular agent
Influence of Obesity on Surgical Regional Anesthesia in the Ambulatory Setting: An Analysis of 9,038 Blocks

Karen C. Nielsen, M.D.,* Ulrich Guller, M.D., M.H.S.,† Susan M. Steele, M.D.,‡ Stephen M. Klein, M.D.,* Roy A. Greengrass, M.D., F.R.C.P.,§ Ricardo Pietrobon, M.D., Ph.D.*‖

Table 5. Risk-Adjusted Outcomes in the Entire Patient Sample (n = 6,920)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category†</th>
<th>Odds ratio (95% confidence interval)</th>
<th>Beta Coefficient (SE)</th>
<th>P Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block failure rate</td>
<td>BMI &lt;25</td>
<td>Referent</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BMI 25–29</td>
<td>1.54 [0.99–2.39]</td>
<td></td>
<td>0.06</td>
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<tr>
<td></td>
<td>BMI ≥30</td>
<td>1.62 [1.03–2.55]</td>
<td></td>
<td>0.04</td>
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<tr>
<td>Pain requiring opioids in PACU</td>
<td>BMI &lt;25</td>
<td>Referent</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>BMI 25–29</td>
<td>0.92 [0.74–1.13]</td>
<td></td>
<td>0.41</td>
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<tr>
<td></td>
<td>BMI ≥30</td>
<td>0.98 [0.79–1.21]</td>
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<td>0.85</td>
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<tr>
<td>Unplanned admission to the 23 h observation unit or hospital</td>
<td>BMI &lt;25</td>
<td>Referent</td>
<td></td>
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<tr>
<td></td>
<td>BMI 25–29</td>
<td>0.90 [0.61–1.33]</td>
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<td>0.61</td>
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<tr>
<td></td>
<td>BMI ≥30</td>
<td>0.94 [0.63–1.42]</td>
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<td>0.77</td>
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<tr>
<td>Complete satisfaction with regional anesthesia 24 h postoperatively</td>
<td>BMI &lt;25</td>
<td>Referent</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>BMI 25–29</td>
<td>1.13 [0.98–1.29]</td>
<td></td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>BMI ≥30</td>
<td>1.11 [0.96–1.28]</td>
<td></td>
<td>0.14</td>
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<tr>
<td>PACU length of stay, min</td>
<td>BMI &lt;25</td>
<td>Referent</td>
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<tr>
<td></td>
<td>BMI 25–29</td>
<td>−5.5 (8.4)</td>
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<td>0.51</td>
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<td>BMI ≥30</td>
<td>−3.6 (8.9)</td>
<td></td>
<td>0.63</td>
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<tr>
<td>Pain at rest in PACU</td>
<td>BMI &lt;25</td>
<td>Referent</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>BMI 25–29</td>
<td>−0.20 (0.14)</td>
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<td>BMI ≥30</td>
<td>−0.18 (0.14)</td>
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<td>Pain with movement in PACU</td>
<td>BMI &lt;25</td>
<td>Referent</td>
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<tr>
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<td>BMI 25–29</td>
<td>−0.36 (0.12)</td>
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<td></td>
<td>BMI ≥30</td>
<td>−0.23 (0.12)</td>
<td></td>
<td>0.05</td>
</tr>
</tbody>
</table>

* P values are based on risk-adjusted comparisons among different BMI categories.
BMI <25 serves as reference category; Complete satisfaction is defined as 5/5 on satisfaction scale.
In the operating room...

Operating Table: BMI x 4 maximum
Installation
Neutral position: head tétière moulée

Light abduction

Neutral position

Warner MA, Anesthesiology 1999
Installation

Membres inférieurs écartés

Très légère flexion des genoux

Creux poplités laissés libres

www.laprevention-medicaele.org
Monitorage de la température

Surface corporelle accrue
Chirurgie plus longue

Figure 1. The amount of redistribution hypothermia (reduction in core temperature during the first hour of anesthesia [ΔTc]) was inversely proportional to the percentage of body fat (BF): ΔTc = 0.034ΔBF - 2.2, r² = 0.63. The 95% confidence interval for the slope was 0.025 to 0.043°C/%. 

Moniteur de la température

Première heure

Figure 2. The amount of redistribution hypothermia (ΔTC) during the first hour of anesthesia (ΔTC) was inversely proportional to the weight-to-surface area (Wt/SA) ratio: ΔTC = 0.0324 · Wt/SA − 3.34, r² = 0.66. The 95% confidence interval for the slope was 0.040 to 0.065°C/%. 

Deuxième phase

Figure 4. The core cooling rate during the second (linear decrease) phase was inversely proportional to the weight-to-surface area (Wt/SA) ratio, although the relationship was weak: Rate = 0.035 · (Wt/SA) − 2.2, r² = 0.29. The 95% confidence interval for the slope was 0.017 to 0.053°C/%. 

Figure 3. Core temperature during the first hour of anesthesia in patients having 10%–24% (n = 10), 25%–35% (n = 11), and 36%–50% (n = 11) body fat. Elapsed time 0 indicates induction of anesthesia. Data are presented as means ± sd. Values in the three groups differed significantly at all times after 20 elapsed minutes. 

Figure 5. Core temperature during the second phase in patients having weight to surface area (Wt/SA) ratios ≤35 kg/m² (n = 14), 36–44 kg/m² (n = 16), and ≥45 kg/m² (n = 10). Elapsed time 0 indicates induction of anesthesia. Data are presented as means ± sd. Values in the three groups differed significantly at all times.
Monitorage et matériel en salle

Influence of a Forced Air Warming System on Morbidly Obese Patients Undergoing Roux-en-Y Gastric Bypass

Debra S. Mason RN, BA, CNOR, RNFA¹; James A. Sapala MD, FACS²; Michael H. Wood MD, FACS³; M. Andrew Sapala MD, FACS⁴

Obesity Surgery, 8, 453–460

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Mason DS, Obes Surg 1998