

Title : VENTILATORY EFFECTS OF LAPAROSCOPY UNDER EPIDURAL ANESTHESIA.

Authors : M.J. Ciofolo, M.D., F. Clergue, M.D., J. Seebacher, M.D., G. Lefebvre, M.D., P. Viars, M.D.

Affiliation : Département d'Anesthésie-Réanimation, Groupe Hospitalier Pitié-Salpêtrière.  
Université PARIS VI, 83, boulevard de l'Hôpital. 75651 Paris Cédex 13 - FRANCE

**INTRODUCTION.** Several studies have shown that spontaneous ventilation may be hazardous for patients undergoing laparoscopy under general anesthesia. Several factors may contribute to raising the PaCO<sub>2</sub>: (i) depression of ventilation by anesthetic agents, (ii) absorption of CO<sub>2</sub> from the peritoneal cavity, (iii) impairment of ventilation by mechanical factors such as abdominal distension and the use of a steep Trendelenburg position. Epidural anesthesia has been suggested to be an alternative for laparoscopy, although the ventilatory changes induced by CO<sub>2</sub> peritoneal insufflation have not yet been reported. This study was therefore undertaken to analyse the ventilatory effects of laparoscopy under epidural anesthesia.

**METHODS.** Seven ASA I female patients (mean age : 29 yrs, range : 23-36 yrs ; mean weight : 55 kg, range 48-70 kg) undergoing laparoscopy for a Gamets Intra Fallopian Transfer (GIFT) procedure were included in this study after informed consent and institutional approval were obtained.

Lumbar epidural anesthesia was performed in the sitting position with 15-18 ml of 1.5 % lidocaine. An epidural catheter was inserted at L3-L4 level for further reinjections. After 10 min, patients were placed in the supine position in order to get an upper level of analgesia between T7 and T9. After oocytes retrieval under echographic control, patients were placed in a 20° head-down position and 8-10 ml of 2 % lidocaine were reinjected in order to get an upper level of analgesia between T2 and T5. Following insufflation of 2-5 l of carbon dioxide into the abdominal cavity, laparoscopy was performed. An intra-abdominal pressure of 25 mmHg was not exceeded. At the end of the procedure, patients returned to the supine position, and care was taken to expel as much CO<sub>2</sub> as possible.

Once the upper level of analgesia reached a level T7-T9, patients were connected to a Beckman Metabolic Measurement Cart by means of a conventional anesthetic face mask while breathing room air, in order to obtain throughout the study an on-line measurement of O<sub>2</sub> uptake (VO<sub>2</sub> ml/min STPD), CO<sub>2</sub> output (VCO<sub>2</sub> ml/min STPD), tidal volume (VT L/breath BTPS), breath rate (F b/min), minute-ventilation (VE L/min BTPS) and end-tidal PCO<sub>2</sub> (PETCO<sub>2</sub> mmHg).

The study consisted of four observation periods : preoperative period (I) in the supine position at T7-T9 level ; period (II) after a 20° Trendelenburg tilt at T2-T5 level ; period (III) during CO<sub>2</sub> peritoneal insufflation ; period (IV) after CO<sub>2</sub> exsufflation in the supine position. At the end of each observation period, arterial blood gas analysis was performed. The alveolo-arterial CO<sub>2</sub> difference (D(A-a)CO<sub>2</sub>) was calculated from simultaneous PETCO<sub>2</sub> and PaCO<sub>2</sub> measurements. All values are expressed as mean ± SD. Statistical analysis was performed using a two way analysis of variance.

**RESULTS.** The results are summarized in table 1.

**Table 1 :** Ventilatory variables (I) during epidural anesthesia, (II) after a 20° Trendelenburg tilt, (III) during CO<sub>2</sub> insufflation, (IV) after CO<sub>2</sub> exsufflation.

	I	II	III	IV
VE	9.15±1.0	10.4±1.7	11.8±2.6	9.9±0.9
L/min			**&&	££
F	16.9±1.9	18.1±1.9	23.1±3.3	18.7±2.1
b/min				
VT	548±87	580±88	518±86	536±63
ml				
VO <sub>2</sub>	285±48	298±36	252±31	257±34
ml/min				
VCO <sub>2</sub>	231±36	271±58	270±48	243±31
ml/min			**&&	**
PETCO <sub>2</sub>	34.9±1.8	34.3±1.4	31.3±3.0	31.6±2.0
mmHg				
PaCO <sub>2</sub>	38.8±2.3	38.3±1.6	37.5±2.3	37.4±2.8
mmHg				
D(A-a)CO <sub>2</sub>	4±2.3	3.7±1.6	5.3±2.3	5.1±1.6
mmHg				
PaO <sub>2</sub>	111±17	109±11	114±12	110±14
mmHg				

Comparison : \* vs I ; & vs II ; £ vs III ;  
& : p < 0.05 ; \*\*, &&, ££ : p < 0.01 ;

**DISCUSSION.** This study shows that the ventilatory consequences of laparoscopy performed under epidural anesthesia are minimal.

CO<sub>2</sub> peritoneal insufflation was associated with a significant increase in VE, due to a marked increase in F, whereas VCO<sub>2</sub> remained unchanged. Accordingly, PaO<sub>2</sub> and PaCO<sub>2</sub> remained constant throughout the study. These facts suggest minimal CO<sub>2</sub> absorption from the peritoneal cavity, as previously reported (1).

Although statistically insignificant, the increase in D(A-a)CO<sub>2</sub> during CO<sub>2</sub> insufflation suggests inequalities in V/Q ratios. Mechanical compression of the chest wall induced by the Trendelenburg tilt and abdominal distension could be involved.

Direct stimulation of the respiratory centers by epidural lidocaine might also explain the absence of CO<sub>2</sub> retention observed in this study.

#### REFERENCES.

1. De SOUSA H. et al. : Can absorption of the insufflation gas during laparoscopy be hazardous ? Anesthesiology 67 : A476, 1987
2. LABAILLE T. et al. : Ventilatory response to CO<sub>2</sub> following intravenous and epidural lidocaine. Anesthesiology 63 : 179-183, 1985