Haemodynamic and ventilatory changes during laparoscopic cholecystectomy in elderly ASA III patients

**Purpose:** To evaluate the haemodynamic and respiratory changes during laparoscopic cholecystectomy in elderly ASA III patients.

**Methods:** This clinical descriptive study included 16 patients aged >75 yr. Anaesthesia was induced with fentanyl and etomidate and maintained with N2O in O2 (50%), fentanyl and isoflurane as needed. Inspired minute volume was kept constant during anaesthesia. Cardiovascular monitoring included a radial artery catheter and a pulmonary artery catheter for measurement of CO, RVEF and S½02, and calculation of right ventricular end diastolic volume indexed (RVEDVI).

Haemodynamic variables, arterial and venous blood gas analyses were collected before and 10 min after anaesthetic induction, 15, 30 and 60 min after insufflation (IAP = 12 mmHg) followed by a 10° head-up tilt, and after exsufflation.

**Results:** The mean age was 81 ± 4 yr. The main cardiovascular depression was recorded after anaesthetic induction. Peritoneal insufflation resulted in improvement of cardiovascular function with increases in cardiac index (+19%), heart rate (+21%), MAP (+19%) and S½02 (+8%), (P < 0.05) which may be the result of a sympathetic stimulation. No change in preload (RVEDVI) and SVR was recorded. Cardiac index was unchanged during pneumoperitoneum. Laparoscopy was associated with an increase in PaCO2 15 min after CO2 insufflation (from 33.9 to 38.3 mmHg, P < 0.05) and a further elevation after 60 min (44.4 mmHg) without any sign of extra peritoneal diffusion. There was no change in the intra-pulmonary shunt and the Pa-erCO2 gradient remained stable (mean 7.2 mmHg).

**Conclusion:** We conclude that gradual abdominal insufflation to 12 mmHg followed by a limited 10° head-up tilt is associated with cardiovascular stability in elderly ASA III patients.

**Key words**

ANAESTHESIA: laparoscopic cholecystectomy, elderly patients, ASA III, haemodynamics;
MEASUREMENT TECHNIQUES: cardiac output, thermodilution pulmonary artery catheter;
SURGERY: laparoscopy.

From the Department of Anaesthesia and Surgical Intensive Care, University Hospital of Poitiers, 86000 Poitiers, France.

Address correspondence to: Dr. K. Dhoste, Département d’Anesthésie-Réanimation, CHU La Milétrie, 350 avenue Jacques Coeur, BP 577, 86021 Poitiers Cédex, France.

Accepted for publication 30th March, 1996.
They have demonstrated that the cardiac index was catheter (REFOX Baxter*) was introduced via the elderly patients, with limited cardiac reserve. Also, the cystectomy in ASA 1-II young and healthy patients. Capnograph was calibrated according to manufacturer's and isoflurane concentration were continuously monitored for ventilatory changes. The respiratory behaviour in the elderly during this type of surgery is unknown. The aim of this study was to investigate the pneumoperitoneum-induced haemodynamic and ventilatory changes in elderly patients.

### Methods

After obtaining local Ethics Committee approval, 16 patients aged >75 yr, and ASA physical class III, scheduled for laparoscopic cholecystectomy, were included in this prospective study. Usual cardiac medication and hydroxyzine 1 mg kg⁻¹ po were given two hours before surgery. Before induction of anaesthesia, the radial artery was cannulated to monitor arterial blood pressure (HP 14360) and a 7.5 F thermodilution pulmonary catheter (REFOX Baxter*) was introduced via the internal jugular vein. Anaesthesia was induced with 2–3 μg kg⁻¹ fentanyl, 0.3 mg kg⁻¹ etomidate. Tracheal intubation was facilitated with atracurium 0.5 mg kg⁻¹. Anaesthesia was maintained with nitrous oxide in oxygen (50%), atracurium, fentanyl and isoflurane. The isoflurane concentration was titrated in response to haemodynamic changes. The end-tidal PCO₂ (PetCO₂) and isoflurane concentration were continuously monitored by a multigas analyser (Dutrex* Capnomac). The capnograph was calibrated according to manufacturer's recommandations in regard to N₂O concentration and atmospheric pressure before each operation. Ventilation was initially adjusted to keep the PetCO₂ between 25 and 30 mmHg and controlled with constant setting (ventilatory rate: 14 · min⁻¹) throughout the study. The following variables were recorded: mean arterial pressure (MAP), heart rate (HR), right atrial pressure (RAP), mean pulmonary artery pressure and pulmonary artery occlusion pressure (PAOP). The cardiac output, SVO₂ and right ventricular ejection fraction (RVEF) were measured (Explorer Baxter*). Then, cardiac index (CI), stroke index (SI), indexed right ventricular end-diastolic volume (RVEDVI) and systemic vascular resistances (SVR) were calculated. All haemodynamic variables were collected before (T₁) and ten minutes after (T₂) anaesthetic induction, 15 min (T₃), 30 min (T₄), 60 min (T₅) after the peritoneal insufflation with a 10° head-up position during surgery, and 15 min (T₆) after peritoneal exsufflation (patient in supine position and still anaesthetized). At each haemodynamic measurement time, arterial and mixed venous blood samples were drawn to measure PaO₂ and PaCO₂, and to calculate the Pa-etCO₂ gradient, the indexed oxygen delivery (DO₂i), the QS/QT ratio and the indexed oxygen consumption (VO₂i).

The pneumoperitoneum was induced with a 12 mmHg electronically regulated intra abdominal pressure (Storz electronic laparofflator 264300-20) in the supine position before a 10° head-up tilt.

Data were expressed as mean ± SD and were analyzed with the ANOVA and Student’s t test; a value of P < 0.05 was considered statistically significant.

### Results

Sixteen patients were initially included in the study. One was subsequently excluded because the pneumoperitoneum duration was limited to 15 min. The demographic data of the 15 other patients are summarized in Table I. The mean age was 81 ± 4 yr (range 75–90) and the duration of the pneumoperitoneum was 81 ± 25 min (mean ± SD). The history and the preoperative physical examination showed several cardiovascular and respiratory pathologies (Table II): hypertension (n = 9), stable coronary artery disease (n = 3), congestive heart failure (n = 5), pre existing lung disease (two COPD and restrictive respiratory disease in one).

Evolution of the haemodynamic variables during