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Case Report

Laparoscopic Cholecystectomy under General Anesthesia in a Patient with Patent Foramen Ovale

Flampouraris Vasileios*, Fragkouli Ioanna, Sevastou Sofia, Makri Fotini, Aggelopoulou Athanasia, Kokolaki Maria

Department of Anesthesiology and Pain Management, Sismanogleio-Amalia Fleming General Hospital Athens, Greece

***Corresponding author:** Flampouraris Vasileios, Department of Anesthesiology and Pain Management, Sismanogleio-Amalia Fleming General Hospital Athens, Greece

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Abstract

We present a case of a woman with patent foramen ovale, who underwent laparoscopic cholecystectomy under general anesthesia and was discharged home on the next day.

Definition

Patent foramen ovale (PFO) is a hole between the left and right atria (upper chambers) of the heart. This hole exists in everyone before birth, but most often closes shortly after being born. PFO is what the hole is called when it fails to close naturally after a baby is born.

The opening is supposed to close soon after birth, but sometimes it does not. In about 1 out of 4 people, the opening never closes. If it does not close, it is called a PFO. Pathophysiology of PFO complications During the prenatal life as the pulmonary vascular resistance is high, PFO allows blood flow from RA to LA; However, after the birth with first breath LA pressure exceeds the RA pressure due to significant decrease in pulmonary resistance and increased systemic vascular resistance. Functional closure of PFO occurs within the first year of life [1]. In significant number of populations there will be a flap-like valve that is formed between septum primum and secundum, and it keeps foramen ovale patent or occurrence of preferential flow from inferior vena cava toward the PFO as a result of postsurgical changes or the presence of prenatal circulation (Eustachian valve). When due to any etiological reason RA pressure increases, it leads to either hypoxia or venous thrombus will cross to left side of the heart causing PDE.

Perioperative procedure with pathological significance of PFO. Central venous catheterization Patients with PFO are at the high risk of PDE (air) during insertion or removal of the central venous catheter.

Mechanical ventilation During the emergence from anesthesia, reaction to the endotracheal tube and coughing causes temporary positive pressure between RA and LA in patients with PFO, leading to the hypoxia. In a comparative study for the effect of PEEP on shunt in patients with PFO, it is found that the shunt fraction increases with adding PEEP in patients with PFO where as it decreases in patients without PFO.

It is also explained that PEEP induced increase in the pulmonary vascular resistance might also contributing to the hypoxia in patients with PFO.

Acute respiratory distress syndrome in these patients as a result of increased pulmonary artery pressure and positive pressure mechanical ventilation will cause increased in right atrial pressure leading to right to left shunt and hypoxia. In a recent study, it is reported that moderate to large PFO shunting occurred in 19.2% of the patient with Acute Respiratory Distress Syndrome (ARDS). They also demonstrated that in ARDS patients with PFO will have poor response to PEEP, greater use of adjunctive interventions, and a longer intensive care and hospital stay.

Perioperative operative management of PFO related complications. The reversal of right to left shunt can be accomplished by the administration of positive inotropic medications, nitric oxide

or both, in the setting of right ventricular failure or pulmonary hypertension.

The cause of a PFO is unknown. There are no known risk factors. It can be found along with other heart abnormalities such as atrial septal aneurysms or Chiari network.

Case Report

A 62- years old female patient (172 cm, 65 kg, BMI: 22.03), with diagnosis PFO was scheduled for laparoscopic cholecystectomy because of 2 attacks of acute cholecystitis in last 3 months. At the properative examination, the patient was alert and oriented.

Two years ago, the patient suffered a transient ischemic stroke with right hemiplegia and dysarthria. These symptoms were fully restored with physiotherapy. ECG showed sinus rhythm 60 per minute with ventricular bigeminy. She was taking the following medicines:

Xarelto (anticoagulant – prophylactic for the thromboembolism), atrost (statine), Concor (beta blocker).

General anesthesia: We put in 18 G and 20 G intravenous line in situ in the left arm in beginning. We used measuring with radial arterial line (in the left arm) BP, SPO2, BIS, ECG, N.M.T train of four, ABGS and urine output. The induction was accomplished by giving:

Dexamethasone 8 mg, fentanyl 50 μg, propofol (2-6 Isopropyl phenol) 1% 50 mg, etomidate 20 mg, rocuronium 40 mg I.V. Intubation of trachea with a 7.5 size endotracheal tube was facilitated with Mc Coy 3.5. Cormack – Lehane 2A.

Maintenance of anesthesia with Desflurane ET 6.0 MAC 0.9, Gas flow 7lt/min, O_2/air. FiO2 0.5. CMV: Vt :475 ml, RR: 14/min PEEP 5 I: E ½. SPO_2: 99% and Remifentanyl 0.05-0.1 μg/kg/min. Ondansetron 4 mg, fentanyl 250 μg, paracetamol 1gr, morphine 4mg, omeprazole 40 mg and mefoxil 1gr given IV. We used warm Intravenous fluids R. Lactate to maintain normothermia. NMT monitoring used on orbicularis oculi muscle, showed no twitches on train of four for the rest of operation. Sugammadex 200 mg IV was given at the end of procedure and train of four 4/4.

Conclusion

Endoscopic surgery pneumoperitoneum for laparoscopic surgeries due to intraabdominal hypertension lead to right to left shunt.

Patients with PFO are exposed to various threats that increase the vulnerability to paradoxical embolism. These risks include hemodynamic changes that increase right-to-left shunting, hypercoagulability, deep venous thromboembolism, air embolism, cement embolism, and carbon dioxide embolism. Surgeons used from 6 mmHg to 8 mmHg intraabdominal pressure (Low).

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