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CLINICAL INFORMATION

Simple handling of venous air embolism during abdominal myomectomy

Betül Basaran[a,*], **Ahmet Basaran**[b], **Betül Kozanhan**[a], **Sadık Özmen**[a], **Mustafa Basaran**[b]

[a] *Department of Anesthesiology and Critical Care, Konya Education and Research Hospital, Konya, Turkey*
[b] *Department of Obstetrics and Gynecology, Konya Education and Research Hospital, Konya, Turkey*

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Abstract We report a case of venous air embolism during abdominal myomectomy. Although true incidence of venous air embolism is not known, in literature most of reported cases are belongs to sitting position craniotomies. Many of those are subclinical, and diagnostic methods have varying degrees of sensitivity and specificity. At time of suspicion, prevention of any subsequent air emboli is the cornerstone of treatment.

PALAVRAS-CHAVE
Embolia aérea;
Miomectomia;
Anestesia

Manejo simples de embolia gasosa durante miomectomia abdominal

Resumo Relatamos um caso de embolia gasosa durante miomectomia abdominal. Embora a incidência exata de embolia gasosa não seja conhecida, a maioria dos casos relatados na literatura se refere à posição sentada em craniotomias. Muitos casos são subclínicos e os métodos diagnósticos têm diferentes graus de sensibilidade e especificidade. No momento da suspeita, a prevenção de qualquer êmbolo de ar subsequente é a chave fundamental do tratamento.

A 36-year-old woman (height 150 cm, weight 80 kg, American Society of Anesthesiologist II) was scheduled for umbilical hernia repair. She was diagnosed to have asthma and was on fluticasone and salmeterol treatment. She had otherwise no specific medical history. There were no abnormal findings during her preoperative examination, laboratory, respiratory function test, electrocardiogram and chest X-ray. Thirty minutes before operation the patient was hydrated with 10 mL/kg lactated ringer solution. On arrival into the operating room, routine monitoring was applied. For spinal block 26 gauge atracaun spinal needle was used at L3–4 in the sitting position by a mid-line approach. A T4 block was

* Corresponding author.
E-mail: betulbasaran1@yahoo.com (B. Basaran).

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obtained and Bromage score was four before surgery. After midline surgical incision large multiple uterin myomas were noticed. Gynecologists decided to make myomectomy for these large myomas after getting informed consent from her family. From beginning of the surgery vital signs were stable. Her average blood pressure 110/60 and heart rate 70–80 beat/min. Three liters of oxygen were administered by nasal cannula and her oxygen saturation was 99–100%. Upon starting myomectomy the patient started to complain about abdominal tenderness and feel uncomfortable although sedated with 0.05 mg/kg midazolam and 1 μg/kg fentanyl. Then we decided to induce general anesthesia. After induction with 200 mg propofol and 50 mg rocuronium trachea was intubated. Anesthesia was maintained O_2–air mixture (40:60), sevoflurane (2%) with controlled ventilation using a tidal volume of 500 mL, respiratory rate 12, PEEP 5 mmHg. The surgery was uneventful, and SpO_2, ECG, ET CO_2 and noninvasive blood pressure was monitored continuously during operation. An abundant blood loss (about 500 mL) during this first myomectomy was seen; her SpO_2 and blood pressure and ET CO_2 fallen down to 80%, 65/40 mmHg, 20 respectively. Left radial arterial cannula was inserted pH: 7.22, PO_2: 45 mmHg, PCO_2: 40 mmHg were detected in arterial blood gas analysis. As a consequence of blood gas analysis and her hemodynamic failure we suspected the venous air emboli. In order to visualize patient's uterus and multiple large myomas, her uterus was exteriorized. Precordial auscultation at the apex of the heart revealed a mill-wheel murmur. Thereafter we changed the patient position to left lateral recumbent position. We informed surgeons about possible venous air emboli. Surgeons flood the surgical field with a normal saline. Air bubble image seen on transthoracic echocardiography also corrected our suspicion. 100% oxygen was administered. PEEP in ventilator setting was increased to 10 mmHg. To increase central venous pressure and replace blood loss the patient was hydrated with 1000 cm^3 lactated ringer solution and 500 cm^3 colloid in 1 h. Along with hydration 10 mg/h ephedrine infusion after two 5 mg bolus dose was started. Within 30 min her blood pressure, SpO_2 and $ETCO_2$ values raised gradually and measured 90/45 mmHg, 90%, 30 respectively. Arterial blood gases at this time showed pH: 7.30, PO_2: 224 mmHg, PCO_2: 35 mmHg. After that mill-wheel murmur was disappeared. The surgery was completed in reverse trendelenburg position. The patient was extubated at the end of the surgery, and returned from intensive care unit to the general ward one day after the surgery.

Discussion

Venous air embolism is defined as entrapment of air from damaged venous structure to the central venous system. Although venous air embolism is mostly seen during sitting position craniotomies, venous emboli can also be seen during cesarean section.[1] Venous air emboli mechanism and diagnosis during cesarean section were defined in many studies.[2,3] The height difference between uterine incision and heart causes a negative pressure gradient thus encouraging air embolism. By the same mechanism, during abdominal myomectomy exteriorization of uterus causes gravitational gradient and lead to entrapment of air to the damaged venous vasculature.[4]

In our patient previously introduced spinal anesthesia decreased systemic vascular resistance and caused venous pooling. After induction systemic vascular resistance fell down further. All these factors would be an explanation of these symptoms. Because in low cardiac output states low $ETCO_2$ can be seen. Asthma related bronchospasm mimics the same symptomatic scenario too.

Preoperative hydration and replacement of bleeding loss with same amount of lactated ringer solution prevented deep hypotension. We did not see any high peak airway pressure and bronchospasm related $ETCO_2$ pattern. So we ruled out both possible two leading causes that may be an explanation of patient's hemodynamic and respiratory alteration.

Venous air embolism (VAE) detection during obstetric procedures would be considered if unexplained hypotension and low level of $ETCO_2$ are seen together, or hypotension and hypoxia are not explained only with hypovolemia.

Since detection of VAE with transthoracic echocardiogram, we excluded pulmonary thromboembolism which may be another reason of this scenario.

Currently, no any valuable data support emergent catheter insertion for aspiration of air from right atrium. We decided to postpone the insertion of central venous line to the time when if any further hemodynamic and respiratory compromise seen. After all preventive and supportive measures patient's hemodynamic and respiratory parameters were normalized, there was no need for any interventional and diagnostic procedure.

In the management process surgeons should be informed about suspicion of VAE. So the surgeon should check and cover any possible site of emboli to inhibit further air entry. Hydration to increase central venous pressure, instant high oxygen pressure to maximize patient oxygenation and trendelenburg position to optimize hemodynamics are other supportive treatment methods.

In conclusion, this case shows us, VAE may be seen during myomectomy. Although VAEs have dramatic consequences, they can be handled conservatively if further preventive measures provided in the case of suspicion.

Conflicts of interest

The authors declare no conflicts of interest.

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