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CLINICAL INFORMATION

Fatal cardiac tamponade that developed in the post-anesthesia care unit: a rare complication after lung lobectomy

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Abstract
Background and objectives: Cardiac tamponade is potentially fatal medical condition, which rarely occurs as a complication of lung lobectomy. We present the first case of cardiac tamponade to develop in a Post-Anesthesia Care Unit following a lung lobectomy.
Case report: A 54-year-old man with pulmonary squamous cell carcinoma underwent an apparently uncomplicated lung lobectomy. His hemodynamics was unremarkable throughout the surgery and initially in the Post-Anesthesia Care Unit. However, after 5 min in the Post-Anesthesia Care Unit, he suddenly became hypotensive and dyspneic. He responded poorly to inotropics and fluid resuscitation. Transesophageal echocardiography conducted by an anesthesiologist who suspected a cardiac etiology revealed a pericardial effusion compressing the heart. After a failed attempt of pericardiocentesis, an emergency pericardial window operation was performed. The patient improved dramatically once the heart was decompressed.
Conclusion: Since cardiac tamponade is generally not suspected as a cause of hemodynamic instability after a lung lobectomy, as it was in this case, a misdiagnosis of the patient's condition may have led to improper management resulting in death. As anesthesiologists are often involved in the initial resuscitation of morbid patients in Post-Anesthesia Care Units, their acquaintance with various postoperative complications and competence in echocardiography for assessing cardiac problems may contribute to patient survival.

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PALAVRAS-CHAVE
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Pneumonectomia;
Recuperação pós-anestésica

Tamponamento cardíaco fatal desencadeado na sala de recuperação pós-anestésica: uma complicação rara após lobectomia pulmonar

Resumo
Justificativa e objetivos: O tamponamento cardíaco é uma condição médica potencialmente fatal, cuja ocorrência como uma complicação da lobectomia pulmonar é muito rara. Apresentamos o primeiro caso de tamponamento cardíaco desencadeado na sala de recuperação pós-anestésica (SRPA) após uma lobectomia pulmonar.
Relato de caso: Paciente do sexo masculino, 54 anos, com carcinoma de células escamosas pulmonares, submetido à lobectomia pulmonar aparentemente sem complicações. Sua hemodinâmica não apresentou alteração durante toda a cirurgia e também inicialmente na sala de resuperação pós-anestésica. Porém, após cinco minutos na SRPA, o paciente apresentou hipotensão e dispneia de forma repentina e respondeu mal ao inotrópico e à reanimação hídrica. Uma ecocardiografia transesofágica feita por um anestesiologista que suspeitou de etiologia cardíaca revelou um derrame pericárdico que comprimia o coração. Após tentativa malsucedida de pericardiocentese, foi feita uma janela pericárdica de emergência. O paciente apresentou melhora dramática com a descompressão do coração.
Conclusão: Como o tamponamento cardíaco geralmente não é suspeito como causa de instabilidade hemodinâmica após lobectomia pulmonar, como ocorreu neste caso, um diagnóstico errado da condição do paciente poderia ter levado a um manejo inadequado, que resultaria em morte. Como os anestesiologistas estão frequentemente envolvidos na reanimação inicial de pacientes debilitados em salas de recuperação pós-anestésica, seu conhecimento de várias complicações pós-operatórias e competência na ecocardiografia para avaliar problemas cardíacos podem contribuir para a sobrevivência do paciente.

Introduction

Cardiac tamponade, a life-threatening medical emergency, is very rarely associated with a lung lobectomy.[1–4] We describe the first reported case of cardiac tamponade following a lung lobectomy that was diagnosed by an anesthesiologist in the postoperative anesthesia care unit (PACU). The symptoms of cardiac tamponade are vague, often leading to misdiagnosis,[4,5] improper treatment, and even death.[4] Therefore, anesthesiologists should consider cardiac tamponade as a possible complication of lung lobectomy to prevent fatal outcomes.

Case report

A 54-year-old man (169 cm, 86 kg) with chronic cough was scheduled for lung lobectomy due to squamous cell carcinoma in the left lower lobe (grade cT1aN0M0). He also had an ostium secundum atrial septal defect and gastroesophageal reflux disease.

He underwent an apparently uncomplicated pulmonary left lower sleeve lobectomy under general anesthesia. The lung was isolated using a 37 Fr right-sided double-lumen tube with a SpO_2 of 96%–100% throughout the operation. The left radial arterial and central venous pressures were monitored. Under video-assisted thoracoscopy, the left lower lobar pulmonary artery and inferior pulmonary vein division were mobilized and stapled. Due to calcified nodules, the surgery was then converted to open thoracotomy. The seventh subcarinal lymph node was dissected en bloc and the entire lower left pulmonary lobe was removed.

After the surgery, the patient was extubated with spontaneous respiration. On arrival in the PACU, he was conscious, and breathing spontaneously (SpO_2, 90%; blood pressure, 136/107 mmHg). Five minutes later, his blood pressure dropped suddenly to 65/49 mmHg and he became dyspneic. Dopamine infusion at 5 $\mu g.kg^{-1}.min^{-1}$ and a rapid fluid infusion were initiated. The thoracic surgeons were notified of the patient's condition. The blood pressure decreased further to 48/37 mmHg (10 min after arrival to the PACU), so his leg was elevated. An electrocardiogram showed a slight inferolateral ST depression. Jugular vein engorgement was detected, but it was attributed to leg elevation. The blood pressure increased gradually to 92/71 mmHg after phenylephrine injection and dopamine infusion at 7 $\mu g.kg^{-1}.min^{-1}$, but the SpO_2 decreased to 85% (30 min after arrival to the PACU), and then increased to 93% with a continuous positive airway pressure of 10 cm H_2O. The blood pressure gradually dropped to 63/51 mmHg (105 min after arrival to the PACU) and became refractory to high-dose epinephrine and an intravascular fluid bolus. Since his dyspnea and tachypnea were worsening, the patient was intubated (2 h after arrival to the PACU). Chest X-ray showed haziness in the left lung field and an enlarged heart with a straightened left cardiac border.

Although his leg was returned to the horizontal position, the jugular vein remained distended. Therefore, the anesthesiologist involved in the case suspected a cardiac or obstructive origin of the hypotension, and performed a Transesophageal Echocardiogram (TEE); a moderate pericardial effusion was detected (155 min after arrival to the PACU) (Fig. 1). Pericardiocentesis was attempted by a cardiologist, but the pericardial drainage was insufficient (3 h after arrival

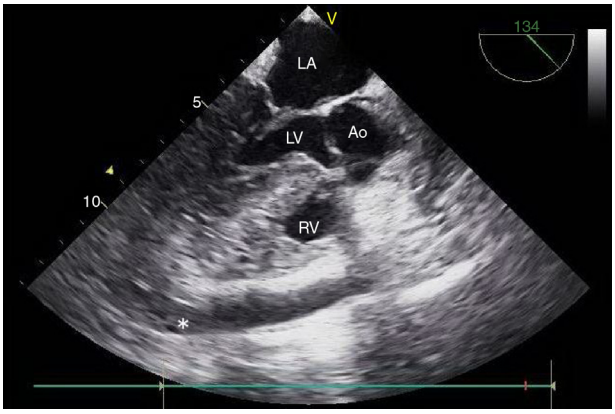

Figure 1 Mid-esophageal left ventricle outflow view at PACU before pericardial window operation (LA, left atrium; LV, left ventricle; RV, right ventricle; Ao, aorta. *Pericardial effusion compressing both left and right ventricle).

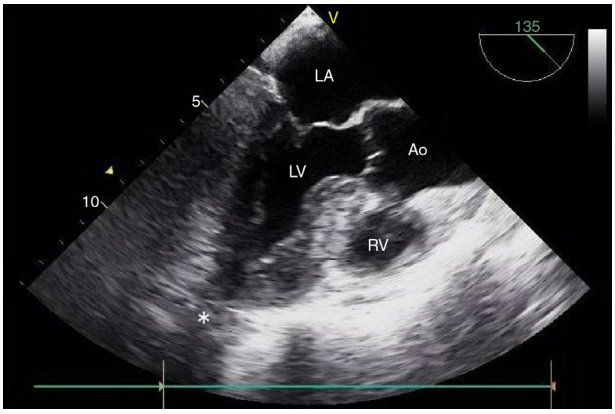

Figure 2 Mid-esophageal left ventricle outflow view at OR after pericardial window operation (LA, left atrium; LV, left ventricle; RV, right ventricle; Ao, aorta. *Resolved pericardial effusion).

to the PACU). Therefore, the surgeons performed an emergency pericardial window operation and suctioned 600 mL of sanguineous pericardial fluid (Fig. 2). Subsequently, his hemodynamics improved dramatically (blood pressure, 120/70 mmHg; SpO_2, 100%). No origin of the pericardial effusion was found during the operation. He recovered well, and outpatient chest X-rays taken during follow-up were clear.

Discussion

In this case, the anesthesiologist diagnosed cardiac tamponade, which prompted an urgent pericardial window operation and consequently saved the patient's life. In the relevant previous cases, anesthesiologists were not involved in the diagnosis of cardiac tamponade because hemodynamic instability developed after the patients had left the PACU.[1–4] In PACUs, however, anesthesiologists are usually the first to be notified of postoperative patients' abnormal findings, and therefore are often involved in the diagnosis.

Signs of cardiac tamponade include hypotension, jugular venous distension, muffled heart sounds, pulsus paradoxus, ST segment changes and low voltage QRS complexes on electrocardiogram, as well as dyspnea.[5] These signs may not always be present and are nonspecific, mimicking other conditions and complicating diagnosis.[6,7] Moreover, cardiac tamponade after pulmonary lobectomy is considered exceedingly rare.[1–4] As such, surgeons often do not consider it until reopening the thoracotomy.[3,4] We also made some mistakes in evaluating the patient by initially ignoring jugular vein distension and omitting postoperative arterial blood gas analysis and monitoring the CVP, which may elevate in cardiac tamponade.[6] Misdiagnosis can lead to death by delaying crucial treatments such as pericardiocentesis and a pericardial window operation.[1,8] Therefore, a systemic diagnostic approach is required to rapidly and accurately assess refractory hypotension.

The causes of refractory hypotension can be hypovolemic (e.g., bleeding), cardiogenic (e.g., cardiac pump failure), obstructive (e.g., cardiac tamponade, tension pneumothorax, pulmonary embolus), or distributive (e.g., sepsis).[9] Among the four types, jugular vein distension suggests cardiogenic or obstructive etiology rather than hypovolemic or distributive causes.[9] The patient's chest X-ray was less suggestive of tension pneumothorax. Thus, we performed TEE rather than Transthoracic Echocardiography (TTE) because TEE more accurately assesses cardiac tamponade[10] and pulmonary embolism,[11] and because the patient was sedated and intubated. In a case of cardiac tamponade following catheterization, TTE failed to offer adequate information, and TEE was used because it yielded better images and enabled evaluation of the hemodynamic status.[10] However, TTE is less invasive and more easily performed. Although cardiac tamponade was successfully detected with TEE, subxyphoid TTE can be generally considered as the first choice even in the present case, as recent several point-of-care ultrasound protocols suggest.[9,12]

It has been demonstrated that for cases of undifferentiated severe hypotension, cardiac, pulmonary, and large vascular status should be assessed promptly using bed-side ultrasound for differential diagnosis.[9,12]

The cause of the cardiac tamponade in this case remains speculative because no source of bleeding was found during the pericardial window operation. The thoracic surgeons thought that they may have caused an inadvertent injury to the pericardium while dissecting pulmonary hilar structures. The putative causes of post-lobectomy cardiac tamponade in other cases include puncture of the pericardium by a malformed staple,[4] bleeding of a pulmonary vessel that retracts into the pericardial sac,[1,2] or an inadvertent pericardial needle stick.[3]

As in this case, patients with a pericardial effusion may suddenly become seriously ill following a period of hemodynamic stability,[1,2,4] which highlights the need for strict vigilance in the PACU and during transport to the intensive care unit, even after an apparently uncomplicated lung lobectomy.

In conclusion, an anesthesiologist's familiarity with various postoperative complications, utilizing a systemic diagnostic approach, and competence in echocardiography may enable early differentiation of the etiology of refractory hypotension in the PACU, and may prevent fatal outcomes.

Conflicts of interest

The authors declare no conflicts of interest.

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