Paradoxical embolism after surgery for breast cancer: a case report

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Abstract

Background: Paradoxical embolism (PDE) presented with concomitant pulmonary embolism (PE) and renal artery embolism (RAE) which occurred to breast cancer patient after breast-conserving therapy, has never been reported.

Case presentation: A 55-year-old female with breast cancer exhibited unexplained hypoxemia, followed with vomiting, diarrhea, unilateral flank pain and abdominal pain after lumpectomy 12 h. The urgent multi-detector row computed tomography (MDCT) confirmed the diagnosis of PE and RAE. Confusingly, the patient had no history of intracardiac defect, cardiac valvular diseases, atrial fibrillation or other cardiovascular disease and the definite cause was still unclear. However, after 10 days of prompt anticoagulant therapy in ICU, she was discharged in good condition.

Conclusion: Breast cancer patients after surgery suffering from unexplained hypoxemia, abdominal pain, vomiting and diarrhea should be highly suspicious of PE or RAE, even PDE. Any clinical presentation on these postoperative patients should be given much more attention to make accurate diagnosis and appropriate interventions.

Keywords: Paradoxical embolism, Pulmonary embolism, Renal artery embolism, Breast cancer, Surgery

Background
Paradoxical embolism (PDE) first proposed by Cohnheim in 1877, referring to the passage of venous or right-sided cardiac thrombus into the arterial or systemic circulation, is comparatively rare and represents less than 2% of all instances of systemic arterial emboli [1]. In general, the most common PDE sites are extremities (49%) and cerebrum (37%), where only 23% of PDE had two definable embolic sites and 10% had three [2]. Renal artery is infrequent and renal artery embolism (RAE) is typically seen on patient with atrial fibrillation or other cardiovascular disease [3]. It has been accepted that patent foramen ovale (PFO) or intracardiac defect working as a significant abnormal passage has played a crucial role in this process. However, in contrast to the accepted fact, the patient of this case without any indicator of most common risks still experienced concomitant PE and RAE after breast-conserving therapy.

Case presentation
A 55-year-old woman with BMI 24.6 kg/m² diagnosed with invasive ductal carcinoma of right breast (cT2N0M0) was suddenly fainted with profuse sweating and followed developing severe gastrointestinal discomfort when she got up to walk in ward 12 h after lumpectomy, but no progressive chest pain, cough or unconsciousness was observed. Subsequently, she felt mild shortness of breath and dull pain on the right flank as well as lower right abdomen, accompanying vomiting and diarrhea in the next 30 min. Under this emergency circumstance, she was performed with a series of physical and screening laboratory examinations. Electrocardiogram monitor detected a mild decrease of blood oxygen saturation which ranged from 82 to 89% with 4 L of 100% oxygen inhalation through nasal cannula, blood pressure dropping to 88/57 mmHg, respiratory rate of...
Paradoxical embolism (PDE) is a potentially life-threatening complication in patients undergoing cancer surgery. It has been reported that the risk of PDE after DVT in patients with PFO is relatively lower which is less than 2% [4]. To the best of our knowledge, PDE presented with concomitant PE and RAE, which occurred to breast cancer patient after breast-conserving therapy, has never been reported. After all, the overall incidence of venous thromboembolism (VTE) was 0.16% after breast operation within 2 months [5].

PDE usually occurs to patients with cardiovascular disease and VTE [2, 6]. Theoretically, a venous thrombus usually ends in the pulmonary artery or one of its branches, unable to cross the pulmonary capillaries and enter the systemic circulation unless an intracardiac communication and a favorable pressure gradient were presented [7]. The established evidence demonstrated that PFO has played a key role in PDE. Confusingly, in this case, the evidences of intracardiac defect, cardiac valvular diseases or abnormalities of visceral vessels in preoperative MDCT failed to be detected (Fig. 4). Hence, how DVT resulted in RAE was still unknown. The potential explanation was that PE resulted in transient pulmonary hypertension, which made invisible PFO reopened in a short time, eventually, incurred DVT into systemic circulation. If that is the case, why any abnormalities in echocardiograph or ultrasound was not detected? We speculated that the reason why any abnormalities in echocardiograph or ultrasound were not detected rested with the interval between the time of examinations and onset of the embolism event, which was similar to the experience of Travis JA [8]. Another additional reason was that we chose the echocardiograph to detect the existence of PFO other than transesophageal echocardiography mainly in consideration of severity of disease, which might affect the result to some extent.

For the breast cancer patients, there is no relationship identified between the stage of breast cancer or type of breast surgery and the development of VTE [5, 9]. However, this patient undergoing breast-conserving surgery without central venous catheter applied perioperatively and continuous compression of incision via elastic compression bandage postoperatively still had VTE. At present, the mechanisms of VTE responsible for cancer patient have not been clarified but thought to be correlated with hypercoagulable state of
malignancy [10]. Three potential contributing factors should be given more focus and concern. The first one was associated with the nature of carcinoma. It’s estimated that cancer patients have a 4-fold increased risk of VTE comparing with general population, for an annual incidence of approximately 0.48% [11]. Moreover, a related study indicated that cancer patients have at least twice risk of developing postoperative DVT and over three times risk of fatal PE compared with non-cancer patients performed with the same surgical procedures [12]. Apart from that, the age and BMI(> 25 kg/m²), as two independent adverse prognostic factors of VTE, should also be taken account in this event [13].

Undoubtedly, compared with identifying VTE, identifying visceral artery embolism under initial stage is rather challenging. Similarly, RAE was difficult to be clinically diagnosed given its vague presentation [14]. In fact, it was gastrointestinal discomfort of this patient that caught our attention and raised clinical suspicion. Ultimately, we decisively adopted MDCT of abdomen to confirm the diagnosis of RAE. Thanks to the prompt diagnosis and effective therapy, she was free from distinct renal insufficiency with a value of serum creatinine and serum urea nitrogen fluctuation in normal range except the lactate dehydrogenase (range: 592-804 U/L; reference 108-252 U/L).

In conclusion, although the mechanisms responsible for increased risk of PDE in breast cancer patients are poorly understood, the unexplained hypoxemia followed by severe gastrointestinal discomfort, which exhibited postoperatively, should be highly considered as potential development of PE, even PDE. Keeping an open mind and attaching more attention to any clinical presentation of patients are indispensable to make an accurate diagnosis and give early appropriate interventions in clinical practice. Failing to do so may result in a considerable and incalculable adverse impact on patients. Moreover, defining patients at high risk will aid in establishing recommendations for PDE prophylaxis in the long run.
Abbreviations
PE: Pulmonary embolism; RAE: Renal artery embolism; PDE: Paradoxical embolism; CTA: Computed tomography angiography; PFO: Patent foramen ovale; VTE: Venous thromboembolism

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Authors’ contributions
JW and JYX contributed to study conception and design. ZMY collected, analyzed clinicopathological data and wrote the manuscript. HRD was involved in data analysis. The final version of manuscript was read and approved by all authors.

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Competing interests
None of the authors declares a conflict of interests.

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