

# World Journal of *Clinical Cases*

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## Contents

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## EDITORIAL

- 8242 Antibiotic treatment in cirrhotic patients  
*Fiore M, Leone S*

## MINIREVIEWS

- 8247 Research progress on preparation of lateral femoral tunnel and graft fixation in anterior cruciate ligament reconstruction  
*Dai Y, Gao WJ, Li WC, Xiang XX, Wang WM*
- 8256 Accessory navicular in children  
*Xiang F, Liu ZQ, Zhang XP, Li YJ, Wen J*
- 8263 Non-pharmacological pain palliation methods in chronic pancreatitis  
*Tez M, Şahingöz E, Marlı HF*

## ORIGINAL ARTICLE

## Retrospective Study

- 8270 Ratio of hemoglobin to mean corpuscular volume: A new index for discriminating between iron deficiency anemia and thalassemia trait  
*Yao QC, Zhai HL, Wang HC*
- 8276 Influence of standardized nursing intervention combined with mindfulness stress reduction training on the curative effect in patients with acute pancreatitis  
*Li S, Yin D, Guo XC*
- 8284 Clinical analysis of 114 cases of bronchiolitis in infants  
*Shi C, Wu MH, Zuo A, Yang MM, Jiang RR*
- 8291 Endovenous laser treatment vs conventional surgery for great saphenous vein varicosities: A propensity score matching analysis  
*Li Q, Zhang C, Yuan Z, Shao ZQ, Wang J*
- 8300 Efficacy of prednisone combined with mycophenolate mofetil for immunoglobulin A nephropathy with moderate-to-severe renal dysfunction  
*Meng MJ, Hu L, Fan Y, Gao H, Chen HZ, Chen CM, Qi Z, Liu B*
- 8310 Efficacy of surgical resection and ultra-reduced tension suture combined with superficial radiation in keloid treatment  
*Hu XY, Yang Q, Guan XY, Li JY, Wang LL, Li K, Zhang XT*

**Observational Study**

- 8320** Prior abdominal surgery as a potential risk factor for colonic diverticulosis or diverticulitis  
*Ariam E, Richter V, Bermont A, Sandler Y, Cohen DL, Shirin H*

**META-ANALYSIS**

- 8330** Vericiguat treatment of heart failure: A systematic review and meta-analysis  
*Yang H, Luo C, Lan WQ, Tang YH*

**CASE REPORT**

- 8343** Rare synchronous colorectal carcinoma with three pathological subtypes: A case report and review of the literature  
*Li F, Zhao B, Zhang L, Chen GQ, Zhu L, Feng XL, Yao H, Tang XF, Yang H, Liu YQ*
- 8350** Twin pregnancy with sudden heart failure and pulmonary hypertension after atrial septal defect repair: A case report  
*Tong CX, Meng T*
- 8357** Diffuse arterial atherosclerosis presenting with acute ischemic gastritis: A case report  
*Wei RY, Zhu JH, Li X, Wu JY, Liu JW*
- 8364** Balloon venoplasty for disdialysis syndrome due to pacemaker-related superior vena cava syndrome with chylothorax post-bacteraemia: A case report  
*Yamamoto S, Kamezaki M, Ooka J, Mazaki T, Shimoda Y, Nishihara T, Adachi Y*
- 8372** Malignant pleural mesothelioma mimics thoracic empyema: A case report  
*Yao YH, Kuo YS*
- 8379** Multifocal papillary thyroid cancer in Graves' disease: A case report  
*Alzaman N*
- 8385** Anlotinib in combination with pembrolizumab for low-grade myofibroblastic sarcoma of the pancreas: A case report  
*Wu RT, Zhang JC, Fang CN, Qi XY, Qiao JF, Li P, Su L*
- 8392** Ankle and toe weakness caused by calcified ligamentum flavum cyst: A case report  
*Jung HY, Kim GU, Joh YW, Lee JS*
- 8399** Atypical case of bow hunter's syndrome linked to aberrantly coursing vertebral artery: A case report  
*Ahn JH, Jun HS, Kim IK, Kim CH, Lee SJ*
- 8404** Phleboscrosis: An overlooked complication of varicose veins that affects clinical outcome: A case report  
*Ren SY, Qian SY, Gao RD*
- 8411** Inflammatory cutaneous metastases originating from gastric cancer: A case report  
*Tian L, Ye ZB, Du YL, Li QF, He LY, Zhang HZ*

- 8416** Metastatic pancreatic solitary fibrous tumor: A case report

*Yi K, Lee J, Kim DU*

- 8425** Abemaciclib-induced lung damage leading to discontinuation in brain metastases from breast cancer: A case report

*Yamashiro H, Morii N*

### **LETTER TO THE EDITOR**

- 8431** Letter to the editor: Aggressive variant prostate cancer: An exemplary case study and comprehensive literature survey

*Ke HW, Zhang WY, Xu KX*

**ABOUT COVER**

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## Abemaciclib-induced lung damage leading to discontinuation in brain metastases from breast cancer: A case report

Hiroyasu Yamashiro, Nao Morii

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### Abstract

#### BACKGROUND

This case report addresses the dearth of effective therapeutic interventions for central nervous system metastases in patients with HER2-negative breast cancer. It presents a unique case of a woman with estrogen receptor-positive, HER2-negative breast cancer who developed brain metastasis. The report highlights her initial favorable response to abemaciclib and letrozole therapy prior to the discontinuation due to drug-induced lung damage (DILD).

#### CASE SUMMARY

In this comprehensive case summary, we present the clinical course of a woman in her 60s, who 11 years following primary breast cancer surgery, was diagnosed with multiple brain metastases. As a third-line systemic therapy, she underwent treatment with abemaciclib and letrozole. This treatment approach yielded a near-partial response in her metastatic brain lesions. However, abemaciclib administration ceased due to the emergence of DILD, as confirmed by a computed tomography scan. The DILD improved after 1 mo of cessation. Despite ongoing therapeutic efforts, the patient's condition progressively deteriorated, ultimately resulting in death due to progression of the brain metastases.

#### CONCLUSION

This case underscores the challenge of managing adverse events in responsive brain metastasis patients, given the scarcity of therapeutic options.

**Key Words:** Breast cancer; HER2 negative; Brain metastasis; Abemaciclib; Drug-induced interstitial lung damage; Case report

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**Core Tip:** In this case report, we address the critical issue of limited therapeutic options for HER2-negative breast cancer patients with brain metastases. We present a case of a woman with estrogen receptor-positive, HER2-negative breast cancer who initially exhibited an encouraging response to abemaciclib and letrozole therapy for brain metastases. However, this treatment had to be discontinued due to drug-induced lung damage. This study reports the challenges of achieving a balance between efficacy and adverse events in managing brain metastases and highlights the need for alternative treatment strategies in this patient population.

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## INTRODUCTION

Central nervous system (CNS) metastasis in primary breast cancer occurs in 10%-15% of advanced/recurrent breast cancer cases[1]. However, drug therapy for brain metastases has been considered less effective due to the presence of the brain-blood barrier (BBB), which restricts the entry of many drugs into the CNS. In certain phenotypes, such as HER2-positive breast cancer, treatment outcomes of CNS metastasis have been improving with the development of new drugs [2]. However, there is currently no drug that has significant efficacy in treating CNS metastasis from HER2 negative breast cancer, and radiation therapy remains the first choice.

Cyclin-dependent kinase (CDK) 4/6 inhibitors, abemaciclib and palbociclib, are available as insurance-covered treatment in Japan. These drugs, when combined with hormonal therapy, were twice as effective in prolonging progression-free interval in estrogen receptor (ER)-positive/HER2-negative metastatic/recurrent breast cancer compared to hormonal therapy alone[3]. Abemaciclib can cross the BBB[4], and it is expected to be effective against brain metastasis of ER-positive/HER2-negative breast cancer.

Here, we report a case of brain metastasis of ER-positive/HER2-negative primary breast cancer that initially responded to concomitant therapy of abemaciclib and letrozole, but required termination owing to drug-induced lung damage (DILD).

## CASE PRESENTATION

### Chief complaints

A postmenopausal woman in her 60s attended our hospital complaining of unsteadiness or dizziness.

### History of present illness

Several months ago, the patient became aware of dizziness and the symptoms gradually worsened. She was not aware of nausea, paralysis, muscle weakness, or memory loss.

### History of past illness

The woman underwent mastectomy and axillary lymph node dissection for breast cancer 11 years ago. The pathological diagnosis was mucinous carcinoma, histological grade 2, pT1c, n0(0/7), ER-positive, progesterone receptor-positive, and HER2-negative (score 0). For the 5 years after surgery, she received endocrine therapy and was no longer followed up after being recurrence-free for 10 years postoperatively.

### Personal and family history

She had no particular personal and family medical history.

### Physical examination

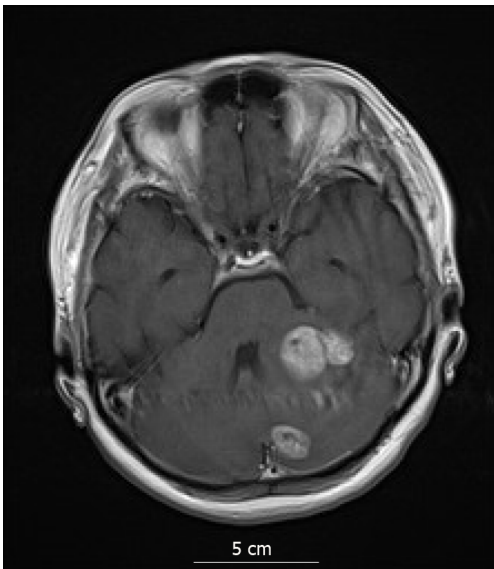
On physical examination, no notable abnormalities were observed.

### Laboratory examinations

The laboratory examination results were unremarkable.

### Imaging examinations

Head magnetic resonance imaging (MRI) indicated multiple brain metastases (Figure 1); no trunk lesions were observed on computed tomography (CT).



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**Figure 1 Initial head magnetic resonance imaging.** The patient was diagnosed with multiple brain metastases based on contrast-enhanced head magnetic resonance imaging when she visited our hospital for the staggering that she began experiencing in the 11<sup>th</sup> year postoperatively.

## FINAL DIAGNOSIS

Late (more than 10 years after primary radical surgery) recurrence of breast cancer. Multiple brain metastases.

## TREATMENT

After whole brain irradiation (40 Gy/20 Fr), exemestane treatment was initiated. Although the brain metastases showed partial response (PR), in the 12<sup>th</sup> year postoperatively, lymph node and adrenal metastases were detected by CT. Consequently, the treatment was changed to palbociclib plus letrozole. Thereafter, owing to deterioration of the pre-existing cerebellar metastasis, localized irradiation was performed. In the 13<sup>th</sup> year postoperatively, the brain metastases progressed (Figure 2A), so treatment was changed to abemaciclib plus letrozole as the third-line treatment. Three months later, MRI showed attenuation of the brain metastases and the contrast effect (Figure 2B), almost reaching a PR. However, DILD was noted on CT (Figure 3), which necessitated the termination of abemaciclib. No other grade 3 or higher hematological toxicity, diarrhea, or fatigue occurred.

## OUTCOME AND FOLLOW-UP

The DILD improved after 1 mo of cessation. The patient continued treatments with TS-1 and fulvestrant but died in the 14<sup>th</sup> year postoperatively due to progression of the brain metastases.

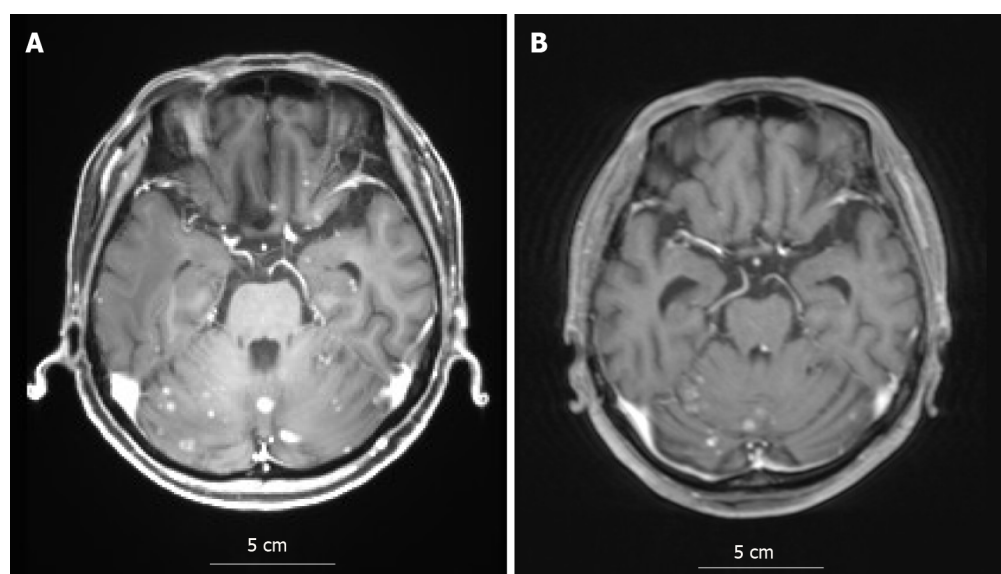
## DISCUSSION

We experienced a case in which abemaciclib was successful for brain metastasis of ER-positive/HER2-negative breast cancer but had to be discontinued due to DILD. Brain metastasis is reported to occur in 10%-15% of cases of advanced or recurrent breast cancer[1]. The mean survival after the appearance of brain metastasis varies depending on the subtype, ranging from several years for HER2-positive breast cancer to less than 6 mo for triple-negative (HER2, ER, and progesterone receptor all negative) breast cancer[5-7].

Breast cancer is recognized as a solid tumor that often responds well to pharmacotherapy, and advancements in translational research have significantly expanded the array of available drugs. However, conventional drugs are limited in their effectiveness for brain metastases of breast cancer due to the BBB and low cerebrospinal fluid penetration[8].

Some case reports and phase II trials have indicated a response rate of 5.2% to abemaciclib in brain metastases of ER-positive breast cancer and the overall outcomes have been less than satisfactory[9]. Capivasertib (a protein kinase B inhibitor) and alpelisib (a phosphatidylinositol 3-kinase inhibitor) may have some potential for the treatment of brain metastasis of hormone receptor-positive breast cancer.





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**Figure 2 Magnetic resonance imaging before and after abemaciclib administration.** A: Contrast-enhanced head magnetic resonance imaging (MRI) before abemaciclib plus letrozole treatment; B: Contrast-enhanced head MRI after abemaciclib plus letrozole treatment. The brain metastases shrunk, and the contrast effect was attenuated after treatment, almost reaching a partial response.



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**Figure 3 Computed tomography scan when diagnosing drug-induced lung disease.** Computed tomography after abemaciclib plus letrozole treatment reveals a pale interstitial shadow on the right lung, which led to the diagnosis of drug-induced lung disease.

Trastuzumab-deruxtecan (T-DXd) is an antibody-drug conjugate that covalently binds trastuzumab, a humanized monoclonal antibody, with deruxtecan, a topoisomerase I inhibitor (a derivative of exatecan). T-DXd has shown promising results with a high response rate of 47.1% for brain metastases of HER2-positive breast cancer[10] owing to its unique mechanism of action. With HER2-low (HER2 score of 1 or 2 and fluorescence in situ hybridization-negative) recurrent metastatic breast cancer being added as an indication, T-DXd is expected to show effectiveness in brain metastases of breast cancer previously considered as ER-positive or triple-negative with low HER2 expression[11]. The first-line drug for ER-positive/HER2-negative metastatic/recurrent breast cancer is a CDK4/6 inhibitor, but if accompanied by brain metastases, T-DXd may be a better first-line choice.

In global trials of abemaciclib (MONARCH 2, 3, and E)[12-14], DILD was reported in approximately 2%-3% of cases. Although DILD is not often fatal with appropriate monitoring and early intervention, in cases of grade 2 or higher severity, treatment must often be terminated without the possibility of it being resumed. Underlying lung diseases such as interstitial pneumonia can be risk factors for DILD, but the exact mechanism of onset is not fully understood, and preventive measures have not yet been established. CDK4/6 inhibitors, abemaciclib, and palbociclib can be prescribed

under Japanese insurance; however, palbociclib has a high incidence of hematological toxicity. In particular, neutropenia was reported in 78% (66% grade 3) of cases in a phase III[3] study. Abemaciclib also has hematological toxicity[12-14], however can be clinically characterized by non-hematological toxicity symptoms, such as diarrhea and fatigue.

As this is a case report, our findings have not been validated, however, they may provide an opportunity to consider the factors involved leading to treatment termination due to adverse events. This is critical as there are no drugs that have shown significant efficacy on brain metastases of breast cancer.

## CONCLUSION

We present the case of a patient with brain metastases from primary breast cancer where abemaciclib was terminated owing to DILD. While we anticipate the development of drugs that are effective for brain metastases, exploring strategies to minimize treatment terminations due to toxicities remains an important approach.

## ACKNOWLEDGEMENTS

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## FOOTNOTES

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**Informed consent statement:** Although the informed written consent cannot be obtained because the patient has already died, I can state clearly that this case report does not contain information that could identify the individual patient.

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