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Gemcitabine Monotherapy Associated with Posterior Reversible Encephalopathy Syndrome

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Key Words
Posterior reversible encephalopathy syndrome · Gemcitabine · Chemotherapy

Abstract
Posterior reversible encephalopathy syndrome is a clinicoradiologic entity that may present with headaches, altered mental status, seizures and visual loss as well as specific neuroimaging findings. We report a case of a 74-year-old woman receiving adjuvant gemcitabine chemotherapy as monotherapy for a stage IIa pancreatic adenocarcinoma, who developed posterior reversible encephalopathy syndrome.

Introduction

Posterior reversible encephalopathy syndrome (PRES) is a clinicoradiologic entity characterized by headaches, altered mental status, seizures, and visual loss and is associated with white matter vasogenic edema predominantly affecting the posterior occipital and parietal lobes of the brain [1–6].

The pathophysiology of PRES remains unclear. Two pathophysiologic mechanisms have been proposed regarding cerebral autoregulation: cerebral vasospasm, which results in cytotoxic edema [7, 8], and vasodilatation, which results in vasogenic edema [3, 9, 10]. The latter is more favored by most experimental and clinical data [11–15]. The pathophysiology of PRES also implicates endothelial dysfunctions, such as preeclampsia or cytotoxic therapies, especially in cases without severe hypertension [1, 16, 17].

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Numerous factors can trigger this syndrome, the most common being acute elevation of blood pressure, abnormal renal function and immunosuppressive therapy [1]. Other possible etiologies are eclampsia [7, 18–21], lupus [22, 23], transplantation [24], neoplasia and chemotherapy treatment [25], systemic infections [26], and acute or chronic renal disease [27, 28].

Gemcitabine has been associated with PRES; nevertheless, the contributory effects of other drugs administered simultaneously with or previously to gemcitabine are not well clarified [29]. The purpose of this report is to present a case treated with gemcitabine as monotherapy.

Case Report

A 74-year-old woman was diagnosed with pancreatic cancer without evidence of metastasis. She underwent pancreaticoduodenectomy, which revealed no regional lymph node metastases or microscopic residual disease (T3 N0 M0). After 4 weeks, the patient was started on her first course of adjuvant treatment with gemcitabine (1,000 mg/m^2 on days 1, 8 and 15 of each 28-day cycle). Her ECOG performance status was 1.

One day after the beginning of the third chemotherapy cycle, the patient developed severe headache. After a few hours, she experienced a tonic-clonic seizure and visual blurring. At that time, her blood pressure was 170/90 mm Hg and her creatinine level was 1.4 mg/dl (2 months before, it was 1.0 mg/dl). A head computed tomography was obtained, which showed mild focal hypodensity in both occipital lobes without any evidence of brain metastasis. In addition, a brain magnetic resonance imaging (MRI; T2 and fluid-attenuated inversion recovery image sequences) was performed, which revealed a subcortical T2 hyperintensity without enhancement, apparent on both the occipital and temporal lobes (**fig. 1**).

The patient was treated with phenytoin and had no further seizures. After 10 days, the patient was asymptomatic and after 2 weeks, she underwent a follow-up brain MRI, which showed no cortical or subcortical T2 hyperintensity (**fig. 2**).

Discussion

The cause of PRES is not yet understood. Hypertension with failed autoregulation and hyperperfusion remains a popular consideration for developing brain edema [1]. The suggested pathophysiologic mechanisms are cerebral vasospasm with resulting ischemia within the involved territories and a breakdown in cerebrovascular autoregulation with ensuing interstitial extravasation of fluid [8].

The most characteristic imaging pattern in PRES is the presence of an edema involving the white matter of the posterior portions of both cerebral hemispheres, especially the parieto-occipital regions, in a relatively symmetric pattern that spares the calcarine and paramedian parts of the occipital lobes [1, 3, 30, 31]. However, other structures such as the brain stem, cerebellum, and frontal and temporal lobes may also be involved, and although the abnormality primarily affects the subcortical white matter, the cortex and the basal ganglia may also be affected [5, 32–34].

No single antineoplastic class or agent has been consistently associated with PRES, although some chemotherapeutic agents may cause direct CNS microvascular injury [35]. PRES is more likely to be encountered after high-dose multidrug cancer therapy, typically in hematopoietic malignancies [36–39].

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Gemcitabine is a nucleoside analogue antineoplastic agent structurally similar to cytarabine that is approved by the US Food and Drug Administration for the use in non-small cell lung, breast, ovarian, and pancreatic cancers [40]. It is unclear if gemcitabine can cross the blood-brain barrier [41]. Neurologic toxicities with gemcitabine are uncommon and include peripheral neuropathy and somnolence in 3 and 9% of patients, respectively [42]. Few data are available showing the association of PRES and gemcitabine. Gemcitabine-associated PRES was first identified in 2001 in the treatment of non-small cell carcinoma of the lung [29]. Two studies demonstrated the association of PRES and gemcitabine in gallbladder and pancreatic cancer treatment [35, 43]. This case is the first report of PRES associated with gemcitabine monotherapy in a treatment with adjuvant intent.

Conclusion

PRES is an entity not well known by neurologists and radiologists. Due to the poor knowledge of this syndrome, i.e. its cause and pathophysiology are not yet fully defined, it is sometimes not recognized. However, because of the increasing number of neuroimaging studies that have been conducted as well as of therapies that can induce PRES (which increases the number of patients treated with chemotherapy or immunosuppression), this phenomenon is becoming increasingly common.

Our report demonstrates that gemcitabine per se is associated with PRES, independent of other drugs.

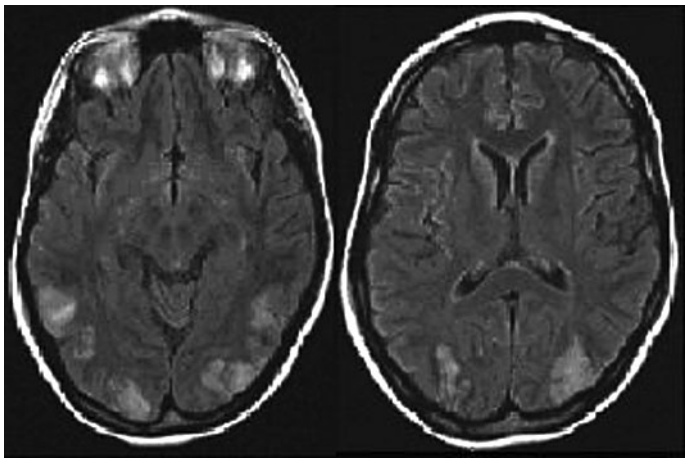

Fig. 1. Brain MRI showing the subcortical edema in the occipital and temporal lobes.

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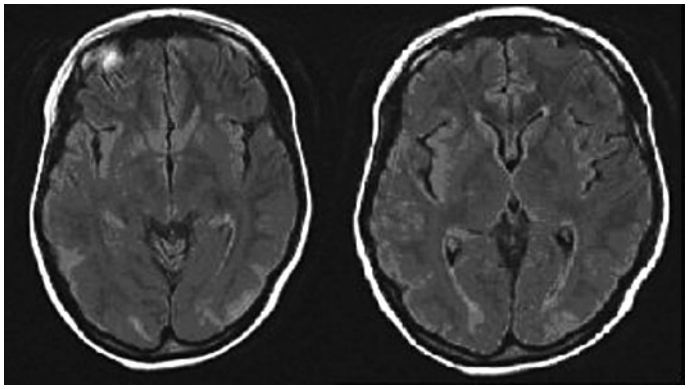

Fig. 2. Brain MRI showing a reduction of the subcortical edema.

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