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Central nervous system solitary fibrous tumour/hemangiopericytoma presenting as nausea, vomiting and hepatic dysfunction after the first trimester of pregnancy: A case report

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ABSTRACT

Background: Solitary fibrous tumour/haemangiopericytoma (SFT-HPC) is a rare fibroblastic mesenchymal neoplasm that develops as a result of the uncontrolled proliferation of mesenchymal fibroblasts and occurs rarely during pregnancy.

Case Presentation: A 26-year-old woman (G_2P_1) with an intrauterine pregnancy at 34^{+4}weeks presented at a university hospital with a history of nausea and vomiting since 20 weeks. Other symptoms included slight headache and 5-kg weight loss. She had attended and been admitted to several hospitals during that time. Laboratory evaluation revealed evidence of hepatic dysfunction with elevated liver enzymes. The patient's headache worsened, and magnetic resonance imaging (MRI) showed an extra-axial mass in the right tentorial and supratentorial spaces, with brain herniation. Caesarean section and brain tumour resection were performed under general anaesthesia at the same time. Histopathological analysis revealed HPC (World Health Organization [WHO] grade III). Nausea and vomiting symptoms gradually improved. Postoperatively, the patient underwent fractional external radiotherapy (total amount 50 Gy). There was no evidence of local recurrence of metastases in the follow-up 6 months after surgery.

Conclusions: Nausea and vomiting are commonly experienced during pregnancy. This often makes patients ignore other aetiologies that cause nausea and vomiting. Central nervous system tumours can mimic the common pregnancy complaint of nausea and vomiting. Although rare in pregnancy, they can adversely affect maternal and fetal survival if untreated. Clinicians should exclude other pathology when the onset of nausea and vomiting is after the first trimester.

1. Introduction

Nausea and vomiting are commonly experienced during pregnancy, affecting 70%–80% of all pregnant women [1]. Although most women with nausea and vomiting during pregnancy have symptoms limited to the first trimester, a small percentage experience a prolonged course until delivery. Women with severe nausea and vomiting during pregnancy may be considered to have hyperemesis gravidarum (HG). However, when persistent symptoms of hyperemesis with electrolyte imbalance are encountered, further work-up is mandated.

Solitary fibrous tumour/haemangiopericytoma (SFT-HPC) is a rare and aggressive type of soft-tissue sarcoma that arises from mesenchymal fibroblasts and involves mostly the musculoskeletal system. Its presentation in the central nervous system (CNS) is very rare, accounting for less than 1% of all intracranial tumours and 2–4% of meningeal tumours [2]. HPC has a slight male predominance and presents within the age range of 38–42 years [3]. Primary tumours are rarely diagnosed during pregnancy and central nervous system (CNS) tumours have no obvious clinical characteristics. Symptoms relate to intracranial hypertension and the space-occupying effects of the tumour. Supratentorial tumours are characterized by headache, and epileptic seizures can present in some patients. Posterior cranial fossa tumours are often characterized by ataxia [4]. Non-specific symptoms may lead to delays in diagnosis.

Abbreviations: SFT-HPC, Solitary fibrous tumour/hemangiopericytoma; WHO, World Health Organization; CNS, Central nervous system; HG, hyperemesis gravidarum; MRI, magnetic resonance imaging; HCG, human chorionic gonadotrophin; ALT, alanine aminotransferase; AST, aspartate aminotransferase; TBIL, total bilirubin; BC, conjugated bilirubin; PET, positron emission tomography; CT, computed tomography; PABC, pregnancy-associated breast cancer; VEGF, Vascular endothelial growth factor; PLGF, placental growth factor; CD34, Cell differentiation factor 34; STAT6, signal transducer and activator of transcription 6; S-100, soluble protein-100; EMA, epithelial membrane antigen.

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We report a case of HPC diagnosed at 34 weeks of pregnancy. The patient had been treated for nausea and vomiting for more than three months, and these symptoms progressively deteriorated. Finally, SFT-HPC was diagnosed by cranial MRI and confirmed by postoperative pathology. Although the incidence of an intracranial tumour in pregnancy is very low, once it occurs, it poses a serious threat to the lives of mothers and babies. Clinicians need to investigate and exclude pathology when the onset of nausea and vomiting is after the first trimester.

2. Case Presentation

A 26-year-old woman (G_2P_1) with an intrauterine pregnancy at 34^{+4} weeks presented with repeated nausea and vomiting for more than three months that had worsened the previous day. She had no significant personal or family medical history. During the first trimester of pregnancy, vomiting and nausea were not problematic. She developed severe nausea and vomiting at about 20 weeks of pregnancy without any obvious precipitating factors. She was hospitalized and treated with intravenous fluids, including dextrose and antiemetics, and discharged after the symptoms improved. During hospitalization, the results for her liver function test were normal. At about 25 weeks of pregnancy, occasional nausea and vomiting occurred, but there was no skin itching, diarrhoea, abdominal pain, or other discomfort. She visited the hospital again and underwent a blood test. The liver function results were as follows: alanine aminotransferase (ALT), 64 U/L; aspartate aminotransferase (AST), 57 U/L; and Hepatitis D Virus (HDV) IgM antibody, (+). Other hepatitis virus tests were normal. Medical treatment did not relieve her symptoms. Hence, she visited another hospital and underwent another blood test. The liver function results were as follows: ALT, 87 U/L; AST, 77 U/L; and HDV IgM antibody, (−). She was discharged home. At home, she experienced occasional nausea and vomiting and sometimes dizziness. At 33 weeks, the symptoms of nausea and vomiting worsened and were accompanied by limb weakness. On admission to a different hospital, the liver function results were as follows: ALT, 210 U/L; and AST, 104 U/L. During her stay in the hospital, intravenous nutritional support and antiemetic therapy were given with glycyrrhizin to improve liver function. After one week of treatment, her liver function test results were as follows: ALT, 447 U/L; and AST, 228 U/L. Her routine urine test results were as follows: urinary protein, 3+; and ketone body, 1 + .

She was therefore admitted for specialist care at a university hospital. She felt that the nausea and vomiting had worsened. Furthermore, she was unable to drink water and had mild headache and limb weakness. Her temperature was 36.2 °C, respiratory rate 19 breaths/min, heart rate 68 beats/min, and blood pressure 100/65 mmHg. Admission results were electrolytes: Na+, 134 mmol/L; HCO_3^-, 16.5 mmol/L; and glucose, 2.90 mmol/L; liver function: total bilirubin (TBIL), 62.5 μmol/L; conjugated bilirubin (BC), 11.3 μmol/L; ALT, 568 U/L; and AST, 352 U/L; and routine urine: weak positive protein; ketone body, 3+; and rapid blood ammonia, 55.0 μmol/L. Routine blood tests, coagulation function and hepatitis transmission were normal. HBsAg, HAV Ab IgM and HCV Ab IgM were negative. Fetal and liver ultrasound scans revealed no obvious abnormalities. Human cytomegalovirus DNA, EB virus DNA, hepatitis A virus IgM antibody and hepatitis E virus IgM antibody levels were also normal. Considering that the patient had persistent nausea and vomiting, along with slight headache, a neurological examination was performed. Ocular examination revealed gaze-evoked nystagmus. The bilateral nasolabial sulcus was symmetrical, tongue extension was slightly right, muscle strength and muscle tension of the limbs were normal, and bilateral pathological signs were negative. The neck was slightly resistant, and the Kernig sign and Brudzinski sign were negative. Hence, it was determined that the cause of the severe vomiting and nausea during pregnancy was intracranial venous sinus thrombosis. She underwent MRI, which showed a mass in the right tentorial area and supratentorial space (59.5 × 48.9 × 86.4 mm) with suspected solitary fibroma or perivascular cell tumour. The upper sagittal sinus, straight sinus, sinus confluence and right transverse sinus were locally invaded, while the left transverse sinus was locally displaced. Supratentorial hydrocephalus and brain parenchyma swelling were also found (Fig. 1). Considering that the patient had a brain hernia and was 34^{+5} weeks pregnant, a decision was made to undertake caesarean section and brain tumour resection under general anaesthesia. A live female baby was delivered. The neonate's Apgar score was 9 points at 1 min and 10 points at 5 min. The birth weight was 2.05 kg. The baby was transferred to the neonatal intensive care unit (NICU) due to premature delivery. After the neonate was delivered, brain tumour resection was started. Surgical findings showed a 6 × 5 × 8 cm well-vascularized tumour originating from the cerebellar hemisphere. Microscopic examination of the resected tumour showed densely and irregularly arranged cells, with a polygonal shape. Cell differentiation factor 34 (CD34) signal transducer and activator of transcription 6 (STAT6) and vimentin were positive on immunohistochemistry, while soluble protein-100 (S-100) and epithelial membrane antigen (EMA) were negative. The postoperative pathological diagnosis suggested SFT-HPC (World Health Organization [WHO] grade III, Fig. 2). On the fifth day after the operation, her liver function test results were as follows: ALT, 142 U/; and AST, 28 U/L.

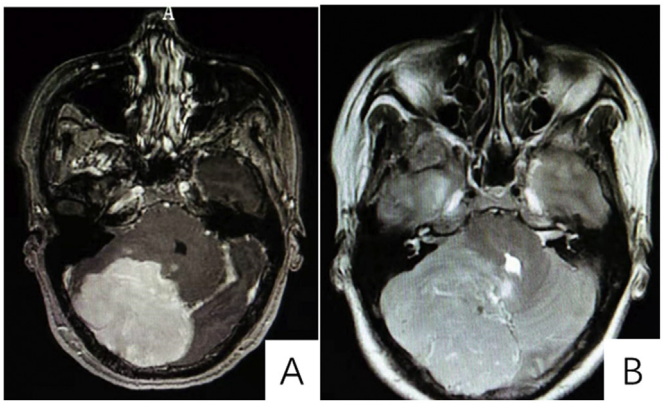

Fig. 1. T1- and T2-weighted brain MRI scans show a voluminous extra-axial mass in the right tentorial and supratentorial spaces.

After surgery, she underwent fractionated external radiotherapy with a cumulative dose of 50 Gy. Postoperatively, her nausea and vomiting substantially improved and were fully resolved at follow-up. No evidence of recurrence or metastasis was found on the 6-month follow-up scans. Fig. 3 presents the patient's follow-up brain positron emission tomography computed tomography (PET-CT) scan.

3. Discussion

For most of her hospitalizations, the clinicians mistakenly believed that the patient's symptoms and abnormal laboratory findings were pregnancy-related, even though they had started after the first trimester.

SFT-HPC is a highly vascularized mesenchymal tumour that accounts for less than 1% of all primary CNS tumours [5]. Endocrinological alterations during pregnancy are very complex and include various placental factors, such as human chorionic gonadotropin, placental growth hormone, human placental lactogen, and different cytokines. A previous study revealed that elevated gestational hormones during pregnancy might lead to the poor prognosis of pregnancy-associated breast cancer (PABC) [6]. Angiogenesis is the process by which new vessels are sprouted from pre-existing vessels and plays a pivotal role in the development, growth and metastasis of various types of tumours, including intracranial tumours [7]. Vascular endothelial growth factor (VEGF) signalling is the best-characterized pathway involved in tumour

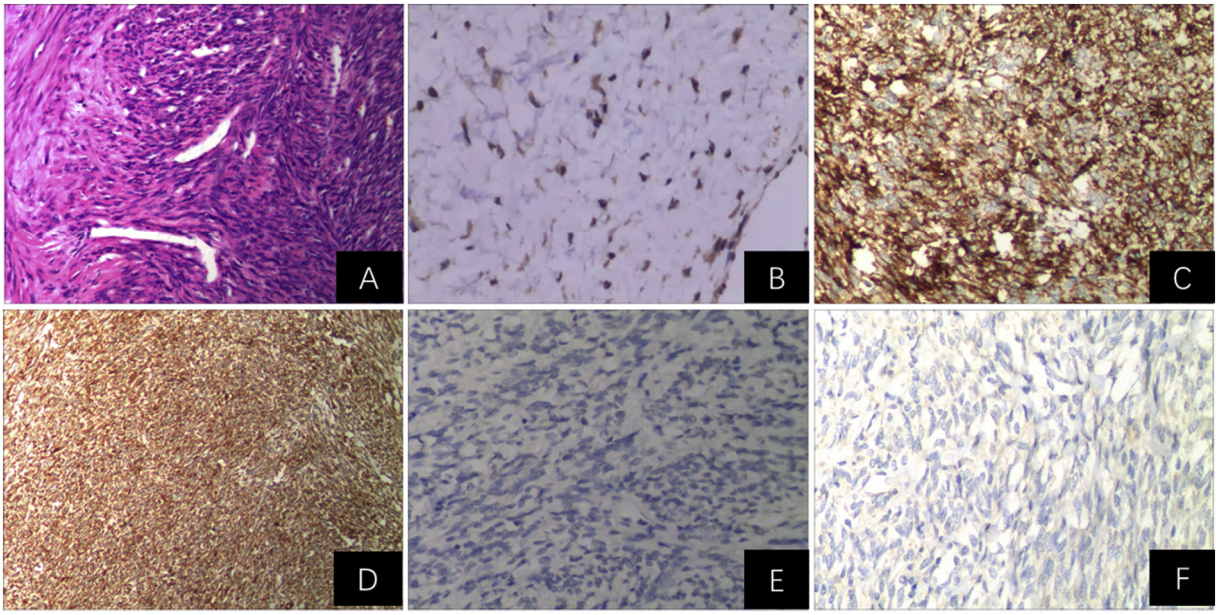

Fig. 2. Haematoxylin and eosin (H&E) staining (original magnification 20×) reveals a highly cellular tumour with a typical "staghorn" vascular channel and the proliferation of oval- to spindle-shaped cells around the vessels, revealing brisk mitotic activity (A). Neoplastic cells are immunoreactive for STAT6(original magnification 20×) (B). Neoplastic cells are diffusely immunoreactive for CD34 (original magnification 20×) (C). Neoplastic cells are diffusely immunoreactive for vimentin (original magnification 20×) (D). EMA negativity in tumour cells (E). T S-100 negativity in tumour cells (F).

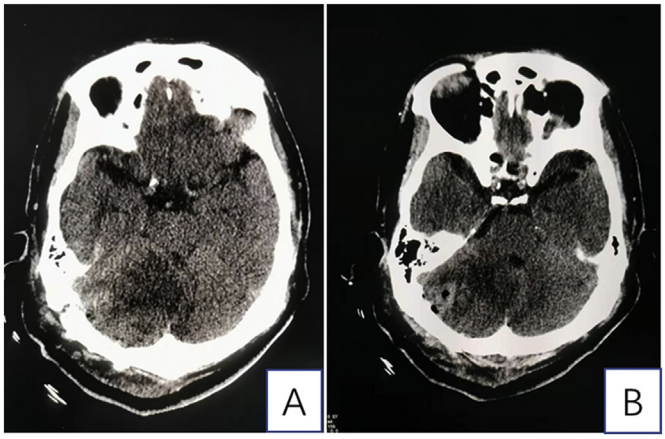

Fig. 3. Postoperative PET-CT scan demonstrates gross total resection of the haemangiopericytoma in the right cerebellar hemisphere.

angiogenesis. The related placental growth factor (PLGF) is produced by syncytiotrophoblasts and can be detected in the mother at 5–6 weeks of gestation. Its secretion increases as pregnancy progresses, peaks at 34–36 weeks of gestation and is maintained until delivery. Furthermore, PLGF is highly expressed in the placenta and controls angiogenesis. VEGF has two endothelial cell-specific tyrosine kinase receptors: VEGFR-1 and VEGFR-2. PlGF potentiates the mitogenic activity of low concentrations of the VEGFR-1 receptor but not VEGFR-2 [8]. Furthermore, PLGF is expressed in renal cell carcinoma as well as in human colon and mammary tumour cell lines. A previous study demonstrated PLGF upregulation in one anaplastic astrocytoma and two meningiomas [9]. Another study [10] revealed the presence of VEGFR-1 and VEGFR-2 in both endothelial cells and stromal cells in this tumour. An analysis of cell lines derived from a human SFT-HPC also revealed the co-expression of VEGF and PlGF. We have therefore hypothesized that pregnancy hormones might have contributed to tumour growth in this case.

There are many causes of nausea and vomiting during pregnancy, such as hyperemesis, acute gastroenteritis, cholecystitis, biliary ascaris, pancreatitis and viral hepatitis. CNS tumours can cause nausea and vomiting too. If severe nausea and vomiting present for the first time after the first trimester, other causes should be considered, including raised intracranial pressure [11]. In this case, the symptoms of nausea and vomiting were caused by the increased intracranial pressure, and abnormal liver function was due to long-term nausea and vomiting.

We report this case to remind clinicians that nausea and vomiting presenting for the first time after the first trimester should not be simply attributed to pregnancy and other causes should be excluded.

Contributors

Ying Ju collected, analyzed and interpreted the data. and drafted the manuscript.

Xu Liu collected data and drafted the manuscript.

Huiling Wang analyzed and interpreted the data, and contributed to the design of the study and the revision of the manuscript.

Jun Yang contributed to the design of the study and the revision of the manuscript.

All authors read and approved the final version.

Conflict of Interest

The authors declare that they have no conflict of interest regarding the publication of this case report.

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Patient Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Provenance and Peer Review

This case report was peer reviewed.

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