

Ectopic pregnancy in the liver incidentally diagnosed by imaging: A case report

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Abstract. The present report describes the case of a 31-year-old woman diagnosed with an ectopic pregnancy in the liver. The patient presented with amenorrhea for 40 days and abdominal distention for 27 days. A liver mass had been detected 6 days prior to presentation. Using ultrasound (US), a hyperechoic mass with a fluid sonolucent area was detected in the right hepatic lobe. Examination by computed tomography (CT) revealed the presence of a mass in the right hepatic lobe with a slightly low-density peripheral region and an oval central portion of lower density in the plain scan; the enhanced scan revealed a significantly enhanced peripheral region and a non-enhanced central portion. ¹⁸F-fluodeoxyglucose (FDG) positron emission tomography (PET)-CT showed a mass in the right hepatic lobe with an increased intake of FDG in the peripheral region (maximum standard uptake value, 5.7) and a non-increased intake of FDG in the central portion. The patient was then subjected to hysteroscopy and laparoscopy. Histopathologically, the mass was an ectopic pregnancy. The patient recovered following the surgery. In conclusion, a timely diagnosis of ectopic pregnancy was made for a 31-year-old woman with an ectopic pregnancy in the liver on the basis of US, CT and PET-CT imaging results, which enabled surgery to be undertaken prior to any serious consequences. These observations may be helpful for the diagnosis of similar cases in the future.

Introduction

Ectopic pregnancy is the implantation of a fertilized egg outside the uterine cavity (1). It is a complication of the first trimester of pregnancy that arises in 1.3-2.4% of all pregnancies (1). The most common site of ectopic pregnancy is the

fallopian tube (97% of ectopic pregnancies) (2), and the second most common is the ovary and broad ligament (3). Ectopic pregnancy may also, although rarely, occur in the liver (4), spleen (5), omentum (6), peritoneum (7), terminal ileum and colon (8).

Once an ectopic pregnancy ruptures, bleeding and other serious complications such as shock and even death (9) often ensue. If the condition is not diagnosed and treated in a timely manner, it can be life-threatening. As a common gynecological emergency, ectopic pregnancy is a focus of considerable attention by clinicians. The diagnostic means for ectopic pregnancy include clinical examination, imaging examination [for example, ultrasonography, computed tomography (CT), magnetic resonance imaging (MRI)], blood human chorionic gonadotropin (hCG) determination, blood progesterone assay and diagnostic curettage, which are often combined in clinical use (1,2).

The choices of treatment for ectopic pregnancy are expectant treatment (close monitoring) (10), drug therapy (11) and surgery (1). Interventional treatment is another alternative for ectopic uterine and extra-uterine pregnancies, although non-tubal ectopic pregnancy, particularly that which is cervical, abdominal, ovarian or in a cesarean scar, represents a major clinical challenge (12).

The present case report describes the case of a 31-year-old woman with an ectopic pregnancy in the liver and her US, CT and positron emission tomography (PET)-CT imaging results, from which a timely diagnosis of ectopic pregnancy was made. The study participant provided informed written consent prior to the study. The study was reviewed and approved by the Institutional Review Board of Second Xiangya Hospital, Central South University (Changsha, China).

Case report

A 31-year-old woman was admitted to the Second Xiangya Hospital, Central South University in December 2015 with the complaint of amenorrhea for 40 days, abdominal distention for 27 days. She was admitted to a local hospital 6 days earlier and a CT scan found a liver mass.

The patient had experienced one cesarean delivery in 2008, and had undergone curettage because of embryo damage in 2009, where histopathological analysis revealed denatured villus tissue and decidual tissue. A contraceptive ring had been in place in the uterine cavity for 6 years.

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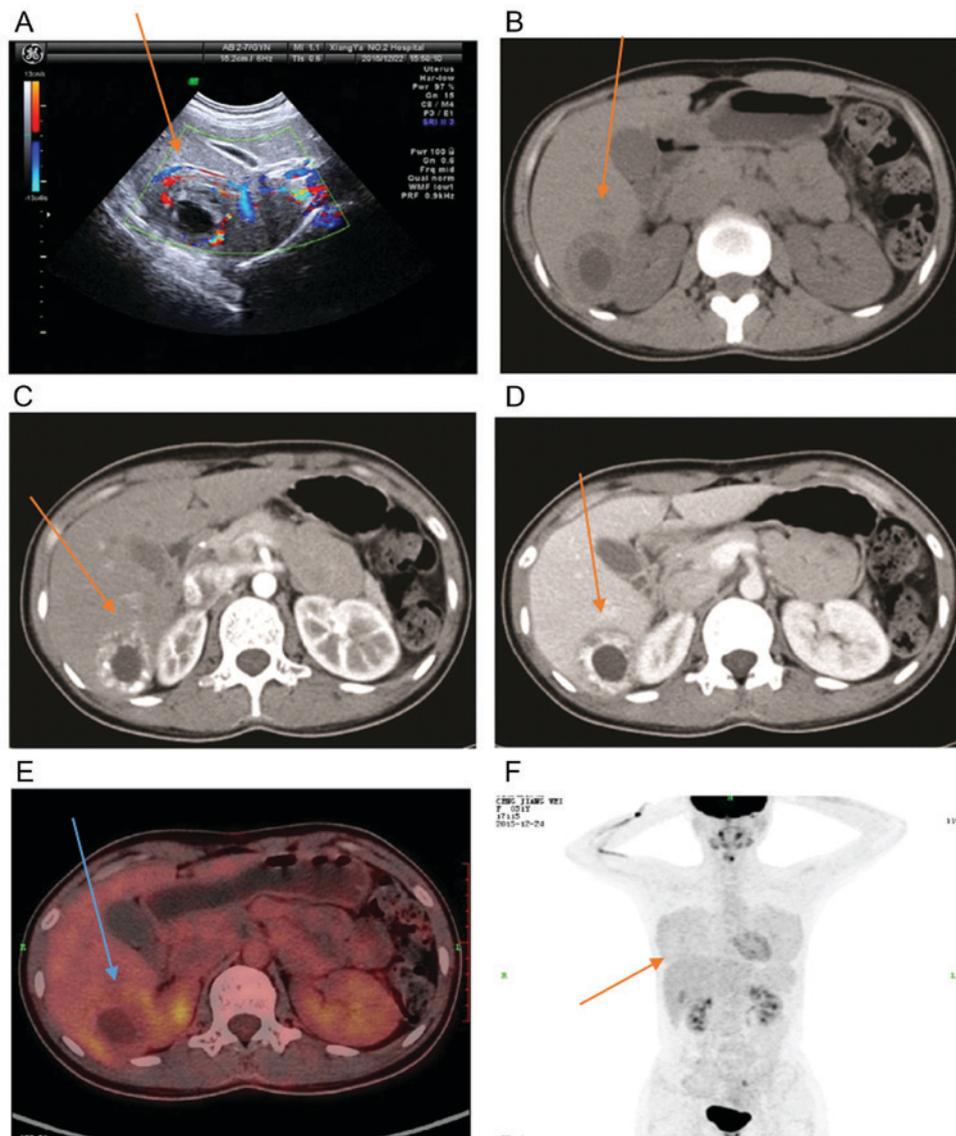


Figure 1. Imaging results for the patient with ectopic pregnancy in the liver (A) Ultrasound image. (B) CT plain scan. (C) Arterial and (D) venous phases in the enhanced CT scan. (E) Positron emission tomography-CT. (F) Positron emission tomography-CT maximum intensity projection image. Orange arrows indicate the location of the ectopic pregnancy mass. CT, computed tomography.

The patient's blood pressure was 117/68 mmHg and her heart rate was 93 beats/min. In addition, the hemoglobin concentration was 109 g/l (normal level >120 g/l) and the serum hCG level was 49,198 U/l (normally level <2.7 mIU/ml) (13). Gynecological examination revealed no evident abnormalities.

An ultrasound (US) examination of the abdomen revealed no obvious gestational sac in the uterine cavity, but detected a 5.4x4.6-cm hyperechoic mass in the right hepatic lobe and a fluid sonolucant area of 2.7x2.1 cm within the mass. The cystic sonolucant area within the fluid sonolucant area (Fig. 1A) was suggestive of an ectopic pregnancy. The intrauterine contraceptive ring was observed to be in a normal position.

CT scanning revealed a mass in the right hepatic lobe with a slightly low-density peripheral portion and oval lower-density central portion (Fig. 1B) in the plain scan, a peripheral portion with a significantly increased density in the arterial phase of the enhanced scan (Fig. 1C), a peripheral portion with a slightly increased density compared with that of the liver parenchyma in the venous phase of the enhanced scan (Fig. 1D), and a

non-enhanced lower-density central portion in the enhanced scan.

¹⁸F-FDG PET-CT revealed a mass in the right hepatic lobe with envelope of 4.2x4.8 cm and a cystic hypo-dense lesion of 1.9x2.7 cm within it. The intake of FDG was not increased in the cystic areas but that in the residual portion was increased; the maximum standard uptake value (SUV_{max}) was 5.7 (Fig. 1E and F).

After 3 days of preoperative preparation, hysteroscopy and laparoscopy were performed. Retro-positioning of the uterus was observed with an increased size, as would be expected for a pregnancy of ≥ 40 days. The bilateral fallopian tubes and ovaries appeared normal, but there were some adhesions between the posterior uterine wall and the recto-uterine pouch and greater omentum. The adhesions were surgically separated. A T-type contraceptive ring placed with left part deletion in the uterine cavity was detected. There were some decidual changes of the endometrium, but no villus tissue in the uterine cavity. A curettage was undertaken with a curette

until the suction tube sensed some roughness, and the curettage was then stopped. The right section of the liver was dissected by hepatobiliary surgeons. There was a mass of 3.0x4.0 cm rich with blood extending out of the liver surface. Histopathologically, the mass was found to be an ectopic pregnancy. The patient was followed up for 3 months and recovered post-surgery without any more treatments.

Discussion

Ectopic pregnancies typically implant on the peritoneal surface following the partial disruption of the initial site of implantation in the fallopian tube. The pelvic cavity is the most common site, but ectopic pregnancies have been reported to occur in various sites within the peritoneal cavity (14). Primary hepatic pregnancy is an extremely rare condition with an incidence rate of 1:15,000 per inner uterus pregnancy (15). Over the past 50 years, only 21 cases have been reported in the English language medical literature, among which only 29% progressed beyond the first trimester (4,16-36).

Ectopic pregnancy is one of the common acute abdominal conditions in clinical obstetrics and gynecology (2% of pregnancies), and comprises implantation anywhere outside the uterine cavity, including tubal pregnancy, ovarian pregnancy and abdominal cavity pregnancy (for example, mesenteric pregnancy, hepatic pregnancy, broad ligament pregnancy, cervical pregnancy, uterine rudimentary horn pregnancy and cesarean scar pregnancy); among these, the most common is tubal pregnancy, accounting for ~97% of cases, while the incidence of abdominal pregnancy is <1% (2,37).

Ectopic pregnancy in the abdominal cavity is often misdiagnosed because of its low incidence, specific location and atypical clinical manifestations and signs. Worley *et al* reported that only 6 of 10 women with advanced extrauterine pregnancies were discovered preoperatively, and hemorrhage was common with 9 of 10 patients requiring blood transfusions (7). Hepatic pregnancy is a rare type of abdominal cavity pregnancy. The majority of the previously reported cases of hepatic pregnancy involved liver rupture and bleeding (38) and the consequences were very dangerous. Hepatic pregnancy is frequently not diagnosed in early pregnancy and so the best treatment period is missed; the majority of patients are admitted for surgery following liver rupture. The patient in the present case soon recovered because of early diagnosis and prompt treatment.

Abdominal pregnancies usually present with acute hemoperitoneum (39) and the pre-operative diagnosis is extremely difficult. Imaging plays an important role in the diagnosis of ectopic pregnancy, particularly that of hepatic pregnancy. Although US is the primary modality used in the diagnosis of ectopic pregnancy, various forms of this condition and their complications may occasionally be further evaluated with CT or MRI. After the patient in the present case study was admitted to hospital, US, plain and enhanced CT, and PET-CT were carried out. The examinations using the three different types of imaging all prompted the diagnosis of liver ectopic pregnancy. The US scan revealed a hyper-echoic mass in the right hepatic lobe with a cystic sonolucent area within a fluid sonolucent area. In a previous case of ectopic pregnancy in the liver, Wang *et al* reported that US revealed only a small

amount of effusion in the pelvic cavity (40). Jiang *et al* used a three-dimensional high-definition live rendering image to diagnosis interstitial ectopic pregnancy (41). In the present case, CT of the patient revealed a mass in the right hepatic lobe with a slightly low-density peripheral region and oval central portion with lower density in the plain scan, and a significantly enhanced peripheral portion and non-enhanced center in the enhanced scan. Wang *et al* reported that CT plain scanning displayed a polygonal, moderate density shadow of the left liver lobe, while enhanced CT exhibited no signs of intensification (40). Kuai *et al* also reported that CT transverse imaging for a patient with ectopic liver pregnancy showed a mixed density lesion within the right liver lobe under the diaphragm (42). MRI is one of the modalities typically used in the diagnosis of ectopic pregnancy. Wang *et al* reported that on T1-weighted imaging (WI), the lesion appeared round with a low signal intensity, while on T2WI, the lesion exhibited a high signal; with enhanced MRI, the lesion exhibited irregular mild plaque-like intensification during the venous phase (40). The PET-CT appearance of hepatic pregnancy has rarely been reported before. The present study revealed a mass in the right hepatic lobe for which the peripheral portion had increased glucose metabolism (SUVmax, 5.7) while the central portion did not exhibit increased glucose metabolism. Familiarity with the typical and atypical US, CT, MRI and PET-CT appearances of various forms of ectopic pregnancy facilitates the prompt and accurate diagnosis and treatment of this condition (43).

The risk of ectopic pregnancy has been found to be associated with previous adnexal surgery [adjusted odds ratio (OR)=3.99, 95% confidence interval (CI): 2.40-6.63], uncertainty of previous pelvic inflammatory disease (adjusted OR=6.89, 95% CI: 3.29-14.41), and positive CT IgG serology (adjusted OR=5.26, 95% CI: 3.94-7.04); a history of infertility including tubal infertility (adjusted OR=3.62, 95% CI: 1.52-8.63), non-tubal infertility (adjusted OR=3.34, 95% CI: 1.60-6.93) and *in vitro* fertilization treatment (adjusted OR=5.96, 95% CI: 1.68-21.21) correlated with the risk of ectopic pregnancy; and women who had previously used condoms were less likely to have an ectopic pregnancy during the current cycle (adjusted OR=0.27, 95% CI: 0.21-0.36) (44). The mechanism of hepatic pregnancy has not yet been clearly elucidated, but may be due to reverse tubal peristalsis causing the gestational sac to be delivered into the abdominal cavity where it plants into the upper surface of the liver through the clockwise peristalsis of the intestinal canal prior to being absorbed by the peritoneum (45). The liver has rich blood circulation, and the surface tension is not strong and is easily penetrated; thus, the early fetus grows normally, until mid-pregnancy, when liver rupture and bleeding may occur (4). Intrauterine devices (IUDs) are potentially an etiological factor. Børllum and Blom reported one case with primary hepatic pregnancy with a history of IUD use (14). The patient described in the present case report also had a history of IUD placement. Another possible cause of hepatic pregnancy has been suggested to be pelvic inflammatory disease, such as salpingitis, resulting in perihepatic adhesion (46).

Hepatic pregnancy is difficult to diagnose due to its particular location and the lack of specific clinical symptoms. The majority of cases are identified due to the bleeding caused by rupture of the liver, but by that time, it is difficult to save

the patient. The present case did not develop bleeding or other serious consequences due to the timely diagnosis and surgery achieved through the use of imaging data. It serves as a reminder to be vigilant for patients with rare ectopic pregnancy by conducting comprehensive examinations, in order to gain valuable time for the timely application of the appropriate treatment.

In conclusion, for women of childbearing age with amenorrhea and elevated β -hCG levels, for whom US or radiographic imaging show a mixed density mass in the liver edge, but no gestational sac can be found in the uterus or by bilateral salpingo-oophorectomy, the possibility of hepatic ectopic pregnancy must be considered.

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