Ectopic Pregnancy Implanted in the Diaphragm: A Case Report and Literature Review

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Abstract: Abdominal pregnancy is a rare occurrence and the location is hardly seen in the upper abdomen. We described a case of a 34-year-old female presenting with upper abdominal pain and reflex sensitivity in the right shoulder. Ultrasound examination revealed a mass under the diaphragm which was suspected to be a liver abscess. The result of an enhanced CT scan was suggestive of an ectopic pregnancy between the diaphragm and right liver lobe. However, Laparoscopic surgery was performed and the histopathological examination confirmed the diagnosis of diaphragmatic pregnancy. By describing this case, we aim to share the value of patients with consistent upper abdominal pain and elevated serum hCG level, a thorough examination of the upper abdomen and pelvic with US as well as CT or MRI is crucial for timely diagnosis.

Key words: Ectopic pregnancy; Diaphragmatic pregnancy; Ultrasound

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Abdominal ectopic pregnancy is a rare variant of ectopic pregnancy and accounts for appropriately 1% of all ectopic pregnancies [1-3]. It has been defined as the implantation of a fertilized egg in the peritoneal cavity outside the uterus, ovary and intraligament [4]. Higher morbidity has been reported to be associated with abdominal pregnancy owing to its atypical presentation [5]. The location of abdominal ectopic pregnancy can occur anywhere in the abdomen [6]. Several hepatic pregnancies have been reported previously but few studies revealed cases of diaphragmatic pregnancy. Here we report a rare case of ectopic pregnancy implanted in the diaphragm and highlight the difficult diagnostic course via US combined with enhanced CT scan.

Case Report

A 34-year-old Chinese woman was admitted to our hospital's emergency department with consistent

severe pain in the right upper quadrant of the abdomen and right shoulder pain radiation for 3 days. The pain was exacerbated with deep inspiration and right arm recumbent/reclining. She had undergone one natural delivery (in 2009) and had not used any contraceptive method afterward. On admission, she claimed to have a regular menstrual period and her last menstruation was fifteen days ago. On examination, her pulse was 78 beats/minute and blood pressure was 135/76 mmHg. Her physical examination was normal except for the right upper and lower quadrant tenderness. A mixed echogenic mass of 49 mm × 22 mm in size with a regular margin was observed attached to the superior surface of the right liver lobe by ultrasound in the emergency room (Fig. 1). Her white blood cell count was $13.1 \times 10^9/L$. Considering the result of higher WBC and no clear history of menopause, the sonographer suggested a hepatic abscess.

Then a urinary pregnancy test was performed and the result was positive. Her serum hCG was elevated at 769.15 mIU/mL. On vaginal examination, there was

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Figure 1 Ultrasonic finding of a mixed echogenic mass of 49 mm × 22 mm in size attached to the superior surface of the right liver lobe. CDFI: no obvious color Doppler signal was found in the lesion.

no vaginal bleeding. Transvaginal and transabdominal ultrasound examination showed a normal-sized uterus with an endometrial thickness of 6 mm and normal right lateral adnexa. No obvious gestational sac was detected in the uterine cavity. A moderate amount of peritoneal fluid and a cystic mass with a maximal diameter of 48 mm in the left lateral adnexa were observed. For further examination, a computed tomography scan of the abdomen and pelvis was performed. A mixed hyperdense mass of 70 × 21 × 59 mm with a mean attenuation value of 52 Hu was obvious in the space between the right liver and diaphragm. On enhanced CT, the lesion presented no enhancement but a visible vessel (Fig. 2).

Because of abdominal pain and a report of fluid in the pelvic, exploration with a laparoscope was performed. Exploration with a laparoscope revealed

a mass of 60 × 40 × 30 mm covered with coagulated blood which was adhered to the diaphragm (Fig. 3). The mass was carefully grasped with lockable laparoscopic forceps. Blood leakage from the fundus of the mass was controlled with bipolar electrocoagulation and hemostatic gauze. The mass was removed piecemeal and completely dissected from the diaphragm. Hemoperitoneum in a moderate amount (of approximately 1 000 mL of blood) in the pelvic was seen and drained. The left ovarian cyst was excised and removed. The total blood loss was approximately 20 mL and no blood transfusion was required. The postoperative course was stable and serum hCG level declined to a normal level. Histopathological examination confirmed the diagnosis of diaphragmatic pregnancy (human villous trophoblasts were seen within the mass).

Figure 2 Enhanced computed tomography transverse image demonstrating a mixed hyperdense dense mass of 70 × 21 × 59 mm and visible vessel within it.

Figure 3 A mass on the surface of diaphragm and a bipolar electrocoagulation was placed to achieve hemostasis.

Discussion

Ectopic pregnancy is a common diagnosis with a high risk of hemorrhage and now accounts for 2% of all pregnancies. The implantation location of fertilized

ovum varies and has been reported to occur in various sites in the abdomen including fallopian tube, ovary and abdominal cavity [7]. Most of the ectopic pregnancies (97%) are implanted within the fallopian tube and only less than 1.4% ectopic pregnancies are implanted

within the abdominal cavity [3]. The etiology and pathogenesis of implantation in the abdominal cavity remains controversial. It has been accepted generally that abdominal ectopic pregnancy can be classified into two categories: primary and secondary [3,4]. In most cases, a secondary ectopic pregnancy is related to tubal rupture, tubal abortion and uterine rupture [8]. While primary ectopic pregnancy must meet the criteria of Studdiford reporting in 1942 [4]: (1) normal fallopian tubes and ovaries with no evidence of recent trauma; (2) the absence of uteroplacental fistula; and (3) a pregnancy of fewer than 12 weeks' gestation with trophoblastic elements related exclusively to a peritoneal surface. In our case, laparoscopic examination demonstrated no abnormality in fallopian tubes or the uterus and no evidence of pregnancy outside the diaphragm. Therefore, the case we described may be concluded as a primary diaphragmatic pregnancy which is an exceptionally rare variant of abdominal pregnancy.

Ectopic pregnancy should be taken into consideration in all reproductive-age females with consistent abdominal pain. Being one of the acutest abdominal conditions in the emergency room, ectopic pregnancy can be life-threatening if not diagnosed and treated in time. Imaging demonstration is crucial for early diagnosis. Ectopic pregnancy within the abdominal cavity is often misdiagnosed as for its rarity, atypical clinical presentation and image manifestations. In this case, the transabdominal US revealed a mixed-echoic mass attached to the superior surface of the right liver lobe under the diaphragm. As for the patient's self-narration of having a fever and without a timely positive result of serum hCG as well as her higher WBC and no clear history of menopause. It was misdiagnosed as an abscess with a US scan at the first time. In previous cases of ectopic pregnancy in the liver, CAI et al reported that the US revealed a hyperechoic mass in the right hepatic lobe with a cystic sonolucent area [9]. Timely serum test for hCG is a very critically sensitive indicator to differentiate the abscess under the diaphragm and diaphragmatic pregnancy.

It is also easily misdiagnosed as hepatic pregnancy. Diaphragmatic pregnancy and hepatic ectopic pregnancy share similar ultrasonic features and locations. Relative motion with the liver can help differentiate whether the mass is from the liver or diaphragm. Since ectopic pregnancy can be implanted anywhere in the abdomen and various forms of complications may occur, the CT or MRI scan is essential for further evaluation. In this case, enhanced CT suggested a mixed hyperdense mass with an enhanced vessel in the space between the diaphragm

and right hepatic lobe. Kuai et al have reported a hepatic pregnancy with a CT scan showing a mixed dense lesion within the right liver lobe under the diaphragm [10]. Yael et al also reported that CT transverse imaging for a patient with splenic pregnancy demonstrated a heterogeneous hypervascular mass at the hilum of the spleen [11]. Therefore, ultrasound combined with a CT scan is valuable for the localization diagnosis of upper-abdominal ectopic pregnancy.

Conclusion

For patients of reproductive age with consistent upper abdominal pain and elevated serum hCG level, a thorough examination of the upper abdomen and pelvic with the US as well as CT or MRI is crucial for timely diagnosis of diaphragmatic pregnancy.

Conflict of Interest

The authors have no conflict of interest to declare.

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