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Ruptured ectopic pregnancy diagnosed with computed tomography

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Summary

Background:

The rupture of ectopic pregnancy (EP) still remains the primary and direct cause of death in the first trimester of pregnancy. Ultrasonography is known to be a modality of choice in EP diagnostics. We found a severe discrepancy between the frequency of ectopic pregnancies (EP) and the number of available computed tomography (CT) examinations.

Case Report:

A 29-year-old woman was admitted to the emergency department with a history of abdominal pain, nausea, vomiting and collapse. Sonographic findings of a suspected EP were unclear. Moreover, not all features of intrauterine pregnancy were present. Due to the patient's life-threatening condition, an emergency multi-slice CT with MPR and VRT reconstructions was performed, revealing symptoms of a ruptured EP. In the right adnexal area, a well-vascularized, solid-cystic abnormal mass lesion was found. Intraperitoneal hemorrhage was confirmed intraoperatively, and the right fallopian tube with a tubal EP was resected. In the surgery *in situ*, as well as in the pathological examination of the tumor mass, a human embryo of approximately 1.5 cm in length (beginning of the 8th week of gestation) was found.

Conclusions:

Although ultrasonography still remains the first-line imaging examination in EP diagnostics, sometimes the findings of suspected EPs are unclear and not sufficient. The rupture of EP, with serious bleeding and symptoms of shock, may require an emergent pelvic and abdominal CT inspection. A clear correlation was found between the macroscopic CT images and the intraoperatively sampled material.

Key words:

ectopic pregnancy • hemorrhage • computed tomography

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Background

Although the ectopic pregnancy (EP) has been known since the 11th century, it still remains the primary and direct cause of death in the first trimester of pregnancy. Moreover, undetected and untreated, it can lead to massive hemorrhages and infertility [1,2]. Nowadays, the incidence of EP is still close to 2% of all pregnancies, with 95–98% of EPs located in the uterine tubes, and 2–5% situated interstitially [1–4]. Standard textbooks on obstetrics, gynecology,

as well as diagnostic and imaging radiology describe the EP as an implantation of a fertilized ovum outside the uterine cavity and endometrium, without any findings of intrauterine pregnancy on sonography [2,5].

Even now, the rapid and accurate diagnostic procedures, such as the routinely used high-resolution transvaginal sonography, in conjunction with blood tests for β -hCG (β -subunit of human chorionic gonadotropin), are not always sufficient and satisfactory for a correct diagnosis.

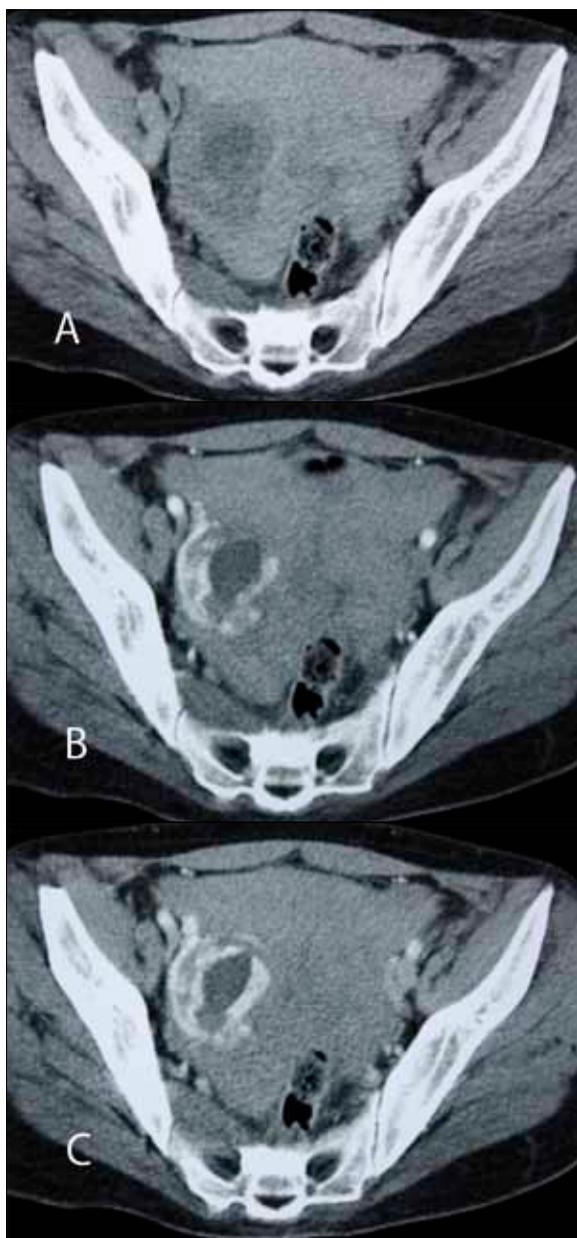


Figure 1. (A) Non-contrast axial CT scan with hemoperitoneum. Axial CT scan after i.v. contrast administration revealing a pathological solid-cystic mass with a strong, peripheral enhancement in arterial (B) and venous (C) phases.

However, sometimes, in emergency situations, the role of CT imaging of the abdominal and pelvic cavity has been evaluated: it remains the first-line treatment in such situations, while other examinations are not diagnostic [2,3,6].

The aim of the study was to highlight the role of CT in emergency radiology as a useful tool in the diagnostics and management of acute female diseases, rather than as a differentiation device in rare EPs.

Case Report

A 29-year-old woman was admitted to the emergency department of our hospital, with an acute, sharp abdominal



Figure 2. A coronal multiplanar reconstruction (MPR) showing a solid-cystic abnormal mass in the right adnexal area.

and pelvic pain. She had a one-week history of symptoms like nausea, sickness and vomiting with paleness, weakness and fainting. All the presenting clinical signs and symptoms intensified on the day of her admission to our hospital. During a physical examination, hypovolemic shock symptoms were found, together with clear peritoneal signs. Laboratory tests showed anemia (RBC – 1.99 mln/mm³, Hb – 6.8 g/dL, Ht – 25.6%). What is more, the pregnancy test was positive. The woman used to be a drug addict. She had an abortion and a history of the right ovary cyst.

Ultrasonography of the abdominal and pelvic cavity was performed. The sonographic findings of suspected EP were unclear and inhomogeneous. Moreover, not all features of intrauterine pregnancy were present.

All the above mentioned symptoms appeared in a life-threatening emergency. The CT examination was immediately performed, with a 40-detector row scanner, before the development of critical signs and symptoms. The triphasic contrast-enhanced CT scans of the abdominal and pelvic cavity were obtained from the area ranging from the diaphragm to the pubic symphysis.

CT examinations showed the following characteristic radiological features:

- A massive intraperitoneal hemorrhage (Figure 1A),
- In the right adnexal area: a solid-cystic abnormal mass lesion measuring 45×40 mm, well vascularized, with a strong and early peripheral contrast enhancement (Figure 1B,C, Figure 2),
- Active extravasation of contrast-enhanced blood was not visible.

After CT examinations, EP rupture was suspected.

During the surgery *in situ*, the peritoneal hemorrhage was clearly seen. The amount of the extravasated blood and blood clots was estimated for approximately 1500 ml. The right uterine tube got enlarged (a tumor similar in its appearance to the EP). The uterine tube ruptured at the length of about 4 cm. The excision of the right fallopian tube together with the tubal EP was undertaken. The *in situ* surgery, as well as the pathological examinations of the tumor mass found a human embryo of approximately

1.5 cm in length (beginning of the 8th week of gestation). A clear correlation between the macroscopic CT images and the intraoperatively sampled material was observed.

Discussion

The EP, being the most common cause of abdominal or pelvic pain in the whole group of women with childbearing potential (usually between 15 and 44 years of age), should always be considered [5]. The risk factors of EP are as follows: tubal surgery, treatment of infertility, use of intra-uterine contraceptive device for longer than two years, history of inflammation (Chlamydia), pyosalpinx, tubo-ovarian abscess, adnexal cyst, ovarian torsion, previous tubal pregnancy or tubal defects [1,3,7].

The key to an adequate diagnosis of EP is the presence of abdominal pain, bleeding (aberrant menses), and adnexal mass. All above mentioned symptoms are known as a classic EP triad, particularly in ruptured EP [2,6]. Typically, EP should be differentiated from a growing or ruptured hemorrhagic corpus luteum, ruptured ovarian cyst and ovarian torsion [3,6]. In these cases, the transabdominal or the transvaginal ultrasonography is the imaging method of choice. The uterus and the adnexal regions (especially the ovaries) should be thoroughly inspected. The sonographic diagnosis of EP is definitive only when a living embryo is detected in extra-uterine regions. However, ultrasonographic signs, like tubal or extraovarian mass or free fluid, usually are not specific for EP. Another sonographic finding differentiating a normal early pregnancy, from a decidual cyst, or the EP, is a small fluid collection surrounded by an echogenic ring [2,5,7].

Since the uterine tube is the most common location of EP (95–98%), a further sonographic finding differentiating it from an extraovarian adnexal mass, a yolk sac, or an embryo, is the tubal ring. The tubal ring represents a concentric trophoblastic tissue surrounding the chorionic sac of EP [1,2,5–7]. Moreover, the presence of the “ring of fire” on color Doppler imaging, reported in 85–93% of cases as a hypervascular ring of increased flow in the trophoblastic tissue around a mass (especially surrounded by bowel loops), may help differentiate a suspected EP from a corpus luteum cyst. However, both are very well vascularized and both might reveal low-impedance high diastolic flow, similarly to a normal pregnancy [1,5,7].

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The main cause of EP rupture is an invasive growth of trophoblast into the wall of the uterine tube, especially when it exceeds 3.5 cm in size. Other causes include: immune factors, abortion, age, etc. [4].

Sometimes, EP is misdiagnosed as: abdominal or pelvic inflammatory disease, like appendicitis, endometriosis, pyosalpinx, tubo-ovarian abscess, spontaneous abortion, or even ovarian vein thrombosis or diverticulitis [3,8].

Pregnant women generally do not undergo CT examination, due to radiation. Pregnancy should be ruled out in all young women complaining of the abdominal pain. CT findings of the ruptured EP are sporadic and extremely rare. The literature has reported on some isolated cases [8,9]. Usually, CT diagnosis is reported in the context of suspected appendicitis when the patient is extremely unstable. The CT scans clearly identified the site of bleeding and helped to differentiate and characterize other various causes of acute abdominal pain [8,9]. Sometimes, an MRI can be helpful as well. However, this is not a first-line examination. It is rather used for a better preoperative planning, or as a problem-solving tool in pregnant patients, or for imaging of fetal anatomy and pathology [10–12].

As in color Doppler ultrasound examination, the “ring of fire” (a strong and early trophoblastic reinforcement along the outer margin of the yolk sac after contrast medium injection) has also been reported on CTs. In case of a massive hemorrhage, an active extravasation of a contrasted blood may also be found on CTs [1,2].

Conclusions

In EP diagnostics, the clinical signs and symptoms, the level of β -HCG and ultrasonographic images are important and should be sufficient for a proper diagnosis. However, sometimes in emergency situations, all the above mentioned symptoms are not clear or obvious and do not suffice for a strong, correct diagnosis. The rupture of EP, with pain, bleeding and extremely unstable condition, is a potential reason for an emergent pelvic and abdominal CT examination. Knowing such a radiological sign as the “ring of fire” can sometimes lead to a proper diagnosis. What is more, the discrepancy between the incidence of EPs and the number of available CT scans is still significant.