Magnetic Resonance-Based Diagnosis of Ectopic Pregnancy: A Case Report

Diagnóstico de Gravidez Ectópica Baseado na Ressonância Magnética: Um Caso Clínico

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Abstract

Ectopic pregnancy is the leading cause of pregnancy-related death in the first trimester. Imaging findings play an important role in the diagnosis of this condition. The authors report a case of an ampullary tubal ectopic pregnancy in an asymptomatic patient that was suggested by magnetic resonance. A review of the role of imaging in ectopic pregnancy is given, with the advantages and disadvantages of the most useful modalities.

Resumo

A gravidez ectópica é a principal causa de morte no primeiro trimestre da gestação. A imagiologia desempenha um papel importante no diagnóstico desta condição. Os autores reportam um caso de uma gravidez ectópica tubária ampular, numa doente assintomática, cujo diagnóstico foi sugerido através de ressonância magnética. É ainda providenciada uma revisão do papel da imagiologia na gravidez ectópica, que inclui as vantagens e desvantagens das modalidades de imagem mais úteis.

Keywords: Magnetic Resonance Imaging; Pregnancy, Ectopic / diagnostic imaging

Palavras-chave: Gravidez Ectópica/diangóstico por imagem; Ressonância Magnética

Introduction

Ectopic pregnancy (EP) occurs when the developing blastocyst implants and matures outside the endometrial cavity. EP is the leading cause of pregnancy-related mortality in the first trimester,[1] with an estimated incidence of 11 per 1000 pregnancies.[2] This condition is subclassified according to the site of implantation, with the most common location being the ampullary segment of the fallopian tube.[2] Common risk factors include previous EP, previous tubal disease/surgery, history of pelvic inflammatory disease, infertility, intrauterine device use, advanced maternal age and smoking.[3]

The classic triad of signs and symptoms consists of pelvic pain, vaginal bleeding and a tender adnexal mass,[4] in an amenorrheic patient, but a plethora of other symptoms can occur, depending on the hemodynamic status.

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Classically, the diagnosis relies on a combination of clinical suspicion, increased serum human chorionic gonadotropin (β-HCG) levels and ultrasound (US) findings, more importantly the absence of endometrial cavity content, and specifically the depiction of a gestational sac, with or without a yolk sac/embryo, outside of the uterus.

Three therapeutic approaches are offered to patients depending on clinical, laboratory and imaging findings: medical treatment with methotrexate (MTX), surgery (salpingostomy or salpingectomy) or expectant management in select cases.

We report a case of an ampullary tubal EP in an asymptomatic patient that was suggested by magnetic resonance (MR).

Case Report

A 30-year-old female, with history of recently completed first gestation (a vaginal birth 11 weeks before, ending a 39-week pregnancy), presented to our institution for scheduled postpartum consultation. The patient had no complaints. Routine pelvic US revealed a left adnexal complex indeterminate mass, predominantly cystic, with hyperechoic solid component, measuring 32 mm. Due to patient anxiety, MR was suggested for further characterization.

MR did not reveal any endometrial or myometrial changes, including genital tract congenital anomalies, and no intrauterine content was found. A left tubal sac-like mass was depicted, measuring 33x31x39 mm, exhibiting heterogeneous predominantly hyperintense signal in T2 weighted-imaging (T2WI) and isointensity in T1 weighted-imaging (T1WI) (Fig. 1).

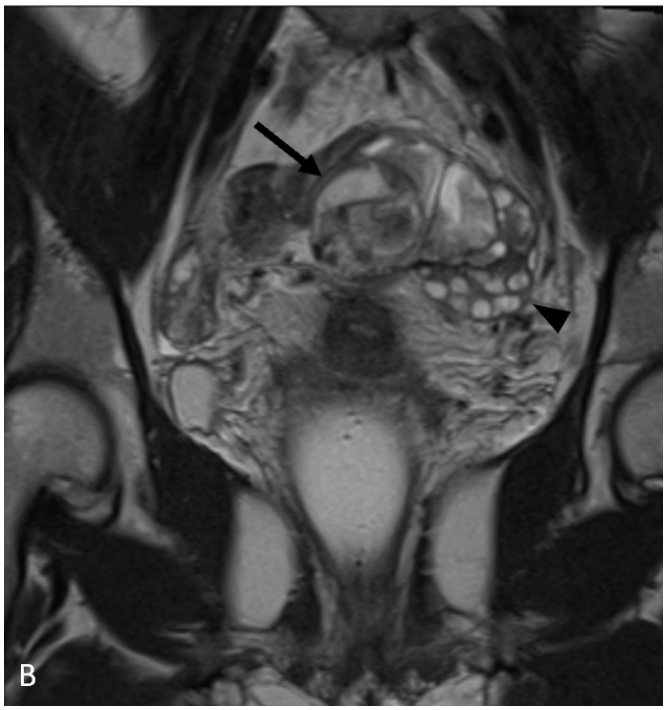

Figure 1. A- Sagittal T2WI shows absence of intrauterine content, endometrial (3 mm thickness) or myometrial changes, including genital tract congenital anomalies. Superiorly to the level of the torus uterinus, a sac-like predominantly cystic mass is seen (arrow), measuring 39 mm of maximal diameter; B- Coronal T2WI depicts the mass in the left adnexa (arrow), clearly demarcated from the left ovary (arrowhead), therefore pointing to a tubal origin

Adjacent to the mass described, a tubular structure filled with T1WI high signal intensity fluid was seen, corresponding to hematosalpinx (Fig. 2). In the rectouterine space, small foci of hemoperitoneum were found.

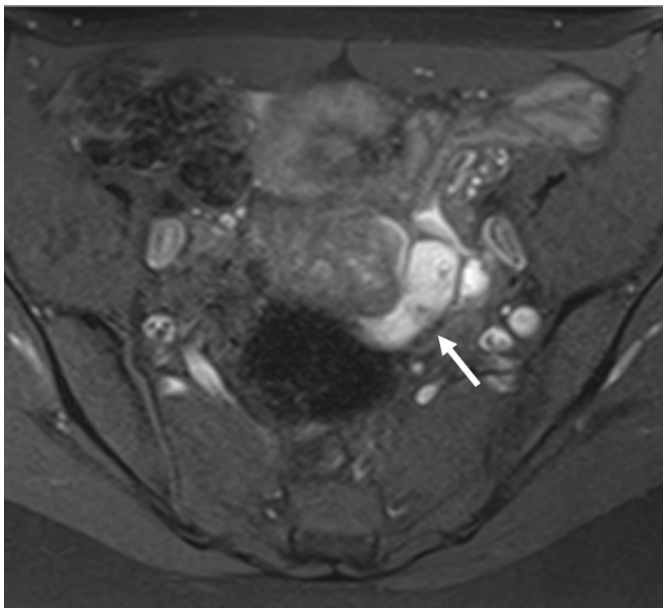

Figure 2. Pre-contrast axial T1WI. Adjacent to the mass described, a tubular structure filled with high signal intensity fluid, was suggestive of hematosalpinx (arrow).

After contrast administration, an early and markedly enhancing papillary solid component was found in the thick wall of the mass, which corresponded to embryonic tissue (Fig. 3).

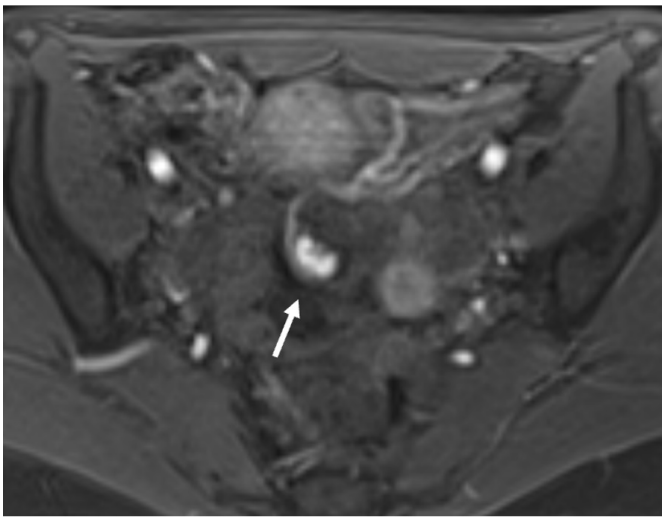

Figure 3. Early contrast-enhanced T1WI shows a markedly enhancing--papillary solid component in the thick wall of the mass (arrow).

These findings suggested the diagnosis of tubal ectopic pregnancy, which was not previously considered, due to the recent delivery and absence of symptoms. Subsequent quantitative analysis of serum β-HCG revealed increased levels (8560 mIU/mL), that confirmed the imaging hypothesis.

As the patient preferred medical over surgical treatment, she stopped breastfeeding and was treated with one dose of intramuscular MTX. β-HCG levels decreased significantly between day 4 and day 7 after treatment, having normalized at day 20, without complications. No adnexal mass was seen at follow--up US.

Informed consent was obtained from the patient for publication of this case report.

Discussion

EP is associated with a 9%-14% mortality rate,[5] as rupture can result in life-threatening intra-abdominal hemorrhage. As such, an early diagnosis is essential to prevent complications and to select the adequate management strategy. This diagnosis encompasses clinical, laboratory and imaging findings.

Regarding imaging, US remains the first imaging modality for abdominal pain in pregnant patients. Computed tomography (CT) is not the preferred modality for the diagnosis of EP, but it is occasionally performed when other diseases are suspected, for example in the emergency department, or if the pregnancy status is unknown. CT might depict hemoperitoneum with or without contrast extravasation surrounding the uterus.[6]

MR has been increasingly used as a problem-solving tool in cases of unclear US diagnosis, due to its superior soft tissue contrast and ability to detect hematic content. Since US is unable to distinguish blood products, MR is particularly helpful in detecting an extra-uterine gestational sac in the presence of hematoma, hematosalpinx or hemoperitoneum. Furthermore, in atypical clinical scenarios such as this case, MR can depict a non-suspected ectopic pregnancy, which should afterwards be confirmed by quantitative β-HCG assay. Firstly, the uterus should be assessed for the presence or absence of an intrauterine pregnancy, as well as congenital genital tract anomalies. Secondly, efforts should be made to find the most specific sign of ectopic pregnancy – an extrauterine gestational sac, usually seen as a thick-walled cystic sac-like structure with heterogeneous signal. In cases of tubal pregnancy, hematosalpinx with wall enhancement is frequently seen. Lastly, the presence of hemoperitoneum in a patient with elevated levels of β-HCG is highly predictive of this condition.

MR is also useful for differential diagnosis. The morphological and functional evidence provided can exclude EP's mimickers, such as ovarian masses, adnexal torsion, tubo-ovarian complex or tubal endometriosis.

Moreover, MR is not only a sensitive, specific and accurate method for evaluating EP, but also may help in guiding management. For example, precise EP localization might be helpful for surgical planning, particularly in cases of interstitial, angular or abdominal pregnancies. US fails to visualise the implantation site in up to 15%-35% of cases, due to high operator dependency and imaging interference by bowel gas or hemorrhage.[7] MR also proved to be accurate in evaluating myometrial infiltration which might be valuable in caesarean scar pregnancies.[2] Furthermore, accurate size evaluation size can be of clinical importance as EP greater than 4 cm in size, can be a relative contraindication to MTX therapy.[3,8] Interestingly, ectopic pregnancy's size is directly related to the risk of rupture and severe haemorrhage.[6]

MR is nowadays considered a safe procedure during pregnancy[9] and when there is a very strong indication for enhanced MR, the smallest possible dose of a macrocyclic gadolinium contrast agent may be given to the pregnant female.[10] Following administration of gadolinium-based agents to the mother during pregnancy, no additional neonatal tests are necessary.[10]

Despite its advantages, MR is not available in every hospital center worldwide, and has many limitations, the most important in EP being the lengthy scan time which excludes this imaging modality in unstable patients with ruptured EP.

In conclusion, we report a case of ampullary tubal EP in an atypical clinical scenario, suggested by MR. We further highlight

the role of MR as a problem-solving tool in hemodynamically stable patients, such as in cases of indeterminate US, and as a potential management guide.

Responsabilidades Éticas

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MS: Investigação, redação do rascunho original e aprovação da versão final

AV e NC: Redação, revisão, edição e aprovação da versão final

MG: Conceptualização, supervisão e aprovação da versão final

Contributorship Statement

MS: Investigation, original draft writing and approval of the final version

AV and NC: Writing, proofreadin, editing and approval of the final version

MG: Conceptualization, supervision and approval of the final version

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