

The value of color Doppler ultrasound in early diagnosis and treatment of ectopic pregnancy an obstetric emergency

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Summary

The advent of color Doppler ultrasound has increased the early diagnosis of ectopic pregnancy (EP) and, as a consequence, the possibility of opting for a mini-invasive surgical approach.

In the present study, the authors report two cases of suspected EP in the early weeks of gestation, aiming to demonstrate that correct application of the color power Doppler ultrasound technique, which could reveal the first sign of early EP, plays a decisive role in confirming the diagnosis.

Correct and early diagnosis of EP allows early surgical treatment and may therefore significantly reduce morbidity and/or mortality.

KEY WORDS: color Doppler ultrasound, ectopic pregnancy

Introduction

First trimester complications are common emergencies in obstetric clinical practice. The primary objective of gynecologists and obstetricians faced with symptomatic pregnant women in the early weeks of gestation is to correctly diagnose intrauterine or ectopic pregnancy (EP).

In the last two decades, the diagnosis of EP has been based mainly on anamnestic, clinical, ultrasound and laboratory evaluations. Recently, the availability of color Doppler ultrasound has made it possible to diagnose EP earlier and, as a consequence, to opt for a mini-invasive surgical approach. Previous studies have examined the application of this technique and the parameters considered suggestive for a diagnosis of EP (1-5). The main color Doppler parameter considered is blood flow in the tube on the side of the suspected gestation.

The present study aims to demonstrate, describing two cases of women with suspected EP, that correct application of color power Doppler ultrasound plays a decisive role in confirming the diagnosis, making it possible to perform accurate elective laparoscopic surgery.

Materials and methods

Case A

A 28-year-old woman presented at our emergency department with moderate vaginal bleeding, which had started two hours earlier, and mild pelvic pain. The clinical history disclosed the following information:

- one spontaneous abortion in 2000 and two previous cesarean deliveries at term in 1999 and 2001.
- amenorrhea for 7 weeks, non-smoker, blood pressure 110/65, temperature 36.8 °C, free beta human chorionic gonadotrophin (beta-HCG) level of 2700 UI/ml (two days earlier).

Clinical and gynecological examination revealed normal external genitalia, hemorrhagic coagulated blood in the vagina, anteverted uterus of normal volume, and moderate pain during exploration of the left lateral vaginal fornix and of the hypogastrum.

Case B

A 31-year-old woman presented at our emergency department with mild vaginal bleeding. In this case, the patient reported no pain and the following information was obtained:

- no previous pregnancy (nulliparous)
- amenorrhea for 6 weeks, non-smoker, blood pressure 100/70, temperature 36.5° C, no measurement of free beta-HCG available.

Clinical and gynecological examination revealed normal external genitalia, mild bleeding (red blood) from the cervix, retroverted uterus of normal volume, and mild pain during the exploration of the left lateral vaginal fornix. In both cases, we performed emergency pre-surgical laboratory evaluations (hemocoagulative parameters, ALT, AST, electrolytic profile, free beta-HCG, glycemia, anesthetic profile), an instrumental evaluation (ECG), and an ultrasound examination using color power Doppler.

Results

The hemocoagulative profile appeared normal in both cases. Circulating glycemia, ALT, AST and electrolyte

levels were also in the normal range (case A: glycemia 87 pg/ml, Na 139, K 4.2, Cl 148, ALT 18 mUI/ml AST 26 mUI/ml; case B: glycemia 70 pg/ml, Na 141, K 4.3, Cl 155, ALT 21 mUI/ml, AST 25 mUI/ml).

Free beta-HCG circulating levels were 2600 UI/ml in case A and 850 UI/ml in case B.

Ultrasound evaluation:

- case A: anteverted uterus of normal dimensions (70x45x53 mm). Normal-appearing right ovary (dimensions and ultrasound structure). Secretory endometrial pattern with endometrial thickness of 17 mm; no evidence of intrauterine gestation. At the level of the left ovary, we observed a 23-mm hypoechoic mass with an increased echo pattern in the pericystic area. The color Doppler evaluation revealed abnormal, i.e. low-resistance, blood flow in this area (RI: 0.26) (Fig. 1). There was a small quantity of fluid in the pouch of Douglas (about 23 mm of maximum diameter).

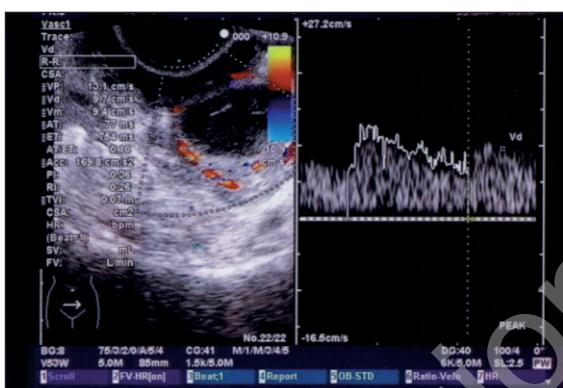


Figure 1 - Case A: color Doppler evaluation showing abnormal blood flow characterized by low resistance at the level of the left adnexum.

- case B: retroverted uterus of normal dimensions (61x40x48 mm). Normal-appearing right ovary (dimensions and ultrasound structure). Secretory endometrial pattern with endometrial thickness of 12 mm; no evidence of intrauterine gestation. At the level of the left ovary, we observed a 34-mm hypoechoic mass with an increased echo pattern in the pericystic area. The color Doppler evaluation showed abnormal, i.e. low-resistance, blood flow in this area (RI: 0.18) (Fig.2). The pouch of Douglas appeared empty.

In both cases, laparoscopic surgery was performed, revealing clear signs of a left tube EP at isthmic-ampullary level with initial mild (case B) and moderate (case A) hemoperitoneum as a result of ampillary bleeding. In both cases, a partial resection of the tubal zone containing the pregnancy was performed. In both cases, macroscopic histology revealed indirect signs of pregnancy, with chorionic villi (Fig.s 3 and 4); these findings were confirmed by microscopic evaluation.

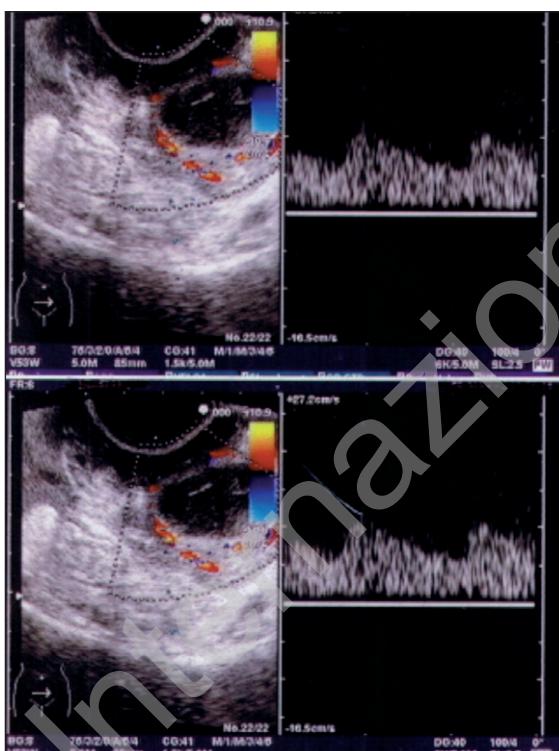


Figure 2 - Case B: color Doppler evaluation showing abnormal blood flow characterized by low resistance at the level of the left adnexum.

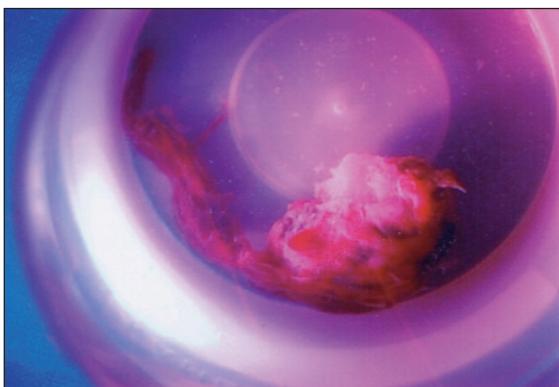


Figure 3 - Case A: Indirect signs of chorionic villi on macrohistological analysis.



Figure 4 - Case B: Indirect signs of chorionic villi on macrohistological analysis.

Discussion

Ectopic pregnancy is the leading cause of morbidity and mortality in women of reproductive age, accounting for 9% of pregnancy-related deaths in the first trimester. Thanks to improved diagnostic methods, the mortality rate associated with EPs has fallen in the last two decades. The early detection of an EP, before tube rupture, allows outpatient treatment, reducing the risk of major complications. The two cases described in this study provide a clear demonstration of this modern approach, in which earlier diagnosis allows a correct therapeutic approach to this obstetric emergency. Since 2002-2003, studies have been published explaining the role of the color Doppler technique as a predictor of EP in the early weeks of gestation (1). The authors of one recent study proposed that all cases of suspected EP should undergo careful color Doppler examination, looking for the presence of a typical eccentric "leash" of low-resistance vessels similar to placental vessels (3). In their view, the presence of this new sign, which they called the "leash sign", confirms the diagnosis of EP (3).

Color Doppler ultrasound evaluation of the vascularity of the adnexal mass in cases of suspected EP should include examination of the peritrophoblastic blood flow, including the peak systolic velocity and resistive index (3,4).

Other studies have highlighted a correlation between transvaginal color Doppler ultrasound and a better patient outcome in the earlier detection of EP, avoiding life-threatening complications (5,6). However, this correlation is not supported by data published and available in recent guidelines. A protocol published in 2001 by the Royal College examined six algorithms (i.e., ultrasound followed by quantitative beta-HCG, quantitative beta-HCG followed by ultrasound, progesterone evaluation followed by ultrasound and quantitative beta-HCG, progesterone followed by quantitative beta-HCG and ultrasound, ultrasound followed by repeated ultrasound, and clinical examination) and the authors concluded that transvaginal ultrasound and quantitative beta-HCG values constituted the best diagnostic strategy on the basis that, according to the results of their study, it did not miss any potential EP. The

use of color Doppler evaluation was not fully evaluated in this decision analysis (7).

On the contrary, the findings of other authors suggested that combining transvaginal Doppler ultrasound with measurement of circulating beta-HCG in the early diagnosis of ectopic cornual pregnancy greatly enhanced outpatient surveillance following systemic methotrexate (MTX) therapy compared with the use of conventional transvaginal ultrasound plus beta-HCG (8). Early diagnosis and systemic MTX treatment, followed by correct surveillance is particularly valuable in this atypical form of EP, in which there is a strong likelihood of complications during surgical interventions or during the local puncture for MTX injection (8).

Both patients described in the present study showed signs of pregnancy, while the anamnesis and clinical examination appeared unclear. Clinical situations of this kind are typical in the early stages of EP. In other cases, the presence of acute abdomen due to hemoperitoneum in a fertile woman, with or without an associated state of shock, will clearly suggest a diagnosis of EP, especially when these signs are associated with a positive circulating beta-HCG concentration and ultrasound evaluation shows no sign of intrauterine gestation. On the other hand, ultrasound evaluation in the early weeks of gestation very rarely demonstrates the presence of cardiac activity outside the uterus. Yet, this ultrasonographic evidence outside the uterine endometrial cavity is the only finding able to confirm the diagnosis of EP. All other clinical and instrumental evidence must be considered only as predictive signs, not as confirmation of the diagnosis. In all other situations, which actually represent the majority of cases, color Doppler ultrasound evaluation revealing the presence of low-resistance peritrophoblastic blood flow, is highly predictive of EP.

In conclusion, the description of these two cases confirms the importance of introducing color Doppler ultrasound into routine clinical practice – the presence of peculiar, low-resistance vascularization outside the uterus, detected using this method, could be the principal and first sign of early EP – and demonstrates that the use of this technique can result in early surgical treatment and thus a significant reduction of morbidity and/or mortality.

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