

Original Research Article

A Case Report of Ultrasonographic “Endometrial Three Layer” Pattern: A Unique Finding in Ectopic Pregnancy Recent Perspective

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Abstract: Although diagnostic ultrasonography is playing an increasing role in the investigation of the patient with suspected ectopic pregnancy (EP), it has significant limitations in the very early stages of pregnancy. By sonographically exploring the intrauterine echoes in 45 cases of documented EP, we demonstrated a unique pattern in 28 cases (62.2%). A well-defined spheric structure forming an endometrial three-layer (ETL) pattern was seen, probably formed by a midline echo between the two adjacent edematous proliferative layers of the endometrium, the latter resembling the late proliferative endometrium. In 17 patients with a proved EP (37.8%), the ETL pattern was not demonstrated. However, the ETL was not demonstrated in all 40 cases of early intrauterine pregnancy and all 50 cases of miscarriage. These findings suggest 100% specificity and a sensitivity of 62.2% for the ETL pattern in the diagnosis of EP.

Keywords: Ectopic pregnancy, endometrial pattern, endometrial three-layer.

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INTRODUCTION

Ectopic pregnancy (EP) comprises 0.3% to 1% of all gestations [1-3] and is one of the leading causes of maternal death worldwide [1-4]. The diagnosis of EP remains a clinical challenge for the gynecologist, despite improvements in diagnostic tests and procedures. There are a number of methods for establishing the presence of an EP: history, physical examination, biochemical tests, and imaging methods. These can all be used to diagnose EP as early as possible.

The combination of serum -HCG and vaginal ultrasonography has shown a high sensitivity and specificity for the diagnosis of ectopic pregnancy in several clinical studies:-⁷ but despite these new technologies, the early diagnosis of EP.

In most cases is still a clinical challenge. In the past, the role of transabdominal (TA) ultrasonography of the pelvis was mainly to exclude an intrauterine pregnancy and to identify fluid or blood in the pelvis [8, 9]. However, the transvaginal (TV) approach has significantly improved the accuracy of ultrasonography

by visualizing an early gestational sac in the uterus, or in an extrauterine location [9-11].

Previous reports [8-10] emphasize the fact that other pelvic findings detected in 50% to 70% of TV examinations strongly suggest an EP [5, 9, 11, 12]. These findings include fluid in the pelvis, congestion of the adnexa, the adnexal “halo sign,” [5] and intrauterine echogenic material, the so-called “pseudogestational sac [9, 13, 14, 15]. The latter is visualized due to the thick proliferative endometrium, with blood or fluid, within the uterine cavity.

By exploring the endometrium in EP with transvaginal sonography, we detected a welldefined spherical structure forming an endometrial three-layer (ETL) pattern with a characteristic midline echo between the two adjacent edematous proliferative layers of endometrium (Figure 1).

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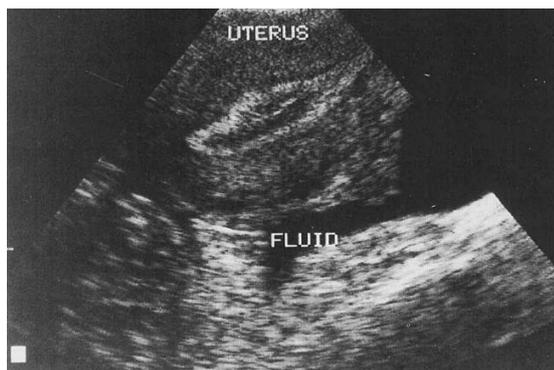


Fig-1: A typical sonographic endometrial three layer (ETL) pattern in a patient with ectopic pregnancy (EP)



Fig-2: A typical sonographic image of a late proliferative endometrium in the non-pregnant woman.

This endometrial appearance resembled the well-known late proliferative endometrium of the normal menstrual cycle (Figure 2).

We used the combined information of a positive maternal beta-human chorionic gonadotrophine, the absence of an intrauterine pregnancy, and the ETL pattern to design a prospective study for evaluating the potential predictive value of the ETL pattern in the clinical evaluation of EP.

MATERIALS AND METHODS

The study population included women who were admitted to the emergency room with suspected EP. All women had a complete medical history, physical examination, routine blood tests, and sonographic evaluations. All patients had a positive serum P-HCG and were evaluated for EP versus early pregnancy or miscarriage. Specifically, all patients underwent TV + TA ultrasonographic examination to evaluate the possibility of EP.

Transabdominal examinations were performed with an Elscint scanner having a 3.5 MHz transducer; TV examinations were performed with an Elscint scanner having a 6.5 MHz transvaginal transducer. An effort was made to demonstrate the endometrium in all

patients as well as the extrauterine anatomy. The sonographic endometrial studies (TV + TA) were photographed and documented on videotape.

Ectopic pregnancy was documented by a surgical procedure (ie, laparotomy or laparoscopy) and was confirmed by a histopathological examination. Early pregnancies were confirmed by a longitudinal ultrasonographic follow-up, and in the cases of miscarriages, by histological examination. As part of the evaluation, progesterone levels were also measured and documented before any surgical intervention in the 23 patients diagnosed with EP. Progesterone levels were measured by a Radio Immuno-Assay (RIA)-kit (DPC-Diagnostic Products Corporation).

Total P-HCG levels were measured in all the cases admitted to the study by the IMX System (Abbott Diagnostics, Abbott Park, IL). The study population consisted of two groups:

Group A: patients with surgically documented EP and Group B: patients diagnosed as having a miscarriage or early normal pregnancy.

RESULTS

The documented EP group (Group A), consisted of 45 patients. In 28 of the cases (62.2%), the typical picture of ETL pattern (Figure 1) was documented. In the other 17 cases (37.8%) in which ETL was not demonstrated, EP was diagnosed surgically and histopathologically. These findings suggest a sensitivity of 62.2% and a positive predictive value of 100%, for the ETL pattern in the diagnosis of EP.

In studying the sonographic image of the endometrium in 90 patients with early normal pregnancies (5 to 6 weeks, menstrual age, or miscarriages (Group B), we found that the ETL pattern was not seen in any of these patients. This gives a specificity of 100% and a negative predictive value of 84% (Table 1).

Table-1: The Sensitivity, Specificity, and Positive and Negative predictive value, of the ETL in EP

	EP	NON EP
POSITIVE ETL	28	0
NEGATIVE ETL	17	90
TOTAL	45	90

Sensitivity: 62.2 %
 Specificity: 100 %
 Positive predictive value: 100 %
 Negative predictive value: 84 %

Because the endometrial tissue is strongly influenced by progesterone levels, and as a low level of maternal progesterone is one of the suggested markers

for EP, 16, 17 we compared the progester- one level in patients with or without the ETL pattern. By using the student t-test," we found that there was no significant difference between the progesterone levels in the two populations, ($p > 0.05$). A trend toward progesterone elevation (mean = 6.69 ng/mL vs. mean = 2.35 ng/mL) was found in the group of patients in which the ETL pattern was observed. The median test, a non-parametric test for two or more independent samples, 18 indicated a statistical significant difference ($p = 0.05$) further supporting a possible difference in progesterone levels.

In 10 of the 45 cases in which EP was eventually diagnosed, endometrial curettage was performed as part of the evaluation. The histopathologic studies showed proliferative endometrium in 5 cases, Arias-Stella reaction in 2 cases, and decidual reaction in 3 cases. Thus, the Arias- Stella phenomenon seen in 2 cases did not correlate with the ultrasonographic ETL. However, a histopathologic diagnosis of late proliferative endometrium (5/5 cases), and decidual reaction (2/3 cases) were associated with the ultrasonographic ETL pattern.

DISCUSSION

Much effort has been devoted to define means for early diagnosis of EP. Today, because of the high sensitivity of P-HCG, there has been an increase in the early detection of EP. However, distinguishing between EP, miscarriage, or early intrauterine pregnancy remains a clinical problem for every gynecologist. Although diagnostic sonography is playing an increasing role in the investigation of the patient with EP, it has significant limitations in the early stages of pregnancy and cannot locate the presence of the embryo in every case. Several ultrasonographic extrauterine parameters have been suggested to improve the sensitivity of TA and TV in the diagnosis of EP. 8-10 These parameters include pelvic fluid, adnexal mass, congestion of the adnexa, intrauterine "pseudosac," and (naturally) the presence of an extrauterine embryo. By exploring the pelvis sonographically in 45 cases of EP, we demonstrated in 28 patients the presence of an ETL pattern, which resembled the sonographic picture of the physiologic late proliferative endometrium.

A sensitivity of 62.2% was achieved by using this finding in the evaluation of EP. None of the cases of early miscarriage or normal early intrauterine pregnancy demonstrated the ETL. This gives a specificity of 100%, a negative predictive value of 84% and a positive predictive value of 100% for EP. 19 It has been documented that the endometrium is influenced by progesterone levels 16, 17 Although we did not demonstrate a significant difference in the progesterone level between EP patients with ETL and without ETL, a higher progesterone level is probably needed for ETL to develop. The exact progesterone levels in cases of EP with positive ETL should be further evaluated. Our

possible explanation for the lack of ETL in intrauterine pregnancy may be attributed to trophoblastic proliferation causing destruction of the edematous proliferating layers of the endometrium. Therefore, when there is no intrauterine trophoblastic growth, as in early EP, the endometrium responds to the hormonal stimulation with a sonographic image that resembles proliferative endometrium. The three hyperechogenic layers separated by two edematous layers of the endometrium are a result of the hormonal stimulation. Based on these findings, when EP is suspected, we evaluate and document the endometrium by TV sonography for two purposes: 1. to find signs of an intrauterine pregnancy; 2. to demonstrate the ETL pattern. Accurate early diagnosis of EP is of practical importance today with the widespread use of systemic methotrexate in the treatment of this condition.

We believe that the above findings may offer an additional specific sonographic pattern that can add to our ability to detect EP. However, confirmation in larger series should be obtained before widespread clinical implementation of the ETL pattern takes place.

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