Chapter

Diagnosis of Ectopic Pregnancy

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Abstract

Ectopic pregnancy is defined as the implantation of a fertilised egg outside the uterine cavity. The site of ectopic pregnancy are Fallopian tube. Cervix, ovary, peritoneal cavity, or uterine scars. Other two site of implantation are cornual pregnancy and interstitial pregnancy. Diagnostic tests for ectopic pregnancy include a urine pregnancy tests, Serum beta hcG and ultrasound. The instant result of a urine pregnancy test is a useful pointer for the clinician to suspect an ectopic pregnancy.. The test is a useful triage tool for clinicians to rule out a pregnancy when the clinical situation is not clear such as a patient who is not sure of dates, does not remember or is in a state of shock and the history cannot be elicited. Ultrasound remains the mainstay of the diagnosis and high index of suspicion and a detailed history are pre-requisite of scanning. Different ultrasonography feature are diagnostic of different site of implantation. For uterine scar pregnancy ultrasonologic criteria are not validated still now.

Keywords: ultrasound, b HCG

1. Introduction

The proverb black cat in dark night fits into the diagnosis of ectopic pregnancy. To diagnose ectopic pregnancy clinician's mind should be suspicious about ectopic pregnancy. The most common ectopic site of implantation (97%) is the fallopian tube. The most common site for tubal pregnancy is ampulla, followed by isthmus, fimbrial and interstitial. Sometimes twin tubal pregnancy with both embryos in one tube or with one in each tube has been noted [1]. The other sites of ectopic pregnancies are implantation in the cervix, ovary, peritoneal cavity, or uterine scars. A growing ectopic pregnancy in any location can make the tissue vascular, friable and eventually rupture and result in intra-abdominal bleeding. This is a life threatening medical emergency. In history the risk factors like Pelvic inflammatory disease, including pelvic tuberculosis, previous ectopic pregnancy, pregnancy with an intrauterine device, tubal surgeries (ligations, reconstructions, and re-implantations), history of STD, smoking, infertility, ovulation induction and ART procedures should be elicited. The majority of women with ectopic gestation have no identifiable risk factor.

Ectopic pregnancy should be suspected in any woman with child bearing age presenting to the clinic or emergency department with symptoms of amenorrhea,

pain abdomen, and vaginal bleeding [2]. They may present with the complaint of fainting, collapse, breathlessness, or dizziness. Uncommon symptoms include diarrhoea, pain in the shoulder, rectal pressure, urinary symptoms, and anaemia. A small, undisturbed tubal pregnancy, the physical examination might be normal. In these situations, the diagnosis is dependent on investigations. On the other hand, with late presentations, there could be a disturbance of the vital signs and features of shock may be present including tachycardia, tachypnoea, hypotension, and rarely bradycardia. On abdominal examination there may be guarding, rigidity and tenderness. There could be also cervical motion tenderness, adnexal tenderness or fullness in the adnexae and pouch of Douglas. The presence of abdominal signs with altered vital parameters suggests presence of hemoperitoneum and mandates urgent resuscitation and management at a centre with appropriate facilities for blood transfusion and surgery.

Diagnostic tools for ectopic pregnancy are urine pregnancy tests, Serum beta-hCG and transvaginal or trans-abdominal ultrasound. Clinical suspicion combined with these tests plays a very important role in diagnosis and management of ectopic pregnancy. The instant result of a urine pregnancy test is a useful pointer for the practitioner to suspect an ectopic pregnancy. This kit test is easily available at low cost and is reliable. The test is a useful triage tool for clinicians to rule out a pregnancy when the clinical situation is doubtful such as a patient who is not sure of dates, does not remember or is in a state of shock and the history cannot be elicited.

Laboratory tests of a single laboratory value of beta-hCG might not be useful to diagnose the location of a pregnancy. The typical level in a healthy intrauterine pregnancy on the day of the missed period is 50 to 100 IU/L. In a normal intrauterine pregnancy, levels of serum beta-hCG will double every 1.4 to 2.1 days and peak between 50,000 and 100,000 IU/L at 8 to 10 weeks of pregnancy. Compared to the pattern observed in healthy intrauterine pregnancies, the rate of increase between two serum-hCG levels when it is done 48 hours apart is slower.

Progesterone levels are not useful for the diagnosis of an ectopic and maybe used in the prognostication of pregnancy of unknown location.

Ultrasound remains the mainstay of the diagnosis [3]. High index of suspicion and a detailed history are pre-requisite of scanning. The majority of tubal ectopic pregnancies should be visualised on transvaginal ultrasound.

Transvaginal ultrasound has sensitivities of 87.0–99.0% and specificities of 94.0–99.9% for the diagnosis of ectopic pregnancy [4]. Usually most of the ectopic pregnancies will be visualised on the initial ultrasound examination [5]. When no intrauterine or extauterine pregnancy is seen in USG it is called pregnancy of unknown location (PUL). Ectopic pregnancies initially classified as a PUL on the initial scan may be ectopic pregnancies are just too small and too early in the disease process to be visualised on the initial ultrasound examination. Sometimes the limiting value of beta-hCG should be evaluated, below which intrauterine pregnancies cannot be seen on USG. In case of PUL serial beta-hCG level assays adone to identify pattern that indicate either a growing or failing IUP. Without clear evidence for ectopic pregnancy, serial β-hCG level is advised and a level is checked after 48 hours. This wards off unnecessary medical therapy and avoids harming an early normal pregnancy. With more concern for an ectopic gestation, D&C is another option to distinguish an ectopic from a failing IUP. Normal rise B-Hcg does not exclude normal and ectopic pregnancy [6]. Laparoscopy is no longer the gold standard for diagnosis of ectopic pregnancies.

2. USG findings

An inhomogeneous or non cystic adnexal mass is the most common finding, about 50–60% of cases.

An empty extra-uterine gestational sac will be present in around 20–40% [7] of cases and an extra-uterine gestational sac containing a yolk sac and/or embryonic pole that may or may not have cardiac activity will be present in around 15–20% of cases [7].

There is no specific endometrial appearance or thickness, based on which diagnosis of tubal pregnancy can be confirmed. A few of cases, in around 20%, a collection of fluid may be seen within the uterine cavity, known as 'pseudosac'. It is difficult to differentiate pseudosac from an early intrauterine gestational sac. The intradecidual and double decidual signs indicates early intrauterine pregnancy (**Figures 1** and **2**). The intradecidual sign is eccentrically located echogenic area within a markedly thickened decidua [8]. The double decidual sign is described as an intrauterine fluid collection surrounded by two hyper echogenic rings [9]. But practically, it is very difficult to distinguish a 'pseudosac' which is just a collection of fluid in the endometrial cavity from

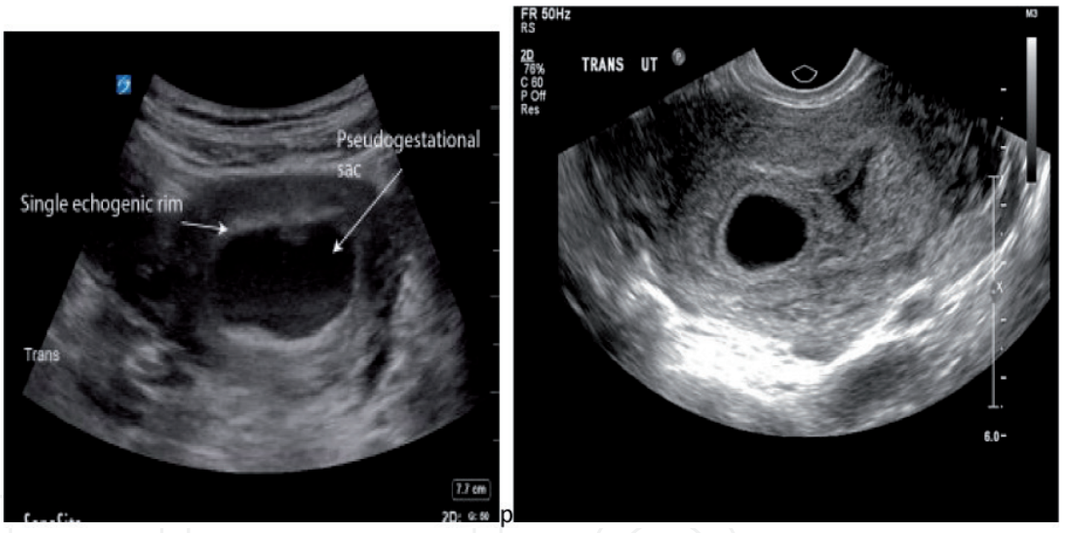

Figure 1.
Double decidual sign.

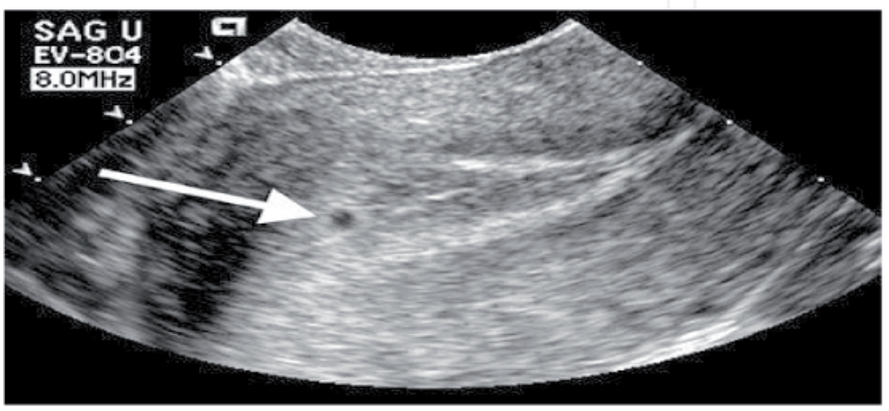

Figure 2.
Intradecidual sign.

an early intrauterine sac. A small anechoic cystic structure is more likely to be an early sac rather than a 'pseudosac'. Positive pregnancy test with and a small anechoic cystic structure without adnexal mass has probability of ectopic pregnancy is 0.02% [9].

When free fluid is seen on ultrasound, it is not a pinpointing feature of ectopic pregnancy. A small amount of anechoic fluid in the pouch of Douglas may be found physiologically in normal pregnancy and may be seen with ectopic pregnancies. Which may signify tubal rupture, Most commonly the echogenic fluid has been reported is due to blood leaking from the fimbrial end of the fallopian tube but it may be tubal rupture. Culdocentesis was used in the past to diagnose hemoperitoneum. Fluid with old blood clots and blood does not clot points to hemoperitoneum. If the blood sample clots it may have been drawn from nearby blood vessel or from profound bleeding ectopic pregnancy. Nowadays culdocentesis is not advised it is replaced by usg.

3. Cervical pregnancy

Cervical ectopic pregnancy is diagnosed by following usg criteria:

1. Empty Uterus

2. a barrel-shaped cervix,

3. a gestational sac is seen below the level of the internal cervical Os,

4. 'Sliding sign' usually absent

5. On colour Doppler, Blood flow around the gestational sac

The 'sliding sign' distinguishes cervical ectopic pregnancies and miscarriages that are within the cervical canal. It is present in cervical miscarriage but absent in cervical ectopic gestation.

When pressure is applied to the cervix using the probe, in a miscarriage, the gestational sac slides against the endocervical canal, but does not in an cervical ectopic gestation.

Cervical Ectopic Gestation usually develops in fibrous wall of the cervix. Risk factors includes previous dilatation and curettage operation and pregnancy due to ART may be implanted in cervical canal [10, 11]. Usually the women present with painless vaginal bleeding and sometimes with massive haemorrhage [12].

Clinical criteria for diagnosis of cervical pregnancy [13].

- Pregnancy with painless vaginal bleeding.
- Soft and expanded cervix with length is equal or more than fundus wasp like or hourglass shape.
- Product of conception firmly attached to cervical canal.
- Closed internal os and partially opened external os (**Figure 3**).

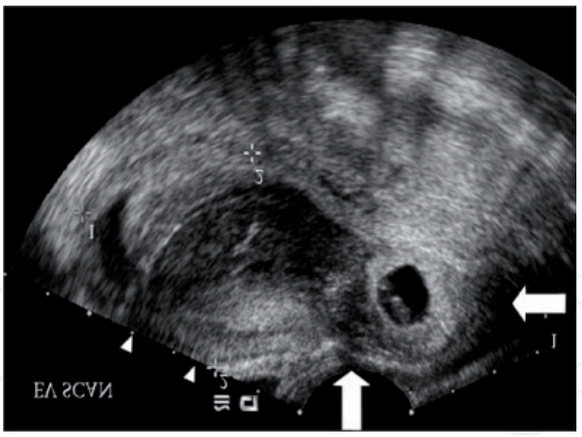

Figure 3.
Cervical pregnancy.

4. Caesarean scar pregnancy

The diagnosis of Caesarean scar pregnancy made by using transvaginal usg sometimes supplemented by trans-abdominal imaging if required.

Magnetic resonance imaging (MRI) can be used as a second-line investigation if the diagnosis is suspicious. Usually women with CSP present with painful bleeding PV and nearly half of women are asymptomatic.

Caesarean scar pregnancy is defined as implantation into the myometrial defect occurring at the site of the previous uterine scar.

The diagnostic criteria described for caesarean scar implantation on transvaginal ultrasound include: [14].

1. Empty uterine cavity and endocervical canal

2. Gestational sac or solid mass of trophoblast located anteriorly at the level of the internal Os embedded at the site of the previous lower uterine segment caesarean section scar

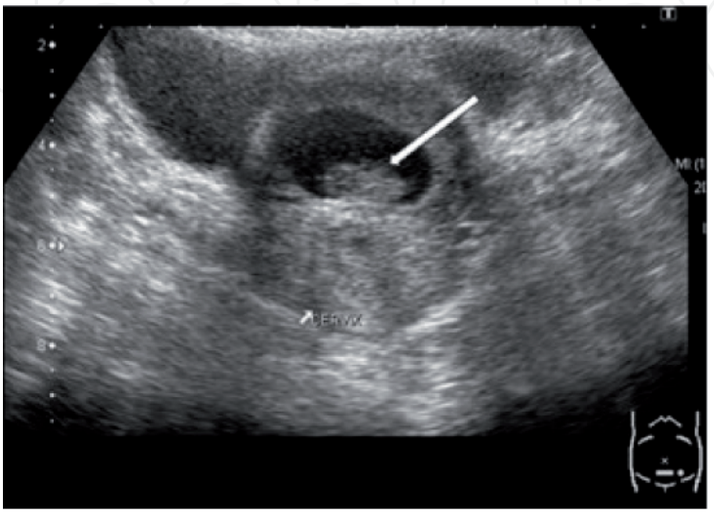

Figure 4.
Caesarean scar pregnancy.

3. Myometrial layer between bladder and gestational sac is absent or thin.

4. Evidence of prominent trophoblastic/placental circulation on Doppler examination.

5. Pregnancy less than 8wks triangular gestational sac is seen previous caesarean scar defect but after 8 weeks of gestation the gestational sac become rounded or oval.

The true prevalence of caesarean scar pregnancies is likely to be somewhat higher than estimated in the literature as some cases end in the first trimester, either by miscarriage or termination, and go unrecorded. A few percentages of reported cases of caesarean scar pregnancy were wrongly diagnosed as intrauterine or cervical pregnancies at presentation (**Figure 4**).

5. Interstitial pregnancy

When the implantation occurs in the proximal part of fallopian tube that lies within the muscular layer of uterus. Ipsilateral salpingectomy is a risk factor for interstitial pregnancy.

The following ultrasound scan criteria may be used for the diagnosis of interstitial pregnancy:

1. Empty uterine cavity, eccentric implantation,>1 cm away from the most lateral edge of uterine cavity.

2. Gestational sac surrounded by less than 5 mm of myometrium in all imaging planes,

3. And presence of the 'interstitial line sign'. An echogenic line extends from gestational sac to uterine cavity. It is highly sensitive and specific.

Dimensional ultrasound may be used if available to avoid misdiagnosis.

Figure 5.
Interstitial pregnancy.

MRI may be useful in addition to ultrasonography in the diagnosis of interstitial pregnancy (**Figure 5**).

6. Cornual pregnancy

The implantation occurs in the rudimentary horn of uterus it may be communicating or non communicating. It is a confusing terminology. Some authors prefer the cornual pregnancy when implantation occurs in upper lateral part of uterine cavity of normal uterus.

Ultrasound scan criteria are used for the diagnosis of cornual pregnancy:

1. Visualisation of a single interstitial portion of fallopian tube in the main uterine body,

2. gestational sac/products of conception seen mobile and separate from the uterus and completely surrounded by myometrium,

3. And a vascular pedicle adjoining the gestational sac to the unicornuate uterus.

7. Ovarian pregnancy

Findings suggestive of an ovarian ectopic pregnancy on transvaginal ultrasound with an empty uterus are:

1. A wide echogenic ring with an internal anechoic area on the ovary is seen commonly. A yolk sac or embryo is rarely seen [15].

2. It is not possible to separate the cystic structure or gestational sac from the ovary on gentle palpation (negative sliding organ sign).

3. Corpus luteum is identified separately from the suspected ovarian pregnancy.

4. Colour Doppler might be useful to detect foetal heart pulsation within the ovary.

A complex echogenic adnexal mass with free fluid in the pouch of Douglas may be the ruptured ovarian ectopic pregnancy.

Usually it is difficult to distinguish ovarian ectopic pregnancies from corpus luteal cysts, tubal ectopic pregnancy stuck to the ovary, a second corpus luteum, ovarian germ cell tumours and other ovarian pathologies and the diagnosis is confirmed surgically and histologically in most of the cases.

8. Abdominal pregnancy

When the implantation occurs in intraperitoneal cavity excluding tubal,ovarian and intraligamentous pregnancy. Usually the women have vague symptoms or no symptoms. Abnormal foetal position may be palpated.

MRI might be a useful diagnostic adjunct in advanced abdominal pregnancy and can help to plan the surgical approach.

1. Early abdominal Pregnancy, no intrauterine gestational sac.

2. Tubes and ovary are normal

3. A gestational sac surrounded by loops of bowel and separated from them by peritoneum and there is no myometrium between anterior abdominal wall and gestational sac.

4. A wide mobility similar to fluctuation of the sac, particularly evident with pressure of the transvaginal probe toward the posterior cul-de-sac.

Sonographic diagnosis may not be useful. MRI is very much useful to confirm the diagnosis and to identify placental implantation because placenta may be implanted over vital structures, such as major blood vessels and bowel [16]. This can help to make preoperative preparedness for perioperative considerations, such as the surgical approach, requirement of blood products, preoperative angiographic embolisation, bowel preparation and insertion of ureteral catheters. Precise mapping of the location of the placenta by using ultrasound and/or MRI prior to laparotomy to avoid incising the placenta and the associated risk of uncontrollable haemorrhage is necessary.

9. Heterotopic pregnancy

When there are both intrauterine and extrauterine implantation it is called heterotropic gestation it can be diagnosed with ultrasonography.

Heterotopic pregnancy should be suspected in if conception is after assisted reproductive technologies, with an intrauterine pregnancy and complaining of persistent pelvic pain and in those.

women with a persistently raised beta-hCG level following miscarriage or termination of pregnancy. A higher than expected level of serum beta-hCG in relation to gestational age may be suspicious of heterotopic pregnancy but, the presence of a complete or partial mole must be ruled out. Two corpora lutea found on laparoscopy or laparotomy. Sometimes patient may present with hemoperitoeum after termination of normal pregnancy or persistence of enlarged uterus and amenorrhoea after excision of ectopic pregnancy.

10. Conclusion

Ectopic pregnancy is associated with high maternal mortality and morbidity. With early diagnosis complications can be avoided. Primary modality of diagnosis is Ultrasound Scan. Hence Obstetrician should be well trained to diagnose ectopic pregnancy, and clinician should have high index of suspicion to diagnose ectopic pregnancy.

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DOI: http://dx.doi.org/10.5772/intechopen.101715

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References

[1] Della-Giustina D, Denny M. Ectopic pregnancy. Emergency Medicine Clinics of North America. 2003;**21**:565-584

[2] Gurel S, Sarikaya B, Gurel K, Akata D. Role of sonography in the diagnosis of ectopic pregnancy. Journal of Clinical Ultrasound. 2007;**35**:509-517

[3] Kirk E, Papageorghiou AT, Condous G, Tan L, Bora S, Bourne T. The diagnostic effectiveness of an initial transvaginal scan indetecting ectopic pregnancy. Human Reproduction. 2007;**22**:2824-2828

[4] Condous G, Van Calster B, Kirk E, Haider Z, Timmerman D, Van Huffel S, et al. Prediction of ectopic pregnancy in women with a pregnancy of unknown location. Ultrasound in Obstetrics & Gynecology. 2007;**29**:680-687

[5] Condous G, Okaro E, Khalid A, Lu C, Van Huffel S, Timmerman D, et al. The accuracy of transvaginal ultrasonography for thediagnosis of ectopic pregnancy prior to surgery. Human Reproduction. 2005;**20**:1404-1409

[6] Shepherd RW, Patton PE, Novy MJ, Burry KA. Serial beta-hCG measurements in the early detection of ectopic pregnancy. Obstetrics and Gynecology. 1990;**75**:417

[7] Yeh HC, Goodman JD, Carr L, Rabinowitz JG. Intradecidual sign: A US criterion of early intrauterine pregnancy. Radiology. 1986;**161**:463-467

[8] Bradley WG, Fiske CE, Filly RA. The double sac sign of early intrauterine pregnancy: Use in exclusion of ectopic pregnancy. Radiology. 1982;**143**:223-226

[9] Doubilet PM, Benson CB. Double sac sign and intradecidual sign in early pregnancy: Interobserver reliability and frequency of occurrence. Journal of Ultrasound in Medicine. 2013;**32**:1207-1214

[10] Ginsburg ES, Frates MC, Rein MS, Fox JH, Hornstein MD, Friedman AJ. Early diagnosis and treatment of cervical pregnancy in an in vitro fertilization program. Fertility and Sterility. 1994;**61**: 966

[11] Jeng CJ, Ko ML, Shen J. Transvaginal ultrasound-guided treatment of cervical pregnancy. Obstetrics & Gynecology. 2007;**109**:1076

[12] Ushakov FB, Elchalal U, Aceman PJ, Schenker JG. Cervical pregnancy: Past and future. Obstetrical & Gynecological Survey. 1997;**52**:45

[13] Paalman R, McElin T. Cervical pregnancy. American Journal of Obstetrics and Gynecology. 1959;**77**:126

[14] Timor-Tritsch IE, Monteagudo A, Santos R, Tsymbal T, Pineda G, Arslan AA. The diagnosis, treatment and follow-up of cesarean scar pregnancy. American Journal of Obstetrics and Gynecology. 2012;**207**:44e1

[15] Comstock C, Huston K, Lee W. The ultrasonographic appearanceof ovarian ectopic pregnancies. Obstetrics & Gynecology. 2005;**105**:42-45

[16] Aliyu LD, Ashimi AO. A multicentre study of advanced abdominal pregnancy: A review of six cases in low resource settings. European Journal of Obstetrics & Gynecology and Reproductive Biology. 2013;**170**:33-38