Early abdominal ectopic pregnancy: challenges, update and review of current management

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Key content

- Early abdominal ectopic pregnancy (EAP), though rare, has a high mortality rate.
- There are no pathognomic symptoms of abdominal pregnancy. Symptoms are akin as for other types of ectopic pregnancy, thus a high index of suspicion is necessary for diagnosis.
- The tool of choice for diagnosis is ultrasound but it only gives 50% accuracy when used along with clinical evaluation. On occasion, magnetic resonance imaging may help to diagnose EAP.
- Medical management is commonly used where potential life-threatening bleeding is anticipated. A number of women who are treated medically may need subsequent treatment with multiple therapies.
- Surgical management requires a great deal of surgical expertise and in most cases a multidisciplinary approach in anticipation of possible life-threatening bleeding during the operation.

Learning objectives

- To outline the classification of EAP.
- To understand the common risk factors associated with EAP.
- To understand how to diagnose EAP.
- To be aware of the different medical and surgical management of EAP and the ethical issues associated with diagnosis and treatment.

Ethical issues

- Distinguishing an abdominal pregnancy from the more common variants of ectopic pregnancy remains difficult and a definitive diagnosis is usually made at surgery.
- There is no established guidance available for the diagnosis and management of EAP.
- Many EAP are never diagnosed because of a successful response to medical management for a pregnancy of unknown location.
- As it is not uncommon to diagnose EAP for the first time during surgery, the difficulties in diagnosis prior to surgery means that patients require life-saving surgery beyond the scope of the preoperative signed consent form.

Introduction

An abdominal pregnancy is one that occurs in the abdominal cavity outside of the female reproductive organs. In an abdominal pregnancy, the trophoblast may become attached to one or several abdominal structures. Implantation sites for abdominal pregnancy mentioned in the literature include the uterine serosa, pouch of Douglas, omentum, bowel and mesentery, mesosalpinx, the peritoneum of the pelvic wall and the abdominal wall,[1–4] the liver,[5] spleen,[6] diaphragm[7] and Gerota's fascia of kidney.[8] Abdominal pregnancy excludes tubal and ovarian pregnancies.

Incidence

Abdominal pregnancies constitute approximately 1% of all ectopic pregnancies, occurring in 1/2200 to 1/10 200 pregnancies and 1/6000 to 1/9000 births.[1] Mortality rates are 7.7 times higher than in tubal pregnancy, and 89.8 times higher than in intrauterine pregnancy.[1] Because of the rarity and associated mortality of abdominal pregnancies, early diagnosis and early recourse to intervention is paramount. In one series only one in nine women who arrived alive in hospital had the correct preoperative diagnosis.[1]

There is an increasing incidence of ectopic pregnancies as a result of increasing use of assisted reproductive technologies,[9]

however, there is no evidence of an increase in the incidence of abdominal pregnancy. In common with other ectopic pregnancies, the mortality rate has decreased from 20% to <5% over the last 20 years[10] because of early intervention.

Classification of abdominal pregnancy

Abdominal pregnancies can be classified as early or late based on the gestational age at which they present. Early abdominal pregnancy (EAP) is one that presents at or before 20 weeks of gestation,[11] while late abdominal pregnancy presents after 20 weeks of gestation.

Abdominal pregnancy can also be classified as primary or secondary depending on its implantation site. If it implants directly in the abdominal cavity and its organs (excluding the tubes and ovaries), it is referred to as a primary abdominal pregnancy. Secondary abdominal pregnancies, however, occur when the conception is extruded from the female reproductive organ and becomes secondarily implanted in the abdominal cavity, which occurs in 1 in 10 000 live births.[1] Classification of abdominal pregnancy, while academically interesting, may not make a difference to management of the condition and thus is of limited clinical value.

In 1942, Studdiford[12] described the first case of an early ruptured primary EAP and set the following criteria for diagnosis:

- normal tubes and ovaries with no evidence of recent or remote injury
- absence of any evidence of a uteroperitoneal fistula
- presence of a pregnancy related exclusively to the peritoneal surface
- early enough to eliminate the possibility of secondary implantation following a primary nidation in the tube.

In 1968 Friedrich and Rankin[13] modified the stipulated criteria to limit acceptable cases. They proposed that to be a true primary abdominal pregnancy the pregnancy should be less than 12 weeks of gestation and the trophoblastic attachments should be related solely to the peritoneal surface.

Risk factors

EAP has similar risk factors to any ectopic pregnancy – these include a previous history of ectopic pregnancy or tubal surgery, endometriosis, history of pelvic inflammatory disease or current use of an intrauterine device.[14] EAP has also been reported after bilateral salpingectomy in a patient who underwent in vitro fertilisation (IVF).[15] It is suggested that IVF may predispose to abdominal pregnancy via unnoticed uterine perforation at the time of embryo transfer, migration of an oocyte into the abdominal cavity with subsequent abdominal fertilisation by spermatozoa or migration through a microfistulous tract through the uterine isthmus.[4] However, there is no overall increase in EAPs reported, despite a greater use of assisted reproduction techniques.

Diagnosis

Signs and symptoms

The clinical presentation is extremely variable and the diagnosis of EAP is complex. As there are no pathognomic symptoms of abdominal pregnancy that distinguish it from tubal pregnancy, it requires a high index of suspicion. It is not uncommon to diagnose EAP for the first time at laparotomy or laparoscopy performed for tubal ectopic pregnancy, and on occasion more than one laparotomy/laparoscopy may be required before the diagnosis is eventually made.

Investigations

A suboptimal increase in serial human chorionic gonadotrophin (β-hCG) titres is not sufficient to make the diagnosis of any ectopic pregnancy, including EAP.[16]

Ultrasound

The tool of choice for diagnosis is ultrasound, but distinguishing an EAP from other variants of ectopic pregnancy remains difficult. Only 50% accuracy can be expected for the diagnosis of EAP when ultrasound is used along with clinical evaluation.[16] An accurate diagnosis is important as eventually management depends on the exact location of the pregnancy and the organs to which the pregnancy is attached.[17] With ultrasound examination, an empty uterus, coupled with the presence of a gestational sac or mass separate from the uterus, adnexa and ovaries, should always raise suspicion of an EAP. A mass seen in the abdomen away from the pelvis, especially with features of pregnancy (gestational and yolk sac, fetal heart beat) is diagnostic but it is not usually possible to differentiate a pelvic mass from the adnexa with ultrasound. Common pitfalls in diagnosis include uterine leiomyoma, retroflexed uterus, false-negative diagnosis as intrauterine pregnancy, and false-positive diagnosis with cervical, intramural, isolated uterine horn and bicornuate uterus pregnancies.[18]

Ultrasound features to aid diagnosis of EAP were suggested by Allibone et al.[19] These include:

- demonstration of a fetus in a gestational sac outside the uterus, or the depiction of an abdominal or pelvic mass identifiable as the uterus separate from the fetus
- failure to see a uterine wall between the fetus and urinary bladder

- recognition of a close approximation of the fetus to the material abdominal wall and localisation of the placenta outside the confines of the uterine cavity.

Magnetic resonance imaging

On occasion, particularly where the location of the pregnancy is still uncertain, a magnetic resonance imaging (MRI) scan may help to diagnose EAP.[20] The MRI contrast agent defines vasculature and may be of more value in assessing organ involvement to plan management rather than diagnosis. Gadolinium-based MRI contrast agents (which cross the placental barrier) are usually contraindicated in pregnancy,[20] but should be considered if the life of the mother is at risk and specific consent would be required for it, including consent for termination of pregnancy. MRI may also be of more value in assessing organ involvement and should be done where possible prior to surgery. During laparoscopy if the diagnosis remains unconfirmed, intraoperative laparoscopic ultrasound or transvaginal ultrasound will also assist in making the diagnosis.[21]

Postoperative diagnosis

Postoperatively, histology showing evidence of trophoblast proliferation with neovascularisation involving the organ or structure the pregnancy was attached to, confirms the diagnosis of an EAP.[22]

Pathophysiology

In 1958, Cavanagh[23] postulated that fertilisation may occur in the posterior cul-de-sac where sperm is known to accumulate and that an ovum could lay there as a result of the dependent flow of peritoneal fluid. Since then there have been several theories about the pathophysiology of EAP. Paternoster and Santarossa[24] suggested that delayed ovulation that occurs close to menstruation may cause retrograde flow of the fertilised ovum, which may carry the zygote from the pouch of Douglas to different peritoneal locations.

Dmowski et al.[25] and Iwama et al.[26] hypothesised that the retroperitoneal EAP would occur because of migration of the embryo from the female reproductive organs to the retroperitoneal space by travelling along lymphatic channels, similar to uterine cancer cells. Iwama et al.[26] and Fisch et al.[27] believed that there could have been a fistulous track, which could also have been caused during the process of IVF. Arora[28] suggested that abdominal pregnancy after total hysterectomy might be as a result of the presence of a fistula between the vaginal apex and the abdominal peritoneum, which would create a track for transportation of spermatozoa, thus enabling conception.

Locations of abdominal pregnancies

Poole et al.[29] in a 45-year review of abdominal pregnancies divided EAP (n = 225) into categories as detailed in Box 1.

Box 1. Categories of early abdominal pregnancy, in order from the most reported to the least[30]

- Pouches surrounding uterus (n = 55), primarily posterior in the pouch of Douglas
- Serosa of the uterus and adnexa (n = 54)
- Multiple abdominal organs (n = 29)
- Omentum (n = 25)
- Bowel/appendix (n = 15)
- Liver (n = 13), more frequent in the right lobe of the liver
- Spleen (n = 12)
- Retroperitoneal (n = 10), may happen in patients with history of bilateral salpingectomy.
- Abdominal wall (n = 7)
- Not specified (n = 5).

Treatment

Maternal mortality with EAP is high because such pregnancies typically implant on highly vascularised surfaces, and can separate at any time during the gestation, resulting in heavy blood loss. The most important factors that influence survival and management modality include maternal haemodynamic status and gestational age at time of presentation.[30]

Medical management

As with all types of ectopic pregnancy, medical management of abdominal pregnancy has been reported. Agents used to treat these ectopic pregnancies include methotrexate (systemic and local),[4,31] local instillation of potassium chloride,[32] hyperosmolar glucose, prostaglandins, danazol, etoposide and mifepristone.[33] Medical management is commonly used where potential life-threatening bleeding is anticipated, such as EAP of the liver and spleen. Even where medical management is used, it is important that patients are kept under surveillance as it is not uncommon for them to still require surgery because of haemorrhage.[34] Despite the widespread use of methotrexate for the management of EAP there are no uniform guidelines[29] and, unfortunately, there are no strong clinical predictors for successful medical therapy. A number of women who are treated medically may need subsequent treatment with multiple therapies.

Angiographic arterial embolisation can be used as first line treatment of EAP with the aim of avoiding surgery.[34] Embolisation, even if unsuccessful in controlling bleeding completely, is likely to reduce the vascularity of the placenta thus making surgery safer. Embolisation of feeding vessels preoperatively will facilitate complete removal of an

abdominal pregnancy.[35] Alternatively, selective embolisation of vessels supplying the placenta should be considered to control the haemorrhage postoperatively from the retained placenta.[36,37]

Surgical management

Managing EAP surgically requires a great deal of surgical expertise and in most cases a multidisciplinary approach in anticipation of possible life-threatening bleeding during the operation.

Expectant management of second trimester abdominal pregnancy carries a risk of sudden life-threatening intra-abdominal bleeding[38] and a generally poor fetal prognosis. Thus when recognised, immediate termination of pregnancy is recommended.[39] Whether the fetus is dead or alive, surgical intervention is generally advocated; there is a particular risk of infection and disseminated intravascular coagulation if the fetus is dead.

Historically, abdominal pregnancies were universally managed by laparotomy, however, in 1993, Balmaceda and colleagues[40] reported their case of laparoscopic management of an abdominal ectopic pregnancy of 7 weeks of gestation. Later Abossolo and colleagues[41] described a case where operative laparoscopy was used in the presence of significant intra-abdominal haemorrhage. Since then, various methods to control haemorrhage laparoscopically have been described, with the most common being bipolar electrocautery,[42] using an ultrasonic surgical cutting and coagulation device (Harmonic ACE® [Ethicon Inc., Johnson & Johnson, Somerville, NJ, USA]),[43] using a haemostatic matrix sealant agent (Floseal™ [Baxter International Inc., Deerfield, IL, USA]),[44] vasopressin[45] and oxidised cellulose (Surgicel® Fibrillar™ [Ethicon Inc., Johnson & Johnson, Somerville, NJ, USA]).[46] Vasopressin analogues used for haemorrhage control carry the risk of injection into vascular areas which can cause cardiac complications, thus should not be used without discussion with the anaesthetist. Fibrin sealants (Evicel®, Quixil®, Crosseal™[Ethicon Inc., Johnson & Johnson, Somerville, NJ, USA])[47] that are used in liver resection surgeries can be tried to achieve haemostasis after an EAP is separated from an abdominal organ. It may be necessary to use a combination of methods to achieve haemostasis.

Shaw et al.[48] published a 12-year case series (1994–2005) on the surgical management of abdominal pregnancy managed laparoscopically. There was an overall operative laparoscopy rate of 55%. The series demonstrated that with technological advances and increased operator skill, cases of abdominal pregnancy were increasingly being able to be managed laparoscopically. Indeed, after the year 2000, the operative laparoscopy rate for early abdominal pregnancy was 100%. The authors reported significant benefits in terms of reduced blood loss and reduced hospital stay in the

laparoscopic group compared with the laparotomy group, in keeping with other forms of ectopic pregnancy. There are also case reports where even with haemoperitoneum, EAP was managed surgically by operative laparoscopy.[44–46]

Ethical issues

While ultrasound scan is the diagnostic tool of choice for EAP, the key to its diagnosis and management is a high index of suspicion. However, because of the rare nature of EAP and difficulty in differentiating it from the more common variants of ectopic pregnancy, there is no established guidance available on the diagnosis and management of EAP.

EAP are normally managed as non-viable and life threatening and therefore the aim is to surgically or medically terminate the pregnancy, however, there are reports of successful births after abdominal pregnancies.[49,50] Although abdominal pregnancies are infrequently encountered, the possibility of EAP must be a part of differential diagnosis of ectopic pregnancy. Atrash et al.'s study[1] suggested that 1% of ectopic pregnancies are abdominal ectopic pregnancies, thus it is more than likely that in our clinical practice we may have easily missed an abdominal ectopic pregnancy or might have ended up treating it successfully under the pretext of pregnancy of unknown location.

As there are no strong predictors for successful medical treatment, the decision to use medical therapy must be individualised based on the distinctive characteristics of each case.[29] The availability of an experienced laparoscopic surgeon will have an impact on whether laparotomy or the laparoscopic route is used when surgical treatment is sought. As with other types of ectopic pregnancy, EAP surgery has moved away from traditional open procedures to operative laparoscopy.

As it is not uncommon to diagnose EAP for the first time at laparotomy or laparoscopy performed for tubal ectopic pregnancy, it may have an impact on the clinician–patient relationship as patients might find it difficult to accept the diagnosis and the management option offered. The difficulties in diagnosis prior to surgery may mean that patients require life-saving surgery beyond the scope of the preoperative signed consent form.

Conclusion

EAP is rare, and successful management depends on a high index of suspicion. While ultrasound and serial human chorionic gonadotrophin may help in the diagnosis, there is no single diagnostic tool available. At laparoscopy it is important that if an ectopic pregnancy is not visualised in the usual locations, then all of the abdominal cavity is inspected to include all abdominal organs. If the diagnosis is still not

confirmed then MRI or intraoperative ultrasound may assist in diagnosis.[4]

Given the benefits of operative laparoscopy and increasing use of this modality for treatment, an initial laparoscopic approach may be appropriate to evaluate the size of the EAP, the organs to which it is attached and relative vascularity, to decide further management. Teamwork, a multidisciplinary approach and expert opinion cannot be overemphasised to ensure successful management of these cases.

Disclosure of interests
None declared.

Contribution to authorship
Both the authors contributed extensively to the work presented in this paper.

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