

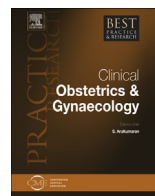


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Ultrasound imaging in the management of bleeding and pain in early pregnancy



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Bleeding and pain are experienced by 20% of women during the first trimester of pregnancy. Although most pregnancies complicated by pain and bleeding tend to progress normally, these symptoms are distressing for woman, and they are also associated with an increased risk of miscarriage and ectopic pregnancy. Ultrasound is the first and often the only diagnostic modality that is used to determine location of early pregnancy and to assess its health. Ultrasound is an accurate, safe, painless and relatively inexpensive diagnostic tool, which all contributed to its widespread use in early pregnancy. Pain and bleeding in early pregnancy are sometimes caused by concomitant gynaecological, gastrointestinal, and urological problems, which could also be detected on ultrasound scan. In women with suspected intra-abdominal bleeding, ultrasound scan can be used to detect the presence of blood and provide information about the extent of bleeding.

In this chapter, we comprehensively review the use of ultrasound in the diagnosis and management of early pregnancy complications. We include information about the diagnosis of gynaecological and other pelvic abnormalities, which could cause pain or bleeding in pregnancy. We also provide a summary of the current views on the safety of ultrasound in early pregnancy.

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Introduction

Pain and vaginal bleeding are experienced by about one in five women during the first trimester of pregnancy [1]. The symptoms may vary from light painless bleeding to severe pain, accompanied by haemorrhagic shock. Clinical presentation is helpful in determining the likely cause of women's symptoms, but, in most cases, ultrasound imaging is required to reach a conclusive diagnosis. About one-half of pregnancies complicated by bleeding will progress normally beyond the first trimester, with the remaining women suffering an early pregnancy failure [2]. A total of 10–15% women presenting with vaginal bleeding have an ectopic pregnancy [3]. A timely and accurate diagnosis of ectopic pregnancy is important to minimise the risk of serious adverse outcomes. It is important to remember that bleeding may also be caused by conditions that are coincidental to pregnancy, such as cervical polyps, vulval and vaginal lesions, and injury during sexual intercourse. Abdominal pain is often a late symptom in women with miscarriages and ectopic pregnancy. It may also be caused by intra-abdominal haemorrhage caused by a ruptured corpus luteum cyst or by ovarian torsion. Non-gynaecological causes of pain include acute cystitis, ureteric stones, appendicitis, and constipation. Differential diagnosis between these conditions is difficult, based on clinical symptoms alone, and some form of imaging is almost always required to reach the correct diagnosis.

The development of high-resolution transvaginal ultrasound technology in the 1980s has enabled significant progress in early pregnancy imaging. Since then, transvaginal ultrasonography has become the accepted standard for examining women with suspected complications of early pregnancy [4,5]. With advances in ultrasound diagnosis, pregnancies could be identified earlier in gestation compared with transabdominal ultrasound, resulting in better diagnostic accuracy. Diagnosis of early pregnancy complications has been further enhanced by combining ultrasound findings with the results of biochemical tests such as human chorionic gonadotrophin (hCG) and progesterone. In this chapter, we aim to provide a summary of recent development in ultrasound imaging in pregnancy, with plenty of practical advice to those providing clinical care to women with suspected early pregnancy complications.

Normal early intrauterine pregnancy

When performing ultrasound scan in early pregnancy, it is important to confirm the location of pregnancy, its viability, and gestational age [6]. Although the ultrasound diagnosis of intrauterine pregnancy is generally considered to be straightforward, criteria to diagnose an intrauterine pregnancy are conspicuously absent from the literature. This makes it hard to differentiate between a pregnancy that is normally implanted within the uterine cavity and several types of ectopic pregnancies confined to the uterus, such as interstitial, cervical, or intramural pregnancies. A normal intrauterine pregnancy should be located within the uterine cavity, which represents a virtual space lined with endometrium extending from the internal cervical orifice to tubal ostia. In addition, the trophoblast should not be invading beyond the endometrial-myometrial junction [7,8].

A normal intrauterine pregnancy can be consistently visualised on ultrasound scan 3 weeks after conception (i.e. 5 weeks after last menstrual period in a woman with regular 28-day cycle) [9]. When assessing the uterus, the probe is moved in the transverse plane from the internal orifice to the fundus in search of an intrauterine pregnancy. Longitudinal view is then used to show the location of the gestational sac beneath the endometrial surface and to confirm its intrauterine location by demonstrating a communication between the cervical canal and the uterine cavity. If a gestational sac is not immediately visible, the endometrial morphology should be assessed to search for the signs of retained products. Endometrial thickness measurements are not useful to discriminate between an early intrauterine pregnancy, incomplete miscarriage, and ectopic pregnancy [10]. Sweeping the probe both side to side and up and down will facilitate the assessment of the cervix, caesarean section scar (if present), myometrium, and interstitial portion of the Fallopian tubes, to rule out unusual sites of ectopic pregnancy implantation.

In a normal pregnancy, the gestational sac first becomes visible on transvaginal scan at 4 weeks and 3 days of gestation (Fig. 1a) [9]. The sac usually appears as a circular structure with a thick echogenic rim surrounding a clear anechoic centre, which represents early chorionic cavity. The sac is located just

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