Ultrasound diagnosis of Caesarean scar pregnancy

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Introduction

A Caesarean scar pregnancy is a form of ectopic pregnancy in which the pregnancy is implanted outside the uterine cavity into a poorly healed lower uterine segment Caesarean section scar. It is a rare complication following previous Caesarean section and it occurs in approximately 1 in 1,800 pregnancies.1,2 There has been a steady rise in the worldwide rates of Caesarean section, reaching an average rate of 21.1% in developed countries3 which may explain greater awareness of scar implantations in recent years. Caesarean scar pregnancies have been associated with an increased risk of significant maternal morbidity as a result of severe haemorrhage thought to be secondary to abnormally adherent placental tissue.4 Clear diagnostic criteria using transvaginal ultrasonography have been established as an effective tool in identifying Caesarean scar pregnancies in order to ensure accurate diagnosis and to support timely, appropriate management.

Why do scar pregnancies occur?

In a Caesarean scar pregnancy, the gestational sac implants into a deficient lower uterine segment Caesarean section scar, which lacks decidua. The absence of the normal vascular architecture at the level of the scar facilitates trophoblastic invasion into the myometrium and the placenta becomes abnormally adherent during this process.5 It is this difficulty in placental separation combined with the loss of functional myometrium that contributes to haemorrhage. Pregnancies with adherent placentas have been shown to account for 41-64% of obstetric hysterectomies and the majority of these cases have had a previous Caesarean section.6

Risk factors for suboptimal uterine muscle healing following Caesarean section include single layer myometrial closure, multiple Caesarean sections and uterine retroflexion.7 The proportion of deficient Caesarean section scars varies between 7% and 42% depending on the definition of poor healing used by different authors and the examination techniques employed. Studies using saline infusion sonography typically report higher deficiency rates compared to non-enhanced ultrasound scans.8 Myometrial deficiency at the scar site has been described using a variety of terms: Caesarean scar defect, deficient Caesarean scar, diverticulum, pouch, isthmocele and niche.9

The importance of identifying a Caesarean scar pregnancy

Making the correct diagnosis will enable clinicians to establish the risk of complications associated with Caesarean scar ectopic pregnancies. The risk of miscarriage in the first and second trimester is approximately 50%, whereas those that continue to term have been shown to develop the complications of placenta previa or accreta.10

Early diagnosis of Caesarean scar pregnancies in the first trimester can aid prompt management and reduce the risk of complications associated with increasing gestational age.11 The size and vascularity of the pregnancy can aid the assessment of the risk of haemorrhage and the site of the pregnancy will indicate whether it is accessible vaginally or abdominally. These variables enable clinicians to formulate a personalised management plan for the patient.

How to diagnose scar pregnancy on ultrasound scan

The following diagnostic criteria are based on transvaginal ultrasonography, an effective tool in identifying the following features. In order to diagnose a Caesarean scar pregnancy the pregnancy has to be located outside the uterine cavity, as with any ectopic pregnancy. There must be evidence of implantation of the pregnancy into a deficient scar. The gestational sac will be partially or completely located within the myometrial mantle and there must be evidence of functional peri-trophoblastic flow.12

On ultrasound examination, the diagnosis of Caesarean scar pregnancy can be made using the following criteria:13
1. The pregnancy is located outside the uterine cavity (figure 1).
2. The site of implantation is confirmed to be into the anterior uterine wall and extends beyond the endometrial-myometrial junction at or below the level of the internal cervical os. The complete embedding of the gestational sac outside the uterine cavity evidences myometrial involvement. This can be confirmed by anterior herniation of the anterior aspect of the uterus towards the bladder or into the broad ligament (figure 2).
3. Evidence of functional peri-trophoblastic or placental circulation on colour Doppler examination. This is demonstrated as high vascularity adjacent to the anterior aspect of the gestational sac and uterine cavity (figure 3).14
4. A negative ‘sliding organ sign’ – the gestational sac cannot be displaced from its position at the level of the internal os with the application of gentle pressure using the transvaginal ultrasound probe.15

Differential diagnoses for Caesarean scar pregnancy include cervical pregnancy, which follows a similar clinical course and it is managed in a similar way; Colour Doppler examination can be used to differentiate between a Caesarean scar pregnancy and miscarriage of intrauterine pregnancy. Examples of this include trophoblastic implantation posterior to the gestational sac and miscarriage (figure 4). During an uncomplicated miscarriage the gestational sac may overlie the scar, however, colour Doppler examination can confirm implantation within the uterine cavity. Alternatively, a lack of peri-trophoblastic flow, in the case of inevitable miscarriage would indicate a diagnosis of the
cervical phase of the miscarriage although embryonic cardiac activity may still be present.1

Management
The management of Caesarean scar pregnancies can be tailored to each specific case depending on the site, size and vascularity of the pregnancy. Other factors affecting timing and choice of management include the patient’s clinical symptoms, the gestational age of the pregnancy, its viability and severity of myometrial deficiency.1 Management options include expectant management, medical management (administration of methotrexate) and surgical management. Medical management with methotrexate is successful in approximately 50% of cases. In those with successful outcomes the median follow-up time until resolution is two months. Expectant management of live scar pregnancies is associated with high maternal morbidity: 70% of women suffer massive obstetric haemorrhage and 50% undergo emergency hysterectomy.1 Transvaginal surgical evacuation with or without Shirodkar cervical suture10 or Foley catheter insertion is successful in 92% of cases with 5% risk of blood transfusion and <1% risk of hysterectomy.2

Follow-up
Transvaginal ultrasound can again be used following expectant, medical or surgical management as a way of ensuring resolution of the scar pregnancy. Cases experiencing abnormal vaginal bleeding following management should be offered an ultrasound in order to assess for retained products of conception.

Conclusion
Ultrasound has been established as a safe and effective method of identifying Caesarean scar pregnancies in the first trimester. Although screening for Caesarean scar pregnancies is of unproven value, an early scan at six to seven weeks' gestation could be considered in women with a past history of multiple Caesarean sections as their risk of scar implantation is particularly high.3

References
Figure 3
A case of Caesarean scar pregnancy at eight weeks’ gestation with the evidence of abnormally high vascularity at the periphery of the gestational sac on Doppler examination. This is a frequent finding in scar pregnancy which is associated with increased blood loss during surgical evacuation of pregnancy.

Figure 4
A longitudinal section of the uterus showing a small gestational sac (GS) covering a deficient Caesarean section scar. On Doppler examination there is evidence of increased blood supply at the posterior aspect of the sac. This finding indicates that the pregnancy is located in the posterior wall of the uterus and it is only covering the scar, but it is not implanted into it.