

Imaging in the Postpartum Period: Normal Findings, Complications and Challenges

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Learning objectives

This pictorial review aims to illustrate and discuss normal post-partum appearances, the challenges in imaging post-partum patients, and complications that can occur in the post-partum period.

Background

The physiological changes that occur in the post-partum period are complex and incompletely understood. Abnormal imaging findings may be directly related to the pregnancy or delivery, or unrelated and incidental. Difficulties in imaging post-partum patients are partly due to:

1. Reluctance to image young fertile patients with ionising radiation
2. Controversial use of intravenous contrast agents for computed tomography (CT) / magnetic resonance imaging (MRI) in patients who are breastfeeding;
3. Concerns regarding hyper-radiosensitive breast tissue in the post-partum period.

Normal Post-Partum Imaging Findings

The post-partum period is defined as the 6-8 weeks after delivery [1] during which the uterus involutes and returns to its normal size. The appearance of the uterus therefore varies according to the time after delivery - the early and middle stages are in the first two weeks while the late stage is beyond two weeks [1].

In the early stage the uterine myometrium undergoes contraction to stop bleeding. This brings the anterior and posterior uterine walls and the decidua (endometrium of the pregnant uterus) together, thereby forming a thick and possibly irregular stripe [1].

The irregularity of the stripe depends on the variable degree of separation of the decidua with the different thickness of the retained decidual layers and possible retained membranes [2]. As the uterus progresses through the middle and late stages there is evolution of this material within the endometrial cavity with healing at the site of placental insertion and the formation of a new layer of endometrium.

The normal post-partum imaging findings on different imaging modalities are summarised in Table 1.

Table 1: Normal post-partum uterus - evolution of imaging appearances according to post-partum stage.

	Post-partum stage		
	Early	Middle	Late
Ultrasound	<ul style="list-style-type: none"> Thin echogenic endometrial stripe [Fig. 1 on page 9], possible heterogeneous solid and cystic mass in the endocervical canal [Fig. 2] (rather than in the uterine cavity) [1], which is usually expelled spontaneously. Increased vascularity in the myometrium on Colour Doppler [Fig. 3] [1]. Air within the uterine cavity [3] 	<ul style="list-style-type: none"> Possible echogenic mass in the uterine cavity. Anechoic fluid or mixed with echoes and solid component [Fig. 4] [1]. Less prominent vascularity on colour Doppler assessment 	<p>New layer of endometrium is regenerated that appears as a thin white stripe [Fig. 5].</p> <p>Possible minimal fluid or echogenic dots within cavity</p> <p>No significant vascularity in the myometrium</p>
CT	<ul style="list-style-type: none"> Density of fluid within the uterine cavity varies depending on the content: hypodense in the presence of fluid or hyperdense as a result of blood clots [Fig. 6]. Increased vascularity in myometrium appearing as dots 	<p>Myometrial vascularity reduced compared to early stage; resolution of the prominent</p>	<ul style="list-style-type: none"> Normal myometrial enhancement with resolution of vessel prominence.

	of contrast [4].	peripheral myometrial vessels.
	<ul style="list-style-type: none"> • Dilated vessels (branches of uterine artery) in the broad ligament [4]. • Air within the uterine cavity [3] 	
MRI	<ul style="list-style-type: none"> • Zonal anatomy of the uterine body is lost but mainly preserved in the cervix. • The myometrium is heterogeneous with intermediate signal on T2 weighted (T2W) images. • The endometrial cavity is thin with variable signal intensity [5]. • Myometrial vessels are nearly always visible as T2W hyperintensities giving a "combed" appearance to the myometrial wall [5]. 	<ul style="list-style-type: none"> • Normal zonal anatomy returns after 6 months.

It is of equal importance to appreciate the normal appearances post-Caesarean section. A Caesarean section is usually performed via an incision through the abdominal wall (laparotomy), usually via a transverse suprapubic incision (Pfannensteil), 2-3 cm above the symphysis pubis. A uterine incision (hysterotomy) is then performed, which is usually a transverse incision through the lower uterine segment.

The expected imaging findings on different imaging modalities following Caesarean section are summarised in Table 2.

Table 2: Expected imaging appearances acutely within the first 2-3 weeks post-Caesarean section.

Hysterotomy

Peri-Uterine

Skin Incision

Ultrasound

- Oval iso- to hypo-echoic area between the uterus and bladder [6] due to oedema [1] [[Fig. 7](#)].
- Echogenic dots at the incision site related to suture material [1] [[Fig. 8](#)].
- Locules of gas and blood clots.
- Hypoechoic mass adjacent to uterine incision, likely small insignificant haematoma [7].
- Minimal pelvic fluid
- Minimal fluid and gas locules

CT

- Incision site does not enhance, appears as oval or triangular area of decreased attenuation in the myometrium in the anterior lower
- Haziness, stranding or small areas of fluid in the subcutaneous fat can be expected as a result of the surgical procedure [8].
- Minimal fat stranding

	uterine segment [8] on sagittal images [4].	<ul style="list-style-type: none"> • Small sub-fascial and extraperitoneal space hematoma is normal if less than 4cm [9].
MRI	<ul style="list-style-type: none"> • Variable T2W appearances - either a low signal intensity surrounded by a band of intermediate signal intensity or high signal intensity surrounded by low signal intensity [5]. 	<ul style="list-style-type: none"> • Minimal increase in T2W signal intensity due to fat stranding and fluid. • Variable signal intensity in case of small haematomas according to age.

A common pitfall is to misinterpret normal post-Caesarean appearances as a collection, haematoma or other pathological findings [[Fig. 9](#)].

Challenges in Imaging the Post-Partum Patient

Clinical Challenges

The post-partum period is a time of intense physical, physiological and psychological stress for the mother. There are numerous changes in the body during this time, many of which are poorly understood. Differentiating a normal post-partum physiological state from a pathological one is at times a clinical challenge. There are certain features

that would cause concern for the obstetrician and prompt them to investigate the patient further. These include post-partum haemorrhage, pyrexia, severe abdominal pain, abdominal distension, urinary retention, calf pain, chest pain and breathlessness.

Biochemical Challenges

During the post-partum period, the body is in a pro-thrombotic and pro-inflammatory state making interpretation of commonly used biochemical tests difficult. Table 3 summaries some of the more important markers that cause confusion in their interpretation.

Table 3: Biochemical challenges in the post-partum period

Biochemical marker	Level in the post-partum period
White Cell Count (WCC)	<ul style="list-style-type: none"> • Often elevated in late pregnancy and following delivery due to pro-inflammatory state [10]. • 'Normal range' in pregnancy is variable [11].
C-Reactive Protein (CRP)	
D-Dimer	<ul style="list-style-type: none"> • Unreliable before 8 weeks post-partum due to pro-thrombotic state [12].

Imaging Challenges: Radiation

Pregnancy and lactation represent a period of rapid changes in breast tissue and there is a perception that mammary tissue is more radiosensitive during this period than the non-gestational/lactating breast. However there is no proven evidence of the proposed theoretic carcinogenic effects of radiation on the more active proliferating breast epithelium present [13]. Human data on breast cancer risk after irradiation of pregnant/lactating women are sparse and while small studies in patients receiving treatment dose radiation for Hodgkin Lymphoma showed an increase in breast cancer risk, the study numbers are too small to provide convincing evidence [14].

The breast radiation dose should be considered when exposing a patient to ionising radiation in the post-partum period and, as with all patients the clinical indication for imaging should be carefully considered. The most common indication for the use of ionising radiation in the post-partum period is the clinical concern regarding potential pulmonary embolus. Here, the benefits of definitive diagnosis and provision of correct treatment outweigh the potential risks of radiation exposure which is relatively low. The

choice of imaging modality is largely dependent on resource availability however, the effective breast dose for a combined ventilation / perfusion lung scan (V/Q scan) is between 0.22-0.28mGy, that of a CTPA between 10-70mGy, and for perfusion scan only is 0.11-0.30mGy [15]. Therefore, as for pregnant patients, it has been suggested that a post-partum patient with suspected pulmonary embolus (PE) should be imaged with a V/Q scan rather than a CTPA if possible [16]. At our institution, CTPA is the preferred imaging modality in these patients due to accessibility and also the additional information that may be obtained regarding other potential thoracic causes for shortness of breath / chest pain.

Imaging Challenges: Intravenous contrast medium

The use of intravenous contrast agents in CT and MR is sometimes essential to reach a diagnosis. For example, CTPA to rule out PE cannot be done without using iodinated contrast. There is a potential dilemma of using contrast agents in the breastfeeding female due to excretion of contrast agent in the breastmilk and subsequent transfer to the neonate.

Several studies have been performed to calculate the amount of contrast medium that is excreted in breastmilk. Both iodinated and gadolinium-based contrast agents are renally excreted from the patient's circulation completely within 24hrs in the presence of normal renal function. Less than 1% of the contrast agent is excreted in the breastmilk [17] and very low levels of contrast agent have been found in a neonate's circulation as a result of breastfeeding [18]. One study found that less than 0.04% of the administered gadopentetate dimeglumine was excreted into the human breastmilk. The oral dose that the infant might receive is more than 100 times less than the permitted intravenous dose of 200µmol/kg of bodyweight in neonates [19].

The American College of Radiology (ACR) Manual of contrast media [20] and the Royal College of Radiologists (RCR) standards for intravenous contrast administration in the adult patient both state that a very small percentage of the injected iodinated contrast dose for CT enters breast milk and therefore no special precaution or cessation of breastfeeding is needed.

With regards to gadolinium-based agents in MRI, the ACR recommends no precautions. However, if after informed consent the mother remains concerned regarding a potential risk to the neonate, then she should abstain from breastfeeding for up to 24 hours. However the RCR recommend cessation of breastfeeding for 24 hours with high risk gadolinium-based agents [21].

Images for this section:

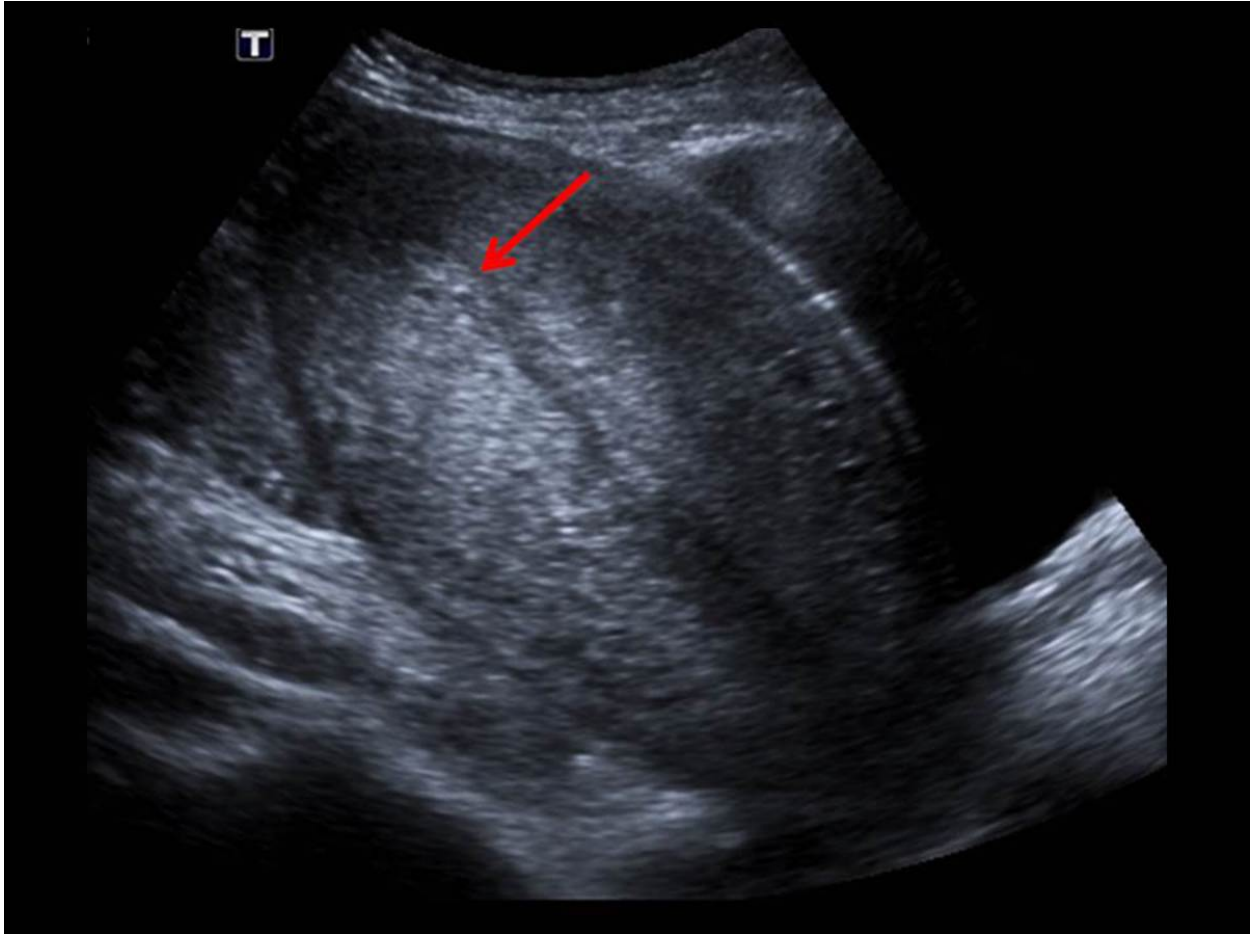


Fig. 1: Trans-abdominal ultrasound of the normal early stage post-partum uterus. The endometrium (arrow) appears as an echogenic stripe extending from the fundus to the internal cervical os.

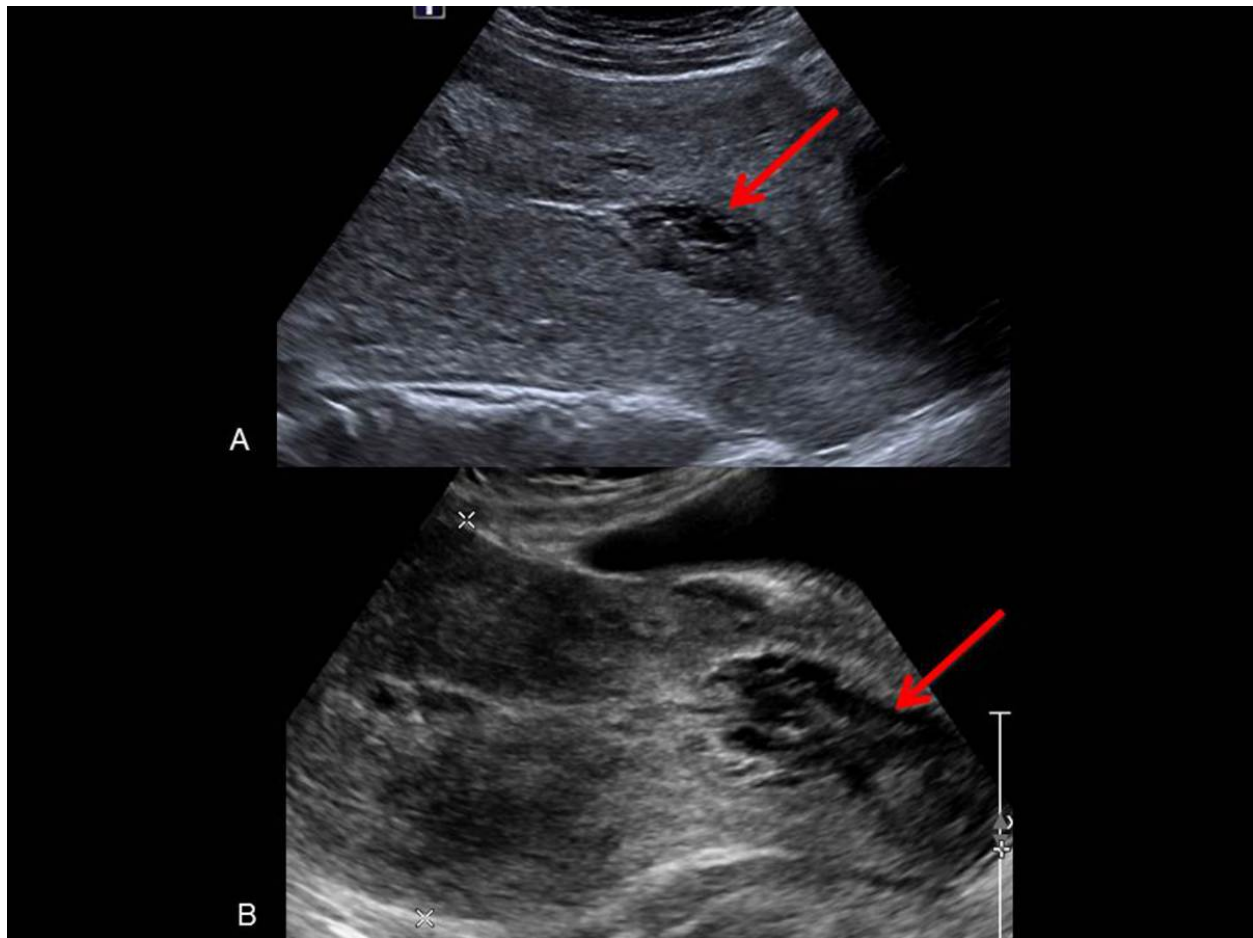


Fig. 2: Trans-abdominal ultrasound studies showing normal early stage post-partum appearance in two different patients. There is a heterogeneous solid and cystic mass at the uterocervical junction (A) and within the endocervical canal (B) (arrows) representing blood clots and shedding decidua.

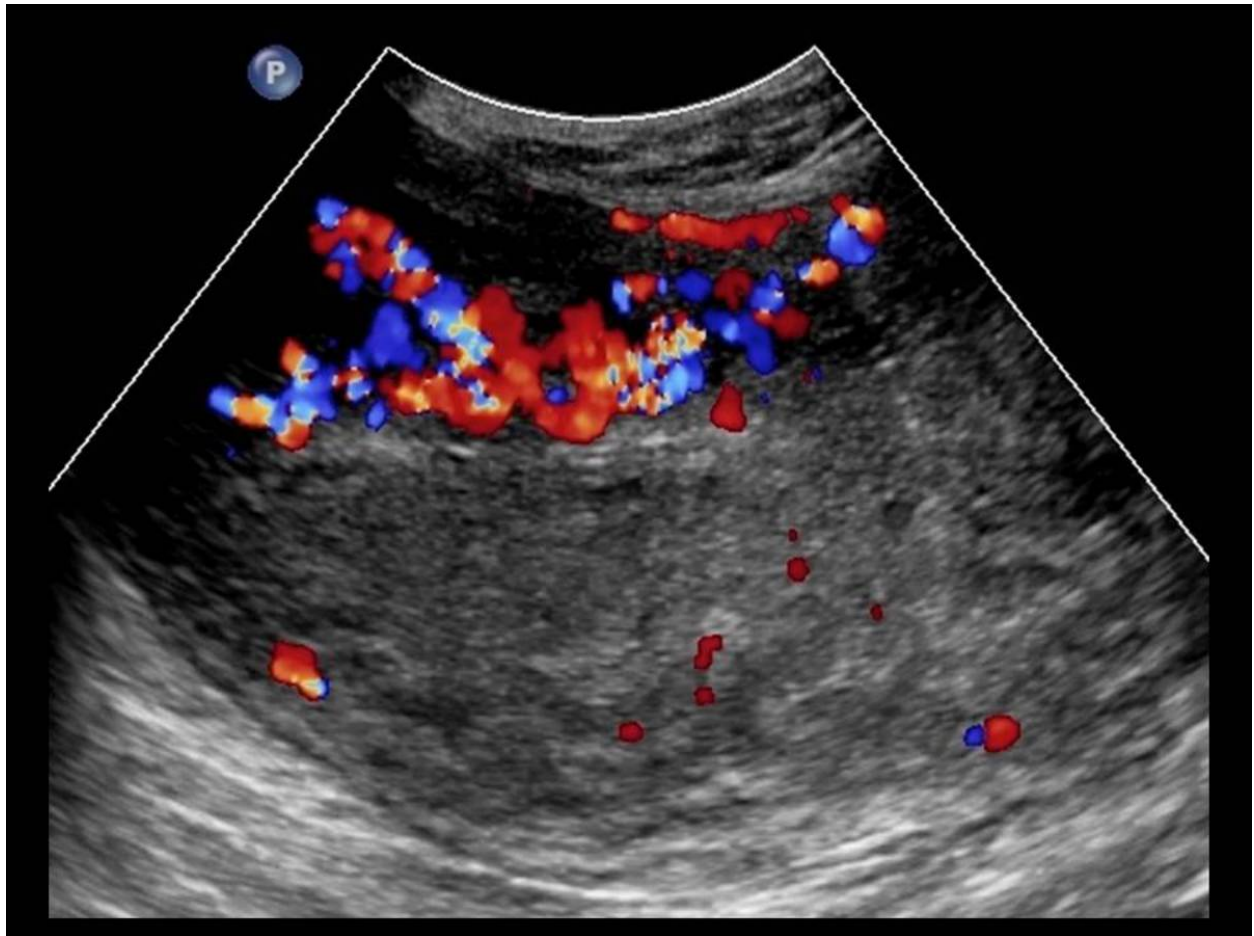


Fig. 3: Transabdominal ultrasound shows increased colour flow on Doppler imaging in keeping with the normal increased myometrial vascularity seen in the early stage post-partum uterus.

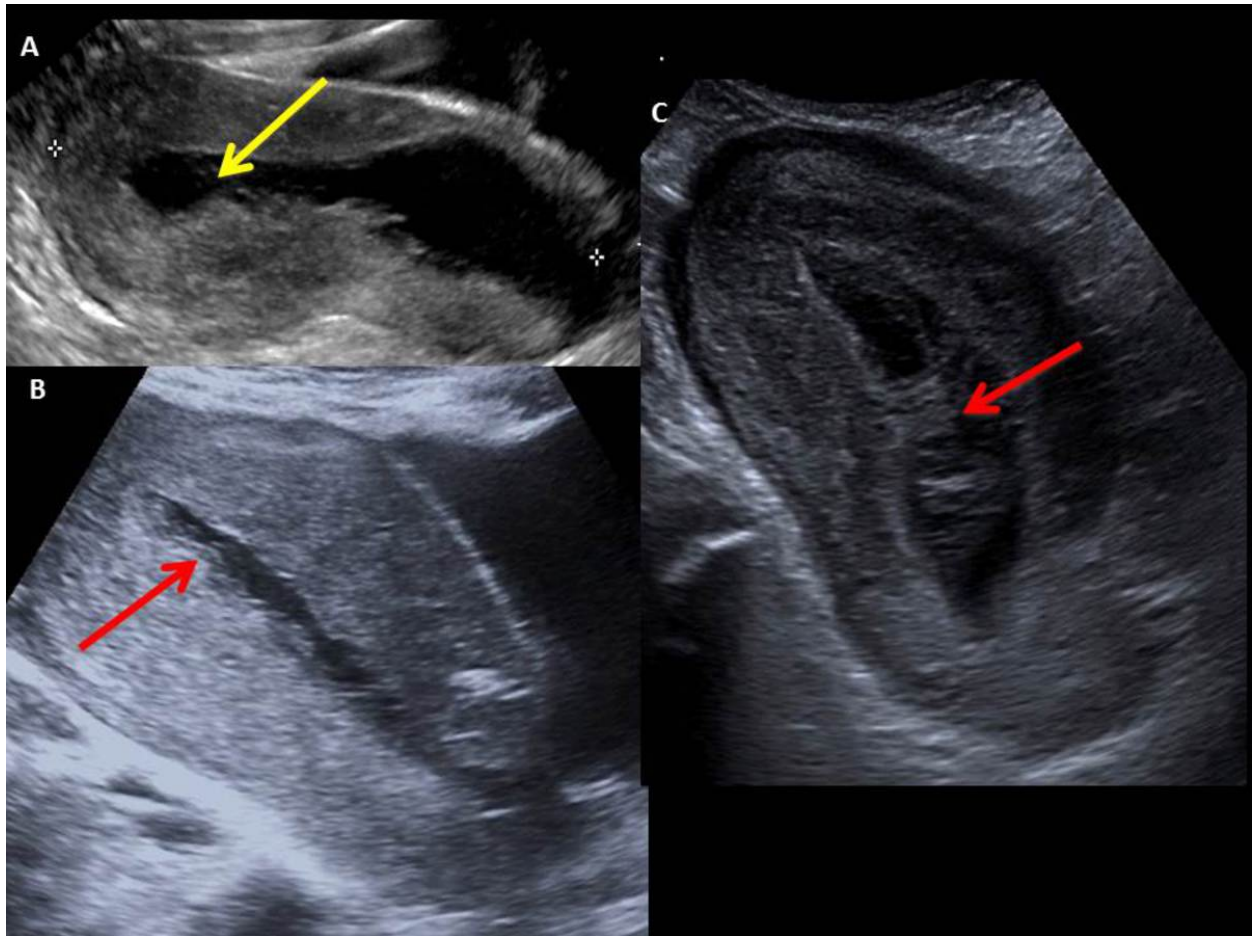


Fig. 4: Transabdominal ultrasound of the normal uterus in the middle post-partum stage in three different patients. The uterine cavity is filled with fluid mixed with echoes [A - yellow arrow] and solid components [B,C - red arrows]. This reflects the healing at the site of the placenta, necrosis of the retained decidua and shedding lochia.

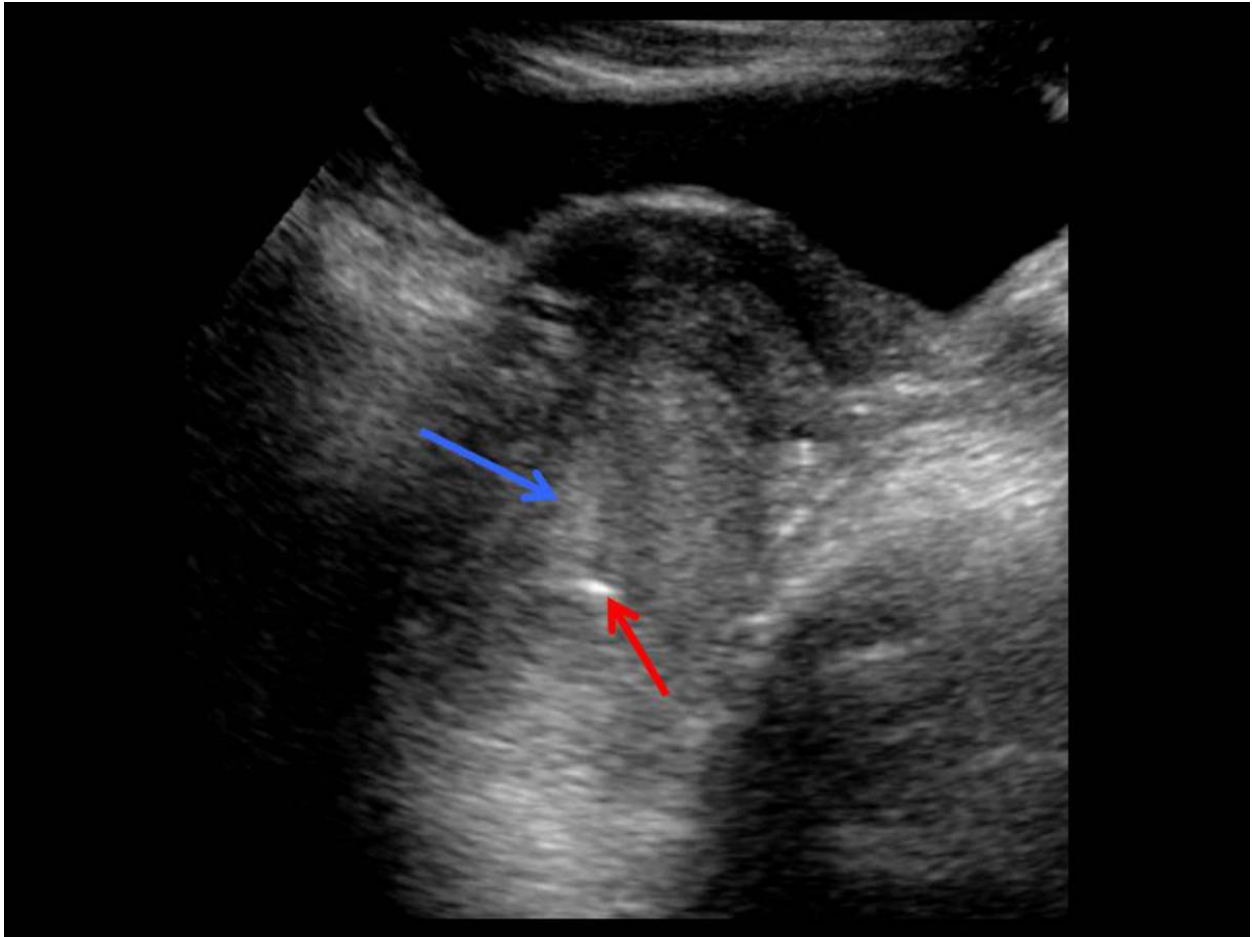


Fig. 5: Transabdominal ultrasound of post-partum uterus in the late post-partum stage. The uterus is retroverted and the endometrium appears as a thin white stripe (blue arrow). There is an echogenic focus at the fundus which is considered a normal imaging finding at this stage (red arrow).



Fig. 6: Normal post-partum appearance of the uterus on CT. Sagittal CT [A] of the pelvis shows a hypodense uterine cavity due to presence of fluid (red arrow). Post contrast axial CT [B] of the pelvis shows prominent vascular channels that appear as dense dots in the outer aspect of the myometrium (yellow arrow).

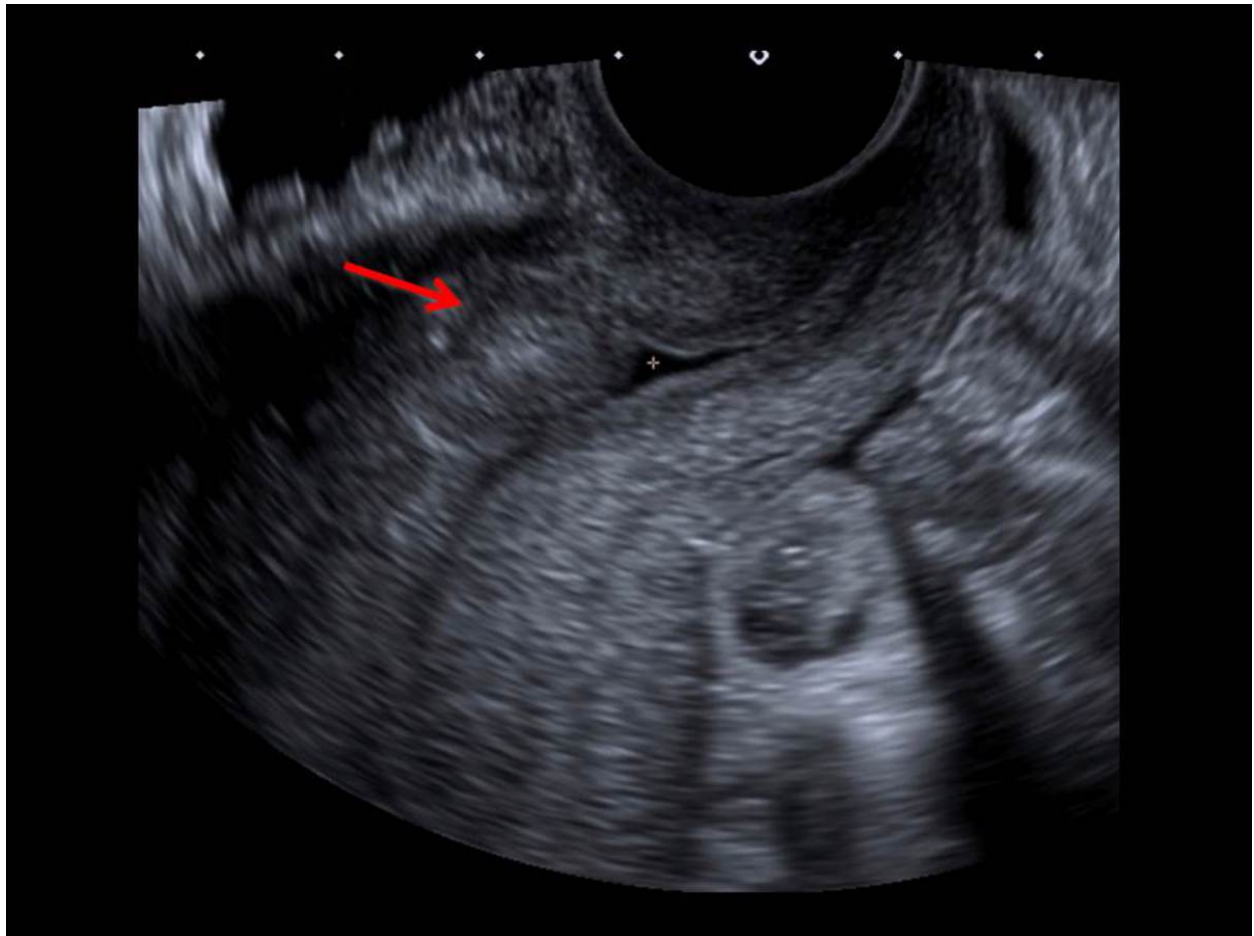


Fig. 7: Normal appearance of a Caesarean section incision on a longitudinal endovaginal ultrasound image of the uterus. There is an oval slightly hypoechoic area (red arrow) representing oedema at the site of the surgical incision in the anterior lower uterine segment.

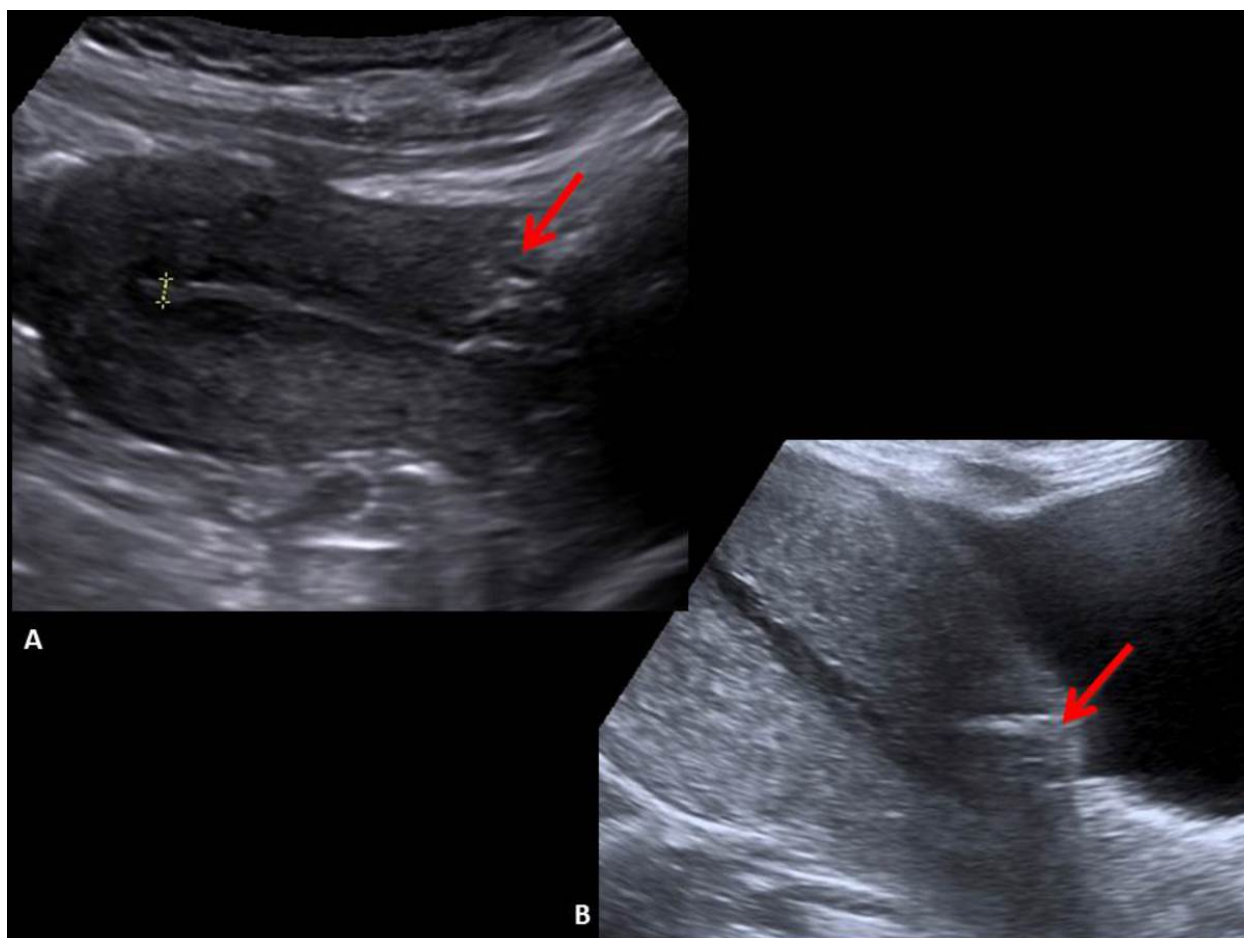


Fig. 8: Normal transabdominal ultrasound appearance in two different patients following Caesarean section. There are echogenic lines and dots at the site of myotomy which are related to suture material (red arrows).

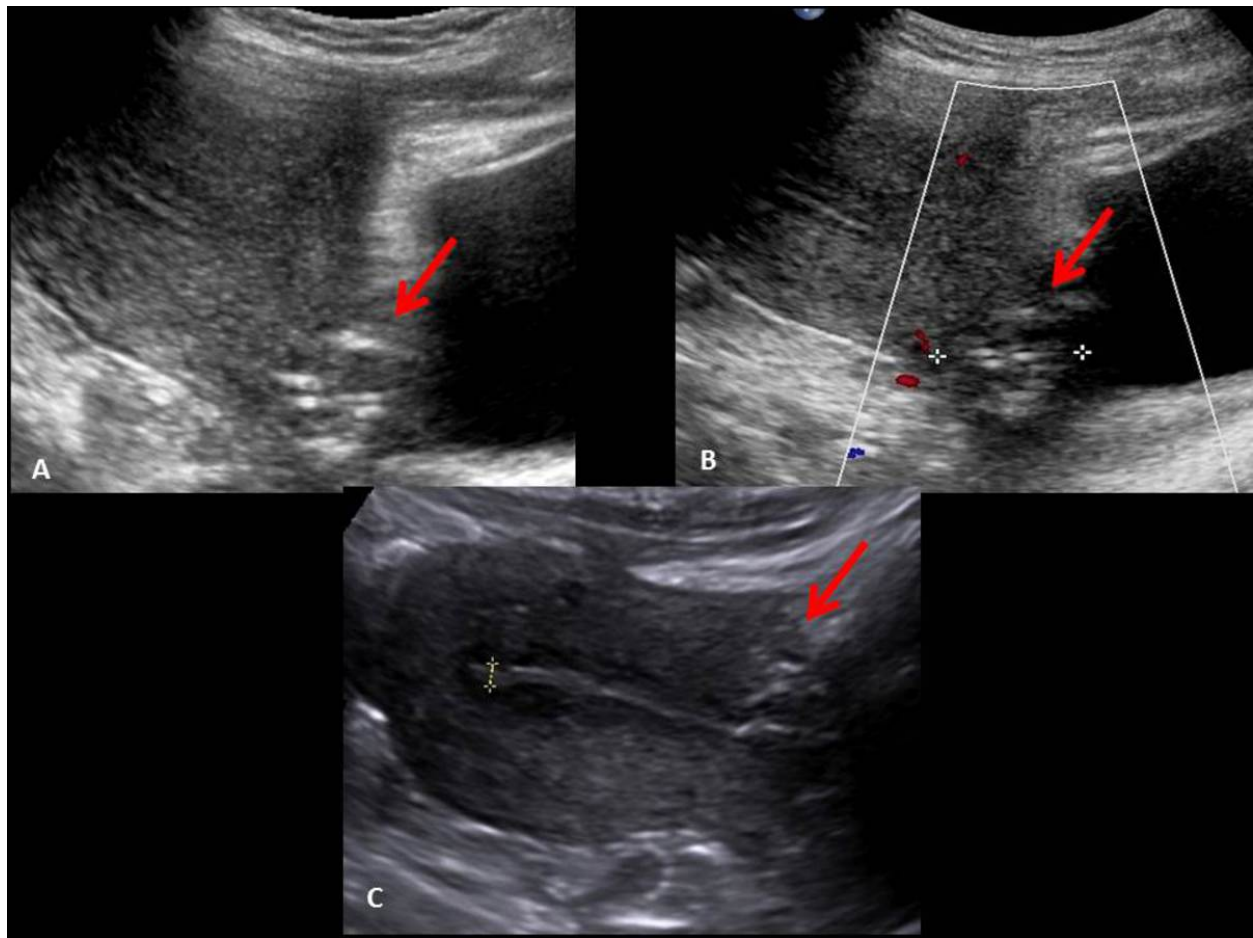


Fig. 9: A series of ultrasound images of a patient presenting with abdominal pain 2 weeks post delivery. Initial ultrasound [A-B] shows a hypoechoic lesion with multiple hyperechoic lines and dots in the vesicouterine pouch (red arrows). No associated vascularity identified on colour Doppler imaging [B]. This was initially interpreted as a collection however, this is a normal post-Caesarean section finding and should not be misdiagnosed as a collection. A subsequent ultrasound showed more typical appearances of the suture material [C].

Findings and procedure details

Post-partum complications

Complications can be divided into obstetric (related to the pregnancy, delivery and post-partum state) and incidental / non-obstetric categories. Obstetric complications are further divided into intra- and extra-uterine [Table 4].

Table 4: Complications encountered in the post-partum period.

Uterine	Extra-uterine	Non-obstetric
<ul style="list-style-type: none"> • Post-partum haemorrhage • Retained products of conception • Placenta accreta • Endometritis • Caesarean-related • Fibroid degeneration 	<ul style="list-style-type: none"> • Pelvic infection • Thrombosis: ovarian & pulmonary • Serositis • Pituitary haemorrhage • Pelvic/wound haematoma 	<ul style="list-style-type: none"> • Appendicitis • Lobar nephronia

Uterine Complications: Post-partum haemorrhage (PPH)

Post-partum haemorrhage is one of the leading causes of maternal mortality worldwide. It is classified as primary PPH when it occurs within the first 24 hours after delivery and as secondary PPH from 24 hours to 12 weeks post delivery [4, 22]. Different modalities can be used to diagnose the cause depending on the clinical condition of the patient. These are summarised in Table 5.

Table 5: How to image post-partum bleeding

	Clinical scenario	Optimal modality	imaging	Summary findings	of
Mild Bleeding	<ul style="list-style-type: none"> • Ongoing bleeding but 	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • Ultrasound 	<ul style="list-style-type: none"> • Echogenic mass in 	

	haemodynamically stable	(MRI for problem solving)	endometrial cavity
Moderate Bleeding	<ul style="list-style-type: none"> Ongoing moderate bleeding with haemodynamic stability 	<ul style="list-style-type: none"> Ultrasound Dual phase CT scan: arterial and portal venous 	<ul style="list-style-type: none"> Arterial blush which enlarges in the portal venous phase
Severe Bleeding	<ul style="list-style-type: none"> Heavy bleeding and haemodynamically unstable. 	<ul style="list-style-type: none"> Dual phase CT scan: arterial and portal venous Angiography 	<ul style="list-style-type: none"> Active bleeding point seen on CT Angiographic blush of contrast amenable to uterine artery embolisation

[\[Fig. 10\]](#)
[\[Fig. 11\]](#)

Uterine Complications: Placenta accreta

This refers to a morbidly adherent placenta that can penetrate through the decidua basalis, myometrium and serosa and into the bladder anteriorly, with a risk of both antepartum and post partum haemorrhage. PPH occurs secondary to the inability of the lower segment of the uterus to contract effectively, large blood vessels in the placental bed and lower uterine segment, and incomplete removal of the placenta at Caesarean section due to its morbid adherence to the lower segment.

The diagnosis of placenta accreta is most often made on antenatal ultrasound however MRI can be used in equivocal cases to distinguish those women at high risk. If it not possible to remove the placenta completely at the time of delivery, it may be left in situ to resolve spontaneously, and resolution and shrinkage can be monitored by imaging [Fig 12].

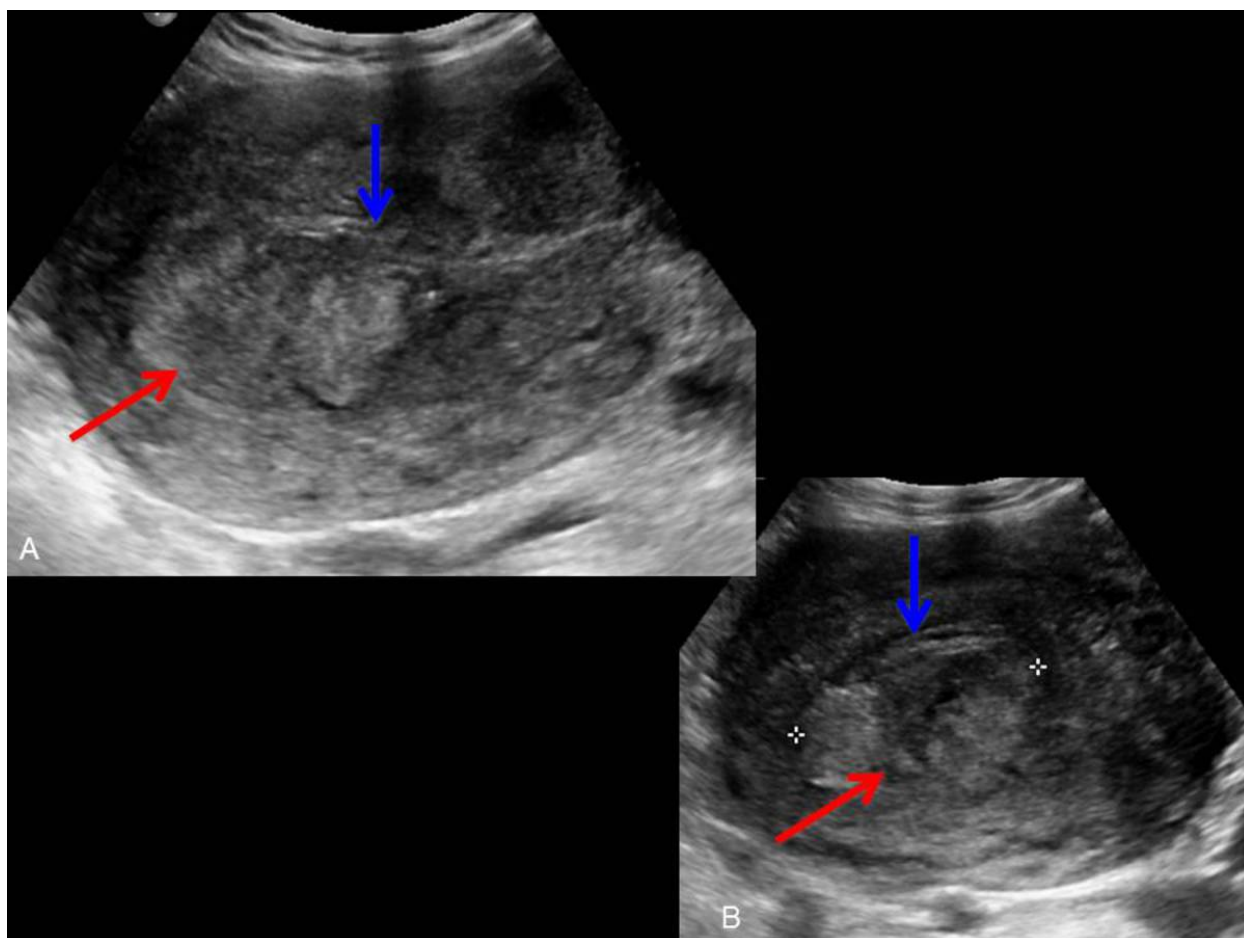


Fig. 12: Retroviral positive patient presenting with post-partum sepsis. Gray scale transabdominal ultrasound [A longitudinal, B transverse] shows a heterogeneous hyperechoic subendometrial mass lesion extending into the posterior myometrium (red arrows) which showed internal colour flow on Doppler imaging in keeping with vascularised tissue. The endometrial cavity is seen as a smooth hyperechoic line (blue arrow) in both images. Histopathology confirmed placenta accreta.

References: radiology, Imperial College NHS trust, Saint Mary's Hospital - London/UK

Interventional radiology can be life saving and uterus sparing for the treatment of massive PPH. Prophylactic placement of catheters for balloon occlusion or embolisation if bleeding ensues are used for management of massive haemorrhage [23].

Uterine Complications: Retained products of conception (RPOC)

Combined grey-scale and colour Doppler ultrasound is the first-line imaging modality in the diagnosis of suspected RPOC. The most common finding is an echogenic mass within the endometrial cavity [Fig 13].

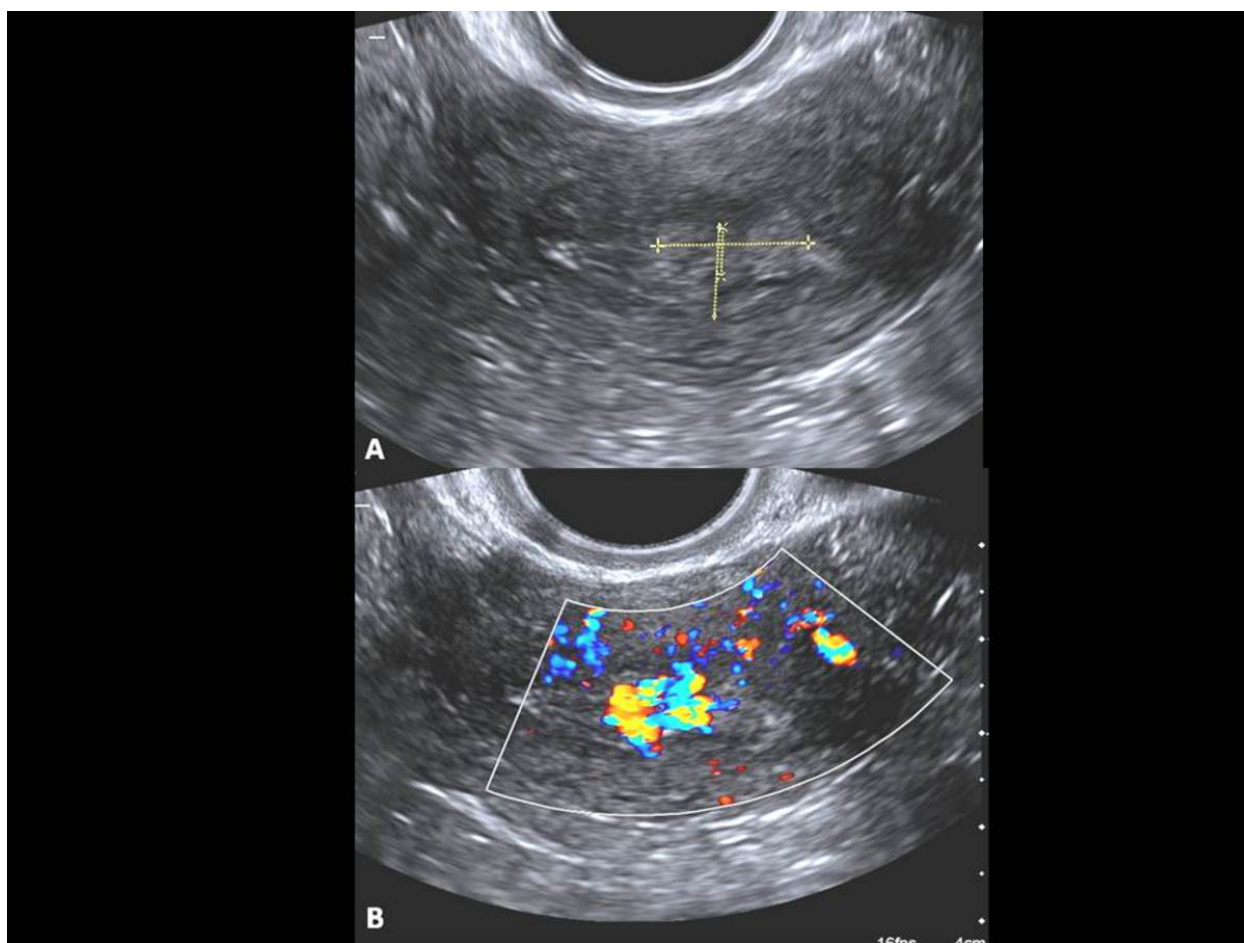


Fig. 13: Transvaginal ultrasound showing a hyperechoic lesion at the fundus of the uterus [A] with increased vascularity on the color Doppler [B] indicative of retained products of conception.

References: radiology, Imperial College NHS trust, Saint Mary's Hospital - London/UK

However, this is also a common normal post-partum finding (see above) and colour Doppler is used to help differentiate blood clot from RPOC [24] [Fig 14].

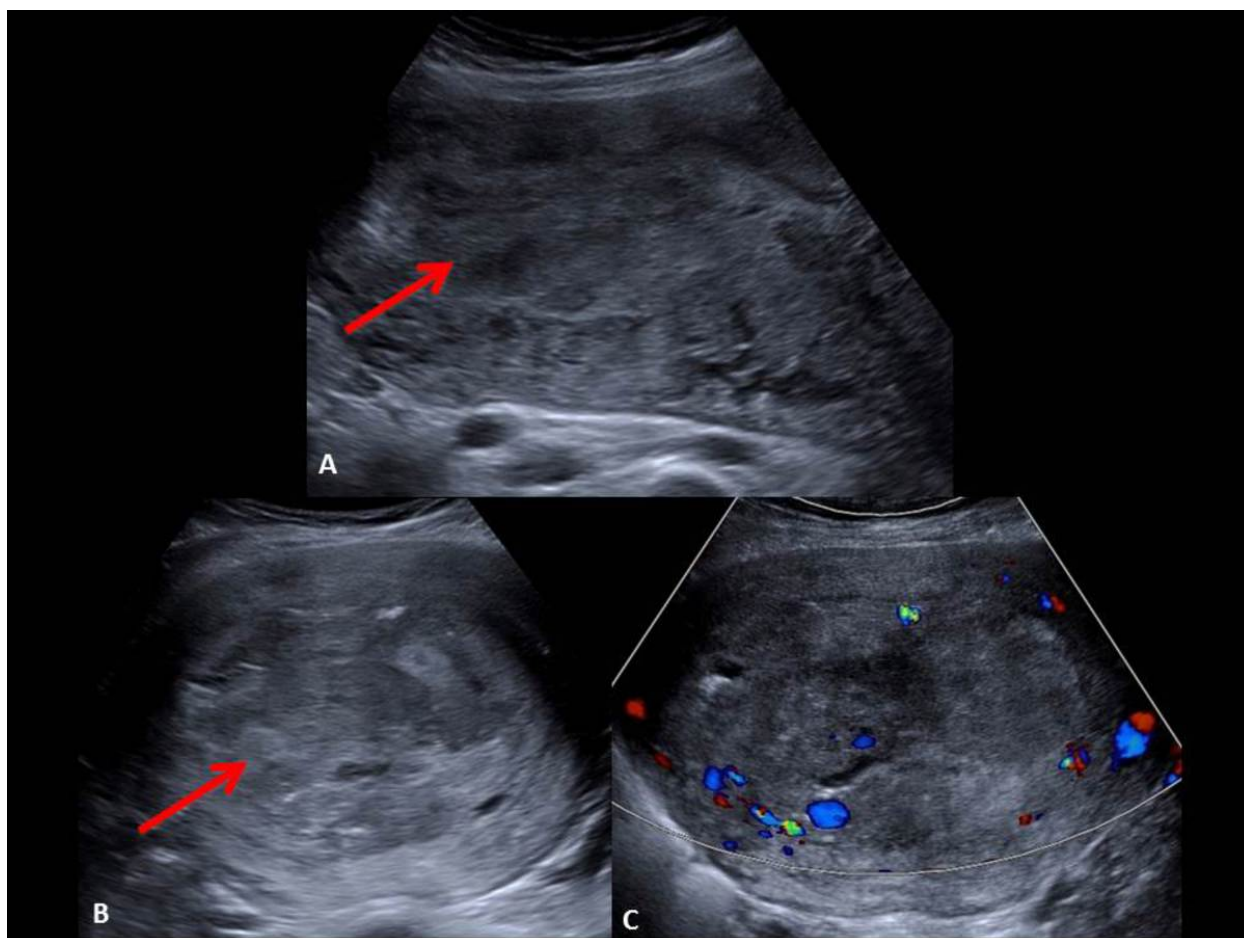


Fig. 14: Transabdominal ultrasound [A, sagittal; B, transverse] of a patient presenting with passage of heavy lochia 2 days post spontaneous vaginal delivery. The uterine cavity is distended and filled with heterogeneous hyperechoic material (red arrows). Note is made of internal colour Doppler flow [C] in keeping with vascularised retained products of conception.

References: radiology, Imperial College NHS trust, Saint Mary's Hospital - London/UK

The literature also suggests that thickening of the endometrial stripe to greater than 10-13 mm is suggestive of RPOC [25] [Fig 15].

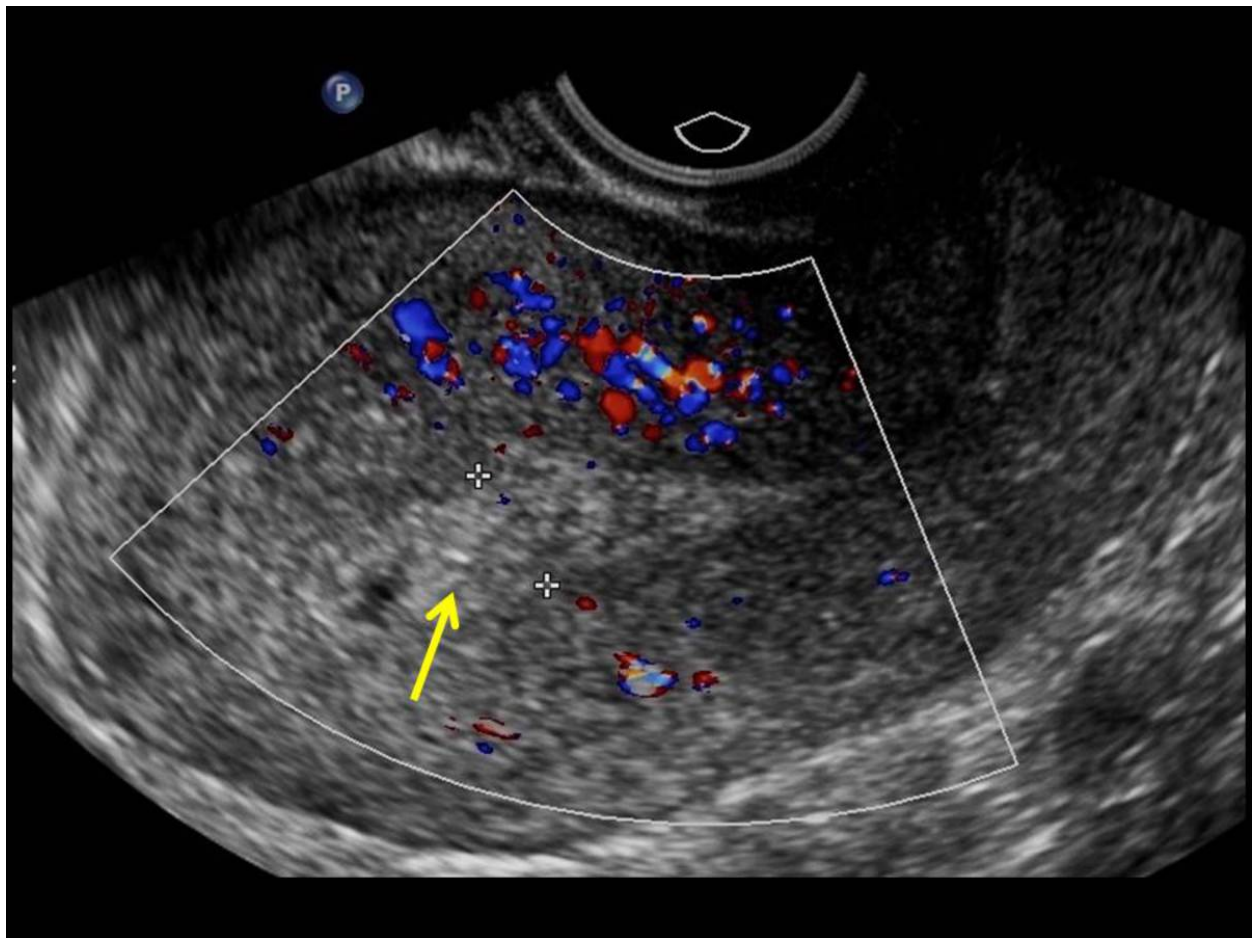


Fig. 15: Transvaginal ultrasound of a patient presenting with persistent bleeding 3 weeks post delivery. There is thickening of the endometrial stripe (yellow arrows). Despite the absence of increased vascularity on colour Doppler imaging, this represented retained products of conception.

References: radiology, Imperial College NHS trust, Saint Mary's Hospital - London/UK

On CT scan RPOC can appear as a hypodense focal widening of the uterine cavity [Fig 16].

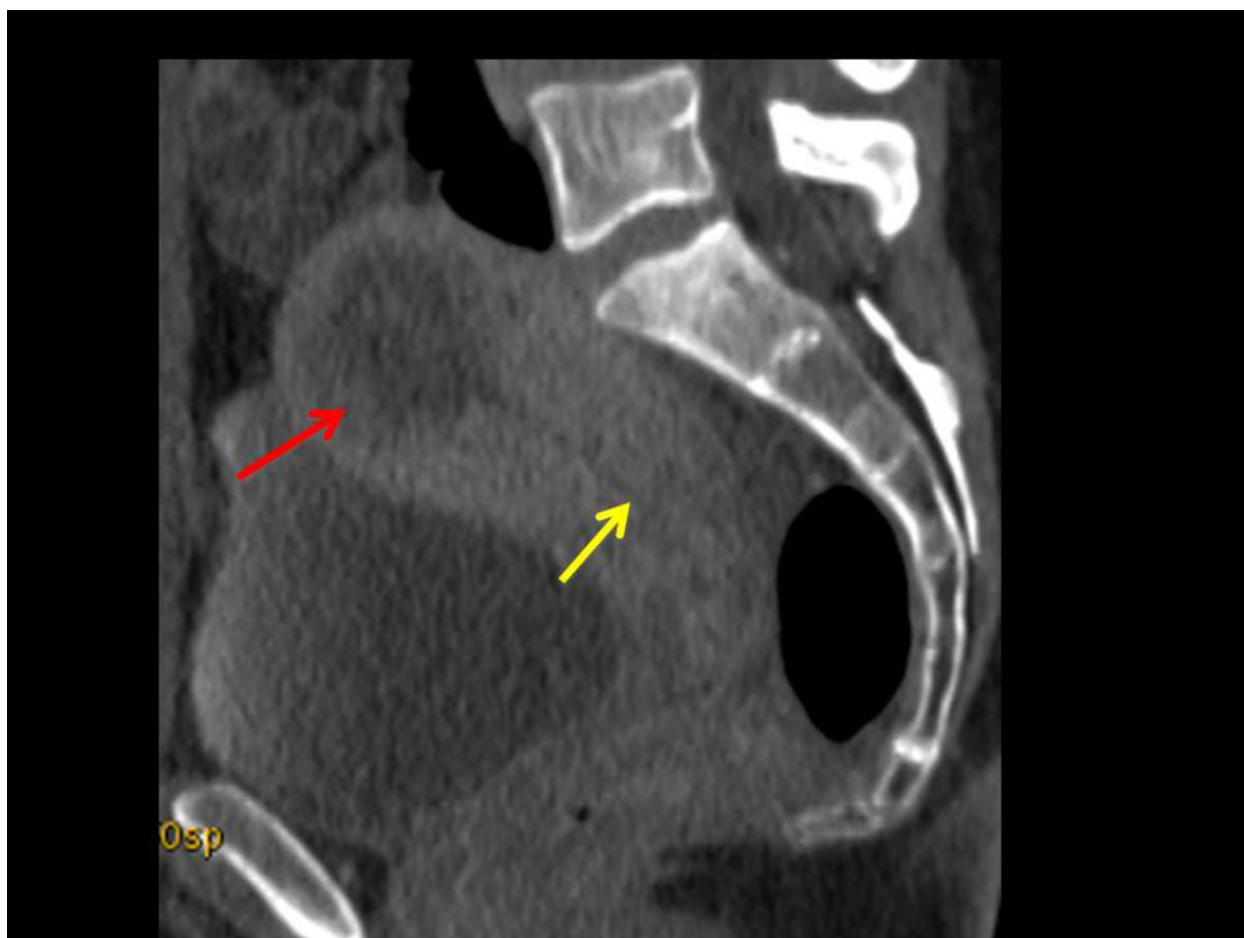


Fig. 16: Sagittal reconstruction of a CT through the pelvis showing focal widening of at the uterine fundus (red arrow) denoting retained products of conception (RPOC). The patient presented three and a half weeks post-Caesarean section with fever and haematuria. Note the uterine cavity line (yellow arrow).

References: radiology, Imperial College NHS trust, Saint Mary's Hospital - London/UK

Uterine Complications: Endometritis

Endometritis is the most common cause of post-partum fever with 30 times increased risk following Caesarean section. The diagnosis is clinical (pelvic pain, uterine tenderness, offensive vaginal discharge, heavy or persistent vaginal bleeding, pyrexia, raised inflammatory markers); however imaging can be used to guide the management [26]. There is significant overlap in the imaging findings of endometritis and normal post-partum uterus. Air in the uterine cavity is an important imaging finding in endometritis [Figs 17-19], but is also found in the normal post-partum uterus for up to 3 weeks following delivery. The presence of echogenic substance can also be normal rather than due to retained products of conception [26]. The most important issue is to rule out the presence of retained products of conception as this will change the management from antibiotic treatment to surgical evacuation.

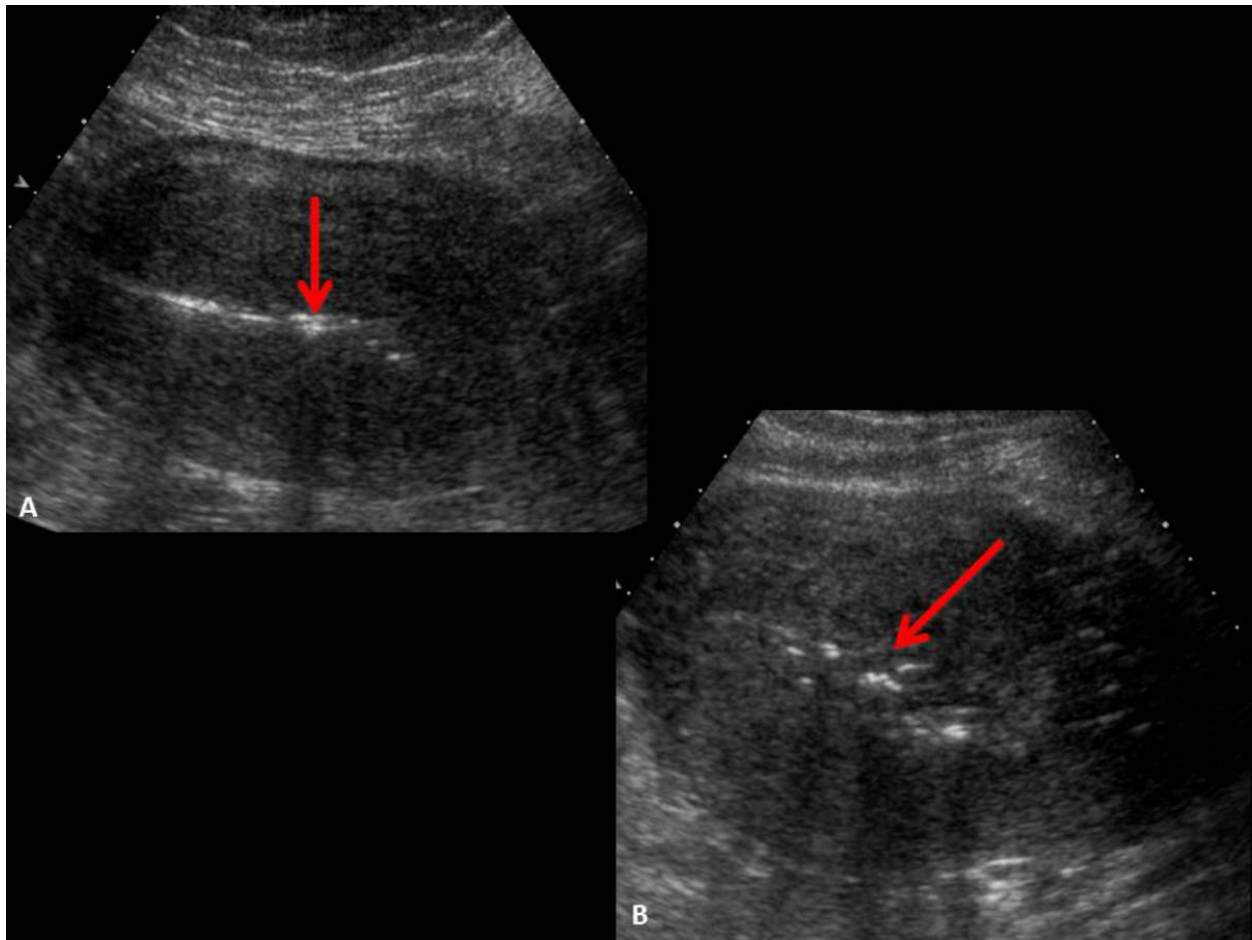


Fig. 17: Patient presented with fever 6 days post caesarean section. Transabdominal ultrasound shows numerous hyperechoic dots in the uterine cavity (red arrows) in keeping with air and raising the possibility of endometritis.

References: radiology, Imperial College NHS trust, Saint Mary's Hospital - London/UK

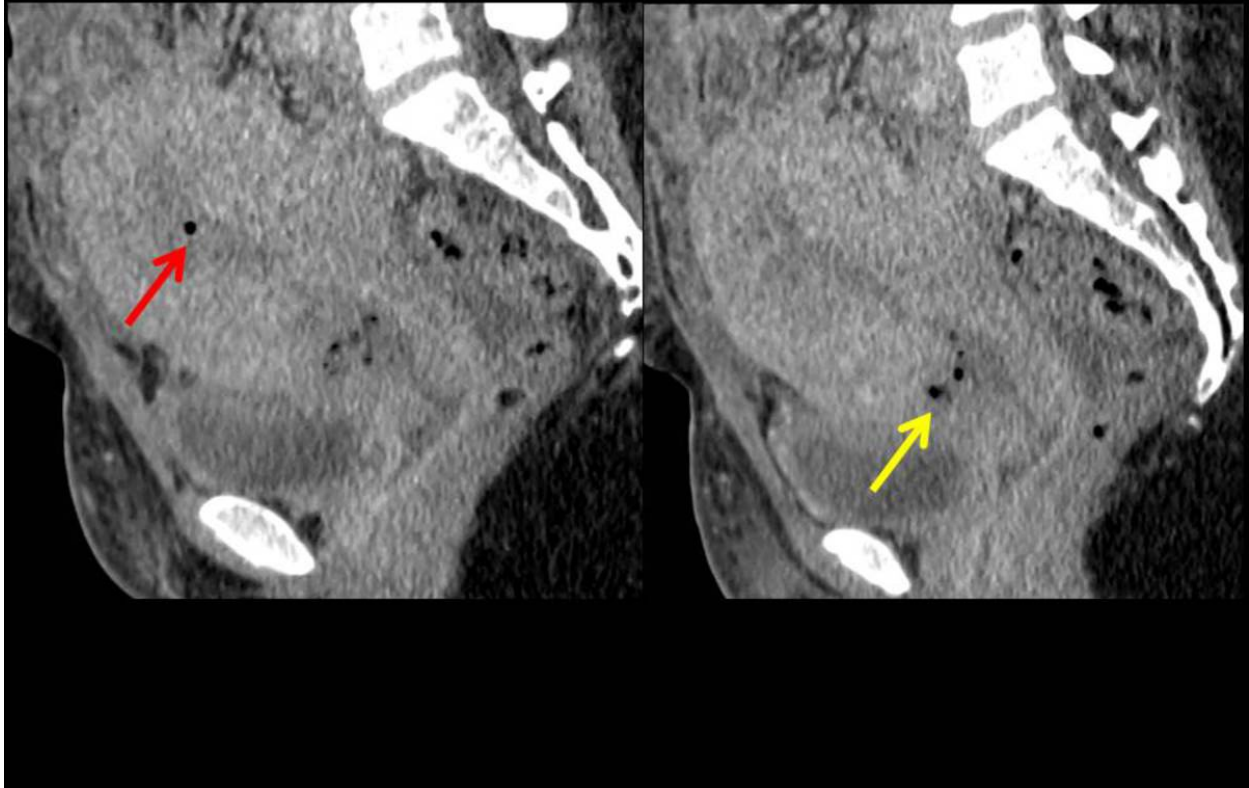


Fig. 18: Post-partum imaging following emergency Cesarean section for sepsis secondary to chorioamnionitis. Sagittal reconstructions of a post-contrast CT scan of the pelvis show air in the uterine cavity (red arrow) and extending along the Caesarean section myotomy (yellow arrow) in keeping with endometritis and wound infection.

References: radiology, Imperial College NHS trust, Saint Mary's Hospital - London/UK

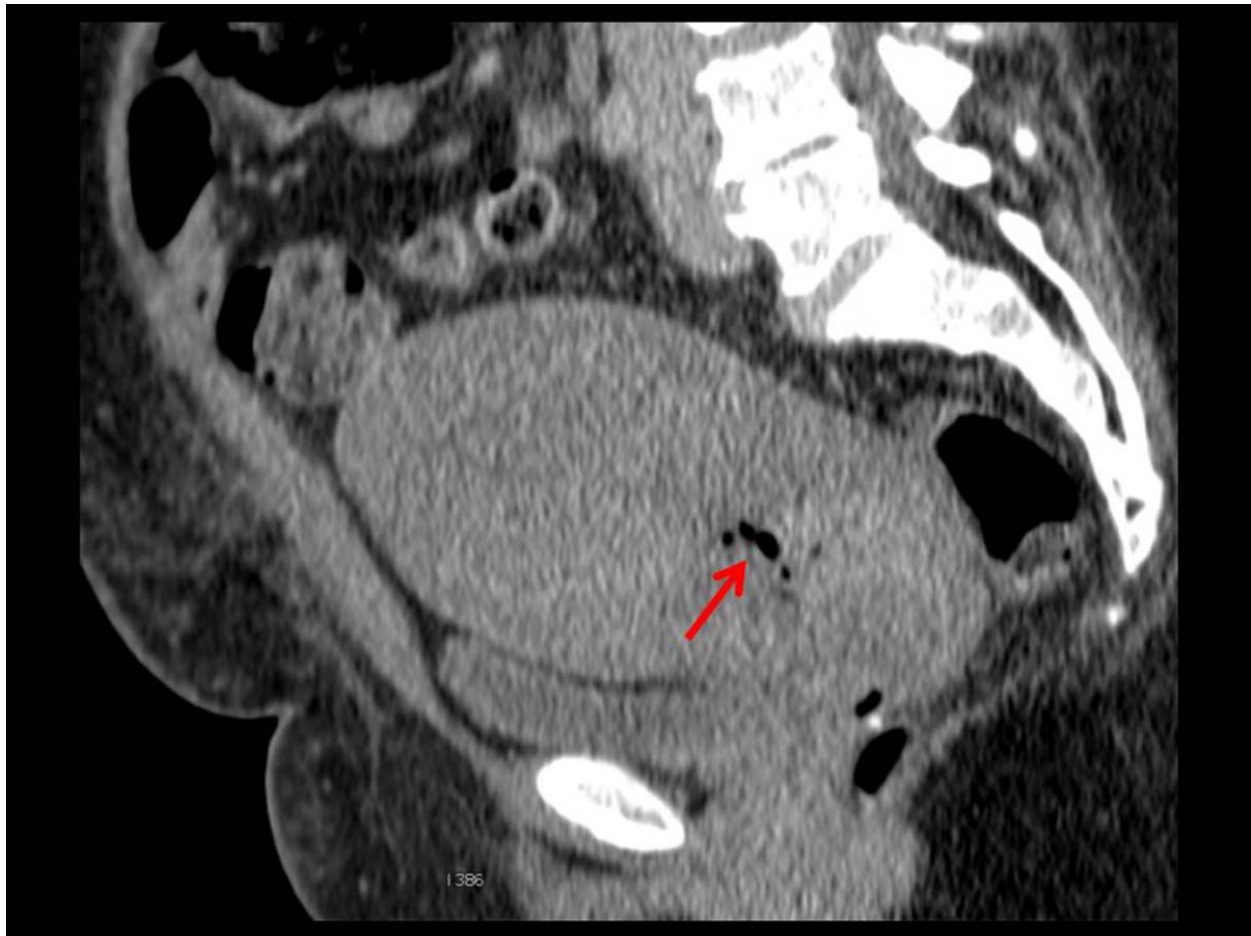


Fig. 19: Sagittal reconstruction through the pelvis of a young female presenting with fever and abdominal pain 5 days post-Caesarean section. The CT scan shows air in the uterine cavity (red arrow). Culture of vaginal swabs showed scanty growth of *Staphylococcus aureus*.

References: radiology, Imperial College NHS trust, Saint Mary's Hospital - London/UK

Uterine Complications: Caesarean section-related

There are a wide range of complications that can occur. The most common are infections, pelvic collections, and haematomas, which may occur anywhere between the uterus and skin [Table 6]. Ultrasound and CT scan are routinely used for the diagnosis of most complications.

Table 6: The range of complications that can occur post-Caesarean section.

Skin

Muscle

Uterus

Complication

- Wound infection
- Infected haematoma [[Fig. 20](#)]
- Abscess formation
- Anterior abdominal wall haematoma [[Fig. 21](#)].
- Abscess formation
- Endometritis
- Haematoma in the lower uterine segment [[Fig. 22](#)], in the extra-peritoneal pre-vesical space [[Fig. 23](#)].
- Uterine rupture
- Ovarian and pelvis thrombophlebitis [8].

Other Uterine Complications

Other uterine complications are related to pre-existing pathology within the uterus, such as a fibroid undergoing degeneration [Fig 24, 25].

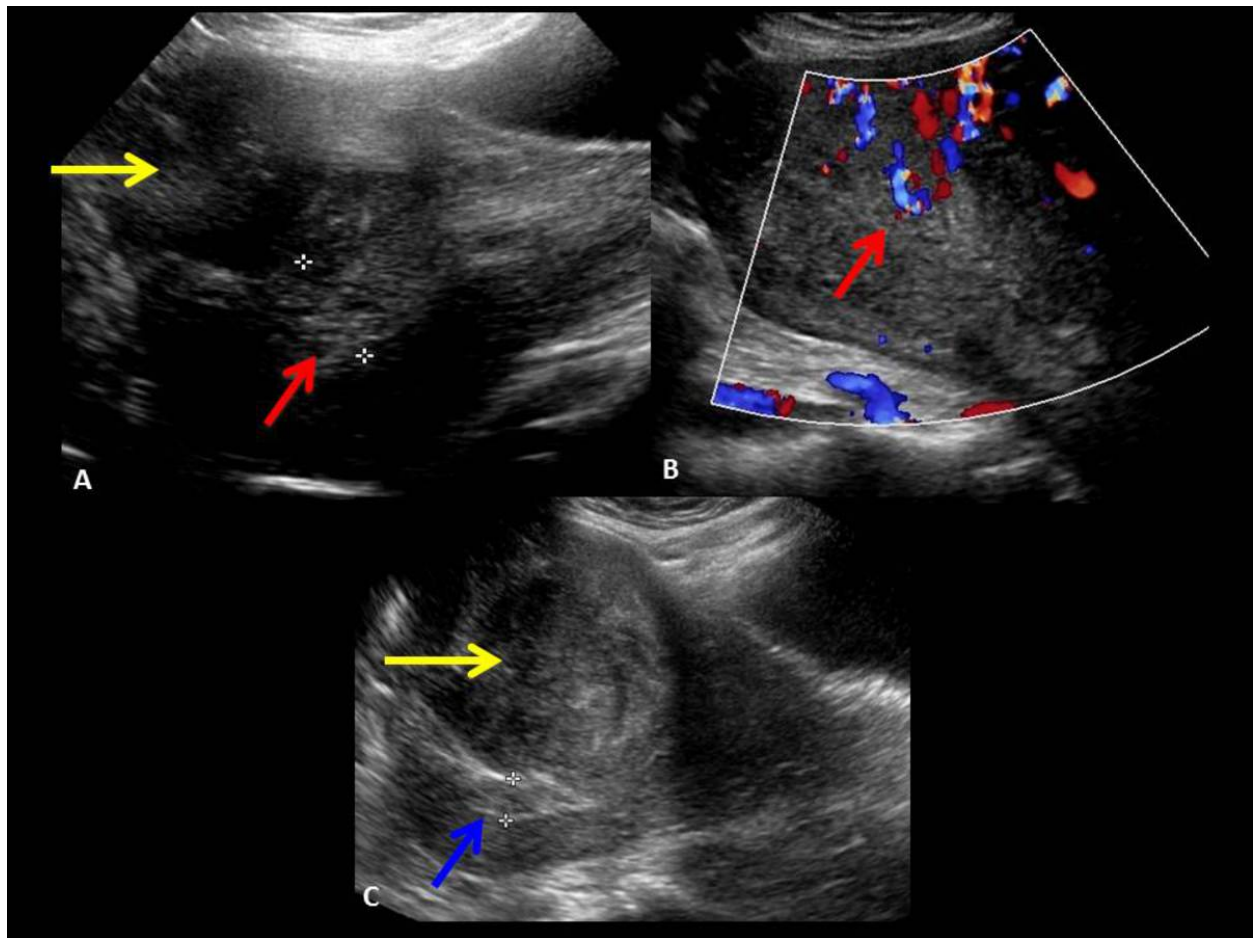


Fig. 24: Transabdominal ultrasound images of the uterus of a patient presenting 3 weeks post delivery with abdominal pain and persistent bleeding [A, B]. The endometrium is thickened (red arrows) with increased vascularity on colour Doppler [B] in keeping with retained products of conception (RPOC). The patient re-presented with further pelvic pain following dilatation and curettage; subsequent ultrasound [C] shows a thin endometrium with fluid in the cavity (blue arrow) but no evidence of residual RPOC. An anterior myometrial fibroid was noted to have increased in size in the interval between scans (yellow arrow) and the patient experienced pain on scanning over this region, appearances are in keeping with fibroid degeneration.

References: radiology, Imperial College NHS trust, Saint Mary's Hospital - London/UK

Doppler ultrasound has an important role in the diagnosis of lower limb deep vein thrombosis (DVT) [28], and if DVT can be confirmed on ultrasound a patient can be started on appropriate anti-coagulant therapy without the need to proceed to the use of V/Q or CTPA. If ultrasound is negative and a high level of clinical suspicion exists, the woman should remain anticoagulated and ultrasound repeated in 1 week or an alternative diagnostic test employed. If repeat testing is negative, anticoagulant treatment should be discontinued. However, if the ultrasound is negative, further imaging is necessary.

The choice of subsequent imaging technique (CTPA or V/Q scan) remains controversial. The obvious benefit for choosing one over the other rests with the breast radiation dose, which has been discussed earlier. However, CTPA has the added benefit of being able to assess for other intrathoracic pathology, which may also present in the post-partum period (pneumonia, pericardial disease). The decision is usually made on an individual patient basis taking into account the full clinical picture and degree of clinical suspicion [Fig 26].

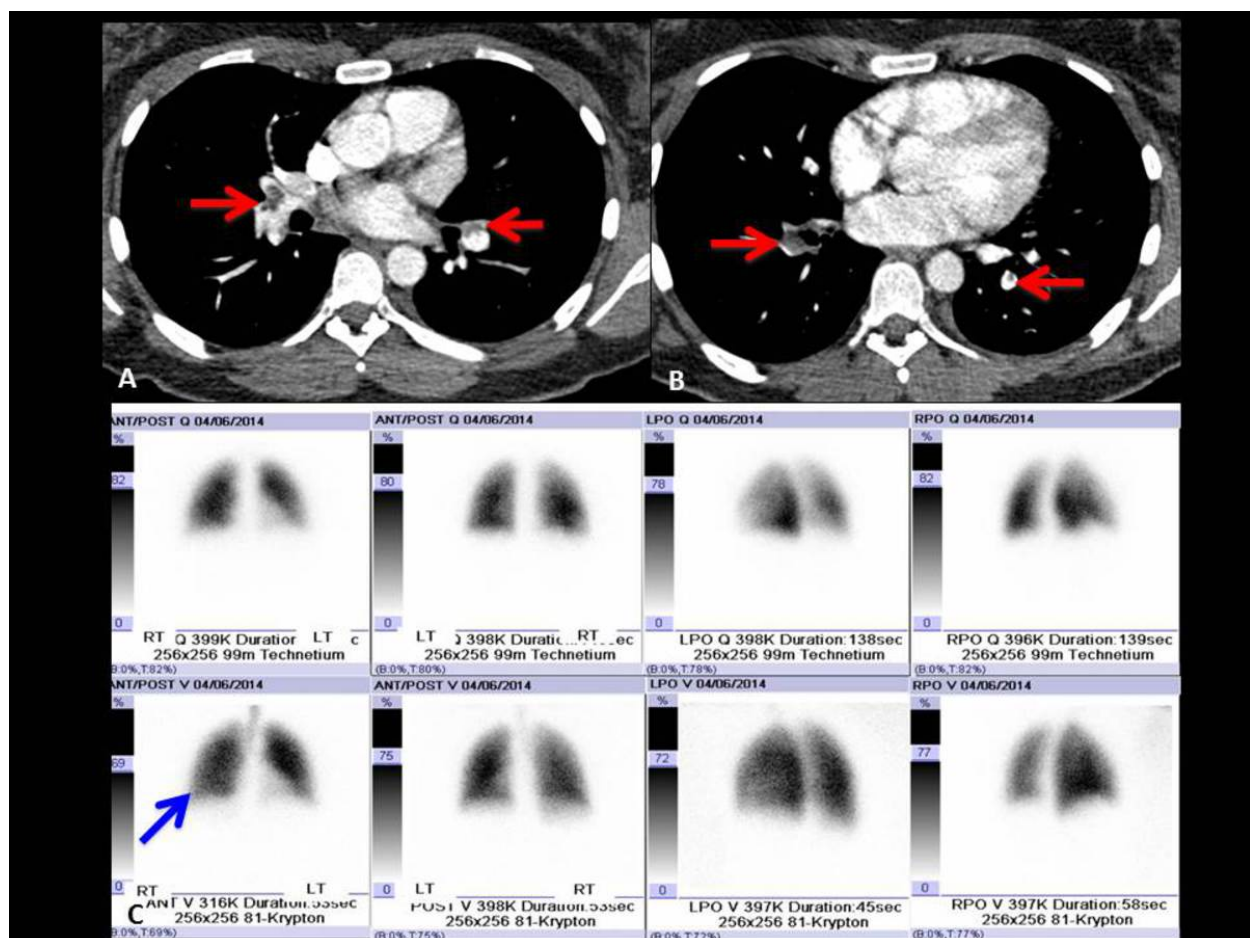


Fig. 26: [A,B] Axial CTPA slices through the chest in a patient presenting with shortness of breath and pleuritic chest pain 2 weeks post delivery. There are bilateral lobar pulmonary artery emboli (red arrows). [C] A follow up V/Q scan shows mild ventilation/perfusion mismatch in the right lower lobe indicative of a small residual embolic burden (blue arrow).

References: radiology, Imperial College NHS trust, Saint Mary's Hospital - London/UK

Extra-Uterine Complications: Ovarian vein thrombosis

The incidence of post-partum ovarian vein thrombosis is 1:2000 deliveries [24]. It is important to consider ovarian vein thrombosis in patients presenting in the post-partum period with an acute abdomen as this may avoid unnecessary surgery [Fig 27]. The patient usually presents in the first post-partum week with abdominal pain and fever. Differential diagnoses include acute appendicitis, pyelonephritis, ovarian torsion and tubo-ovarian abscess. Diagnosis is by CT scan or MRI. Ultrasound is operator dependent and can be used as a primary examination to rule out other causes. Treatment is with anticoagulants and antibiotics [29].



Fig. 27: A patient 3 days post spontaneous vaginal delivery presenting with right iliac fossa pain. Coronal reconstruction of a contrast-enhanced CT of the abdomen luminal filling defect within the right ovarian vein extending from the uterus to the right renal vein (red arrows).

References: radiology, Imperial College NHS trust, Saint Mary's Hospital - London/UK

Other extra-uterine complications

There are many more extra-uterine complications which are outside the scope of this review to discuss individually. We have come across haematomas in the adnexa [Fig 28] following vaginal delivery.

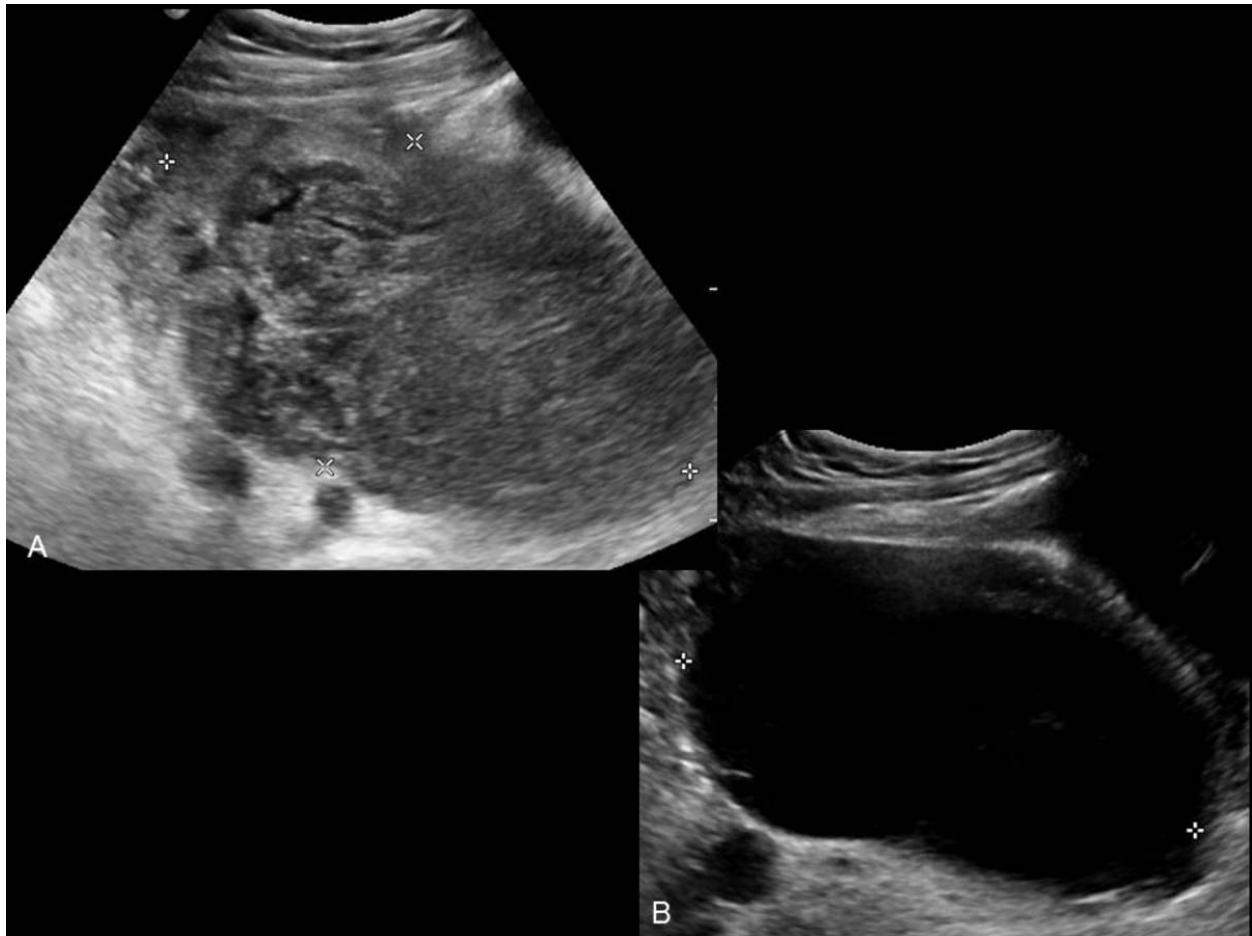


Fig. 28: Transabdominal ultrasound images of a patient presenting with fever and abdominal pain 3 weeks post spontaneous vaginal delivery. Figure [A] shows a large hyperechoic heterogenous mass in the right adnexa. A follow up scan [B] after a few weeks shows transformation of the mass into a cystic lesion. Aspiration of the lesion revealed a haemtoma.

References: radiology, Imperial College NHS trust, Saint Mary's Hospital - London/UK

Other complications include post-partum pituitary haemorrhage (Sheehan's syndrome), which is pituitary haemorrhage secondary to large post-partum haemorrhage and hypovolaemia [30][Fig 29].

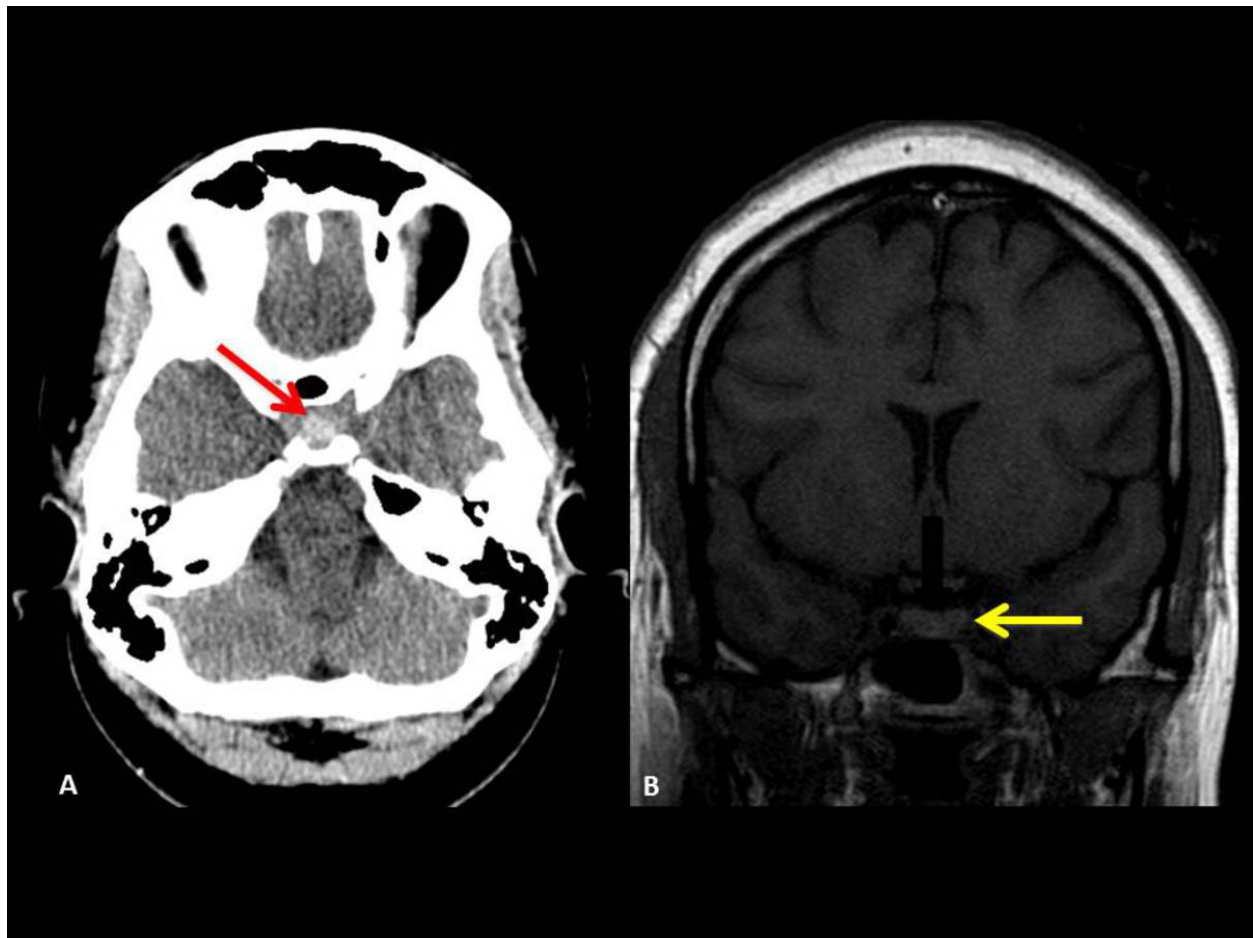


Fig. 29: Brain imaging of a patient presenting with headache, diplopia and sixth nerve palsy 1 week post-partum. An unenhanced CT scan of the head [A] shows high density within the pituitary gland (red arrow). A T1-weighted coronal image [B] shows mild diffuse increase in the signal intensity of the pituitary gland (yellow arrow) denoting haemorrhage (Sheehan's syndrome).

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Non-Obstetric Complications

There are a number of non-obstetric complications that can present incidentally in the post-partum period, but we will only mention briefly acute appendicitis and lobar nephronia.

The diagnosis of acute appendicitis should be prompt because this patient group presents with a higher than usual proportion of appendiceal rupture. This is partly because of the atypical presentation and the ectopic position of the appendix (migrates superiorly to accommodate for the enlarging uterus) [15] [Fig 30].

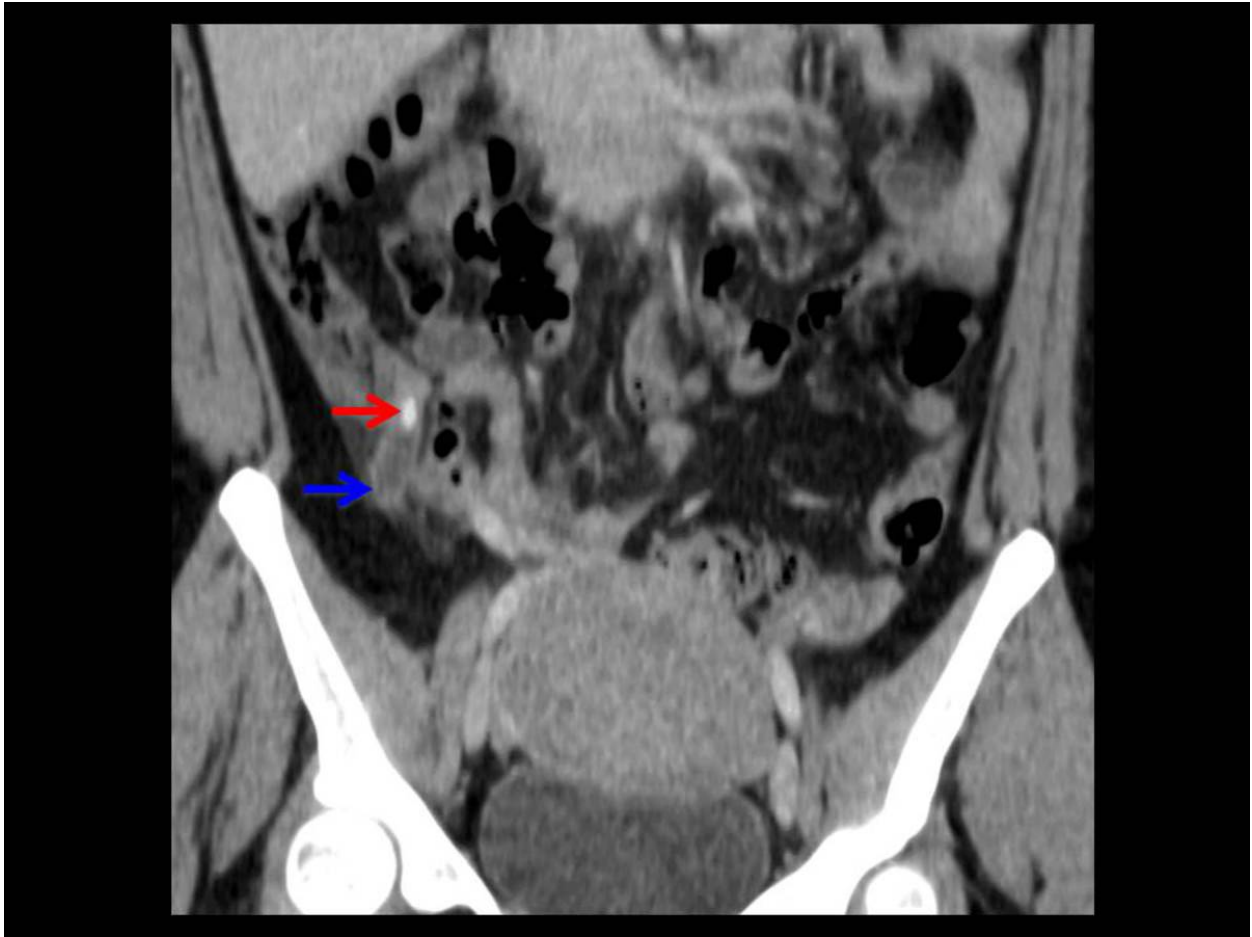


Fig. 30: Coronal reconstruction of a CT abdomen of a patient 3 weeks post-partum presenting with right iliac fossa pain. The CT shows a fluid-filled, distended appendix with mural enhancement denoting acute appendicitis (blue arrow) with an obstructing appendicolith (red arrow).

References: radiology, Imperial College NHS trust, Saint Mary's Hospital - London/UK

In our clinical practice we have also encountered a case of lobar nephronia [Fig 31] in a post-partum patient presenting with sepsis and dysuria.



Fig. 31: Contrast-enhanced CT scan of the abdomen of a patient presenting with fever and haematuria 3 weeks post-Caesarean section. There is a hypodense non-enhancing area in the left renal cortex (red arrow) denoting lobar nephronia.

References: radiology, Imperial College NHS trust, Saint Mary's Hospital - London/UK

Images for this section:

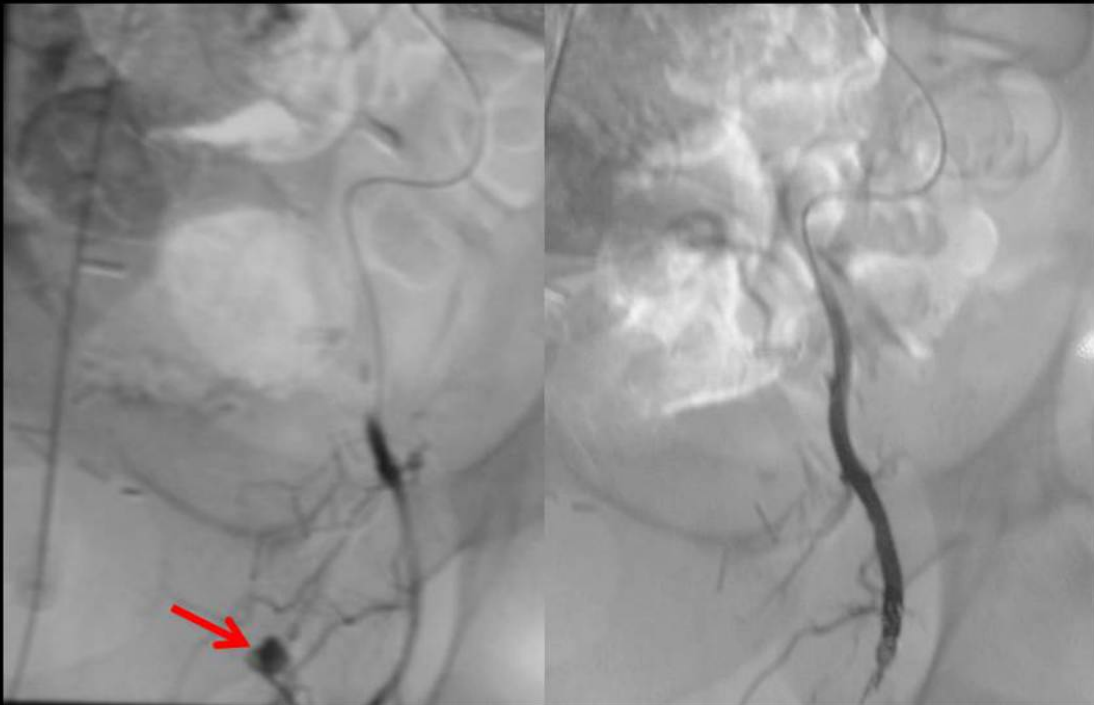


Fig. 10: Angiographic images of a patient presenting with uncontrolled post-partum haemorrhage post spontaneous vaginal delivery. [A] A blush of contrast is seen from a branch of the vaginal artery (red arrow) due to birth canal laceration. [B] Post embolisation angiography demonstrates successful embolisation.

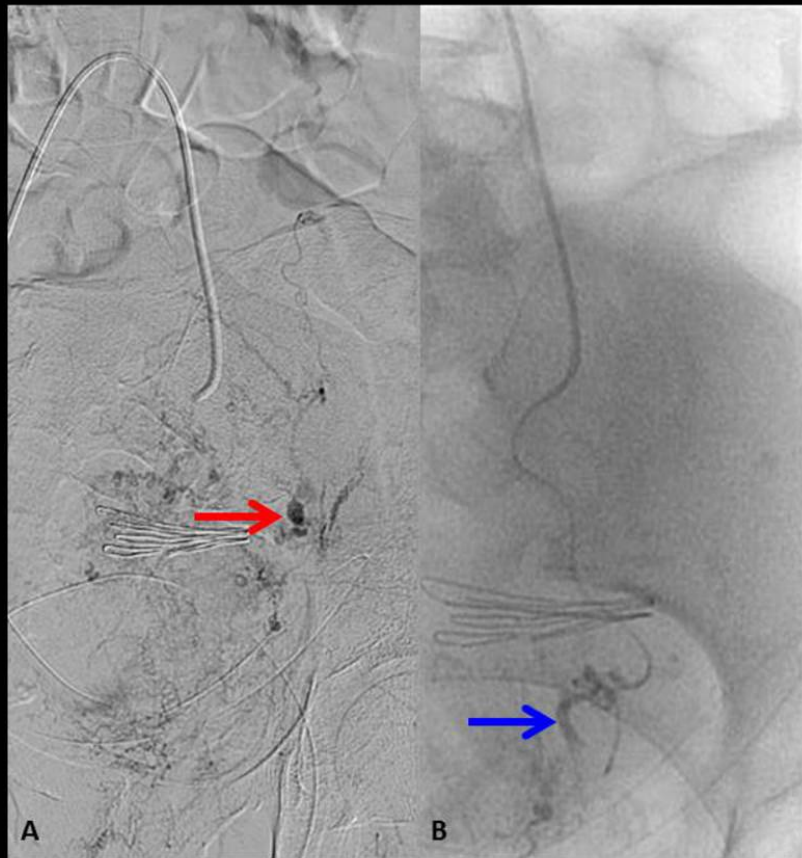


Fig. 11: Angiographic images of a patient presenting with uncontrolled post-partum haemorrhage following Caesarean section. [A] Selective angiography of the left uterine artery shows a blush of contrast (red arrow) denoting active haemorrhage. [B] Post embolisation images show stagnation of contrast in a branch of the uterine artery (blue arrow) denoting successful embolisation.

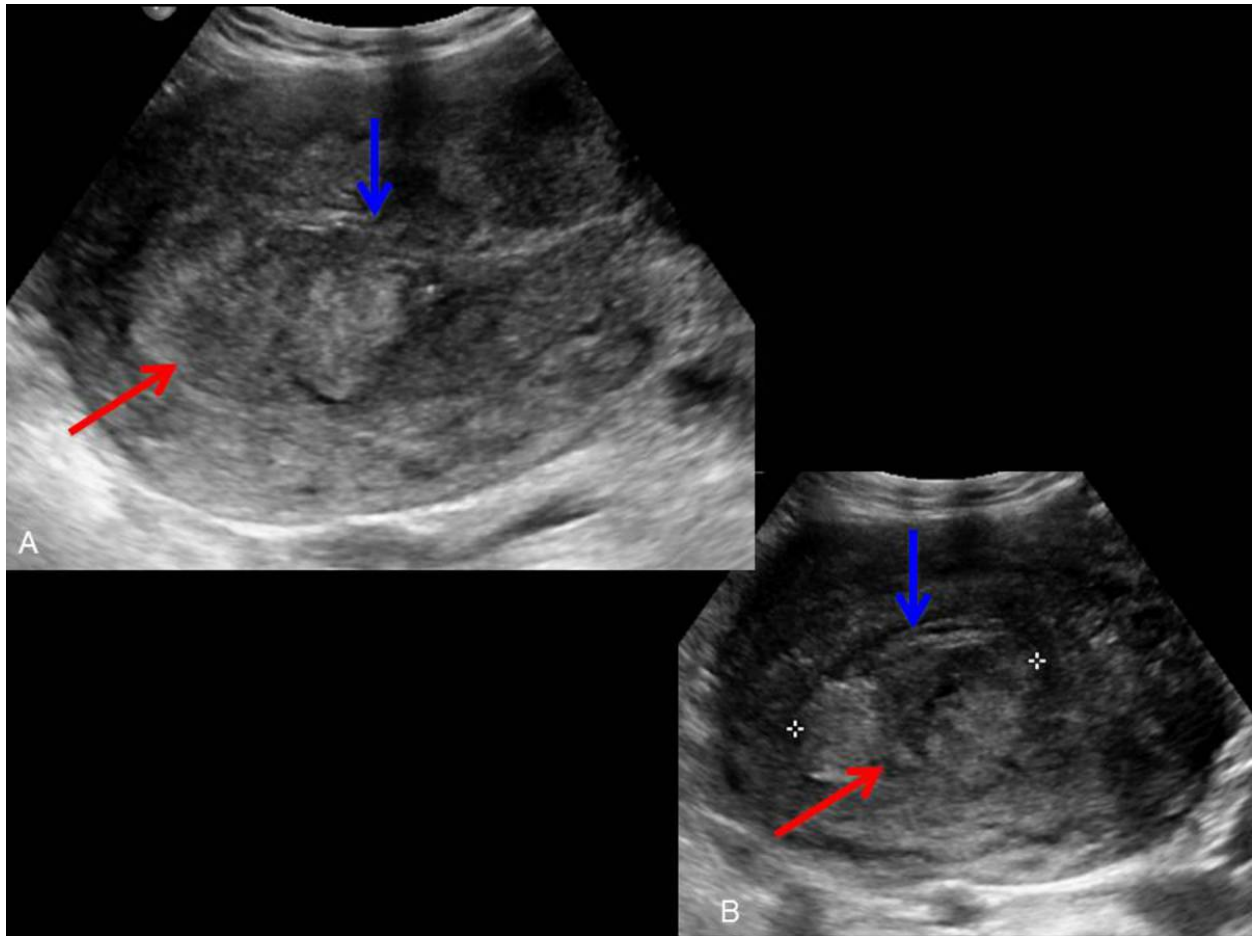


Fig. 12: Retroviral positive patient presenting with post-partum sepsis. Gray scale transabdominal ultrasound [A longitudinal, B transverse] shows a heterogeneous hyperechoic subendometrial mass lesion extending into the posterior myometrium (red arrows) which showed internal colour flow on Doppler imaging in keeping with vascularised tissue. The endometrial cavity is seen as a smooth hyperechoic line (blue arrow) in both images. Histopathology confirmed placenta accreta.

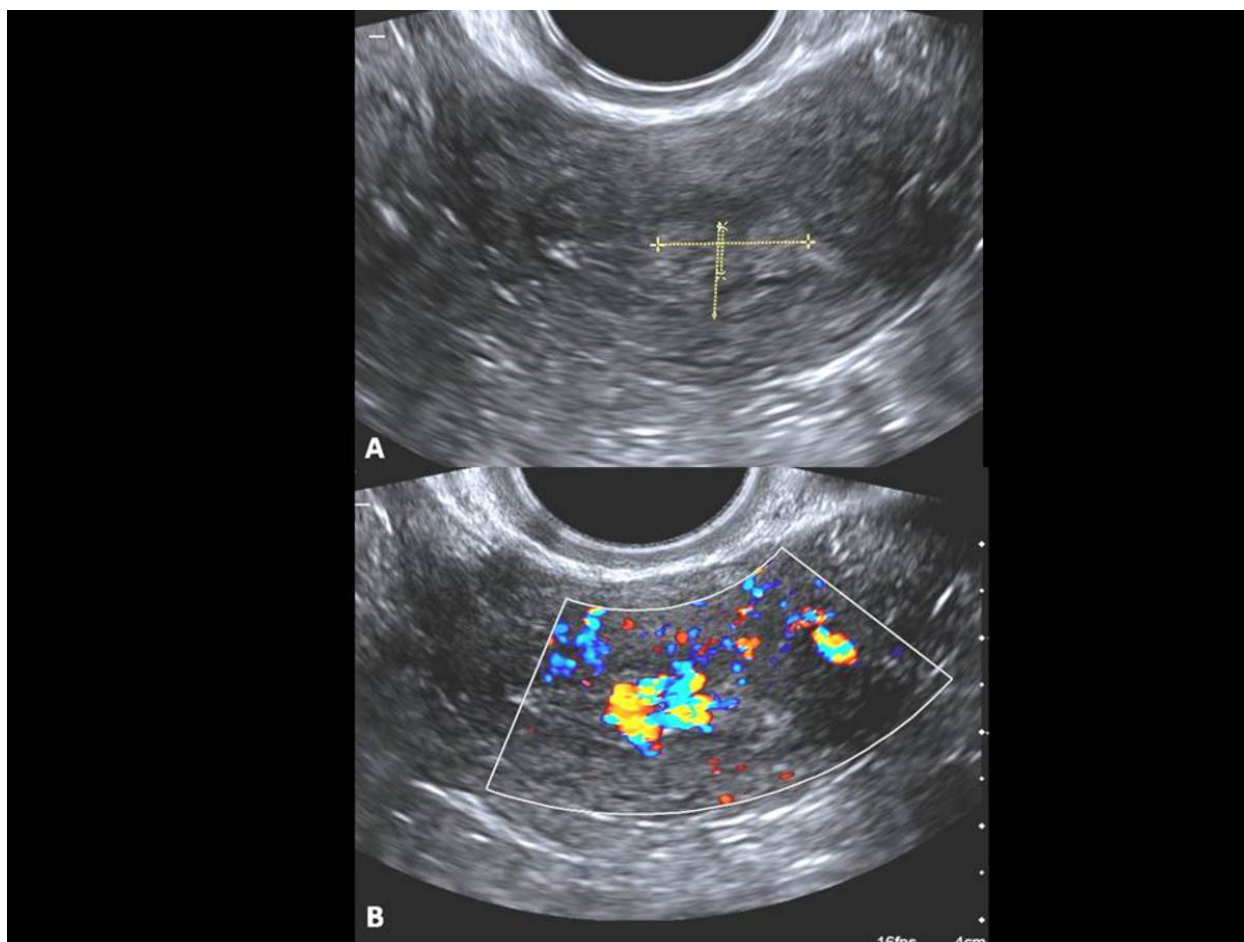


Fig. 13: Transvaginal ultrasound showing a hyperechoic lesion at the fundus of the uterus [A] with increased vascularity on the color Doppler [B] indicative of retained products of conception.

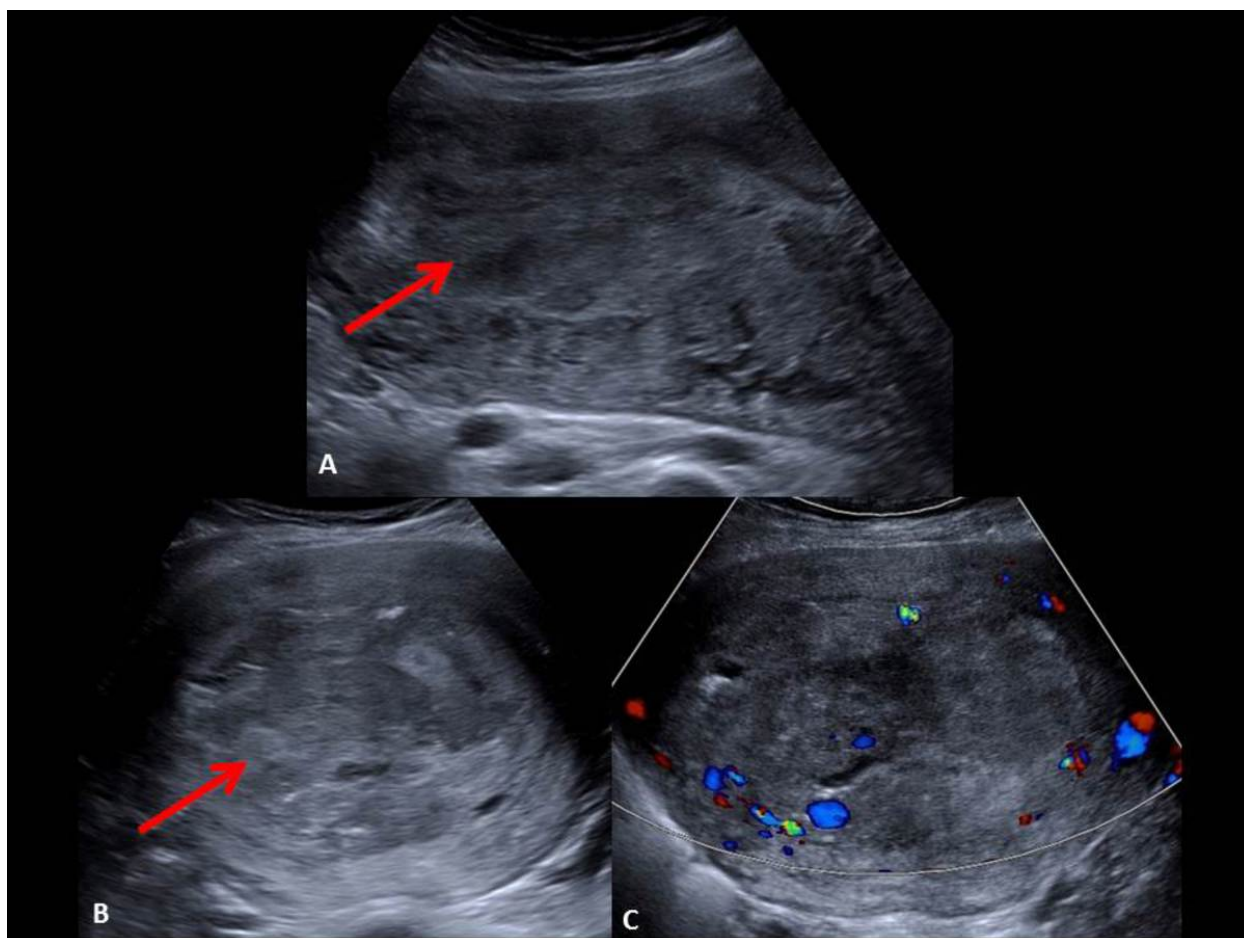


Fig. 14: Transabdominal ultrasound [A, sagittal; B, transverse] of a patient presenting with passage of heavy lochia 2 days post spontaneous vaginal delivery. The uterine cavity is distended and filled with heterogeneous hyperechoic material (red arrows). Note is made of internal colour Doppler flow [C] in keeping with vascularised retained products of conception.

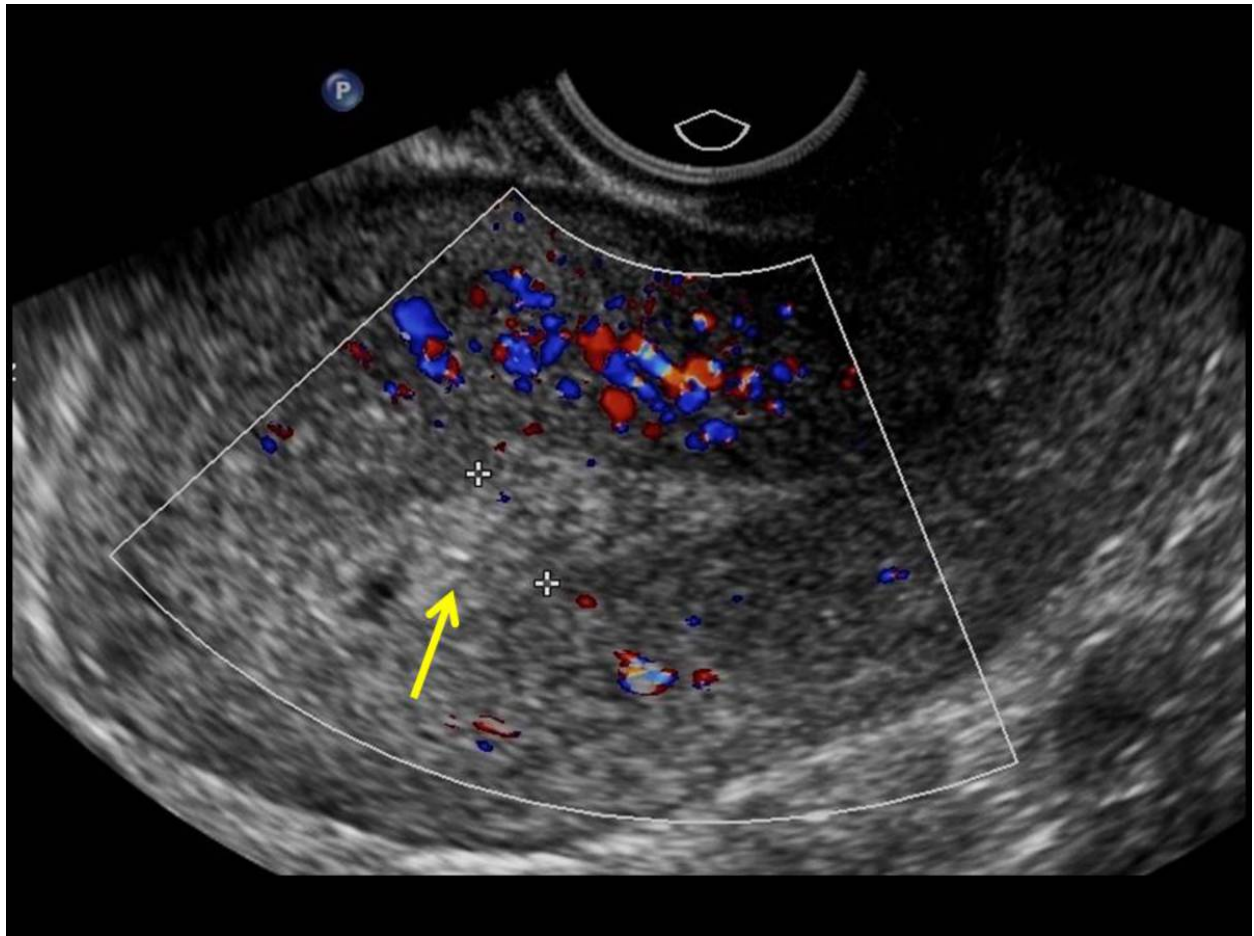


Fig. 15: Transvaginal ultrasound of a patient presenting with persistent bleeding 3 weeks post delivery. There is thickening of the endometrial stripe (yellow arrows). Despite the absence of increased vascularity on colour Doppler imaging, this represented retained products of conception.

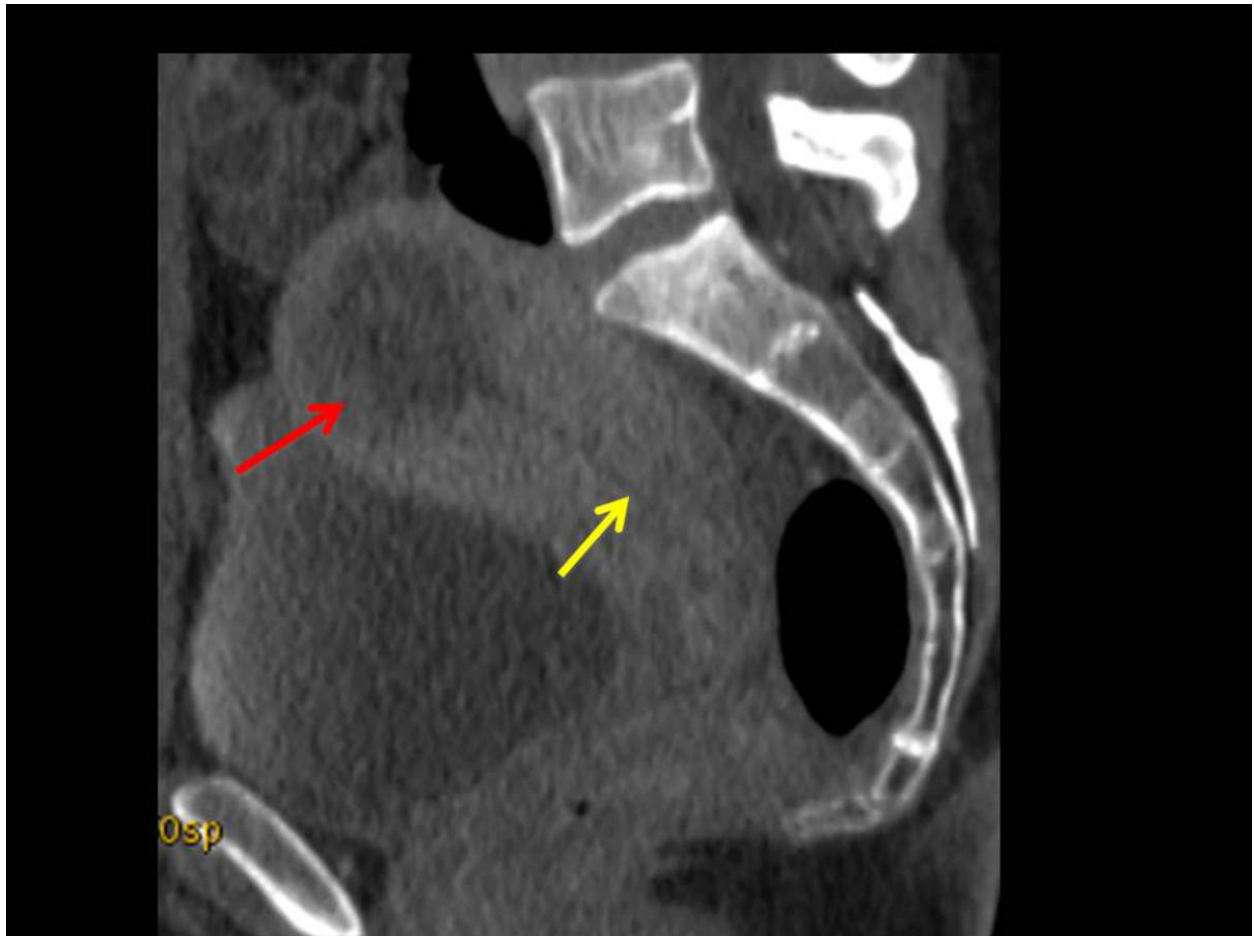


Fig. 16: Sagittal reconstruction of a CT through the pelvis showing focal widening of at the uterine fundus (red arrow) denoting retained products of conception (RPOC). The patient presented three and a half weeks post-Caesarean section with fever and haematuria. Note the uterine cavity line (yellow arrow).

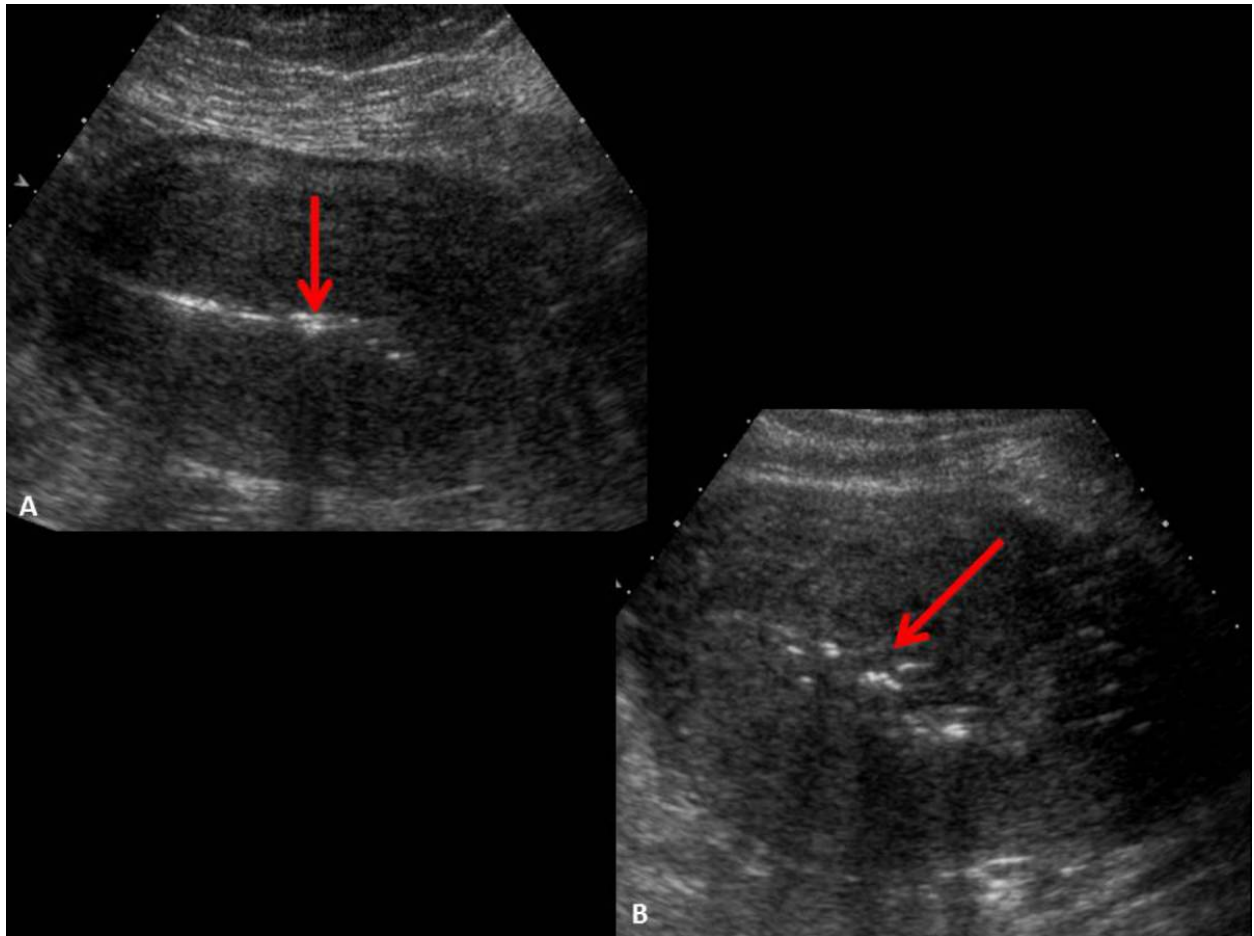


Fig. 17: Patient presented with fever 6 days post caesarean section. Transabdominal ultrasound shows numerous hyperechoic dots in the uterine cavity (red arrows) in keeping with air and raising the possibility of endometritis.

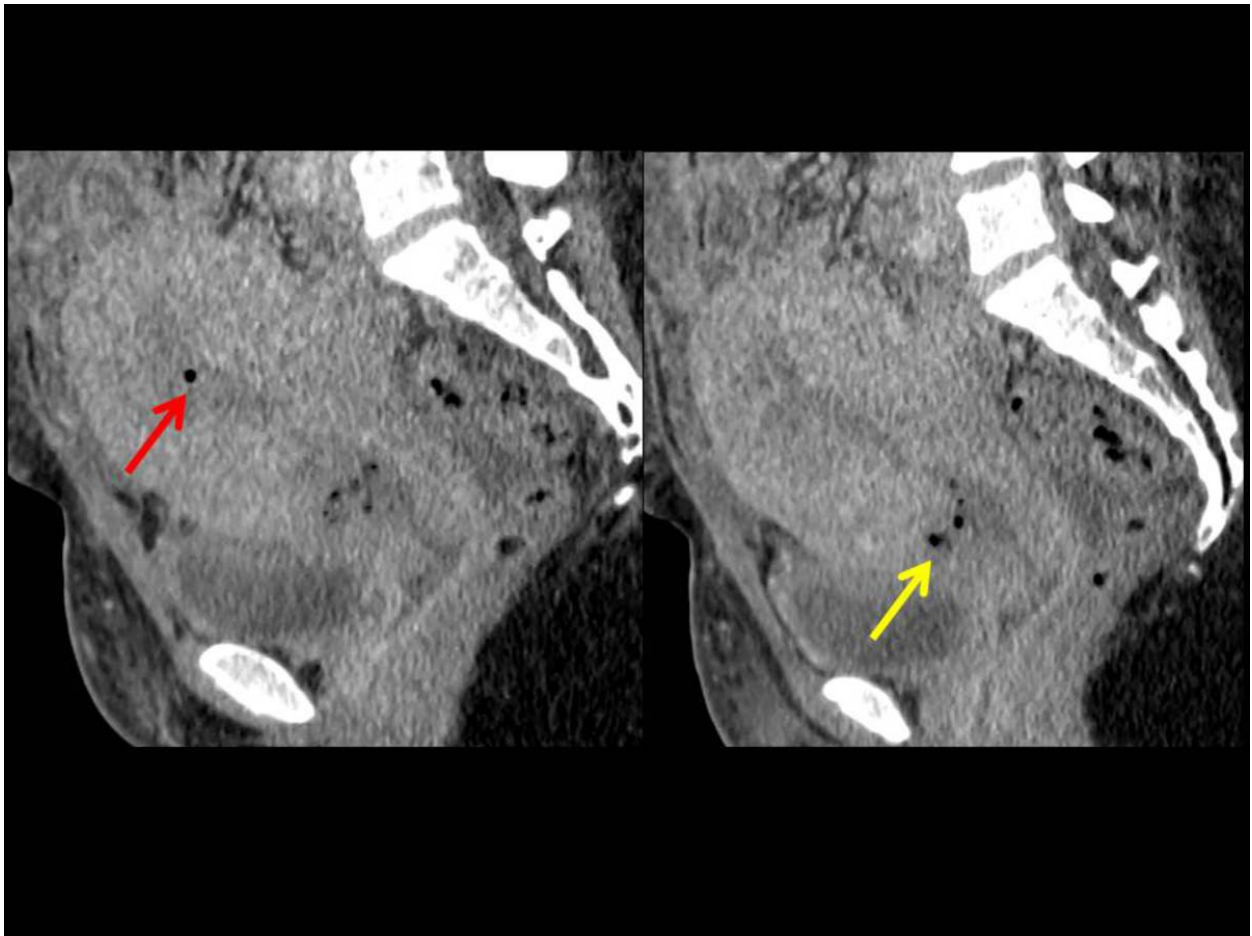


Fig. 18: Post-partum imaging following emergency Cesarean section for sepsis secondary to chorioamnionitis. Sagittal reconstructions of a post-contrast CT scan of the pelvis show air in the uterine cavity (red arrow) and extending along the Cesarean section myotomy (yellow arrow) in keeping with endometritis and wound infection.



Fig. 19: Sagittal reconstruction through the pelvis of a young female presenting with fever and abdominal pain 5 days post-Caesarean section. The CT scan shows air in the uterine cavity (red arrow). Culture of vaginal swabs showed scanty growth of *Staphylococcus aureus*.

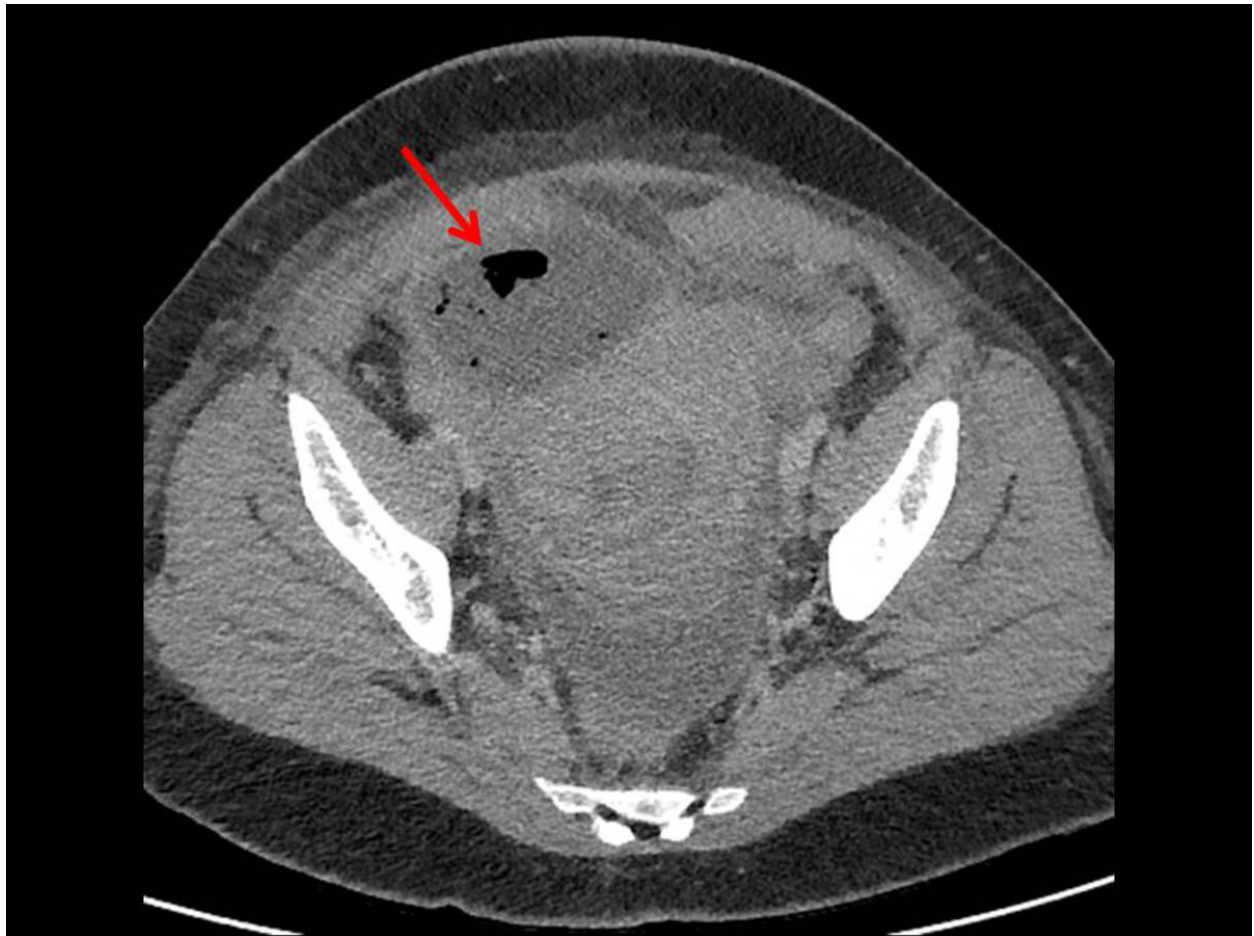


Fig. 20: Axial CT scan through the pelvis of a patient 7 days post-Caesarean section presenting with fever and abdominal pain. CT shows a collection with air in the right hemipelvis anterior to the uterus (red arrow). Ultrasound-guided aspiration revealed dark fluid denoting infected haematoma.

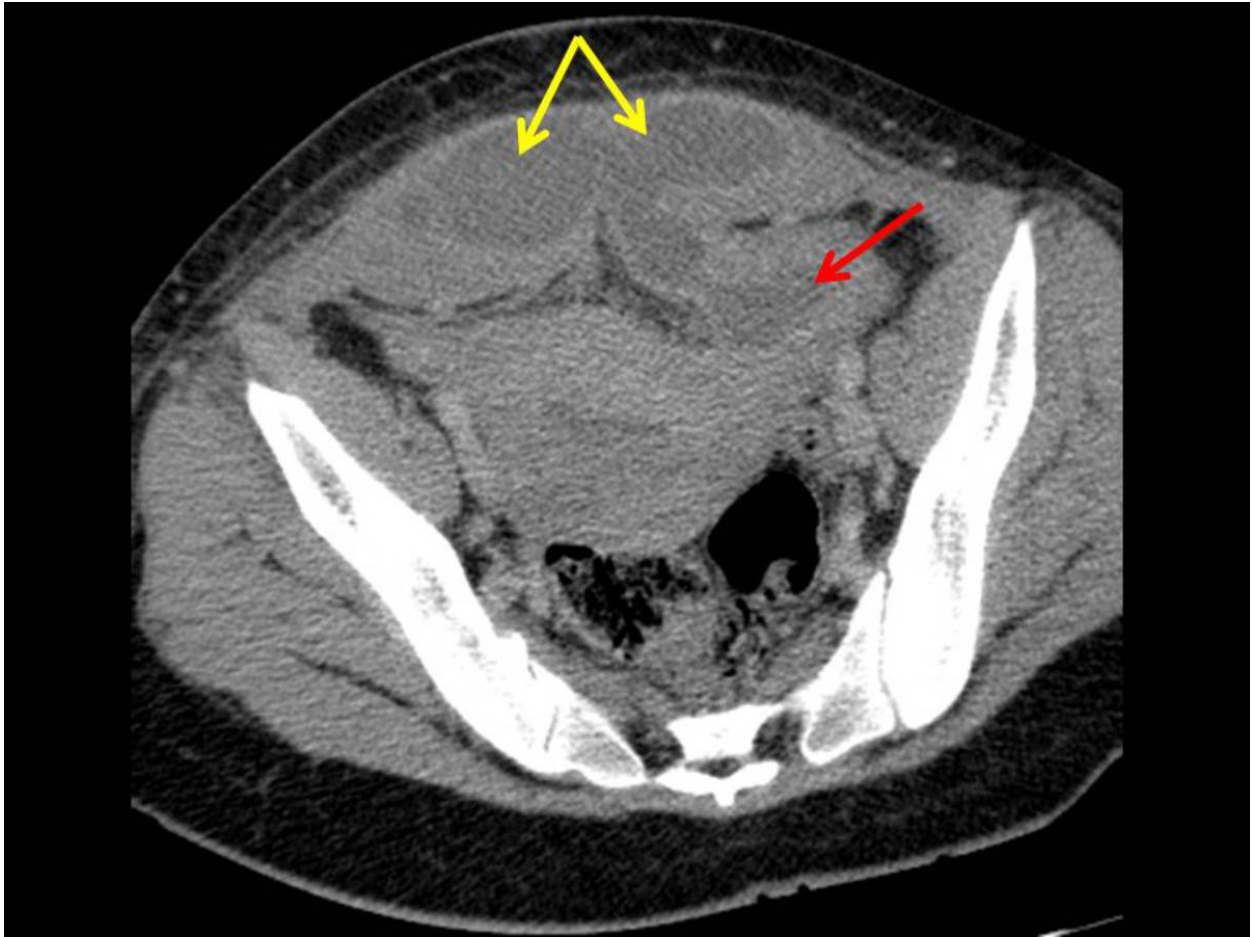


Fig. 21: Axial post contrast CT scan through the pelvis shows bilateral rectus sheath haematoma (yellow arrows) with extension into the peritoneal cavity (red arrow) following Caesarean section.

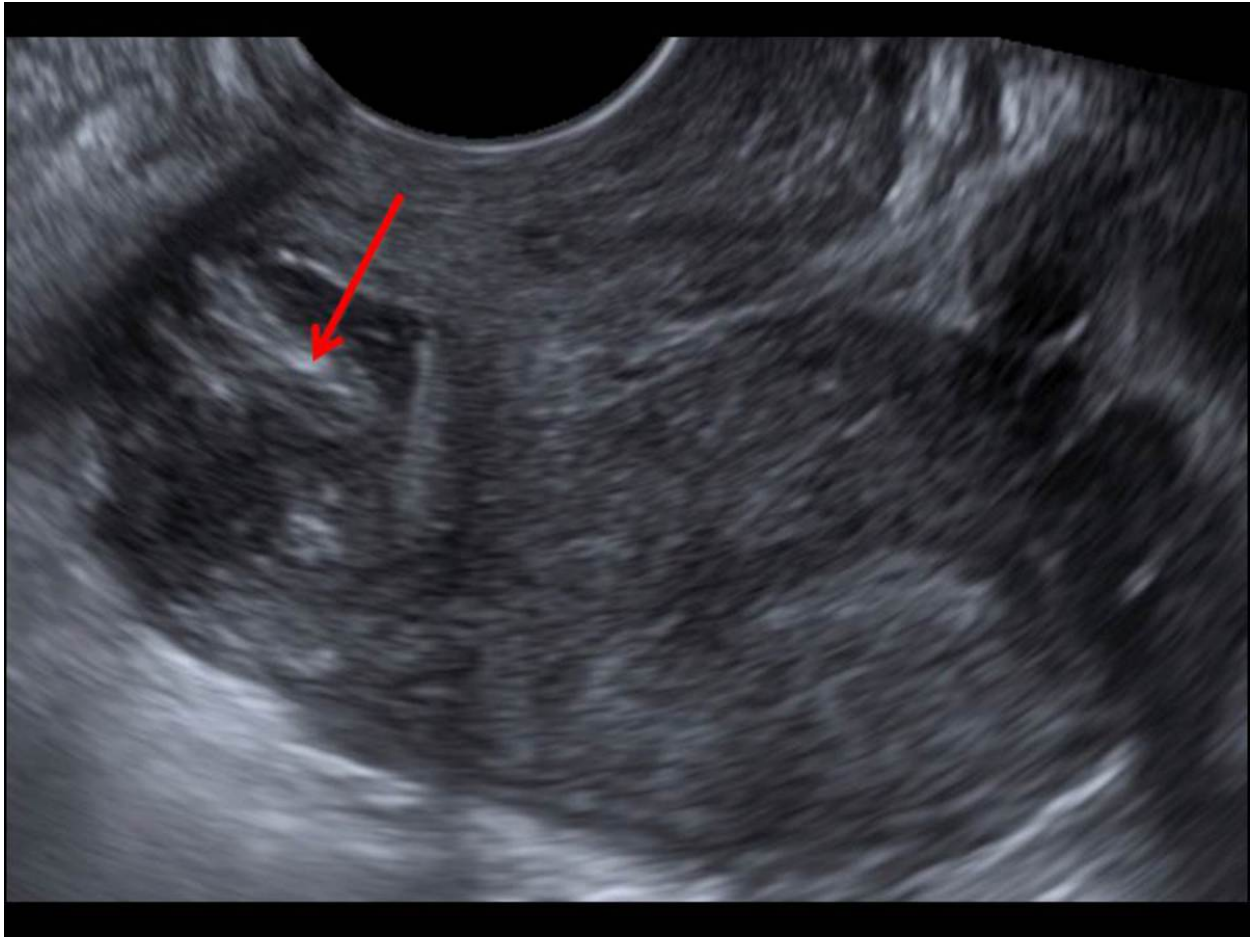


Fig. 22: Transvaginal ultrasound of a patient presenting with abdominal pain 5 weeks post-Caesarean section. The uterus is retroverted and there is a heterogeneous hypoechoic mass at the site of the Caesarean section scar in keeping with a haematoma (arrow).

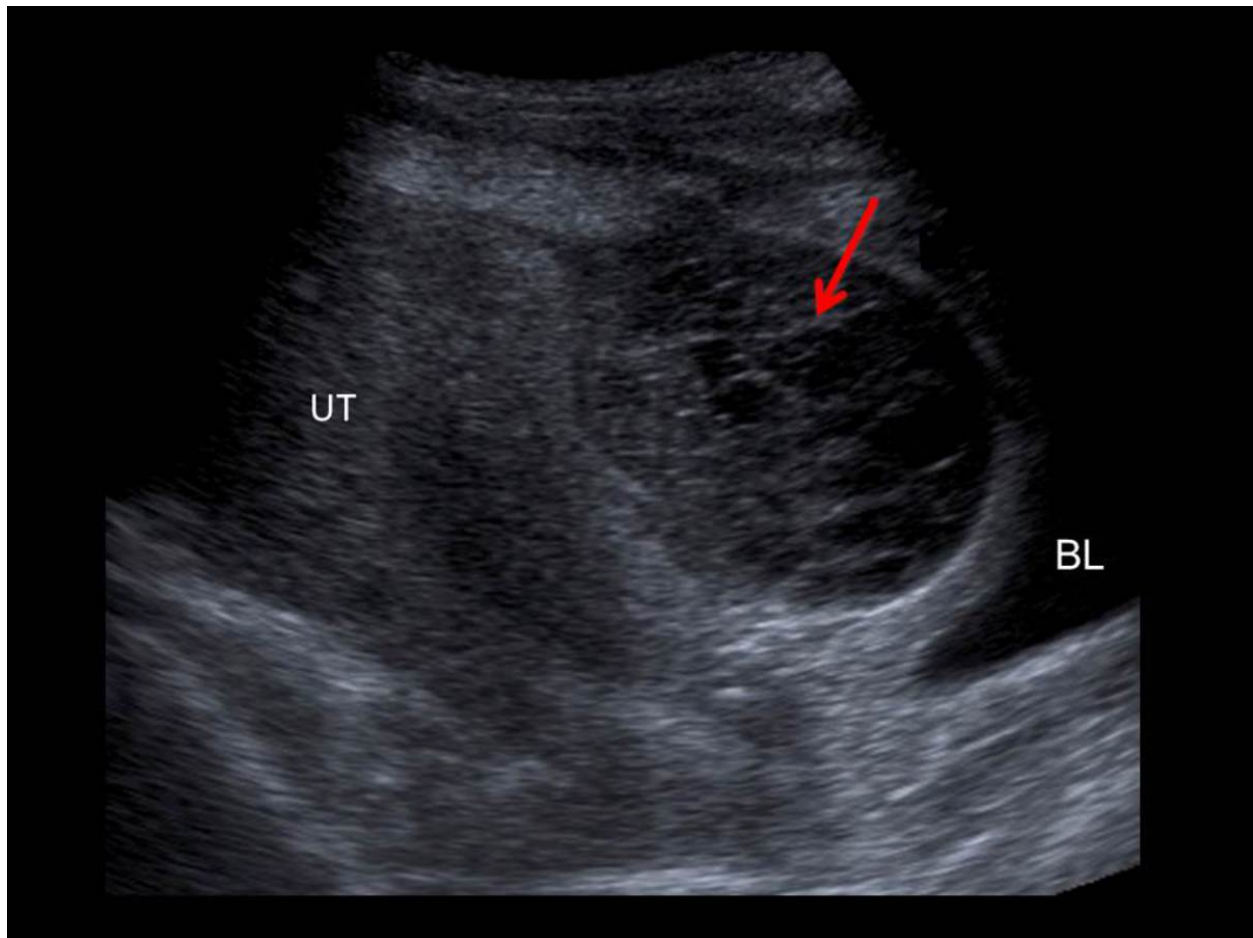


Fig. 23: Transabdominal ultrasound of a patient presenting with fever 2 weeks post-Caesarean section. Ultrasound shows a haematoma between the uterus (UT) and urinary bladder (BL) (red arrow).

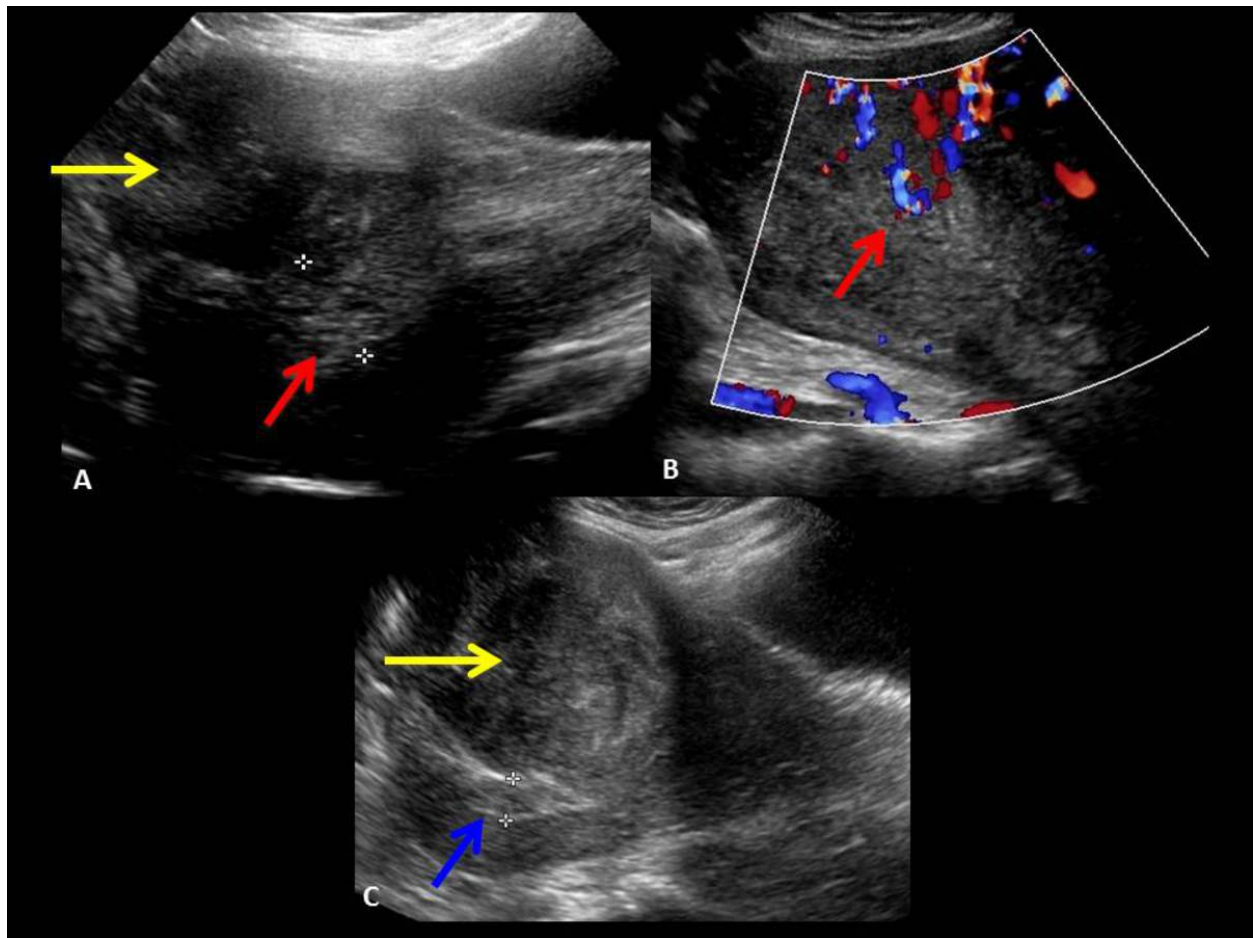


Fig. 24: Transabdominal ultrasound images of the uterus of a patient presenting 3 weeks post delivery with abdominal pain and persistent bleeding [A, B]. The endometrium is thickened (red arrows) with increased vascularity on colour Doppler [B] in keeping with retained products of conception (RPOC). The patient re-presented with further pelvic pain following dilatation and curettage; subsequent ultrasound [C] shows a thin endometrium with fluid in the cavity (blue arrow) but no evidence of residual RPOC. An anterior myometrial fibroid was noted to have increased in size in the interval between scans (yellow arrow) and the patient experienced pain on scanning over this region, appearances are in keeping with fibroid degeneration.

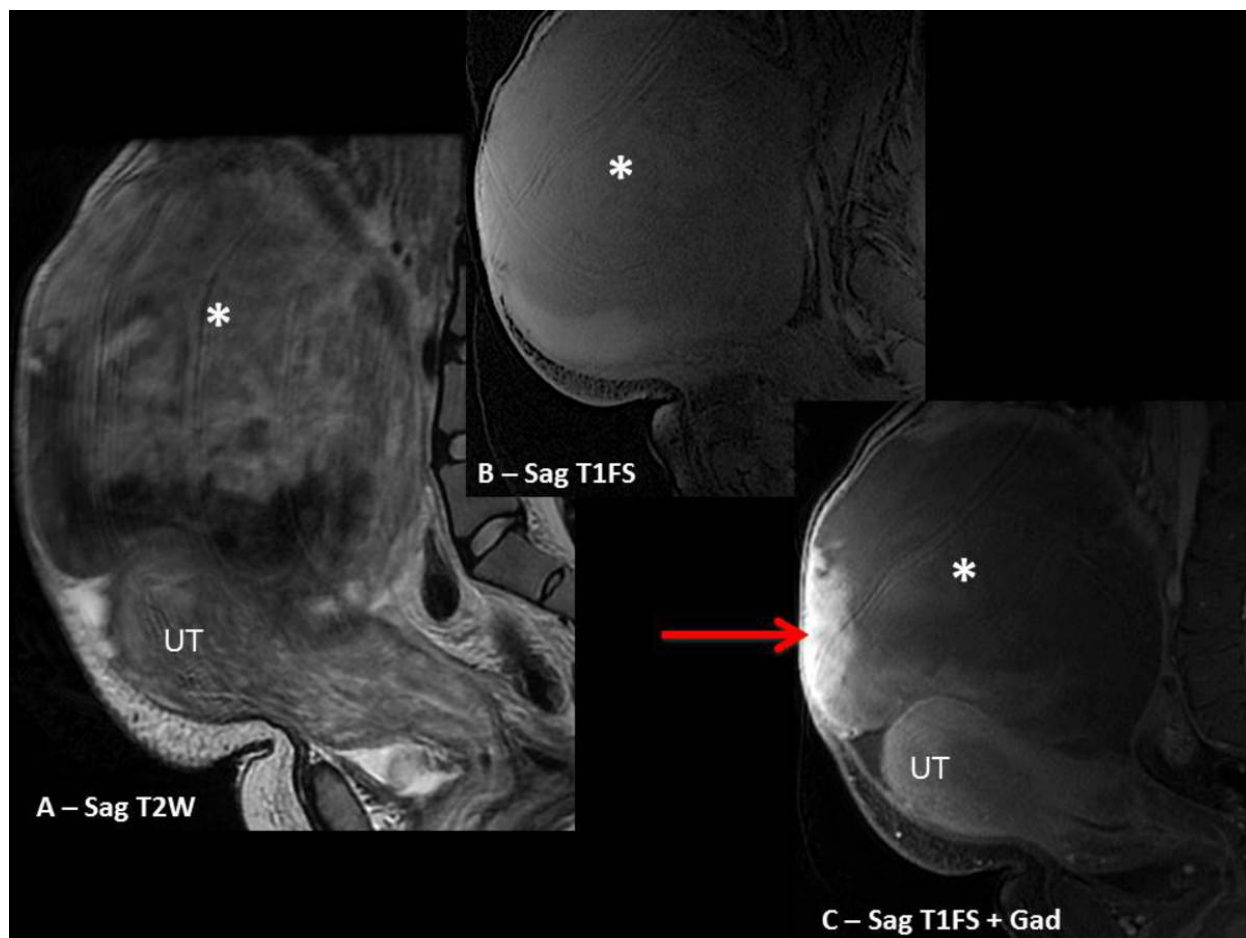


Fig. 25: Sagittal MR images through the pelvis of a patient 3 days post delivery presenting with severe abdominal pain. A large posterior pedunculated subserosal fibroid (*) is noted to contain high T1W signal intensity material on the precontrast image [B] with minimal peripheral enhancement (red arrow) on post-contrast images in keeping with degeneration. UT=Uterus

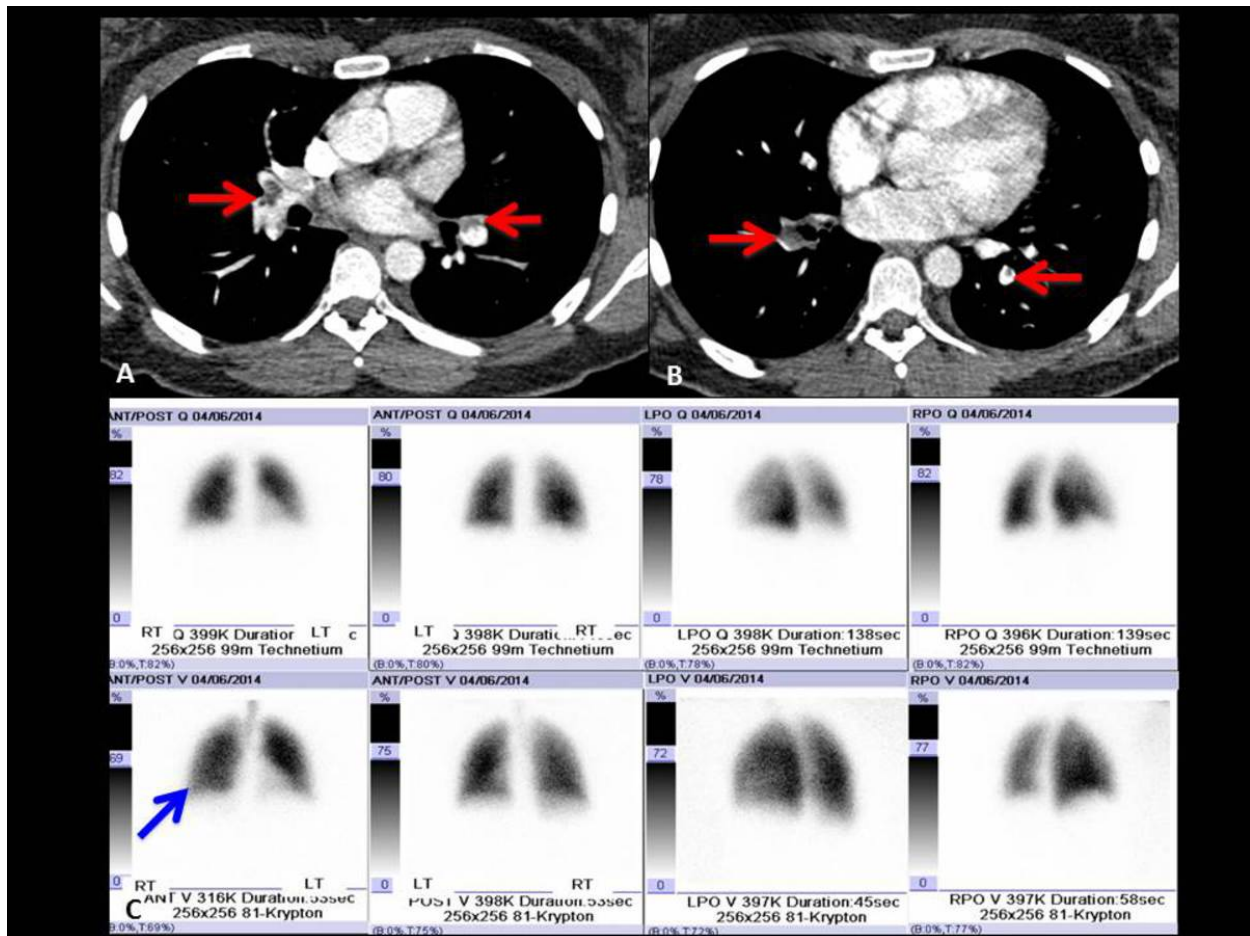


Fig. 26: [A,B] Axial CTPA slices through the chest in a patient presenting with shortness of breath and pleuritic chest pain 2 weeks post delivery. There are bilateral lobar pulmonary artery emboli (red arrows). [C] A follow up V/Q scan shows mild ventilation/perfusion mismatch in the right lower lobe indicative of a small residual embolic burden (blue arrow).



Fig. 27: A patient 3 days post spontaneous vaginal delivery presenting with right iliac fossa pain. Coronal reconstruction of a contrast-enhanced CT of the abdomen luminal filling defect within the right ovarian vein extending from the uterus to the right renal vein (red arrows).

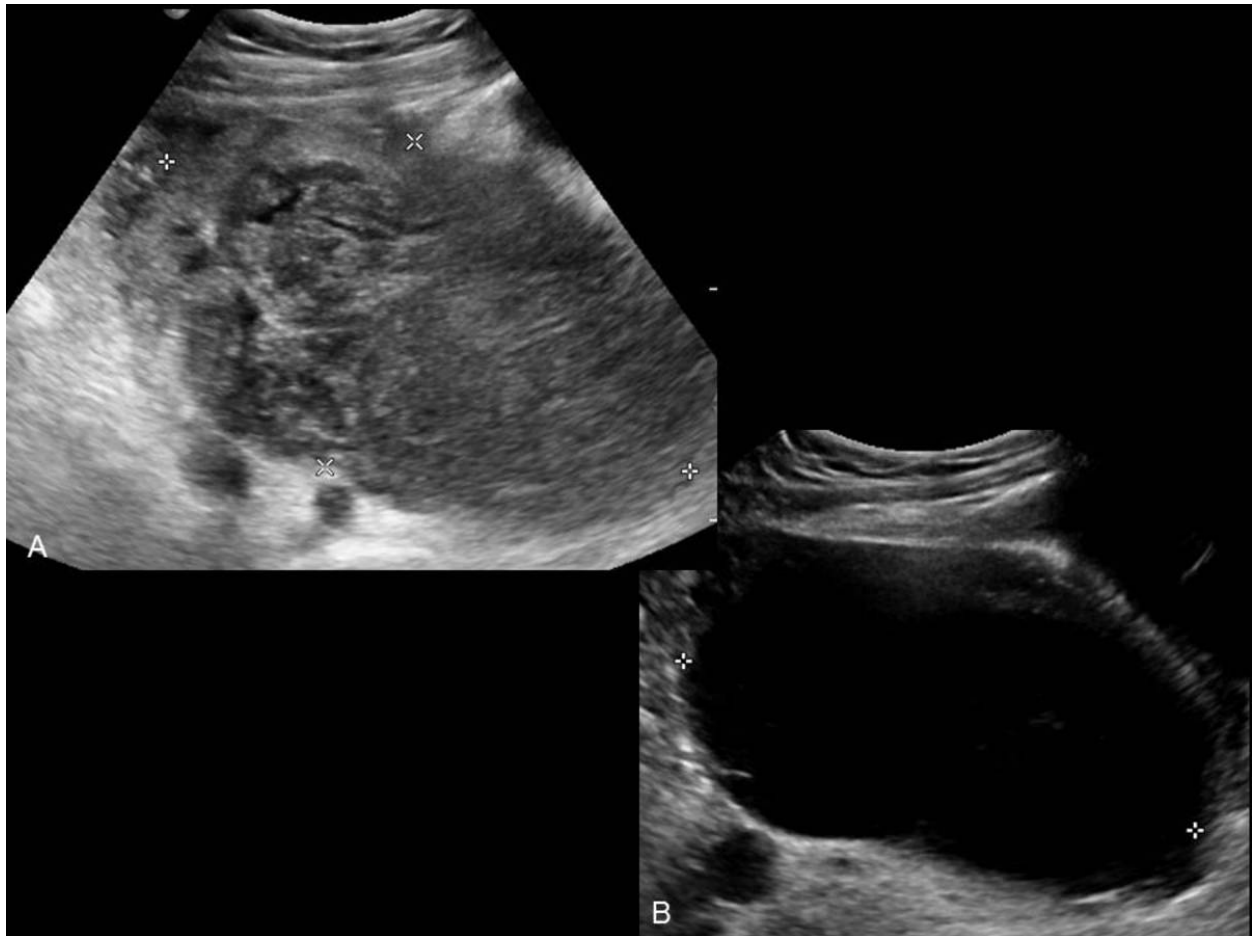


Fig. 28: Transabdominal ultrasound images of a patient presenting with fever and abdominal pain 3 weeks post spontaneous vaginal delivery. Figure [A] shows a large hyperechoic heterogenous mass in the right adnexa. A follow up scan [B] after a few weeks shows transformation of the mass into a cystic lesion. Aspiration of the lesion revealed a haemtoma.

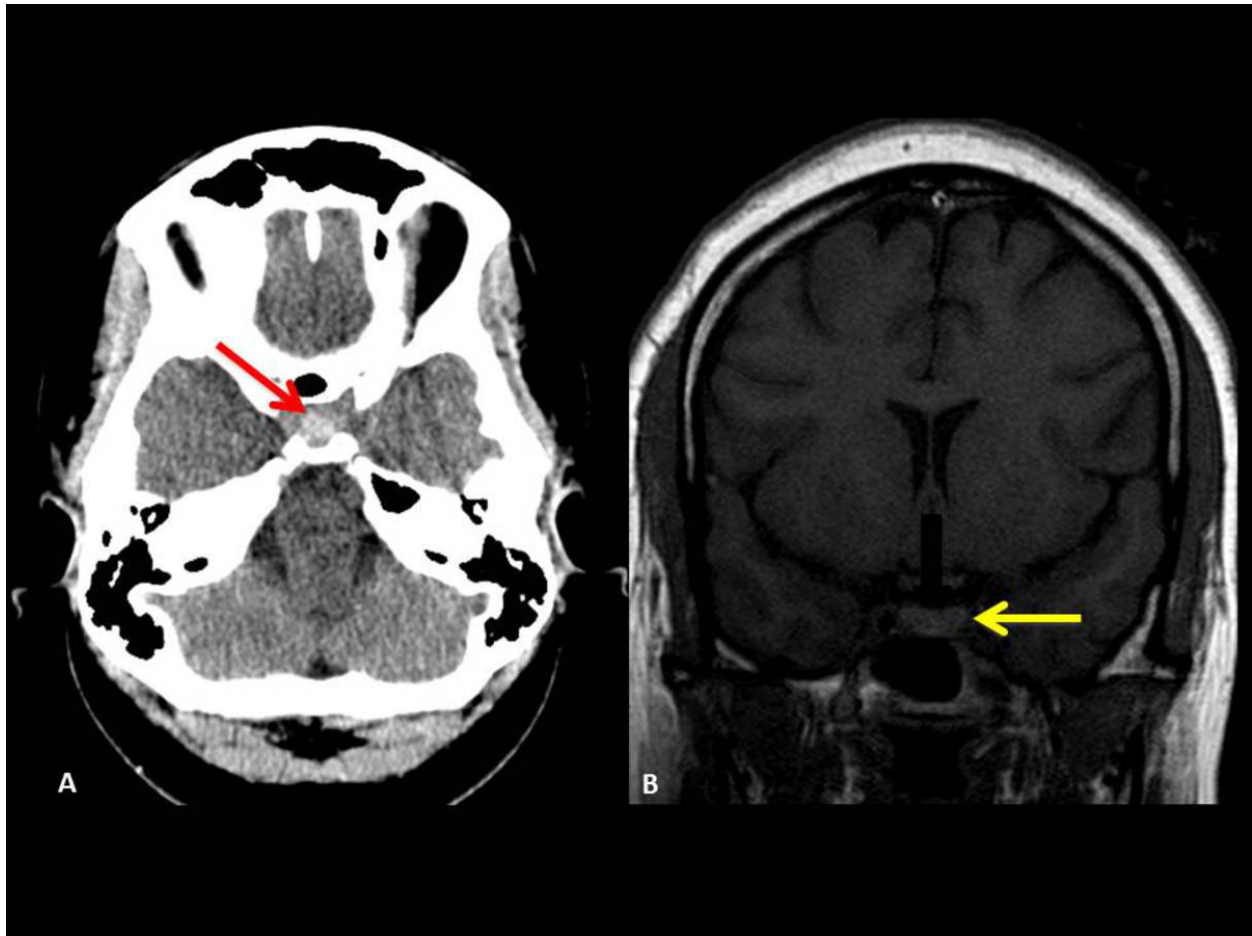


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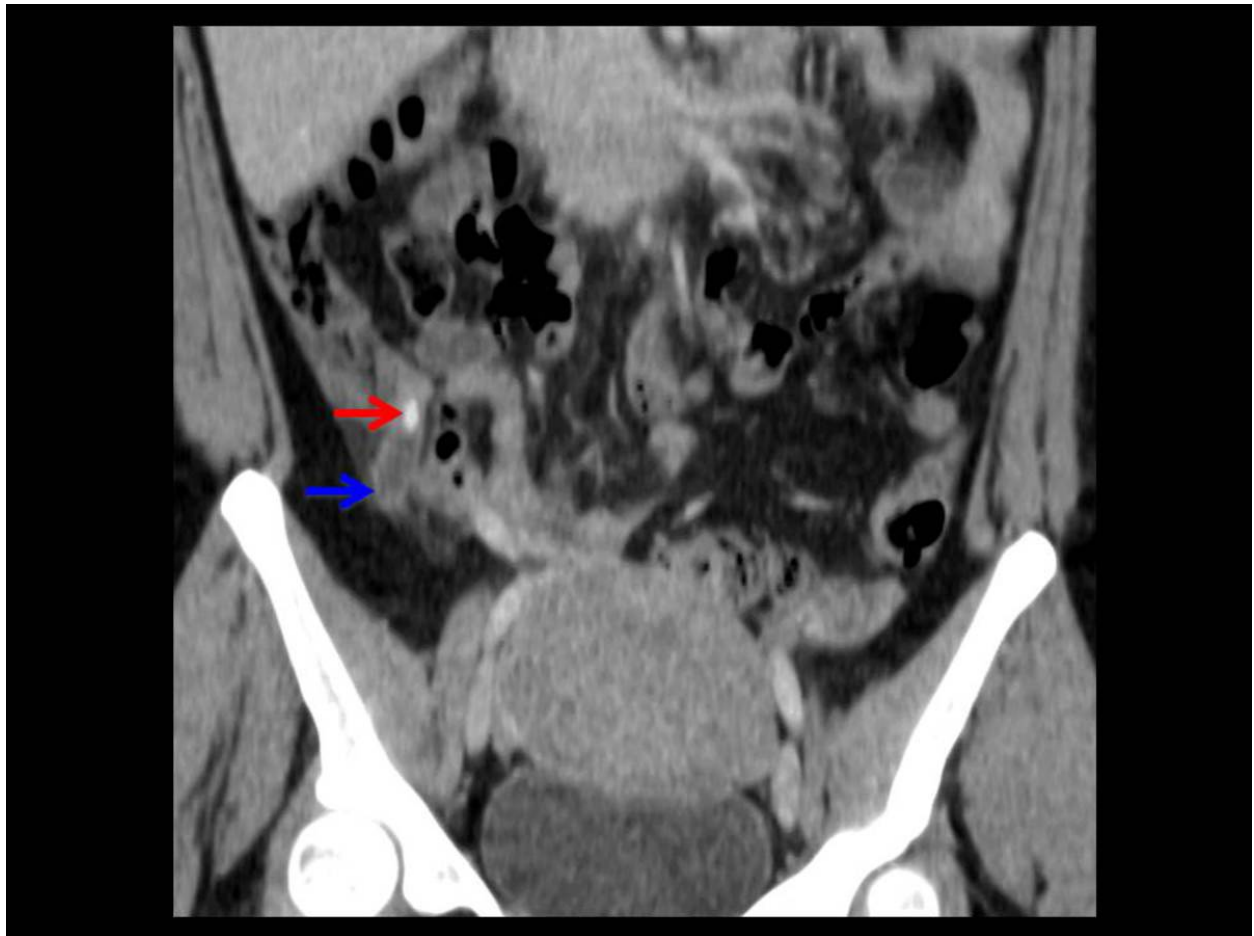


Fig. 30: Coronal reconstruction of a CT abdomen of a patient 3 weeks post-partum presenting with right iliac fossa pain. The CT shows a fluid-filled, distended appendix with mural enhancement denoting acute appendicitis (blue arrow) with an obstructing appendicolith (red arrow).

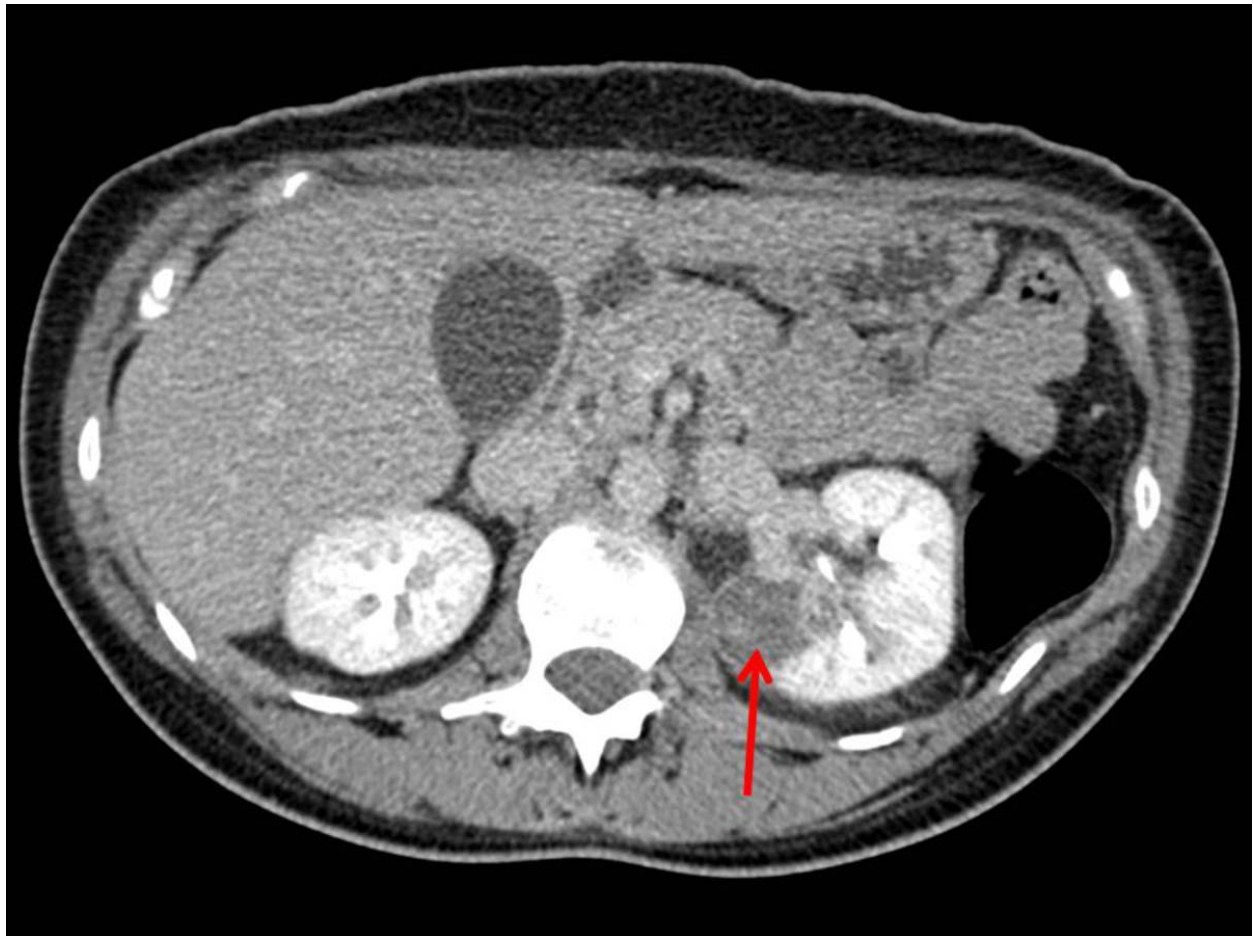


Fig. 31: Contrast-enhanced CT scan of the abdomen of a patient presenting with fever and haematuria 3 weeks post-Caesarean section. There is a hypodense non-enhancing area in the left renal cortex (red arrow) denoting lobar nephronia.

Conclusion

In summary, we have provided an overview of normal post-partum imaging findings and the main challenges clinically, biochemically, and radiologically. We have also provided a pictorial review of the main uterine, extra-uterine and non-obstetric complications that can occur, highlighting the imaging findings that are the key to making the diagnosis.

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