Case report: Incarceration of the gravid uterus: a radiologic and obstetric challenge

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ABSTRACT

We will present the fourth case in the English-language literature of a mid-gestational colonoscopy-assisted manual reposition of an incarcerated uterus. Despite the ready availability of ultrasound, a great number of incarcerations are not recognized before term. Since early diagnosis is the key to a successful treatment, it is important that providers acquire prompt knowledge of this obstetric disorder. Magnetic Resonance Imaging has an important additional value to ultrasound in the detailed scanning of this potentially perilous condition.

CASE REPORT

CASE REPORT

A 35-year-old primigravida with no documented medical history was admitted to the Obstetric Unit of our hospital during the 17th week of pregnancy because of urinary retention and abdominal pain. Due to the combination of urinary retention, an extremely anteriorly displaced cervix out of reach of the examining fingers and a supra-pubic position of the bladder during ultrasound, a posterior incarceration of the gravid uterus was suspected. This diagnosis was confirmed by Magnetic Resonance Imaging (MRI) (Figure 1).

The urinary retention was resolved by bladder catheterization, but the polarity of the uterus remained disturbed despite repeated knee-elbow position (Simm's position). Two gynecologists tried to reduce the posterior incarceration by a combined recto-vaginal manipulation with the pregnant woman in Simm's position and in a left and right lateral decubitus position, but all attempts failed. Some days later, the polarity of the uterus was easily restored by a colonoscopy-assisted manipulation with the woman lying in a left lateral decubitus position, followed by a left lateral tilted supine position. Simultaneously with the insertion of the flexible sigmoidoscope, an extra anterior pressure was generated by insertion of two fingers in the vagina. All the maneuvers mentioned above were performed after emptying the bladder and the bowel (by tap water enemas). No anesthesia was used during the procedure. There were no procedure-related complications. Correction of the normal polarity of the uterus was confirmed by vaginal examination (central position of the cervix, easily within the reach of the examining fingers). Simultaneously, a pessary was placed until the 19th week of pregnancy since recurrence of an incarceration has been reported [1-3]. The further course of the pregnancy was uneventful. In the 39th week, a healthy girl weighing 2,935 g was born vaginally. Manual revision was performed for a retention of the placenta.

DISCUSSION

The uterus is retroverted in about 15% of pregnancies during the first trimester. The fundus usually enters the

abdominal cavity by the end of the first trimester. Incarceration of the gravid uterus is defined as the intrapelvic locking of the uterine fundus despite of the increasing volume of the uterine contents. Symptoms often are non-specific or even absent [4,5], but some severe complications may occur in a more advanced pregnancy (Table 1). There are several well known risk factors predisposing to an incarceration of the gravid uterus: uterine anomalies [6], endometriosis, pelvic adhesions, uterine prolapse [7], fibroids on the posterior wall, a deep sacral concavity with an overlying promontorium and adhesions between the uterine fundus and the peritoneum [8-11] (Table 2). No such risk factor could be identified in this case.

It is important that providers become aware of this fairly rare condition (1/3000 pregnancies) -as it often escapes notice- and recognize its clinical and imaging features. A high degree of suspicion and caution is the key to a timely diagnosis. Urinary symptoms such as retention during the early mid-trimester should alert the clinician, as is illustrated in this case report. During the vaginal examination, a large mass can be felt in the cul-de-sac and the cervix is usually out of reach of the examining fingers.

While performing an ultrasound examination for non-specific abdominal complaints in pregnancy, most obstetricians focus on the uterine contents (fetus & placenta) and the ovaries, rather than on the structures adjacent to the abdominal wall. Although the supra-pubic position of the bladder, the cervix and/or the vagina just posterior of the abdominal wall, is one of the rather easily recognizable ultrasound features of a posterior incarceration of the gravid uterus [5,8,12-21]. This is probably the reason why a great number of reported incarcerations are not recognized before term [4,5,13,22-33].

Both MRI and ultrasound are complementary, non-invasive and safe methods for the diagnosis and differential diagnosis of an incarcerated gravid uterus. MRI has an additional value to ultrasound in the detailed scanning of the uterus and its adjacent organs, due to the multi-planar imaging capabilities, the large fields of view and the excellent contrast between the uterus and its adjacent organs [12,15,22,23,30,34-40].

Next to the elongated and anteriorly displaced cervix, the deformed bladder shape is an additional clue that can be helpful in detecting a posterior incarceration. Due to the mass effect of the incarcerated uterus, there is (1) a typical ventral out-pouching of the anterior bladder wall, just cranially of the pubic symphysis on mid-sagittal MR images and (2) a crescent-shaped bladder on the transverse supra-pubic MR images (Figure1, 2 and 3).

Besides, if the placenta is located in the fundus of an incarcerated uterus - as in this case (Figure 1) - the examiner should take care not to take the uterine fundus in the cul-de-sac for the lower uterine segment. If the physician is unaware of this obstetric disorder, the ultrasound and/or MRI findings may be misinterpreted as a placenta previa [5,8,13,17,31,34,41].

Furthermore, detailed scanning of the adjacent organs and structures is mandatory, because any sub-umbilical incision during an operative procedure might bivalve the urinary bladder, the cervix and/or vaginal vault before accessing the posterior uterine wall, as shown in Figure 4 [1,4-6,13,20,22,25-28,31-33,42-45]. A conscientious description of the position of the adjacent organs, with reference to the umbilicus, should guide the surgeon in choosing a vessel-free portion to avoid transection of any other displaced structure.

Some important differential diagnoses should include a fibroid/red degeneration of a fibroid (myometrial tumor with a cystic core (Ultrasound) & changed signal intensity (MRI)), uterine torsion (changed position of the placenta/ovarian vessels), uterine anomalies (evaluation of the uterine contour, presence of a separated endometrium) and any pelvic/adnexal mass extending into the cul-de-sac (mass in the Douglas separated from the uterus) (Table 3).

Most authors recommend to restore uterine polarity [22,23,45-47]. In a very early pregnancy several methods of manual reduction can be tried [8]. Colonoscopic insufflation of the recto-sigmoid can facilitate the manual repositioning, as is illustrated in this case report. When the flexible sigmoidoscope passes the sigmoid colon, a loop is routinely formed. The air insufflation during this procedure together with this loop formation create an extra anterior pressure on the uterine fundus, facilitating the reposition [23].

When all these interventions fail, an operative reduction via laparoscopy or laparotomy is advised, although this is followed by an increased recovery time and can lead to severe maternal and fetal morbidities [1,5,6,13,17,25,27,42,43,45]. So, the prognosis strongly depends on the time of diagnosis and is good if one is able to restore the normal polarity of the uterus.

To the authors' knowledge, colonoscopic release of an incarcerated uterus has only been described by two authors in the global English literature. Seubert et al. successfully restored the uterine polarity by colonoscopy insufflation of the recto-sigmoid, actually six times in five patients at the gestational age of 13-15 weeks of the pregnancy [48]. In 2011 Dierickx et al. described four cases of uterine incarceration between the 15th and 25th week of pregnancy of which three colonoscopy-assisted manual repositions proved successful [23]. So, to the best of our knowledge the present case report is the fourth reported case of a successful colonoscopy-assisted manual reposition of an incarceration of the gravid uterus, at a gestational age of more than 15 weeks.

TEACHING POINT

Magnetic Resonance Imaging of an incarceration of the gravid uterus is the cornerstone of a successful approach, since a conscientious description of the disturbed uterine and pelvic anatomy is the key to anticipating possible complications and morbidity of this disorder and its treatment. Colonoscopy-

assisted manual reduction of this potentially perilous obstetric condition is feasible during the second trimester of pregnancy.

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FIGURES

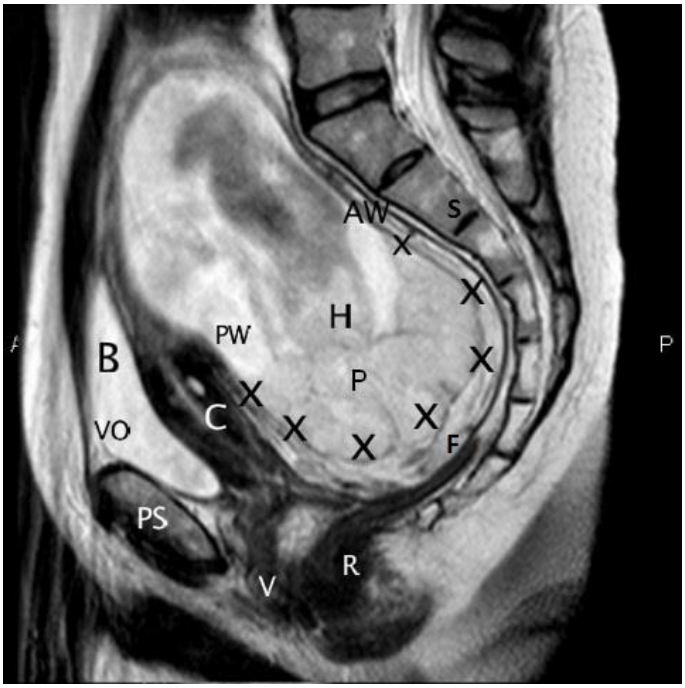

Figure 1: A 35-year-old primigravida with an incarceration of the gravid uterus.
FINDINGS: Mid-sagittal T2-weighted MR imaging of a posterior incarceration with sacculation of the anterior wall (AW) during the 17th week of pregnancy. The uterine fundus (F), containing the fetal head (H) and the placenta (P), is incarcerated in the pouch of Douglas. The border between the placenta and the myometrium is clearly defined (x). The uterine wall at the locus of the sacculation is regular and the wall thickness of the anterior wall (AW) is only slightly thinner than the fundal uterine wall, respectively 6 - 7 mm and 7 - 8 mm. The rectum (R) is flattened and deviated to the right side. The elongated cervix (3.8 cm) (C) is displaced cranially and anteriorly behind the pubic symphysis (PS). At least half of the volume of the bladder (B) is located supra-pubic with the anterior bladder wall revealing a ventral out-pouching (VO) just cranially of the pubic symphysis.
PW: posterior uterine wall; S: sacrum; V:vagina
TECHNIQUE: Acquisition 1.5T (Philips): T2 sag, TR3425 and TE 150; sense 2; acq 1.16/1.47/5.00 and rec 0.80/0.80/5.00.

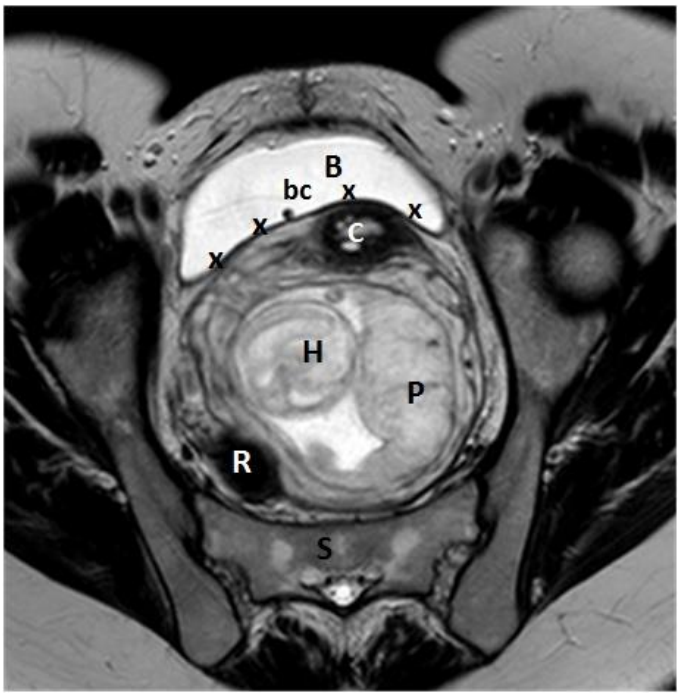

Figure 2: A 35-year-old primigravida with an incarceration of the gravid uterus.
FINDINGS: Supra-pubic transverse T2-weighted MR image demonstrates the crescent-shaped bladder (B) that is flattened against the maternal abdominal wall by the anterior uterine wall and cervix (C). The remarkable concavity of the posterior bladder wall (x) is explained by the mass effect of the incarcerated uterus. The rectum (R) is slightly deviated to the right side. The cervix is located centrally, excluding an associated uterine torsion.
bc: bladder catheter; H: fetal head; P: placenta: S: sacrum
TECHNIQUE: Acquisition 1.5T (Philips): T2 ax, TR3425 and TE 150; sense 2; acq 1.14/1.59/1.50 and rec 0.78/0.78/5.00.

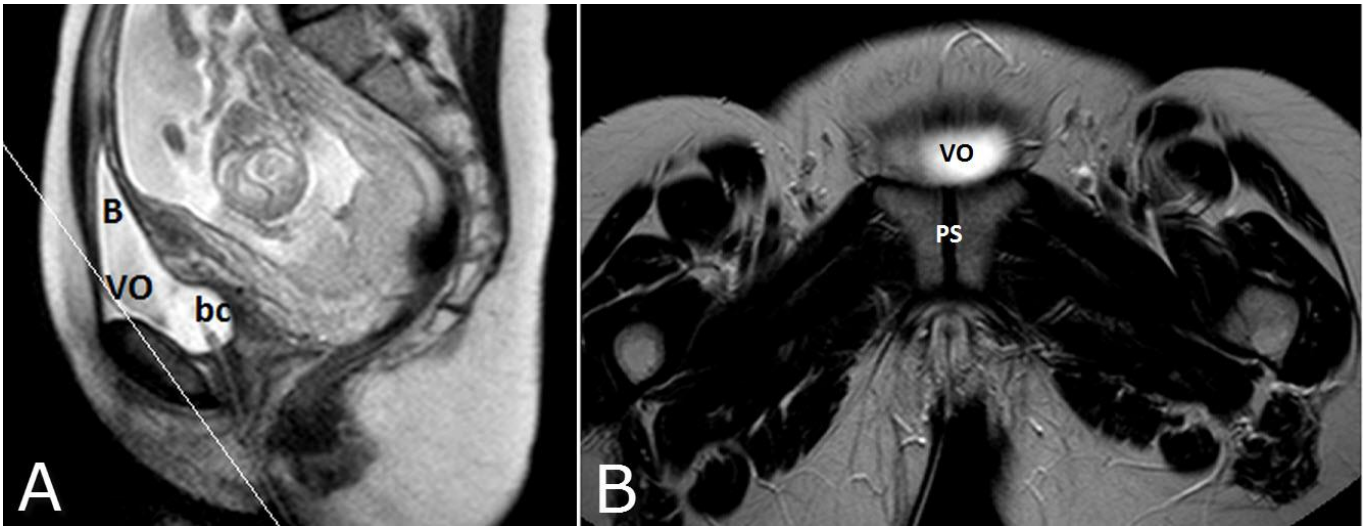

Figure 3: A 35-year-old primigravida with an incarceration of the gravid uterus.
FINDINGS Figure 3a:
Sagittal T2-weighted MR imaging of a posterior incarceration with sacculation of the anterior wall during the 17th week of pregnancy. The site of the para-coronal T2-weighted image (Figure 3b) is shown (white line in figure a).
B: bladder; bc: bladder catheter: VO: ventral out-pouching of the bladder
TECHNIQUE: Acquisition 1.5T (Philips): T2 sag, TR3425 and TE 150; sense 2; acq 1.16/1.47/5.00 and rec 0.80/0.80/5.00.

FINDINGS Figure 3b:
Para-coronal T2-weighted MR imaging of a posterior incarceration with sacculation of the anterior wall during the 17th week op pregnancy illustrating the typical ventral out-pouching of the bladder (VO). Due to the mass effect of the incarceration of the gravid uterus the bladder is displaced anteriorly and cranially of the pubic symphysis (PS).
TECHNIQUE: Acquisition 1.5T (Philips): T2 paracor, TR3425 and TE 150; sense 2; acq 1.16/1.47/5.00 and rec 0.80/0.80/5.00.

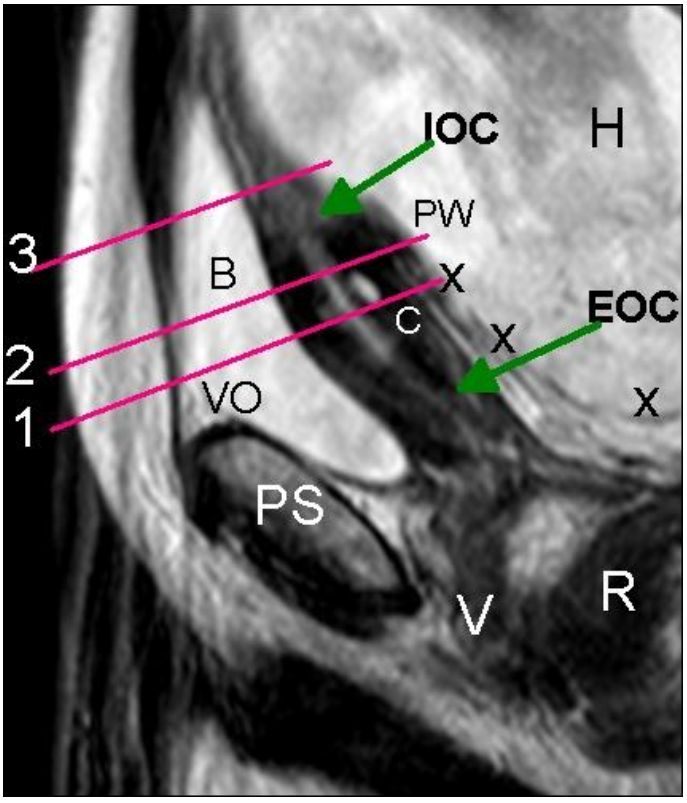

Figure 4 (left): A 35-year-old primigravida with an incarceration of the gravid uterus.
FINDINGS: Mid-sagittal T2-weighted MR imaging of the maternal abdominal wall showing the elongated cervix (C) - with its internal (IOC) and external cervical os (EOC) - that is flattened between the urinary bladder (B) and the posterior uterine wall (PW). The site of a conventional cesarean section (Pfannenstiel incision) is marked by a red line, illustrating that a conventional surgical entrance would pass through the bladder, cervix and posterior uterine wall (incision 1 and 2). The incision in the uterus should -if possible- be made in the lower (anterior) uterine segment (incision 3), taking into account that the bladder is likely to be encountered very high, and also that the cervix may be indistinguishable from the true lower segment. The border between the placenta and the myometrium is clearly defined (x).
H: fetal head; PS: pubic symphysis; R: rectum: V: vagina: VO: ventral out-pouching of the bladder
TECHNIQUE: Acquisition 1.5T (Philips): T2 sag, TR3425 and TE 150; sense 2; acq 1.16/1.47/5.00 and rec 0.80/0.80/5.00.

	FIRST TRIMESTER
Obstetric	(Late) miscarriage, false-positive diagnosis of extra-uterine gravidity, vaginal bleeding
Urologic	Dysuria, frequency, pollakiuria, urinary infection, urinary retention
	SECOND & THIRD TRIMESTER
Obstetric	Vaginal bleeding, intra-uterine growth retardation, oligohydramnios, false-positive diagnosis of placenta previa, premature labor, preterm premature rupture of membranes, premature delivery, sacculation, dystocia, fetal mal-presentation, abnormal placentation, rupture of the uterus/ bladder/cervix, incision of bladder/cervix during cesarean section, postpartum hemorrhage, pulmonary embolism
Urologic	Urinary retention, dysuria, frequency, urinary incontinence, urinary infection, renal failure, sepsis, hydronephrosis, post-obstructive diuresis
Gastro-enterologic	Abdominal pain, constipation, rectal gangrene
Vascular	Venous congestion in lower limbs, venous thrombosis

Table 1: Symptoms and complications of an incarceration of the gravid uterus

Etiology	The fundus of a retroverted uterus does not enter the abdominal cavity by the end of the first trimester of pregnancy but remains trapped in the pelvic cavity despite of the increasing volume of the uterine contents.
Incidence	1/3000 pregnancies.
Gender ratio	Only females.
Age predilection	Reproductive age.
Risk factors	Uterine anomalies [6], endometriosis, pelvic adhesions, uterine prolapse [7], fibroids on the posterior wall, a deep sacral concavity with an overlying promontorium, adhesions between the uterine fundus and the peritoneum [8-11].
Treatment	To try to restore the normal polarity of the uterus: *Very early pregnancy: manual reduction, *Early mid-pregnancy: colonoscopy-assisted manual reposition, *Late pregnancy: operative reduction via laparoscopy or laparotomy.
Prognosis	The prognosis strongly depends on the time of diagnosis. The prognosis is good if one is able to restore the normal polarity of the uterus. On the other hand, incarceration of the gravid uterus can be associated with severe complications, too (Table 1). Especially when the diagnosis was made during a caesarean section, an accidental transection of the bladder, the cervix, the vagina or of the uterine wall could happen.
Findings on imaging	US: Incarceration of the gravid uterus often is not recognized by ultrasound, especially when the examiner is unaware of the condition. (1) The cervix is difficult to localize by a transvaginal ultrasound [15], but a transabdominal ultrasound may reveal the position of the cervix and internal os, and also the relations between the bladder, uterus and vagina [12]. The anterior location of the cervix is the most consistent ultrasound finding [8,13,14]. The transabdominal longitudinal scan shows two hypo-echogenic layers with an intervening echogenic layer (the elongated cervix with the internal os). The transverse scan shows the cervix as a spindle-shaped echogenic structure superficial to the lower uterine segment [12]. (2) The bladder is displaced superiorly and anteriorly to the uterus; it may be distended and incompletely obstructed. (3) The fetus is positioned very posteriorly and is impacted against the curve of the sacrum. MRI: The two most consistent MRI findings are: (1) A stretched, elongated and anteriorly displaced cervix, (2) A deformed bladder shape, (2a) a ventral out-pouching of the anterior bladder just cranially of the pubic symphysis (mid-sagittal MR images), (2b) a crescent-shaped bladder (transverse supra-pubic MR images), (3) Other MRI parameters that should be evaluated are: the location of the placenta, the presence of an associated uterine torsion, the thickness and regularity of the uterine wall at the locus of the sacculation.

Table 2: Summary table for incarceration of the gravid uterus

	Ultrasonography	**MR Imaging**
Incarceration of the gravid uterus	*Often not recognized, *Elongated and anteriorly displaced cervix, *Superiorly and anteriorly displaced bladder, *Very posteriorly positioned fetus, impacted against the curve of the sacrum, *Longitudinal US: two hypo-echogenic layers with an intervening echogenic layer, *Transverse US: spindle-shaped cervix, presenting as an echogenic structure superficial to the lower uterine segment.	*Stretched, elongated and anteriorly displaced cervix, *Deformed bladder shape: (a) Ventral out-pouching of the anterior bladder wall just cranially of the pubic symphysis (mid-sagittal images), (b) Crescent-shaped bladder (transverse supra-pubic images).
Fibroid	*Well-defined hyper- or hypo-echoic myometrial tumor, *Often acoustic shadowing, *Sometimes areas of calcification.	*Well-defined masses, *T1-weighted images: isointense to the myometrium. *T2-weighted images: low-signal density as compared to the myometrium.
Red degeneration of a fibroid	*a cystic core in the fibroid which may be filled with hypo-echoic fluid and septa and the remnants of necrotic myometrium.	*T1-weighted images: diffuse or peripheral high signal intensity, *T2-weighted images: variable signal intensity.
Uterine anomalies	*Absence or presence of the ovaries? *Intact uterine contour (examination during secretory phase)? *Associated renal anomalies (20-30%)?, *Doubtful cases: 3D-Ultrasound.	*Absence or presence of the cervix?, *Evaluation of the contour of the fundus?, *Absence or presence of separated functioning endometrium?
Any pelvic or adnexal mass extending into the cul-de-sac	*Variable US features depending the origin of the pelvic mass, *No distortion/displacement of the urinary bladder.	*Mass in the Douglas (variable MRI features) separated from the uterus
Uterine torsion	Changed position of the placenta/the ovarian vessels (as seen on previous US scans)	Axial images: *At the level of the low vagina: a normal H-shaped configuration of the cervix, *More superior: the left lateral vaginal wall apex is twisted to the right side and vice versa (X-shaped configuration).
Simple sacculation	*Containing all layers of the uterus, *Located at any part of the uterus, *Not associated with a retroverted uterus.	Out-pouching of the uterine wall, located at any part of the uterus.
Pregnancy in a non-communicating horn	Visualization of an endometrial stripe within a separate mass representing the main horn of the bicornuate uterus.	Visualization of an endometrial stripe within a separate mass representing the main horn of the bicornuate uterus.
Early pregnancy: extra-uterine pregnancy	Incarceration of the gravid uterus can mimic an ectopic pregnancy: False impression of a linear central cavity echo between the maternal urinary bladder and the products of conception (due to the anterior displacement and folding over of the non-expanded lower uterine segment).	

Table 3: Differential diagnosis table for incarceration of the gravid uterus

ABBREVIATIONS

AW: anterior uterine wall
B: bladder
bc: bladder catheter
C: cervix
EOC: external cervical os
F: uterine fundus
H: fetal head
IOC: internal cervical os
MR: Magnetic Resonance
MRI: Magnetic Resonance Imaging
P: placenta
PS: pubic symphysis
PW: posterior uterine wall
R: rectum
S: sacrum
V: vagina
VO: ventral out-pouching of the bladder

KEYWORDS

Uterine incarceration; Pregnancy; Diagnosis; Ultrasound; Magnetic resonance imaging; Sigmoidoscopy

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