ORIGINAL PAPERS

Ultrasound in Obstetrical and Gynecologic Emergencies

Andreea Ruxandra ALBU[1,2], Delia Maria GRADINARU[1], Diana SECARA[1,2], Doina BRANESCU[1], Alice NEGRU[1], Octavian MUNTEANU[1,2], Andra BALAN[1], Oana TEODOR[1], Miruna PIRLOG[1], Adriana KLEIN[1], Bogdan DOROBAT[1], Monica Mihaela CIRSTOIU[1,2]

Abstract

In Bucharest University Emergency Hospital every day we deal with difficult cases either presented per primam in our setting or, even more difficult situations, cases that were intended to be treated in other hospitals but due to lack of infrastructure are sent towards our multidisciplinary hospital, as a final stop.
Conditions that our teams have to deal in a very restricted amount of time in the Emergency Room are: submucous myoma with heavy bleeding acquired uterine arteriovenous fistulae, ovarian ruptured cyst , ovarian hyperstimulation syndrome, adnexal torsion, tuboovarian abscess, classical tubal ectopic pregnancy, Cesarean scar ectopic pregnancy, molar pregnancy, incomplete abortion, ruptured uterus post minimally invasive procedures performed before pregnancy, placental abruption, placenta praevia with heavy bleeding, and the PAS – Placenta Accreta Spectrum.
All these conditions recquire a rapid differential diagnosis where ultrasonography is useful in adopting a tailored management either conservative or radical, in avoidance of haemorhagic accidents or even death and, when needed, in fertility sparing.

Keywords: Placenta Accreta Spectrum, Cesarean scar pregnancy, uterine arteriovenous fistula, submucosal myoma

Rezumat

În Departamentul Primiri Urgențe al Spitalului Universitar de Urgență București ne confruntăm în fiecare zi cu cazuri dificile, fie prezentate per primam la camera de garda, fie cazuri la care s-a tentat gestionarea în alte spitale, dar din lipsă de infrastructură, sunt trimise către spitalul nostru multidisciplinar pentru a fi rezolvate.
Aducem în prim plan afecțiuni cărora echipele noastre trebuie să le facă față într-un timp foarte scurt în camera de gardă: mioame submucoase cu sângerare abundentă, fistula arteriovenoasă uterină dobândită, sindromul de hiperstimulare ovariană, torsiunea anexială, chistul ovarian eclatat, abcesul tuboovarian, sarcina ectopică tubară clasică, sarcină ectopică implantată la nivelul cicatricii post operație cezariană, mola hidatiformă, avort incomplet efectuat cu sângerare, ruptură uterină pe uter gravid post proceduri minim invazive efectuate înainte de sarcină, decolare a placentei normal inserată, placentă praevia și Spectrul Placentei Accreta (PAS).
Toate aceste entitați impun un diagnostic diferențial efectuat rapid în care ultrasonografia este de mare ajutor în abordarea conduitei corespunzătoare fiecărei patologii, pentru prezervarea fertilității și evitarea unor accidente hemoragice și chiar decesul.

Cuvinte cheie: Placenta Accreta Spectrum, sarcina implantată în cicatrice post cezariană, fistulă arteriovenoasă uterină, fibrom submucos.

[1]University Emergency Hospital Bucharest, Romania
[2]Carol Davila University of Medicine and Pharmacy, Bucharest, Romania

Corresponding author:
Delia Maria GRADINARU, University Emergency Hospital Bucharest, Romania
E-mail: dr_deliagradinaru@yahoo.com

INTRODUCTION

In an emergency setting, Ob-Gyn specialists must react within minutes to make a correct diagnosis and must act properly to save the patient.

Whenever a woman of reproductive age presents with pelvic pain or vaginal bleeding at the Emergency Room pregnancy should be taken into consideration. Personal history of uterine interventions before the present pregnancy leading to endo - myometrial damage should be noted as a possible cause for pregnancy complications, previous cesarian sections, prior abortions either spontaneous, instrumental or medical, history of infertility, Sexually Transmitted Diseases (STD), and Assisted Reproductive Techniques (ART) are of utmost importance when dealing with an emergency patient.

Clinical exam and laboratory tests have ultrasound as a fast, precise, complementary investigation and there are cases where ultrasound is highly sensitive in generating the correct medical attitude.

We present a series of cases that we met in the Emergency Room of Bucharest University Emergency Hospital where ultrasound examination pointed to the correct diagnosis hence the correct medical attitude.

1. Submucous myoma with vaginal bleeding

Among gynecologic emergencies, submucous endocavitary myoma may present with severe bleeding, unresponsive to medical treatment, anemia, general fatigue, sometimes syncope. Transvaginal or abdominal ultrasound shows the presence of circumscribed endocavitary mass, appreciates its homogeneity and vascular pattern, measures the endometrial thickness. A resectoscopic procedure or Uterine Artery Embolization are possible indications for a myoma with a diameter of less than 6 cm. as a conservative management[1,2]. Voluminous endocavitary myoma with anemia and persistent bleeding has instead a clear surgical indication. The importance of ultrasound resides in the correct management adapted to the case – knowing the dimensions, appreciate if necrobiosis is associated, measure the depth of myometrial invasion and the remnant myometrial depth from the myoma border to the uterine serosa[1]. In this way we can decide which attitude could be adopted.

We present the case of a 39 years old nullipara with menometrorrhagia and anemia with an intramural myoma with an important submucous component, 47/50 mm in dimensions, who declined hysteroscopy or surgical management. She had Uterine Artery Embolization in our department followed by spontaneous vaginal elimination of a great part of the embolized, necrotized myoma and restoration of her menstrual cycles (Fig. 1,2,3).

Figure 1. Intramural myoma 47.6/53 mm with a submucous component with bleeding and anemia at 39 years old nulliparous woman

Figure 2. Myoma aspect at 2 weeks post embolization of uterine arteries

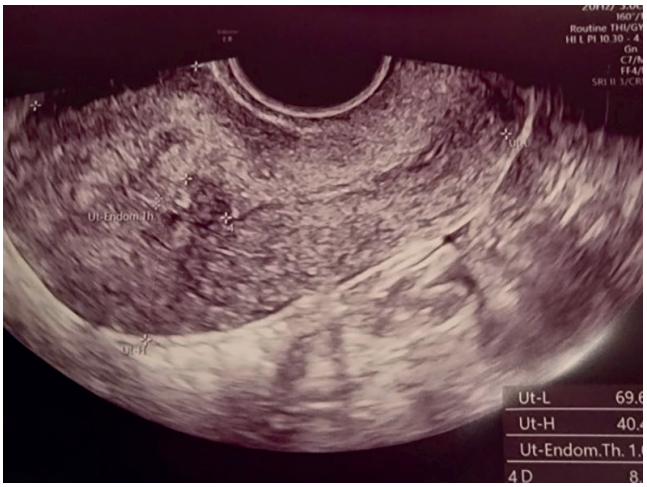

Figure 3. Aspect at 2 months after Uterine Artery Embolization. Notice the 8/10 mm remnant of the myoma on the anterior uterine wall

Another case is a 52 year old patient with a previous cesarean section presented at our Emergency Room for persistent heavy bleeding with anemia, intense pelvic pain, nausea and vomiting. Clinical exam revealed a voluminous pelvic mass which was confirmed by ultrasound as a posterior wall submucous myoma aprox. 150 mm in diameter with a large implantation base, distending the whole endometrial cavity, protruding through the dilated cervical canal. The surgical decision was taken and an emergency total hysterectomy with bilateral adnexectomy was performed (Fig. 4,5).

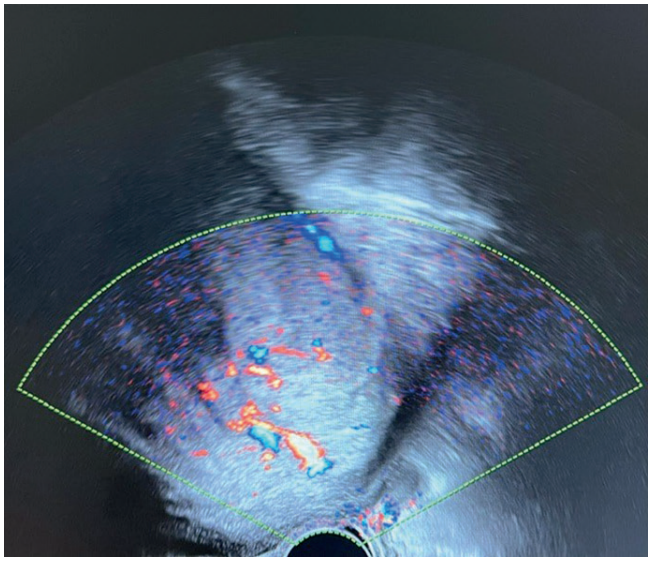

Figure 4. Voluminous endocavitary tumor protruding through the dilated cervical canal with its inferior pole at the level of the external cervical os

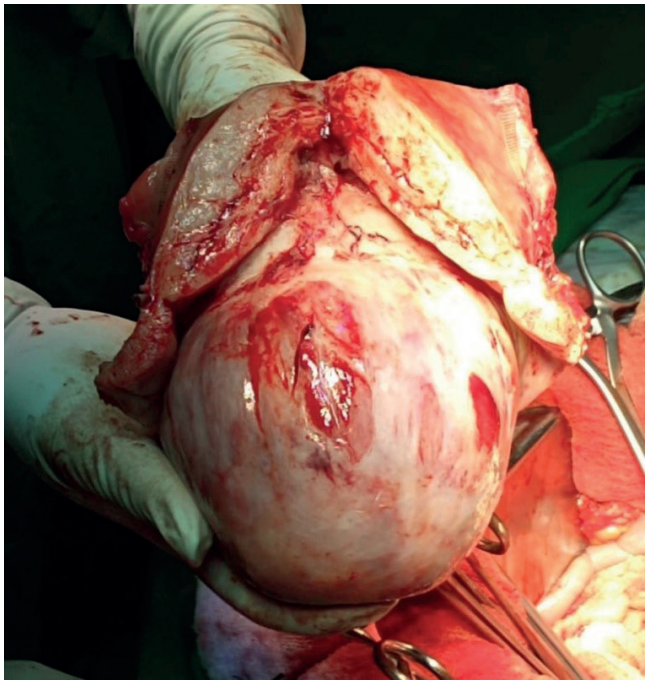

Figure 5. Intraoperative aspect of the endocavitary voluminous tumor protruding through the cervical canal

2. Acquired arteriovenous fistulae

Another condition met after the incomplete evacuation of placenta after birth or after incomplete abortions (either spontaneous, medical or instrumental), and seldom after a myomectomy is the acquired arteriovenous fistula – a life threatening emergency. It is a short circuit between the uterine arterial and venous circulation without the intervening capillary network – direct fistulas between the intramural arterial branches and the myometrial venous plexus. In Colour Doppler ultrasound they are described as enhanced myometrial vascularity with high peak systolic velocity of more than 20 cm/sec.[3,4]. Patients usually present with severe persistent bleeding.

It is important to recognize them by ultrasound and proceed to conservative management such as Uterine Artery Embolization and abstain from emergency curettage as first maneuver for stopping the severe bleeding which would cause a life threatening hemorrhage with the need for subsequent emergency hysterectomy. Thus, in acquired cases of arteriovenous fistula, Uterine Artery Embolization proves to be a safe alternative to emergency hysterectomy that can be performed to stop the massive bleeding[5,6].

One case treated in our Department in August 2021 was a 31 years old woman who had a Cesarean section in the UK 10 months prior to presentation when apparent incomplete placental extraction was followed by persistent bleeding and a first uterine curettage was performed 2 months after birth in the UK, followed by a second curettage performed in Romania 8 months after birth for placental remnants. She was brought by Ambulance after massive bleeding at home after an episode of syncope. Blood tests revealed severe anemia. Ultrasound revealed increased myometrial vascularity with high peak velocity at Doppler investigation with a thin endometrium (Fig. 6). After explaining to the patient the benefits of Uterine Artery Embolization she consented for the procedure. The first attempt of UAE was unsuccessful, but the second embolization using an endovascular coil stopped the bleeding (Fig. 7). The patient is followed up and reports normal menstrual bleeding with an improved aspect of the myometrial vasculature noticed at ultrasound evaluation (Fig. 8).

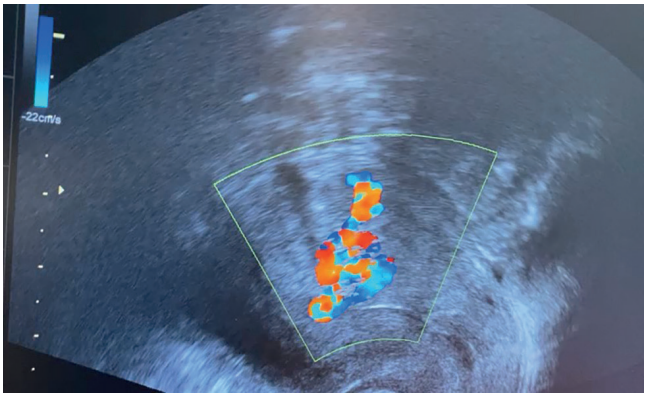

Figure 6. Preinterventional aspect of high intensity tortuous enhanced myometrial vascularization

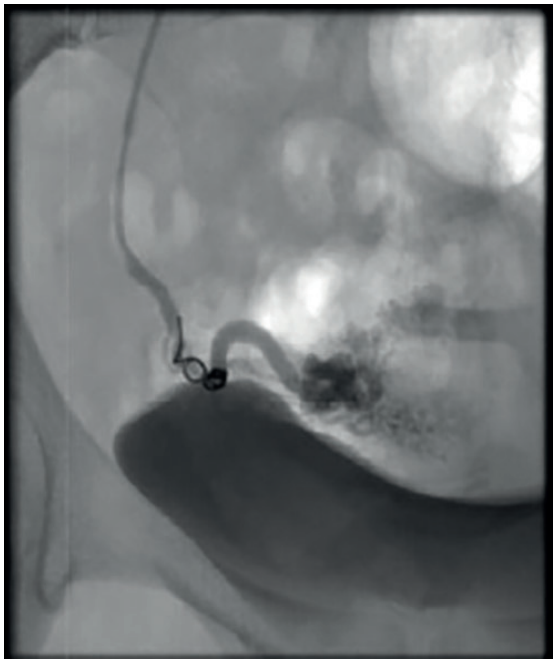

Figure 7. Status post bilateral embolization of uterine arteries. Second UAE attempt with endovascular coil

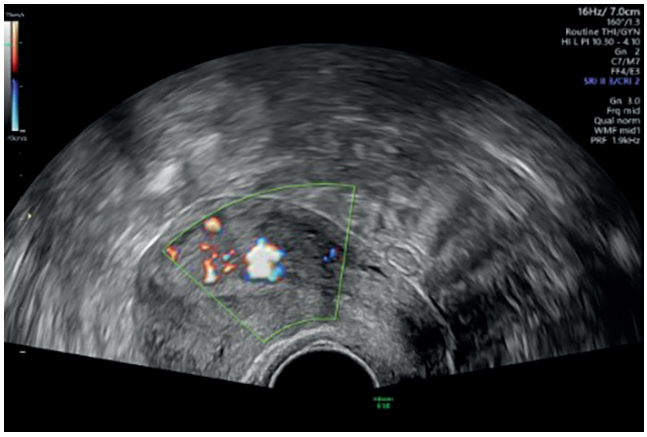

Figure 8. Postinterventional aspect 9 monthsb after UAE with diminished myometrial vascularization

3. Adnexal pathology

Ovarian ruptured cyst with hemoperitoneum (Fig.9), adnexal torsion (Fig.10), ovarian hyperstimulation syndrome (Fig.11), tuboovarian abscess (Fig 12) are also conditions that we meet in the Emergency Room. As all of these conditions present as an acute abdomen, ultrasound helps establish the correct diagnosis which favours surgical intervention (adnexal torsion with displacement of the enlarged ovary, with some-

times altered vascularization) or prevents inappropriate surgical interventions (cases of a ruptured ovarian cyst with mild to moderate haemoperitoneum and haemodynamic stable patient where expectant management should be adopted).

Figure 9. Hemoperitoneum in ovarian ruptured cyst (negative pregnancy urine test)

Figure 10. Intraoperative aspect of ovarian torsion with necrosis, edema and median displacement of the ovary

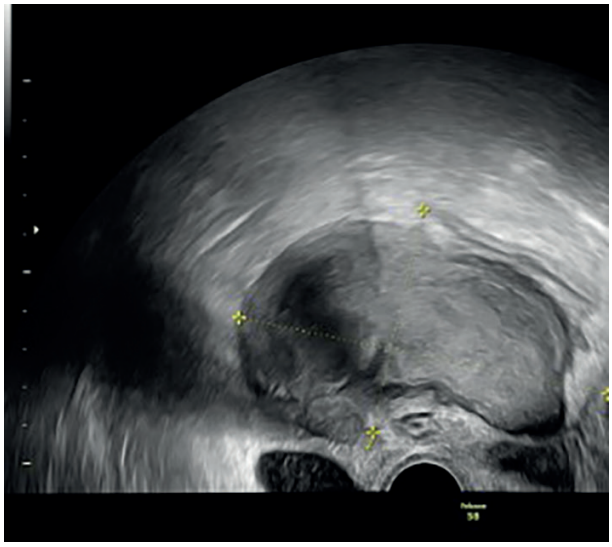

Figure 11. Tuboovarian abscess

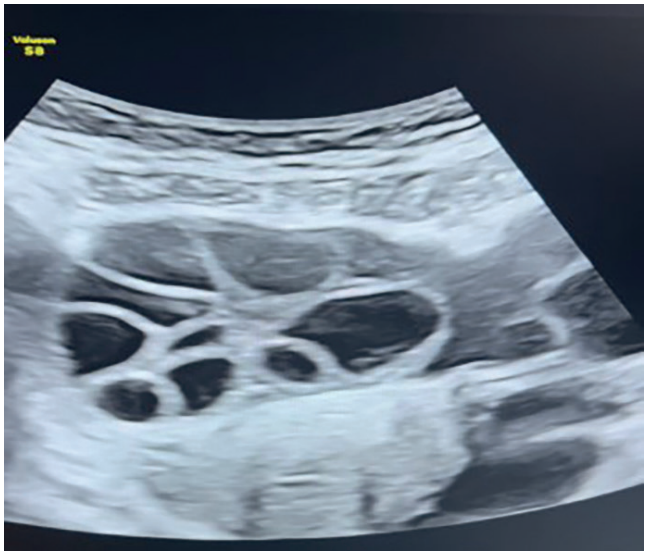

Figure 12. Hyperstimulated ovary with ascites

4. First trimester pregnancy complications

Ectopic pregnancy

Ectopic pregnancy is a common diagnosis in women who present in the ER with pelviabdominal pain, amenorrhea, vaginal bleeding together with positive urinary pregnancy test or elevated blood β HCG. The ultrasound examination together with biochemical markers and clinical symptoms establishes the diagnosis and guides the management. Tubal pregnancy is the most common but, lately, due to the increasing number

of cesarean sections, cesarian scar pregnancy is often met and if recongnised requires a customized management.

The ultrasonographic features of cesarean scar pregnancy are: empty uterus and cervix, the gestational sac present in the anterior part of the lower uterine segment corresponding to the Caesarean scar with a thin myometrial layer between the bladder wall and gestational sac[7].

Termination of pregnancy in the first trimester should be taken in consideration as there is a high risk of uterine rupture or abnormal adherent placenta. Treatment options should be individualized[7].

First line curettage is avoided due to high risk of uncontrolled life threatening bleeding and subsequent hysterectomy[7, 8, 9].

Several therapeutic options are reported in the literature – chemotherapy with systemic administration or local injection of Methotrexate under ultrasound guidance before curettage, Uterine Arteries Embolization and curettage, hysteroscopy, laparoscopy, vaginal or open excision and repair[8, 9].

In our hospital Cesarean scar pregnancy is treated according to the following protocol: Uterine Artery Embolization and subsequent curettage with no increased bleeding and no increased hospital stay. When using ultrasound, care must be taken in the differential diagnosis with incomplete abortion where the gestational sac is detached from the normal implantation site and can be found on the descending way to the cervical canal at the level of the uterine scar (Fig. 15). Lack of vascularization at Colour Doppler assessment and previous ultrasound showing normal implantation of the gestational sac could reassure the obstetrician and the patient that a uterine curettage will not generate a severe bleeding requiring emergency hysterectomy.

The next photos show one of the most recent cesarean scar pregnancy 7 weeks of amenorrhea that was successfully managed in our department with UAE and curettage at a 29 years old patient with a previous Cesarean section (Fig .13,14).

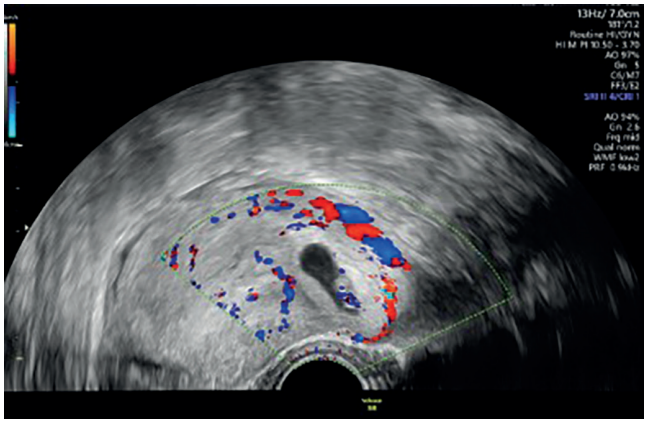

Figure 13. Cesarean scar pregnancy with alive embryo, yolk sac, deep anterior trophoblastic invasion at the scar level, empty uterine cavity and empty cervical canal, intense vascularisation

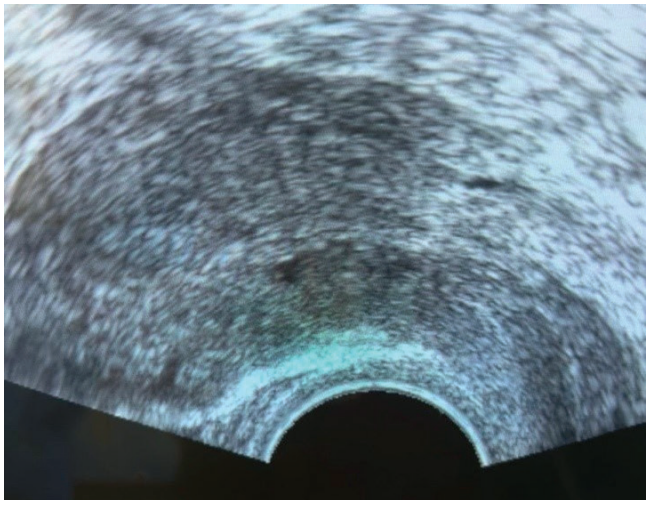

Figure 14. Transvaginal grayscale ultrasound image of the uterus at 2 weeks post UAE with subsequent uterine aspiration

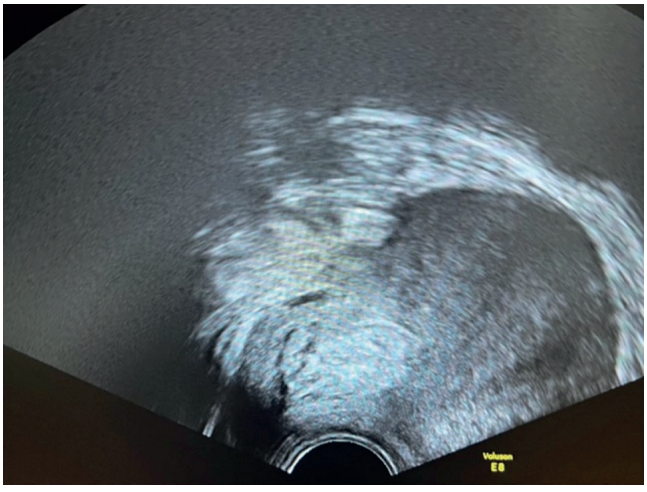

Figure 15. Incomplete abortion – note the full thickness of the uterine scar. No signs of implantation at this level

Incomplete abortion

Along the fairly common first trimester periovular haematoma or missed abortion, incomplete abortion with the remnants of the pregnancy blocked at the level of the isthmus or internal cervical os is always challenging as the differential diagnosis is made with the abnormal trophoblastic invasion described in Cesarean scar pregnancy or cervical pregnancy. Normal width of the anterior isthmic wall, no previous uterine scar, no vascularization at Colour Doppler favours the diagnosis of incomplete abortion (Fig 16).

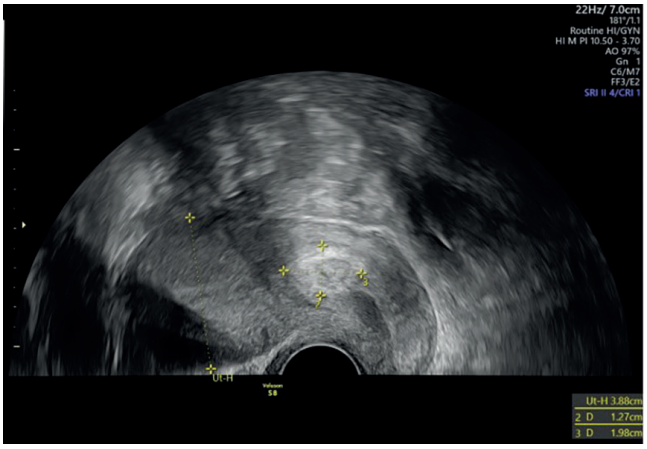

Figure 16. Incomplete Abortion - gestational sac at the isthmic zone at a nulliparous 18 years old patient

Molar pregnancy is another rare condition that requires careful management and follow up (Fig17).

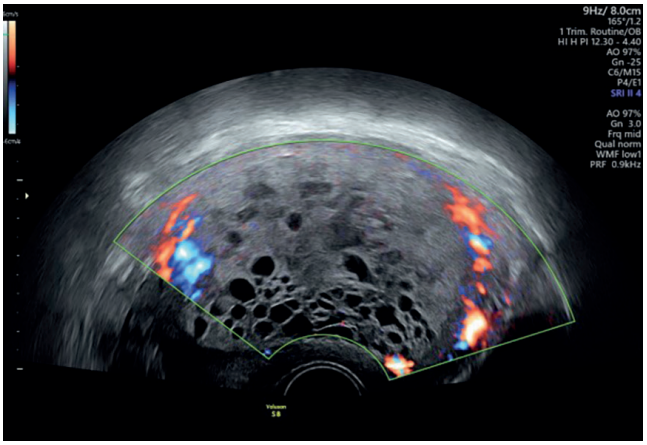

Figure 17. Molar pregnancy 11 weeks of amenhorea - note the abnormal placental tissue filling the uterine cavity with vesicles depicted as irregular sonolucent lacunae, myometrial thinning and intense vascularization

6. Second and third trimester pregnancy complications

Placenta praevia and Placenta accreta Spectrum

It is mandatory that placental location should be documented in relation with the internal cervical os after 24 weeks of gestation knowing the fact that placenta praevia - placenta that has its inferior pole at less than 2 cm from the internal cervical or covers it in various degrees - is associated to bleeding, a higher number of cesarean sections and maternal and neonatal morbidity. Placental adherence should be also assessed when a patient with placenta praevia is examined[10].

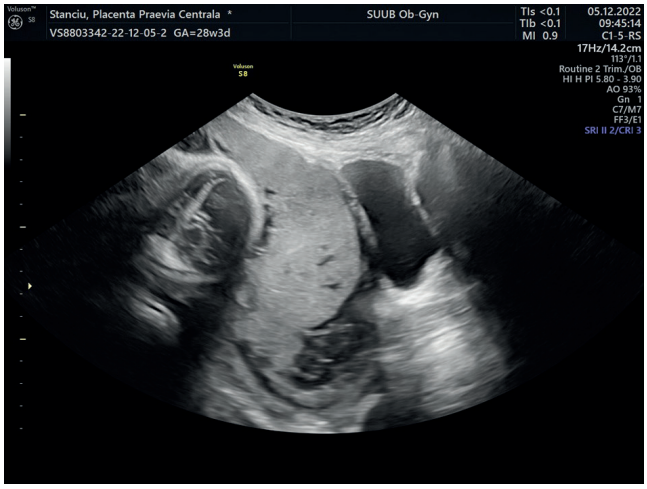

Figure 18. Placenta praevia covering the entire internal cervical os

Placenta Accreta Spectrum (PAS) is a condition associated with a high maternal morbidity and mortality rate. Due to an impaired placentation following the damage of the endometrium - myometrial interface as a result of an endometrial aggression (manual removal of the placenta, curettage, endometritis) especially in the past and as a result of the high number of cesarian section.

The pathophysiology of the PAS consists of the trophoblastic invasion of the myometrium in absence of endometrial continuity. PAS is classified into three categories[11]:

1. Accreta: Simple adherence to the myometrium.
2. Increta: where the villi invade the myometrium.
3. Percreta: villi invade the full thickness of the myometrium.

Several sonographic signs are described[12,13]:

1. The disappearance of the utero-placental interface – the clear "hallo" of the anechoic zone
2. Placental Lacunae and placental bed hypervascularity
3. Myometrial thinning (< 1mm)
4. Focal interruption of myometrial continuity and bladder wall interruption
5. Placental bulging
6. Bridging vessels linking placenta and bladder
7. The "rail sign" – 2 parallel blood vessels depicted by colour Doppler over the utero-vesical junction and bladder mucosa with interconnecting bridging vessels perpendicular to both, being associated to more additional perioperative and adverse outcomes[13].

Patients that present for the first time at the Emergency Room for uterine contractions with or without bleeding that were not monitored throughout the pregnancy, declaring a history of one or more cesarean births or other uterine interventions (myomectomy, hysteroscopy) with placenta covering the the previous uterine scar should be considered at great risk for abnormal adherent placenta and intrapartum bleeding, hysterectomy or death. Therefore the immediate mobilization of the multidisciplinary surgical team, anesthesiology team, reassuring that blood products are available are mandatory before performing a C-section in this case. Usually the cesarean section is performed at the level of uterine fundus, sagitally, the placenta is left inside the uterus and the hysterectomy follows. The maneuvers of placental detachment could attract uncontrollable bleeding[12].

We present the case of a 25 years old IIG IIP with a 35 weeks pregnancy who was admitted to our Department after presentation at the Emergency Room for uterine contractions at 35 weeks of amenorrhea. Ultrasound evaluation revealed: placenta praevia covering the whole internal cervical os and the previous Cesarean scar with multiple lacunae, loss of myometrial continuity, loss of bladder wall continuity, increased vascularization at the placental base and vesical bulging Fig. 19).

An emergency mediocorporeal Cesarean section was performed followed by a total hysterectomy (Fig.20).

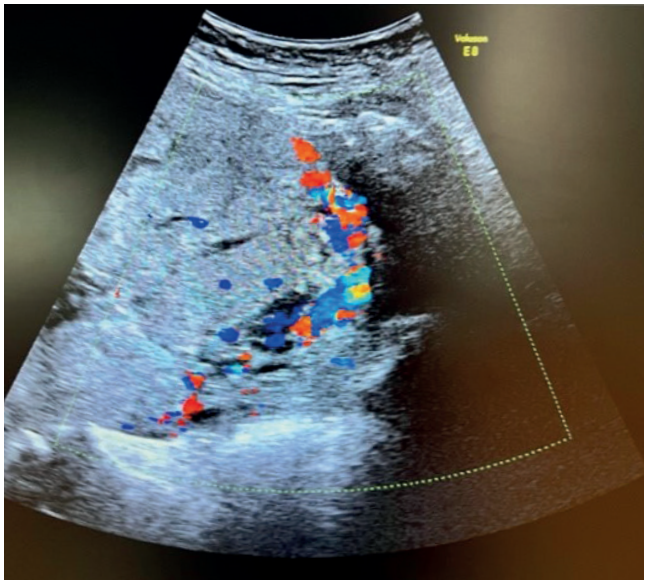

Figure 19. Placenta covering internal os and cesarean scar with increased basal vascularity, placental bulging, myometrial thinning, and disappearance of utero-vesical interface

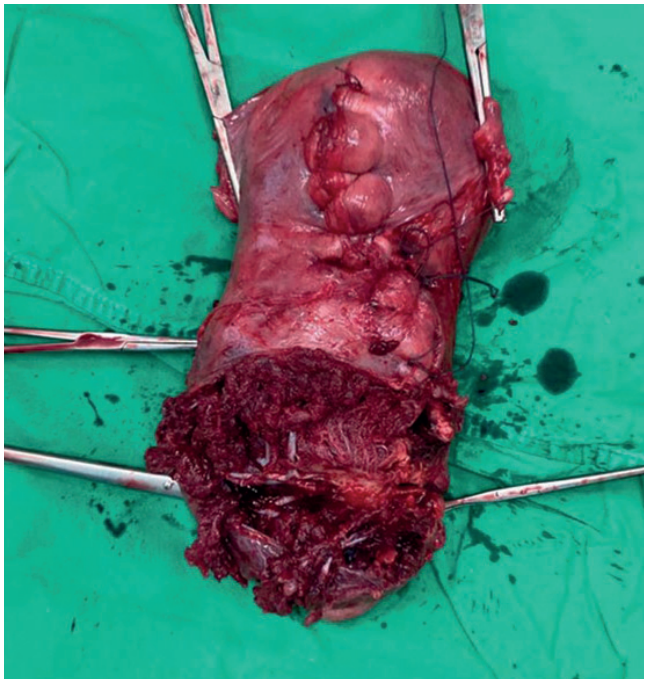

Figure 20. Posthysterectomy specimen (note the sagittal uterine incision for fetal extraction)

Uterine rupture after microinvasive surgical uterine procedures

Another rare case admitted in our Department is that of a 35 years old patient with a 20 weeks pregnancy following embryotransfer with a history of hysteroscopic

polipectomy who presented in the Emergency Room for intense abdominal pain with elevated serum leukocytes and fever. Ultrasound evaluation found a dead fetus in the abdominal cavity, and a placenta that was invading and protruding through the posterior uterine wall. Immediate surgery was performed with conservative uterine management - partial uterine resection and hysteroraphy[14].

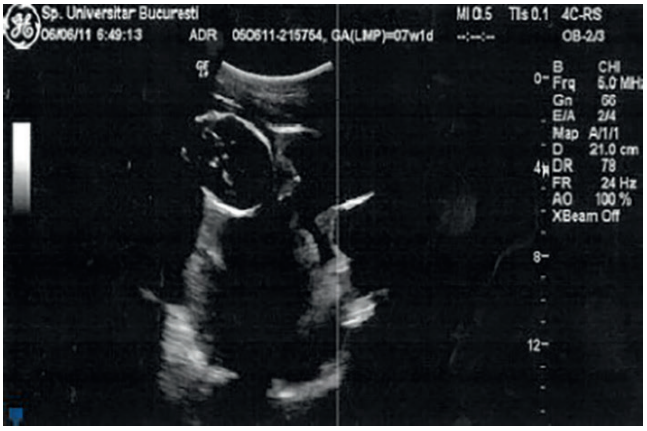

Figure 21. Dead fetus outside the uterine cavity

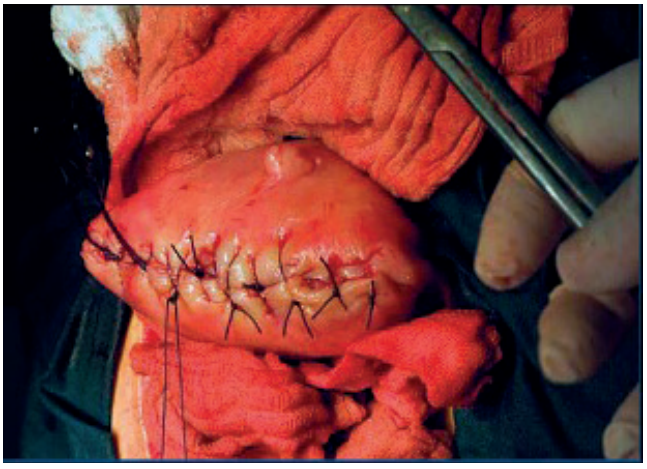

Figure 22. Uterine aspect after resection and hysteroraphy

DISCUSSIONS

The use of ultrasound in the Emergency setting in Obstetrics and Gynecology is mandatory and all specialists should be skilled into using ultrasound in order to identify the etiology of the condition a patient presents and also in order to make a differential diagnosis.

For instance identification of a thick endometrium will guide towards a diagnostic and therapeutic curettage can be made to a patient that presents with vaginal bleeding. A thin endometrium assessed at ultrasound will prohibit a curretage.

The dimensions of a submucous myoma will prompt a conservative management either one or two stages hysteroscopic resection or Uterine Artery Embolization or, in selected cases, hysterectomy.

We encounter a rise in the number of Cesarean scar pregnancies. The correct diagnosis and performing uterine curretage after chemotherapy or Uterine Artery Embolization can diminish hemorrhagic accidents and even the need for hysterectomy, preserving the patient's reproductive capacity.

Assessment of placental localization throughout the pregnancy and at the moment a patient comes in the Emergency Room with an advanced pregnancy presenting uterine contractions and/ or vaginal bleeding together with assessment of placental adherence in cases where placenta lies on previous uterine scars can be lifesaving.

Patient history should always be recorded and clinical signs and symptoms together with laboratory tests should be incorporated into the diagnostic algorithm together with a thorough ultrasound examination.

Statement: The study was conducted with approval of the local Ethics Committee and in accordance with the ethical standards of the Helsinki Committee for Human Rights. All patients gave signed informed consent for image publishing.

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