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Diagnosis of placenta Accreta in cases of placenta previa

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ABSTRACT

Back ground:Placenta accreta occurs when there is an abnormal adherence of a part or entire of the placenta to the uterine wall with either partial or complete absence of the decidua basalis.The placenta may be abnormally adherent to the myometrium or extend to invade other tissues (uterine serosa or urinary bladder). This study aimed to determine the value of ultrasonographic criteria in diagnosis of placenta accreta in cases of placenta previa.**Conclusion:** Antenatal diagnosis of placental invasion by ultrasonography and colour Doppler was Successful.

Key words: Color Doppler, Placenta accrete, Placenta previa

Introduction

The placenta is an organ that develops in uterus during pregnancy. This structure provides oxygen and nutrients to growing baby and removes waste products from baby's blood. The placenta attaches to the wall of the uterus, and baby's umbilical cord arises fromit[(1)].The placenta is amateno-fetal organ which begins developing at implantation of the blastocyst and is delivered with the fetus at birth. As the fetus relies on the placenta for not only nutrition, but many other developmentally essential functions[(2)].

Functions of placenta: Respiratory function**,** Nutritive function**,** excretory function**,** Production of enzymes**,** Production of pregnancy associated plasma proteins**,** Placental barrier and Endocrine function[(3)].

Separation of the Placenta:

The placenta and its membranes are delivered from the uterus after delivery of the fetus. The separation of the placenta from the uterine wall occurs through the stratum spongiosum, and produce rupture of the uterine vessels. The orifices of the torn vessels are closed by the firm contraction of the uterine muscular fibers so preventing and controlling postpartum hemorrhage. The epithelial lining of the uterus is regenerated again by the proliferation and extension of the epithelium which lines the persistent portions of the uterine glands in the unaltered layer of the deciduas[(4)].

Placenta Accreta

Definitions:

Defined as abnormal attachment of the placenta to the uterus, due to missing or deficiency of Nitabuch’s layer or the spongious layer of the decidua penetration to the

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myometrium is called placenta increta, and penetration through the myometrium and serosa is defined as placenta percreta[5].

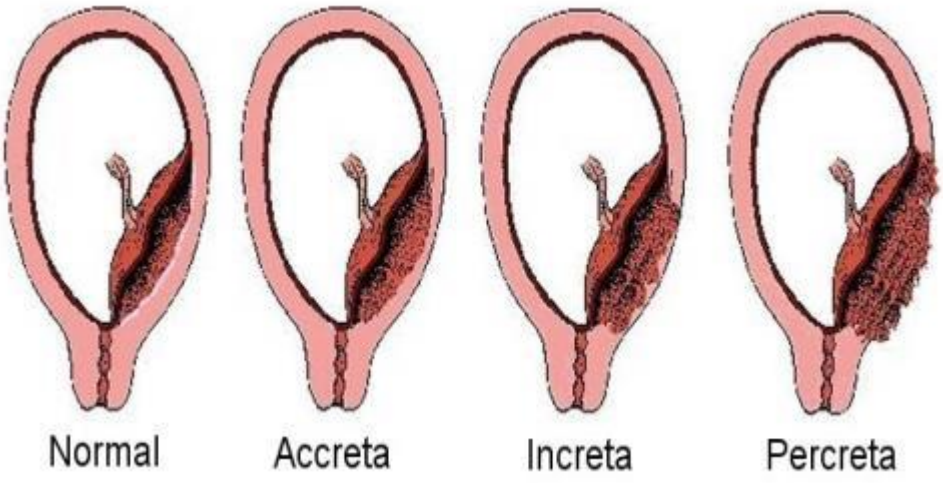

Fig (1): normal and abnormal attatchement of placenta[6].

Placenta percreta is the rarest and most serious form of placenta accreta. It is accompany with severe obstetrical complication such as bladder injury[7].

Incidence

Incidence of placenta accreta has increased worldwide, mostly due to increased caesarean section rates, from 1 in 2500 pregnancies to 1 in 500 pregnancies[8].

Placenta previa and previous caesarean section are the most recognized risk factors for placenta accrete. A recent systematic review reported an increase in the incidence of abnormally invasive placenta from 3.3 % -4% in women with placenta previa and no previous caesarean section to 50% -67% in women with three or more previous caesarean deliveries[8].

According to a case-control study using the UK Obstetric Surveillance System (UKOSS),the odds of having abnormal invasive placentation was increased in women who had a previous caesarean delivery (aOR 14.41, 95% CI 5.63-36.85), other previous uterine surgery (aOR 3.40, 95% CI1.30-8.91), an in vitro fertilization (IVF) pregnancy (aOR32.13, 95% CI 2.03-509.23) and placenta previa diagnosed antepartum(aOR65.02, 95% CI16.58-254.96). The study also found raised odds of placenta accrete associated with advanced maternal age in women without a previous caesarean delivery (aOR1.30, 95% CI1.13-1.50 for every 1-year increase in age from 35 years) [8].

Risk Factors

Many factors can increase the risk of placenta accreta, including[9]:

1. Maternal age.
2. Multiparity.
3. Prior uterine surgery or uterine curettage.
4. Asherman syndrome.
5. Previous cesarean delivery .
6. Uterine leiomyomata.
7. Uterine anomalies.

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8. Hypertensive disorders of pregnancy.
9. Smoking.

Table (1): Frequency of placenta accreta according to number of cesarean deliveries and presence or absence of placenta previa[10]

Cesarean delivery	Placenta previa with accreta	No. placenta previa without accreta
First	3.3%	0.03%
Second	11%	0.2%
Third	40%	0.1%
Fourth	61%	0.8%
≥ **Fifth**	67%	0.8%

Presence or absence of **placenta Accreta (Table 1)**, the risk of placenta accreta was 3.3% for those at their first cesarean delivery if there was placenta previa, remained 67 % for women having up to their ≥fifth cesarean delivery[10]**.**

Pathogenesis:

Placentation is a complex process, mediated by prostaglandins, sexual hormones, cytokines and immunological factors. Physiologically, invasion of the endometrium by the trophoblast limited to the decidua basalis[11]**.** There is no doubt that the decidua normally regulates trophoblast invasion, as evidenced by the aggressive invasion of the muscular and serosal layers seen at sites of ectopic implantation in cesarean section scar, the fallopian tube or in the abdomen[12]**.**

The exact pathogenesis of morbidly adherent placenta is unknown. Generally, MAP (morbid adherent placenta or placenta accrete spectra) has been diagnosed on hysterectomy specimens when an area of accretion showed chorionic villi in direct contact with the myometrium and an absence of decidua[13]**.**

Finally, data derived from studies demonstrate that the signaling components of the vascular endothelial growth factor (VEGF) family including VEGF-A, Placental Growth Factor (PlGF) and their receptors VEGFR-1 and VEGFR-2 are present in the decidua and play crucial roles in the normal development of the feto-placental vascular network. Kinase-insert Domain Receptor (KDR) is recognized as the central VEGF receptor in angiogenesis, while VEGFR-1 plays a supporting role. Engagement of VEGFR-1 and VEGFR-2 receptors by both VEGF and PlGF leads to various downstream activations which are responsible for endothelial cell proliferation, migration and survival. Presence of phosphotyrosine was proposed as an immunohistochemical marker of VEGF-mediated receptor activation. The process of normal trophoblast invasion and placentation requires fine coordination among VEGF and PlGF that oxygen tension has a key role in regulating their expression[14]**.**

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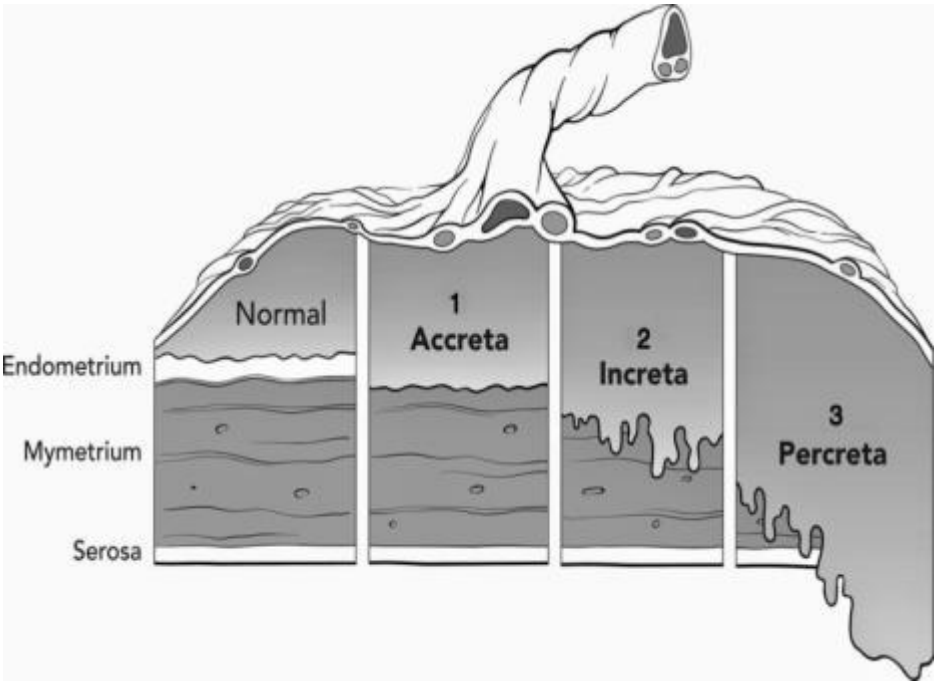

Fig (2): Depth of placental attchement to uterus (orgrows into the uterus) determines the severity of the accreta[(2)].

Three grades of abnormal placental attachment are defined according to the degree of pathological penetration.

Abnormal placental adherence can be classified into three distinct conditions; Placenta accreta refers to a superficial attachment without invasion into the myometrium. Placenta increta occurs when placental villi extend into the myometrium. In placenta percreta, the invasions extend deep beyond the uterine serosa[(15)].

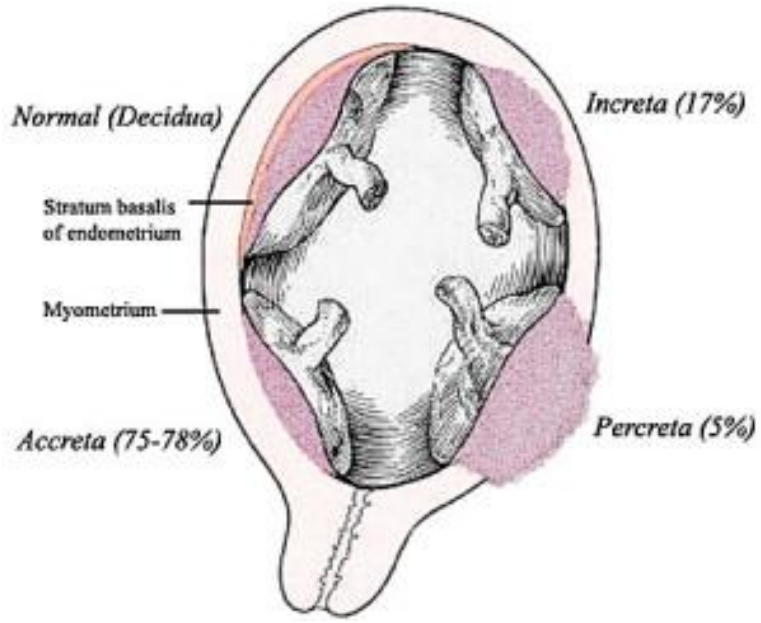

Fig (3): Placental implantation abnormalities[(2)].

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Among patients with a histologic diagnosis of abnormal placental invasion, 75-78% of cases were placenta accreta, 17% of cases were placenta increta, and 5% were placenta percreta[12].

Clinical Presentation:

Asymptomatic in most patiens. Symptoms associated with placenta accreta may be vaginal bleeding and cramping. These symptoms are common find in relation to placenta previa, which is the main risk factor for placenta accreta. Catastrophic presentation is that of acute abdominal pain and hypotension due to hypovolemic shock from uterine rupture secondary to placenta percreta. These can occure at any time during gestation from the first trimester to full-term gestations in the absence of labor pain[16].

Early prenatal differentiation between the three types of placental invasion would be desirable because it would enable the creation of a precise individual treatment plan for each affected patient. Prenatal diagnosis of placental invasion is based upon characteristic findings on ultrasound examination. Ultrasonography has been reported to be a reliable imaging method for this purpose. However, screening has been limited to those at high risk for placental invasion[17].

Clinical Significance:

One of the complications of placenta Accreta is massive hemorrhage at the time of placental separation which can lead to renal failure, adult respiratory distress syndrome, and even death. In severe cases hysterectomy may be required, also urinary bladder or ureteral injury, pulmonary embolism are other serious complications[18].

The required amounts of infused blood products (eg, whole blood, packed red blood cells, fresh frozen plasma, platelets, and cryoprecipitate) are difficult to predict. Women undergoing cesarean hysterectomy typically will have an intraoperative blood loss of 2000-5000 mL[19].

In some cases, ≥10 L blood loss has been reported[20]. Severe hemorrhage can occur during cesarean hysterectomy. The blood loss reach from 7000 mL to 47,000 mL reported in cases of placenta percreta[21].

Urologic complications include bladder lacerations 26%, urinary fistulas 13%, gross hematuria 9%, ureteral transection 6%, and a small capacity bladder 4%. Another study reported that partial cystectomy 10% or cystotomy 10% are required for the treatment of placenta accreta and placenta percreta cases[22].

Sonographic findings associated with placenta accreta include:

Criteria include focal or diffuse intraparenchymal placental lacunar flow, vesicouterine serosa interphase hypervascularity, prominent retroplacental venous complex, and loss of retroplacental Doppler vascular signals[23].

Factors should raise suspicion for placenta accreta include[24]:

- Loss of the hypoechoic retroplacental (clear) zone.
- Irregular vascular lacunae.
- Abnormal color Doppler.
- Hypervascularization between the placental basal plate or subplacental zone and underlying tissues.

- Thinning or loss of myometrial layer.

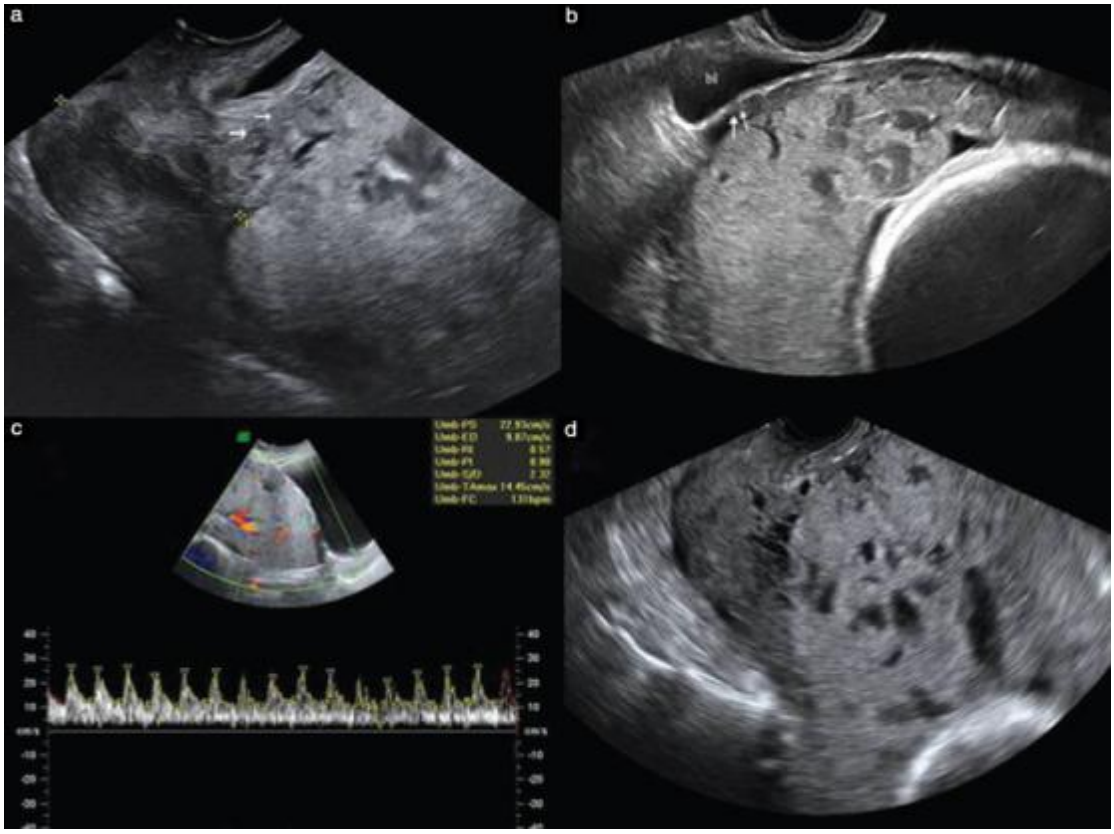

Fig (4): Gray-scale and colour Doppler images showing sonographic diagnostic criteria for morbidly adherent placenta. (a) Clear space: loss/irregularity of echolucent area located between uterus and placenta (arrows). (b) Bladder line: thinning or interruption of hyperechoic interface between uterine serosa and bladder wall (arrows). (C, d) Placental lacunae with turbulent high-velocity flow[(25)].

Placental lacunae:

These sonolucent spaces contain slow-moving maternal blood on gray-scale imaging and have been previously described as intra-placental "lakes". When involving small area of the placenta, they have no clinical significance and are found in area of low villous tissue density such as in the center of the cotyledons or under the chorionic plate. In placenta accreta, the lacunae are sometimes extensive creating a "moth-eaten" placental appearance[(26)].

Presences of placental lakes were defined as large and irregular ("Swiss cheese" appearance). These lacunae were not surest the areas of peneration. Observation of this sonographic crieria has reported to be accompanied with the highest positive predictive value for placenta accreta when identified in the second and third trimesters, the sensitivity of these criteria is 79%, with a positive predictive value of 92%[(27)].

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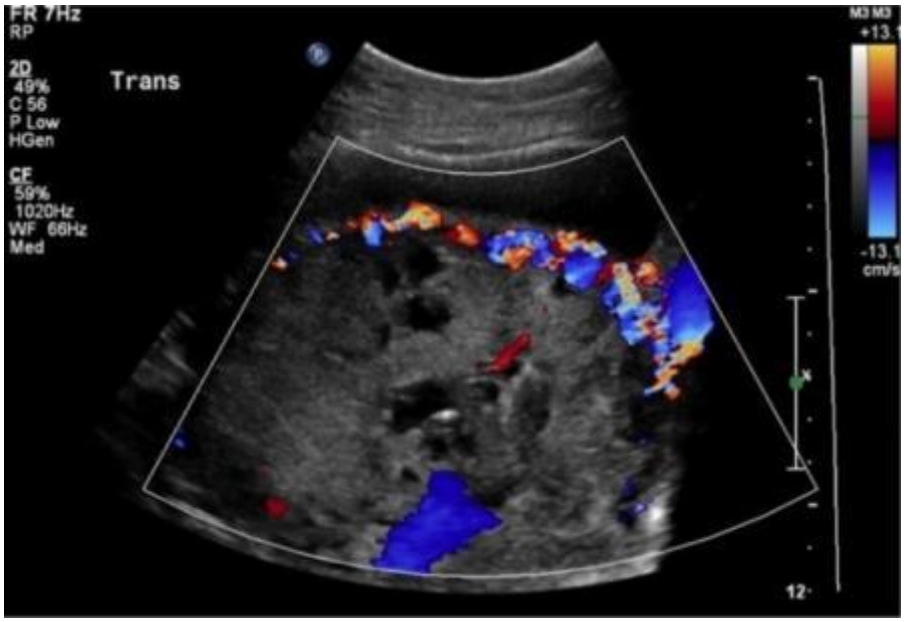

Fig (5): Vascular lacunae[(28)].

Loss of Retroplacental Clear Space:

Royal College of Obstetricians and Gynaecologists 2011 stated thatabsence of the normal hypoechoic retroplacental zone, loss of the clear space between the placenta and the uterus, has been reported to have a detection rate of about 93% with sensitivity of 52% and specificity of 57%. The false-positive rate, however, has been in the range of 21% or higher. This marker should not be used alone, as it is angle dependent and can be lost in normal anterior placentas.

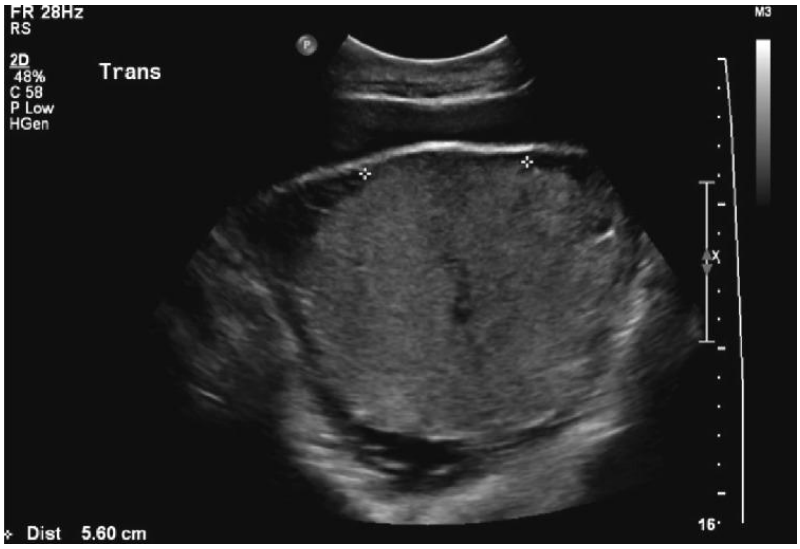

Fig (6): Deficiency of retroplacental sonolucent zone[(28)].

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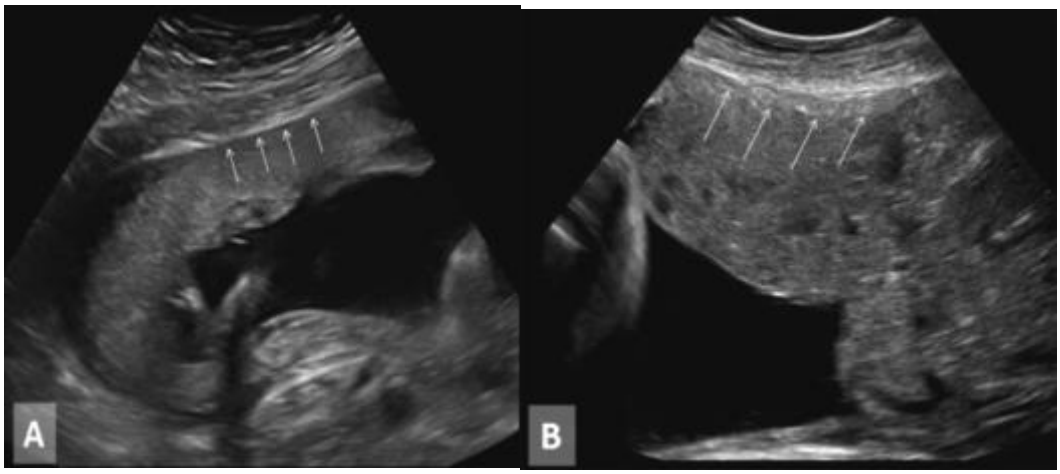

Fig (7): A, Normal hypoechoic retroplacental zone (arrows) between the placenta and uterine wall. **B,** Absence of the hypoechoic retroplacental zone where the clear space between the placenta and the uterine wall (arrows) is lacking[(29)]**.**

The presence of sonographic criteria is not pathognomonic and must be interpreted with caution in the clinical setting. Although found to be of high sensitivity and positive predictive value, the presence of placenta lacunae and loss of sonolucent zone have (not infrequently) been found in placenta previa without morbid adherence of placenta[(30)].

Myometrial thickness:

The presence of of thin myometrium of less than 1 mm has been found to be associated with placenta accreta, but not all authers find this reliable sign alternatively finding that the echogenic line of the serosa between bladder and uterus is interrupted is very specific for placenta percreta especially if associated crossing blood vessels are also showen very rarely discrete mass of placental tissue will be seen extending into bladder[(31)]**.**

Accompanied with presence of large placental lacunae, the sensitivity of this sign reaches nearly 100% and specificity is 72%–79%, with a positive predictive value of 73**%**[(28)]**.**

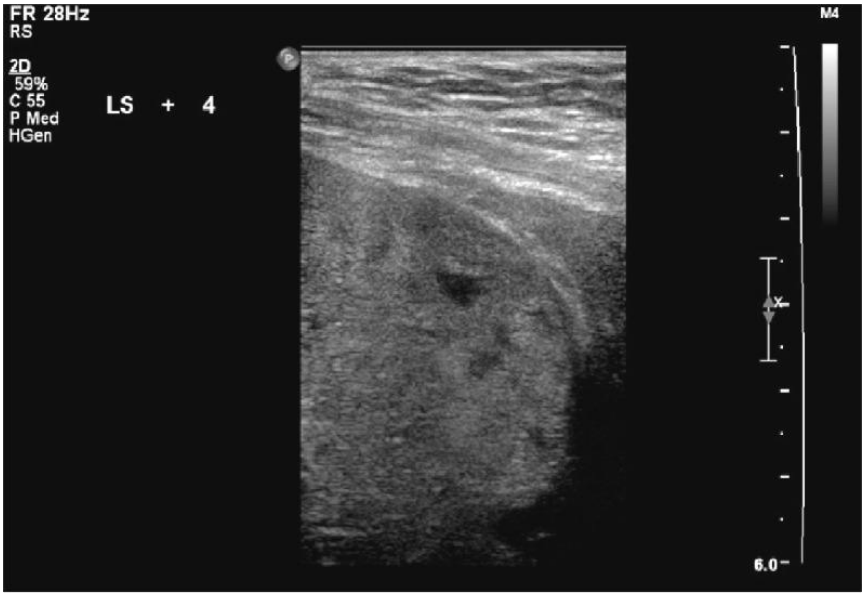

Fig (8): Myometrial thining[(28)]**.**

Bladder border:

Bulging and interruption of the integrity between the bladder and uterine wall which may also warned us about the adherent placenta; however, also a prior cesarean operation with the retraction of the bladder peritoneum before the uterine incision could have resulted in the increase of the vascularity in that area which may have caused an impression of placenta percreta[(32)].

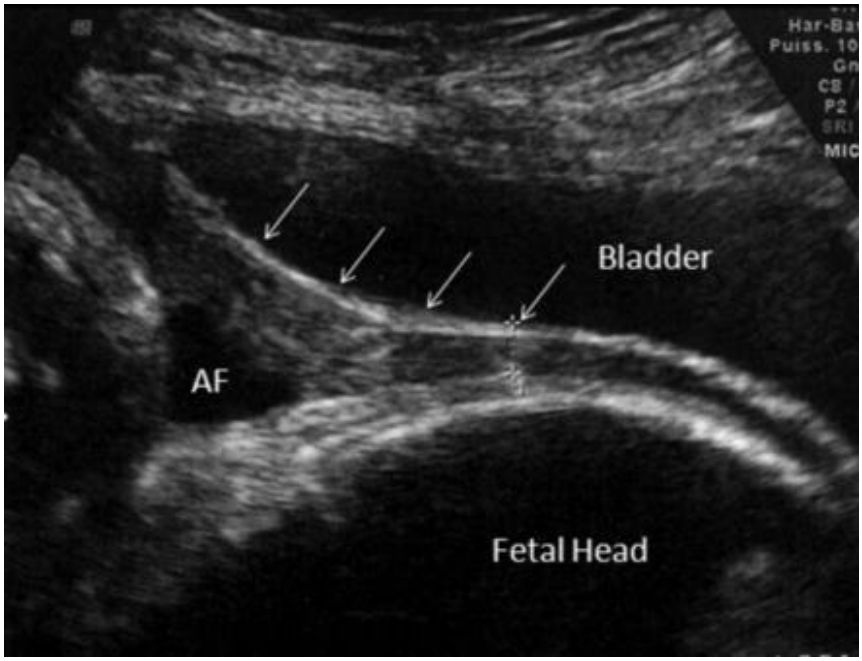

Fig (9): Note the difference in this image of a normal uterine serosa–bladder interface with the presence of a smooth wide thin line without irregularities or vascular signals. AF indicates amniotic fluid[(29)].

Disruption of the bladder-uterine serosal interface:

Disruption of the bladder–uterine serosal interface was evident in all cases of placenta accreta, so it is statistically significant in predicting placenta accreta[(28)].

Fig (10): Interruption of bladder line[(28)].

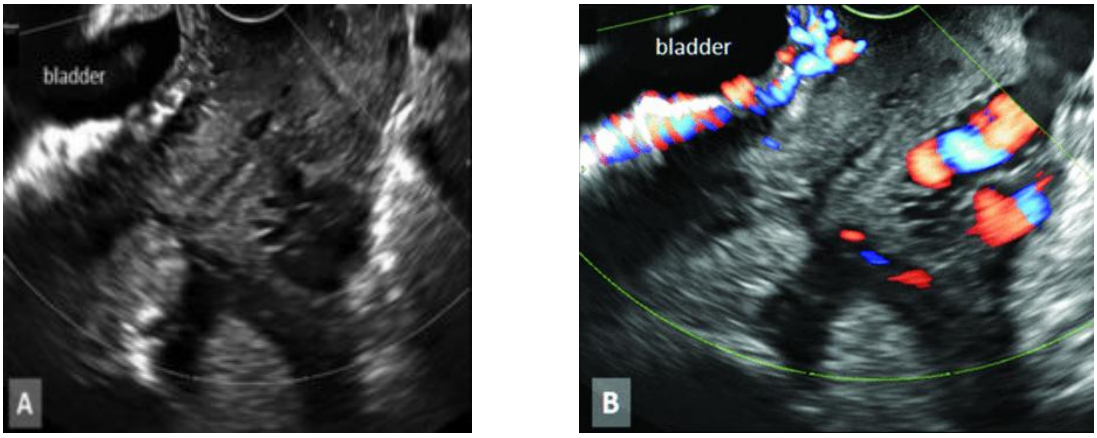

Fig (11): A, Thickening and irregularities of the uterine serosa–bladder interface line in a pregnancy with complete placenta previa. **B**, Addition of colour Doppler imaging to illustrate increased vascularity. Both of these findings are suggestive of placenta accreta[(29)].

Presence of exophytic masses:

In rarely cases, the presence of extrauterine placental parenchyma may identified the diagnosis of placenta percreta[(28)].

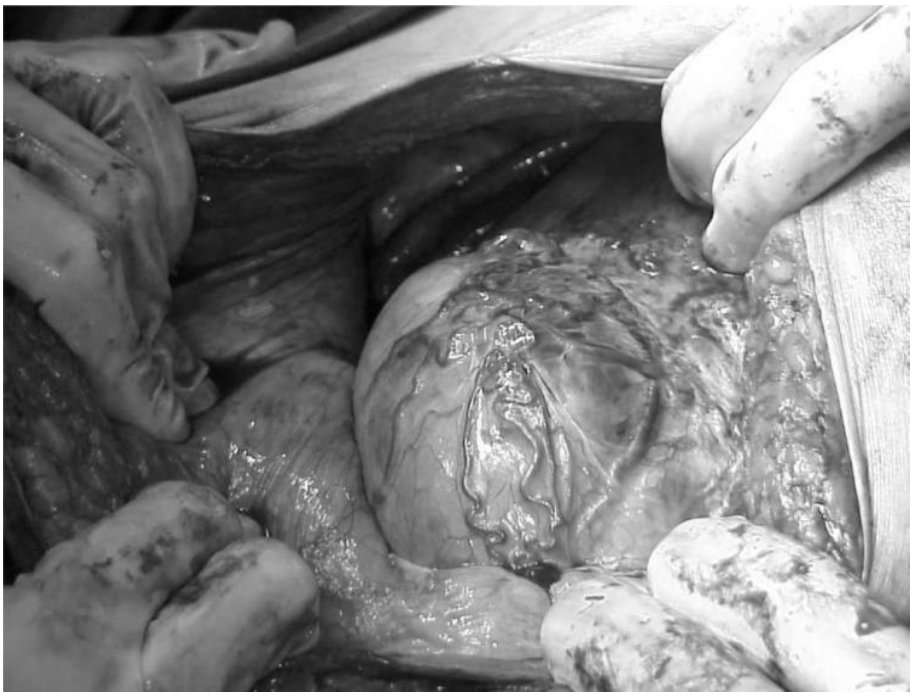

Fig (12): Thin and very vascular uterine lower segment at the time of cesarean section[(28)]

Colour Doppler Ultrasonography:

Doppler features suggesting placenta accreta include chaotic intra-placental blood flow, the presence of altered blood flow in the retroplacental space and aberrant vessels crossing between placental surfaces. Disruption of the normal continuous colour flow appearance resulting in a gap in myometrial blood flow can be seen in most cases of praevia

and non-praevia placenta accreta. This gap represents the site of placental invasion into the myometrium and can be diagnosed in the first trimester of pregnancy before the intervillous circulation is fully established. This indicates that the intra-placental lacunae described at that stage are in fact the result of the anatomical disturbance of the utero-placental circulation with disruption of the normal placental anatomy rather than atrue primary intra-placental vascular lesion[(26)].

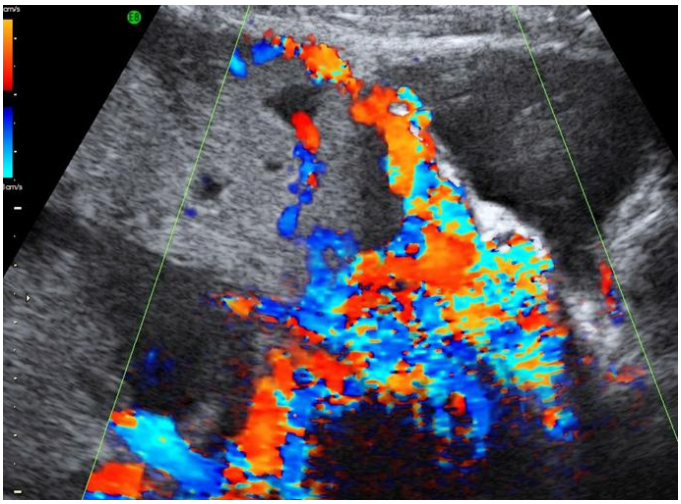

Fig (13): Colour doppler mapping showing chaotic intra-placental blood flow, the presence of altered blood flow in the retroplacental space and aberrant vessels crossing between placental surfaces[(26)].

The most common and most sensitive sonographic finding associated with placenta accreta is the loss of myometrial interface with enlargement of the underlying uterine vasculature giving the impression that the above placental cotyledon is floating in uterine vessels. The addition of colour Doppler evaluation has been valuable in improving the diagnosis of placenta accreta[(26)].

Criteria of Colour Doppler[(33)]:

- Diffuse or focal lacunar flow
- Vascular lakes with turbulent flow (peak systolic velocity over 15cm/s)
- Hypervascularity of serosa–bladder interface
- Markedly dilated vessels over peripheral subplacental zone.

In cases of placenta percreta, Doppler examination for assessment of vascularization of the uterine serosa-bladder interface shows an extensive hypervascular appearance with densely confluent anarchic vessels that occasionally protrude into the bladder lumen[(34)].

Sub placental venous complex:

The presence of colour flow in the subplacental venous plexus was found to be statically significant in predicting placenta accreta[(18)].

Placental–bladder interface hyper vascularity:

Using colour Doppler ultrasound revealed placental–bladder hyper vascularity as diagnostic significant in predicting placenta accreta[(18)].

Fig (14): Transabdominal Doppler ultrasound showed hypervascularity in the interphase between uterine serosa and the urinary bladder wall[(35)].

No antenatal diagnostic technique affords the clinician 100% assurance of either presence neither abscence of placenta accreta. The definitive diagnosis of placenta accreta is usually made at delivery and/or by histopathology[(36)].

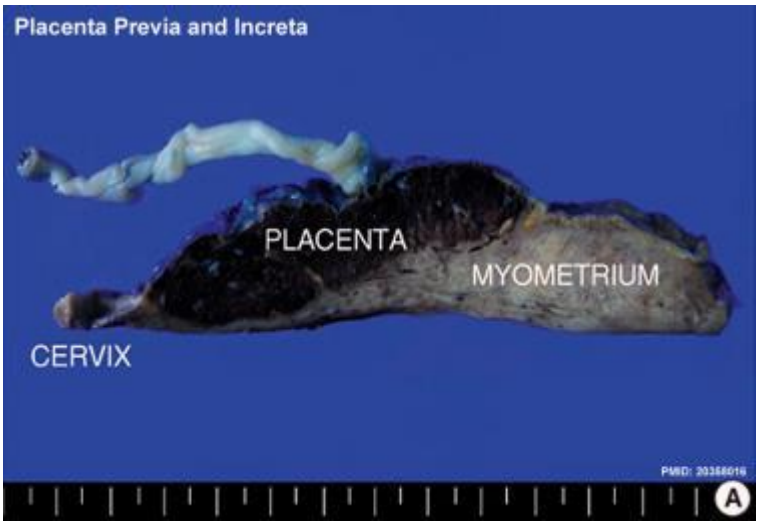

Fig (15): Placenta previa and Increta. Cut surface of the uterus with attached placenta and umbilical cord. The left end of the uterus is the uterine cervix, and the right end of uterus is the uterine fundus. The cut surface shows abnormal placental adherence[(37)].

Placenta Accreta Management

The best strategy to prevent placenta accreta is to avoid multiple cesarean deliveries, the most best strategy to avoid multiple cesarean deliveries is to avoid primary cesarean delivery, and encouraged vaginal birth after cesarean delivery[(38)].

Counseling: Patients with prenatally suspected placenta accreta should be extensively counseled about potential risks and complications. Early delivery should be recommended when there is reasonable certainly regarding the diagnosis of placenta accreta[(39)].

Once suspected, adequate preparation must be available, starting from appropriate staff, sufficient blood products and Cell Saver. In addition, interventional radiology has important role to decrease the morbidity rate of placenta accreta and utilized both pre- and postoperatively. New findings to the use of a staged embolization hysterectomy procedure for placenta accreta as significantly decreasing maternal morbidity, especially in terms of blood loss[(20)].

Antenatal Management:

1. All patients with high risk factors must be assessed with ultrasound.
2. Hospitalization until delivery for patients with heavy or recurrent vaginal bleeding.
3. Scheduled delivery at 34wks after a course of antenatal cortecosteroids.
4. Patient counseling[(40)].

With compared strategies for the timing of delivery in individuals with placenta previa and ultrasonographic criteria of placenta accreta to determine the optimal gestational age for delivery. The strategies ranged from a scheduled delivery at 34, 35, 36, 37, 38, or 39 weeks of gestation to a scheduled delivery at 36, 37, or 38 weeks of gestation only after amniocentesis confirmation of fetal lung maturity. In order to avoid an emergency cesarean on the one hand and to minimize complications of prematurity on the other, it is acceptable to schedule cesarean at 34 to 35 weeks[(41)].

Steroids: are used if bleeding episodes is slight or spotting and alternating, if the mother not in stress and if gestational age is below 37 weeks. It used to stimulate the improvement of the lungs in the baby.Pre-labor corticosteroids need to be given to all ladies at possibility of iatrogenic or spontaneous premature labor up to 34+6 weeks of pregnancy also pre-labor corticosteroids are connected with an effective decrease in rates of neaonatal demise & respiratory-distress-syndrome& intra-ventricular-haemorrhage[(41)].

Anti-D: Anti-D Ig must be given to all non-sensitized RhD-VE pregnant females after occurrence of Antepartum haemorrhage, irrespective to traditional taking prenatal prophylactic anti-D has been taken or not. In non-sensitized RhD-VE lady if there is an intermittent attack of vaginal bleeding after 20+0 weeks of pregnancy, anti-DIg must be given at a least of 6-week interims[(41)].

Conservative management:

Delivery by CS without hysterectomy.

During the caesarean-sections of patients with invasion anomalies such as placenta accreta, increta, and percreta we observed very serious bleeding subsequent to the removal of placenta some cases with heavy bleeding requiring peripartum hysterectomy. For cases with such invasion anomalies, we recommend penetrating into abdomen by vertical incision, applying the uterine high incision as far as possible from the placenta and taking out the fetus by this way. The purpose of this is to avoid harming the placenta and prevent the initiation of bleeding at placenta. After the removal of fetus, we waited 15 minutes to see normal placental separation. In case that spontaneous placental separation cannot be seen, no efforts should be done to remove the placenta which will cause bleeding. First, bilateral hypogastric artery should be tied in order to minimize the bleeding after removing the placenta. This process

will reduce bleeding and allow the surgeon to properly manage the bleeding control of the patient[(42)].

Follow-Up After Conservative Management

Conservative management with placenta left in situ results in less blood loss and need for transfusion at the time of surgery, but may be associated with an increased risk of post operative infection Successful pregnancies are possible after conservative management of placenta accreta but are associated with a high rate of recurrence[(41)].

Conclusion:

Antenatal diagnosis of placental invasion by ultrasonography and colour Doppler was Successful. The use of Gray scale ultrasound and colour flow Doppler is a good tool in diagnosis of placenta previa accreta.

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