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Conservative Surgical Techniques for Hemorrhage Control in Placenta Previa: A Narrative Review

Ahlam Ahmed Basha, Ahmed Mohamed Elhussieny, Heba Allah Yaser Mohammed Farid, Ahmed Mohamed Abd-elkader

Department of Obstetrics and Gynecology, Faculty of Medicine, Zagazig University, Zagazig, Egypt

***Corresponding author: Heba Allah Yaser Mohammed Farid**

Abstract

Background: Placenta previa is associated with antepartum and intrapartum hemorrhage, while abnormal placental attachment may increase the risk of severe bleeding and hysterectomy. Several conservative techniques have been developed to control hemorrhage and preserve the uterus.

Objective: To review the clinical assessment and management of placenta previa, with particular emphasis on surgical techniques for hemorrhage control and the role of lower uterine segment purse-string suturing.

Conclusion: Intrauterine balloon tamponade, uterine compression sutures, and uterine devascularization are among the conservative options for controlling hemorrhage. Purse-string suturing may help control bleeding from the placental bed when initial measures are insufficient. The choice of technique should depend on placental invasion, bleeding severity, and the clinical situation; hysterectomy remains necessary when conservative measures fail.

Keywords: Placenta Previa; Placenta Accreta Spectrum; Ultrasound; Uterine Preservation

Introduction

Pathological events may occur during development of the placenta, this includes abnormal placement (placenta previa) &/or abnormal attachement (placenta accreta spectrum). The exact underlying cause of placenta previa is still not discovered however, there may be an association between endometrial damage and uterine scarring [(1)].

Placenta accreta spectrum (PAS) is characterized by abnormal placental adherence and invasion into the uterine wall and is increasingly recognized as a disorder involving both defective maternal tissue remodeling and dysregulated trophoblast invasion. In PAS, there is disruption of the endometrial–myometrial interface, particularly in areas of previous uterine injury or scarring, resulting in inadequate decidualization and loss of the normal barrier to trophoblastic invasion. Consequently, placental anchoring villi and extravillous trophoblasts may extend abnormally close to, or directly into, the myometrium, producing the pathological features characteristic of placenta accreta, increta, and percreta [(2, 3)].

The key principle in management of placenta previa cases is to achieve best maternal and foetal outcomes including avoiding haemorrhage and pushing pregnancy as far as possible. Most cases are terminated by 34-36+6 weeks (as the risk of massive bleeding increases after 36 weeks of gestation unless any emergent event occurs before that, termination is considered [(4)].

Intrauterine balloon tamponade, different types of compression sutures and uterine artery occlusion techniques have been increasingly used to reduce or stop intraoperative bleeding and PPH. use of intrauterine hydrostatic balloon catheters, including the Bakri balloon, the BT-Cathâ balloon or the Sengstaken–Blakemore tube, in women with placenta praevia have reported success in controlling PPH ranging from 75% to 88% [(5)].

Clinical Presentation and Diagnosis

As one of the 3 main causes of antepartum haemorrhage, placenta previa often classically presents as painless, bright red vaginal bleeding in the second or third trimester. It may start slightly and increase or present as sudden intense gush of blood from the vagina (attack of vaginal bleeding). The first attack is usually between 24-28 weeks of gestation (even though some cases may present earlier or later in pregnancy) as approximately around this time the lower uterine segment begins to form and the shearing movements as a result of lower segment development causes a stretching effect on the placental tissue leading to painless bleeding **(6).**

Any patient presenting with antepartum haemorrhage should first receive a transabdominal scan before having a digital examination. If there is a concern for placenta previa, then a transvaginal sonogram should be performed to confirm the location of the placenta. Transvaginal sonogram has been shown to be more accurate in determining the exact position of the placenta in relation to the cervix than a transabdominal sonogram and is considered safe. Low lying and marginal placentas are identified with sonography and are determined by measuring the distance between the edge of the placenta and the internal os **(7).**

At the time of sonography, evaluation for PAS is also necessary in determining the severity of the case. Placenta accreta is the invasion of the placenta beyond the normal boundary that is established by the Nitabuch fibrinoid layer.Placenta increta is the invasion of the placenta into the myometrium(suerficial vs deep), and placenta percreta is the invasion into the uterine serosa and or the surrounding organs **(8).**

Placenta accreta spectrum can lead to massive hemorrhage, and an integrated team approach is necessary before delivery. Placenta accreta spectrum diagnosis is via ultrasonography with very high sensitivities and specificities **(9).**

MRI is useful diagnostic tool for cases of posterior placenta previa or to assess potential invasion to the bladder. However,it is an expensive tool, it has not been shown to improve diagnostic outcomes as compared with TVS in most cases. Once the diagnosis has been made the patient has to be counselled for the possibility of caesarean hysterectomy as the worst-case scenario especially in cases of PAS and all possible complications must be discussed **(9).**

Antepartum vaginal bleeding is an important obstetric symptom with a differential diagnosis ranging from physiological cervical changes to conditions associated with substantial maternal and fetal morbidity and mortality. The clinical significance of bleeding depends on gestational age, the volume and character of blood loss, the presence or absence of abdominal pain or uterine tenderness, membrane status, fetal condition, and maternal risk factors. Important causes of bleeding in the second half of pregnancy include placental abruption, placenta previa, vasa previa, uterine rupture, and less severe conditions such as bloody show and subchorionic hematoma. A systematic clinical and ultrasonographic assessment is therefore essential to distinguish potentially life-threatening causes from benign or self-limiting conditions **(ACOG, 2024).**

The Society for Maternal-Fetal Medicine (SMFM) recommends a systematic ultrasound examination that begins with transabdominal imaging and is complemented by TVUS, with color Doppler used to evaluate abnormal placental and uterovesical vascularity. TVUS is particularly valuable because it provides high-resolution assessment of the lower uterine segment, posterior bladder wall, cervix, and placental–myometrial interface (10). Importantly, although ultrasound is the principal imaging modality for prenatal PAS assessment, a normal ultrasound examination does not completely exclude PAS; therefore, imaging findings must always be interpreted in conjunction with the patient's clinical risk factors and obstetric history **(2).**

Several characteristic gray-scale and color Doppler findings have been associated with PAS, this includes:

Multiple irregular placental lacunae which represent irregular vascular spaces within the placenta and may demonstrate turbulent, high-velocity blood flow on color Doppler examination.

Loss or irregularity of the normal retroplacental hypoechoic clear zone.

Utero-vesical hypervascularity and the presence of bridging vessels.

Marked thinning of the retroplacental myometrium especially when associated with other abnormalities, may reflect extension of placental tissue toward the uterine serosa.

Interruption of the uterine serosa–bladder interface focal placental or uterine bulging may indicate more extensive invasion, particularly in cases of suspected percreta involving the bladder [2, 10].

Color Doppler assessment provides additional information regarding the abnormal vascular architecture associated with PAS. Increased subplacental and uterovesical vascularity, turbulent flow within placental lacunae, gaps in normal myometrial vascularity, and bridging vessels extending from the placenta toward the uterine serosa or bladder are among the recognized Doppler features. These findings reflect the abnormal neovascularization and increased vascular connections that accompany invasive placentation. However, individual ultrasound markers vary in their diagnostic performance, and their interpretation may be influenced by gestational age, placental location, operator experience, and technical factors. Therefore, contemporary consensus recommendations emphasize the use of a standardized combination of ultrasound markers rather than reliance on a single sonographic feature [10].

Studies have emphasized that a history of at least one cesarean delivery, previous myomectomy, or previous PAS should prompt consideration of detailed PAS ultrasound assessment. Furthermore, anterior placenta previa or placenta previa involving the cervix was recognized as an important ultrasound finding that increases the probability of PAS, particularly in women with previous uterine surgery [11].

Another important ultrasonographic role in cases of placenta previa is cervical length assessment as a potentially useful prognostic parameter in identifying patients in need for closer survellaince and delivery planning. In this population, cervical shortening may reflect progressive cervical remodeling and increased susceptibility to uterine activity and disruption of the placental attachment at the lower uterine segment, thereby increasing the risk of antepartum hemorrhage and preterm delivery. Recent evidence supports the clinical value of cervical-length assessment in pregnancies with placenta previa. A systematic review and meta-analysis including 13 studies and 1,462 pregnancies demonstrated that a cervical length of ≤30 mm measured between 28 and 34 weeks of gestation was associated with significantly increased risks of antepartum bleeding, preterm birth, and postpartum hemorrhage. Furthermore, a cervical length ≤30 mm may be useful in predicting emergency cesarean delivery because of severe hemorrhage [12].

As part of the assessment of cases with antepartum haemorrhage and after ultrasound examination ,speculum examination may form an important component of the initial clinical assessment when placenta previa is suspected. Its primary purpose is not to diagnose placenta previa itself, but rather to assess the cervix and vagina, determine the source and amount of bleeding, and identify alternative causes of genital tract bleeding, such as cervical ectropion, cervical lesions, vaginal trauma, infection, or active cervical dilatation. In women with antepartum hemorrhage, a speculum examination can also provide useful information regarding cervical dilatation and the presence of blood or clots within the vagina. The examination should, however, be performed cautiously and within an appropriate clinical setting, particularly when placenta previa has not yet been excluded.A speculum examination allows direct visualization of the lower genital tract without digital palpation of the cervix and may therefore be used when clinically indicated. [2, 13].

Magnetic resonance imaging (MRI) plays an important complementary role in the prenatal assessment of placenta accreta spectrum (PAS), particularly in patients with an equivocal or inconclusive ultrasound examination, posterior placental location, or suspected extensive placental invasion. MRI provides excellent soft-tissue contrast and multiplanar imaging, allowing more accurate assessment of the depth and topography of placental invasion and its relationship to adjacent pelvic structures. Although ultrasound remains the primary imaging modality for the initial diagnosis of PAS, MRI can provide additional information that is particularly valuable for surgical planning in suspected placenta increta or percreta. The characteristic MRI features of PAS include:

- T2-weighted dark intraplacental band.
- Heterogeneous placental signal intensity.
- Abnormal uterine or placental bulging.

- Loss or interruption of the normal low-signal retroplacental myometrial interface.
- Myometrial thinning or disruption
- Abnormal placental-bed vascularity.
- Focal exophytic placental mass.
- Interruption or tenting of the bladder wall.

Among these findings, intraplacental dark bands, placental/uterine bulging, and disruption of the uteroplacental interface are among the most frequently described signs. Recent meta-analytic evidence indicates that MRI has good overall diagnostic performance for PAS, although its accuracy varies according to the individual MRI sign and study population. Therefore, MRI should be interpreted in conjunction with clinical risk factors and ultrasound findings rather than used as an isolated diagnostic test [14].

Placenta previa is most appropriately assessed during the routine second-trimester fetal anatomical ultrasound examination, generally at approximately 18–22 weeks of gestation, when placental location should be documented in relation to the internal cervical os. However, a low-lying placenta or placenta previa identified at this stage should not necessarily be considered a persistent diagnosis, because the apparent placental position may change as pregnancy progresses due to development of the lower uterine segment and relative migration of the placenta away from the internal os. Current guidance recommends that a placenta covering or reaching the internal os after 16 weeks be considered placenta previa, while a placental edge located within 20 mm of the internal os is classified as low-lying. When low placentation or placenta previa is identified at the mid-trimester scan, follow-up ultrasound, preferably including transvaginal sonography, is recommended at approximately 32 weeks of gestation to determine whether the abnormal placental location persists. If the placenta remains low-lying or covers the internal os at 32 weeks, a further transvaginal ultrasound around 36 weeks may be appropriate to guide delivery planning. Therefore, the diagnosis of persistent placenta previa should ideally be confirmed in the third trimester, rather than being based solely on a mid-trimesteric scan. [15, 16].

Maternal assessment in cases of placenta previa should focus primarily on the severity and ongoing nature of antepartum hemorrhage, maternal hemodynamic status, and the risk of recurrent or major obstetric hemorrhage. Clinically, the history should document the onset, duration, frequency, and characteristics of vaginal bleeding, including the estimated amount of blood loss, presence of clots, previous bleeding episodes, associated abdominal pain or uterine contractions, and any symptoms suggestive of hypovolemia such as dizziness, weakness, palpitations, or syncope. Placenta previa classically presents with painless vaginal bleeding, although uterine contractions or abdominal pain may coexist, Maternal vital signs, including pulse rate, blood pressure, respiratory rate, oxygen saturation, and temperature, should be assessed repeatedly because tachycardia and hypotension may indicate significant blood loss. Abdominal examination should assess uterine tenderness, tone, contractions, and fetal presentation. Importantly, digital vaginal examination should be avoided until placenta previa has been excluded by ultrasound, because manipulation of the cervix may precipitate severe hemorrhage [17, 15].

Laboratory evaluation is an essential component of maternal assessment, particularly in women with active or recurrent bleeding. A complete blood count (CBC) should be performed to establish the hemoglobin and hematocrit levels and assess platelet count, thereby identifying pre-existing or hemorrhage-related anemia and thrombocytopenia. Blood grouping and antibody screening should be undertaken, with cross-matched blood arranged according to the severity of bleeding and the clinical risk of further hemorrhage. In women with significant or ongoing bleeding, coagulation studies, including prothrombin time, activated partial thromboplastin time, and fibrinogen concentration, are important for detecting developing coagulopathy and guiding blood-product replacement. Current guidance recommends close coordination with the transfusion service, particularly for women with anterior placenta previa or placenta covering the internal cervical os [15, 18].

Not only is maternal assessment essential but fetal assessment is as equal owing to the fact that recurrent or significant antepartum hemorrhage may result in maternal hypovolemia and secondary reduction in uteroplacental perfusion, with potential fetal compromise and preterm birth. Initial assessment should include confirmation of fetal viability and fetal heart rate (FHR), together with evaluation of fetal movements and

gestational age. Ultrasound examination should assess fetal biometry and growth, amniotic fluid volume, fetal presentation, and placental location. In women with placenta previa, particularly those with recurrent bleeding or additional risk factors for fetal compromise, serial ultrasound assessment of fetal growth may be appropriate because fetal growth restriction or other complications may coexist and influence the timing of delivery. When fetal growth restriction is suspected, umbilical artery Doppler velocimetry provides additional information regarding placental function and fetal well-being **(American College of Obstetricians and Gynecologists [ACOG], 2021; Society for Maternal-Fetal Medicine [SMFM], 2020).**

During an episode of active vaginal bleeding, fetal assessment should be performed promptly and should be guided by the severity and persistence of hemorrhage, gestational age, and maternal condition. Continuous cardiotocographic monitoring is appropriate when there is significant or ongoing bleeding, maternal hemodynamic instability, uterine activity, or concern regarding fetal well-being, as fetal heart-rate abnormalities may indicate impaired fetal oxygenation. A reassuring FHR pattern provides evidence of current fetal well-being but does not eliminate the need for continued maternal and fetal observation when bleeding persists or recurs. Conversely, persistent fetal tachycardia, recurrent late decelerations, prolonged decelerations, reduced variability, or other non-reassuring features should prompt immediate reassessment of the maternal condition and consideration of expedited delivery when clinically indicated. ACOG emphasizes that antepartum fetal surveillance should be interpreted in the context of the overall maternal and fetal clinical picture, rather than as an isolated determinant of delivery **(ACOG, 2021).**

Classifications And Associated Disorders

The normal placenta is located >20mm from the internal cervical os. The American Institute of Ultrasound in Medicine (AIUM) classifies placenta previa according to it's distance from the internal cervical os. Placenta previa which occurs when the placenta covers the internal cervical os. A low-lying placenta occurs when the placental edge is < 20 mm from the internal cervical os without covering it.

A more detailed classification of placenta previa grades could be:

Minor placenta previa:

Grade I (minor previa) is when the lower edge of the placenta is inside the lower uterine segment (low lying).

Grade II (marginal previa) is when the lower edge of the placenta is reaching the internal os.

Major placenta previa:

Grade III (partial previa) is when the placenta partially covers the cervix.

Grade IV (complete previa) is when the placenta completely covers the cervix[3].

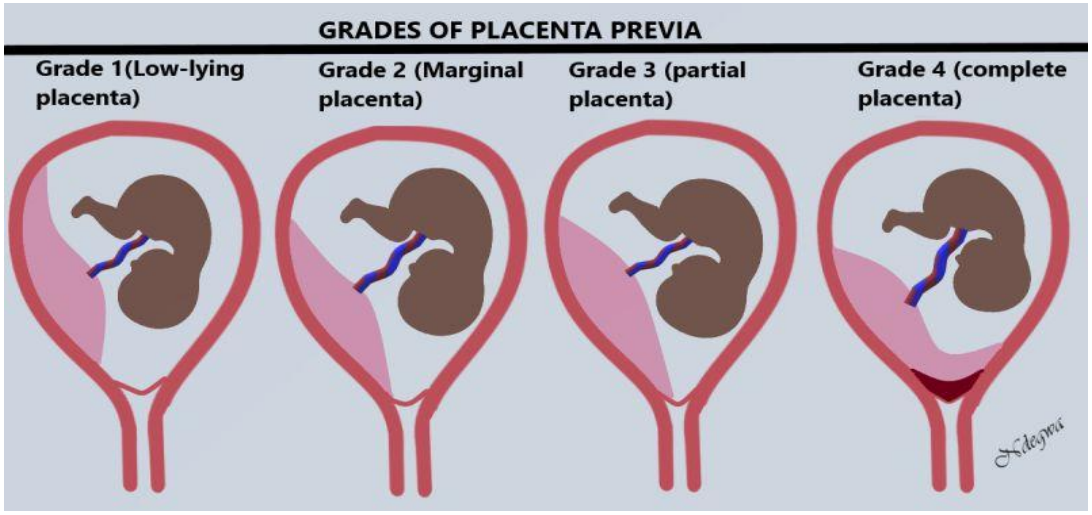


Figure (1): Grades of placenta previa [19].

Grades of placenta previa

A new classification based on TVS data of placenta previa (performed within 28 days of term) might be [19]:

(1) > 20 mm from internal os: No CS needed.

(2) 11 to 20 mm{grey zone}: discussing trial of labour versus caesarean according to patient clinical condition & history, cs is often considered in cases of antepartum haemorrhage, prior cs, and short cervical length.

(3) 0 to 10 mm: Greater likelihood of bleeding and need for CS.

(4) Overlap of the internal os by any distance: CS is indicated.

While the traditional grades I-IV remain useful for teaching, the AIUM and the Matsuo classifications provide more precise clinical guidance based on edge-to-os distance. The Matsuo classification is particularly useful for counselling regarding the likelihood of bleeding and need for caesarean delivery.

The risk of bleeding is not determined solely by the distance from the internal os. A thick placental edge (>10mm) and the presence of a marginal sinus or sponge-like echo are associated with a higher risk of bleeding and need for caesarean delivery [18].

One of the most common associated disorders with placenta previa is the placenta accreta spectrum and this is due to the deficient lower segment, it is further divided into grades by FIGO depending on the degree of invasion of the placental villi to the uterine wall. This includes [3]:

(1) Grade 1 (Placenta Accreta or Creta) – Abnormally adherent placenta (PC) when the villi adhere directly to the superficial myometrium without a decidual interface.

(2) Grade 2 (Placenta Increta) – Abnormally invasive placentation (PI) when the villi invade into the myometrium and sometimes in the lumen of the deep uterine vasculature.

(3) Grade 3 (Placenta Percreta)– Abnormally invasive placentation (PP) when the villi invade the full thickness of the uterine wall either to the serosa or beyond. They are subdivided into:

Grade 3a: limited to and including the uterine serosa.

Grade 3b: when there is urinary bladder invasion.

Grade 3c:when there is invasion of other pelvic tissue/organs.

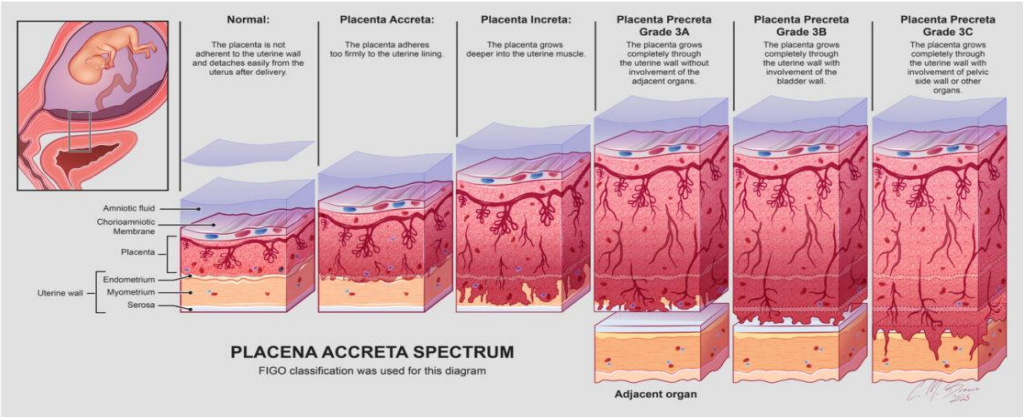


Figure (2): Placenta Accreta Spectrum [3].

The management of placenta accreta spectrum (PAS) should be individualized according to the depth and extent of placental invasion, the more the PAS grade, the more the complexity and risk of hemorrhage. In the FIGO clinical classification, **PAS grade 1 (placenta accreta)** when the area of adherence is focal and accessible, uterine-preserving treatment with repair of the uterine defect is usually considered; however, planned caesarean hysterectomy with the placenta left in situ remains an accepted definitive treatment when extensive

adherence or significant hemorrhage is anticipated. **PAS grade 2 (placenta increta)** is associated with a greater risk of failure of spontaneous placental separation and severe hemorrhage. Consequently, planned delivery in a specialist multidisciplinary center with adequate blood products and surgical expertise is recommended, and caesarean hysterectomy with the placenta left in situ is generally the preferred definitive approach. However, when the disease is focal and the implantation site can be completely excised and repaired, uterine preserving management could be anticipated.**PAS grade 3 (placenta percreta)**, **Grade 3a** requires highly planned multidisciplinary surgery, with caesarean hysterectomy and avoidance of placental separation being the standard approach in extensive disease. **Grade 3b** a particularly high risk of massive haemorrhage and urinary tract injury; therefore, delivery should be undertaken in a specialist centre with experienced pelvic surgeons and urological support, with preoperative assessment of bladder involvement and careful retroperitoneal and bladder dissection when hysterectomy is undertaken. **Grade 3c**, represents the most extensive form of PAS and requires individualized surgical planning involving appropriate subspecialists, potentially including urology, vascular surgery, general surgery, interventional radiology and critical care. In grades 3b and 3c, attempts at forcible placental removal should be avoided because disruption of the placenta may precipitate catastrophic haemorrhage [(15)].

The relationship between the degree of placenta praevia and placenta accreta spectrum (PAS) is complex, and the degree of previa alone should not be considered a reliable predictor of PAS. Rather, the risk is determined by the combination of placental location, particularly anterior implantation in the lower uterine segment, and the presence and number of previous caesarean deliveries or other uterine surgical trauma. Placenta praevia itself is an important risk factor for PAS, with the association being particularly strong when the placenta overlies a previous caesarean scar. Current RCOG guidance identifies anterior low-lying placenta or placenta praevia in the setting of previous lower-segment caesarean birth as an important risk combination for PAS. Among women with placenta praevia and previous caesarean delivery, the reported risk of PAS increases progressively with the number of previous caesarean deliveries, reaching approximately 3%, 11%, 40%, 61% and 67% after one, two, three, four and five or more previous caesarean births, respectively. Therefore, although complete or central placenta praevia warrants a high index of suspicion, PAS risk should be assessed using the complete clinical and ultrasound context rather than the grade of placenta praevia alone [(15)].

Management Strategies

The key principle in management of placenta previa cases is to achieve best maternal and foetal outcomes including avoiding haemorrhage and pushing pregnancy as far as possible. Most cases are terminated by 34-36+6 weeks (as the risk of massive bleeding increases after 36 weeks of gestation unless any emergent event occurs before that, termination is considered [(4)].

Antenatal care may be considered in patients diagnosed with placenta previa and have substantial vaginal bleeding, 4-6 hr interval vitals should be performed, and daily electronic foetal monitoring must be initiated. Corticosteroids for lung maturity must be administered as preterm delivery is possible at any time. The patient should receive two large-bore intravenous lines with ABO screening and have CBC & coagulation profile drawn. If there is any significant drop in haemoglobin consider blood transfusion, 2-4 units of blood should be crossed and matched in preparation for delivery or for any emergency [(20)].

The risks of bleeding, labour, or bleeding and labour leading to the need for emergency delivery increase with advancing gestational age, whereas the risks of morbidity associated with prematurity decrease. The risk of an emergent bleeding associated with placenta praevia has been reported to be 4.7% by 35 weeks of gestation,15% by 36 weeks of gestation, 30% by 37 weeks of gestation and 59% by 38 weeks of gestation [(21)].

As long as patient is stable and still preterm home monitoring may commence and this involves pelvic rest including avoiding sexual intercourse, PV, vaginal douche and heavy duties/lifting/physical exercise [(20)].

In the third trimester, antenatal care including hospitalization must be tailored according to each patient, this includes individual woman's needs and social circumstances, e.g. distance between home and hospital and availability of transportation, previous bleeding episodes, haematology laboratory results Preterm delivery

should always be anticipated in cases of placenta previa and maternal safety should always be the priority in cases of repeated attacks of vaginal bleeding and disturbed vitals [22].

Delivery for women diagnosed with placenta accreta spectrum should take place in a specialized centres with immediate access to blood products, adult intensive care unit and neonatal intensive care unit by a multidisciplinary team with expertise in complex pelvic surgery (including vascular, general surgery and urology teams). The most senior clinicians must be available in order to manage any sophisticated complications [23].

When placenta previa spectrum has been established in a patient an informed consent must be taken from the patient and all risk factors anticipated must be discussed with the patient and this includes fetal or maternal loss, massive haemorrhage with massive blood transfusion that may be severe enough to drop the vitals and at this case hysterectomy might be the only choice for saving the patient, in addition , patient must be aware that there is high risk for urinary tract injury and second set hysterectomy in cases of uterine preservation if there is dramatic drop in vitals and labs [24].

It is important to include counseling about the possibility of unscheduled pregnancy termination for maternal indications such as repeated attacks of severe vaginal bleeding and prelabour premature rupture of membranes given the significant risks of maternal morbidity and mortality [25].

The type of anaesthesia given during delivery is to be decided by the anestheologist and the patient must be aware that there can be shifting from spinal to general anaesthesia if matters worsen [26].

Caesarean section hysterectomy with the placenta left in situ is preferable to attempting to separate it from the uterine wall as this reduces the risk of uncontrolled bleeding. When the extent of the placenta accreta is limited in depth and surface area, and the entire placental implantation area is accessible and visualised (i.e. completely anterior, fundal or posterior without deep pelvic invasion), uterine preservation may be appropriate and this may include segmental resection of the uterine myometrium [27].

Women presenting with a placental edge less than 20 mm from the internal os in the third trimester are more likely to need delivery by caesarean section when the placental edge is thicker (over 10 mm) and/or contains a sponge-like echo or marginal ‘sinus’ [28].

Surgical Techniques of Haemorrhage Control

The key role during surgery is to control haemorrhage and give the patient the best chance for preservative operation if it doesn’t compromise her life. The choice of surgical technique will depend on the placental site, the depth of invasion, and the parametrial extension of the placenta accreta spectrum as assessed by ultrasound and/or MRI before delivery, the visual assessment of the uterus at the time of surgery [29].

Vertical incision in cases of transversely lying foetus is advised in order to avoid incising in the placental tissue if the placental tissue has been incised immediate clamping of the umbilical cord must be done following the delivery of foetus in order to reduce severe haemorhage. In cases of anterior placenta praevia, cutting through the placenta is often associated with increased maternal bleeding. Thus uterine incision above the placental site is advised after 24 weeks of gestation in order to reduce the need for maternal blood transfusion during or after caesarean delivery [30].

The triple-P procedure [perioperative placental localisation, pelvic devascularisation and placental non-separation] involving delivery of the fetus via transverse uterine incision above the upper border of the placenta, myometrial excision and reconstruction of the uterine wall has shown promising results in reducing the rate of hysterectomy, PPH and duration of hospital stay [27].

When the urinary bladder is invaded by placental tissue, preoperative cystoscopy and the placement of ureteric stents have been recommended. Planned cystotomy can prevent extensive muscularis damage and bleeding from attempts at dissection [31].

Interventional radiology has been recently suggested in assisting surgical and conservative management of placenta accreta with variable success. The main aim of this procedure is to reduce the risks of intraoperative haemorrhage during the caesarean delivery of pregnancies diagnosed antenatally with placenta accreta spectrum. Various combinations have been proposed, including intraoperative internal iliac artery and/or postoperative uterine artery embolisation and internal iliac artery or abdominal balloon occlusion [32].

Intrauterine balloon tamponade, different types of compression sutures and uterine artery occlusion techniques have been increasingly used to reduce or stop intraoperative bleeding and PPH. use of intrauterine hydrostatic balloon catheters, including the Bakri balloon, the BT-Cathâ balloon or the Sengstaken–Blakemore tube, in women with placenta praevia have reported success in controlling PPH ranging from 75% to 88% [5].

Uterine compression sutures is on of the techniques that can control haemorrhage and at the same time preserve the uterus. The B-Lynch suture has been the most commonly used compression suture technique and is described as oversewing of the uterus with a continuous suture to apply ongoing compression. Modifications of the original technique, as well as various other suturing techniques, have since been advocated.other techniques include,multiple square suturing, ,v-shapes suture and purse-string suturing of the anterior wall of the lower uterine segment [33].

Another technique for controlling haemorrhage and preserving the uterus includes, segmental resection technique which involves trimming of the ozzing placental site and then suturing the remaining uterine tissue together with cervical tamponade and/or uterine artery or internal iliac artery ligation [34].

If all measures including medical administration of ecbolics fail to control haemorrhage maternal survival musn't be compromised and hysterectomy must intervene which is at this case the last solution for controlling severe haemorrhage or uterine atony following following delivery of the fetus [35].

There are various surgical sutures that prove success in controlling haemorrhage one of which includes the Nausicaä suture technique which involves dissection of the vesico-uterine fold in order to expose the uterine serosa then a needle-transfixing from the uterine serosa lateral to the bleeding area inside the uterine cavity along a horizontal course inside the uterine cavity until it encompassed the bleeding area, and then finally emerged at the other side of the uterine serosa. The sutures penetrated the full thickness of the myometrium without stitching the anterior and posterior walls together and transfixing any engorged parametrial vessels [36].

A flat surgical knot was then tied as tightly as possible above the serosa using healthy myometrium as anchoring points for needle transfixion. Additional sutures are then made approximately 1.5–2.0 cm vertically parallel with the previous stitches until haemostasis was achieved. This suture can be performed on anterior and posterior wall and once the desired haemostasis is achieved the uterine incision is then closed by continuous sutures [37].

One of the most promising haemostatic sutures is the purse string suture of the lower uterine segment, it is a conservative and rapid surgical technique used during cesarean section to control severe hemorrhage from placenta previa or PAS (placenta accreta spectrum). It involves application of a circular suture to plicate the lower segment, providing direct vascular occlusion at the bleeding site as well as enhancing the function of weak myometrial fibers of the scarred lower uterine segment by compressing them forming a uterine tamponade as the suture involves the whole thickness of the uterine wall [38].

This suture is useful for controlling bleeding from the placental bed when conservative methods like uterotonics or figure-of-eight sutures fail, and it is one of the new methods for controlling bleeding and hence avoiding caesarean hysterectomy. Purse string suture is an effortless technique it doesn't require special skills as internal iliac artery ligation, it is not time consuming and doesn't affect cervical tissue as it only involves the anterior wall of the lower uterine segment unlike segmental resection.it also prevents obliteration of the uterine cavity for the same reason [39].

Even though the success rate is said to be 96% limited cases were reported in previous studies due to limited candidates for the suture, varying degrees of placental invasion, making the suture posing some challenges for the suture. In addition, this haemostatic suture may lead to uterine necrosis due to compression of

the feeding vessels and bladder injury due to massive bladder dissection and it is not applicable in cases of placenta previa percreta [(40)].

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