AOGD BULLETIN

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Safeguarding women and their Doctors

Issue Theme:
Placenta Accreta Spectrum - An Obstetrician's Nightmare

AOGD SECRETARIAT

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PAS Foreword

It gives me great pleasure to be writing a foreword for the AOGD bulletin focussing on Placenta Accreta Spectrum disorders.

The incidence of this problem has been increasing exponentially over the past few years and considering the associated high maternal morbidity, and possible mortality, this not only makes it an important diagnosis but also mandates that each practising OBG specialist be well aware of all details pertaining to it. I therefore congratulate team AOGD for devoting an entire issue to this very pressing contemporary problem.

I am glad to note that the editors have focussed both on diagnostic and interventional strategies as both are important and have a significant impact on outcomes.

Furthermore, as this is a problem where results can be optimised using a multidisciplinary approach it is appropriate that they have a dedicated chapter on this too. Our anaesthesia and intensivist colleagues play a large role in improving management outcomes subsequent to large blood volume replacement requirements and their contribution needs to be acknowledged and stressed.

In the current medicolegal scenario, it is also pertinent that there is focus on indemnity and insurance as it is preferable that one could need it any time and one should never get caught off guard!

I further hope that by devoting an entire issue to this problem all members will register the seriousness of this grave maternal diagnosis and will have a high index of suspicion in possible cases so that no case goes undetected and no one is faced with the catastrophe of managing an undiagnosed case. If this happens in a small set-up then the situation is further gravely compounded.

For myself, I would like to put on record my appreciation of this dedicated issue which should go a long way to achieve our ultimate goal of minimising maternal morbidity and mortality.

I hope the AOGD members will receive this issue well.

Best wishes to the editorial team.

Professor Reva Tripathi
Head, Deptt of Obstetrics & Gynecology
Sitaram Bhartia Institute of Science and Research, New Delhi
Former Head, Department of Obstetrics & Gynecology,
Maulana Azad Medical College, New Delhi &
Hamdard Institute of Medical Sciences & Research (HIMSR), New Delhi

From the AOGD Office


Dr. Asmita M. Rathore


Dr. Y. M. Mala


Dr. Deepti Goswami

Dear AOGD members

Warm greetings !!

World Cancer Day is marked on 4th of February and it aims to promote awareness on cancer as a public health issue and to strengthen actions towards improving access to screening, early detection, treatment, and quality care. The slogan for this year, 2023 is "Close the care gap".

The main focus this year was on prevention of cervical cancer as the maximum burden of this disease is in the low and middle income countries. An important land mark we achieved was development and launching of first indigenously developed, made-in- India HPV Vaccine for prevention of cervical cancer. Many public awareness programs, screening camps and workshops were conducted in Delhi under the aegis of AOGD with an aim to reach our goal "Cervical Cancer Mukt Bharat" in near future.

Patients presenting with placenta accreta spectrum is an obstetrician's nightmare. Its incidence is on the increasing trend which is due to a rise in the cesarean section rates. The present bulletin covers various aspects of placenta accreta spectrum including latest guidelines which will help in better management of these cases and minimizing maternal mortality.

Dr. Asmita M Rathore, President
Dr. Y M Mala, Vice President
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AOGD Risk Management Support [ARMS] Group

One of the ways to ensure the stress-free work environment and optimal patient care is mutual support among professional colleagues. We propose to form an advisory group of senior AOGD members that can be contacted if one of us is caught in a complex clinical dilemma / dealing with aggressive clients or is apprehensive about how to document or effectively troubleshoot a potential problem. This group will provide the timely advice and will be led by-

Convener- **Dr. Vijay Zutshi** - 9818319110

Co convener- **Dr. Aruna Nigam** - 9868656051

We invite suggestions from all members regarding functioning of this cell which will guide us forming the SOPs. Any member interested in being part of Advisory group may contact the convener.

Pl mail to aogdmamc2022@gmail.com

From the Editor's Desk

Dr. Madhavi M. Gupta
Editor

Dr. Nalini Bala Pandey

Dr. Reena Rani

Dr. Chetna A. Sethi

Co-Editor

Greetings to all !

Dear Friends

The editorial team is pleased to present to you the second issue of the AOGD Bulletin for the year 2023

This issue focusses on Placenta Accreta Spectrum (PAS), the last thing an obstetrician would want to encounter on the table unannounced. Maternal morbidity and mortality can occur because of severe and sometimes life-threatening hemorrhage. Under the Game Changer section we bring the FIGO classification of PAS & a comparison of recent guidelines in the diagnosis and management of placenta accreta spectrum disorders.

We have tried to cover all aspects of this disordered placentation- etiology, risk factors, prenatal diagnosis and antenatal management. The issue also carries articles on surgical and non-surgical management, the anaesthesia requirements and what all and how many blood products are required.

Last but not the least, management of Placenta accreta spectrum is sub-optimal in the absence of a multi disciplinary team. Studies demonstrate better maternal outcomes in centres with MDT in place. The author walks us through the constitution of a MDT and the role of every member and the most important aspect, how to operate a MDT.

Risk Management under 'Safeguarding the Doctors' section is dedicated to professional indemnity and insurance, something we all should be aware of but in reality are not.

My heartfelt gratitude to all the authors for their efforts in putting together an interesting and informative read.

As always, we look forward to receiving your feedback to help us bring out a better version each time.

Yours in health

Dr. Madhavi M Gupta
Editor

Game Changer:

FIGO classification for the clinical diagnosis of placenta accreta spectrum disorders & A comparison of recent guidelines in the diagnosis and management of placenta accreta spectrum disorders

Madhavi M Gupta*, Reena Rani**

*Director-Professor, **Assistant-Professor, Department of Obstetrics & Gynaecology, MAMC & Lok Nayak Hospital, New Delhi

Abstract of the research articles are available free at the journal websites and on Pubmed (http://www.ncbi.nlm.nih. gov/PubMed)

FIGO classification for the clinical diagnosis of placenta accreta spectrum disorders

Jauniaux E, Ayres-de-Campos D, Langhoff-Roos J, Fox KA, Collins S; FIGO Placenta Accreta Diagnosis and Management Expert Consensus Panel. FIGO classification for the clinical diagnosis of placenta accreta spectrum disorders. Int J Gynaecol Obstet. 2019 Jul;146(1):20-24.

Abstract - Globally Placenta accreta spectrum (PAS) is impacting maternal health outcomes and its prevalence is likely to increase. Maternal outcomes depend on the identification of the condition before or during delivery and, in particular, on the differential diagnosis between its adherent and invasive forms. Adherence to this new International Federation of Gynecology and Obstetrics (FIGO) classification should improve future systematic reviews and meta-analyses and provide more accurate epidemiologic data essential to developing new management strategies.

General classification of placenta accreta spectrum

Grade 1: Abnormally adherent placenta (placenta adherenta or acreta)

Clinical criteria

- At vaginal delivery or cesarean delivery
  - o No separation with synthetic oxytocin and gentle controlled cord traction
  - o Attempts at manual removal of the placenta results in heavy bleeding from the placenta implantation site requiring mechanical or surgical procedures

Macroscopically, the uterus shows no obvious distension over the placental bed (placental "bulge"), no placental tissue is seen invading through the surface of the uterus, and there is no or minimal neovascularity

Microscopic examination of the placental bed samples from hysterectomy specimen shows extended areas of absent decidua between villous tissue and myometrium with placental villi attached directly to the superficial myometrium

- The diagnosis cannot be made on just delivered placental tissue nor on random biopsies of the placental bed

Grade 2: Abnormally invasive placenta (Increta)
Clinical criteria

- At laparotomy
  - o Abnormal macroscopic findings over the placental bed: bluish/purple colouring, distension (placental "bulge")
  - o Significant amounts of hypervascularity (dense tangled bed of vessels or multiple vessels running parallel craniocaudially in the uterine serosa)
  - o No placental tissue seen to be invading through the uterine serosa.
  - o Gentle cord traction results in the uterus being pulled inwards without separation of the placenta (so-called the dimple sign) Histologic criteria
- Hysterectomy specimen or partial myometrial resection of the increta area shows placental villi within the muscular fibers and sometimes in the lumen of the deep uterine vasculature (radial or arcuate arteries)

Grade 3: Abnormally invasive placenta

(Percreta) Grade 3a: Limited to the uterine serosa Clinical criteria

- At laparotomy
  - o Abnormal macroscopic findings on uterine serosal surface (as above) and placental tissue seen to be invading through the surface of the uterus
  - o No invasion into any other organ, including posterior wall of the bladder (a clear surgical plane can be identified between the bladder and uterus)
- Histologic criteria
  - o Hysterectomy specimen showing villous tissue within or breaching the uterine serosa

Grade 3b: With urinary bladder invasion Clinical criteria

- At laparotomy
  - o Placental villi are seen to be invading into the bladder but no other organs
  - o Clear surgical plane cannot be identified between the bladder and uterus Histologic criteria • Hysterectomy specimen showing villous tissue breaching the uterine serosa and invading the bladder wall tissue or urothelium

Grade 3c: With invasion of other pelvic tissue/ organs

Clinical criteria

- At laparotomy
  - o Placental villi are seen to be invading into the broad ligament, vaginal wall, pelvic sidewall or any other pelvic organ (with or without invasion of the bladder)

Histologic criteria

- Hysterectomy specimen showing villous tissue breaching the uterine serosa and invading pelvic tissues/organs (with or without invasion of the bladder)

A comparison of recent guidelines in the diagnosis and management of placenta accreta spectrum disorders

Jauniaux E, Kingdom JC, Silver RM. A comparison of recent guidelines in the diagnosis and management of placenta accreta spectrum disorders. Best Pract Res Clin Obstet Gynaecol. 2021 Apr;72:102-116.

Abstract-Accreta placentation and in particular its invasive forms are impacting maternal health outcomes globally and the prevalence of placenta accreta spectrum (PAS) continues to increase. The Royal College of Obstetricians and Gynaecologists (RCOG) and the American College of Obstetricians and Gynecologists (ACOG) with the Society for Maternal-Fetal Medicine (SMFM) have updated their national guidelines whereas the Federation International of Gynecology and Obstetrics (FIGO) and the Society of Obstetricians and Gynecologists of Canada (SOGC) have developed new guidelines on the diagnosis and management PAS. For women diagnosed with PAS, multidisciplinary team-based care, with full logistic support structures (immediate access to comprehensive blood products, adult and neonatal intensive care) and established expertise in complex pelvic surgery, is critical to maximize safe outcomes for mother and newborn.

Summary of good/strong evidence supported by high-quality evidence in the different guidelines. Modified from references1-8.

Guidelines	Recommendations (strategies)	Level
RGOG	The major risk factors for PAS are history of accreta in a previous pregnancy, previous CD and other uterine surgery, including repeated endometrial curettage. This risk rises as the number of prior CD increases.	B
	Refer women with any ultrasound features suggestive of PAS to a specialist unit with imaging expertise.	B
ACOG/ SMFM	The absence of ultrasound findings does not preclude a diagnosis of PAS; thus, clinical risk factors remain equally important as predictors of PAS by ultrasound findings.	1A
	Delivery at 34+0 – 35+9 weeks of gestation is the preferred gestational age for scheduled CD or hysterectomy absent extenuating circumstances in a stable patient.	1A
	In the setting of hemorrhage, data from other surgical disciplines support the use of a range of 1:1:1 to 1:2:4 strategy of packed red blood cells: fresh frozen plasma: platelets.	1A

FIGO	The recent increase in the incidence and prevalence of PAS is a consequence of the rise in CD over the last two decades.	High & Strong
	Women with a previous history of CD, presenting with a low-lying placenta/placenta praevia in the second trimester of pregnancy are the largest group of women with the highest risk of PAS.	High & Strong
	The use of standardized protocol and terminology for both the clinical diagnosis and histopathological confirmation of PAS is essential to obtaining new and more accurate epidemiological data.	High & Strong
	Ultrasonography is a relatively inexpensive and widely available imaging modality and therefore should be the first line for the diagnosis of PAS.	High & Strong
	The recorded presence or absence of each ultrasound sign will be influenced by the operator's interpretation of what constitutes that marker.	High & Strong
	Where available, tranexamic acid should be administered (1gr slow IV or 1000-1300 mg PO) immediately prior to or during CD for PAS.	High & Strong
	The extirpative approach or forcible manual removal of the placenta should be abandoned.	High & Strong
SOGC	Pregnant women with clinical risk factors for PAS disorders and anterior placenta previa at the 18–20-week fetal anatomical ultrasound should be referred for specialist imaging to diagnose or exclude this disorder.	II-2A
	Surgery should be considered earlier for repeated episodes of antepartum hemorrhage or contractions to reduce the risks of emergent unplanned surgery and should ideally be preceded by a course of corticosteroids to enhance fetal lung maturation if prior to 35+0 weeks of gestation.	II-2A
	Regional anaesthesia may be safer than general anaesthesia as it is associated with reduced blood loss and is preferred by patients and their partners.	II-2A
	IV tranexamic acid should be administered at the commencement of surgery because it reduces intraoperative blood loss.	I-A

PAS= Placenta Accreta Spectrum; CD= Caesarean Delivery; IV= Intravenous

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Placentation – Normal and Abnormal

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"Marvels of universe you can enter into it only if you have curiosity and thinking."
- A.P.J. Abdul Kalam

Introduction

Complex collaboration between endometrium and embryo is crucial for implantation. The process of implantation consists of apposition, adhesion and invasion. Trophoblast invasion of the uterus is required for fetoplacental development. It help perform multiple other essential functions including the anchoring of the placenta to the uterus, regulating materno-fetal immune tolerance and conversion of the maternal spiral arterioles, ensuring adequate blood supply to the intervillous space. The mechanisms and regulation of these functions need to be elucidated. Further knowledge about invasion will help in understanding pathologies related to problems in invasion like under invasion in preeclampsia or over-invasion seen in Placenta Accreta Spectrum (PAS). Less is known about PAS due to its low incidence.

The "spectrum" in PAS includes a range of abnormal placental attachment and invasion to the uterus or other adjacent structures, which can be classified as creta, increta and percreta according to the depth of trophoblastic invasion in the uterine wall. There has been an exponential increase in global rates of CD, which was particularly marked over the past 25 years with rates increasing from <7% to in 1990 to over 19% in 2014. Currently the highest regional caesarean delivery rates are found in Latin America (40 to 50%) and lowest in sub-Saharan Africa (3 to 6%).[2] The two primary risk factors for PAS are placenta previa and utero-myometrial damage, mostly from one or more lower transverse Caesarean sections. Thin endo-myometrial layer around the cervix in placenta previa probably provides less impedence to trophoblast over-invasion. The loss of the plane of placental cleavage from the uterine wall and the excessive vascular remodeling of the radial and arcuate arteries can explain increased risk of hemorrhage when manual removal of an undiagnosed placenta accreta is attempted. Invasive PAS is the major concern for maternal morbidity and mortality from uterine rupture, catastrophic postpartum hemorrhage, and urinary tract injury. It is an ongoing debate whether aberrant extravillous trophoblast or the defective decidual/uterine components which enable over-invasion. It may be a possibility that uterine characteristics which influence the invasion process toward PAS may also be apparent in the non-pregnant state.[1] Intervention to modify these characteristics, pre-pregnancy, might also be possible. It is prudent to understand the molecular etiology to explore these avenues.

Pathophysiology

The placenta is consists of the chorionic plate and basal plate with intervening intervillous space. On maternal side is the basal plate and chorionic plate on fetal side (Figure 1). Nitabuch's layer also called as fibrinoid layer is formed during placental development and it helps to prevent deeper implantation of conceptus. At birth, placenta detaches itself from the uterus from this particular area. PAS is a consequence of uterine remodeling following scarification with secondary increase in the subplacental and intervillous circulation leading to progressive fibrinoid deposition. This fibrinoid deposition distorts the Nitabuch membrane and may explain the loss of parts of the physiological site of detachment of the placenta from the scarred uterine wall at delivery.[3]

Basal plate consists of a diversified mixture of decidual cells and trophoblastic cells and contains the decidua basalis. There are 2 types of trophoblast: the villous trophoblast which covers the placental villi and is made of cytotrophoblast cells and the syncytiotrophoblast and the extravillous trophoblast (EVT) which arises from the distal tips of the anchoring villi that normally make contact with the decidua basalis. The EVT differentiate primarily into interstitial and endovascular cells subpopulations that

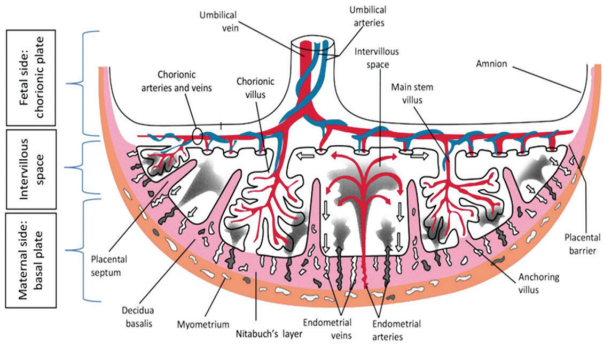

Figure 1. Schematic drawing of fetal amd maternal side of placenta. Fetal side: Chorionic plate that contains the amnion and main stem villi (chorionic villi). Maternal side: Basal plate that contains placental septa and deciduas basalis.

migrate through the decidual stroma and in the lumens of the spiral arteries respectively. The interstitial EVT invade the uterine wall as far as the inner third of the uterine myometrium, also called the junctional-zone (JZ), where they fuse to form multinucleated trophoblast giant cells (MNGCs). In the weeks following implantation, EVT cells are found both within and around the spiral arteries in the central area of the placenta. Endovascular EVT cells in the central area, destined to become the definitive placenta, act as plugs blocking the spiral arteries. These plugs prevent a continuous flow of maternal blood from entering the placenta during most of the first trimester. This phenomenon creates an environment of physiological hypoxia inside the gestational sac, which is essential for normal fetal-placental development and which modulates the formation of the membranes of definitive placenta. Both endovascular and interstitial EVT invasion are associated with the physiological conversion of the terminal part of the uterine circulation, extending as far the basal part of the spiral arteries at the level of the JZ or the inner third of the myometrium. In normal pregnancies, the transformation of spiral arteries into uteroplacental arteries is described as complete around midgestation. There is a gradient in the infiltration of the EVT along the spiral artery, and even in a normal pregnancy not all spiral arteries are completely transformed.[4]

Equally important in the regulation of placentation are the inhibitors of trophoblast invasion. The precise regulation of trophoblast invasion will therefore depend on the balance of local concentrations of many factors, and also the composition of the extracellular matrix.

Exact pathogenesis for PAS is yet to be known, but several have been proposed. The abnormal adherence in PAS is thought to be a result of abnormal expression of growth-related, angiogenesis - related, and invasion - related factors in the different trophoblast populations. EVT cells in PAS are increased in size and number, as well as in the depth of myometrial invasion. EVT fails to undergo their normal terminal differentiation. The absence of the JZ is of more importance in the pathogenesis than excessive EVT proliferation or invasiveness. In invasive PAS, EVTs can be found beyond the JZ and chorionic villi inside myometrial vascular spaces. This leads to an absence of the normal plane of cleavage and prevents placental separation after delivery. It is possible these uteroplacental vascular changes in the accreta area result from both neovascularization and/or increased recruitment of deep uterine vessels by EVT and chorionic villi beyond the JZ (Table 1).

Table 1. The main histopathologic and immunostaining changes observed in PAS[4]

Villous trophoblast (Dysregulation of the trophoblastic cellular invasive capacity)
Lower syncytiotrophoblast immunostaining for MicroRNA-34a, TGF-β, E-CAD, EGF c-(erbB-2), VEGFR-2, and RTK Tie-2
Higher syncytiotrophoblast immunostaining for EGFR and TIMP-1
EVT (Pathologic programming of EVTs toward increased motility and invasiveness in PAS)
Increased in the size, numbers and depth of myometrial invasion of EVTs
Reduced formation of MNGCs
Higher EVT immunostaining for VEGF and phosphotyrosine
Lower EVT immunostaining for sFLT-1
Uteroplacental vasculature
Decreased proportion of remodeled spiral arteries
Greater degree of remodeling in radial/arcuate arteries in increta and percreta

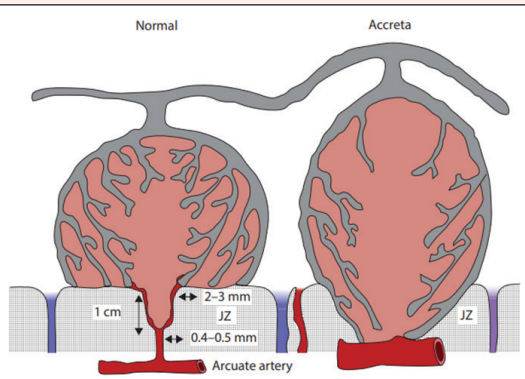

Figure 2. Diagram showing a normal and an accreta placental cotyledon. Note the accreta villi reaching the arcuate artery through the JZ of the inner third of the myometrium, the dilatation of the arcuate circulation, and the absence of a cleavage zone.[5]

The scar tissue of the uterus caused by a caesarean section is relatively anoxic, which is mainly due to a local increase in fibrous tissue, absence of re-epithelialization, decreased angiogenesis, and impaired blood circulation around the scar.[6] During cytotrophoblast invasion, trophoblasts differentiate and change their behavior once they reach the spiral arterioles, and the spiral arterioles reorganize to increase oxygen tension and delivery. The relative hypoxia of the caesarean scar tissue can preferentially recruit the blastocyst to implant in areas that result in an increased risk of placenta accreta. Due to scar dehiscence, trophoblasts have better access to large outer myometrial vessels and invade them.

Epidemiology and risk factors

The first case reports of PAS were published in the literature in the 1920s, and the first series in 1937 by the obstetrician Frederick C. Irving and the pathologist Arthur T. Hertig from the Boston Lying-In Hospital. PAS disorder was first described by Luke et al to include both abnormal adherence and abnormal invasion of placenta.[7] In the last decade, even the condition itself has begun to be known by many different names, with 'morbidly adherent placenta' becoming particularly popular. This terminology is misleading as 'morbidly adherent' does not encompass the abnormally invasive end of the accreta spectrum (increta and percreta), which usually have the worst clinical outcomes. The FIGO (International Federation of Gynecology and Obstetrics) proposed a nomenclature grading system under the umbrella diagnosis of placenta accreta spectrum disorders (PAS), that replaced the old categorical terminology (placenta accreta, increta, and percreta).

Accreta incidence estimates is influenced both by the definition used and the specific population of patients studied. When using either a clinical or pathologic diagnosis, regardless of previa status or mode of delivery, general incidence ranges from 1/533 to 1/731 deliveries.[5] As previously noted, prior cesarean delivery is a risk factor for placenta accreta, so the rise in placenta accreta incidence over the past decades is reflective of the rise in cesarean deliveries. Approximately 6.7% of patients with five prior c-sections were noted to have placenta accreta, compared to 0.3% of patients with one prior c-section.[8]

Table 2. lists reported risk factors for placenta accreta, categorized by strength and consistency of evidence. Placenta previa and history of a prior cesarean delivery comprise the strongest, most-cited risk factors for placenta accreta. Theoretically, any primary uterine anomaly or secondary damage to the uterine wall structure can lead to PAS disorders, including the invasive forms. Development of PAS disorders has also been reported in women with no prior uterine surgery, but with uterine pathology such as bicornuate uterus, adenomyosis, submucous fibroids, and myotonic dystrophy However, these cases are extremely rare and past surgical history, in particular regarding pregnancy termination, may not always be accurate. The Nordic Obstetric Surveillance Study, which investigated severe obstetric complications between 2009 and 2012, found that maternal age greater than 35 years increases the odds of PAS disorders by 4.59. This association is most likely due to confounding factors such as multiparity, risk of previa, and the risks of prior uterine surgery rather than advanced maternal age itself.

Table 2. Risk factors for PAS[5]

Consistent Evidence from Controlled Studies
• Placenta previa
• Prior CS(s) (particularly with a placenta previa)
• In vitro fertilization (IVF)
Inconsistent evidence from controlled studies
• Maternal age ≥35
• Prior dilation and curettage of the uterus
• Prior myomectomy or other uterine surgery (besides CS)
• Maternal smoking
Anecdotal evidence from case series and reports
• Prior history of accreta
• Uterine synechiae or Asherman's syndrome
• Prior endometrial ablation
• Prior uterine fibroid embolization
• Congenital uterine anomalies (such as a rudimentary horn)
• Prior uterine irradiation

It has been suggested that surgical techniques used for entering and closing the uterus during cesarean delivery could play a role in the etiology of PAS disorders. For example, single-layer uterine closure versus a multiple overlapping layer type of closure, or locked versus interrupted suturing, or different suture

materials could influence the risk of developing PAS disorders in subsequent pregnancies. A systematic review has indicated that single continuous locked suture of the cesarean incision may be associated with thinner residual myometrium thickness as evaluated by postoperative ultrasound. A recent systematic review and meta-analysis of nine randomized controlled trials including 3696 participants found a similar incidence of uterine scar defects in women who had a single-layer compared with double-layer closure (RR 0.77, 95% CI 0.36–1.64). Outcomes were considered inaccurate because the studies reviewed had included relatively few patients and events (five trials with 350 participants). Nonetheless, these data suggest that type of uterine closure has little influence on uterine scar healing and thus less impact on PAS disorders than emergent versus elective cesarean delivery.[8]

A caesarean scar pregnancy is the implantation of clinically detectable pregnancy into a scar. It can be recurrent and is associated with severe maternal morbidity and significant mortality from very early in pregnancy. It has been suggested that a caesarean pregnancy is not a separate entity from PAS but rather a continuum of the same condition.

What happens during the initial phase of placentation in PAS remains a mystery. We can only witness the consequences of an abnormally deep trophoblast migration and villous attachment below the JZ at delivery. To conclude, consider PAS as a disease resulting from a combination of many factors such as a defect in decidua, abnormal trophoblastic attachment, aberrant angiogenesis, vascular remodelling and progressive uterine scar dehiscence.

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Placenta accreta spectrum- Prenatal Diagnosis and Antenatal Management

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Placenta accreta spectrum (PAS) includes various types of abnormal placentation in which chorionic villi attach directly to or invade the myometrium. In recent past, its prevalence has risen manifold, primarily due to the increasing percentage of pregnant patients undergoing primary and repeat cesarean sections. PAS has emerged as a significant cause of maternal morbidity and mortality. An accurate and an early prenatal diagnosis of PAS allow time for a multidisciplinary team to plan delivery in a center with expertise in surgical management of these disorders.

Identifying women at risk

It is utmost desirable to identify women at risk of developing PAS. The most common risk factor is a previous cesarean delivery, with the incidence of PAS increasing with the number of prior cesarean deliveries.[1,2] In a systematic review, the rate of placenta accreta spectrum increased from 0.3% in women with one previous cesarean delivery to 6.74% for women with five or more cesarean deliveries.[3]

Placenta previa is another significant risk factor. PAS occurs in 3% of women diagnosed with placenta previa and no prior cesarean deliveries. In the setting of a placenta previa and one or more previous cesarean deliveries, the risk of placenta accreta spectrum is dramatically increased. For women with placenta previa, the risk of placenta accreta is 3%, 11%, 40%, 61%, and 67%, for the first, second, third, fourth, and fifth or more cesarean, respectively. [4]

Additional risk factors include advanced maternal age, multiparity, prior uterine surgeries or curettage, and Asherman syndrome.[2]

Diagnosis of PAS

The primary diagnostic modality for antenatal diagnosis is obstetric ultrasonography. Features of accreta visible by ultrasonography may be present as early as the first trimester; however, most women are diagnosed in the second and third trimesters. Ideally, women with risk factors for PAS, such as placenta previa and previous cesarean delivery, should be evaluated by obstetrician–gynecologists or other health care providers with experience and expertise in the diagnosis of placenta accreta spectrum by ultrasonography.

Transabdominal imaging is performed with the patient's bladder full. Transvaginal ultrasonography (USG) is performed carefully when the placenta is low lying or placenta previa is present.

Normal USG Appearance of the Placenta and Myometrium- In the early first trimester the placenta is normally seen as a focal mass that causes indentation of the gestational sac and is more hyperechoic than the underlying myometrium. The myometrium is seen as a thin, well-demarcated rim of hypoechoic tissue. In the second trimester, the placenta is homogeneous and granular in echotexture. By the third trimester, calcifications and multiple vascular lakes are often seen, which can give the placenta a more heterogeneous appearance. Adjacent to the myometrial side of the placenta is a thin, subplacental clear space. Normal placental blood flow forms a regular continuous pattern, with an occasional vessel dipping into the placental parenchyma.

USG Findings in PAS

USG Features are shown in Table 1

Table 1

Signs	Grayscale	Color Doppler
Intraplacental lacunae	Numerous, large, irregular sonolucent intraplacental spaces containing turbulent flow	Diffuse or focal vascular flow within placenta

A bnormally thick placenta	Mushroom-like thickening of the placenta; increased lower uterine segment placental thickness (>50 mm at 32-34 weeks)	
Loss of retroplacental clear zone	The normal hypoechoic retroplacental zone in the myometrium under the placental bed is visible or irregular	Increased subplacental vascularity; vessel distributions heterogeneous with the size and spatial organization
Reduced myometrial thickness	Reduced myometrial thickness <1 mm (normal 4 ± 1 mm) or undetectable at the level of the inferior uterine segment, between the bladder wall and retroplacental vessels	Increased vascular flow in the surrounding myometrium
Interruption of the bladder flap, placental bulge and exophytic mass	Focal defects in the echogenic bladder border, or a bulging of the bladder wall or focal exophytic masses extending beyond uterine serosa into adjacent extrauterine organs usually the bladder	Uterovesical hypervascularity, vessels extending from the placenta to the bladder and vessels crossing the interface disruption site; often running perpendicular to myometrium

Diagnostic accuracy of the antenatal ultrasound scan

According to a systematic review in 2013, prenatal ultrasound has a high accuracy for diagnosis of PAS in women with an anterior placenta previa and a previous cesarean section, with a sensitivity of 91% and a specificity of 97%.[5] Among the various sonographic signs of PAS, the presence of abnormal vasculature (overall) on CDI had the best prediction accuracy with a sensitivity of 90.7% and a specificity of 87.7%. Abnormality of the uterus and bladder interface had the best specificity (97.5 to 99.8%), but a low sensitivity (49.6%).[5] The présense of placental lacunae and loss of the clear zone had the sensitivity of 77.4% and 66.2%, respectively, though both had a specificity of around 95%. Despite a high accuracy for prenatal ultrasound diagnosis of PAS, a significant proportion of PAS remains undiagnosed before surgery.[6,7]

A small study on 20 PAS among 198 women with posterior placenta previa showed that prenatal ultrasound evaluation have a low sensitivity (60%) albeit a high specificity (98.8%).[8] Some ultrasonographic signs are not specific to PAS. Intraplacental lacunae can be present in normal pregnancies or uteroplacental insufficiency. Myometrial thinning can be due to a previous Cesarean scar.

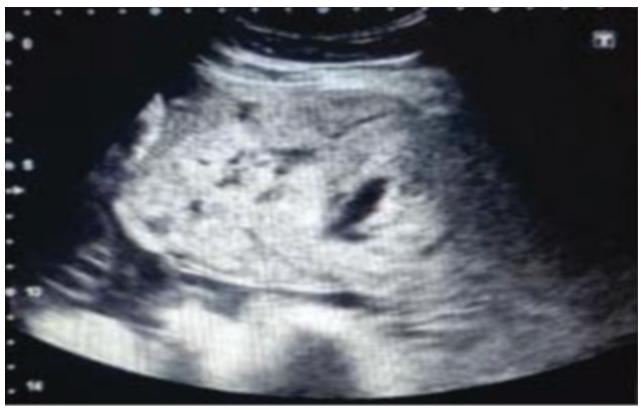

Figure 1: Grey scale USG showing placenta lacunae

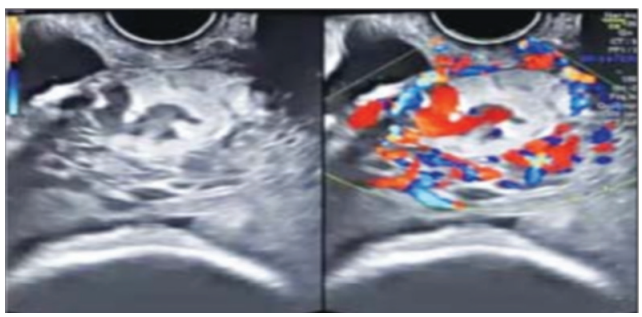

Figure 2: Colour doppler USG showing multiple vascular lacunae

Detection of PAS in first trimester

A meta-analysis including seven studies, involving 551 at-risk pregnancies showed the detection of at least one ultrasound sign suggestive of PAS in 91.4% of women with confirmed PAS in the first trimester.[9] The most common ultrasound feature was low implantation of the gestational sac (82.4%), followed by a reduced myometrial thickness (66.8%), and lacunae (46.0%).

When CSP is found, the relationship between gestational sac position and Cesarean scar

should be assessed to predict the severity of PAS. This relationship can be classified according to-

(a) cross-over sign (COS) by Cali et al.[10]

(b) implantation of the gestational sac within a dehiscent scar ("niche") vs implantation on top of a well-healed scar by Kaelin Agten et al.[11]

(c) implantation "above the uterine midline" vs "below the uterine midline" by Timor-Tritsch et al.[12]

When combining the three classifications, Cali et al. proposed "high-risk-for PAS Triangle" which is formed by(a) the endometrial line,(b) Cesarean scar, and (c) the uterine midline (c). If the center of the gestational sac is "in the niche", the pregnancy will be at high risk for PAS. Further, large prospective studies are required to evaluate this proposal.

Invasions in the inferior third of the lower uterine segment, posterior bladder, and parametria, involving the main branches of uterine arteries and surrounding pelvic vessels are associated with a higher risk of surgical morbidity than those in the upper uterine segment. On the other hand, if the placental invasion involves the upper posterior bladder than that involves the lower posterior bladder or parametrium, uterine preservation will be more likely.

Jellyfish sign is a new sign of PAS, and defined as the absence of the normal linear demarcation between the placenta previa and the cervix.

Intracervical lakes (ICLs) is another new sign, and defined as tortuous anechoic spaces within the cervix, which appeared to be hypervascular on CDI, using a pulse-rate frequency <1.3 kHz. ICL is thought to be the result of massive trophoblastic invasion of the uterine cervix leading to an intracervical disruption process.

The role of a staging or scoring system for PAS

'Placenta Accreta Index' has been proposed for prediction of PAS. This incorporates history, location of placenta, thickness of myometrium, absence of retro placental clear zone, presence of bridging vessels and size and number of lacunae to determine the score (Table 2). A score of 9 means 96% chance of PAS with sensitivity of 17% & specificity of 100%, PPV 100%, NPV 72%. A score of 1 means 5% chance PAS with sensitivity of 100% & specificity city of 19% PPV 38%, NPV 100%.

Table 2: Value of each Parameter is added together to generate placenta accreta index score.

Parameter [a]	*Value*
≥ 2 caesarean deliveries	3.0
Lacunae Grade 3 Grade 2	 3.5 1.0
Sagittal smallest myometrial thickness [b] ≤1 mm < 1 but ≥ 3 mm > 3 but ≤ 5 mm	 1.0 0.5 0.25
Anetrior placenta previa [c]	1.0
Bridging vessels	0.5

[a] - if parameter is not present, than value is 0
[b] - measured in sagittal plane.
[c] - if any potion of placenta is anterior

Role of prenatal MRI

Magnetic resonance imaging (MRI) can be used to diagnose PAS, and the findings include the presence of uterine bulging, heterogeneous signal intensity within the placenta, dark intraplacental bands on T2 - weighted images, abnormal placental vascularity, focal interruptions in the myometrial wall, tenting of the bladder, and direct visualization of the invasion of near-by organs.[13] The sensitivity for detection of placenta accreta, increta, and percreta is 94.4%, 100% and 86.5%, respectively; the corresponding values for specificity are 98.8%, 97.3%, 96.8%. The role of MRI is particularly important in posteriorly localized placenta, where USG might be indecisive.

Role of Biomarkers

Some biomarkers have been found to be raised in condition of PAS. These are Maternal Serum Alfa fetal fetoprotein (MSAFP), PAPP-A (Pregnancy-Associated plasma protein A), pro-B type natriuretic peptide, Troponin, Free b-HCG (mRNA) and Human Placental Lactogen (cell-free mRNA) and total placental cell free mRNA. Though found to be raised in PAS but are nonspecific to be recommended for clinical use at present.

Management of PAS

A. Antenatally Diagnosed Placenta Accreta Spectrum

Diagnosis Made in the Previable Period

When the diagnosis of placenta accreta spectrum is made in the previable period, counseling is important about the possibility of pregnancy termination for maternal indications.[14] However, there are currently no data to support the magnitude of risk reduction, if any. Also, pregnancy termination in the setting of suspected placenta accreta spectrum also carries risk.

Timing of delivery

A planned preterm delivery is recommended in PAS. In the absence of risk factors for preterm delivery in women with placenta accreta spectrum, planned delivery at 35+0 to 36+6 weeks of gestation provides the best balance between fetal maturity and the risk of unscheduled delivery.[15] However ACOG recommends even earlier intervention between 34+0 to 35+6 weeks of gestation.[16]

Preoperative Considerations and Management

1. Availability of a comprehensive multidisciplinary care team, preferably consisting of experienced obstetricians, pelvic surgeons with advanced expertise, urologists, interventional radiologists, obstetric anesthesiologists, critical care experts, general surgeons, trauma surgeons, neonatologists and maternal–fetal medicine subspecialists.
2. An extensive discussion should be held with the patient and her partner/family to discuss the severity of the diagnosis and plan of care, including caesarean hysterectomy.
3. Notification and collaboration with the blood bank and optimizing hemoglobin values during pregnancy.
4. Pelvic examinations, sexual intercourse, and rigorous activity should be avoided. Bed rest is of unproven benefit.
5. The value of preoperative ureteric stent placement in cases with noted bladder involvement is unclear and is left to a case-by-case evaluation. The role of preoperative placement of catheters or balloons into pelvic arteries for potential interventional radiologic occlusion is also controversial.
6. Issues such as distance from a hospital or referral center and other logistic considerations must be kept in mind while making decision to hospitalize.

Intraoperative Considerations and Management

1. The most generally accepted approach to placenta accreta spectrum is cesarean hysterectomy with the placenta left in situ after delivery of the fetus (attempts at placental removal should never be made).
2. Choice of skin incision- Vertical incisions are recommended for better access and visualization. Other alternatives are wide transverse incisions such as a Maylard or Cherney incision.
3. Inspection of the uterus after peritoneal entry is highly recommended to discern the level of placental invasion and specific placental location.
4. Whenever possible, the incision in the uterus should avoid the placenta, which sometimes makes a classical uterine incision or fundal transverse incision necessary.
5. Close monitoring of volume status, urine output, ongoing blood loss, and overall hemodynamics is critically important during these cases. Use of a 1:1:1 to 1:2:4 strategy of packed red blood cells: fresh frozen plasma: platelets is recommended.
6. Antifibrinolytic therapy may be useful in placenta accreta spectrum, especially in the setting of hemorrhage. Prophylactic tranexamic acid given at the time of delivery after cord clamping may reduce the risk of hemorrhage.
7. Patients should be kept warm because many clotting factors function poorly if the body temperature is less than 36°C. Acidosis also should be avoided. If blood loss is excessive, often defined as estimated blood loss of 1,500 mL or greater, prophylactic antibiotics should be re-dosed.

Postoperative Considerations and Management

1. These patients are at particular risk of ongoing abdominopelvic bleeding, fluid overload from resuscitation, potential for multiorgan damage, and the need for supportive efforts.
2. Clinical vigilance for complications such as renal failure; liver failure; infection; unrecognized ureteral, bladder, or bowel injury; pulmonary edema; and diverse intravascular coagulation is must.
3. Lastly, attention to the small but real possibility of Sheehan syndrome (also known as postpartum pituitary necrosis) is warranted given the clinical scenario and the potential for hypoperfusion.

B. Unexpected" and Unplanned Intraoperative Recognition of Placenta Accreta Spectrum

Sometimes placenta accreta spectrum is unexpectedly recognized at the time of cesarean delivery, either before the uterine incision (Uterus over the placental bed appears abnormal, can have bluish/purple appearance, or 'placental bulge' or placental tissue might be seen to have invaded through surface of uterus) or after the uterus is opened, the fetus is delivered, and attempts to remove the placenta have failed. It is also possible to make the diagnosis of placenta accreta spectrum after vaginal delivery.

The level and capabilities of the response will vary depending on local resources, timing, and other factors.

If placenta accreta spectrum is suspected based on uterine appearance and there are no conditions mandating immediate delivery, the case should be temporarily paused until optimal surgical expertise arrives. In addition, the anesthesia team should be alerted and consideration given to general anesthesia, additional intravenous access should be obtained, blood products should be ordered, and critical care personnel should be alerted.

Similar principles apply when placenta accreta spectrum is inadvertently discovered with the uterus already open immediately after delivery. Once the diagnosis of placenta accreta spectrum is established and it is clear that placental removal will not occur with usual maneuvers, then rapid uterine closure and proceeding to hysterectomy as judiciously as possible should be considered. If the patient is stable after delivery of the fetus and the center is unable to perform the hysterectomy under optimal conditions, transfer should be considered. Temporizing maneuvers, packing the abdomen, tranexamic acid infusion, and transfusion with locally available products should be considered.

Role of endovascular intervention

Prophylactic endovascular intervention with a balloon catheter, arterial embolization, or a combination of the two may be used to decrease hemorrhage during or after delivery. For embolization, Gelfoam is used after delivery of the infant and for balloon occlusion, the balloon-tipped catheters are introduced into the target artery, which are inflated intermittently for up to 20 minutes to reduce bleeding in the operative field. Larger studies are necessary to determine the safety and efficacy of interventional radiology before this technique can be advised in the routine management of PAS.

Uterine preservation and expectant management

Uterine preservation, also referred to as conservative management, is defined as removal of placenta or uteroplacental tissue without removal of the uterus. Expectant management is defined as leaving the placenta either partially or totally in situ. These are considered in women desirous of preserving their reproductive function and sometimes in cases where surgeon considers it appropriate (eg in percreta with extensive invasion into bladder and surrounding tissues). Conservative management should be considered only for carefully selected case of PAS after detailed counseling about risks, uncertain benefits and efficacy and should be considered investigational.[16]

The prerequisite is that the patient should not be bleeding and should be hemo-dynamically stable. The placenta is left in situ after clamping & cutting the cord close to it. These patients are followed closely by regular ultrasound to look

for spontaneous resolution of placenta. Beta hcg monitoring is helpful only in initial follow up period. Methotrexate adjuvant therapy should not be used for expectant management as it is of unproven benefit and has significant adverse effects.[15] In some cases, a planned secondary hysterectomy may be performed, after the vascularity of the uterus and placenta has significantly diminished, making the surgery much safer.

The second situation is when there is a focal accreta, wherein the conservative surgery like Triple P Procedure may be performed.[17] Triple P Procedure has been described as a conservative surgery for focal placenta accreta; the steps include;

1. Preoperative localization of placenta using TAS and delivery of fetus by transverse incision 2 finger breath above it.
2. Pelvic devascularization by inflating pre-placed occlusion balloons in both internal iliac arteries.
3. Area of placental non separation is dealt by en bloc myometrial excision and reconstruction of the uterine wall. In a large series of patients managed conservatively it was seen that the treatment was successful in 78% of the cases. Severe maternal morbidity was seen in 6.0%, whereas infection was observed in 28%. Secondary PPH occurred in 11% and sepsis in 4%. The median interval from delivery to delayed hysterectomy was 22 days (9-45) and mortality rate was 0.6%.[18]

Summary

The Accurate prenatal identification of affected pregnancies allows optimal obstetric management. Ultrasonography (US) remains the diagnostic standard, and routine US examination at 18–20 weeks gestation affords an ideal opportunity to screen for the disorder. Placental lacunae and abnormal color Doppler imaging patterns are the most helpful US markers for PAS. In recent years, there has been increased interest in magnetic resonance (MR) imaging for the evaluation of PAS, since it can more clearly depict posterior PAS.

PAS is a clinical and diagnostic challenge that is being encountered with increasing frequency, not unusually without any prior diagnosis. Clinicians should be aware of the clinical issues, risk factors, and imaging findings associated with PAS to facilitate optimal case management.

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Management of Placenta accreta spectrum (PAS)- Surgical and Nonsurgical /Conservative

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Introduction

Placenta accreta spectrum is abnormal trophoblast invasion into the myometrium. FIGO expert panel created a classification system that describe PAS as follows

Grade 1- Abnormally adherent placenta- Accreta

Grade2- Abnormally invasive placenta- Increta

Grade 3- Abnormally invasive placenta – Percreta-subtype of Grade 3 are 3a - Limited to the uterine serosa. 3b - Urinary bladder invasion. 3c - Invasion of other pelvic organs.[1]

The marked increase in PAS is observed globally and attributed to the increase in cesarean section rates. The frequency of PAS increased with increasing number of cesarean section. Other important risk factors include myomectomy where uterine cavity is entered, removal of intrauterine adhesions by hysteroscopy, dilatation and curettage. Prevelence reported range from 0.01 to 1.1%[2] The types and frequencies of abnormal placentation were 63% accreta, 15% increta and 22% percreta in a systematic review.[2]

Diagnosis- Women with low lying placenta and uterine surgery should have thorough sonographic evaluation both tranabdominally and transvaginally of interphase between placenta and myometrium between 18 and 24 weeks of gestation as at this gestation the diagnosis of PAS can be made or ruled out with approximately 90% accuracy.

Ultrasound findings

Multiple placental lacunae – Large intraplacental irregular, multiple sonolucent spaces in the centre of cotyledon adjacent to the involved myometrium replacing normal placenta homogeneity. The risk of PAS is greater if more than three lacunae with irregular borders and turbulent flow are present. Sensitivity of lacunae in diagnosis of placenta accreta, increta and percreta was approximately 75, 89, 76% respectively in a meta-analysis and specificity were 97, 98 and 99% repectively.[3] Loss of sonolucent area - the normal hypoechoic zone behind the placenta may be missing or irregular. Sensitivity of this mentioned in a metaanalysis is 75, 92 and 88% for accreta, increta and percreta respectively and specificity is 92, 77 and 71% respectively.[3] Myometrial thinning- myometrium behind the placenta may be thin due to placental invasion or poor scar because of previous surgery. Abnormal vascularity- Vessels going from placenta through the myometrium into bladder or through the serosa are clearly placenta percreta.

Colour Doppler- Specific findings are turbulent lacunar blood flow, bridging vessels, diffuse and focal intraparanchymal flow, hypervascularity of serosa–bladder interface and prominent subplacental venous complex. Colour doppler is useful when used in conjunction with other USG findings.[3] 3D power doppler USG diagnostic criteria include irregular intraplacental vascularization with tortuous confluent vessels crossing placental width and hypervascularity of uterine serosa-bladder wall interface.

MRI may be more useful then USG in evaluation of possible posterior PAS, assessment of depth of myometrium and parametrial involvement and evaluation of myometrium and placenta at the most lateral portion of the uterus. For high diagnostic performance MRI findings are interpreted in conjunction with the USG findings when both are interpreted by an expert. MRI findings which are most accurate predictors of PAS are uterine bulging in to bladder, interruption of bladder wall, loss of retroplacental hypointense line on T2W images, abnormal vascularization of placental bed, dark intraplacental bands of T2W images, myometrial thinning and focal exophytic mass.[4]

Management of PAS

Women suspected to have PAS based on

clinical risk factors and USG findings should be counseled about the diagnosis and potential complications associated with it like haemorrhage, massive blood transfusion, need for cesarean hysterectomy and complications during surgery and need for ICU admission. Such patient should be referred to a tertiary centre with expertise in dealing with PAS and availability of multidisciplinary approach.

During antenatal period correction of iron deficiency anemia if present, regular routine antenatal care and if antepartum haemorrhage (APH), conservative management as indicated in patients with APH. Antenatal corticosteroids if gestation less than 34 weeks and increased risk of delivery within 7 days especially if APH occurs and avoidance of pelvic examination. As far as admission to hospital is concerned, preferable these patient should be admitted in the third trimester in the setting of APH. Routine Fetal surveillance with NST biophysical profile is not indicated if there is no FGR.

Timing of Delivery

At what gestation delivery should be planned is controversial and individualized management is appropriate. The risk of preterm should be weighed against the risk of complications such as bleeding leading to emergency surgery in suboptimal conditions. ACOG recommends planned delivery between 34 weeks to 35 weeks plus six days in stable patients with no APH or preterm labour.[5] As per RCOG in the absence of risk factors planned delivery at 35+6 to 36+6 weeks of gestation provide balance between fetal maturity and risk of unscheduled delivery.[6] A number of patients develop complications preterm prelabour rupture of mermbrane, preterm labour or antepartum haemorrhage leading to delivery earlier than planned.

Preoperative preparation

It is always desirable to develop a plan preoperatively for women diagnosed with PAS. Interventions that will reduce the risk of massive postpartum haemorrhage should be planned and the strategies in place. Various components of preoperative planning are-

Informed consent- Patient should be explained the need for cesarean hysterectomy, potential complication due to severe haemorrahge, massive blood transfusion, injury to bladder and need for bladder resection in case of percreta, ICU admission and post operative complication related to massive transfusion, prolonged surgery.

Multidisciplinary team including obstetrician with expertise in managing PAS, anaesthiologist, interventional radiologist if facility available, neonatologist, blood bank and nursing personnel and a surgeon/urologist all should be on board. Delivery should be planned electively when optimal availability of necessary personnel facilities are available as it has been seen that planned surgery is associated with less intraoperative blood loss than emergency surgery Decision regarding conservative management or cesarean hysterectomy should be made preoperatively. In our experience we usually do cesarean hysterectomy without disturbing the placenta when it is reasonably sure that it is PAS by imaging especially in case of previous LSCS when the placenta is adherent to the scar. However conservative management is also an option.

Intravenous access – Two large bore intravenous cannula should be placed. Central line offers no additional benefit so not routinely required. Invasive arterial monitoring is commonly performed. Pneumatic compression devices should be placed given that prolonged surgery, massive haemorrhage and blood transfusion all increase risk of postpartum venous thrombosis. Massive transfusion protocol should be activated and blood bank should be notified. Adequate red blood cells, fresh frozen plasma, platelets and cryoprecipitate should be available at the time of surgery. The median estimated blood loss in reported to be 2.5 to 7.8 liters[7] and it is difficult to predict magnitude of blood loss. Three way Foleys catheter and ureteral stents should be available if need arise to assess the integrity of bladder especially in cases of placenta percreta. Surgery is mostly done under General Anesthesia but continuous epidural anesthesia has been used successfully in scheduled deliveries.[8]

Preop or peroperative measures for haemorrhage control

Prophylactic endovascular occlusion with balloon catheter in both internal iliac arteries

or uterine arteries or combination may be used to control bleeding during and after surgery if facility available. In a meta-analysis of this procedure in pregnancies with PAS, the intervention is associated with a reduced blood loss of ≥ 2.5 litres. However, this did not translate in to a statistically significant decrease in red cell transfusion and approximately 5% of patients had procedure related complication.[8] Complications reported are popliteal, external iliac artery thrombus, ilac artery rupture with balloon and ischemic nerve injury apart from hematoma formation at the femoral artery site. If this procedure is planned, then patient should undergo surgery on a fluoroscopic table so that procedure can be done immediately after delivery of infant. For this preoperatively a balloon tipped catheter is inserted under fluoroscopic guidance in to each femoral artery and guides it to desired target vessel. After delivery of infant,balloon can be inflated intermittently for up to 20 minutes to reduce bleeding in operative field. If pressure manometer is used to inflate and deflate balloon then fluoroscopy can be avoided. The catheter may be left for few hours postoperatively and can be used for selective embolization if postoperative bleeding occurs.[9]

Prophylactic use of resuscitative endovascular balloon occlusion of the aorta (REBOA) has been described in a small number of women with abnormal placentation,, but data on safety is limited.[10] Some obstetricians have used specially designed clamp to occlude aorta intermittently during surgery to reduce blood loss.

Steps of surgery

A midline vertical incison is preferred especially in case of low lying placenta in a case of previous LSCS, and incision may be extended above umbilicus as per need. If PAS is posteriorly located, then transverse incision may be given on the skin. Thorough inspection of pelvis for signs of percreta and the location of any collateral blood supply before proceeding with the uterine incision. Operating obstetrician should be aware of upper placental edge from preoperatve imaging and determine the best position for the uterine incision which should avoid transecting the placenta. Therefore a vertical incision well above the edge of placenta more towards fundus to prevent the disruption of placenta during opening of uterus should be given. Then deliver the fetus, the cord is cut and tied and put it back in the uterus and close the uterine incision in single layer to decrease the blood loss from cut edges. Prophylactic tranexamic acid given at the time of delivery after cord clamping may reduce the risk of haemorrhage in PAS. One should avoid prophylactic oxytocin after the delivery because it may lead to partial placental separation and increased chance of bleeding. As far as internal iliac ligation is concerned, it is at the discretion of the operator whether wants to do before starting hysterectomy or not, as it may be time consuming, operator dependent and may be ineffective[11] for controlling bleeding without hysterectomy and it precludes use of selective pelvic angiography and embolization if needed subsequently. Careful dissection in retroperitoneal space to devascularise the uterine corpus close to the placenta often is required because of the vascularity and friability of involved tissues While doing hysterectomy, one should avoid putting clamps too close to uterus specially in the lower part where placenta is adherent in order not to disrupt it as it is highly vascular and chances of torrential bleeding are there. Try to find a clear area at the lateral margin of uterus and clamp is put successively in this fashion. Also lots of blood vessles are there in lower part between bladder peritoneum and lower uterine segment, bladder can be filled retrograde and these vessels can be ligated one by one very meticulously before pushing the bladder, thereby reducing blood loss markedly. Mostly total hysterectomy is done because lower uterine segment or cervical bleeding frequently preclude a supracervical hysterectomy. But subtotal can be done if complete hemostasis can be achieved. Close monitoring of volume status, urine output,ongoing blood loss and overall hemodynamics are very important in these cases. Frequent dialogue between surgical, anesthesia and intraoperative nursing staff is very important to ensure all are continuously apprised of current status ,ongoing blood loss.[12] It is better to use haemorrahgic check list so that no details are neglected due to the focus on surgical activity and accordingly replacement of blood and blood products can be provided. Mostly strategy of 1:1:1 to 1:2:4 of red cell, FFP and platelets is followed.[13] Viscoelastic

coagulation testing can be used to assess and predict severity of haemorrhage and depending on test results replacement can be done. At the end of surgery drain is put in order to monitor any haemoperitoneum in postop period. If placneta percreta with bladder invasion is there, it may require partial cystectomy. And for that urogynaecologist or urologist should have to be on board. Laboratory investigations such as platelet count, PT, aPTT and fibrinogen levels are important but patient is treated based on clinical presentation initially and do not wait for lab results. Keep the patient warm, rapidly transfuse and be sure to transfuse in RBC, FFP and platelets in fixed ratio.

Conservative Management of PAS

In cases where women want to preserve fertility, these women should be counseled regarding the risks of haemorrahge, infection and possible need for intra or postoperative lifesaving hysterectomy and even mortality. In cases where hysterectomy is thought to have an acceptably high risk of haemorrhage or injury to other organ which may be avoided by leaving the placenta in situ and in cases when placenta resection is thought to be possible because of focal accreta or a fundal posterior placenta.

Leaving placenta in situ approach

Also called expectant management ,in this placenta is left in situ after delivery of fetus and umbilical cord is tied close to placental surface and the uterine incision is closed. Uterotonic agents, intrauterine balloon tamponade, uterine artery embolization and uterine artery ligation are variably used. ACOG recommends that such approach should be attempted rarely in a fully informed patients.[14] Delayed hysteroscopic resection of placental remnants to expedite resolution of the placenta has been tried but the experience is limited.[15]

Delayed interval hysterectomy is an option especially in patients with percreta. Obstetricians experienced with the technique have suggested it is an option for only most severe cases of placenta percreta when immediate hysterectomy is too dangerous because of extent of invasion and lack of appropriate resources.[16] High quality data regarding advantages and disadvantages of this approach as compared to planned cesarean section is lacking. Methotrexate should not be used as adjuvant therapy as there is no convincing evidence that it improves any outcome when the placenta is left in situ.

Complications - A systematic review of conservative management of placenta left in situ reported outcome as severe vaginal bleeding in 53%, sepsis in 6%, secondary hysterectomy in the range of 6-31% and death in range of 0-4%. Long term outcome following conservative management appear to be suboptimal. There appears to be increased chances of intrauterine adhesions, increased risk of recurrent placenta accreta in subsequent pregnancy.[17]

Conservation with placental resection

In case of focal placenta accreta which is suspected on antepartum imaging or detected intrapartum because of haemorrhage and a partially retained placenta at delivery. In women with clearly delineated focal area of PAS i.e area is less than 50% of the anterior surface of uterus and an accessible border of healthy myometrium. Management consists of resection of uterine tissue containing the focally adherent placenta and repair the area. Another approach of uterine conservation is Triple –P procedure which involves.

(i) Preoperative placental localization using transabdominal ultrasound to identify the superior border of the placenta so as to deliver the fetus by an incision above the upper border of the placenta.

(ii) Pelvic devascularisation involving preoperative placement of intra-arterial balloon catheter in anterior division of internal iliac arteries.

(iii) No attempt to remove the entire placenta and with large myometrial excision and uterine repair.[18]

What to do when unexpected placenta accreta is found at cesarean delivery ?

Diagnosed when the placental tissue invading lower uterine segment, serosa or bladder, increased and tortuous vascularity along the serosa of LUS and when a bluish and markedly distended lower uterine segment bulging toward the pelvic side walls. When suspected on table, just wait for optimal surgical expertise to be available and adequate blood products arranged before giving uterine incision. In cases where diagnosis of PAS is uncertain,

incision on the uterus should be given carefully avoiding placenta altogether, after delivery of fetus, a period of intraoperative observation for spontaneous placental separation is appropriate as long as preparation for uterine removal are in place. Alternative conservative approaches can be used in stable patients. But if excessive bleeding and patient condition is unstable, better to proceed for cesarean hysterectomy with all the availability of massive transfusion protocol and all the resuscitative measure in place.

Postoperative care

Mostly these patients require ICU care because of massive transfusion, prolonged surgery, chances of acute transfusion related lung injury, need for vasopressor support and invasive hemodynamic monitoring. Antibiotic to be continued and measures to reduce thromboprophylaxis like pneumatic compression devices to be used. There are chances of postoperative bleeding. Obstetrician should have low threshold for reoperation in cases of suspected ongoing bleeding. Need for interventional radiology to provide angiographic embolization of deep pelvic vessels may arise. To be considered if facility is available.

Conclusion

It is critical to develop a plan preoperatively for managing women with PAS. The plan should involve multidisciplinary team and a scheduled delivery in a facility with resources and personnel to manage massive haemorrhage and complicated pelvic surgery. Prophylactic endovascular intervention if available may be used to decrease haemorrhage during and after surgery for PAS, but efficacy is uncertain and complications may occur. Cesarean hysterectomy with placenta left in situ is the most reasonable and safest approach to manage these cases. In certain situations, uterine conservation may be attempted after extensive counseling regarding risks.

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Peripartum Anaesthesia in Placenta accreta spectrum-What is required?

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Introduction

Placenta accreta spectrum (PAS), formerly known as morbidly adherent placenta refers to a range of pathological conditions pertaining to abnormal adherence of the placenta to the uterine wall leading to failure of placental separation during delivery.[1] Placenta accreta refers to abnormal attachment of all or part of the placenta to the myometrium beyond decidua basalis,[1] placenta increta is when chorionic villi invade into the myometrium and placenta percreta is the most severe form where the placental villi invade through the decidua basalis, myometrium and uterine serosa and may attach to pelvic organs like the urinary bladder. The cause is probably a failure of decidualisation in a previous scarred area of the uterus leading to varying degrees of invasion of the trophoblast into the myometrium.[2] The incidence has been increasing over the past few decades related in part to the increase in rates of caesarean delivery (CD). Associated maternal morbidity and mortality relates to postpartum haemorrhage (PPH), coagulopathy, anaemia, acute kidney injury and the requirement of gravid hysterectomy, critical care unit admission and death.[3,4]

Preoperative considerations

Risk factors for PAS should be sought in all pregnant patients. These include previous surgery or manipulation of the uterus including previous caesarean delivery (CD),[5] and prior uterine surgeries or curettage. Placenta praevia in the present pregnancy with history of previous CD is an important risk factor.[6] Other established risk factors include in vitro fertilisation, asherman's syndrome, multiparity and advancing maternal age.[6] In these patients, an antenatal diagnosis of PAS should be made by perinatal ultrasonography in a specialised centre during the second and third trimester which allows referral of the higher risk patients to specialised obstetric centres with multidisciplinary teams experienced in the clinical management of these parturients.

The timing of the delivery needs to be planned to balance maternal risks and benefits with those of the fetus or neonate. Delivery is usually planned between 35 and 36 weeks of gestation in which case the patient should have received a single course of glucocorticoids to enhance fetal lung maturity.[7] For women with suspected PAS but no risk factors for preterm birth, placenta increta or percreta, or previous CD, delivery may be delayed to 36 weeks.[6] However the need for delivery may be hastened if there is bleeding or preterm labour. An interdisciplinary team including interventional radiologists, blood bank providers, specialized surgical teams like urologists and critical care specialists should be available for the management of these cases and the team members should be in constant communication with each other.

There are various surgical options available to manage PAS depending on placental localization, invasion and the extent of adherence. A caesarean hysterectomy is the most commonly accepted option[8] in which the placenta is left in situ after CD of the fetus and closure of the uterine incision and a hysterectomy is done after confirming that the placenta will not separate spontaneously. For patients who wish to preserve their fertility and where placental adherence is focal, a local uterine resection or uterus conserving surgery is reasonable wherein only the part of the myometrium where the placenta is abnormally adherent is surgically removed and the uterus is conserved.[8] In another method to conserve the uterus, the whole of the placenta is untouched and left in situ and the umbilical cord is ligated near the placenta. The uterine incision is closed followed by subsequent

selective uterine artery embolization.[9] Vascular occlusion techniques may be considered in parturients with severe degree of placental invasiveness, who desire future fertility or refuse blood product transfusion. These may be used preoperatively or postoperatively and in the emergency or elective settings and include balloon occlusion of the infrarenal abdominal aorta (IAABO), the internal iliac arteries (IIABO) and common iliac arteries (CIABO) or uterine artery embolization (UAE). Prophylactic IIABO for placenta praevia or PAS is associated with lower intraoperative blood loss and rates of hysterectomy. If neuraxial anaesthesia is being planned, placement of the epidural catheter should be done before this as the lower limbs cannot be flexed after this. [6]

Preanaesthesia consultation

All patients with suspected PAS should have an obstetric anaesthesia consultation before planned delivery. During this the anaesthesiologist must ascertain the degree of invasiveness and severity of PAS based on USG findings, presence of any active bleeding and the degree of anaemia. The surgical plan must be thoroughly discussed with the obstetricians.

A detailed history of pre-existing comorbidities and prior anaesthetic history should be taken and a detailed airway and physical examination done. Any likely difficulties in airway management or contraindications to neuraxial anaesthesia should be noted. Preoperative investigations should be ordered as indicated by associated comorbidities. The degree of anaemia, and coagulation status should be evaluated. Early detection and treatment of iron deficiency anaemia with oral iron replacement, intravenous infusions and, when indicated, use of erythropoietin stimulating agent can be done well in advance of planned delivery to correct anaemia and reduce intraoperative blood transfusion requirements. In patients who decline for transfusion of blood products, other options may be discussed like modified cell salvage, use of erythropoietin, acute normovolemic haemodilution, uterine artery embolization and delayed hysterectomy along with the risks associated with each one of these. The patient and attendants should be counselled regarding the risks and options of the planned surgical procedure, options for anaesthesia, intraoperative blood transfusion requirements and possibility of postoperative intensive care unit (ICU) admission and an appropriate high risk informed consent should be taken.

Preparation for surgery

The anaesthesia management of patients with PAS may prove to be extremely challenging and when it occurs the blood loss can be extremely rapid and life threatening. The operation theatre must be prepared and properly equipped. The anaesthesia team needs to check the availability of:

1. Adequate and trained operating room technical staff.
2. Adequate Equipment. This includes a properly functioning operation table, left uterine displacement wedge, dedicated suction machine for anaesthesiologist, airway equipment (video laryngoscope, tracheal tubes of appropriate size, supraglottic airways, large bore suction catheters), infusion pumps, arterial line transducers, 3-way stopcocks, primed rapid infuser device, high-flow fluid warmers, patient warming equipment, point of care ultrasound machine, quantitative blood loss system, point of care coagulation monitors (ROTEM or TEG), multiparameter monitors to allow determination of cardiac output (noninvasive or minimally invasive), pulse pressure variation (PPV), stroke volume variation (SVV) etc to allow goal directed fluid therapy, cell salvage equipment, defibrillator etc .
2. Medications. Vasopressors: phenylephrine, ephedrine, adrenaline (epinephrine); Uterotonics: oxytocin, methylergometrine, carboprost; Tranexamic acid, Fibrinogen concentrate, sterile water 50 ml, calcium gluconate, warm intravenous fluids.
3. Availability of blood and blood products. It has been recommended that cross-matched blood products, including at least 4 units of packed red blood cells and 4 units of fresh frozen plasma, should be immediately available in the operating theatre. An additional 8 units of packed red blood cells, 4 units of fresh frozen plasma and 2 units of platelets must be available and cross-

matched in the blood bank for use as needed.[6]

4. Patient positioning equipment, lithotomy rods. The obstetrician may want to place the patient in the dorsal lithotomy position to allow optimal surgical visualization of the pelvis during surgery, and they may place a calibrated under-buttock 'v drape' to collect intrauterine blood loss after hysterotomy closure and before hysterectomy.
5. Vascular access. The main problem in patients with PAS is the risk of associated massive haemorrhage and cardiovascular collapse or development of a coagulopathy during CD. Good vascular access is extremely important so as to be able to ensure timely replacement of blood and blood products. All patients should have at least 2 large bores intravenous cannula placed before surgery. If peripheral access is adequate, it may not always be necessary to insert a central venous catheter (CVC). A CVC may be required if peripheral venous access is difficult or limited, if a separate line is required for vasopressor infusions or if there is underlying cardiac disease where measurement of central venous pressure is desirable.

Anaesthesia technique – General anaesthesia (GA) vs Neuraxial anaesthesia.

During the preanesthetic check-up, the mother's preferences and concerns should be noted. The final decision must be taken after multidisciplinary consultation and review of obstetric surgical plan, updates about any comorbidities, likelihood of difficulty with airway management and the chances of severe or uncontrolled PPH.

Neuraxial anaesthesia

Neuraxial anaesthesia for caesarean section is usually considered a standard of practice. Compared with GA, neuraxial anaesthesia facilitates the mother's childbirth experience, avoids complications associated with GA including failed endotracheal intubation, aspiration of gastric contents, hypoxia, and intraoperative recall and enhances intraoperative and postoperative pain control. However, patients with PAS may develop haemodynamic instability due to excessive blood loss. Neuraxial anaesthesia for CD requires a sensory blockade to the T4 dermatome which almost inevitably results in a sympathectomy and consequent hypotension which is managed by patient positioning to prevent aortocaval compression, intravenous fluid pre or co-loading and the early and judicious use of vasopressors. In patients with PAS, there may be excessive haemorrhage and a need for massive transfusion of blood and blood products which may lead to coagulation abnormalities. Furthermore, the CD is likely to be more prolonged and may be followed by caesarean hysterectomy. Thus, if neuraxial anaesthesia is planned it may be more appropriate to place an epidural catheter but this substantially increases the risk of spinal or epidural hematoma formation[10] in patients who develop coagulopathy and disseminated intravascular coagulation.

Recently a few retrospective, and prospective series have demonstrated the safety of neuraxial anaesthesia for PAS management.[11,12] However, the likelihood of conversion from neuraxial to GA increases in the high-risk situation as bleeding increases and incidence may be up to 25 to 50%.[11,12] Induction of GA after neuraxial anaesthesia may result in significant hypotension due to the combined effects of neuraxial anaesthesia induced sympathectomy and the effects of anaesthetic agents on the cardiovascular system. Furthermore, conversion to GA is usually required if there is massive ongoing blood loss or surgery is getting prolonged or the patient is uncomfortable. Hypotension must be anticipated and vasopressors kept ready. Thus, use of neuraxial anaesthesia may be reserved for the healthy parturient with a minimally invasive placenta or patients selected for conservative management with a plan to leave the placenta in situ. For such patients, epidural or combined spinal–epidural (CSE)[13] anaesthesia would be preferable to spinal anaesthesia as haemodynamic changes are minimal and level of neuraxial block can be titrated slowly to the optimal level.

Advantages:

- Better birth experience to the mother and mother-child-bonding.
- Titration and maintenance of anaesthesia is

possible with epidural catheter in situ.
- Provides postoperative epidural analgesia.

Disadvantages:

- Hemodynamic instability in the mother and foetal bradycardia due to spinal anaesthesia induced hypotension especially in high-risk cases.
- Discomfort from declining analgesia in long lasting procedures if only spinal anaesthesia is given.
- Possible need for secondary conversion to GA in cases of hemodynamic instability due to excessive bleeding.
- Central venous line or arterial line if required would be inserted without GA.

General Anaesthesia

General Anaesthesia (GA) is routinely used as the standard anaesthetic method in some centres for PAS patients.[14,15] This is the technique of choice for cases of anticipated difficult airway, or if the surgical procedure is expected to be complex and /or prolonged or massive post-partum haemorrhage (PPH) is anticipated. The main advantage is that the airway can be secured in a controlled setting, before the onset of haemodynamic instability, airway oedema or coagulopathy. Also, as there is no sympathetic blockade, there may be a better haemodynamic stability. Video laryngoscopy should be preferred for facilitating tracheal intubation in obstetric patients because of the increased incidence of difficult intubation, faster rate of deoxygenation, airway friability at term gestation and increased risk of aspiration.[6]

Advantages:

- Controlled setting and safe hemodynamic stability.
- No conversion of anaesthesia required in case of prolonged duration of surgery.
- Adequate intraoperative analgesia can be provided throughout the duration of procedure.

Disadvantages:

- Incision-to-cord clamping times during CD may be delayed in PAS patients, resulting in significant anaesthetic drug exposure of the foetus leading to poor APGAR score and need for neonatal intervention.
- No epidural analgesia can be provided.
- Mother cannot experience the child birth experience and child mother bonding is delayed.
- Risks associated with difficult airway and of gastric aspiration.

A third option is to combine neuraxial anaesthesia with elective conversion to GA after delivery of the baby and before proceeding for hysterectomy.[6] This optimises the mother's childbirth experience and minimises anaesthesia drug exposure of the foetus, and simultaneously facilitates resuscitative efforts during hysterectomy and bleeding. In this situation too, hypotension should be anticipated due to dual cardiovascular effects of neuraxial anaesthesia and GA drugs but may be safer than if conversion to GA is done due to massive haemorrhage or maternal discomfort later during the procedure. An infusion of phenylephrine may be started after neuraxial anaesthesia and titrated in the event of further hypotension after induction of GA.[6]

Intraoperative Monitoring:

1. Basic non-invasive monitoring – Electrocardiography (ECG), non-invasive blood pressure (NIBP), pulse oximetry (SpO2) in all patients and end tidal carbon dioxide (ETCO2) in patients receiving GA.
2. Temperature monitoring. Hypothermia is detrimental and must be prevented. Perioperative hypothermia reduces coagulation factor activity; every 1°C drop in temperature causes a 10% reduction in coagulation factor activity, alters platelet activity and decreases citrate metabolism.[16] Preinduction warming at 43°C in patients receiving GA or neuraxial anaesthesia helps in preventing hypothermia.[17]
3. Neuromuscular and depth of anaesthesia monitoring for patients who receive GA.
4. Central venous cannulation for intravenous access and/or central venous pressure monitoring.
5. Urine output measurement. This may not be reliable when there is invasion of the bladder and bladder tears.

6. Radial arterial cannulation for continuous invasive BP monitoring and serial arterial blood gas, haemogobin, coagulation parameter and electrolyte (potassium and calcium) analysis.
7. Monitoring of volume status by PPV, SVV, and cardiac output monitoring in patients with massive bleeding, high volume resuscitation and massive transfusion. Point-of-care transthoracic (TTE) or transoesophageal echocardiography (TOE) can be an adjunctive diagnostic tool to assess maternal volume status in the operating theatre[6] but may require presence of a cardiologist or cardiac anaesthetist.
8. Coagulation monitoring with point-of-care devices in patients undergoing massive blood transfusion.
9. Monitoring of blood loss. By quantitative blood loss (QBL) methods like gravimetry, calibrated under-buttocks v-drapes, colorimetric technologies along with laboratory indices. Cervical and collected vaginal blood loss must be included in blood loss assessment.

Management of Post-partum haemorrhage (PPH)

- The anaesthesiologist must continuously assess the surgical field and ensure appropriate volume resuscitation. In case of rapid unstable haemorrhage, a massive transfusion protocol (MTP) should be activated. MTP's release a predefined ratio of packed red blood cells, fresh frozen plasma and platelets from the blood bank, and may also include cryoprecipitate. A MTP protocol should be in place in all delivery areas, keeping in view local expertise and facilities available. There have been no controlled studies of the best ratios for blood product replacement in obstetrics. However, data from other surgical disciplines support the use of a 1:1:1 to 1:2:4 strategy of packed red blood cells: fresh frozen plasma: platelets.[19,20] The use of point-of-care testing may eliminate the need for fixed ratio transfusion and may lower overall transfusion rate and incidence of transfusion-associated circulatory overload.[21]
- Intraoperatively forced air warming and fluid warmers should be used to prevent secondary hypothermia and hypothermia-induced coagulopathy.
- Acidosis should be prevented by maintaining adequate tissue perfusion. However, use of more than 4 L of crystalloid or colloid has been found to have adverse maternal outcomes, and should be avoided whenever possible.[22]
- If blood loss exceeds 1,500 ml, prophylactic antibiotics should be redosed.[6]
- Use of Tranexamic acid (TXA) at the onset of PPH decreases the risk of overall mortality.[23] A dose of 1gm should be given intravenously at the onset of PPH and repeated after 30 min if bleeding persists. TXA should be avoided in patients with vascular occlusion devices and used with caution in patients at risk of acute renal insufficiency.[24] Prophylactic use of TXA is not indicated even in cases of PAS.
- The use of uterotonics for atonic bleeding during CD is a mainstay in the management of PPH. There is no definitive data on use of prophylactic uterotonic drugs in patients with suspected or confirmed PAS. Expert consensus suggests avoiding the routine use of prophylactic uterotonic drugs in patients with suspected PAS unless there is placental removal or separation with associated atonic bleeding.[1]
- Cell salvage is being used with increased frequency in PPH patients. Washing processes and leukocyte-reducing filters eliminate the risk of amniotic fluid contamination. Cell salvage for patients with PAS has been reported with good outcomes.[25]
- There may be need to resort to interventional radiological procedures if all conservative, surgical and pharmacologic measures fail. Use of a resuscitative endovascular balloon occlusion of the aorta (REBOA) catheter is being increasingly used for the management of PAS with large volume, unstable PPH.[6]

Management of coagulopathy

During ongoing PPH, point-of-care coagulation testing using equipment like rotational thromboelastometry (ROTEM) or thromboelastography (TEG) can be invaluable as they provide real-time information about the global coagulation status and help

guide transfusion of blood and blood products. Standard coagulation tests, like activated partial thromboplastin time and prothrombin time, may be normal until the blood loss exceeds 4- 5 L.[22] Low serum fibrinogen (<200 mg dl/l) indicates progression to severe PPH, and monitoring of serum fibrinogen helps guide fibrinogen concentrate or cryoprecipitate dosing.[21] Approximately 3 ml/kg of cryoprecipitate is sufficient to raise the fibrinogen level by 1 g/l and should be considered early during management of severe haemorrhage.[31] Use of recombinant activated factor VII (rFVIIa) is not recommended routinely in the management of major PPH. [27]

Unexpected PAS

Occasionally patients present with unanticipated PAS at the time of CD. Protocols should be in place for team-based crisis management and guidelines for mobilising available members of the multidisciplinary team. While stabilising these patients and transferring them to better-equipped centres seem reasonable, it is rarely feasible. The emergent management of PPH from unanticipated PAS should include ensuring additional large bore intravenous access and maintaining circulating blood volume and haemodynamic stability, activation of obstetric MTP, frequent quantification of blood loss, institution of appropriate monitoring and blood testing and communicating with obstetricians regarding surgical plan and control of bleeding. If the patient has received neuraxial anaesthesia, conversion to GA with securing of the airway may be required if large amounts of blood products are being given or there is haemodynamic instability. Critical care, general surgical, gynaecological or interventional radiology teams may need to be activated for multidisciplinary care.

Postoperative Considerations and Management

Given the extensive surgery, PAS patients require intensive hemodynamic monitoring in the early postoperative period. Patients who are haemodynamically unstable, hypothermic, or acidotic or in fluid overload may require a period of postoperative ventilatory support. PAS patients are at high risk of ongoing abdominopelvic bleeding, fluid overload from resuscitation, potential multiorgan failure, coagulopathy, renal dysfunction, electrolyte and metabolic abnormalities, transfusion reactions and other postoperative complications depending upon the magnitude of surgery and degree of blood loss. For this intensive ICU monitoring is required with correction of coagulopathies and electrolyte and acid base abnormalities and hypothermia. Obstetricians and intensivists should have a low threshold for re-exploration if ongoing bleeding is suspected. Pelvic vessel interventional radiologic strategies may be considered but their need is to be considered on a case-by-case basis.

Postoperative analgesia

Patients after CD for PAS often have greater postoperative pain due to the complexity of surgery, with longer operative times, and greater tissue dissection and trauma. Most commonly a multimodal approach is used which employs paracetamol, NSAIDs, neuraxial analgesia with intrathecal opioids like fentanyl (if neuraxial anaesthesia is given) and maybe a truncal block under ultrasound guidance (transversus abdominis plane, quadratus lumborum, or erector spinae block if GA is used). Non -opioid analgesics like ketamine, clonidine, gabapentin, lidocaine, or magnesium have been cited as possible co-analgesics to reduce systemic opioid consumption although data regarding their efficacy in PAS is lacking.[28] Systemic opioids should be reserved for rescue medication when above mentioned modalities are not completely effective. Oral route e.g., hydrocodone, tramadol should be preferred over intravenous opioids. Codeine is contraindicated in lactating mothers.[29] Dexamethasone, which is frequently used for prevention of postoperative nausea and vomiting, may have an additional analgesic effect.[30] Postoperative epidural local anaesthetics may cause motor weakness and delay mobilisation and cause significant sensory block which warrants close neurological monitoring if a uterine artery balloon remains in situ.

Conclusion

Management of pregnant patients presenting

with PAS needs a multidisciplinary approach. Although GA is the technique of choice in patients with PAS, appropriate patient selection may allow neuraxial anaesthesia with its advantages to be employed. To ensure a good outcome, postpartum haemorrhage, intrapartum anaemia and coagulation abnormalities should be treated with massive transfusion protocols, antifibrinolytic agents, and specialised blood products as indicated by point of care testing.

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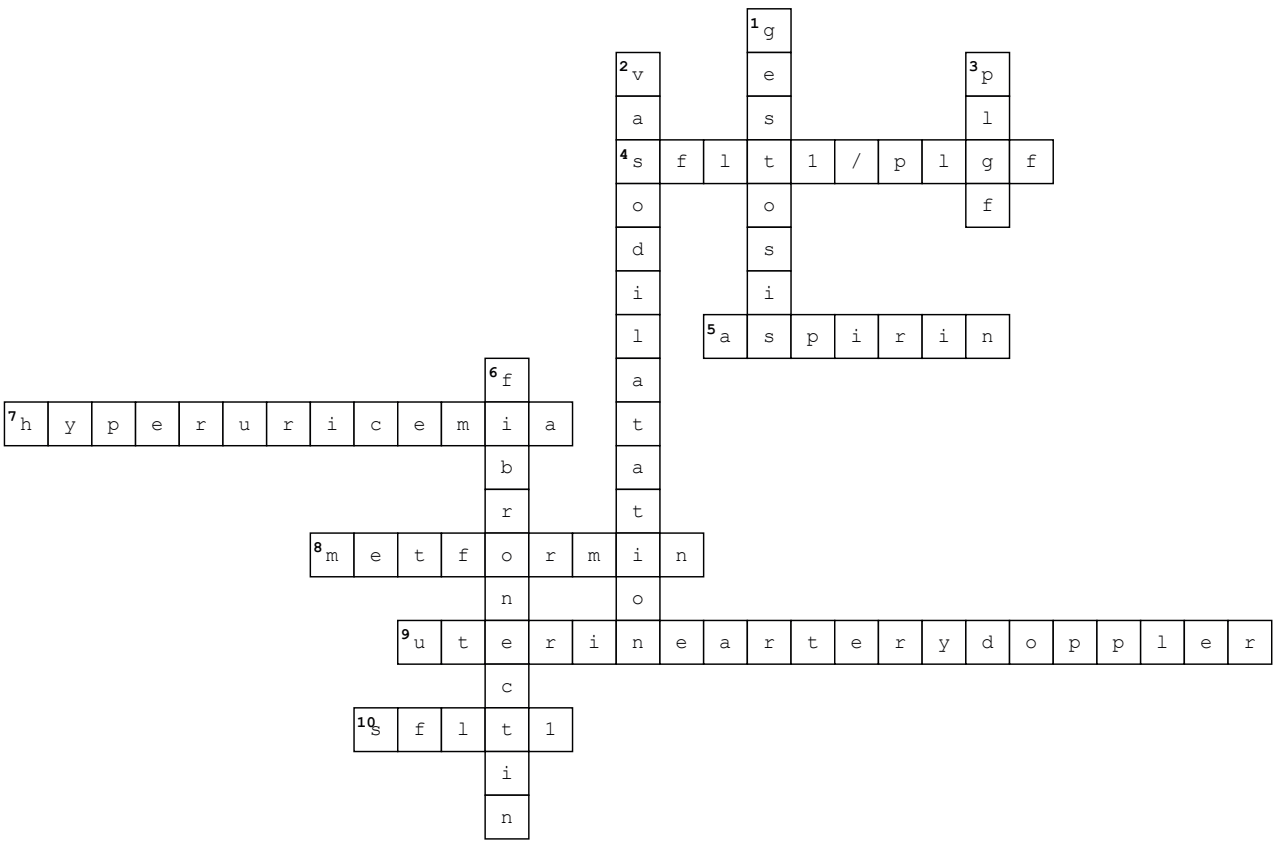
Answer key of Quiz of January 2023



Blood Products in the management of abnormal placentation

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Abnormal Placentation or Placenta accreta spectrum (PAS), formerly known as morbidly adherent placenta, includes the range of pathologic adherence of the placenta, ranging from accreta to increta to percreta. In a patient with known risk factors for PAS, the importance of arranging adequate blood products at the time of delivery cannot be over emphasized. The risk factors for PAS are previous cesarean delivery, previous history of accreta, history of uterine endo-myometrial trauma following uterine curettage, manual removal of the placenta, postpartum endometritis or myomectomy. Rarely, it may develop in women with no surgical history but having a uterine pathology like bicornuate uterus, adenomyosis, submucous fibroids and myotonic dystrophy.[1,2] Antenatal diagnosis of PAS is highly appropriate because outcomes are enhanced when delivery occurs at a level III or IV maternal care facility before the onset of labor or bleeding and with avoidance of placental disruption.[3]

Maternal morbidity and mortality can occur because of severe and sometimes life-threatening hemorrhage, which often requires blood and blood products transfusion. Replacement of blood components is more important than crystalloid infusion if massive hemorrhage has occurred or is likely, to prevent dilutional coagulopathy from crystalloid infusion. Informed consent should be obtained where possible prior to administering a blood transfusion. In an emergency, where it is not feasible to get consent, information on blood and blood products should be provided retrospectively.

Blood & blood product transfusion may be a life-saving procedure but it is not without risk. Recipients may rarely develop transfusion-transmitted infections or suffer immunological sequelae such as red cell allo-immunisation. The major risk, however, of blood transfusion is of a patient receiving an 'incorrect blood component'.[4] Strict adherence to correct sampling, cross-match and administration procedures is therefore of paramount importance, even in an emergency.

Good collaboration with the hospital blood bank is recommended in while planning for delivery due to the frequent need for large-volume blood products. This is particularly relevant in cases that are difficult to cross match in emergency situations. Estimates of perioperative blood loss in cases of abnormal placentation vary and may not always be accurate.[5] Thus, anemia during pregnancy should be evaluated and managed based on specific diagnosis. Optimizing hemoglobin values during pregnancy is important. When iron deficiency is diagnosed, treatment should be started - oral replacement, intravenous infusions and also erythropoietin stimulating agents, when indicated, can be employed. Autologous advance blood donation and serial hemodilution strategies are infrequently used and not routinely recommended in anemic patients.

Bleeding in abnormal placentation may present in the form of major obstetric haemorrhage, which is a life-threatening emergency, in such cases there should be no delay in the provision of blood. The initial use may be of group O-negative units, with subsequent transfusion of cross-matched antigen negative units as available. In such situations, standard leucocyte-depleted components should be given to avoid delay and CMV-negative blood or platelets are not needed for transfusion during delivery or in the postpartum period.[6] In the event of life-threatening haemorrhage, even if a woman has RBC alloantibodies, the transfusion of group O negative red cells, or group specific red cells, must not be delayed. Full blood counts play an important role in guiding red cell and platelet

transfusion during major haemorrhage, while PT/APTT and fibrinogen results should be used to guide FFP and cryoprecipitate transfusion respectively.[7]

There have been no controlled studies of the best ratios for blood product replacement in obstetrics. However, data from other surgical disciplines support the use of a 1:1:1 to 1:2:4 strategy of packed red blood cells: fresh frozen plasma: platelets.[8,9]

A massive obstetric hemorrahge protocol should be in place, which may be 2 units RBCs and 2 units of FFP followed by 4 units each of RBCs and FFP and thawing of one pool (6 bags) cryoprecipitate. Another pragmatic approach is 1 unit FFP for every 2 to 3 units of RBCs or 4 units FFP for every 6 units of RBCs.[10]

Refer to Table 1 for indications of usage of these products. A description of the blood products from a practical clinical standpoint is outlined below.

Red blood cells

Whole blood is seldom transfused, and hence packed red cells are the mainstay of therapy. One unit has about 350mL of RBCs in an additive solution. Each unit raises the Hb by 1g/dL or hematocrit by 3%.

There are no fixed criteria for initiating red cell transfusion.[11] The decision to perform blood transfusion should be made on both clinical and hematological assessment. Blood transfusion is almost always required when the Hb is less than 6 g/dL (Hct <18%), and is rarely required when the Hb is greater than 10 g/dL. It should also be remembered that patients with acute hemorrhage can have normal Hb; hence the clinical evaluation of the patient in this situation is extremely important.

Platelets

Platelet count should not be allowed to fall below 50 x 10^9/L, in the acutely bleeding patient as this represents the critical level for haemostasias. Such a low platelet count may be anticipated when approximately two blood volumes have been replaced by fluid or blood components. A platelet transfusion trigger of 75 x 10^9/l is recommended in a patient with ongoing bleeding, so as to provide a margin of safety. The platelet concentrates may be single donor (SDP) or random donor platelets (RDP). The former raises the platelet counts by 20-30 thousand per transfusion, and the latter 5-7 thousand. The lifespan of the transfused platelets also varies, 3-5 days for SDP and 1-2 days for RDP.

Administration of ABO-non identical platelets is an acceptable transfusion practice, in particular, when platelet concentrates are in short supply or when human leucocyte antigen (HLA)-matched platelets are required and the best match is not ABO compatible.

Platelets may be given via an unused blood giving set, although a platelet giving set reduces wastage because it has less dead space. Transfusion of platelets through a set previously used for red cells is not recommended.[12]

Fresh Frozen Plasma (FFP)

FFP is a licensed plasma product that must be prepared from whole blood or apheresis and frozen within eight hours of collection. FFP contains all of the coagulation factors and other proteins present in the original unit of blood, mildly diluted by the citrate-containing anticoagulant solution used to collect the blood. FFP at a dose of 12–15 ml/kg should be administered for every 6 units of red cells during a major bleed in abnormal placentation. Subsequent FFP transfusion should be guided by the results of clotting tests (if they are available in a timely manner), aiming to maintain PT and APTT ratios at less than 1.5 x normal.

Once the FFP has been ordered, it takes at least 30 minutes to thaw and issue. During this time, resuscitation should be continued with volume expanding fluids or red cells as appropriate. It is seen generally that, units of FFP (as is the case with red cells, platelets and cryoprecipitate) are not virally inactivated and that transfusion with these products offers a small risk of transfusion-transmitted infection.[13]

Cryoprecipitate

Cryoprecipitate is a plasma-derived blood product for transfusion that contains fibrinogen (factor I), factor VIII, factor XIII, von Willebrand factor, and fibronectin. Cryoprecipitate at a standard dose of two 5-unit pools should be

administered early in massive bleeding in abnormal placentation with ongoing bleeding. Subsequent cryoprecipitate transfusion should be guided by fibrinogen results, aiming to keep a fibrinogen level of more than 1.5 g/l.

In order to avoid the low risk of ABO-associated hemolysis, FFP and cryoprecipitate should ideally be of the same blood group as the recipient. If this is not possible, FFP of a different group may be acceptable if it does not possess high-titer anti-A or anti-B activity.[13]

Recombinant Activated Factor VIIa (rFVIIa)

Recombinant Activated Factor VIIa has been used in the management of severe and refractory postpartum hemorrhage due to abnormal placentation. Starting dose is 40-60mcg/kg and may be repeated once in 15 to 30 minutes if there is no response. Its advantages are that being a recombinant product, it is independent of donation unlike other blood components. It has no risk of anaphylaxis and no risk of viral transmission. However, its action is short lived and requires multiple doses, thus cost becomes and limiting factor. There is also a low but significant risk of thrombosis at the injury site. As its mechanism of action is binding of factor VIIa to the exposed tissue factor (TF)-dependent pathway and, independently of TF, activation of factor X directly on the surface of activated platelets localized to the site of injury. Two large case series that included some placenta accreta spectrum patients noted positive responses in 76–86% of cases. However, there were six thromboses in fewer than 200 patients.[14] Thus, use in placenta accreta spectrum should be limited to post-hysterectomy bleeding with failed standard therapy. There is no laboratory test to monitor the clinical effectiveness of rFVIIa, which is judged clinically, by arrest of hemorrhage, hemodynamic stabilization and reduce in requirement of other blood products. In order to ensure the maximum effect of rFVIIa on clot formation, attempts should be made to correct thrombocytopenia, acidosis and hypofibrinogenemia before administering it. The pre-requisites to gain maximum benefit from rFVIIa, hemoglobin levels. preferably above 7 g/dl, INR <1.5, platelets more than 50,000/ cumm and fibrinogen levels at least 100 mg/dl, preferably more than 150 mg/ dl.

Fibrinogen Concentrate

It is a heat-treated, lyophilized fibrinogen (Factor I) powder made from pooled human plasma. Each vial contains approximately 1000 mg fibrinogen. It is used when fibrinogen levels are critically low (ie, <100 mg/dL), and FFP and cryoprecipitate are not available. It may also be used in addition to cryoprecipitate. Although cryoprecipitate can be used to increase fibrinogen, fibrinogen concentrates may be preferred to reduce the risk of transmitting viral pathogens. The main advantages of fibrinogen concentrate compared with cryoprecipitate are faster reconstitution, ease of use and not requiring thawing or ABO compatibility.

In the past, the goal of fibrinogen therapy was to achieve levels of 100 mg/dL or greater, but this may be too low in pregnancy. Levels less than 200 mg/dL are associated with severe postpartum hemorrhage.[15] Hence, it may be prudent to elevate the fibrinogen level to >300 mg/dL in those situations where there is active bleeding and resuscitation is being carried out, given the higher normal baseline fibrinogen level in pregnancy.

Antifibrinolytics

Antifibrinolytic therapy is another adjunctive therapy that may be useful in abnormal placentation, especially in the setting of hemorrhage. Tranexamic acid, is a synthetic derivative of the amino acid lysine that reversibly binds to the lysine-binding sites of the plasminogen molecule. In doing so, it prevents activation of plasminogen to plasmin, leading to inhibition of fibrinolysis.

A large, recent, multicenter, international randomized clinical trial showed a reduction in maternal death due to hemorrhage in cases of postpartum hemorrhage treated with tranexamic acid.[16] These trial results, have been endorsed by leading authorities like WHO.[17] The dose is 1 g intravenously, up to 3 times a day. This was also showed in a recent meta-analysis, where bleeding decreased with prophylactic usage of tranexamic acid at the time of cesarean delivery.[18] Prophylactic use in placenta accreta spectrum is unstudied.

General considerations

Important factors that should be considered in the setting of hemorrhage and abnormal placentation. Patients should be kept warm because many clotting factors function poorly if the body temperature is less than 36°C. Acidosis also should be avoided. If blood loss is excessive, often defined as estimated blood loss of 1,500 mL or greater, prophylactic antibiotics should be repeated. Laboratory testing is critical to the management of obstetric hemorrhage. Baseline assessment at the initiation of bleeding should include platelet count, prothrombin time, partial thromboplastin time, and fibrinogen levels, which are normally elevated in pregnant women. Rapid and accurate results can facilitate transfusion management, although the massive transfusion protocol is not based on laboratory studies. Other components of managing massive bleeding, like hypocalcemia and hyperkalemia. For this, calcium gluconate 1 to 2 grams i.v can be given over two to three minutes empirically for every four units of RBCs transfused. Hyperkalemia may be countered with a half neutralizing drip (10-20 U insulin in 10% dextrose) i.v over 60 minutes.

Special considerations

RH negative women

If Rh-positive platelets are transfused to a Rh-negative woman of childbearing potential, anti-D immunoglobulin should be administered. A dose of 250 IU anti-D immunoglobulin is sufficient to cover five adult therapeutic doses of platelets given within a 6-week period. This may be given subcutaneously to minimize bruising and hematomas in thrombocytopenic women.

Sensitization following the administration of Rh-positive FFP or cryoprecipitate to Rh-negative patients is very unlikely, so anti-D prophylaxis is not routinely recommended after these transfusions.[14]

Jehovah's witness

These are members of the Biblical Watchtower society who have reservations to blood transfusion. However, most will accept their own blood if available and required. So autologous advance blood donation is done in anticipation of future emergency.

The use of autologous cell-saver technology is also becoming an option, with better filtration techniques to filter out amniotic debris.

Conclusion

Abnormal placentation is becoming increasingly common and is associated with significant morbidity and mortality. Knowledge of risk factors and antenatal imaging expertise can help guide the diagnosis. Because of the risk of bleeding intrapartum and postpartum in these women, centers caring for these patients should have the ability to rapidly mobilize blood products for transfusion. In major obstetric haemorrhage, first treat the patient based on clinical presentation and do not wait for laboratory results to initiate transfusions. Keep the patient warm, rapidly transfuse, and when transfusing in the setting of acute hemorrhage, ensure transfusion packed red blood cells, fresh frozen plasma, and platelets in a fixed ratio (1:1:1).

Table 1: characterstics of blood products, anticipated effects and complications[9]

Blood product	Laboratory values prompting transfusion	Volume	Anticipated effect	COMPLICATIONS
Packed Red Blood Cells	Hct<18 Hct<30 in unstable patient or active bleeding	300 ml	Increase Hct 3% per unit	Human error Hemolytic reaction Infection TRALI
Platelets	Platelet count<50,000 Microvascular bleeding Massive transfusion 1:1 with RBC	50 ml	Increase platelet count 7500/mm3/U	Human error Hemolytic reaction Infection TRALI
Fresh Frozen Plasma	INR >2 x normal aPTT > 1.5 x normal Massive transfusion 1:1 with RBC	250 ml	Increase fibrinogen 10-15 mg/dl/U	Human error Hemolytic reaction Infection TRALI
Cryoprecipitate	Fibrinogen < 100 mg/dl	40 ml	Increase fibrinogen 10-15 mg/dl/U	Human error Hemolytic reaction Infection TRALI

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Role of Multidisciplinary Team in the management of Placenta accreta spectrum (PAS)

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Introduction

Placenta accreta is one of the most dreaded obstetric complication in which placenta is completely or focally adherent to the myometrium. The worldwide incidence of placenta accreta spectrum (PAS) is increasing significantly, mostly due to the increasing trends in caesarean section rates. PAS is now the most common reason for peripartum hysterectomy in India and an important contributor to maternal mortality and morbidity.[1] It has an overall mortality as high as 7% and is even higher in developing countries.[2] There are many risk factors for placenta accreta spectrum, the most common and defined risk factor is previous caesarean section, and the risk is directly proportional to the number of previous caesarean deliveries.[3] Placenta previa is another significant risk factor observed in 3% of women without a previous Surgical scar in the uterus. The likelihood of PAS is higher in women, who have a placenta previa and one or more repeat caesarean deliveries. In such women the risk of placenta accreta is 3%, 11%, 40%, 61% and 67% for the first, second, third, fourth and fifth or more repeat caesarean deliveries respectively.[3] The most generally accepted treatment approach for placenta accreta spectrum is caesarean hysterectomy with placenta left in situ after delivery of fetus and avoiding any attempts for removal of placenta as it is associated with massive haemorrhage. Surgical management of PAS can result in abrupt, unexpected, life-threatening haemorrhage. Dilutional coagulopathy, transfusion-related complications, cardiorespiratory overload, electrolyte abnormalities, acute kidney injury, and intensive care unit admission are very real possibilities in the setting of PAS. Surgery is frequently complicated by injury to the bladder, bowel, or ureters. Optimal management involves a standardised approach with a comprehensive multidisciplinary care team accustomed to management of placenta accreta spectrum.

Impact of Multidisciplinary Team in management of PAS

Maternal outcomes are improved when patients with PAS are managed by multidisciplinary teams (MDTs) in experienced referral centres. In a large population-based study of all PAS patients in Utah from 1996 to 2008, Eller and colleagues demonstrated improved maternal outcomes when cases of PAS were managed in hospitals with an MDT care model.[4] They compared the outcomes of 141 cases managed at two tertiary care PAS referral centres (MDT care) to those at 26 other hospitals in Utah that did not meet the criteria for MDT care and they provided standard obstetric care to these patients at their hospital. Women with PAS managed by multidisciplinary care had a significantly lower frequency of a composite early maternal morbidity and mortality. These patients had lower rates of prolonged admission to the intensive care unit, large-volume blood transfusion, coagulopathy, ureteral injury, or early reoperation compared to women managed by standard obstetric care (47% vs 74%, p = 0.026). Even at tertiary care referral centres, the care of women with PAS can be improved by implementing an MDT care approach. Shamshirsaz and colleagues conducted a study and showed that change from standard care of patients with PAS to coordinated multidisciplinary care improves maternal outcomes.[5] In this study, the authors evaluated the surgical outcomes of 90 patients with PAS managed before and after a system-wide practice change at three referral centres. Before the change to MDT care, patients were managed by individual clinicians without a standardized protocol. After the intervention, women with PAS who were cared for by MDTs had lower median blood loss (2.1 l versus 3 l, P = 0.025) and were less likely to require emergent surgery (23% vs 64%; P = 0 and .001). These

outcomes were achieved despite there being a higher frequency of placenta accreta in the MDT study group (after the intervention) (P = 0.008). Experience and stability of the MDT also matter. In another single-site study, Shamshirsaz et al evaluated the outcomes of patients with PAS over time after establishing an MDT care model.[6] Three maternal-fetal medicine specialists served as central leaders for the accreta team over the study period from 2011 until 2016, managing a total of 118 cases. The authors compared two time periods, before and after April 2014. Median blood loss, red cell transfusion, and crystalloid transfusion were less common in the latter group, suggesting that team learning and experience improved patient safety outcomes over time. Impressively, the need for massive transfusion was one- fifth as frequent in the latter period (5.1% vs 25.4%, P < 0.01).

The benefit of delivery at a referral centre extends beyond cases of PAS to all women with massive obstetric haemorrhage requiring peripartum hysterectomy. In a study of 2209 women undergoing peripartum hysterectomy in a nationwide US database of over 500 hospitals, Wright, and colleagues[7] found that women undergoing peripartum hysterectomy for obstetric haemorrhage, whether PAS is present, are less likely to die at high volume centres (OR 0.29 [95% CI 0.10–0.88]). They also showed lower odds of perioperative surgical complications (OR 0.66 [95% CI 0.477–0.93]) and intensive care unit utilization (OR 0.53 [95% CI 0.34–0.83]) at high- volume centres. PAS was the most common reason for the peripartum hysterectomy, accounting for 35% of cases.

The central role of experienced MDTs in the management of PAS is reinforced by recent international guidelines. The American College of Obstetricians and Gynaecologists (ACOG) Obstetric Care Consensus[8] states that the "optimal management [of PAS] involves a standardized approach with comprehensive multidisciplinary care team accustomed to the management of placenta accreta spectrum." ACOG has also supported regionalization of care for women with antenatally diagnosed PAS, who should, along with all women at "extreme risk of massive haemorrhage at delivery," be referred to and managed in at least a level III hospital according to the levels of maternal care paradigm.[9] The Royal College of Obstetricians and Gynaecologists (RCOG) Green Top guidelines state that "women diagnosed with placenta accreta spectrum should be cared for by a multidisciplinary team in a specialist centre with expertise in diagnosing and managing invasive placentation."[10]

Despite data demonstrating that delivery at a hospital with a multidisciplinary PAS team is beneficial, and straightforward guidelines calling for referral to highly experienced maternity centres, many patients with PAS are managed outside these optimal settings. One important reason is that patients with PAS may not be referred. In a survey, less than one quarter (23%) of general OBGYNs refer women with PAS to a sub-specialist.[11] Another important reason for delivery outside of MDT care settings is missed diagnosis. Large population-based studies show that only half of the patients with PAS are diagnosed antenatally.[12,13] The barriers to diagnosis and referral are largely unstudied.

Importance of antenatal diagnosis of PAS and referral to Centres of Excellence

Management of PAS at a referral centre is unlikely to occur if an antenatal diagnosis is missed. Making the diagnosis is critical and marks the first step in the MDT subspecialty care of patients with PAS. When antenatal diagnosis of PAS is made, the risk of adverse maternal outcomes is significantly decreased.[14,15] The decision to refer to more specialized PAS centres depends on several factors. One of the important factor is the skill and experience of radiologists and feto-maternal medicine subspecialists to make a diagnosis of PAS, other factors include the experience and volume of surgical specialists and anaesthesiologists for PAS and (most importantly) the blood bank resources available at the centre. Various studies have shown better outcome in expected cases of PAS than those diagnosed during caesarean, despite a high proportion of women having more severe placental invasion. The better outcome in expected cases is due to multidisciplinary approach and ongoing process of improvement in management of these cases. The presence of an experienced team appears to be more important determinant of maternal morbidity

than the depth of placental invasion in PAS. Indications for referral to Centres of Excellence (COE) are listed in Table 1.[16]

Table 1: Consider referral to Centres of Excellence for diagnosis and management in patients with clinical or sonographic risk factors for placenta accreta spectrum.

	Clinical risk
1	Multiple prior caesarean sections
2.	Placenta previa
3.	History of endometrial ablation
4.	Previous uterine surgery
5.	First- or second-trimester bleeding with other risk factors for placenta accreta spectrum
	Sonographic risk
1.	Abnormal placental appearance
2.	Abnormal uterine shape
3.	Abnormal vascularity of myometrial wall
4.	Caesarean scar pregnancy

Adapted from Silver. Placenta accreta: center of excellence. Am J Obstet Gynecol 2015.[16]

Components of a Multidisciplinary Accreta Team

Suggested members of a PAS MDT are shown in Table 2. Centres of excellence should be able to quickly mobilize team members 24 hours per day year around.

Table 2: Members of PAS MDT.[17]

	Members of PAS MDT
1.	Experienced obstetricians and maternal-fetal medicine specialists
2.	Experienced diagnostic imaging experts and interventional radiologist
3.	Transfusion medicine and blood bank specialists
4.	Obstetric anaesthesiologists, or anaesthesiologists with experience in massive obstetric haemorrhage
5.	Expert pelvic surgeons (may be, though not exclusively, gynaecologic oncologists)
6.	Urologists
7.	General surgeons, trauma surgeons, and/or vascular surgeons
8.	Neonatologists
9.	Expert placental pathologists
10.	Psychological and social support staff

Role of Multidisciplinary Team members in the Management of Placenta Accreta Spectrum Disorders

Role of experienced diagnostic imaging expert and interventional radiologist

The" placental bulge" sign focal area of myometrial placental bulging beyond the normal uterine contour on ultrasound or MRI is postulated to represent deeper venous invasion in placenta accreta spectrum. The presence of placental bulge has a great role in diagnosing severe PAS on both ultrasound and MRI, with a potentially stronger performance on MRI.[18] Accurate prenatal diagnosis of severe PAS by imaging could help guide maternal counselling and the selection of either hysterectomy or uterine preserving surgery and to optimally plan the surgical approach.

On-site interventional radiology service is also important. Although the use of routine or prophylactic interventional radiology procedures (e.g., intermittent endovascular aortic occlusion or pelvic artery balloon catheter occlusion) for PAS is controversial, it is to a centre's great advantage to have the option of postoperative embolization for active bleeding. The choice of which, if any, interventional radiological technique is utilised is determined by local expertise and available resources and the planned obstetric approach. Therefore, an experienced interventional radiologist should be a member of the PAS team.

Role of obstetric-anaesthesiologist

The presence and active participation of obstetric anaesthesiologists or anaesthesiologists with advanced expertise in massive obstetric haemorrhage is unquestioned. These experts keep the patient alive through episodes of rapid exsanguination, hemodynamic instability, and potentially prolonged surgery. Obstetric anaesthesiologists monitor the cardiorespiratory, hemodynamic, and hematologic status of the patient and have unique knowledge of the physiologic changes of pregnancy and postpartum. They administer vasopressors and blood products. When possible, preoperative consultation of PAS patients with expert anaesthesiologists is preferred. Anaesthesiologists also aid in the pre and peri-operative management decisions and optimization of medical comorbidities and

serve as key members of the pre-operative planning team.

Concern about massive haemorrhage associated with placenta accreta spectrum (PAS) prompts the routine use of general anaesthesia (GA) at many centres. Although neuraxial anaesthesia has an advantage over GA among pregnant women in terms of higher risk of maternal pulmonary aspiration and neonatal results. As a result of the establishment of multidisciplinary team patients can be selected for Neuraxial anaesthesia (NA) and the frequency of conversion to general anaesthesia after initial management with Neuraxial anaesthesia has greatly reduced.[19]

Role of blood bank specialist

A well-stocked blood bank is a non-negotiable component of a PAS COE (Centre of excellence). Although the median blood loss at the time of PAS surgery is reported as 2–3 L, it is not uncommon for PAS cases to lose their total blood volume. Haemorrhage is often abrupt, rapid, and life-threatening. The blood bank should be able to deliver multiple blood products quickly round the clock. It should have a defined massive transfusion protocol (MTP), and an ample supply of packed red cells, fresh frozen plasma (FFP), cryoprecipitate, platelets, and fibrinogen. Transfusion medicine specialists, who can guide the preparation and delivery of blood products in the case of massive haemorrhage, are indispensable members of the PAS team. Ideally, blood products should be available in the room prior to starting the accreta surgery case.

Role of other team members

Intensive care specialists are also key members of the PAS team. Up to half of all patients undergoing caesarean hysterectomy require ICU admission and some centres routinely admit all patients to an ICU after caesarean hysterectomy for intensive hemodynamic, cardiorespiratory, and hematologic monitoring. Intensive care may be indicated for ventilator support in women who require massive fluid and transfusion resuscitation. Given the frequency of transfusion, some PAS patients may have transfusion-related acute lung injury or acute pulmonary edema. In the case of disseminated intravascular coagulation (DIC), pelvic packing and delayed closure of the abdomen may be useful. In these patients, ICU care is appropriate.

Since preterm birth often occurs, neonatologists and a neonatal intensive care unit are also crucial. An experienced neonatologist is an important member of this multidisciplinary team as pregnancy in most patients with placenta accreta spectrum is terminated well before term due to increasing morbidity with advanced gestational age. The decision for termination of pregnancy at an optimum period of gestation should be taken after consultation with neonatologist who is an important member of the multidisciplinary team. All the team members should meet well before time of termination of pregnancy to have best outcome afterwards.

Several other types of expertise are also useful for PAS COE (Centre of excellence) These include surgeons with expertise in pelvic and urologic surgery and may include experienced general obstetrician, maternal fetal medicine specialists, gynaecologic oncologists, and urologists. As most of these patients usually have previous one or more abdominal surgeries resulting in formation of dense adhesions requiring extensive adhesiolysis and thus need arises for an experienced surgeon who is well versed with pelvic anatomy and urogenital system. Rarely, additional expertise in trauma, vascular, or gastrointestinal surgery may be required.

Surgical support staff who are familiar with the equipment and instruments needed for safe and rapid hysterectomies are also necessary for optimal surgical outcomes. It is always better to have same surgical support staff team every time to improve outcome of surgery in terms of blood loss, operative time, and accidental injuries to adjacent organs. Thus, surgical support staff is an important integral part of multidisciplinary team.

Finally, it is important to have skilled mental health care counsellors to provide emotional support to women and families with PAS. These individuals are at increased risk for depression, anxiety, and PTSD and often have complex emotions about having a hysterectomy. Pre and

post operative counselling of patients with PAS and their family members by an experienced psychologist should be an important part of management and skilled mental healthcare workers should be included in the multidisciplinary team for the management of PAS.

How to operate a multidisciplinary team in placenta accreta spectrum

To operationalize an MDT approach, we recommend the following:

1. Centres should implement an on-call PAS MDT. Up to 50% of patients with PAS will undergo unscheduled preterm delivery, even when delivery is planned for 34– 35-week gestation (5). These deliveries are often more difficult and morbid than planned cases and should not be left to less-experienced operators just because they are unscheduled.
2. The PAS MDT should meet regularly to discuss cases at patient care conferences. These conferences may resemble multidisciplinary tumour board conferences in oncology, where upcoming cases are planned, and past cases are reviewed. Continuous quality improvement and system optimization happen at these conferences and have exponential downstream improvement benefits. For each patient, care is improved because her case is optimally planned, prepared, and timed. Unique medical conditions (e.g., comorbid conditions, extensive past surgical history) can be discussed. Also, unique social circumstances (e.g., non-proximity to the hospital, social chaos) can be addressed.
3. A standard protocol for management of PAS should be established at each centre. Though too few quality data are available about a single evidence-based standard of care for the management of PAS, a standardized approach to diagnosis, antenatal management, delivery timing, anaesthesia, transfusion preparedness, and operative management is key to reducing errors and confusion. Preoperative checklists and team-training exercises can enhance this process and improve interdisciplinary care processes.[20,21]
4. Lower-acuity obstetric practices and centres should prepare for the inevitability of managing patients with PAS. Clear indications for antenatal referral to higher levels of maternal care should be protocolized and encouraged. For example, a practice with more limited imaging capabilities may decide to refer all patients with clinical or sonographic risk factors for accreta to a referral centre for diagnosis or to rule out PAS. Similarly, a hospital with no capability for massive transfusion or no 24-hour interventional radiology should refer patients with any risk of PAS to centres with these resources.

Finally, even lower acuity hospitals should have a written plan and transfer protocols in place for when a case of PAS is diagnosed during delivery and there should be a prompt referral of these patients to centres with a multidisciplinary team for the management of PAS.

Conclusion

The key to the successful and safe treatment of patients with PAS is in the implementation of a coordinated MDT of highly skilled and experienced providers within a system having ample subspecialty resources. This article has addressed evidence and guidelines supporting the benefit to PAS management by a multidisciplinary care team. We recommend referral to a tertiary care centre with experience in the diagnosis and treatment of PAS, when women have the clinical or sonographic risk for PAS (e.g., placenta previa in the setting of prior caesarean delivery). MDT coordination is an absolute requirement in the management of patients with PAS.

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Professional Indemnity and Immunity

Geetendra Sharma
Medico-legal Consultant

Medico-legal cases are on rise. A few reasons for the same are

- Increasing awareness of patients due to media and internet
- Decreasing threshold of people in society
- Change in doctor patient relationship.

There are more than 100 laws which are applicable on a single Nursing Home. Nursing Home must comply all the requirements under different Acts.

Patient can sue doctor in multiple Fora simultaneously. A few of them are

- Consumer court or Civil Court
- Criminal case at Police Station of Court for medico-legal negligence issues or for violation of different Acts e.g. PC-PNDT Act, MTP Act, POCSO Act, Bio-medical waste rules etc.
- Medical council – State or National
- Human rights commission
- Women Right Commission
- At CMOs office under Clinical establishment Act
- At Chief Minister's office even Prime Minister's office

What is Indemnity ?

Indemnity means "to make good for losses incurred."

Most indemnity companies do that job.

Traditional Indemnity insurances do not include any help in criminal cases or cases under PNDT, MTP, BMW, ART, MCI Regulation etc.

Indemnity Insurance company comes into picture only after you receive notice and to get the help from Indemnity insurance company one must incur loss first and then the loss can be recovered from the indemnity insurance company that is also now a days not easy.

When Indemnity Insurance Company comes into picture the water is already flowing over the head and it is already too late.

But the question is

"IS THAT ENOUGH?"

"WILL YOU BE TENSION FREE?"

"WILL YOU BE BOTHERED ABOUT YOUR OWN DEFENSE?"

Because the best of the lawyers will be dependent on you for the evidence to defend your case.

This simply means that "only you, ultimately, will have to defend your own case "

"Our courts are not the courts of justice, but they are the courts of evidence" and you will be bothered to collect evidence and who will check for the authenticity of that evidence?

A lawyer, who only knows the law and nothing about medicine? or

A colleague? Who knows medicine but is ignorant about the laws?

Documents are the only weapon in the hand of doctor to protect himself. Indemnity insurance will never help in preparing or checking documents but that is the main support of immunity services.

Here comes the role of medico-legal consultant.

Medico-legal consultants are not lawyers in traditional sense but are into counseling role. They translate the medical terms in to legal and legal terms in to medical. They check the case paper for correctness, collect medical evidence, case laws and makes your lawyer understand the problem in legal terms.

In short medico-legal consultants are bridging the gap between the law and medicine

We have done one survey and according to the survey 95% cases lost by the doctors in different consumer commissions is due to poor documentation and poor representation.

What is Immunity Services

Let us understand what is immunity – It is like

"PREVENTING MEDICOLEGAL PROBLEMS" from the very beginning

BECAUSE

"PREVENTION IS ALWAYS BETTER THEN CURE"

Following is the comparison of indemnity and immunity services

Indemnity Services	Indemnity and Immunity
Starts services only when notice is received	Day to day help can be sought even on apprehension
Works only for consumer and civil cases	Help in any type of cases including criminal, cases under PNDT, MTP, BMW, SMC or NMC or local inquiries by CMO
Only lawyers will be provided, and you will have to guide the lawyer	Lawyers shall be provided the guidance by the medico-legal consultants
No such scheme	Training to the staff/admin on medico-legal issues
No such scheme	Work starts with guidance on case paper writing and preparing documents even on apprehension of prosecution
No such scheme	Compliance of different Acts is one kind of service can be availed
No such scheme	You can get legally valid documents
No such scheme	You can get Procedure specific consents
No such scheme	Guidance in terms of licenses and insurances required

So Immunity is an added services which are added into the package of indemnity. It is absolutely new concept same like Preventive Medico-legal services. One should take advantage of these kind of services to become tension free in practice.

Events held in January 2023

S No	Date	Events
1	4th to 8th Jan 2023	All India Congress of Obstetrics & Gynaecology (AICOG) 2023 at Kolkata
2	16.01.2023	PG Forum on "Renal Disease in Pregnancy"
3	27.01.2023	AOGD monthly clinical meeting at ABVIMS & Dr RML Hospital
4	28.01.2023	Live Operative Hysteroscopic Workshop by Safdarjung Hospital

Forthcoming Events

S No	Date	Events
1	08.02.2023	Health camp in Jamia Hamdard campus by AOGD
2	17.02.2023	Webinar on Contraception by FOGSI Family welfare committee
3	24.02.2023	AOGD Monthly Clinical meeting by UCMS & GTB Hospital
4	16.04.2023	POCUS Masterclasses (Basics of Ultrasound) at Fortis Hospital Noida in collaboration with AEPI and multidisciplinary committee of AOGD

Cross Word Puzzle

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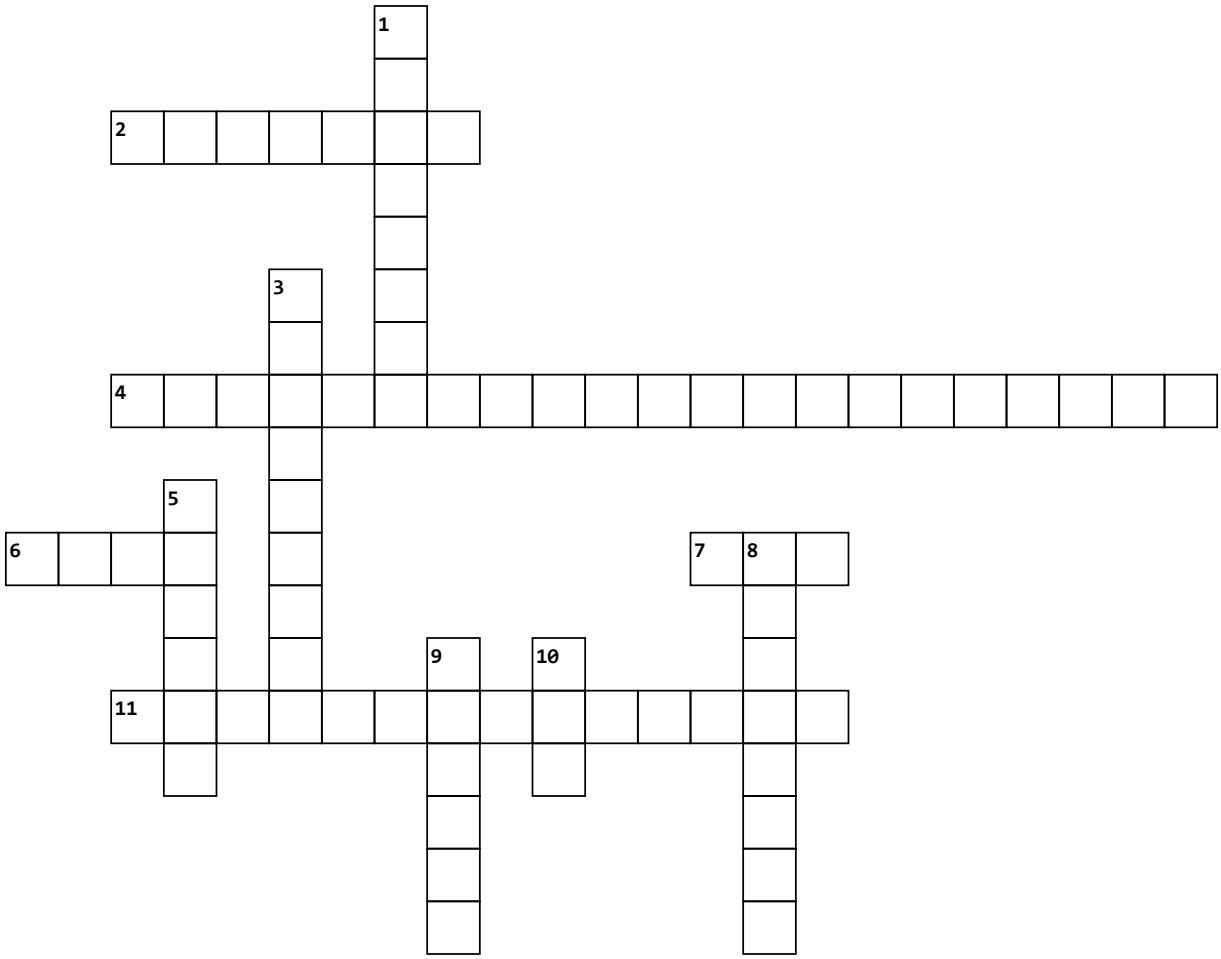

Across

2. Major risk factor of PAS is the previous history of

4. What should be the most common surgical approach in the Placenta Acrcreta spectrum

6. The median number of units of blood transfusion in PAS cases

7. PAS is suspected if the distance between uterine and bladder serosa is less than(mm)

11. Most common USG sign associated with PAS is _____ lacunae

Down

1. In previous caesarean section,PAS is likely to develop on the _____ uterine wall

3. MRI complements ultrasound in a case of PAS where the placenta is _____

5. Cesarean scar pregnancy is diagnosed earliest at _____ month amenorrhea

8. Imperfect development of the _____ layer predisposes to the morbidly adherent placenta

9. What is the risk of PAS in placenta praevia with previous 2 caesarean sections(%)

10. Aneuploidy marker associated with increased risk of PAS

Mail the answers to aogdeditor22@gmail.com. The correct answers and names of the three winners will be announced in the next issue.

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Proceedings of the AOGD monthly clinical meeting at ABVIMS & Dr RML Hospital on 27.01.2023

Successful outcome of pregnancy in a case of acute intermittent porphyria

P. Meghana Reddy, Kamna Datta, Ashok Kumar

Introduction: Acute intermittent porphyria is rare genetic disorder involving the heme synthesis pathway. Its incidence in general population is 1-2/2 lakh having female preponderance with female to male ratio of 1.5 : 1 and affecting 1 in 20,000 pregnancies. Pregnancy worsens AIP with about 25-54% of women having acute attacks during pregnancy or puerperium due to the hormonal changes. AIP also affects pregnancy with spontaneous abortions in 6-12 % , hypertension in 16%, maternal mortality in 2-20% cases and increased risk of low birthweight infants and perinatal mortality.

Case report: A 22 year old female, known case of Acute intermittent porphyria, presented to gynaecology casuality at 36+ 4 weeks POG complaints of pain abdomen associated with tightening of abdomen for 8-10 hours. Abdominal examination revealed 36 weeks size gravid uterus with a singleton gestation cephalic presentation with uterine contractions lasting 15 seconds every 20 minutes and with regular fetal heart rate of 146bpm. The per speculum examination revealed a posterior, closed and approximately 3cm long cervix with no demonstrable leaking or bleeding through os. A provisional diagnosis of threatened preterm labour in a known case of Acute intermittent porphyria was made. Threatened preterm labour pain resolved with conservative management in 12 hours of admission and remained asymptomatic for next 48 hours. Later had recurrent episodes of pain abdomen once in 2 days, not associated with uterine contractions or bowel or bladder symptoms and relieved with oral paracetamol in 1-2 hours. An ultrasound of the upper abdomen and obstetric scan revealed no abnormality. With the significant medical history of being a case of Acute Intermittent Porphyria, urinary porphyrin levels were done and were found to be elevated and these episodes of pain abdomen were diagnosed as acute exacerbations of AIP on consultation with physician and was advised high carbohydrate diet of 400 grams/day. Extreme caution was maintained during hospital stay to avoid any porphyrogenic drugs to prevent further acute attacks. At 39 weeks POG, elective induction of labour done with intracervical dinoprostone gel and 4 hours after the 2nd dose, CTG showed absent beat to beat variability. Artificial rupture of membranes done, drained thick meconium stained liquour. Emergency cesarean done and delivered a female child of birthweight 2.6 kg. Intraoperative period was uneventful. In post operative period, care was exercised to maintain adequate hydration, prevent starvation and only porphyria safe antibiotics [Cefotaxim, Amikacin and Metronidazole] and analgesics [Paracetamol] were given. The postoperative period was uneventful with no acute attacks. Barrier method was opted by the couple as a safe method of contraception. The neonate was tested for urinary porphyrins and was found to be negative. The mother and the neonate were discharged in good condition.

Discussion: The patient had uneventful pregnancy till the threatened preterm labour at 36+4 weeks POG, when she started having acute attacks of AIP. The relative starvation of labour acted as a possible trigger in precipitating the acute attack. The management by high carbohydrate diet inhibits the rate limiting enzyme, Aminolevulinic acid Synthase-1 [ALA Synthase -1] of heme synthesis, thereby decreasing the porphyrin precursors. The female child would be kept under surveillance as she is at an increased risk of AIP though not manifested birth.

A rare case of extra gastrointestinal stromal tumour masquerading as a leiomyoma in a case of postmenopausal bleeding

Namita Chopra, Renuka Malik, Bengali Majhi

Post menopausal bleeding occurs in 4 -11% of patients in gynae OPD.We report a case of post-menopausal bleeding diagnosed as fibroid on imaging, which turned out to be a rare tumor of urinary bladder. CASE: A 54-year-old postmenopausal female presented to OPD with two episodes of bleeding for 3 months along with increase in urinary frequency and urgency. On abdominal examination, a mass was felt arising from pelvis corresponding to 16 weeks size uterus with well-defined margins, firm and nontender. On

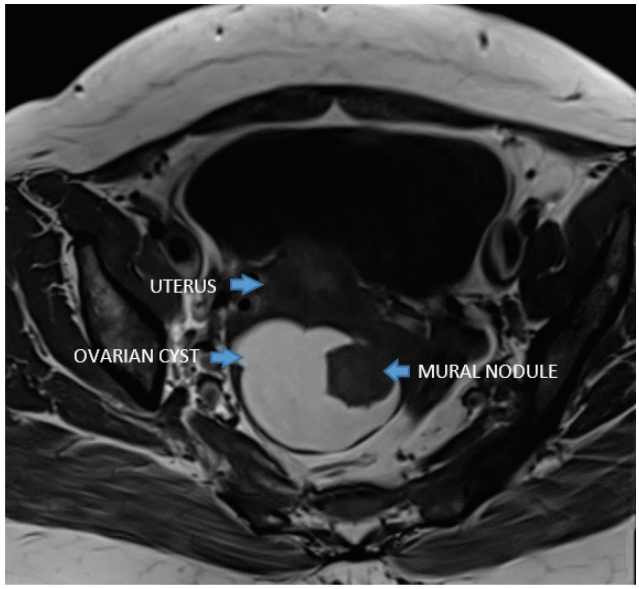
per speculum, vagina and cervix were normal. On bimanual examination, uterus was mid position, 16 weeks size, irregularly enlarged, firm, mobile, non-tender, bilateral adnexa clear. TVS showed heterogeneous mass from anterior wall of uterus of size 15x14 cm, ET 8mm. CECT, showed large solid cystic lesion 10x9x6.5 cm arising from anterior wall of uterus likely subserosal degenerative fibroid. All preoperative blood investigations were normal, LBC was NIELM and endometrial biopsy showed secretory endometrium. Patient was planned for Total abdominal hysterectomy with bilateral salpingoophorectomy. Intra operatively, uterus with both tubes and ovaries were normal. There was 16 x 14 cm yellowish firm mass with areas of necrosis at the level of uterovesical fold. Mass appeared to be arising from the bladder. TAH and BSO was done. Cystotomy was done by the urologist and tumor was arising from posterior wall in supratrigonal region of bladder. Bladder muscle layer was resected, tumor was completely resected followed by repalr of bladder wall. No evidence of metastatic deposits was seen. On histopathological examination, it was a well circumscribed tumor arising from bladder muscle layer, with spindle cells with mitotic figures <5 per 50hpf. On Immunohistochemistry it was CD 117, DOG 1 positive. confirming with the diagnosis of Gastrointestinal stromal tumor of urinary bladder. Patient was discharged on post op day 25 and was advised oncology consultation in AIIMS as she was having a high malignancy risk due to large size of tumor. Till date only four case reports of EGIST of urinary bladder have been reported.

Serous cell carcinoma arising in an endometriotic CYST

Shaheen Aftab, Anjum Ara, Indu Chawla

A 29 yrs old unmarried female presented with complaints of heavy menstrual bleeding and dysmenorrhea of 10 months duration. Her systemic examination was normal excwept for pallor (moderate anemia). Uterus was enlarged to 28 weeks size, firm and non-tender and bosselated appearance.

Ultrasound showed multiple fibroids in the uterus and another 6x4 cm size adnexal mass suggestive of endometrioma of left ovary, right ovary normal. MRI findings were suggestive of multiple fibroids and an adnexal lesion with a mural nodule which was interpreted as Mature cystic teratoma. Her blood investigation and tumor markers were within normal limits except for CA 125 which was 40.4 (normal 35u/ml).



The patient underwent Myomectomy with left ovarian cystectomy. On histopathology evaluation it was diagnosed as a low grade serous cell carcinoma arising in an endometriotic cyst. On immunohistochemistry, the tumor was positive for WT-1 /PR and negative for p53. Patient is planned for reoperation i.e. staging laparotomy.

Discussion

Endometriosis-associated ovarian cancers (EAOC) are seen in 1 to 2 % of endometriosis patients. The signs and symptoms may be nonspecific, overlapping, and tumor markers may be misleading. The knowledge of EAOC is of paramount importance in identifying patients who are at risk of this malignant progression.

Endometriosis is associated with a higher risk of ovarian cancer (SRR 1.93), particularly the clear-cell (21-51%) and endometrioid histotypes (23-43%. Serous cell carcinoma is rare in an endometriotic cyst.

Ultrasound is the first line of investigation and can pick up solid areas and mural nodules, but it fails to differentiate malignant from non-malignant ones. MRI is the most sensitive for mural nodules and papillary projections and hence remains the investigation of choice. There is no role of serial CA 125 measurement and TVS in the early detection of EAOC.

In case of clinical suspicion or the presence of abnormal findings on MRI (presence of nodule/ loss of shading on T2) one should opt for the frozen section which can help in optimizing the plan of management. The mainstay of treatment is staging laparotomy with or without chemotherapy

Events held under Aegis of AOGD in January 2022

AOGD shining at 65th AICOG, KOLKATA, FOGSI Awards 2023

• Best publication award	Dr Zeba Khanam (VMMC & SJH) & Dr Nikita Kumari (VMMC & SJH)
• FOGSI Dr Rajat Ray award	Dr Divya Pandey (VMMC & SJH)
• FOGSI Dr Nimish Shelat award	Dr Divya Pandey (VMMC & SJH)
• Corion award Sr category	Dr Manju Puri (LHMC) (1st)
• Corion award Sr category	Dr Richa Sharma (GTB)(1st runner up)
• Corion award Jr category	Dr Raj Laxmi Mundhra (1st runner up)
• FOGSI Dr Shanti Yadav award	Dr Shewta Sri
• FOGSI K Tamaskar award	Dr Anjali Chaudhary
• FOGSI Dr RD Pandit Award	Dr Kritika Agnihotri

- ***FOGSI Focus on Urinary Incontinence by Dr JB Sharma, Chairperson Urogyne Committee of FOGSI was released in AICOG Kolkata by FOGSI President Dr HD Pai.***

- ***Dr Vidushi Kulshreatha got the Best-Case Report Award by JOGI for her case report entitled 'Role of rifampicin with ursodeoxycholic acid for intactable Intrahepatic cholestasis of pregnancy.***

- ***Siuli Rudra Sinha Best Paper on Endoscopy- Dr Mansi SR from AIIMS Won above award at AICOG Kolkata - ' To compare efficacy of Vaginal versus laparoscopic peritoneal vaginoplasty in women with MRKH syndrome'***

PG Forum on "Renal Disease in Pregnancy" on 16th January 2023

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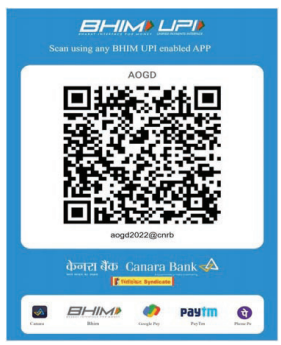

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Source:

1. Dugoff L, Norton ME, Kuller JA. The use of chromosomal microarray for prenatal diagnosis. J Obstet Gynecol 2016;215(04):B2-B9
2. Microarrays and Next-Generation Sequencing Technology: The use of Advanced Genetic Diagnostic Tools in Obstetrics and Gynecology. Obstet Gynecol 2016;128(06):262-268
3. N Engl J Med. 2012 December 6; 367(23): 2175–2184. doi:10.1056/NEJMoa1203382.

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