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Research Article

# ABNORMALLY INVASIVE PLACENTA! A SERIOUS CONSEQUENCE OF CESAREAN DELIVERY

**Shakira Perveen and Syedah Ammarah Mahwish**

Department of Obstetrics and Gynecology, Dow University of Health Sciences.

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**ABSTRACT**

**Objective:** To determine risk of abnormally invasive placenta previa with previous cesarean delivery.
**Introduction:** Abnormally invasive placenta is the abnormal adherence of placental tissue to the myometrium. Its life threatening obstetric condition associated with severe hemorrhage and principal indication of peripartum hysterectomy. Its incidence is increasing owing to the growing numbers of cesarean deliveries being performed. Invasion in almost all cases is at the site of uterine scar. Prenatal accurate diagnosis of this fatal condition is necessary to prevent maternal morbidity and mortality.
**Study design, place and duration:** Retrospective cross sectional observational study was carried out at tertiary care teaching hospital for period of one year
**Material and methods:** All cases of previous cesarean delivery and current placenta previa underwent clinical and imaging evaluation for confirmation of AIP. Final diagnosis was made on histopathology of hysterectomy specimen.
**Result:** out of 146 cases of previous cesarean delivery and current placenta previa 34 (20.73%) had abnormally invasive placenta.
**Conclusion:** Direct relationship between abnormally invasive placenta with previous cesarean delivery and current placenta previa highlighted.



## INTRODUCTION

Increasing cesarean section rate (CSR) may indicate a trend towards a more costly medical delivery system. An alarming high morbidity and mortality makes it matter of concern. It's doubtful that the improvement in perinatal outcome is linked to high cesarean deliveries. The countries with the lowest perinatal mortality rates in the world have CSR less than 10 %[1].

Two important complications of cesarean delivery (CD) are mortality/morbidity and abnormally invasive placenta (AIP) in next pregnancy. AIP is an abnormal adherence of placental tissue to the myometrium. Histological its placenta accreta when septa of placenta are composed of uterine muscles, rather than normal decidua, extravillous trophoblast and fibrinoid, deeper invasion into myometrium is placenta increta and complete invasion through the uterine wall is placenta percreta[2,3]. AIP is life threatening condition which may lead to severe obstetric complications such as profuse hemorrhage, uterine dehiscence /rupture and premature delivery, principal indication of peripartum hysterectomy and related surgical injuries[1,4,5]. Its incidence is increasing owing to the growing numbers of cesarean deliveries being performed and raised to 10 folds in the past 50 years[6]. Recent reports suggests its frequency/ delivery is 1:2500 – 1: 110[6,7,8]. In almost all cases invasion is at the site of uterine scar[9]. Less important risk factors of AIP are advanced maternal age, myomectomy with endometrial entry, heavy curettage with asherman syndrome[10]. Endometrial ablation[11]and uterine artery embolisation[12]. Studies found high risk of this fatal condition with previous CD and current placenta previa (PP) [13,14]. One study found that in the presence of PP, the risk of AIP is 3%, 11%, 40%, 61% and 67% for the 1st, 2nd, 3rd, 4th, 5th and greater repeated cesarean deliveries[4].

Clinically AIP becomes problematic during delivery, when the placenta not completely separated from the uterus and followed by massive hemorrhage leading to disseminated intravascular coagulopathy (DIC), the need for hysterectomy, surgical injury to bladder and ureter, bowel or neurovascular structures, adult respiratory distress syndrome, acute transfusion reaction, electrolyte imbalance and renal failure. The average blood loss at delivery in women with AIP is 3000-5000 ml. As many as 90 % of cases with AIP require blood transfusion, and 40% required more than 10 units of blood[15]. Maternal mortality with AIP is reported 7-10%[16,17].

There is need to diagnose this fatal condition in antenatal period to reduce the risk of maternal and fetal morbidity and

**Corresponding author:* **Shakira Perveen**
Department of Obstetrics and Gynecology, Dow University of Health Sciences.

mortality. Screening of cases at high risk of AIP due to previous CD and current PP is mandatory. Along with clinical evaluation imaging is also necessary. Ultrasonography is used routinely but diagnostic criteria and accuracy is still subject of debate[2,6]. Fetal magnetic resonance imaging (MRI) is also emerging, as it's relevant when AIP is suspected on ultrasound. The added value of MRI to ultrasound in the diagnosis of AIP is still debated[18,19].

***Rationale:*** Prenatal screening of high risk population (previous CD and current PP) for AIP is mandatory. This allows modification of the approach to delivery to conserve blood loss and avoid major medical and surgical problems associated with it.

## MATERIAL AND METHODS

Retrospective cross sectional observation study carried out at tertiary care teaching hospital for one year.

We enrolled 164 pregnant mothers with previous CD and current PP between 28-38 weeks for evaluation of AIP. Cases with history of myomectomy, curettage and moderate to severe medical disorders were excluded. Those cases fulfilled inclusion criteria underwent history, examination and 2-D grey scale for presence of placenta overlying uterine scar. When ultrasound placenta over scar confirmed, color Doppler ultrasound was performed for the diagnosis of AIP. Diagnosis of AIP was made if any of following color Doppler criteria met[20].

1. Diffuse or focal lacunar flow pattern.
2. Sonoluscent vascular lakes with turbulent flow typified by high velocity (peak systolic velocity/15cm/s) and low resistance waveform.
3. Hypervascularity of the uterine bladder interface with abnormal blood vessels linking the placenta to the bladder.
4. Markedly dilated vessels over the peripheral subplacental region[21].

Out of those 164 cases underwent color Doppler ultrasonography 52 were labeled as cases of AIP. All of them planed for CD at 36-37 completed weeks but 7 of them had emergency cesarean section for antepartum hemorrhage. Abdomen was opened through mid line incision. When it was evident that placenta had reached serosa, uterine incision was performed, avoiding the lower segment to prevent excessive bleeding. Following the delivery of the fetus and clamping of the cord there was no attempt to remove the placenta manually. In doubtful cases placental removal tried gently if partially or totally impossible and no cleavage plane found immediate hysterectomy performed with conservation of adnexa and placenta left in situ. On histopathology definite diagnosis of AIP was made with labeling of placenta accrete if villi attached to the myometrium without intervening decidua, placenta increta if invading into the myometrium or placenta percreta if reaching serosa.

***Sample size:*** by using WHO sample size calculator taken prevalence of AIP as 12.07[22] and margin of error 5%, confidence interval (CI) 95%, the estimated sample size n= 164

***Statistical analysis:*** Data was entered in SPSS version 17. Mean and standard deviation (SD) was calculated for age, parity and gestational age. Frequency and percentage was calculated for outcome variables. Effect modifier was controlled through stratification of gestational age, parity to see effect of these on outcome variables, post stratification applying chi- square test taken $p \leq 0.05$ as significant.

***Result:*** During study period of one year we had 2600 vaginal and 1647 abdominal deliveries. Frequency of abdominal deliveries is 63.3%. Out of 1647 cases 907 had previous CD (55%). Around 164 (18.08%) of these cases had PP and 34 (20.73%) had AIP. Demographic and clinical characteristics of cases are shown in table 1 and 11.

**Table 1** Demographic characteristics of cases at risk of AIP

N=164

| characteristics | AIP N=34 | % | NO AIP N=130 | % | Mean ±SD | Test value | p-value |
|---|---|---|---|---|---|---|---|
| Age (yrs) | | | | | | | |
| 25-30 | 22 | 64.7 | 74 | 56.9 | 30.77 | 0.826 | 0.662 |
| 31-35 | 9 | 26.4 | 45 | 34.6 | ± 3.4 | | |
| 36-40 | 3 | 8.8 | 11 | 8.4 | | | |
| Multipara | 17 | 50 | 96 | 73.8 | 4.37 | 7.15 | 0.007 |
| Grand multi | 17 | 50 | 34 | 26.1 | ±1.83 | | |
| Gest age | | | | | | | |
| <37 | 31 | 91.1 | 85 | 65.38 | 35.65 | 8.66 | 0.003 |
| >37 | 3 | 8.8 | 45 | 34.6 | ±2.3 | | |

Gest age= Gestational age

**Table 11** Clinical characteristics of cases at risk of AIP: N=164

| Clinical charactristics | AIP n-34 | % | No AIP n=130 | % |
|---|---|---|---|---|
| Previous CD | | | | |
| 1 | 4 | 11.76 | 76 | 58.46 |
| 2 | 18 | 52.94 | 31 | 23.84 |
| 3 | 10 | 29.41 | 23 | 17.69 |
| 4 or more | 2 | 5.88 | 0 | 0 |
| Em CS | 3 | 8.88 | 87 | 66.92 |
| EL CS | 31 | 91.17 | 43 | 33.07 |
| P accreta | 10 | 30 | - | - |
| P increta | 8 | 24 | - | - |
| P percreta | 16 | 47.1 | - | - |

Em CS= emergency cesarean section, EL= elective, P= placenta

Maternal deaths were 30 during said period, and 3 of them were in cases with AIP.

## DISCUSSION

Prenatal identification of women with AIP and planning their delivery have shown to decrease maternal mortality and morbidity[23,24]. It is critically important that obstetrician and radiologists are familiar with the risk factors and diagnostic modalities for AIP for its potential emergent nature and the associated risk of life threatening hemorrhage.

We investigated high risk population for AIP (cases with previous CD and current PP) and our findings are likely to influence practice as prevalence of this potentially fatal condition continues to increase. It has been documented in this and other studies[22] that previous CD is risk factor for PP. we found around 18.08 % cases and one local study[22] found 6.89% cases of previous CD with PP. Presence of previous CD and current PP then became strong risk factor for AIP. In this study significant number of cases 20.73% with this risk factor had AIP and its 12.07%, 40% and 34.74 % in other studies[3,22,25]. Prevalence of AIP/vaginal delivery is 1: 130 while its 1: 110 in one study[23]. Mean age was 30.77± 3.49 and

mean parity was 4.37±1.83 and is almost similar in one study[26]. In this study majority of cases were placenta percreta 47% followed by placenta accrete 30% and increta 24% while in one study frequency of placenta accrete was 81.6%, increta 11.8% and placenta percreta 6.6% [6].

We evaluated high risk population of previous CD and current PP in 3rd trimester. Suspicion of AIP can also develop in 1st trimester if cesarean scar pregnancy (CSP) found on ultrasound. CSP is an implantation of new gestational sac in the area of incision of previous CD. Invasion of gestational sac in 1st trimester produce smallest anterior myometrial thickness in sagittal plan on ultrasound. Later cases of CSP were confirmed as AIP[26]. Evaluation of such high risk cases include clinical evaluation as well as accurate imaging to avoid false +ve results that increases maternal morbidity as unnecessary invasive procedures exposed women to inherent complications [27]. If there is strong suggestion of AIP, health care providers practicing at small hospitals or institutions with insufficient blood bank supply or inadequate availability of sub specialty and support personnel can transfer patients to a tertiary care centre to achieve improved outcome.

Doppler ultrasonography and MRI are the two main modalities. An assessment of diagnostic tool {(positive predictive value/ negative predictive value) (PPV/NPV)} is mandatory for planning management and information of patients. High PPV justified more aggressive treatment (preterm delivery, corporal hysterectomy, hysterectomy) while a high NPV justified an attempt to remove placenta without risk of major bleeding complications[20,21]. Apart from color Doppler 3- D power Doppler ultrasound could represent a turning point for the diagnosis of AIP. In 3-D power Doppler mapping of vascularization of intraplacental and uterine serosa-bladder interface is observed in sagittal and coronal section[3]. 3-D power Doppler confirmed the color Doppler with sensitivity of 97% and specificity of 92% [3]. Hypervascularity of the uterine serosa-bladder interface is the best diagnostic performance with the highest PPV and NPV[3]. Placenta percreata can also be differentiated on 3-D power Doppler as hypervascular anarchic vessels even protrude into the bladder lumen. This ability to detect an AIP evolving into the placenta percreta could justify extreme premature delivery, in order to prevent serious bleeding complications due to uterine rupture[28]. The added value of MRI to ultrasound in the diagnosis of AIP is debated[19]. MRI is especially helpful in post placental invasion and bodily habitus and when ultrasound findings inconclusive or if there is suspicious that placenta has invaded the parametrium and surrounding organs[20]. MRI is able to outline the anatomy of the invasion and relate it to the regional anastomatic vascular system. The most reliable features of AIP are dark infiltration bands, infiltration of pelvic organs and focal interruption of the myometrial border. The specificity of MRI can be enhanced by using contrast gadolinium injection. This contrast provide better delineation of the outer placental surface proximal to the myometrium which in turn helps to distinguish between heterogeneous signals arising from the placenta and those caused by maternal blood vessels. Gadolinium contrast injection significantly improves the performance of the MRI for both less experienced and expert radiologists[19,25] . gadolinium crosses the placenta and can diffuse in the amniotic fluid and its use therefore in pregnancy is controversial, but European Society of Radiology has issued guidelines concluding that gadolinium during pregnancy is safe as the dosage used for MRI diagnostic purpose is not expected to cross the placenta; moreover it is thought that it would not be toxic to the fetus if it did [19,20,24,31]. However gadolinium injection should be reserved for MRI in woman whose diagnosis of AIP remains uncertain or for morphological sequences only[25]. Results of one cohort study comparing color Doppler ultrasound and MRI for the diagnosis of AIP were significantly better with MRI[2].

Maternal mortality (MM) was 10% due to AIP during study period. In literature MM of 7-10% has been reported[16,1]. In one local study its 14.28%[22] and as high as 30% has been reported in other study[26]. High MM reported in those cases of AIP where patients presented in poor general condition with no previous record and they had to operate without proper preparations. High index of suspicion in women with risk factors, meticulous ultrasonography , 3-D power Doppler and even MRI with or without contrast is mandatory for accurate prenatal diagnosis of AIP.

## CONCLUSION

Direct relationship between AIP and previous CD with current PP highlighted. No single modality determines the prenatal diagnosis of AIP with absolute accuracy. 3-D power Doppler ultrasonography could represent turning point for the diagnosis of AIP. MRI is able to outline the anatomy of the invasion and relate it to the regional anastomotic vascular system MRI with contrast injection gadolinium is safe during pregnancy but should be used when necessary.

**Recommendation**

To Revisit departmental policies regarding dealing with commonest indications for ever increasing CD rate.

Trial of vaginal birth after CD.

By using effective contraceptive methods, limit family size.

***Limitations of study:*** Hospital based small scale study. We need new confirmatory, multicentre studies to identify correct criteria for the diagnosis of AIP, and to assess the possibility of differential diagnosis between placenta accrete and percreta

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