



## “MAGNETIC RESONANCE IMAGING IN THE EVALUATION OF PLACENTA ACCRETA SPECTRUM AND ITS CORRELATION WITH COLOUR DOPPLER ULTRASOUND.”

### Radio Diagnosis

|                          |                                                                                                            |
|--------------------------|------------------------------------------------------------------------------------------------------------|
| <b>Dr. Hari Singh</b>    | Associate Professor & Head, Department of Radio Diagnosis, Sarojini Naidu Medical College, Agra.           |
| <b>Dr. Shikha Singh</b>  | Professor, Department Of Obstetrics and Gynaecology, Sarojini Naidu Medical College, Agra.                 |
| <b>Dr. Kapil Kumar</b>   | 3 <sup>rd</sup> year Junior Resident, Department of Radio Diagnosis, Sarojini Naidu Medical College, Agra. |
| <b>Dr. Archit Gupta</b>  | Assistant Professor, Department of Radio Diagnosis, Sarojini Naidu Medical College, Agra.                  |
| <b>Dr. Rekha Rani</b>    | Professor, Department Of Obstetrics and Gynaecology, Sarojini Naidu Medical College, Agra.                 |
| <b>Dr. Anupam Biswas</b> | 3 <sup>rd</sup> year Junior Resident, Department of Radio Diagnosis, Sarojini Naidu Medical College, Agra. |

### ABSTRACT

**Introduction:** Placenta accreta spectrum (PAS) disorders, formerly known as pathologically adherent placenta, defines a group of conditions characterized by abnormal adhesion called as abnormally adherent placenta (AAP) or invasion of the placental trophoblast to the uterine myometrium or beyond known as abnormally invasive placenta (AIP). **Methods:** The present study was a prospective comparative study. A total of 50 antenatal women with history of per vaginal bleeding, repeated cesarean section with suspicion of placenta accrete were screened by Transabdominal USG Color Doppler imaging and magnetic resonance imaging. Postnatally the placenta and uterus were sent for histopathological examination for confirmation in cases of hysterectomy done in severe PAS disorder. **Results:** Mean age of the patients in whom histopathological result is positive was 31.75 year with higher number of gravida and parity with at least history of 1 previous caesarian section. Most of the patients had anterior location of placenta. On comparing the results of USG with histological findings USG was found 81.25% sensitive, 85.29% specific and MRI was 93.75% sensitive and 79.41% specific. **Conclusion:** On the bases of our study we conclude that both USG and MRI have fairly good sensitivity for prenatal diagnosis of PAS disorder. Colour doppler aided USG remains the primary modality for prenatal diagnosis of PAS. MRI though more sensitive is reserved for cases where USG is inconclusive or less specific as in case of posterior location of placenta, for grading of depth of invasion and locating extrauterine invasion.

### KEYWORDS

Placenta accreta spectrum disorders, Colour doppler ultrasonography, Magnetic resonance imaging and Anterior location of placenta.

#### INTRODUCTION:-

Placenta accreta spectrum (PAS) disorders, formerly known as pathologically adherent placenta, defines a group of conditions characterized by abnormal adhesion called as abnormally adherent placenta (AAP) or invasion of the placental trophoblast to the uterine myometrium or beyond known as abnormally invasive placenta (AIP). The spectrum comprehends placenta accreta (adhesion of the placenta to myometrium without intervening decidua), placenta increta (infiltration of the trophoblast into the myometrium layer), and placenta percreta (infiltration through the myometrium, serosa, and eventually contiguous organs)<sup>1</sup>.

The American college of obstetricians and gynecologists (ACOG) and the society for maternal-fetal medicine (SMFM) joint consensus guidelines states that prenatal diagnosis of PAS is crucial, as the diagnosis can lead to a decrease in maternal morbidity. Further diagnosis of the severity of PAS is important for treatment selection; hysterectomy with the placenta left in situ is warranted for AIP, whereas uterine preservation with manual extraction of the placenta is possible in carefully selected cases of AAP.<sup>2</sup>

The most common risk factors for MAP are prior caesarean delivery and placenta previa. Other risk factors include prior uterine surgery viz- previous myomectomy, advanced maternal age, and Asherman syndrome. Prior caesarean section and placenta previa are the two most important risk factors for PA.<sup>3-6</sup>

Magnetic resonance imaging (MRI) though not used as primary tool for antenatal evaluation, gives detailed anatomical evaluation of placenta in cases of equivocal Ultrasonography (USG) findings.

The characteristic USG findings in cases of PAS disorders are placenta previa, placental lacunae, abnormal color doppler imaging patterns, loss of retroplacental clear space, reduced myometrial thickness, placental bulge.<sup>9</sup>

Although USG remains the primary modality in the evaluation of placental implantation, in recent years there has been interest in the use of MR imaging. Some authors have suggested that MR imaging is most clearly indicated when there is a posterior placenta or when the USG findings are ambiguous.

The characteristic MR imaging findings in cases of PAS disorders are placenta previa, uterine bulging, heterogeneous signal intensity within the placenta, dark intra placental bands on T2-weighted images, focal interruptions in the myometrial wall, tenting of the bladder, direct visualization of the invasion of pelvic structures by placental tissue.<sup>9-10</sup>

#### AIM AND OBJECTIVES:

To evaluate the efficacy of ultrasonography (USG) & Magnetic resonance imaging (MRI) in placenta accreta spectrum (PAS) disorder. To compare the two imaging modalities (Ultrasonography & Magnetic resonance imaging) in detection of placenta accreta spectrum (PAS) disorder.

#### MATERIALS & METHODS:

This prospective study namely “**Magnetic Resonance Imaging in the Evaluation of Placenta Accreta Spectrum and Its Correlation with Colour Doppler Ultrasound**” was conducted in the Department of Radiodiagnosis, Sarojini Naidu Medical college Agra from October, 2019 to September 2021 in total of 50 antenatal women with history of per vaginal bleeding, repeated cesarean section with suspicion of placenta accrete were screened by Transabdominal USG Color Doppler imaging and MRI imaging.

#### Inclusion Criteria:

All antenatal women in third trimester with placental previa on ultrasonography Examination.

All antenatal women with History of third trimester bleeding with previous caesarean section or myomectomy.

**Exclusion Criteria:**

Patient having pacemaker, Having cochlear implant, Claustrophobia, Metallic prosthesis, Aneurysmal clips and Patients not giving consent.

**RESULTS:-****Table-1. Gravidia Wise Distribution**

| Gravidia | Total |        | Other |        | PAS |        |
|----------|-------|--------|-------|--------|-----|--------|
|          | N     | %      | N     | %      | N   | %      |
| 2        | 20    | 40.00  | 17    | 50.00  | 3   | 18.75  |
| 3        | 21    | 42.00  | 12    | 35.29  | 9   | 56.25  |
| 4        | 8     | 16.00  | 5     | 14.71  | 3   | 18.75  |
| 5        | 1     | 2.00   | 0     | 0.00   | 1   | 6.25   |
| Total    | 50    | 100.00 | 34    | 100.00 | 16  | 100.00 |

In the above table it is found that the patients gravidia was found to be on higher side in case of morbidly adherent placenta.

**Table-2. Parity Wise Distribution**

| Parity | Total |        | Other |        | PAS |        |
|--------|-------|--------|-------|--------|-----|--------|
|        | N     | %      | N     | %      | N   | %      |
| 1      | 25    | 50.00  | 21    | 61.76  | 4   | 25.00  |
| 2      | 22    | 44.00  | 12    | 35.29  | 10  | 62.50  |
| 3      | 3     | 6.00   | 1     | 2.94   | 2   | 12.50  |
| Total  | 50    | 100.00 | 34    | 100.00 | 16  | 100.00 |

In the above table 62.50% of the cases of MAP were of parity 2 whereas in the cases where MAP was not diagnosed only 35.29% patients were parity 2.

**Table-3. Distribution According To Placental Location**

| Location  | Total |        | Other |        | PAS |        |
|-----------|-------|--------|-------|--------|-----|--------|
|           | N     | %      | N     | %      | N   | %      |
| Anterior  | 30    | 60.00  | 16    | 47.06  | 14  | 87.50  |
| Posterior | 20    | 40.00  | 18    | 52.54  | 2   | 12.50  |
| Total     | 50    | 100.00 | 34    | 100.00 | 16  | 100.00 |

Anterior location of placenta was seen radiologically in 87.50% of the cases of MAP where as in the cases where MAP was not seen 52.54 % of cases posterior location of placenta was seen.

**Table-4. Ultrasound And Color Doppler Findings.**

| Findings                              | Number of cases | Percentage |
|---------------------------------------|-----------------|------------|
| Multiple lacunar spaces               | 15              | 83.3%      |
| Loss of retroplacental clear zone     | 14              | 77.7%      |
| Myometrial thinning                   | 14              | 77.7%      |
| Disruption of uterine-bladder serosa  | 10              | 55.5%      |
| Utero- vesical hypervascularity       | 6               | 33.3%      |
| Prominent subplacental venous complex | 6               | 33.3%      |
| Placental bulge                       | 2               | 11.1%      |

It was found that more common finding on USG color Doppler was multiple lacunar spaces, loss of retroplacental clear zone, myometrial thinning were next common findings and less common finding were uterovesical hypervascularity and prominent subplacental venous complex.

**Table-5. MRI Findings.**

| Findings                                                | Number of cases | Percentage |
|---------------------------------------------------------|-----------------|------------|
| Thinning of myometrium                                  | 18              | 81.8%      |
| Placental bulge                                         | 17              | 77.2%      |
| Disruption of interface between placenta and myometrium | 15              | 68.1%      |
| Loss of retro placental dark zone                       | 12              | 54.5%      |
| Dark intra-placental bands                              | 10              | 45.4%      |
| Heterogeneous placenta                                  | 8               | 36.3%      |
| Abnormal vascularization of placental bed               | 8               | 36.3%      |

It is found that more common finding on MRI imaging were thinning of myometrium, placental bulge, disruption of interface between placenta and myometrium whereas heterogeneous placenta, abnormal vascularization of placental bed were less common finding.

On comparing the results of USG with histological findings USG was found 81.25% sensitive, 85.29% specific, PPV is 72.22% and NPV is 90.63 %.

**Table-6. Accuracy Of USG As A Parameter**

| USG      | Total no. of cases | PAS      |          |
|----------|--------------------|----------|----------|
|          |                    | Positive | Negative |
| Positive | 18                 | 13       | 5        |
| Negative | 32                 | 3        | 29       |
|          |                    | 16       | 34       |

| Statistic                 | Value  | 95% CI           |
|---------------------------|--------|------------------|
| Sensitivity               | 81.25% | 54.35% to 95.95% |
| Specificity               | 85.29% | 68.94% to 95.05% |
| Positive Likelihood Ratio | 5.52   | 2.38 to 12.84    |
| Negative Likelihood Ratio | 0.22   | 0.08 to 0.62     |
| Disease prevalence        | 32.00% | 19.52% to 46.70% |
| Positive Predictive Value | 72.22% | 52.81% to 85.80% |
| Negative Predictive Value | 90.63% | 77.54% to 96.44% |
| Accuracy                  | 84.00% | 70.89% to 92.8   |

**Table-7. Accuracy Of MRI As A Parameter**

| MRI      | Total no. of cases | PAS      |          |
|----------|--------------------|----------|----------|
|          |                    | Positive | Negative |
| Positive | 22                 | 15       | 7        |
| Negative | 28                 | 1        | 27       |
|          |                    | 16       | 34       |

| Statistic                 | Value  | 95% CI           |
|---------------------------|--------|------------------|
| Sensitivity               | 93.75% | 69.77% to 99.84% |
| Specificity               | 79.41% | 62.10% to 91.30% |
| Positive Likelihood Ratio | 4.55   | 2.33 to 8.92     |
| Negative Likelihood Ratio | 0.08   | 0.01 to 0.53     |
| Disease prevalence        | 32.00% | 19.52% to 46.70% |
| Positive Predictive Value | 68.18% | 52.25% to 80.76% |
| Negative Predictive Value | 96.43% | 80.07% to 99.45% |
| Accuracy                  | 84.00% | 70.89% to 92.83% |

On comparing the results of MRI with histopathological findings, MRI is 93.75% sensitive, 79.41% specific, PPV is 68.18% and NPV is 96.43%.

**DISCUSSION:-**

Placenta accreta is relatively rare but it is one of the life-threatening complications for pregnancy due to massive obstetric hemorrhage. The incidence of placenta previa and placenta accrete have increased in past few decades due to increase in the rate of caesarean sections.

In study of SilverRM, UstaIM, Hobeika LauWC, GrobmanWa and WuS , et al. Maternal morbidity associated with multiple repeat cesarean sections.<sup>3-8</sup>

In our study in 93.75% cases of PAS disorder, atleast one previous caesarean section was reported.

In our study, it was found that the gravidity was found to be on higher side in case of morbidly adherent placenta.

In our study, it was found that out of 50 patients; 30 patients had anterior placental location and 20 patients had posterior placental location, most cases of morbidly adherent placenta had history of anterior placental location.

Levine D, Hulka CA, Ludmir J, Li W, Edelman RR. Placenta accreta: evaluation with color Doppler US, power Doppler US, and MR imaging. Radiology 1997;205:773-776.<sup>9</sup>

In our study, the common findings on USG color Doppler were multiple lacunar spaces (83.3%), loss of retroplacental clear zone (77.7%), myometrial thinning (77.7%), disruption of uterine-bladder serosa (55.5%), uterovesical hypervascularity (33.3%), prominent subplacental venous complex (33.3%), placental bulge (11.1%).

Palacios Jaraquemada JM, Bruno CH. Magnetic resonance imaging in 300 cases of placenta accreta: surgical correlation of new findings. Acta ObstetGynecolScand2005;84:716-724.<sup>10</sup>

In our study, the MRI findings in the diagnosis of placenta accreta were thinning of myometrium (81.8%), placental bulge(77.2%), disruption of interface between placenta and myometrium (68.1%), loss of retro placental dark zone (54.5%), dark intra placental bands(45.4%),heterogeneous- placenta(36.3%), abnormal

vascularization of placental bed (36.3%).

In our study, it was found that USG had sensitivity of 81.25% and Negative predictive value of 90.63% to diagnose PAS whereas the sensitivity of MRI was 93.75% and Negative predictive value was 96.43%. It was found that MRI is more sensitive than USG for diagnosis. Though, USG was found to be more specific. MRI is helpful in case of posterior location of placenta and in delineating depth of invasion.

#### CONCLUSION:-

This study was conducted in the Department of Radio diagnosis in Sarojini Naidu Medical college Agra where 50 patients were enrolled in the study and screened by trans abdominal USG and colour doppler imaging. Same patients also underwent MRI and after delivery histopathology of hysterectomy specimen or clinical observation during attempted placental delivery confirmed the diagnosis of PAS disorder.

The mean age of the patient was 31.75 years. All patients who were selected belonged to the age group 24-36 years, the mean weight of the patients was 59.74kg, patient's gravida on higher side with history of at least one previous cesarean section was present. Majority of patients had anterior placental location. On comparing the accuracy of USG & it was found 81.25% sensitive, 85.29% specific. PPV was found to be 72.22 %, NPV was 90.63% with common findings on USG color Doppler were Multiple lacunar spaces, Diffuse lacunar flow & Disruption of uterine-bladder serosa and less common finding were loss of retroplacental clear zone and prominent subplacental venous complex.

Whereas on comparing the results of MRI with proven cases of PAS, MRI was 93.75% sensitive, 79.41% specific. PPV is 68.18 % whereas NPV is 96.43 % with common findings in MRI in the diagnosis of placenta accreta were Placental hypointense areas & Thinning of myometrium whereas loss of tissue plan between uterus and bladder were less common finding.

It is found that both USG and MRI have fairly good sensitivity for prenatal diagnosis of PAS disorder. Colour doppler aided USG remains the primary modality for prenatal diagnosis of PAS. MRI though more sensitive is reserved for cases where USG is inconclusive or less specific as in case of posterior location of placenta, for grading of depth of invasion and locating extrauterine invasion.

#### REFERENCES:-

1. Comstock CH. Antenatal diagnosis of placenta accreta: a review. *Ultrasound ObstetGynecol* 2005;26: 89–96.
2. ACOG Committee on Obstetric Practice. ACOG Committee opinionno.266, J a n u a r y 2002: placenta accreta. *ObstetGynecol* 2002;99:169–170.
3. SilverRM, Landon MB, Rouse DJ, et al. Maternal morbidity associated with multiple repeat cesarean deliveries. *Obstet Gynecol* 2006;107:1226–1232.
4. UstaIM, Hobeika EM, Musa AA, Gabriel GE, Nassar AH. Placenta previa-accreta: risk factors and complications. *Am J Obstet Gynecol* 2005;193: 1045–1049.
5. LauWC, Fung HY, Rogers MS. Ten years experience of caesarean and postpartum hysterectomy in a teaching hospital in Hong Kong. *Eur J ObstetGynecolReprod Biol* 1997;74:133–137.
6. GrobmanWA, Gersnoviez R, Landon MB, et al. Pregnancy outcomes for women with placenta previa in relation to the number of prior cesarean deliveries. *ObstetGynecol* 2007;110:1249–1255.
7. WuS, Kocherginsky M, HibbardJU. Abnormal placentation: twenty-year analysis. *Am J Obstet Gynecol* 2005;192:1458–1461.
8. HungTH, Shau WY, Hsieh CC, Chiu TH, Hsu JJ, Hsieh TT. Risk factors for placenta accreta. *Obstet Gynecol* 1999;93:545–550.
9. Levine D, Hulka CA, Ludmir J, Li W, Edelman RR. Placenta accreta: evaluation with color Doppler US, power Doppler US, and MR imaging. *Radiology* 1997;205:773–776.
10. Palacios Jaraquemada JM, Bruno CH. Magnetic resonance imaging in 300 cases of placenta accreta: surgical correlation of new findings. *Acta Obstet Gynecol Scand* 2005;84:716.