

*Research Article***Myometrial thickness as a Predictor of Placenta Accreta in cases with Placenta Previa Centralis****Mo'men M. Hassan, Mohammed H. Mosbeh, Mohammed A. Mohammed, Heba R. Mohammed and Ahmed R. Abd El-Raheim**

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**Abstract**

**Introduction:** Placenta accreta (PA) is a major life-threatening obstetrical burden associated with high morbidity and mortality. This study aims to evaluate the role of measuring myometrial thickness in prediction of placenta accreta in cases with placenta previa centralis. **Aim of the work:** Evaluate the role of measuring myometrial thickness in prediction of placenta accreta in cases with placenta previa centralis. **Methods:** This is a prospective study carried out at Minia Maternity University Hospital, Egypt during the period from October 2017 to March 2019. This study included a total of 80 pregnant women who are admitted to the hospital for CS between 28:38 weeks of gestation. They were classified into 2 groups (40 women per each), group (I) Diffuse PA: include women with diffuse placenta accreta and group (II) Control group: include women with normally implanted placenta. **Results:** Both groups were comparable regarding age, residence and parity however, diffuse PA group had significantly higher number of cases with  $\geq 4$  previous CSs and positive history of placenta previa. Group (I) had lower postoperative hemoglobin and platelet count ( $p < 0.01$ ). myometrial thickness was significantly lower in PA group compared to control ( $0.66 \pm 0.22$  vs.  $1.33 \pm 0.38$  mm,  $p < 0.01$ ). Also, group (I) had higher amount of blood transfused units and longer duration of hospital stay compared to control group (all  $p < 0.01$ ). Incidence of complications was obviously higher in PA group (31 cases, 82%,  $p < 0.01$ ). The results of the predictive value of myometrial thickness for placenta accrete revealed that the area under curve (AUC) was 0.958 and the best cutoff was  $< 0.84$  mm with a sensitivity of 92%, specificity = 82% PPV = 83%, NPV = 87.2% and accuracy of 85% ( $p < 0.01$ ). **Conclusion:** In conclusion, the results indicate a significant association between decreased myometrial thickness and placenta accreta. Also, myometrial thickness has a high predictive value for placenta accreta in cases with complete placenta previa centralis.

**Keywords:** Placenta accrete, obstetrical burden, morbidity and mortality**Introduction**

Abnormal placental adherence is associated with major pregnancy complications, it could be presented in three conditions; placenta accreta, increta and percreta<sup>[1]</sup>. Placenta accreta is the complete or partial attachment or penetration of the placenta to the myometrium or related organs that obstruct normal separation at delivery, this case results in significant hemorrhage that threatens both mother and neonate life<sup>[2]</sup>. Placenta accreta has become a major life-threatening obstetrical burden because of its increased incidence and related mortality rate, it has been reported that its incidence increased from 0.12% to 0.31% and related mortality rate reached 7.0% in the last 30 years<sup>[3]</sup>. Additionally, placenta accreta is associated with high morbidity that includes hysterectomy, blood transfusion, infection and

ICU admission, etc..<sup>[3]</sup>. Numerous risk factors have been associated with placenta accreta, placenta previa is one of them<sup>[4]</sup>. Placenta accreta was reported to occur in approximately 15% of cases with placenta previa and in about 67% of cases where placenta previa occurs in cases with previous cesarean delivery for placenta previa<sup>[5]</sup>. The antenatal diagnosis of placenta accreta is pivotal, because it allows both the medical team and the patient to be prepared for the suspected complications during delivery<sup>[6]</sup>.

Many methods were studied for the early prediction of placenta accreta with varying results. Of these, Ultrasound findings associated with placental invasion in the second and third trimesters (gray-scale ultrasonography) include the presence of placenta previa, obliteration of

the clear space between the uterus and placenta, multiple placental lacunae, extension of the villi into the myometrium or beyond, interruption of the posterior bladder wall-uterine interface. An anterior myometrial thickness less than 1 mm<sup>[7]</sup> (as measured between the echogenic serosa and the retroplacental vessels) was also reported to be as predictive as placental lacunae for PA<sup>[8]</sup>. Also, it has been reported that retroplacental myometrial thickness of <1 mm is another US finding characteristic of PAS. This finding can result from trophoblastic invasion with minimal intervening myometrium<sup>[9]</sup>. A thin myometrium also may be due to partial dehiscence (the so-called uterine window) of the uterine wall<sup>[10, 11]</sup>. In a recent study by Rac et al., (2015), they found that some characteristics found to be positively associated with morbidly adherent placenta include placental location, smallest myometrial thickness, and bridging vessels<sup>[12, 13]</sup>. The sensitivity and specificity of second- and third-trimester ultrasonography for the identification of MAP has been reported to be as high as approximately 80–90%.<sup>[14]</sup>

#### **Aim of the work.**

Evaluate the role of myometrial thickness in prediction of placenta accrete in women with complete placenta previa centralis.

#### **Patients and methods**

This is a prospective study that was carried out at Minia Maternity University Hospital, Egypt during the period from October 2017 to March 2019 (18 months). The study was approved by the research ethics committee of the Department of Obstetrics and Gynaecology, Faculty of Medicine, Minia University. All patients had signed a written informed consent after they have been made aware of the purpose of the study, interventions, outcome and possible complications. The study included a total of 80 pregnant women with previous CS who are admitted to the hospital for CS between 28:38 weeks of gestation. They were classified to 2 groups (40 women per each) as follow:

Group (I) Diffuse PA: include women with diffuse placenta accreta.

Group (II) Control group: include women with normally implanted placenta.

Women with placenta previa centralis who were delivered by CS had history of prior CS and gestational age of 28:38 weeks were

included. Exclusion criteria were; recurrent pregnancy loss, IUFD, IUGR, multiple pregnancy, fetal chromosomal anomaly, prior cervical or uterine surgery other than CS and curettage, any known systemic disease eg. diabetes mellitus, hypertension, etc., pregnancy achieved by ART, placental abnormality other than placenta previa and congenital fetal malformation such as neural tube defect, abdominal wall defect gastrointestinal and skeletal abnormality.

Full history was taken. General and abdominal examinations, basic laboratory investigations and detailed US examination were done for all included cases. The diagnosis of placenta previa was based on the presence of placental tissue covering the internal cervical os. retroplacental myometrial thickness was measured in mm by Toshiba 6000 us device. Given blood units for each case was recorded. Postoperatively, patients who were admitted to ICU were subjected to close daily follow-up. Postoperative complications and hospital stay duration were recorded.

#### **Results**

The baseline characteristics of studied groups are shown in Table (1). No significant differences were observed between groups regarding age ( $p=0.40$ ), residence ( $p=0.11$ ), parity ( $p=0.61$ ), however, group (I) had significantly higher number of cases with  $\geq 4$  previous CSs and positive history of placenta previa. Group (I) had lower postoperative hemoglobin and platelet count compared to control group ( $p<0.01$ ). myometrial thickness was significantly smaller in PA group compared to control ( $.66 \pm 0.22$  vs.  $1.33 \pm 0.380$ ). Also, group (I) had higher amount of blood transfused units and longer duration of hospital stay compared to control group (all  $p<0.01$ ). Incidence of complications was obviously higher in PA group (31 cases, 82%,  $p<0.01$ ) of these, 19 cases with post-partum hemorrhage and 14 cases with bladder injury. Regarding surgical interference in group (I), 25 cases (70%) had hysterectomy, 11 cases (22%) had leaving placenta in situ and 4 cases were managed conservatively. However, 4 cases (8%) only in control group were managed conservatively (3 cases by bilateral uterine artery ligation and 1 case by ballon tamponade) (Table 2). The results of the predictive value of myometrial thickness for placenta accrete revealed that the

area under curve (AUC) was 0.958 and the best cutoff was < 0.84mm with a sensitivity of 92%, specificity = 82% PPV = 83%, NPV = 87.2%

and accuracy of 85% ( $p < 0.01$ ) (Table, 3 and Figure 1).

**Table (1): Baseline characteristics between groups.**

Variable	Groups		P. value (Sig.)
	Group (I) Diffuse PA (n=40)	Group (II) Control (n=40)	
Age (year)	28.2 ± 3.9		0.40 <sup>NS</sup>
Residence	Urban	25 (62.5%)	0.11 <sup>NS</sup>
	Rural	15 (37.5%)	
Gravidity	2-3	12 (30%)	0.61 <sup>NS</sup>
	4-5	16(40.0%)	
	≥ 6	12 (30.0%)	
Previous CSs	1	5 (12.5%)	<0.01**
	2	8 (20.0%)	
	3	9 (22.5%)	
	≥ 4	18 (45.0%)	
History of placenta previa (+ve)	5 (10.0%)	0	<0.01**

Quantitative data were presented as mean ± SD. Qualitative data were presented as No. (%).

Chi-square and T tests were used to compare between groups.

NS Not significant.

\*\* Significant ( $P \leq 0.01$ ).

**Table (2): Laboratory investigations, clinical finding and surgical interference between groups.**

Variable	Groups		P. value (Sig.)	
	Group (I) Diffuse PA (n=40)	Group (II) Control (n=40)		
Heamoglobin (g/dl)	Preoperative	11.2 ± 1.7	11.3 ± 1.3	0.74 <sup>NS</sup>
	Postoperative	8.6 ± 1.3	9.8 ± 1.3	<0.01**
Platelet count (10 <sup>3</sup> )	Preoperative	245.3 ± 29.2	252.9 ± 31.5	0.21 <sup>NS</sup>
	Postoperative	155.2 ± 23.7	195.4 ± 26.8	<0.01**
Myometrial thickness in mm				<0.01**
		1.33 ± 0.38	0.66 ± 0.22	<0.01**
Blood transfusion (units)	4.74 ± 1.95	0.2 ± 0.4	<0.01**	
Duration of hospital stay (days)	7.1 ± 3.9	1.3 ± 0.7	<0.01**	
Complications	No	7 (17.5%)	36 (90.0%)	<0.01**
	Bladder injury	11 (27.5%)	2 (5.0%)	
	ICU admission	7 (17.5%)	1 (2.5%)	
	Post-partum hemorrhage	15 (37.5%)	1 (2.5%)	
	Delayed hysterectomy	0	0	
Surgical interference				
Hysterectomy	25 (62.5%)	0	<0.01**	
Leaving placenta in situ	Partial	1 (2.5%)	0	0.31 <sup>NS</sup>
	Complete	10 (25.0%)	0	<0.01**
Conservative management	Bilateral uterine artery ligation	0	3 (7.5%)	0.08 <sup>NS</sup>
	Cervical tamponade	2 (5.0%)	0	0.15 <sup>NS</sup>
	Ballon tamponade	2 (5.0%)	1 (2.5%)	0.56 <sup>NS</sup>

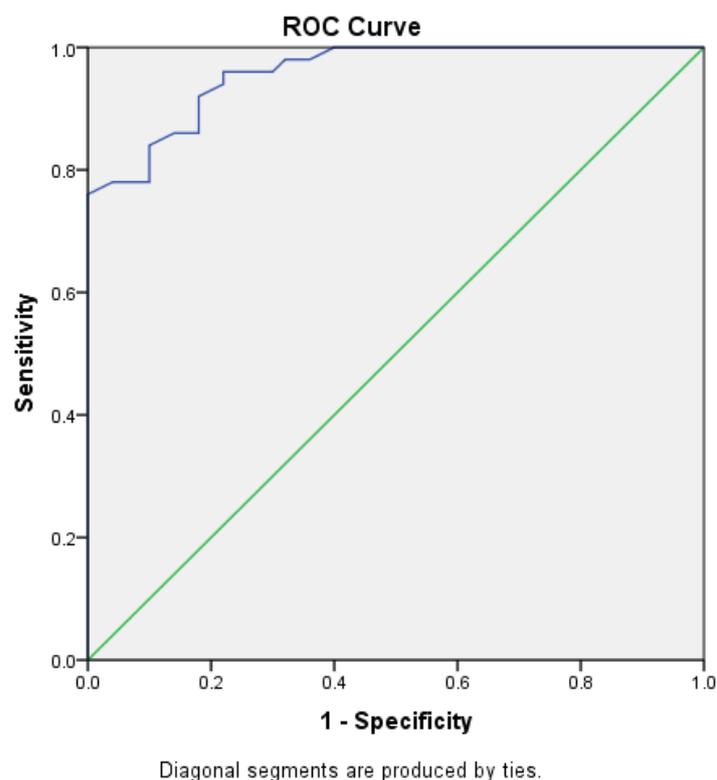
Chi-square and T tests were used to compare between groups.

NS Not significant.

\*\* Significant ( $P \leq 0.01$ )

**Table (3): myometrial thickness for prediction of placenta accreta.**

Parameter	AUC	Cutoff	Sensitivity (%)	Specificity (%)	PPV (%)	NPV(%)	Diagn. Accuracy
Myometrial thickness (mm)	0.958	> 0.84	92.0	82.0	83.0	87.2	85.0

**Figure (1): ROC curve analysis of myometrial thickness for prediction of placenta accreta.**

## Discussion

Diagnosing pregnancy complications such as placenta accreta, preeclampsia, PROM, etc.. in the early gestational period by safe means is pivotal for reducing morbidity and mortality rates.<sup>[15]</sup> Myometrial thickness is used for the prediction of placenta accreta<sup>[16]</sup>.

The results of our study revealed that myometrial thickness was significantly smaller in placenta accreta group ( $0.66 \pm 0.22$  mm) compared to control group ( $1.33 \pm 0.38$  mm). Also, myometrial thickness has a high predictive value for placenta accreta in women with complete placenta previa with cutoff >

0.84 mm, area under curve of 0.958, with a sensitivity of 92%, specificity = 82% PPV = 83%, NPV = 87.2% and accuracy of 85% ( $p < 0.01$ ). Our results are consistent with the previous studies indicating that reduced myometrial thickness is strongly associated with MAP among women with placenta previa. Hung et al.,<sup>[17]</sup> reported a strong significant association between reduced myometrial thickness and placenta accreta in women with placenta praevia (myometrial thickness ranged between 0.5 and 0.9 mm in 89% of accreta patients). In addition, Zelop et al.,<sup>[18]</sup> reported that there is a strong correlation between the extent of invasion and reduced myometrial

thickness. In another study by, Kupfermanc et al.,<sup>[14]</sup>, they observed that myometrial thickness reduced in 45% of patients with abnormal placental adherence in the absence of an obvious cause. Also, Oyelese and Smulian,<sup>[1]</sup> found that myometrial thickness is smaller in 45% of cases with placenta accreta in patients with placenta previa. Also, Lyell et al.,<sup>[19]</sup> studied the relationship between myometrial thickness and morbidly adherent placenta in women with placenta previa (n=736). They found that myometrial thickness (<1.79 mm) was associated with a nearly 3-fold increased risk for placenta accreta. Also, similar to our study, they found that the risk for MAP was increased by 23-36 fold in women with previa that had reduced myometrial thickness in addition to high previous CSs.

Similar to our findings, Dreux et al.,<sup>[20]</sup> studied myometrial thickness and placenta accreta, they found that myometrial thickness was 0.99 mm in placenta accreta group (n=69) versus 1.23 mm in control group (n=552), (p<0.01). In a recent study by Verma et al.,<sup>[21]</sup>, they found that myometrial thickness was smaller in 93.3% of cases with placenta previa with placental adherence. Also, they found a significant surgical intervention (80%) and increased maternal morbidity (68.8%). They concluded that myometrial thickness is important us marker for prognostication of placental adherence. Oztas et al.,<sup>[22]</sup> studied the ability of myometrial thickness in the prediction of morbidly adherent placenta that requiring hysterectomy among women with placenta previa totalis. They found that according to the ROC analysis, the area under the curve was 0.742, the best myometrial thickness cut-off value was 0.88 mm with 85.9% sensitivity and 71.4% specificity (p=0.036).

The reduced myometrial thickness in cases with placenta accreta in our study can possibly be attributed to the abnormal vascularisation and invasion noticed in placenta accreta.<sup>[23]</sup> Also, Chandra et al., suggested that the reduced myometrial thickness could be considered as a marker for abnormal implantation and placental malfunction<sup>[24]</sup>.

In our study, placenta accreta group had a significantly higher number of cases with  $\geq 4$  previous CSs than control group. Similarly,

Silver et al.,<sup>[25]</sup> reported that in women with placenta praevia, the frequency of placenta accreta increases with an increasing number of cesarean deliveries. Also, Mohammed et al.,<sup>[26]</sup> found similar results.

In the current study, placenta accreta group had significantly higher amount of blood transfusion and longer duration of hospital stay compared to control group (all p<0.01). Also, incidence of complications was obviously higher in placenta accreta group (41 cases, 82%, p<0.01) with high occurrence of bladder injury and post-partum hemorrhage. This was attributed to the high number of cases that had hysterectomy in this group (25 cases, 62.5%). The present findings agree with those of Warshak et al.,<sup>[27]</sup>, which analyzed 99 placenta accreta cases, found that approximately 75% required blood transfusion with a mean of  $5.4 \pm 2.1$  units of RBCs. Also, Zakherah et al.,<sup>[28]</sup> reported that the majority of cases with placenta accreta (94.7%) in their study received blood transfusion. Other causes of early morbidity such as ICU admission and bladder injury, etc... are high in patients with placenta accreta<sup>[29]</sup>. Zelop et al.,<sup>[30]</sup> reported that placenta accreta is the leading cause of intractable postpartum hemorrhage that requires emergency peripartum hysterectomy. It has been reported that both morbidity and complications following hysterectomy are significant and both bladder injury and hemorrhage are most common<sup>[31, 32]</sup>.

## Conclusions

In conclusion, the results indicate a significant association between reduced myometrial thickness and placenta accreta. Also, myometrial thickness has a high predictive value for placenta accreta in women with complete placenta previa centralis. Further prospective studies are warranted to confirm our findings.

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