Maternal and Neonatal Outcomes of Morbidly Adherent Placenta in Ain-Shams University Maternity Hospital From 2012 to 2017

Original Article

Ayman Abdelrazek Abouelnour, Ahmad Muhammad Bahaaelden Ahmad, Rasha Mahmoud Medhat abd elhady, Ehab Salah Hussein

Department of Obstetrics and Gynecology, Faculty of Medicine, Ain-Shams University, Cairo, Egypt

ABSTRACT

Background: Morbidly adherent placenta (MAP) is now a significant obstetric challenge results in significant maternal morbidity and mortality (it is responsible for 7-10% of maternal mortality). The incidence of MAP have increased over the past few decades, this is mainly because of the increasing caesarean delivery rate. Risk factors for MAP include placenta previa, cesarean delivery, high maternal age and high parity.

Aim: This study aimed to investigate patient characteristics and neonatal and maternal outcomes of placenta accreta in Ain-Shams from 2012 to 2017.

Materials and Methods: This is a retrospective study which was carried out in Ain Shams University Maternity Hospital (a major tertiary referral hospital in Egypt) during the period from January 2012 to December 2017 (6 years), the archives of the hospital were examined for hospital records fulfilling the criteria of the study population during the study period.

Results: The results revealed that morbidly adherent placenta was recorded during the studied period in 467 cases with an incidence of 6.6/1000 deliveries (0.66%). Also, cases with placenta accreta were 379 (81.2%) of the total MAP cases (the incidence of placenta accreta was 5.36/1000 of the total deliveries). The mean age of MAP patients was 31.7 ± 4.8 year. Regarding parity, only 9 cases were Primiparous, about half of them (226 cases, 48.4%) were P3:P4, 170 cases (36.4%) were P1:P2, 62 cases 13.3% were grand MP (>5). The majority of MAP cases (458 cases, 98.1%) had previous caesarean section (about two thirds of them 264 cases, 56.5% had 2-3 CSs). These results revealed that increasing maternal age, high parity, placenta previa and previous caesarean section were significant risk for MAP.

Conclusion: Early antenatal diagnosis of morbidly adherent placenta through imaging (ultrasound colour Doppler and MRI) allows for multidisciplinary planning in an attempt to minimize potential maternal or neonatal morbidity and mortality. Also, proper counselling of patients regarding associated risks reduces maternal morbidity and mortality.

INTRODUCTION

Abnormal placental implantation occurs when placental trophoblasts invade into the deep uterine endometrium (placenta accreta), into the myometrium (placenta increta), or beyond the uterine serosa (placenta percreta). The pathogenesis is primarily attributed to the defective decidualization of the implantation site and the absence of both the decidua basalis and the Nitabuch's layer, which results in a direct attachment of chorionic villi to the myometrium[11].

Placenta accreta occurs more frequently than placenta Increta and percreta. In a pooled analysis of results from series of confirmed, abnormally implanted placentas from hysterectomy specimens, the type and frequency of abnormal placentation were the following: placenta accreta, 79%, placenta increta 14%, placenta percreta,7% [42].

Incidence estimates of abnormally invasive placenta (AIP) vary widely ranging from 1.7 to 90 per 10000[16]. This wide range is likely due to differences in diagnosis and case definition (histopathological or clinical) of abnormally invasive placenta (AIP), and being predominantly based on tertiary hospital based studies[38].

There is a significant increase in the incidence in women with multiple prior cesarean deliveries, particularly in the setting of a placenta praevia[14]. The rates of placenta accreta in women with a placenta praevia range from 3% in those undergoing their first cesarean delivery to over 60 % for those undergoing their fourth or fifth cesarean deliveries[35].

Abnormally invasive placenta is associated with severe pregnancy complications such as postpartum hemorrhage and requires complex multidisciplinary management which may include large volume of blood transfusion, embolization of major arteries, hysterectomy, and admission to intensive care unit (ICU)[17].

Previous studies have focused on maternal morbidity, and there has been limited exploration of neonatal outcomes. Additionally, previous studies have had small sample sizes and limited generalizability as a result of being case reports or Institution_based medical reviews [16].

Some studies have shown high neonatal morbidity associated with placenta accreta[4]. On the other hand, other studies didn't observe adverse neonatal effects in such cases[31].

AIM OF THE STUDY

To investigate patient characteristics and neonatal and maternal outcomes of placenta accreta in Ain-Shams from 2012 to 2017.

PATIENTS AND METHODS

This is a retrospective study which was carried out in Ain-Shams University Maternity Hospital (a major tertiary referral hospital in Egypt) during the period from January 2012 to December 2017 (6 years), the archives of the hospital were examined for hospital records fulfilling the criteria of the study population during the study period.

Study Interventions: Records of hospital admissions during the planned time frame with the diagnosis of antepartum hemorrhage or placenta accreta/increta/percreta were reviewed. The following data was gathered, tabulated and subjected to the statistical analysis:

All subjects were chosen according to the following criteria: All cases of abnormally invasive placenta surgically confirmed or have histopathological evidence, and all cases who delivered at least 28 weeks gestation. While patients with congenital fetal malformations were excluded from the study.

STATISTICAL ANALYSIS

Data were analyzed using Statistical Program for Social Science (SPSS) version 20.0. Quantitative data were expressed as mean ± standard deviation (SD). Qualitative data were expressed as frequency and percentage. The following tests were done: Independent-samples t-test of significance was used when comparing between two means. Chi-square (X^2) test of significance was used in order to compare proportions between two qualitative parameters. The confidence interval was set to 95% and the margin of error accepted was set to 5%.

RESULTS

Table 1 showed that there were a total of 71121 deliveries in our hospital during the studied period 36264 (51.0%) were vaginal deliveries and 34857 (49.0%) were by caesarean section. Morbidly adherent placenta was recorded in 467 cases with an incidence of 6.6/1000 deliveries (0.66%) and 1.34% of CS deliveries), of these, 212 cases (45.4%) were managed by hysterectomy and the other 255 cases (54.6%) were managed by conservative management.

Table 2 presented the baseline and some obstetrical characteristics of MAP cases. The mean age of the included cases was 31.7 ± 4.8 year ranged between 17:43 years and the mean gestational age was 35.8 ± 2.1 weeks. Regarding parity, about half of them (226 cases, 48.4%) were P3:P4, 170 cases (36.4%) were P1:P2, 62 cases 13.3% were grand MP (>5) and only 9 cases were Primiparous. There were 458 cases (98.1%) with previous caesarian section about two thirds of them 264 cases (56.5%) had 2-3 CSs. A total of 110 cases (23.5%) had previous other uterine surgery (91 cases had D and C, 9 cases had Myomectomy, 6 cases hysterescopic surgery and 4 cases had hysterotomy).

Results of Table 3 showed the findings of imaging studies done for antenatal diagnosis of MAP cases. Most of the patients (354 cases, 75.8%) had anterior placenta, 389 cases (95.8%) showed US findings suggestive of invasion, either by grey scale (loss of retroplacental zone of cleavage) or Doppler study (increased placental vasculature). Only 31 cases (6.6%) suspected to have MAP had MRI done.

Table 4 presented the preoperative data of MAP cases. Of the total 467 included cases, 351 cases (75.2%) had elective CSs and 116 cases had emergent CSs. The mean pre-operative Hb was 10.64 ± 0.95 and decreased postoperative to 8.76 ± 1.19 however, the mean pre-operative Ht was 32.3 ± 2.6 and decreased postoperative to 25.7 ± 3.8. The mean operative time was 2.47 ± 0.82 hrs.

Table 5 presented the operative techniques used of different studied cases. All patients received general anaesthesia and were operated upon by senior consultants. 317 cases had lower segment uterine incision however, 150 cases had upper segment uterine incision. Of the total 212 cases who underwent hysterectomy, 138 cases (65.1%) failed conservation and the rest of 74 cases were pre planned. Of the total 255 cases who underwent

conservation, 76 cases (16.3%) were subjected to UA ligation, 48 cases (10.3%) subjected to II.A ligation. The mean of blood loss was 1978 ± 255 ml (500-10000) and a total of 409 cases (87.6%) received PRBCs.

Regarding postoperative complications represented in Table 6, 71 cases (15.2%) had bladder injury and 16 cases had uteric injury. Also, 27 cases (5.8%) had uterine artery. Disseminated intravascular coagulation (DIC) was recorded in 27 cases, surgical site infection (SSI) was found in 31 cases (6.6%), however, only one case recorded deep vein thrombosis (DVT). Regarding mortality, only one case (0.21%) was recorded (it had DIC after massive blood loss). About half of the cases were admitted to ICU (222, 47.5%) with a mean duration of $1.67 ± 1.59$ day. The mean of hospital admission duration was $7.7 ± 4.1$ days.

Table 7 presented the perinatal outcomes for pregnancies with MAP. The mean 1-minute Apgar score was $5.95 ± 1.94$, however, the mean 5-minute Apgar score was $7.89 ± 2.09$. The mean birth weight was $2.91 ± 0.73$ kg. A total of 118 cases (24.8%) had NICU admission, the preterm neonates were 333 (69.9%), intrauterine fetal demise (IUFD) was recorded in 58 neonates (12.2%).

Table 8 presented the comparison between caesarean hysterectomy and uterine conservation groups regarding different imaging modalities. Placental localization was highly correlated with the outcome, 174 cases of 345 cases with anterior placenta underwent caesarean hysterectomy. However, 69 cases of posteriorly located placenta (77 cases) underwent successful conservation. Patients showing US findings suggestive of invasion were significantly higher in CS hysterectomy group compared to conservation group (202 vs. 187 cases) ($P ≤ 0.01$), also, the same trend of results was noticed in patients with retroplacental zone of cleavage. CS hysterectomy group had significantly higher number of cases with increased placental vasculature ($P≤ 0.01$).

Results of Table 9 showed that, generally, complications were more common in hysterectomy group, there were no significant differences between CS hysterectomy and conservative management groups regarding preoperative Hb and HCT, however, CS hysterectomy had significantly lower postoperative Hb and HCT compared to conservative management group ($P≤ 0.01$). Also, CS hysterectomy group had significantly longer operative time and higher amount of blood loss ($P≤ 0.01$). Bladder injury was more common in CS hysterectomy group (55 cases vs. 16 cases in conservative management group). No significant difference was noticed between groups as regards incidence of DIC or DVT. Surgical site infection was more present in CS hysterectomy group ($P≤ 0.01$). Also, CS hysterectomy

group had significantly higher number of patients admitted to ICU, also, with higher duration of hospital stay and ICU admission duration ($P≤ 0.01$). There was one case of maternal mortality who had DIC after massive blood loss as we mentioned above.

Table 10 showed the comparison between elective and emergent cases regarding pre-operative and intraoperative data, there was a highly significant correlation between the urgency of delivery and abdominal incision ($P≤0.01$), most of elective cases were operated upon through Pfannenstiel incision and most of emergent cases had a midline laparotomy. Almost, no differences were found between elective and emergency CSs regarding preoperative Hb and HCT, however, elective CS group had significantly lower postoperative HCT compared to emergency CS group ($P≤ 0.05$). Lower segment uterine incision was significantly more common in elective CS group (255 cases, 72.6%), ($P≤ 0.05$). Emergency CSs group had higher number of cases who managed by CS hysterectomy (65 cases, 56.1%), however, about two thirds of cases of elective CS group (204 cases, 58.1%) were managed conservatively (Fig. 43). No obvious difference was found between the two groups regarding amount of blood loss.

Table 11 presents the comparison between elective and emergency CSs cases regarding postoperative complications. The results showed that emergency CSs group had significantly higher number of cases with uterine artery injury (18 cases, 15.5%), however, no significant differences between groups regarding other visceral and vascular injuries. Disseminated intravascular coagulation was significantly more presented in emergency CSs group compared to elective one (12.1% vs. 1.7%), however, in contrary, surgical site infection was more found in elective CSs group compared to emergency CSs group (10.8% vs. 3.1%). No significant differences were found between groups as regard DVT and duration of ICU admission.

Results of the comparison between LSCS and USCS regarding operative technique and postoperative complications are shown in Table 12. As regards line of management, the majority of LSCS cases (92.0%) were managed conservatively versus 11.3% in USCS group, this difference was statistically significant ($P≤ 0.01$). The results showed that LSCS group had significantly higher incidence of bladder injury compared to USCS group (60 cases, 18.9% vs. 11 cases, 7.3%) ($P≤ 0.01$). Also, the same trend of results was fond in uterine artery injury (27 cases, 8.5 in LSCS group vs. no cases in USCS group) ($P≤ 0.01$). No significant differences were found between groups as regard SSI and DVT. However, DIC was significantly more presented in USCS group (14 cases, 9.3%) versus LSCS group (8 cases, 2.5%).

Table 1: Statistics and data for the studied period (2012-2017)

Variable		Number	%
Deliveries	Vaginal	36264	51.0
	Caesarean	34857	49.0
	Total	71121	-
Morbidly adherent placenta (MAP)	Placenta acrreta	379	81.2
	Placenta increta	49	10.5
	Placenta percreta	39	8.3
	Total	467	0.66% of total deliveries 1.34% of CS deliveries
Management	Hysterectomy	212	45.4
	Conservatively	255	54.6

Table 2: Baseline and some obstetrical characteristics of studied cases

Variable		N (%) or Mean ± SD (range) (n=467)
Age (years)		31.7 ± 4.8 (17-43)
Gestational age (wks.)		35.8 ± 2.1 (28-42)
Parity	Primiparous	9 (1.9%)
	P1-P2	170 (36.4%)
	P3-P4	226 (48.4%)
	Grand MP (>5)	62 (13.3%)
Previous Caesarian section (n=458)	1 CS	95 (20.7%)
	2 CS	131 (28.6%)
	3 CS	133 (29.0%)
	4 CS	70 (15.3%)
	5 CS	25 (5.5%)
	6 CS	4 (0.9%)
Previous other uterine surgery	Hysterotomy	4 (0.85%)
	D & C	91 (19.5%)
	Myomectomy	9 (1.92%)
	Hysterescopic surgery	6 (1.3%)

Table 3: Findings of different imaging modalities of studied cases

Variable			(n=467) No.	%
Ultrasonography				
Placental localization	Anterior		354	75.8
	Posterior		77	16.5
	Centralis complete		36	7.7
	Not recorded		61	13.0
Signs of invasion	Recorded (n=406)	Present	389/406	95.8
		Absent	17/406	4.2
	Not recorded		74	15.8
Retroplacental zone of cleavage scale	Recorded (n=393)	Lost	261/393	66.4
		Part. lost	107/393	27.2
		Normal	25/393	6.4

Placental vasculature (Doppler)	Not done		78	16.7
	Done (n=389)	Normal	153/389	39.3
		Increased	236/389	60.7
	Not done		436	93.4
		Accreta	18/31	58.0
MRI	Done (n=31)	Increta	3/31	9.7
		Percreta	9/31	29.1
		Preavia	1/31	3.2

Table 4: Preoperative data of studied cases

Variable		N (%) or Mean ± SD (range) (n=467)
Type of CSs	Elective cases	351 (75.2%)
	Emergent cases	116 (24.8%)
Pre-operative CBC	Hb	10.64 ± 0.95 (8.1-14.0)
	Ht	32.3 ± 2.6 (25.5-43.2)
Post-operative CBC	Hb	8.76 ± 1.19 (4.6-12.8)
	Ht	25.7 ± 3.8 (18.0-38.1)
Operative time (hrs.)		2.47 ± 0.82 (0.5-7.0)

Table 5: Operative techniques used of studied cases

Variable			N (%) or Mean ± SD (range) (n=467)
Skin incision	Midline		199 (42.6%)
	Pfannens-tiel		268 (57.4%)
Dissection of bladder	After uterine incision		83 (17.8%)
	Before uterine incision		384 (82.2%)
Uterine incision	Lower segment		317 (67.9%)
	Upper segment		150 (32.1%)
Deal with placenta	Failure of separation		179 (38.3%)
	Manually separated		273 (58.5%)
	Spontaneously separated		15 (3.2%)
Pelvic devascularization	U.A ligation		76(16.3%)
	I.I.A ligation		48(10.3%)
Line of management	Conservation		255 (54.6%)
	Cs. hysterectomy	Pre planned	74 (34.9%)
	(n=212)	Failed conservation	138 (65.1%)
Blood loss (mL)			1978 ± 255 (500-10000)
Blood product transfusion	PRBCs		8.74 ± 2.57 (0-25)
	FFP		2.17 ± 0.94 (0-26)
Patients received PRBCs			409 (87.6%)

Table 6: Postoperative complications of studied cases

Variable		N (%) or Mean ± SD (range) (n=467)
Visceral injuries	Bladder	71 (15.2%)
	Ureteric	16 (3.4%)
	Intestinal	5 (1.1%)
Vascular injuries	Uterine artery	27 (5.8%)
	Internal iliac artery	3 (0.6%)
	Internal iliac vein	1 (0.21%)
	Common iliac artery	1 (0.21%)
Disseminated intravascular coagulation (DIC)		22 (4.7%)
Surgical site infection (SSI)		31 (6.6%)
Deep vein thrombosis (DVT)		1 (0.21%)
		1 (0.21%)
Morality		
Patients admitted to ICU		222 (47.5%)
ICU admission (days)		1.67 ± 1.59 (1-14)
Hospital admission duration (days)		7.7 ± 4.1 (2-30)

Table 7: Perinatal outcomes for pregnancies with MAP

Variable	N (%) or Mean ± SD (range) (n=476)
1-minute Apgar score	5.95 ± 1.94 (3-9)
5-minute Apgar score	7.89 ± 2.09 (5-10)
Birth weight (kg)	2.91 ± 0.73 (1.5-4.2)
NICU admission	118 (24.8%)
Preterm neonates	333 (69.9%)
Intrauterine fetal demise (IUFD)	58 (12.2%)

Table 8: Comparison between caesarean hysterectomy and uterine conservation groups regarding different imaging modalities

Variable		Groups		P. value (Sig.)
		Caesarean hysterectomy (n=212)	Conservative management (n=255)	
Placental localization	Anterior	174 (82.1 %)	180 (70.5 %)	<0.001**
	Posterior	8 (3.8 %)	69 (27.0 %)	
	Centralis	30 (14.1 %)	6 (2.5 %)	
Signs of invasion	Not recorded	8 (3.8 %)	53 (20.8 %)	0.005**
	Present	202 (95.2 %)	187 (73.3%)	
	Absent	2 (1.0%)	15 (5.9 %)	
Retroplacental zone of cleavage	Not recorded	2 (1.0%)	72 (28.2 %)	<0.001**
	Lost	207 (97.5 %)	54 (21.2 %)	
	Part. lost	1 (0.5 %)	106 (41.5 %)	
	Normal	2 (1.0%)	23 (9.1 %)	
Placental vasculature	Not done	8 (3.8 %)	70 (27.5 %)	<0.001**
	Normal	1 (0.5 %)	152 (59.6 %)	
	Increased	203 (95.7 %)	33 (12.9 %)	
MRI	Not done	190 (89.6 %)	246 (96.5 %)	0.011*
	Accreta	10 (4.8 %)	8 (3.1 %)	
	Increta	3 (1.4 %)	0	
	Percreta	9 (4.2 %)	0	
	Preavia	0	1 (0.4 %)	

Chi-square, comparison of proportions and odds ratio tests were used

**Significant difference at p. value ($P \leq 0.01$)

Table 9: Comparison between caesarean hysterectomy and uterine conservation groups regarding pre-operative data and postoperative complications

Variable		Groups		
		Caesarean hysterectomy (n=212)	Conservative management (n=255)	*P. value (Sig.)*
Pre-operative CBC	Hb	10.62 ± 1.05	10.68 ± 0.99	0.526[NS]
	Hct	32.21 ± 2.9	32.25 ± 2.69	0.877[NS]
Post-operative CBC	Hb	8.48 ± 1.24	9.11 ± 1.42	<0.001**
	Hct	24.92 ± 2.82	25.96 ± 3.89	0.004**
Operative time (hrs.)		3.08 ± 0.74	2.18 ± 0.71	<0.001**
Blood loss (ml)		2324 ± 1457	1845 ± 981	<0.001**
Visceral injuries	Bladder	55 (25.9 %)	16 (6.2 %)	<0.001**
	Ureteric	12 (5.7 %)	4 (1.6%)	0.065[NS]
	Intestinal	4 (1.9%)	1 (0.4%)	0.119[NS]
Vascular injuries	Ut. artery	10 (4.7 %)	17 (6.6 %)	0.379[NS]
	Int. iliac art.	3 (1.4%)	0	0.113[NS]
	Int. iliac vein	1 (0.5%)	0	0.967[NS]
	Com. iliac art.	1 (0.5 %)	0	0.967[NS]
DIC		11 (5.2%)	11 (4.3%)	0.647[NS]
SSI		23 (10.8%)	8 (3.1%)	<0.001**
DVT		0	1 (0.4%)	0.967[NS]
Morality		1 (0.5%)	0	0.967[NS]
Patients admitted to ICU		129 (60.8%)	93 (36.5%)	<0.001**
ICU admission (days)		1.89 ± 1.75	1.36 ± 1.2	<0.001**
Hospital admission duration (days)		5.58 ± 4.8	3.92 ± 2.74	<0.001**

Chi-square, comparison of proportions and odds ratio tests were used

Table 10: Comparison between elective and emergency CSs regarding pre-operative and intraoperative data

Variable		Groups		
		Elective CSs (n=351)	Emergency CSs (n=116)	P. value (Sig.)
Pre-operative CBC	Hb	10.67 ± 1.02	10.58 ± 1.10	0.419[NS]
	Hct	32.35 ± 2.7	31.98 ± 2.8	0.205[NS]
Post-operative CBC	Hb	8.84 ± 1.45	9.13 ± 1.38	0.094[NS]
	Hct	26.95 ± 4.75	28.14 ± 4.96	0.021*
Operative time (hrs.)		2.69 ± 0.86	2.63 ± 0.92	0.522[NS]
Skin incision	Midline	138 (39.3%)	61 (52.6%)	0.012*
	Pfannens Tiel	213 (60.7%)	55 (47.4%)	
Dissection of bladder	After uterine incision	47 (13.4%)	36 (31.0%)	<0.001**
	Before uterine incision	304 (86.6%)	80 (69.0%)	
Uterine incision	Lower segment	255 (72.6%)	62 (53.4%)	<0.001**
	Upper segment	96 (27.4%)	54 (46.6%)	
Deal with placenta	Failure of separation	126 (35.9%)	53 (45.7%)	0.168 [NS]
	Manually separated	213 (61.7%)	60 (51.7%)	
	Spontaneously separated	12 (3.4%)	3 (2.6%)	
Line of management	Conservation	204 (58.1%)	51 (43.9%)	0.007**
	Cs. hysterectomy	147 (41.9%)	65 (56.1%)	
Blood loss (ml)		2067 ± 1678	2095 ± 1549	0.873[NS]

Chi-square, comparison of proportions and T test were used.
**   Significant difference at p. value ($P \leq 0.01$).
*   significant ($P \leq 0.05$).   NS   Not significant.

Table 11: Comparison between elective and emergency CSs regarding postoperative complications

		Groups		
	Variable	Elective CSs (n=351)	Emergency CSs (n=116)	*P. value (Sig.)*
Visceral injuries	Bladder	56 (16.0 %)	15 (12.9 %)	0.421[NS]
	Ureteric	13 (3.7 %)	3 (2.6%)	0.572[NS]
	Intestinal	5 (1.4%)	0	0.477[NS]
Vascular injuries	Ut. artery	9 (2.6 %)	18 (15.5%)	<0.001**
	Int. iliac art.	3 (0.9%)	0	0.305[NS]
	Int. iliac vein	1 (0.3%)	0	0.555[NS]
	Com. iliac art.	1 (0.3 %)	0	0.555[NS]
DIC		6 (1.7%)	14 (12.1 %)	<0.001**
SSI		26 (10.8%)	5 (3.1%)	0.011*
DVT		0	1 (0.9%)	0.234[NS]
Morality		1 (0.3 %)	0	0.555[NS]
ICU admission (days)		1.64 ± 1.67	1.39 ± 0.48	0.112[NS]

Chi-square, comparison of proportions and T test were used

Table 12: Comparison between LSCS and USCS regarding operative technique and complications

		Groups		
	Variable	LSCS (n=317)	USCS (n=150)	*P. value (Sig.)*
Line of management	Conservation	195 (61.5%)	17 (11.3%)	<0.001**
	Cs. hysterectomy	122 (38.5%)	133 (88.7%)	
Dissection of bladder	After uterine incision	35 (11.0%)	48 (32.0%)	<0.001**
	Before uterine incision	282 (89.0%)	102 (68.0%)	
Visceral injuries	Bladder	60 (18.9%)	11 (7.3%)	0.001**
	Ureteric	11 (3.5%)	5 (3.3%)	0.911[NS]
	Intestinal	5 (1.6%)	0	0.151[NS]
Vascular injuries	Ut. artery	27 (8.5 %)	0	<0.001**
	Int. iliac art.	3 (0.9%)	0	0.313[NS]
	Int. iliac vein	1 (0.3%)	0	0.677[NS]
	Com. iliac art.	1 (0.3 %)	0	0.677[NS]
DIC		8 (2.5%)	14 (9.3 %)	<0.001**
SSI		25 (7.9%)	6 (4.0%)	0.114[NS]
DVT		0	1 (0.9%)	0.176[NS]
Morality		1 (0.3 %)	0	0.677[NS]

Chi-square and comparison of proportions were used.

DISCUSSION

Morbidly adherent placenta is an abnormal invasion of placental tissue (trophoblast) into inner or outer myometrium or through the serosa of the uterus (termed as accreta, increta, percreta respectively)[10].

The present study is a retrospective one which was carried out in Ain-Shams University Maternity Hospital during the period from January 2012 to December 2017 (6 years), during the studied period, there were a total of 71121 deliveries in our hospital 36264 (51.0%) were vaginal and 34857 (49.0%) were by caesarean section.

The present results revealed that morbidly adherent placenta was recorded during the studied period in 467 cases with an incidence of 6.6/1000 deliveries (0.66%). Also, cases with placenta accreta were 379 (81.2%) of the total MAP cases (the incidence of placenta accreta was 5.36/1000 of the total deliveries).

These obtained results were comparable with a recent retrospective study (for five years) carried out in our studied hospital[13], they found that the incidence of MAP was 7/1000 deliveries (0.7 % of total deliveries). Also, this incidence is comparable with published studies in the last decade (0.4-0.9%)[24]. In the same line,[36] found that the incidence of MAP was 4.8/1000 which is slightly lower from our obtained results. In addition,[26] found that 80 women out of 21083 who delivered during the study period had morbidly adherent placenta with an incidence of 0.38% (3.8/1000 deliveries.[23]conducted a five-year study at a tertiary care centre (2007-2011), there were a total of 42329 deliveries. Of those cases, 17 women were diagnosed to have MAP, with an incidence of 1/2490 (0.04%) of total deliveries.

[13]concluded that this alarming increase in MAP incidence appears to be directly related to the rising rates of CS, plus increasing maternal age at delivery. Also, another possible explanation for the higher obtained incidence is that the studied hospital is the main tertiary referral hospital in our region.

In earlier studies, [42]reported an incidence of 1 in 533 deliveries during the period from 1982 to 2002. Also,[28] found a range of 1 in 4027 to 1 in 2510 births, however[6] reported an incidence of 1/70000 births in the 1970s to 1980s.

Furthermore, in a recent Chinese study by[22] for a 3-year period conducted at 2 tertiary referral hospitals, total delivers were 29220 and the number of CSs was 14.529 (49.7%). A total cases diagnosed with placenta accreta were 47 cases with an incidence of 1/667.

In a recent study conducted in a university hospital in Egypt for one year (2015) by[45] who found that the incidence of placenta accreta was 0.33%. However,[8] reported that the exact incidence of placenta accreta is not easy to ascertain, but it is about 1/1000 deliveries and this incidence is increasing along with increasing the risk factors.

As similar to our findings, in a recent study by[26], they found that the incidence of placenta accreta was drastically higher among women with MAP (88.88%).

In the current study, the mean age of MAP patients was 31.7 ± 4.8 year. Regarding parity, only 9 cases were primiparous, about half of them 226 cases (48.4%) were P3:P4, 170 cases (36.4%) were P1:P2, 62 cases (13.3%) were grand MP (>5). The majority of MAP cases 458 cases, (98.1%) had previous caesarean section (about two thirds of them 264 cases, 56.5% had 2-3 CSs). These results revealed that increasing maternal age, high parity, placenta previa and previous caesarean section were significant risk for MAP.

These results agreed typically with[24] and Carusi, [8] who reported that high maternal age, high parity and placenta previa were significantly associated with the development of MAP. Also, previous studies supporting these results[18]. Likewise, [5]have reported that rising maternal age at delivery and an increasing number of previous caesarean deliveries were independent risk factors for placenta accreta.

Recently, [26]found that previous C-section appeared to be the most important risk factor for MAP accounting for 88.8% of cases followed by placenta previa which accounted for 83.3% of the cases.

[17]reported that morbidly adherent placenta is most commonly associated with placenta praevia in women previously delivered by caesarean section. In addition it has been reported that the high risk factors for placenta accreta include placenta previa, prior caesarean delivery, patients who underwent uterine curettage previously and gravida (6 or more)[40].

Additionally, in a recent study by[15], they reported that older maternal age, prior caesarean section, placenta praevia and high parity were independent risk factors for placenta accreta. Also, other recent studies reported similar results[4, 43,46].

In the current study, out of the 467 MAP patients, 212 cases (45.4%) were managed by hysterectomy and the other 255 cases (54.6%) were managed conservatively.

[33]carried out a multicentre study of conservative

management of placenta accreta in 167 women treated in 25 French university hospitals. The results showed that conservative treatment for placenta accreta was successful in 78.4% of cases.

Many authors reported that conservative approaches for the management of placenta accreta reduce the morbidity of peripartum hysterectomy as well as allow for future fertility[37,9].

[22]recommended that doctors should conduct hysterectomy immediately when they met these situations. One situation is that a wide range of MOP adherent to bladder, which causes the placenta inseparable; another situation is that patients with a history of CS plus complete placenta praevia and placenta implantation in lower uterine segment and cervical muscle layer. If conservative surgical treatments fail and bleeding is difficult to control, hysterectomy should be used. This recommendation is supported by the results of the current study that most 96.1% of patients with MAP who were diagnosed antenatally by US with placenta completely covering internal os had been ended in caesarean hysterectomy, while 86.6% of patients with MAP who had posterior placental localization, ended in conservative management. These data may be used in development of a prediction model for the outcomes according to placental localization.

[12]reported that when accreta was suspected a scheduled C-hysterectomy without attempting placenta removal was associated with a significantly decreased rate of early morbidity compared with cases in which placenta removal was attempted.

[10]found that 60% women (of his study group) had to undergo caesarean hysterectomy, all were emergency hysterectomy. However[32] demonstrated that planned caesarean hysterectomy in selected patients allows the surgical team to be prepared for complications to prevent morbidities with no demonstrable increase in intraoperative and postoperative complications, when compared with women who undergo hysterectomy within 6 months of cesarean delivery. [30]too cites that there is a great benefit of planned as opposed to emergent peripartum hysterectomy. In mothers with placenta previa and a suspected accreta who required peripartum hysterectomy, a scheduled delivery has been associated with shorter operative times and lower frequency of transfusions, complications, and intensive care unit admissions.

The present results demonstrated that anterior placental localization was strongly correlated with MAP (354 cases, 75.8%). These result agreed with those of a recent study by[25] found that anterior placental localization was associated with the incidence of MAP. Also, [7]found similar results. This result can be explained by the presence of previous CS scars.

In the current study, patients showing US findings suggestive of invasion were more likely to undergo caesarean hysterectomy. Also, MRI grading of myometrial invasion was also highly correlated with caesarean hysterectomy. These findings agreed with[20] who studied prenatal ultrasound imaging of MAP. [19]reported that the ultrasound findings suggestive of accrete include placental lacunae, myometrial thinning to less than 1 mm, the loss of a placental-uterine interface and an abnormal uterine bladder interface.

Regarding the diagnostic accuracy of different imaging modalities, [1]reported that MRI had a higher prediction rate of abnormal invasive placentation compared to ultrasound (98.4% versus 91.9%).

In our study, 409 patients (87.6%) received blood product transfusion with a mean of 8.74 ± 2.57 units and the mean estimated blood loss was 1978 ± 255 ml. The present findings are similar to the other reported rates of transfusion. In a most recent study, [13]found that the majority of MAP cases needed blood transfusion with a mean of 9.06 units and the mean estimated blood loss was 2027 ml. Also, [41]analyzed 99 placenta accreta cases, found that approximately 75% required blood transfusion with a mean of 5.4 ± 2.1 units of PRBCs.

In a most recent study, [26]found that average blood loss was 1.8 litres, the mean intraoperative blood transfusions were 3 units of PRBC, 3 units of FFP and 1.4 units of platelet.

In the current study, 71 cases (15.2%) had bladder injury. The present results are in agreement with[13] who found that 16.3% of MAP cases had bladder injury. Similar rate of bladder injury was reported in MAP cases by[40].

The present study showed that 22 cases (4.7%) were complicated with disseminated intravascular coagulation and 31 cases (6.6%) were complicated by surgical site infection (SSI). The present findings are in comparable with those of [13]who recorded DIC in 4.4% and SSI in 7.2% of MAP cases. However, [12]reported that DIC was found 27.6% of patients with MAP. This highly significant difference between both rates may be attributed to vigorous blood products replacement.

Regarding mortality, the present results showed that only one case (0.21%) was recorded (it had DIC after massive blood loss) with a mortality rate of 2/1000. This rate is obviously lower than that was reported in the literature. A comparable to our results, in a nationwide study in USA, a mortality rate of 1.0% was reported in women with MAP[27], whereas other studies have described mortality rates of 1-6 %[44].

On the other hand, recently, [39]found that the maternal mortality of MAP cases was 25% and all of them died due to DIC, this is obviously higher than our obtained results.

In the present study, about half of the cases were admitted to ICU 222/467, (47.5%) with a mean duration of 1.67 ± 1.59 day and the mean of hospital admission duration was 7.7 ± 4.1 days. As similar to our findings,[39]found that 60% of MAP cases had to be shifted to ICU. Also, [13]found that 47.8% of MAP patients were admitted to the ICU with a mean duration of 1.6 day and they found that the mean hospital stay duration was 7.6 days. However, [26]found that the average total hospital stay was 20.46 days, which is higher than our results.

As lower to our rate, [12]carried out a retrospective cohort study in two tertiary care teaching hospitals in USA and they found that 27.6% of patients with MAP were admitted to the ICU.

Regarding the results of the perinatal outcomes for MAP, a total of 118 cases (24.8%) had NICU admission, neonates were 333 (69.9%), intrauterine fetal demise (IUFD) was recorded in 58 neonates (12.2%).

The present findings are comparable with a retrospective study done by[3] at two tertiary hospitals in Istanbul in the 5-year period from 2005 to 2010. The perinatal outcomes for patients who had placenta accreta were as following: the mean gestational age at delivery was 35.4 ± 4.4 weeks, gestation. The mean birth weight (kg) was 2.8 ± 8.1, 8.7 Apgar score at 5 minutes<7, 19.5% NICU admission and 4.3% Neonatal mortality. There is no statistically significant between the perinatal outcomes of both studies.

Recently, [26]found the perinatal mortality rate was 6.25%, 61.0% of neonates were premature while 27.7% were term neonates. Neonates had an average birth weight of 1.7 kg. The NICU admission rate was 81%. There were 2 preterm intrauterine fetal demise. Respiratory distress syndrome was the leading cause of neonatal death accounting for 80% and sepsis in 20%.

In the study done by[4] the NICU admission rate was 86%. In present study the NICU admission rate was lower comparatively.

The present results revealed that complications were more common in hysterectomy group in general, CS hysterectomy had significantly lower postoperative Hb and HCT compared to conservative management group (*P≤ 0.01*). Also, CS hysterectomy group had significantly longer operative time and higher amount of blood loss (*P≤ 0.01*). Bladder injury and surgical site infection were more common in CS hysterectomy group. In addition, CS hysterectomy group had significantly higher number of

patients admitted to ICU, with higher duration of hospital stay and ICU admission duration (*P≤ 0.01*). There was one CS hysterectomy case of maternal mortality (0.2%) that had DIC after massive blood loss.

Similar to our findings, [13]found that there was no statistically significant difference between both outcomes (conservation and hysterectomy) of MAP cases regarding pre-operative hemoglobin and hematocrit, patients who underwent caesarean hysterectomy had significantly lower post-operative hemoglobin and hematocrit. CS hysterectomy patients had longer operating time mean. Also, [12] reported similar rate of 11.8% with no statistically significant difference between both studies.

Recently, in a study conducted in Egypt, Alanwar *et al.* (2018) reported that the incidence of urinary tract injuries during CS hysterectomy was 21.7%. It has been reported that the average postoperative hospital stay after CS hysterectomy ranges from 4 to 8 days[34].

It has been reported that, caesarean hysterectomy has been the management of choice for placenta accreta, it is associated with significant morbidity as documented above as well as the psychological consequences of the loss of fertility[19].

In our study, emergency CSs group had higher number of cases who managed by CS hysterectomy (65 cases, 56.1%), however, about two thirds of cases of elective CS group (204 cases, 58.1%) were managed conservatively. Our results revealed that there was a significant reduction if postoperative haematocrit in elective cases compared to emergency ones. The association of marginally greater than blood loss with emergency cases would imply more aggressive intra-operative replacement, thus a greater post-operative haematocrit. Emergency CSs group had significantly higher number of cases with uterine artery injury (18 cases, 15.5%). Also, DIC was significantly more presented in emergency CSs group compared to elective one (12.1% vs. 1.7%), however, in contrary, surgical site infection was more found in elective CSs group compared to emergency CSs group (10.8% vs. 3.1%)

[13]found that there was a highly significant difference between both groups (elective and emergent cases groups) regarding post-operative hematocrit, being lower in elective cases. Also, they found that there was no internal iliac artery injury in elective cases, while there was 2.9% in emergency cases and most of uterine artery injury showed 2.8% in the elective cases and 17.6% in emergent cases occurred in cases of emergency, while the injury of internal iliac vein was 0.3% and common iliac artery was 0.3% which occurred in the elective cases. Coagulopathy (DIC) occurred in 12.7% of emergent cases, while it was 6% of elective cases and that difference was statistically significant.

In a recent study by[22], they studied a comparison between 29 elective and 18 emergent CS of 47 cases with MAP in China. The study concluded that placenta separated during CS in most of the cases in both groups 68.9% in elective cases and 77.7% in emergent cases, accordingly most of (58.2%) elective and (66.6%) of emergent cases had successful uterine conservation.

CONCOLUSION

Early antenatal diagnosis of morbidly adherent placenta through imaging (ultrasound colour Doppler and MRI) allows for multidisciplinary planning in an attempt to minimize potential maternal or neonatal morbidity and mortality. Also, proper counselling of patients regarding associated risks reduce maternal morbidity and mortality.

CONFLICT OF INTEREST

There are no conflicts of interests.

REFERENCES

1. Aitken K, Allen L, Pantazi S, Kingdom J, Keating S, Pollard L, et al. MRI significantly improves disease staging to direct surgical planning for abnormal invasive placentation: a single centre experience. J Obstet Gynaecol Canada. 2016;38(3):246-51.

2. Alanwar A, Al-Sayed HM, Ibrahim AM, Elkotb AM, Abdelshafy A, Abdelhadi R, et al. Urinary tract injuries during cesarean section in patients with morbid placental adherence: retrospective cohort study. J Maternal Fetal Neonat Med. 2018 (Article in press).

3. Asıcıoglu O., A. Ş ahbaz, K. Güngördük ,et al. Maternal and perinatal outcomes in women with placenta praevia and accreta in teaching hospitals in Western Turkey. Journal of Obstetrics and Gynaecology, 2014; Early Online: 1–5

4. Balayla J, Bondarenko HD. Placenta accreta and the risk of adverse maternal and neonatal outcomes. J Perinat Med. 2013;41(2):141–149.

5. Bowman ZS, Eller AG, Kennedy AM, Richards DS, Winter TC III, Woodward PJ, et al. Accuracy of ultrasound for the prediction of placenta accreta. Am J Obstet Gynecol. 2014; 211:210 e1–7.

6. Breen JL, Neubecker R, Gregori CA, Franklin JE Jr. Placenta accreta, increta, and percreta. A survey of 40 cases. Obstet Gynecol 1977;49:43-7.

7. Cali G, Giambanco I, Puccio G, Forlani F. Morbidly adherent placenta: evaluation of ultrasound diagnostic criteria and differentiation of placenta accreta from percreta. Ultrasound Obstet Gynecol. 2013;41:406–412.

8. Carusi DA. The Placenta Accreta Spectrum: Epidemiology and Risk Factors. Clin Obstet Gynecol. 2018 Dec;61(4):733-742.

9. Chandraharan E, Rao S, Belli AM, Arulkumaran S. The Triple-P procedure as a conservative surgical alternative to peripartum hysterectomy for placenta percreta. Int J Gynaecol Obstet 2012;117:191–4.

10. Desai Ranjana, Bhanwar Singh Jodha, Richa Garg. Morbidly adherent placenta and it's maternal and fetal outcome. Int J Reprod Contracept Obstet Gynecol. 2017 May;6(5):1890-1893.

11. Dreux S, Salomon LJ, Muller F, Goffinet F, Ouryl JF, Aba Study Group, et al. (2012): Second-trimester maternal serum markers and placenta accreta. Prenat Diagn. 2012; 32-1010-2.

12. Eller AG, Bennett MA, Sharshiner M, Masheter C, Soisson AP, Dodson M and Silver RM (2011): Maternal morbidity in cases of placenta accreta managed by a multidisciplinary care team compared with standard obstetric care. Obstet. Gynecol.,117: 331–337.

13. El-Shalakany A. H. , Amr Abdel Aziz Elsayied , Ahmed Mohammed Ragab. Outcomes of Patients with Morbidly Adherent Placenta in Ain Shams Maternity Hospital: a Retrospective Study. The Egyptian Journal of Hospital Medicine (2017) Vol.69 (3), Page 2149-2158.

14. Eshkoli T, Weintraub AY, Sergienko R, et al.(2013): Placenta accreta: risk factors, perinatal outcomes, and consequences of subsequent births. Am J Obstet Gynaecol. 2013; 208(3): 219. el-219. E7.

15. Farquhar CM, Li Z, Lensen S, et al. Incidence, risk factors and perinatal outcomes for placenta accreta in Australia and New Zealand: a case–control study. BMJ Open 2017;7:e017713.

16. Fitzpatrick KE, Sellers S, Spark P, Kurinczuk JJ, Bro-cklehurst P, Knight M. Incidence and risk factors for Placenta Accreta/Increta/Percreta in the UK: a national case-control study. PLoS One. 2012; 7 (12): 52893.

17. Fitzpatrick KE, Sellers S, Spark P, Kurinczuk JJ, Brocklehurst P, Knight M. The management and outcomes of placenta accreta, increta, and percreta in the UK: a population-based descriptive study. BJOG. 2014;121(1):62–70.

18. Gielchinsky Y1, Rojansky N, Fasouliotis SJ, Ezra Y. Placenta accreta--summary of 10 years: a survey of 310 cases. Placenta. 2002 Feb-Mar;23(2-3):210-4.

19. Goh W., and I. Zalud. Placenta accreta: Diagnosis, management and the molecular biology of the morbidly adherent placenta. J Matern Fetal Neonatal Med. 2016; 29(11): 1795–1800.

20. Jauniaux E, Collins SL, Jurkovic D, Burton GJ. Accreta placentation: a systematic review of prenatal ultrasound imaging and grading of villous invasiveness. Am J Obstet Gynecol 2016; 215: 712 – 721.

21. Knight M. Peripartum hysterectomy in the UK: management and outcomes of the associated haemorrhage. BJOG 2007;114: 1380–7.

22. Kong X, Kong Y, Yan J, Hu JJ, Wang FF, Zhang L. On opportunity for emergency cesarean hysterectomy and pregnancy outcomes of patients with placenta accreta. Medicine (Baltimore). 2017 Sep;96(39):e7930.

23. Malhotra V, Bhuria V, Nanda S, Chauhan M, Rani A. Placenta Accreta: Five-Year Experience at a TertiaryCare Center. J Gynecol and Surg. 2014; 30 (2): 91-5

24. Morlando M, Samo L, Napolitano R, Capone A, Tessitore G, Maruotti GM, et al. Placenta accreta: incidence and risk factors in an area with a particularly high rate of cesarean section. Acta Obstet Gynecol Scand. 2013;92:457-460.

25. Panaiotova G, Peisner DB, Timor-Tritsch IE, et al. Screening for morbidly adherent placenta in early pregnancy. Ultrasound Obstet Gynecol 2019; 53: 101 – 106

26. Paneerselvam A., A. Sundaram. Fetomaternal outcome in morbidly adherent placenta in a tertiary referral hospital. Int J Reprod Contracept Obstet Gynecol. 2018 Nov;7(11):4540-4544.

27. Perez-Delboy A, Wright JD. Surgical management of placenta accreta: to leave or remove the placenta?. BJOG 2014;121:163– 170.

28. Pridjian G, Hibbard JU, Moawad AH. Cesarean: changing the trends. Obstet Gynecol 1991;77:195-200.

29. Riteau AS, Tassin M, Chambon G, Le Vaillant C, de Laveaucoupet J, Quéré MP, Joubert M, Prevot S, Philippe HJ & Benachi A. (2014). Accuracy of ultrasonography and magnetic resonance imaging in the diagnosis of placenta accreta. PLoS ONE , 9, e94866.

30. Robinson BK, Grobman WA. Effectiveness of timing strategies for delivery of individuals with placenta previa and accreta. Obstet Gynecol. 2010;116:835-42.

31. Rosenberg T, Pariente G, Sergienko R, Wiznitzer A, Sheiner E(2011): Critical analysis of risk factors and outcome of placenta praevia. Arch Gynaecol Obstet. 2011; 284:47-51.

32. Seago DP, Roberts WE, Johnson VK, Martin RW, Morrison JC, Martin JN Jr. Planned cesarean hysterectomy; a preferred alternative to separate operations. Am J Obst Gynecol. 2004;104;537-40.

33. Sentilhes L, Ambroselli C, Kayem G, Provansal M, Fernandez H, Perrotin F, et al. Maternal outcome after conservative management of placenta accreta. Obstet Gynecol. 2010;115: 526–534.

34. Shellhaas CS, Gilbert S, Landon MB, Varner MW, Leveno KJ, Hauth JC, et al. The frequency and complication rates of hysterectomy accompanying cesarean delivery. Obstet Gynecol 2009;114:224–9.

35. Silver RM, Landon MB, Rouse DJ, Leveno KJ, et al. Maternal morbidity associated with multiple repeat cesarean deliveries. Obstet Gynecol. 2006 Jun;107(6):1226–32.

36. Stafford I, Belfort MA. Placenta accrete, increta and percreta: A team-based approach starts with prevention. Contemp Ob/Gyn. 2008; 77.

37. Timmermans S, van Hof AC, Duvekot JJ. Conservative management of abnormally invasive placentation. Obstet Gynecol Surv 2007;62:529–39.

38. Upson K, Silver RM, Greene R, Lutomski J, Holt VL(2014): placenta accreta and maternal morbidity in the Republic of Ireland, 2005-2010. J Matern fetal Neonatal Med. 2014; 27:24-9.

39. Vijayasree M. Retrospective Analysis of Morbidly Adherent Placenta in a Tertiary Care Referral Centre - A Decade of Experience. SM J Gynecol Obstet. 2018; 4(2): 1031.

40. Wajid Rabia, Saira Bashir, Asif Hanif. Treatment Outcome of Adherent Placenta: An Experience at Tertiary Care Hospital . Annals vol. 23, issue 1, Jan. – Mar. 2017.

41. Warshak CR, Ramos GA, Eskander R, Benirschke K, Saenz CC, Kelly TF, Moore TR and Resnik R (2010): Effect of redelivery diagnosis in 99 consecutive cases of placenta accreta. Obstet., and Gynecology, 115(1):65-9s.

42. Wu S, Kocherginsky M, Hibbard JU. Abnormal placentation: twenty-year analysis. Am J Obstet Gynecol 2005;192:1458-61.

43. Yu J, Ma Y, Wu Z, et al. Endometrial preparation protocol of the frozen-thawed embryo transfer in patients with polycystic ovary syndrome. Arch Gynecol Obstet 2015;291:201–11.

44. Yucel O, Ozdemir I, Yucel N, Somunkiran A. Emergency peripartum hysterectomy: a 9-year review. Arch Gynecol Obstet 2006;274:84–7.

45. Zakherah MS, Abdel-Aziz M, Othman ER and Abbas AM. Maternal and neonatal outcomes of placenta previa and accreta at Assiut women's health hospital, Egypt. International Journal of Reproduction, Contraception, Obstetrics and Gynecology, 2018; 7(8), 3024.

46. Zhang D, Siqin Y, Yanyan H, Yan S, Haofan S, Wei G. Risk factors, outcome and management survey of placenta accreta in 153 cases: a five-year experience from a hospital of Shanghai, China. Int J Clin Exp Med 2017;10(8):12509-12516.