Risk factors for occurrence of placenta accrete spectrum following primary cesarean delivery

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Abstract

Background: Many maternal and fetal complications were reported during delivery for patients diagnosed to have placenta accrete spectrum (PAS). Cesarean delivery (CD) is considered to be the most common risk factor for developing PAS disorders during pregnancy specially with increasing rate of CD in developing countries.

Methods: A cross- sectional study over 12 months in a tertiary care obstetric unit between January 2020 and January 2021.

Results: 47 pregnant females having history of previous one CD were divided into 2 groups after ultrasonic and intraoperative evaluation of placenta site and invasion to the uterine wall.14 cases were in the low risk group ad 33 cases were in the high-risk group. The mean ages of patients were (27.6 ± 4.6 & 27.6 ± 4.6, p value =0.961) respectively. The median gravidity was (3 & 2) in both groups. We found that 36.4 % of case in the high-risk group had unreliable indications of the primary CD. Emergency caesarean deliveries were done in about 18 % of cases in the high-risk group either due to failure to progress in labour or foetal distress. We reported successful conservative management in both groups using either cervico-isthmic compression suture or step wise approach. There was statistically significant in the mean amount of intraoperative blood loss (1000 ml (850-1200) &1600 ml (850-2500), $p<0.001$) in the low and high-risk groups respectively. We reported 3 cases of intraoperative pulmonary embolism, urinary bladder injury and

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HELLP (hemolysis, elevated liver enzymes and low platelet count) syndrome among patients in the high-risk group. There was statistically significant longer hospital stay duration among patients in the high-risk group ranging from 2 days up to 21 days. On the other hand, there were no serious complications reported in the low risk group.

Conclusion: Decreasing rate of primary CD and optimizing obstetric care are mandatory to prevent maternal of fetal complication that could happen due to having future PAS. Fertility sparing surgery is feasible during surgical management of PAS disorders.

Key words: Placenta accrete spectrum, caesarean delivery, primary, fertility sparing, planned surgical management, maternal. neonatal complications

Introduction

Placenta accrete spectrum (PAS) is considered to be an epidemic in our locality. It is also thought to be due to the high rate of caesarean delivery (CD) [1]. Most of the primary elective caesarean delivery in our locality is performed due to unjustified indications and in private practice.

Patients withPAS have different degree of placental invasion either through the endometrium (accreta), myometrium (increta)or the serosa of urinary bladder(percreta)[2]. Those patients are at risk of havingsignificant blood loss during delivery and massive blood transfusion according to the degree of PAS [3].

Other risk factors are studied and well known to be associated with increased risk of PAS includingpresence of uterine scar due to evacuation of abortion, curettage of endometrium, Myomectomy, septal resection, assisted reproductive techniques, Uterine artery embolization, pelvic inflammatory diseases ,Intra-uterine device and presence of some uterine abnormalities as (Bicornuate uterus, Adenomyosis, Submucous fibroids) [4, 5].Also, the chance of recurrence is very high after having complicatedpregnancy with PAS.

Many surgical techniques were used to preserve fertility in such group of patient like step wise approach after pelvic devascularisation (ligation of uterine arties and internal iliac arteries) [6]however, with presence of morbidly adherent placenta and more invasion uterine wall the need for hysterectomy is increasing[7].

We conducted a hospital based cross sectional study on a group of patients undergoing repeat elective caesarean delivery due to abnormal placentation aiming to study the association betweenplace, indications of the primary caesarean delivery and the degree of PAS.

Patients and methods

This study was conducted in the period between (January 2020 till January 2021)on a group of patients admitted for repeat elective caesarean delivery (CD) at Mansoura university hospital (MUH). All patients had history of previous one CD.

Inclusion criteria

1. Patients with history of previous one caesarean delivery
2. Patients who refused trail of vaginal birth after caesarean section
3. Patients with permanent indication for caesarean section like contracted pelvis
4. Patient without any history of complicated medical diseases

Exclusion criteria

1. Patients with history of more than one previous caesarean delivery
2. Patients with medical disorders necessitating emergency termination of the current pregnancy.
3. Patients with known uterine abnormalities eg (Bicornuate uterus, Adenomyosis and submucous fibroids)

4. Patients who are candidates for vaginal birth after caesarean section

Methods

ll the sociodemographic data were collected including age, residency, job, special habits and body mass index (BMI). Also, a detailed Past obstetric history was taken from all patients i.e. (Gravidity, parity, number of full-term normal delivery, number of full-term assisted vaginal deliveries, number of preterm deliveries, number of stillbirth deliveries, number of previous abortions, previous pregnancy complication and complication during puerperium). Details about the primary CD were taken including (Indication, duration, place of delivery, results of delivery, complication during labour, complication during puerperium). Any significant past medical, surgical and gynaecological histories were taken including the used methods for contraception. According to our protocol of management all the diagnosed pregnant females were admitted between 34-36 weeks of gestation and elective termination of pregnancy was planned at completed 37 weeks of gestation. All patients were evaluated by Trans abdominal ultrasound [7] and trans vaginal ultrasound (TVS)before hospital admission and a diagnosis of placenta praevia was made if the lower edge of the placenta is less than 2 cm form the internal os of the cervix[8].Placenta accretaspectrum (PAS) was considered according to the presence of at least 2 of the following signs[9, 10]:

- Multiple placental lacunae with turbulent blood flow
- Loss or irregularity of the retroplacental hypoechoic space
- Irregularities of myometrial–bladder interface
- Myometrial thickness at placental bed less than1 mm
- Bulging of placenta into a nearby organ
- Increased uterovesical vascularity with multiple bridging vessels
- Multiple placental lacunae feeder vessels

All the collected data by ultrasound were compared to intraoperative findings and final grading system was put according to FIGO classification 2019 [11]:

- **Grade 1: Placenta accreta**

Intraoperative assessment:there is no placental bulge at the site of implantation, absent or very low vascularity

- **Grade 2: Placenta Increta**

Intraoperative assessment: bluish placental bulge at the site of implantation, increased vascularity (multiple vessels running over the serosa of the uterus), no placental invasion to the serosa of the uterus, no placental separation after cord traction

- **Grade 3: Placenta Percreta**

- **Grade 3a:** Limited to the uterine serosa Intraoperative assessment: placental bulge over uterine serosa and presences of a clear dissection plane between the urinary bladder and uterine serosa
- **Grade 3b**: With urinary bladder invasion Intraoperative assessment: Placental invasionto urinary bladder only and non-identifiable dissection plane between the urinary bladder and uterine serosa
- **Grade 3c:** With invasion of other pelvic tissue/organs Intraoperative assessment: Placental invasionto other pelvic structures e.g. (vagina, broad ligament and lateral pelvic walls)

The data were analysed after classifying patients into 2 groups: low risk group (diagnosed to have grade 1)and high-risk group (diagnosed to have grade 2 or more) after ultrasound and intraoperative assessment.

Outcome measurements

Primary outcome

The primary outcome was the correlation-

between the indication for the primary CD (elective without labour or emergency after some labour) and the degree of placenta accrete spectrum.

Secondary outcome

Secondary outcomes were correlation between parity, gravidity, place of the primary CD, assisted conception and the degree of PAS.

Assessment of the maternal and foetal complication during and after delivery for patients with different grades of PAS.

Statistical analysis and data interpretation

Data were analysed using IBM SPSS Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp. Qualitative data were described as number and percent. Quantitative data were described as median (minimum and maximum) & inter quartile range for non-parametric data and mean, standard deviation for parametric data after testing normality using Kolmogrov-Smirnov test. Significance of the obtained results was judged at the (0.05) level. For Qualitative data Chi-Square test was used tocompare≥2 groups.Monte Carlo test as correction for Chi-Square test when more than 25% of cells have count less than 5 in tables (>2*2).Fischer Exact test was used as correction for Chi-Square test when more than 25% of cells have count less than 5 in 2*2tables.Student's t-test was used to compare 2 independent groups for parametric data. Mann-Whitney U test was used to compare 2 independent groups for non- parametric data.

Results

We conducted a cross sectional study over 12 months to assess the correlation between degree of placenta invasion after primary caesarean delivery and the indications of this delivery. Also, we tried to specify the most frequent area of referral in our locality. Out of 267 cases were referred to our centre for elective termination of pregnancy due having different degrees of PAS only 47 cases fulfilled our inclusion criteria. After intraoperative assessment we found that 29.8% of cases were copping with low risk group and 70.2% of cases were copping with high risk group (figure 1).

There were no statistically significant differences between both groups regarding base line and sociodemographic data (table1). The mean ages of patients were (27.6 ± 4.6 & 27.6 ± 4.6, p value =0.961) respectively. The median gravidity was (3 & 2) in both groups. Only 4 cases had history of surgical evacuation of abortion in the low risk group and 6 cases in the high-risk group. On the other hand, 35.7% of cases had history of passive cigarette smoking in the low risk group and about 15.5% in the high-risk group. Intrauterine device was used as a method of contraception in about (78.6% & 57.6%) of low and high-risk groups respectively (table 1).

After assessing the different indications of the primary caesarean delivery in both groups, we found that 36.4 % of case in the high-risk group had unreliable indications of the primary CD. Reliable indications for caesarean deliveries were found in about 18 % of cases in the high-risk group either due to failure to progress in labour or foetal distress (table 2). Only 4 cases in the high-risk group had elective termination of pregnancy due to either foetal malpresentations or cephalopelvic disproportions (table 2). Although it is not recommended nowadays, we found that (7.1% & 15.2) of cases in the low and high-risk groups were requesting elective CD respectively (table 2).There was no statistically significant difference between both groups in the duration of previous CD (2.3 & 2.2 years) in the low and high-risk groups respectively.

Many recommendations were published regarding the plan of management of patients with PAS [12]. According to our local protocol of management we admit patients be-

tween 34-36 weeks of gestations and we arrange for elective termination of pregnancy at 37 weeks of gestation unless there is another indication of earlier termination of pregnancy. We reported successful conservative management in both groups using either cervico-isthmic compression suture or step wise approach (table 3). However serious complications were reported during management of high-risk group (table 3). There was statistically significant in the mean amount of intraoperative blood loss (1000 ml (850-1200)&1600 ml (850-2500), $p<0.001$) in the low and high-risk groups respectively. Transfusion of ≥ 4 units of packed RBCs were present in 18 % of cases in the high-risk group. Also, pulmonary embolism was diagnosed in one case in the high-risk group and administration of thrombolytic therapy was done to save her life. Urinary bladder injury also was reported in one case in the high-risk group which was in need for urological consultation and management. In spite of being rare condition to coexist with PAS, we reported one case of sever preeclampsia and HELLP (haemolysis, elevated liver enzymes and low platelet count) syndrome among patients in the high-risk group (table 3). There was statistically significant longer hospital stay duration among patients in the high-risk group ranging from 2 days up to 21 days according to the complication and plan of management after surgery. On the other hand, there were no serious complications reported in the low risk group (table 3).

There were no statistically significant differences in the foetal and neonatal outcomes between both groups (table 4). The mean foetal weights were (2968.6 gm ± 705.6& 2766.7 gm ± 607) in the low risk and high-risk groups respectively. Only 3 cases in the high-risk group were in need for neonatal intensive care unit after delivery and discharged after supportive treatment in a good health. Also 3 cases were diagnosed with intrauterine foetal death and it was an indication for early termination of pregnancy.

We studied the geographical distribution of the sites of primary CD and we found a higher incidence at certain areas and cites (figure 2) which could target a future research to assess the obstetric care and practice at such centres and to recommend more auditing of their practice.

Discussion

Placenta accrete spectrum is considered to be one of the high-risk conditions during pregnancy. Caesarean delivery also considered to be one of the major risk factors for having PAS. This is mostly due to abnormal trophoblastic invasion at the site of previous CD scar. With increasing incidence of CD nowadays, PAS complicated pregnancies are increasing specially in the developing countries. The CD rate in Egypt is increasing in the past decade[1, 13]. In our centre we perform between 250-300 delivers annually for pregnant ladies with different grades of PAS. We conducted this cross-sectional study to correlate the degree of severity of PAS with different indications of primary CD and trying to specify if there are certain areas of higher incidence in our locality. Out of 47 cases with PAS after only one CD we found 70.2 % of cases had high grade of PAS ($\geq$ grade 2). It is known that the risk of having PAS is going to be about 3% after one CD[14].In another study about 22 % of 46 pregnant females with PAS were following the first CD[15]. In our study we classified our patients into low risk group and high-risk group after ultrasonic assessment this is due to the increased risk of anaesthetic, intraoperative, and post-operative complications in the high-risk group. In the high-riskgroup,about (18.2%, 15.2% and 57.6%) of cases had past history of surgical evacuation of abortion, passive smoking and using IUCD as a method of contraception respectively. This in comparison to a German study in which about 52% of cases had history of uterine curettage[15]. Being performed in private facilities, most of indications of the primary CD were not scientifically sound. Only (21.4% & 30.3 %) of primary CD were

done due reliable indications in the low and high-risk groups respectively. In spite of being recommended by WHO to justify the indications for primary CD[16], still there is unjustified obstetric practice in the developing countries. Maternal request was an indication of primary CD for 15% of cases in a study comparing the elective and emergency primary CD[17]. In another study the CD rate was 18.7% in a multicentric study conducted at Bhutan[18].

Different management protocols were put in order to guide clinical practice during treatment of PAS disorders[12]. We adopted hospital admission 1-2 weeks before delivery and termination of pregnancy after completing 37 weeks of gestation. As we were treating young age patients (mean age 27 years) with low parity we were trying to perform fertility sparing surgery during delivery. This was done after counselling of patients and arranging multi-disciplinary team (MDT) to lead the plan of management. As it was known also that many techniques were safe and effective during doing fertility preservation surgery [19]. Starting from the choice of type of anaesthesia [20] , till the choice of surgical technique .intraoperative and post-operative care are crucial parts in our plan. We succeeded to preserve fertility in all cases after using cervico-isthmic compression technique[21] and stepwise approach [6]. We preferred to do pelvic devascularization before placental delivery during performing the stepwise approach in high risk cases as it was expected to have more bleeding (1600ml (850-2500) in high risk group) and more need for blood transfusion (≥3 unites of packed RBCs in 36.4% of high-risk cases). The median hospital stay was (2 and 4 days) in the low and high-risk groups respectively. We reported 3 cases of intraoperative pulmonary embolism, urinary bladder injury and HEELP syndrome. All cases were in the high-risk group. In another study the median blood loss was (1600 ml (1100-2750)) and the median hospital stay was 6 days , also they reported one case of urinary bladder injury [15]. However, this study was conducted on patients with different grades of PAS and not restricted to only previous one CD. Our foetal and neonatal outcomes were comparable in both study groups and only 3 cases were diagnosed antenatally with IUFD and it was an indication of early termination of pregnancy. The estimated foetal weights (EFW) at delivery were (2968.57 gm ± 705.75&2766.67 gm ± 606.96) in the low and high-risk groups respectively. Only 3 neonates in the high-risk group were in need of NICU admission and were discharged in a good health. The mean EFW was 2750 gm (2235, 3156) and 41% of neonates were in need for NICU admission[15]. This could be due to adopting different protocol of management and different indication for termination of pregnancy. We performed a geographical distribution analysis for the place of primary CD in our study (figure 2) and we found that only 2 cases had the primary CD delivery at a governmental hospital while 45 cases were done at private facilities. Also, we localized certain cities in our locality with higher rates of primary CD. We recommend a future research to focused in such cites and trying to optimize the obstetric practice in such cities so as to minimize these high rates of primary CD and to prevent its future maternal and foetal complications which could life threatening.

In conclusion it is mandatory to decrease the rate of primary CD specially in low resource countries and optimize the obstetric care in our locality to prevent the major maternal of foetal complication that could happen due to having future PAS. Also, fertility sparing surgery is feasible during delivery of patients having different grades of PAS after one CD. MDT is mandatory during surgical management of PAS disorders.

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Disclosure

All authors disclose no conflict of interest.

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Table (1): Socio-demographic characteristics and past obstetric history among studied pregnant females.

Age/years **Mean ± SD**	27.64 ± 4.63	27.73 ± 5.58	t=0.05 p=0.961
BMI (kg/m2) **Mean ± SD**	26.49 ± 3.02	27.60 ± 3.52	t=1.04 p=0.305
Gravidity **Median (min-max)**	3 (2.0-5.0)	2.0 (2.0-14.0)	z=0.727 p=0.467
Parity **Median (min-max)**	1.0 (1.0-3.0)	1.0 (1.0-3.0)	z=0.212 p=0.832
Abortion **Median (min-max)**	0.0 (0.0-3.0)	0.0 (0.0-10.0)	z=0.133 p=0.894
History of Uterine surgery n (%) **No** **MVA**	 10 (71.4) 4 (28.6)	 27 (81.8) 6 (18.2)	χ^2=0.33 P=0.426
Smoking n (%) **No** **passive smoker**	 9 (64.3) 5 (35.7)	 28 (84.8) 5 (15.2)	χ^2=2.48 P=0.115
IUD usage n (%) **No** **Yes**	 3 (21.4) 11 (78.6)	 14 (42.4) 19 (57.6)	χ^2=1.88 P=0.171

Z: Mann Whitney U test , IQR: Interquartile range , t:Student t test χ2=Chi-Square test
BMI: body mass index, MVA: manual vacuum aspiration, IUD: Intrauterine device
*statistically significant (if p<0.05)

Table (2): Different indications and duration of primary Caesarean delivery among studied females.

Indications of CD			
Unreliable	8 (57.1)	12(36.4)	χ^2=1.74 p=0.19
EROM	2 (14.3)	3 (9.1)	FET P=0.59
Patient demand	1 (7.1)	5 (15.2)	FET P=0.45
ICSI	0	1 (3.0)	FET P=0.51
Failure to progress	2 (14.3)	3 (9.1)	FET P=0.62
Fetal distress	1 (7.1)	3 (9.1)	FET P=1.0
Cephalopelvic disproportion	0	1 (3.0)	FET P=1.0
Breech presentation	0	3 (9.1)	FET P=0.54
APS	0	2 (6.1)	FET P=1.0
Duration of previous CS median (min-max)	2.3 (1.0-5.0)	2.2 (0.5-6.5)	z=0.548 p=0.583

FET: Fischer exact test, χ2=Chi-Square test,EROM: Early rupture of membranes, ICSI: Intracytoplasmic sperm injection, APS: Antiphospholipid syndrome, CD: Caesarean delivery *statistically significant (if p<0.05)

Table (3): Intraoperative management and hospital stay and maternal complications of patients with different grades of placenta accrete spectrum.

Gestational age at delivery/week Median (min-max)	37.0 (25.0-39.0)	37.0 (19.0-38.0)	t=0.960 p=0.342
Used surgical techniques n (%) **Cervico-isthmic suture** **Stepwise approach**	14 (100) 0	27 (81.8) 6 (18.2)	χ^2=2.92 P=0.09
Units of blood transfusion n (%) **1** **2** **3** **4** **5**	13 (92.9) 1 (7.1) 0 0 0	7 (21.2) 14 (42.4) 6 (18.2) 5 (15.2) 1 (3.0)	MC P<0.001*
Intraoperative blood loss/ ml median (min-max)	1000 (850-1200)	1600 (850-2500)	z=4.24 p<0.001*
Duration of hospital stay /days median (min-max)	2.0 (2.0-4.0)	4.0 (2.0-21.0)	z=3.79 p<0.001*
Maternal Complications n (%) **No** **Pulmonary embolism** **Paralytic ileus** **HELLP syndrome** **Bladder injury**	14 (100.0) 0 0 0 0	29 (87.9) 1 (3.0) 1 (3.0) 1 (3.0) 1 (3.0)	p=0.762

Used tests: Chi-Square test, z: Mann Whitney U test, FET:Fischer exact test, MC:Monte Carlo test HELLP: Haemolysis, Elevated Liver enzymes and Low Platelet count *statistically significant (if p<0.05)

Table (4): Foetal and neonatal outcomes of patients with different grades of placenta accrete spectrum.

Foetal weight/gm Mean ± SD	2968.57 ± 705.75	2766.67 ± 606.96	t=0.994 p=0.326
NICU# n (%) **No** **Yes**	13 (100.0) 0 (0.0)	28 (90.3) 3 (9.7)	FET P=0.544
Ordinary ICU n (%) **No** **Yes**	10 (76.9) 3 (23.1)	16 (51.6) 15 (48.4)	χ2=2.43 P=0.119

3 cases with IUFD

Used tests: Chi-Square test, z: Mann Whitney U test, FET:Fischer exact test, MC: Monte Carlo test

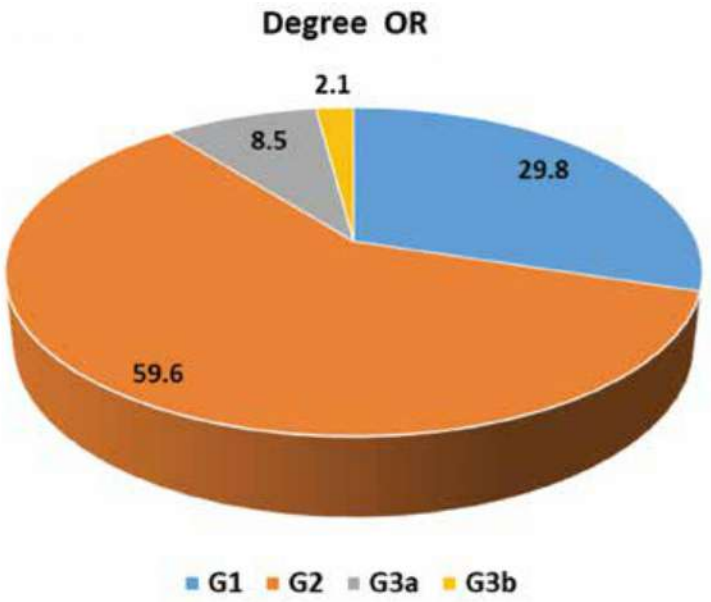
NICU: Neonatal intensive care unit, ICU: intensive care unit

*statistically significant (if p<0.05)

Legends of figures

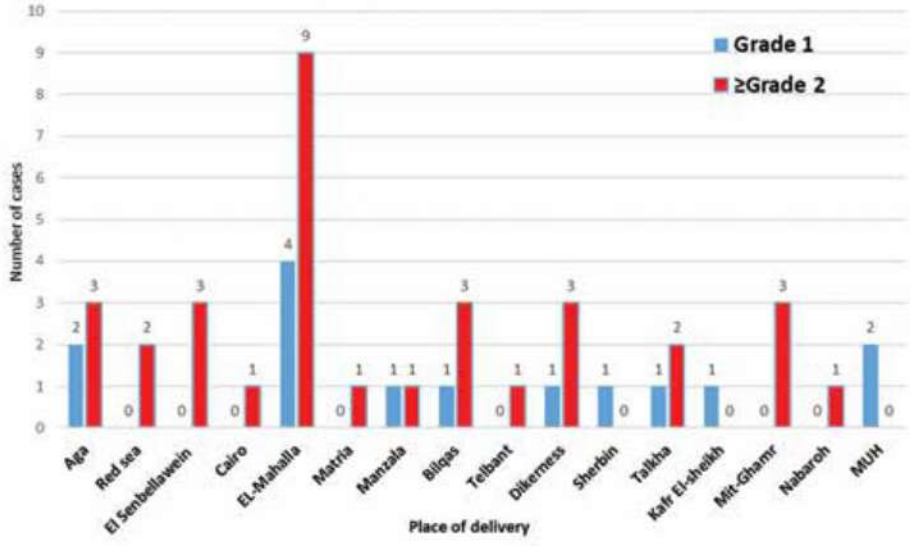
Figure (1)Different grades of placenta accrete spectrum after intraoperative (OR) assessment according to the International Federation of Gynaecology and Obstetrics (FIGO) 2019 classification.
Figure (2)Geographical distribution of primary caesarean delivery places among the studied pregnant females. Patients were classified into low risk (grade 1) and high risk (≥ grade 2) according to the International Federation of Gynaecology and Obstetrics (FIGO) 2019

Figure (1)



Data were presented as percentage (%).
Abbreviations degree OR: degree after intraoperative assessment, G: Grade
Total number (n) = 47 cases

Figure (2)



Data were presented as numbers.
Low risk cases (Grade 1) total number = 14 cases
High risk cases (≥ Grade 2) total number = 33 cases
Abbreviations; MUH: Mansoura university hospitals