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Maternal and neonatal outcomes of couvelaire uterus

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Abstract

Couvelaire uterus is a life-threatening condition in which placental abruption causes bleeding that penetrates the uterine myometrium. The objective of this study was to determine the risk factors of Couvelaire uterus and maternal and neonatal outcomes. Obstetrics emergency clinic data between January 2013 – December 2019 were screened and placental abruption patients confirmed by pathology or surgery note were recruited. Patients were divided into two groups; with or without Couvelaire uterus. Clinical features; such as maternal age, gravida, parity, gestational age at delivery, comorbidities, chief complaint, ultrasonography examination, placental pathology, degree of placental separation, DIC (disseminated intravascular coagulation), required hysterectomy and transfusion, maternal hemoglobin, maternal or fetal ICU (intensive care unit) admission, neonatal birth weight, APGAR 1' and 5' scores were compared. Age, gravida, and parity were significantly higher in patients with couvelaire uterus ( $p < 0.001$ ,  $p = 0.017$ ,  $p = 0.034$  respectively). The degree of placental separation was significantly larger and APGAR 1' and 5' scores significantly lower in the Couvelaire uterus group ( $p < 0.001$ ). Incident of Couvelaire uterus increases with higher age, gravida, and parity. Neonatal APGAR scores were lower and intrauterine fetal death rates were higher in Couvelaire uterus patients.

**Keywords:** Couvelaire uterus, fetal mortality, placental abruption, pregnancy, risk factors

Introduction

Placental abruption is the separation of a normally situated placenta before the delivery of the fetus [1]. This rare but significant cause for both maternal and neonatal mortality occurs in about 0.2%-1% of pregnancies [2,3]. The most common presentations are vaginal bleeding with abdominal pain, tetanic uterus contractions, and fetal distress in non-stress tests (NST). While the etiology of abruptio placentae remains unclear, there are well-documented risk factors as previous abruption, multiparity, advanced maternal age, maternal hypertension, premature rupture of membranes, polyhydramnios, multiple gestation, and abdominal trauma. Maternal, fetal, and neonatal common severe outcomes of placental abruptions are postpartum hemorrhage and coagulopathy, multiorgan failure as shown in the literature [4,5].

Couvelaire uterus is a rare complication of severe placental abruption. In a systematic review, the Couvelaire uterus was found

16.5% in placental abruption patients and with the critical maternal morbidity leading to emergency hysterectomy [6]. It occurs when vascular damage within the placenta causes hemorrhaging that progresses to and infiltrates the wall of the uterus. It is a syndrome that can only be diagnosed by direct visualization or biopsy (or both) [7].

Although Couvelaire uterus is a syndrome with critical results, there are limited studies comparing patients with or without Couvelaire uterus regarding maternal and fetal outcomes. We aimed to assess the impact of the Couvelaire uterus on maternal perinatal morbidity and mortality.

Materials and Methods

Placental abruption patients admitted in obstetrics emergency clinic between January 2013 – December 2019 were recruited. Clinical data, operation notes, and laboratory findings were obtained from computer-based data systems and patients files. 137 placental abruption patients confirmed by pathology or surgery note, were included in the study. 188 patients were excluded with the differential diagnosis of vaginal bleeding includes preterm labor and placenta previa. Demographics, chief complaint, ultrasound

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examination, and laboratory findings were collected.

33.6% of 137 placental abruption patients who met the criteria were complicated with Couvelaire uterus. On inspection, the uterus was found to have dark purple patches with ecchymosis and indurations diagnostic of Couvelaire uterus or uteroplacental apoplexy [7]. Patients were divided into two groups; with (n=46) or without (n=91) Couvelaire uterus. Following data were extracted and compared between groups: maternal age, gravida, parity, gestational week, comorbidity, chief complaint, ultrasound examination, placental pathology, degree of placental separation, DIC, the requirement of hysterectomy or transfusion, pre- and postpartum hemoglobin, maternal and neonatal ICU admission, neonatal birth weight and 1'-5' APGAR scores.

Kolmogorov-Smirnov test was used for normality tests, box plots and histograms were used as graphical methods. We performed  $\chi^2$  or Fisher exact for categorical and Mann-Whitney U test for ordinal or continuous variables. Wilcoxon test was used to compare repeated measurements. Categorical variables were summarized using frequencies and percentages, whereas mean and standard deviation were used for continuous variables. A p-value of <0.05 was considered statistically significant. Statistical analyses were conducted using SPSS (SPSS Inc., Chicago, IL).

This retrospective study was held in our obstetrics clinic, after approval of the local ethical committee. The registration number is 2020/9-29.

## Results

Our total birth count was 67.773 between January 2013-December 2019. 0.002% of the births were diagnosed as placental abruption. Detailed demographics of the patients were shown in table 1. 66.4% (n=91) of the patients were without and 33.6% (n=46) of the patients with Couvelaire uterus. Age, gravida, and parity were higher in Couvelaire uterus patients (p<0.001, p=0.017, p=0.034 respectively). Also the degree of placental separation significantly larger in Couvelaire cases (p=0.001). 15 subjects (32.6%) with Couvelaire uterus required transfusion, whereas only 9 subjects (9.9%) without Couvelaire syndrome needed transfusion (p=0.001). 1' and 5' APGAR scores of the patients' neonates without Couvelaire uterus were significantly higher (p<0.001, p<0.001). Both groups were mostly presented with vaginal bleeding. Placental pathology was performed in 28 patients and there was no significant difference between the groups. Comparison analysis of the groups presented in Table 2.

**Table 1.** Demographics of placental abruption patients

Demographics	Mean±SD	Median(Min-max)
Age	27.45±6.02	27(17-40)
Gravida	2.69±1.95	2(1-15)
Parity	1.36±1.39	1(0-8)
Gestational week	33.48±5.13	34(20-41)
<b>Comorbidity n(%)</b>		
Diabetes mellitus	3(2.2)	
Preeclampsia	5(3.6)	
Cholestasis	1(0.7)	

**Table 2.** Demographics and clinical features of placental abruption patients complicated with Couvelaire Uterus

	Placental Abruption		P
	Without CU (n:91) Mean±SD	With CU (n:46) Mean±SD	
Age	26.03±5.55	30.24±5.99	<0.001*
Gravida	2.45±1.91	3.17±1.97	0.017*
Parity	1.13±1.10	1.83±1.77	0.034*
Gestational week	33.91±4.88	32.63±5.55	0.229*
<b>Hemoglobin</b>			
Prepartum	11.30±1.45	10.85±1.35	0.175*
Postpartum	9.64±1.51	8.90±1.59	0.006*
ΔHemoglobin	-1.65±1.77	-1.95±1.24	0.122
Birth weight	2138±863	1904±1066	0.134*
<b>APGAR</b>			
1'	5.08±2.26	2.07±2.47	<0.001*
5'	6.36±2.50	2.98±3.30	<0.001*
	<b>n(%)</b>	<b>n(%)</b>	
<b>Comorbidity</b>			
Diabetes mellitus	2(2.2)	1(2.2)	1.000
Preeclampsia	3(3.3)	2(4.3)	1.000
Diabetes mellitus+Cholestasis	0(0)	1(2.2)	0.336
<b>Chief complaint</b>			
Vaginal bleeding	30(33)	18(39.1)	0.475
Abdominal pain	15(16.5)	3(6.5)	0.103
PROM	13(14.3)	4(8.7)	0.349
Decreased fetal movements	7(7.7)	4(8.7)	0.838
Vaginal bleeding+abdominal pain	17(18.7)	12(26.1)	0.316
Vaginal bleeding+PROM	2(2.2)	0(0)	0.551
Vaginal bleeding+Decreased fetal movements	5(5.5)	4(8.7)	0.484
Abdominal pain+Decreased fetal movements	2(2.2)	1(2.2)	1.000
<b>Ultrasound Examination</b>			
None	82(90.1)	39(84.8)	0.359
Thickened placenta	9(7.7)	6(13)	0.360
Thickened placenta+Fetal death	0(0)	1(2.2)	0.336
<b>Placenta pathology</b>			
Bleeding in placental bed and fibrin accumulation	16(17.6)	12(26.1)	0.244**
<b>Surgery note</b>			
Minimal abruption	8(8.8)	0(0)	0.051
1/3 abruption	57(62.6)	0(0)	<0.001
2/3 abruption	26(28.6)	23(50)	0.013
Total abruption	0(0)	23(50)	<0.001
Transfusion requirement	9(9.9)	15(32.6)	0.001**
<b>Neonatal ICU admission</b>			
None	40(44)	8(17.4)	0.002
ICU admission	39(42.9)	14(30.4)	0.159
Neonatal death	6(6.6)	5(10.9)	0.507
Fetal death	6(6.6)	19(41.3)	<0.001

\*: Mann Whitney U test, \*\*:  $\chi^2$  test, CU: Couvelaire uterus, PROM: Premature rupture of membranes, ICU: Intensive care unit.

## Discussion

Abruptio placentae is a common and considerable pregnancy complication, also one of the major causes of vaginal bleeding. It is associated with critical obstetrics complications with attendant increased risks of perinatal and maternal morbidity and mortality [5,8-11]. Prevalence of placental abruption is in between 0.2%-1% [2,3]. Rates can vary considerably depending on the countries regarding modified diagnostics and management [12,13].

Incidence of the abruptio placenta was found 0.002% in our study. Lower rates could be associated with improved antenatal care and women's health perception also increased accessibility of pregnancy care. Cases of asymptomatic, mild, or chronic placental abruption were excluded considering no routine pathology examinations were performed in cesarean deliveries.

The incidence of Couvelier uterus in patients with abruption placenta in our study was 33.6%. The reason why this rate is higher than the rate reported in the literature may be that our hospital is a tertiary center in the region and a referral clinic.

Even though the pathophysiology remains speculative, the cause is considered to be inadequate trophoblastic invasion [14]. Abnormal placentation and vascular malformation result in hematoma in deciduae basalis and finally followed with placental abruption [15]. It brings along the decrease in maternal surface of the placenta which assures fetal oxygenation, fetal distress, and even fetal death [16].

Well-documented risk factors for abruption are multiparity, advanced maternal age, low socioeconomic status, smoking, abdominal trauma, alcohol assumption, cocaine use, polyhydramnios, multiple gestation, thrombophilia, and previous abruption whereas there may be others yet to unfold [9,17,18].

Ananth et al. stated advanced maternal age and multiparity in younger women are associated with a higher risk of placental abruption [19]. Furthermore Baumann et al. found multiparity (3 or more) is an age-independent risk factor [20]. Parker et al. presented data in European cases of ablatio placenta mean age was >30 [21]. Lower mean age in our study compared to other findings in Europe; maybe the result of early marriage and pregnancy age also increased age-related multiparity in our country. Similar findings also reported in other studies, maternal age, gravida, and parity increase risk of abruptio placentae complicated with Couvelaire uterus.

The diagnosis of abruptio placentae is primarily clinical, however, ultrasound examination is useful for mostly excluding placenta previa. It is noteworthy that approximately half of the women diagnosed with abruption are with negative sonographic findings [22]. Thus the sensitivity of ultrasound findings for the diagnosis of abruption is considerably low. In a study by Fadl et al., they determined the presence of progressive thickening may indicate an abruptio placentae [23]. In our study, only 9.5% of patients presented suggestive placental thickening.

In the study conducted by Su et al. in 2021, it was shown that maternal and fetal complications increase as the degree of placental separation increases [24]. In our study, a significant difference

was found between the two groups in terms of the surface area of placental abruption according to the data in the surgery notes. ( $p < 0.001$ ). While there was no total abruption in 91 cases without Couvelaire syndrome, 62.6%, 1/3 abruption, and 28.6%, 2/3 abruption was noted in those subjects. Yet 50% total and 50%, 2/3 abruption were shown in couvelaire uterus patients.

Placental abruption was found often associated with increased neonatal resuscitation need, ICU admission, and neonatal mortality in Downes et al.'s study [25]. Accordingly, in our study, there was a significant difference in 1' and 5' APGAR scores between the groups. Furthermore, there was a significant difference in fetal death ( $p < 0.001$ ) and neonatal ICU admission rates ( $p = 0.002$ ) in comparison of the groups. The reason for increased fetal and neonatal complications in cases with couvelaire uterus could be explained by the higher surface area of placental abruption.

In a systematic review, Downes et al. reported placental abruption correlated with increased cesarean delivery, vaginal bleeding, and perinatal mortality rates [26]. In a retrospective study conducted by Mei et al. in 2018, the chief complaint of 77% of patients was vaginal bleeding [27]. Consistent with other studies, the common chief complaint was vaginal bleeding. Our rates of vaginal bleeding in couvelaire uterus patients and the others were 33% and 39.1% respectively. All individuals in our study are delivered by cesarean section. 2 patients required emergency hysterectomy also DIC occurred in one of them as well as the need for massive transfusion and ICU admission. There was a significant difference when compared 32.6% of the couvelaire uterus versus 9.9% of those without couvelaire uterus patients who needed transfusion ( $p = 0.001$ ).

Our study stated higher maternal age, gravida, and parity increase the risk of developing the Couvelaire uterus. Couvelaire uterus development should be assessed in patients with placental abruption diagnosis plus advanced maternal age or multiparity. Considering the potential of adverse maternal and neonatal outcomes, establishing the diagnosis and appropriate management must initiate promptly; also blood and blood product replacement arrangements should be required pre-operation. However, prospective studies including larger patient groups are needed to clarify this subject.

### Conflict of interests

*The authors declare that they have no competing interests.*

### Financial Disclosure

*All authors declare no financial support.*

### Ethical approval

*This retrospective study was held in Izmir Tepecik Training and Research Hospital, Health Sciences University, after approval of local ethical committee. Registration number is 2020/9-29.*

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