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Histopathological Results and the Outcome of Women Who Underwent Postpartum Evacuation and Pelvic Ultrasound Scan

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ABSTRACT

Objectives: This study aimed to assess the proportion of women who underwent postpartum evacuation and were histopathologically confirmed to have retained products of conception (RPOC), compare the reliability of histopathology and ultrasound (US) in determining the presence of RPOC, and assess the maternal complications associated with postpartum evacuation. ***Methods***: A retrospective cross-sectional study was conducted on all women who delivered and had postpartum evacuation at a tertiary teaching hospital in Oman over 11 years from May 2009 to May 2020. The participants were divided into two groups based on their histopathology results. McNemar test was used to compare the sonographic results with the histopathological findings. ***Results:*** A total of 151 women were included in this study. The diagnosis of RPOC was confirmed in histopathological reports of 64 (42.4%) women (group 1) but not in 87 (57.6%) women (group 2). There was no significant difference between the two groups in maternal characteristics. Parameters of clinical presentation including fever and abdominal pain were significantly different between the two groups ($p = 0.026$ and $p = 0.028$, respectively). Vaginal bleeding was not significantly different between the groups ($p = 0.255$). Pelvic US detected RPOC in 135 (89.4%) women whereas the histopathology confirmed it in 64 (42.4%) women ($p < 0.001$). The sensitivity of US compared to histopathology in diagnosing RPOC was 98.4% (95% CI: 91.60–99.96) and the specificity was 17.2% (95% CI: 9.98–26.84). The overall diagnostic accuracy of US in detecting RPOC was 51.7%. Two (1.3%) women had hysterectomy as a result of the evacuation. Histopathology showed smooth muscle in 20 (13.2%) women. Significant bleeding during surgery occurred in 17 (11.3%) cases. ***Conclusions:*** Diagnosis of postpartum RPOC is challenging. Our results highlighted the complexity of diagnosing RPOC. Special training is needed for doctors to diagnose RPOC from transvaginal scans. A multicenter study in Oman with a larger sample size is recommended to confirm our findings.

Retained products of conception (RPOC) is a term used to describe the fetal or placental tissue that remains in the uterus after a vaginal term delivery, preterm delivery, incomplete miscarriage, or medically terminated pregnancy.[1] It is one of the most common clinical complications seen after a miscarriage or vaginal delivery.[2] RPOC is considered the second most common reported cause of postpartum hemorrhage, defined as blood loss of more than 500 mL after uterine atony.[3]

Presentation of women with RPOC varies from asymptomatic to severe abdominal or pelvic pain, fever, and early or delayed postpartum hemorrhage.[4] Challenging to diagnose, RPOC can result in serious long-term complications such as intrauterine adhesions and infertility.[5] For correct diagnosis, skilled clinical evaluation of signs and symptoms of RPOC and sensitive interpretation of pelvic ultrasound (US) scans are essential.[6]

Previous studies have suggested that transvaginal US scanning is the key diagnostic tool to

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differentiate normal from abnormal postpartum uterus, an additional tool being color Doppler scanning.[7] However, color Doppler has been shown to detect the general hypervascularity of thickened endometrium, which may be present in non-RPOC cases. Therefore, Doppler is not considered a specific diagnostic tool for RPOC.[4] US scanning also has limitations — its findings of hyperechoic or mixed echogenicity mass with a thickened endometrium are not reliable for diagnosing RPOC due to factors such as operator error and presence of clots in the uterus.

Another important diagnostic technique for RPOC is hysteroscopy as it could be done for asymptomatic patients with high suspicion of RPOC if US was inconclusive.[8] However, this procedure is not recommended during the immediate postpartum period due to the risk of complications such as uterine perforation and infection.[8]

The gold standard procedure to diagnose RPOC is dilatation and/or evacuation and curettage and histopathological examination of the sample obtained from the uterine cavity. Histopathological results will confirm the presence of fetal or placental tissue. A study by Thangarajah et al,[9] has shown that 61.5% of suspected RPOC cases were confirmed histopathologically. However, performing this procedure during the postpartum period risks complications such as uterine perforation, infection, cervical laceration, subsequent uterine cavity adhesion, abnormal implantation in future gestation, and sometimes even necessitating hysterectomy.[10]

We conducted this study to review the histopathological results of women who underwent postpartum evacuation at Sultan Qaboos University Hospital (SQUH), Muscat. We also sought to correlate the US results with histopathological results—the gold standard—to assess the diagnostic value of sonography in detection of RPOC in postpartum women. The outcomes of those cases were assessed. The results of this study might help in deciding whether surgery can be avoided in certain cases.

METHODS

This was a retrospective cross-sectional study based on the hospital records of all women who delivered and underwent postpartum evacuation at SQUH during the 11-year period from May 2009–May 2020. The sample size was calculated for a single proportion for an absolute precision of 8% assuming that the proportion of RPOC was 50% among women who had postpartum evacuation. For desired CI of 95%, the required sample size was estimated at 151 patients. Prior to data collection, institutional ethical committee approval was obtained from the Medical Research Ethics Committee, College of Medicine and Health Sciences, SQU (MREC#2207).

The inclusion criteria were as follows: female patients of childbearing age who underwent pelvic US scan for suspected RPOC after delivery, had evacuation performed at SQUH, and whose final histopathology diagnosis was available. The exclusion criteria were: postpartum women who underwent evacuation without pelvic US and those who underwent delayed evacuation (seven days post-delivery).

The following data was collected from the hospital information system: maternal socio-demographics including age and body mass index; obstetrical history including parity, prior abortion, prior cesarean section, prior vaginal delivery, prior dilatation and curettage (D&C), gestational diabetes, and infection with Group B *Streptococcus*; pregnancy details including gestational age at delivery, history of blood transfusion, hemoglobin levels pre- and post-delivery, mode of delivery (vaginal or cesarean section), placenta delivery details (spontaneous or manual), D&C, and estimated blood loss prior to and post-surgery; postpartum presentation including hemorrhage, abdominal pain, and fever; uterus features on pelvic scan heterogeneity (hyperechoic) and uterine anomalies; and histopathology results: RPOC, decidua, and/or clots.

Based on the diagnosis of RPOC, the subjects were divided into two groups—Group 1: women with histopathologically-confirmed RPOC defined as the presence of remnants of placental trophoblastic tissue; and Group 2: women with negative histopathological results for RPOC.

Data analysis was performed using IBM SPSS statistical software (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.). Continuous variables were presented as mean±SD, whereas categorical variables were presented as frequency and percentage. Means between two independent groups were compared using the independent samples *t*-test. Associations between two categorical variables were tested using a Chi-square test (Fisher's exact/likelihood ratio). A

multivariate binary logistic regression analysis was performed to determine the independent predictors of RPOC. McNemar test was used to determine the association of US findings with the histopathology results of RPOC. A p-value < 0.05 was considered statistically significant.

RESULTS

The study included 151 women who met the inclusion criteria, whereas 349 women were excluded as they had D&C without pelvic US being performed or underwent delayed evacuation (seven days post-delivery. RPOC was confirmed histopathologically in 64 (42.4%) women (group 1), while 87 (57.6%) women had negative histopathological reports for RPOC (group 2). The mean age of the women in group 1 was 32.0 years, against 31.5 years in group 2; however, the difference was not statistically significant ($p = 0.604$). The mean body mass index difference between group 1 (28.3 kg/m^2) and group 2 (29.0 kg/m^2) was also not significant ($p = 0.495$). The mean parity of group 1 women was 2.6 versus 2.9 in group 2, again lacking in significance ($p = 0.478$). The mean gestational age at delivery for group 1 was 37.9 weeks, which also did not differ significantly from those of group 2 whose mean gestational age was 37.5 weeks [Table 1].

We found that 24 of 37 (64.9%) women with history of prior abortion had confirmed results for RPOC, which was significantly higher than those who had prior abortion history but negative histopathological results (13 of 37; 35.1%; $p = 0.002$). Four out of 12 (33.3%) women with history of prior cesarean section had RPOC (group 1), however, there was no statistically significant association. Thirty-nine out of 89 (43.8%) women with history of prior vaginal delivery had confirmed histopathological results for RPOC.

Among women with history of prior curettage, 15 of 24 (62.5%) had positive histopathological results for RPOC, while nine of 24 (37.5%) had negative results ($p = 0.042$). Table 2 describes more predictive parameters.

A significantly higher percentage of women from group 1, (12; 18.8%) presented with postpartum fever compared to those from group 2 (5; 5.7%; $p = 0.026$). Again, postpartum abdominal pain (a clinical symptom of RPOC) was proportionately higher among group 1 (19; 29.7%), than among group 2 ($p = 0.028$). The difference in increased vaginal bleeding after delivery was not statistically significant between the two groups [Table 3].

US findings suspected the presence of RPOC in 135 (89.4%) cases, and histopathologic

Table 1: Maternal demographics (N = 151).

Characteristics	Positive (n = 64) Mean ± SD	Negative (n = 87) Mean ± SD	p-value
Age, year	32.00 ± 5.90	31.52 ± 5.45	0.604
BMI, kg/m^2	28.33 ± 6.52	29.05 ± 6.21	0.495
Parity	2.63 ± 1.71	2.91 ± 2.82	0.478
Gestational age, weeks	37.95 ± 2.79	37.54 ± 3.10	0.400

BMI: body mass index.

Table 2: Potential predictive parameters for the presence of retained products of conception (N = 151).

Characteristics	Positive (n = 64) n (%)	Negative (n = 87) n (%)	p-value
Prior abortion (≥ 1)	24 (64.9)	13 (35.1)	0.002*
Prior cesarean section	4 (33.3)	8 (66.7)	0.560
Prior vaginal delivery (≥ 1)	39 (43.8)	50 (56.2)	0.739
Prior curettage (≥ 1)	15 (62.5)	9 (37.5)	0.042*
Gestational diabetes	22 (44.9)	27 (55.1)	0.726
Infection with Group β-*Streptococcus*	8 (47.1)	9 (52.9)	0.796

**Statistically significant.*

Table 3: Prevalence of clinical symptoms in RPOC positive women versus RPOC negative women (N = 151).

Symptoms	Positive (n = 64) n (%)	Negative (n = 87) n (%)	*p*-value
Postpartum fever	12 (70.6)	5 (29.4)	0.026*
Postpartum abdominal pain	19 (59.4)	13 (40.6)	0.028*
Increased vaginal bleeding after delivery	5 (29.4)	12 (70.6)	0.225

*RPOC: retained products of conception; *Statistically significant.*

Table 4: Comparison of sonographic and histopathological findings of RPOC (N = 151).

RPOC in ultrasound	RPOC in histopathology		
	Absent n (%)	Present n (%)	*p*-value
Absent	15 (17.2)	1 (1.6)	
Present	72 (82.8)	63 (98.4)	< 0.001*
Total	87 (100)	64 (100)	

*RPOC: retained products of conception. *Statistically significant (McNemar test).*

examination confirmed RPOC in 64 (42.4%) cases ($p < 0.001$) [Table 4].

According to these results, US had a sensitivity of 98.4% (95% CI: 91.60–99.96), specificity of 17.2% (95% CI: 9.98–26.84), positive predictive value (PPV) of 46.7%, negative predictive value (NPV) of 93.8%, and diagnostic accuracy of 51.7%.

Of the 151 women, two (1.3%) had hysterectomy as a life-saving procedure. Histopathology results showed 20 (13.2%) cases of smooth muscle. Records mentioned 17 (11.3%) women having significant bleeding during surgery (estimated blood loss > 500 mL).

We performed a multivariate binary logistic regression analysis to determine the independent predictors of RPOC; prior abortion was the only significant predictor of RPOC in the multivariate analysis. Patients who had prior abortion(s) were three times more likely to have RPOC compared to those who had not (odds ratio = 3.093, 95% CI: 1.113–8.593; $p = 0.030$) [Table 5].

DISCUSSION

RPOC are noted in about 1% of postpartum women.[11] Histopathologic examination of the tissue obtained from the uterus after postpartum evacuation is considered the most accurate tool in the diagnosis of RPOC.[4] We followed the same principle in this study. Our results have shown that histopathology confirmed RPOC in 42.4% of our study population. A recent study conducted in Jerusalem had similar results where 55% of 96 patients had confirmed RPOC histopathologically.[12] A previous work that was conducted in Pakistan confirmed RPOC by histopathology in 58.6% of 193 patients.[9] A study conducted in Southern Iran confirmed RPOC histopathologically in 62.4% of 109 patients.[13] The minor differences in the results might be due to differences in the demographic features of various cohorts.

It should be borne in mind that postpartum evacuation can have potentially serious

Table 5: Multivariate binary logistic regression analysis to determine the independent predictors of RPOC.

Characteristics	B	*p*-value	Odds ratio	95% CI
Age, years	0.008	0.796	1.008	0.949–1.071
Prior abortion (≥ 1)				
No (Reference)	-	-	-	
Yes	1.129	0.030*	3.093	1.113–8.593
Prior curettage (≥ 1)				
No (Reference)	-	-	-	
Yes	0.060	0.922	1.062	0.316–3.575
Postpartum abdominal pain				
No (Reference)	-	-	-	
Yes	0.552	0.224	1.737	0.713–4.236
Postpartum fever				
No (Reference)	-	-	-	
Yes	0.860	0.140	2.363	0.755–7.394

*RPOC: retained products of conception; B: regression coefficient. *Statistically significant.*

consequences. In our cohort, 13.2% of patients were histopathologically found to have smooth muscle, which carries a risk for Asherman syndrome and adhesion. During the evacuation, 11.3% of patients had bleeding. Hysterectomy was performed later in 1.3% of patients. These results correlate well with a study in the USA which found similar complications in women who underwent postpartum evacuation, where 0.3% of them had hysterectomy and 3.8% had severe bleeding during evacuation.[14] Another study conducted in Croatia had a higher reported rate of complications as a result of postpartum evacuation including uterine perforation, uterine atony, and massive bleeding resulting in 4.4% of the cohort having to undergo lifesaving hysterectomy.[15]

In view of the above risks, postpartum evacuation should be performed only where essential, hence the challenge of accurately diagnosing RPOC. Transvaginal sonography is the preferred non-invasive tool to evaluate the uterine cavity and detect suspected RPOC. Within this framework, we calculated the diagnostic accuracy of US results that showed suspected RPOC. Compared to histopathology, US results had a sensitivity of 98.4% and specificity of 17.2% with a diagnostic accuracy of 51.7%, PPV of 46.7%, and NPV of 93.8% in diagnosing RPOC. The low PPV suggested that the majority of our subjects who tested positive on US were less likely to have RPOC.

A recent review of literature on this topic estimated US's diagnostic sensitivity for detecting RPOC at 75%, specificity at 72%, PPV at 79%, NPV at 67%, and accuracy at 74%.[9] A study in south Iran reported 87% sensitivity, 41% specificity, 71% PPV, 65% NPV, and 70% diagnostic accuracy.[2] Matijevic et al,[15] estimated 98% sensitivity and 33% specificity. An Indian study reported the following values: sensitivity of 92%, specificity of 60%, PPV of 87.3%, and NPV of 71.4%.[16]

Reasons for these differences between studies are likely to be multifarious: such as heterogeneous patient demographies, varying operator skills, differences in image resolutions in the US machines, and differences in the US criteria used to define RPOC. Our definition was based on variety of factors including the presence of thickened endometrium of > 18 mm, the presence of irregularity and hyperechoic endometrium echogenic material in the uterus, endometrial lining (thickness and regularity), and vascularity. However, Thangarajah et al,[9] looked at the finding of a discrete mass only. On the other hand, there are several newer studies that seek multiple criteria similar to ours. For example, Sellmyer et al,[17] focused on the presence of a thickened endometrium echo complex (range = 8–13 mm) on a gray-scale US image, or an endometrial mass with vascularity on Doppler US. Durfee et al,[18] looked at thickened endometrium > 10 mm, endometrial mass, and vascularity. An endometrial mass was seen as the most sensitive (79%) and specific (89%) sonographic feature of RPOC. If no mass or endometrial fluid was seen and the endometrial thickness was < 10 mm, RPOC was considered extremely unlikely. Additionally, a case report[19] and other studies supported and revealed that the presence of echogenic material within the endometrial cavity with blood flow seen by color Doppler on pelvic scan is indicative of RPOC.[8,20]

Our work clearly has certain limitations. The most important limitation is its retrospective nature and the consequent problem of incomplete data. Moreover, US scans could have missed several genuine cases of RPOC (false negative results) leading to discharge without evacuation. In some such cases, the procedure might have been done later at another hospital. Additionally, we excluded patients who had no US before evacuation, leading to an unavoidable selection bias. Such patients need to be addressed in a future study. Another limitation was that our data came from a single center in Oman. Finally, the quality of US machines used (periodically upgraded), operator and interpreter skills, and variations in reference criteria for RPOC, would have all impacted the quality and reliability of the US findings over this 11-year period.

CONCLUSION

Transvaginal ultrasonography was sensitive in identifying women suspected to have RPOC but had lower PPV. On the other hand, histopathological examination demonstrated higher specificity and PPV. Hence, the diagnostic accuracy of US in our cohort was seen to be lower than in other studies. However, US scans performed by well-trained and experienced technicians on modern machines and interpreted by competent clinicians can go a long way in preventing unnecessary invasive procedures like postpartum evacuation which carry the risk of long-term complications for the patient. Further

work needs to be done in training doctors in the diagnosis of RPOC using transvaginal US. Studies evaluating cut-off value of the endometrial thickness in postpartum women and deciding who will require evacuation is crucial. Future multicenter studies with larger sample sizes are recommended.

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