The Sonographic and Color Doppler Features of Retained Products of Conception

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Objective. The purpose of this study was to identify the sonographic features of retained products of conception (RPOCs). ***Methods.*** Cases of clinically suspected RPOCs referred for pelvic sonography between September 1994 and July 2001 were identified. Patient age, indication, gestational age at delivery, and days postpartum were recorded and sonographic findings were reviewed. Outcomes were determined from medical records and pathology reports. ***Results.*** One hundred sixty-three cases were identified. Indications for pelvic sonography included vaginal bleeding in 82 (50%), pelvic pain in 77 (47%), and fever in 55 (34%). Gestational age at delivery ranged from 14 to 43 weeks (mean, 37 weeks), and the sonographic examination was performed from 0 to 95 days postpartum (mean, 21 days). Thirty-six patients underwent surgical intervention, and 28 of these had RPOCs. The remaining 127 patients were followed clinically. An endometrial mass was the most sensitive (79%) and specific (89%) sonographic feature for RPOCs. The isolated finding of either complex fluid in the endometrial canal or a thick endometrium measuring greater than 10 mm had low sensitivity, specificity, and negative and positive predictive values. None of the patients with RPOCs had normal sonographic findings. The absence of an endometrial mass or complex fluid and an endometrial thickness of less than 10 mm were considered normal findings. Color Doppler flow was detected in the endometrium somewhat more often when RPOCs were present than in the absence of RPOCs (75% versus 40%). ***Conclusions.*** An endometrial mass is the most sensitive finding for RPOCs. If no mass or endometrial fluid is seen and the endometrial thickness is less than 10 mm, RPOCs are extremely unlikely. The absence of blood flow does not exclude the diagnosis of RPOCs. ***Key words:*** color Doppler sonography; postpartum; retained products of conception; sonography; uterus.

Abbreviations
RPOCs, retained products of conception

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Retained products of conception (RPOCs) are uncommon complication of labor and delivery. The retained tissue can cause prolonged postpartum hemorrhage and endometritis. The usual treatment is curettage, which results in further complications in 7%, including uterine perforation, cervical laceration, and subsequent synechia formation.[1] Retained products are suspected when routine examination of the placenta at delivery reveals an incomplete placenta or when a patient has signs of endometritis or prolonged vaginal bleeding in the postpartum period.

Clinical evaluation for RPOCs is inaccurate because symptoms of retained products are nonspecific and may be similar to those following a normal delivery. To improve on clinical evaluation and to avoid unnecessary surgery, pelvic sonography is performed in cases of suspected retained products. However, similar to clinical

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evaluation, the sonographic findings are often nonspecific because blood clots and retained products show considerable overlap in their sonographic appearances.[2] Several studies have been performed to assess the appearance of the normal uterus during involution after birth and the uterine appearance in cases of postpartum hemorrhage.[3–6] On the basis of these reports, it appears that in patients with postpartum bleeding, an empty uterus or one containing only fluid has a high negative predictive value for RPOCs. It has been suggested that these patients may be treated conservatively and can avoid unnecessary interventions. Patients with RPOCs, however, have a more varied appearance on sonography, with variable sensitivities (44%–93.8%) and specificities (73.9%–92%) reported.[2,7,8] We conducted this study to assess the accuracy of transabdominal and transvaginal sonography for diagnosing and excluding RPOCs in patients after second- and third-trimester deliveries.

Materials and Methods

Our study population included cases referred for the sonographic evaluation of possible retained products that were identified through our ultrasound database between September 1994 and July 2001. Only patients who had had a second- or third-trimester delivery were included. Institutional Review Board approval was obtained before review of the medical records. Informed consent was not required for this retrospective study. The following information was recorded: maternal age, indication for sonography, gestational age at delivery, type of delivery, and days postpartum at the time of pelvic sonography. Outcomes were determined from medical records, pathology reports, and follow-up pelvic sonographic examinations when performed. The pelvic sonography was performed per standard departmental protocol, initially from a transabdominal approach, and, as needed, from a transvaginal approach. Gray scale and color Doppler sonography were performed with a 3.5- to 5-MHz transabdominal transducer, a 5- to 7-MHz transvaginal transducer, or both (Acuson 126XP; Siemens Medical Solutions, Mountain View, CA) or with 2.0- to 4.0-MHz and 2.6- to 6-MHz transabdominal transducers, a 5- to 8-MHz transvaginal transducer, or both (Acuson Sequoia 512; Siemens Medical Solutions). The examinations were reviewed retrospectively in conference by 2 radiologists who did not know the clinical outcome. The sonographic findings, including the presence or absence of an endometrial mass (Figures 1 and 2) or complex endometrial fluid (Figure 3) and thickness of the endometrium, were recorded. An endometrial mass was defined as a focal echogenic or heterogeneous lesion within the endometrium. The endometrium was considered thickened if it measured greater than 10 mm (Figures 2 and 4). When color Doppler imaging of the endometrium was performed, the presence or absence of flow in the endometrium or in the endometrial mass was recorded (Figure 1). The absence of an endometrial mass or complex fluid and an endometrial thickness of less than 10 mm was considered normal (Figure 5).

All statistical comparisons were made with the Fisher exact test.

Results

There were 163 patients identified for our study, ranging in age from 14 to 44 years (mean, 31 years). The indication for sonography included abnormal vaginal bleeding in 82 (50%), pelvic pain in 77 (47%), and fever in 55 (34%) cases. Some patients had more than 1 symptom. Delivery had been transvaginal in 122 cases, cesarean in 39 cases, and unknown in 2 cases. Gestational age at delivery ranged from 14 to 43 weeks (mean, 37 weeks). The pelvic sonography was performed 0 to 95 days postpartum (mean, 21 days). The sonographic approach was transabdominal in 113 cases, transvaginal in 37 cases, and both in 13 cases.

Thirty-six of the 163 patients underwent surgical intervention following the sonography. Of these, 28 patients had retained products on pathologic examination; the remaining 8 did not. The 127 patients who did not have surgery had clinical follow-up or medical treatment, including treatment with antibiotics, methylergonovine maleate, or both. None of these 127 patients subsequently required intervention for retained products on follow-up. Overall, retained products were found in 17% (28 of 163) of all study patients and 78% (28 of 36) of patients who had surgical intervention.

The sonographic findings in the 28 patients with retained products and the 135 patients without retained products are listed in Table 1. All patients with retained products had sonographic

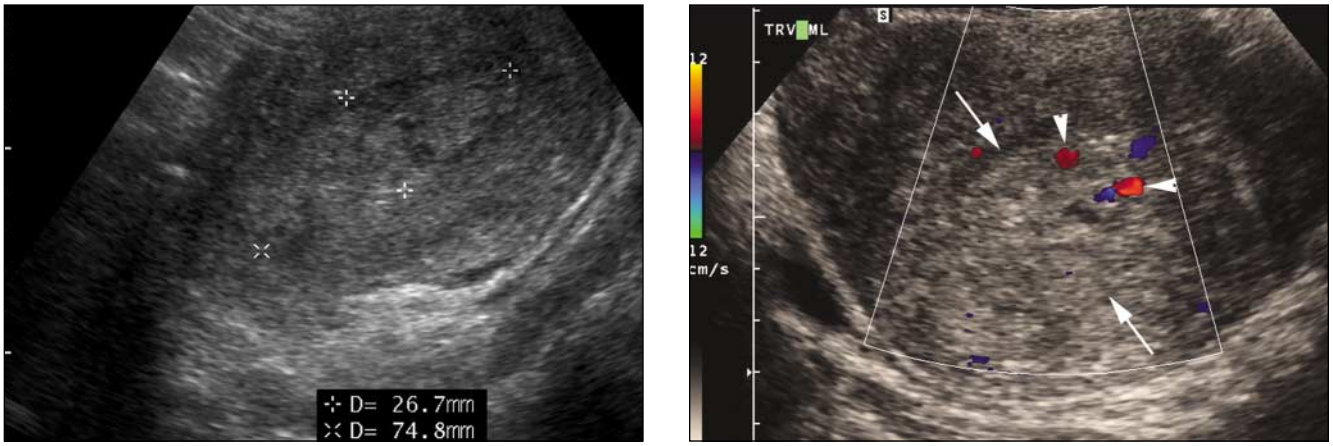

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Figure 1. A, Sagittal image of the uterus showing an echogenic mass in the endometrial cavity (outlined by calipers). On surgical pathologic examination, this mass was found to represent RPOCs. **B**, Transverse color Doppler image of the uterus shows blood flow (arrowheads) within the endometrial mass (arrows).

findings suggesting RPOCs, including an endometrial mass in 22 (79%), complex endometrial fluid in 8 (29%), and a thick endometrium (>10 mm) in 2 (7%). (Note that 4 patients had more than 1 sonographic finding.) The sonographic findings in the 8 patients without retained products at pathologic examination were similar to the sonographic findings of the 127 patients without retained products on the basis of clinical follow-up. Slightly more than half (55%) of the 135 patients without retained products had sonographic findings suggesting retained products, including an endometrial mass, complex fluid, or a thickened endometrium.

The finding of an endometrial mass was the most sensitive and most specific sonographic feature for RPOCs (Table 2), with sensitivity of 79% and specificity of 89%. Likewise, this factor had the best positive predictive value (59%) for retained products. The isolated finding of either complex fluid in the endometrial cavity or a thick endometrium measuring greater than 10 mm had low sensitivity, specificity, and negative and positive predictive values. In fact, a thickened endometrium was actually seen more often in the absence of retained products than in the presence of retained products ($P = .045$). Normal sonographic results, that is, absence of all sono-

Figure 2. A, Sagittal image of the uterus showing an echogenic mass and a thick endometrium (calipers) measuring 15.3 mm. **B**, Transverse image of the uterus showing the endometrial mass outlined by calipers. On surgical pathologic examination, RPOCs were found.

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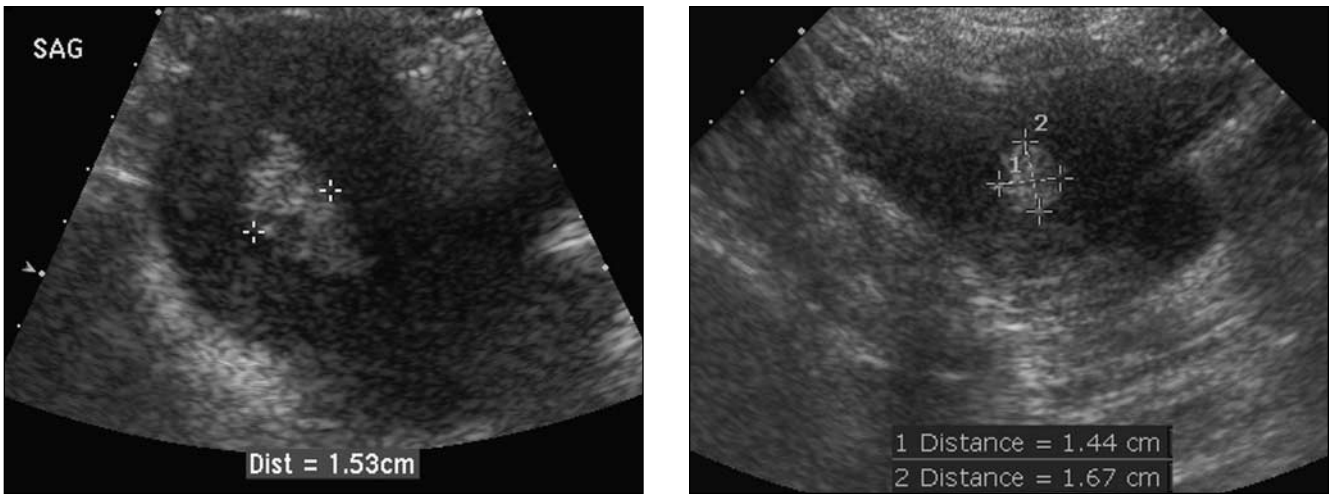


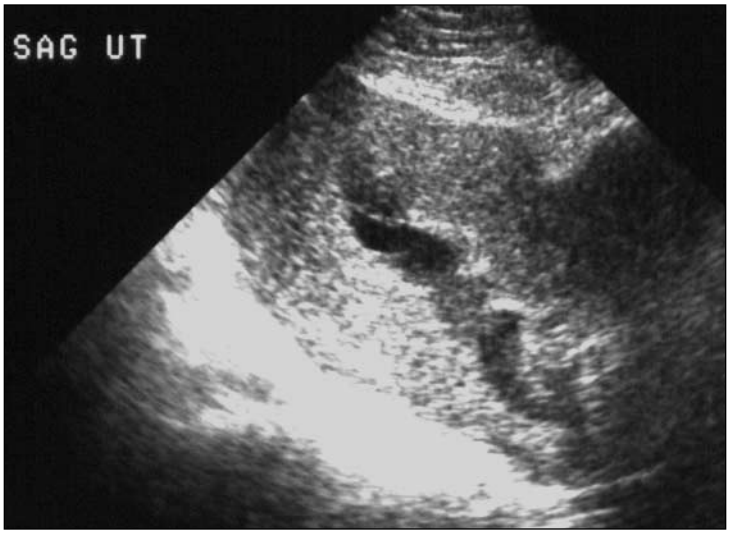
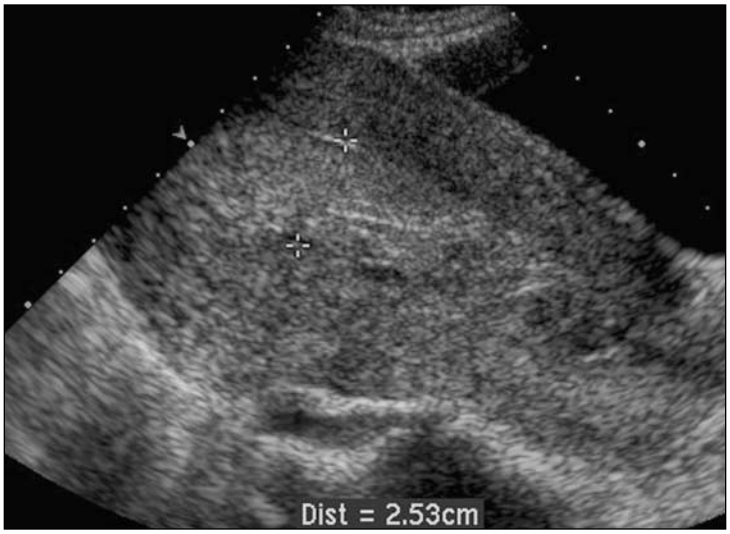


Figure 3. Sagittal image of the uterus showing complex fluid within the endometrial cavity. The patient was treated successfully for endometritis with intravenous antibiotics. No RPOCs were suspected on clinical follow-up.

graphic findings suggestive of retained products (ie, endometrial mass, complex endometrial fluid, or thick endometrium), were found in no patient with retained products and in 47% of patients without retained products. Thus, the absence of any sonographic finding suggestive of retained products excludes retained products (negative predictive value, 100%).

Color Doppler imaging was performed in only 29 or our 163 study patients, 16 (55%) of whom proved to have retained products and 45% of whom did not. Flow was detected in the endometrium somewhat more often when retained products were present than in the absence of retained products (75% versus 40%) (Table 3), but the finding was not significant ($P = .27$).

Figure 4. Sagittal image of the uterus showing a thick endometrium (calipers) measuring 25.3 mm. On surgical pathologic examination, no retained products were found. The thickened endometrium was found to represent a necrotic decidualized endometrium and a blood clot.



Discussion

Retained products of conception are rare complications of labor and delivery, leading to postpartum bleeding and infection if left untreated. Malvern et al[9] were among the first to report on the use of pelvic sonography in the evaluation of postpartum hemorrhage and in the evaluation for RPOCs. Although they performed sonographic compound B scanning, they found that 74% of the patients could be spared unnecessary curettage based on the sonographic findings. However, this study also reported a high-false positive rate of 17%. More recent studies confirm this early study that the false-positive diagnosis of retained products on sonography is high, in the range of 17% to 51%.[2,7,9,10]

Despite the fact that the finding of an echogenic mass in the uterus or thickened endometrium is the most common sonographic feature, the appearance of retained products on sonography is variable.[2,5,6] The presence of calcified and uncalcified placental tissue, blood clots, and necrotic decidua in varying amounts leads to overlap of findings in patients with and without retained products.[6,8] It is because of this variability in appearance that our study was undertaken in patients after a second- or third-trimester delivery. All patients with a first-trimester spontaneous or therapeutic abortion were excluded from the study.

To understand the appearance of RPOCs, several studies have evaluated the appearance of the uterus and uterine cavity after normal vaginal delivery.[3,4,11–13] In the first week postpartum, the endometrium may be thick, measuring greater than 10 mm, and in up to 51% of patients, an echogenic endometrial mass may be present.[3,4] Sonographic evidence of gas within the endometrial cavity can also be a normal finding after spontaneous vaginal delivery.[12] Within the second to third week postpartum, the endometrial cavity may increase in thickness and may contain fluid or debris.[4] Over time, the endometrium diminishes in thickness, appearing as a thin white line by 8 weeks postpartum.[4] The presence

of fluid, debris or an endometrial mass also becomes less frequent over time.[3,4] Our study confirms prior studies by showing that the most sensitive sonographic finding for RPOCs is an endometrial mass.[2,5,6,10] However, an endometrial mass did not always represent RPOCs. In some cases, the appearance of a mass likely represents a blood clot or normal involution of the endometrium postpartum.

The absence of sonographic findings suggestive of retained products accurately excludes retained products, with a predictive value of 100% in our study. Thus, patients who have postpartum symptoms raising concern for RPOCs do not require surgical intervention if the sonographic findings are normal.

The presence of blood flow on color Doppler imaging was not helpful in distinguishing the presence or absence of retained products, although blood flow was seen somewhat more commonly in the endometrium with retained products than without. It has been hypothesized that the presence of endometrial flow in the absence of retained products may be due to delay in involution of the placental implantation site vessels, leading to postpartum bleeding.[1,14,15] The implantation site may remain vascular during this time of involution, and if a blood clot is adjacent to the site, color Doppler flow may appear to be within the endometrium. Retained products with no blood flow may be explained by physiologic and technical factors. Some retained products may have minimal or very slow blood flow despite failure of complete separation at delivery. This blood flow may be difficult to detect with current color Doppler equipment. Last, optimal detection of flow with color Doppler imaging requires the ability to achieve

Figure 5. Sagittal image of the uterus showing a normal endometrial thickness (calipers) measuring 3 mm without an endometrial mass or endometrial fluid. The patient did not have retained products.

Table 1. Sonographic Findings in Patients With RPOCs Compared With Those Without RPOCs

Finding	Retained Products	No Retained Products		*P*†
	Path Proved (28)*	Path Proved (8)*	No Path (127)*	
EM mass, n (%)	22 (79)	1 (12)	14 (11)	<.000001
Complex fluid, n (%)	8 (29)	2 (25)	27 (21)	.46
Thick EM, n (%)	2 (7)	2 (25)	28 (22)	.045
Normal, n (%)	0 (0)	3 (38)	61 (48)	<.00001

EM indicates endometrium; and Path, pathologically.
*Numbers in parentheses represent numbers of patients.
†Comparisons are between patients with retained products versus patients with no retained products, Fisher exact test.

Table 2. Performance Characteristics of Sonographic Findings for Predicting Retained Products of Conception

Finding	Sensitivity, %	Specificity, %	PPV, %	NPV, %
EM mass	79	89	59	95
Complex fluid	29	79	22	84
Thick EM	7	78	6	80
Negative findings	0	47	28	100
Blood flow to EM on color Doppler imaging	63	60	75	46

EM indicates endometrium.

Table 3. Color Doppler Findings in the Endometrium in 29 Study Patients

Finding	Retained Products	No Retained Products
Endometrial flow	12	7
No endometrial flow	4	6

Differences were not significant, $P = .27$, Fisher exact test. Information was only available in 29 of the study patients; prevalence of retained products in this group was higher (55%) than that of the entire group (17%).

optimal Doppler settings, a skill not universal among sonographers.

Neither a thickened endometrium nor complex endometrial fluid was a helpful sonographic sign in the assessment for retained products. However, the absence of these findings (as well as absence of an endometrial mass) is highly predictive of the absence of retained products.

One of the limitations of our study is that many of the patients did not undergo surgery but were followed clinically. It is conceivable that some of these patients had RPOCs. However, none of these patients needed surgical intervention at a later date. If RPOCs were present, they were not clinically important and were likely passed spontaneously without complication. A second limitation of the study is the small number of cases in which color Doppler imaging was performed. Color Doppler imaging was not part of our standard protocol during the study period. A larger prospective study would be useful to evaluate the role of Doppler sonography in the diagnosis of retained products.

In summary, our study shows that, although an endometrial mass is the most sensitive and specific sonographic finding for diagnosing and excluding RPOCs, retained products are present in only slightly more than half the patients in whom an endometrial mass is identified. However, RPOCs can be excluded with confidence in the absence of suggestive sonographic findings.

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