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ORIGINAL ARTICLE

Accurate Detection of Retained Products of Conception after First- and Second-trimester Abortion by Color Doppler Sonography

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Objective: The aim of this study was to identify the role of transvaginal color Doppler and grayscale ultrasonography findings in managing first- and second-trimester miscarriges.
Methods: A prospective interventional study was conducted from March 2009 to April 2010 in our center in which 77 women with first- and second-trimester abortion were recruited. All women were evaluated by transvaginal grayscale and color Doppler ultrasonography. Blood flow within the endometrium was measured using color Doppler. Pulsed Doppler was performed to evaluate blood flow impedance by calculating the resistance index (RI).
Results: Forty-six patients underwent dilation and curettage of which 67.4% were proven to have retained products of conception (RPOC). Thirty-one patients were followed up through expectant management. Endometrial thickness (ET) was greater in the group with RPOC ($p < 0.001$). The sensitivity, specificity, and positive and negative predictive values with 95% confidence intervals of vascularity for detecting RPOC were 88% (72—97%), 68% (52—81%), 67% (51—81%), and 88% (73—97%), respectively. RI was significantly lower ($p = 0.004$) among these patients. Echogenic mass was detected in 93.9% of women with RPOC, but only in 22.7% of the cases without retained tissues ($p < 0.001$). Transvaginal grayscale ultrasonography was 100% sensitive in detecting RPOC when ET was >10 mm. The combination of vascular pattern and endometrial echogenic mass was the most sensitive and specific ultrasonographic feature for detecting RPOC (88%; 95% confidence intervals: 79—95).

Conflicts of interest: All contributing authors declare no conflicts of interest.

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Conclusion: Transvaginal color Doppler ultrasonography can be used to verify the presence of RPOC after spontaneous miscarriges.

Introduction

Retained products of conception (RPOC) are common complications of spontaneous miscarriage, which can potentially be life threatening. The retention of placental products can cause extended bleeding and infection [1].

Clinical manifestations of RPOC are not specific and clinical diagnosis is difficult. Dilation and curettage (D&C) are the usual treatments of choice for RPOC. However, these procedures are associated with serious complications such as uterine perforation, bowel damage, or uterine adhesions. To avoid unnecessary surgery and select patients for expectant management, a reliable diagnostic method is necessary.

Transvaginal ultrasonography has been introduced as a helpful technique to assess abnormal uterine bleeding and RPOC [2—4]. However, sonographic appearance of blood clot and retained products is similar, and therefore, RPOC are difficult to identify sonographically. Most published data are based on endometrial appearance and thickness [5—7]. Doppler sonography combined with grayscale ultrasound can improve the accuracy of diagnosing retained products. However, only limited data are available on color Doppler for detecting RPOC. Atri et al [8] proposed that the image of focal vascularity in Doppler ultrasound is likely to represent more accurate diagnosis of retained products. Achiron et al [9] evaluated the diagnostic accuracy of transvaginal pulsed Doppler sonography to identify postpartum and postabortion patients with excessive hemorrhage who are suspected to have RPOC. They concluded that this technique is useful for such patients.

In this study, we hypothesized that the presence of focal color Doppler vascularity in the endometrium improves the accuracy of sonography in detecting RPOC. In a previous retrospective study at our center, ultrasound findings of hyperechoic materials were proven to be the best predictor of RPOC [7]. The aim of this study was to determine whether transvaginal color Doppler ultrasonography could play a role in managing patients with RPOC.

Methods

This was a prospective interventional study to investigate the presence of RPOC after spontaneous first- or second-trimester miscarriage. Ethics approval was obtained from the Institutional Review Board of Tehran University of Medical Sciences, Tehran, Iran prior to conducting the study. All pregnant women who had symptoms of vaginal bleeding and/or lower abdominal pains were evaluated for the presence of RPOC. The patients underwent uterine evacuation or conservative management based on their clinical manifestations. Patients managed conservatively underwent weekly transvaginal sonography and their serum beta subunit of human chorionic gonadotropin levels were monitored for 4 weeks. The specimens were sent for histopathologic analysis on the same day. The presence of chorionic villi confirmed a diagnosis of RPOC. Patients who had elective termination of pregnancy or unstable hemodynamic were excluded. The study population consisted of 77 patients who were evaluated by transvaginal grayscale and color Doppler ultrasound. Ultrasound examinations were performed using a 5-MHz transvaginal transducer (Sequoia 512; Acuson, Mountain View, CA, USA) by three attending staff trained in ultrasound scanning. Informed consent was obtained from all patients prior to their participation in the study.

Images in the sagittal and axial planes were obtained. The grayscale sonographic diagnosis of RPOC was based on the appearance of hyperechoic materials or endometrial thickness (ET) $>$ 10 mm. The ET in the anteroposterior dimension was assessed on sagittal midline views. Echogenicity, size, and location of an intrauterine mass were recorded. Color Doppler appearances of the endometrium were assessed.

Two features of vascular and avascular signals were defined. Endometrial vascularity was based on the presence of a color Doppler signal of the endometrium. Pulsed Doppler was used to obtain a flow velocity waveform and to interrogate color signals. The vascular impedance was estimated by calculating the resistance index (RI $=$ peak systolic velocity minus end diastolic velocity divided by peak systolic velocity). The lowest RI of different arterial signals was used for analysis. The high pass filter was set at 100 MHz. The sample volume of pulsed Doppler was set at a width of 1.2—2 mm. The power output of $<$ 80 mW/cm^2 was considered in system setting. An RPOC was suspected when RI was $<$ 0.45.

Statistical analysis

Data were analyzed with SPSS, version 17 (SPSS Inc., Chicago, IL, USA). Independent t test was used to compare continuous variables, and Chi-square test was used to compare dichotomous variables between women with and without RPOC diagnosis. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy were calculated for color and pulsed Doppler ultrasound findings with 95% confidence intervals. Significance level was set at $\alpha = 0.05$.

Results

The median of gestational age was 13.5 weeks (range 6—24). D&C were performed on 46 women (59.7%); among