



ORIGINAL ARTICLE / *Genito-urinary imaging*

Abdominopelvic ultrasonographic findings after uncomplicated delivery



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KEYWORDS

Ultrasonography;
Duplex Doppler
examination;
Post-partum;
Cesarean section;
Uterus

Abstract

Purpose: To prospectively determine the range of abdominopelvic ultrasonographic findings, including Doppler resistance index (RI) of uterine arteries, 2 and 24 hours after uncomplicated delivery.

Method: Women who delivered vaginally or after cesarean section without complication from January 2012 to April 2012 in a tertiary care hospital were prospectively included. Abdominopelvic ultrasonography, including uterine artery resistance index (RI) at duplex Doppler ultrasonography, was performed 2 hours and 24 hours after delivery.

Results: Ninety-two women (mean age, 32.7 years) were included. Sixty-one (66%) delivered vaginally and 31 (34%) had cesarean section. Twenty-four hours after vaginal delivery, endometrial and anterior wall thicknesses dropped and uterine width increased ($P < 0.001$). No changes in uterine length and posterior wall thickness were observed between 2 and 24 hours after delivery. Transient pelvic free-fluid effusion was observed in 1/92 woman (1%). Uterine artery RI increased significantly from 2 to 24 hours (0.50 vs 0.57, respectively; $P < 0.001$).

Conclusion: Pelvic free-fluid effusion is exceedingly rare in the early course of uncomplicated delivery. A significant increase in uterine artery RI during the 24 hours following uncomplicated delivery is a normal finding. It can be anticipated that familiarity with these findings would result in more confident diagnosis of complications.

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Ultrasonography is the front line imaging examination in woman with suspected pelvic postpartum complications either after vaginal delivery or after cesarean section [1–4]. In addition, ultrasonography may have a pivotal role in a subset of women with postpartum hemorrhage to help decide on the most appropriate therapeutic strategy in case of major bleeding [5]. However, to avoid inappropriate decision and to best depict abnormalities, knowledge of normal appearance of the pelvis at ultrasonography after delivery is mandatory [2].

So far, the majority of papers that described the ultrasonographic appearance of the pelvis after delivery have focused on complications [5–11]. In the same time, those reporting normal findings have predominantly focused on the uterine cavity in the late post-partum period [12–16]. In addition, the majority of researchers have described relatively late pelvic ultrasonographic findings after cesarean section [11,17,18] whereas only one study has described early ultrasonographic findings after cesarean section [19]. Finally, uterine artery resistance index (RI) as measured at duplex Doppler ultrasonography early after delivery has received little attention [20,21]. Accordingly, it becomes evident that a study that comprehensively describes the normal ultrasonographic appearance of the pelvis of women after either cesarean section or vaginal delivery, including the uterus, the pelvic cavity and the uterine arteries, after an uneventful delivery is currently lacking.

This prospective study was performed with two goals in mind. First, we wanted to report the normal range of ultrasonographic abdominopelvic features and uterine artery RI at 2 hours and 24 hours after uncomplicated delivery. Second, we wished to determine if differences in ultrasonographic findings between these two time points exist.

Materials and methods

Study Population

This prospective study was conducted between January 2012 and April 2012 inclusively in our institution. Data collection was approved by our Institutional Review Board and informed consent was obtained from all women. We included all women who had an uneventful vaginal delivery (group 1) or uncomplicated cesarean section (group 2). Uneventful delivery was defined using the following criteria:

- singleton pregnancy;
- pregnancy > 35 weeks' gestation;
- no late pregnancy;
- no postpartum hemorrhage;
- no requirement for blood transfusion;
- no administration of prostaglandins;
- no need for pelvic arterial embolization;
- no associated surgical procedures during or following cesarean section.

Exclusion criteria were as follows:

- blood loss > 500 mL;
- multiple pregnancy;
- preterm delivery;
- hemostasis disorders;
- pre-eclampsia;

- abnormal placentation;
- presence of uterine leiomyoma.

Delivery procedures

All cesarean sections were performed using a low transverse incision followed by either Pfannenstiel or Joel-Cohen techniques. Manual examination of the uterine cavity was performed in all women. If any, placental remnants and blood clots were removed from the uterine cavity and lateral and posterior abdominal spaces using absorbent gauze sponge. All women received oxytocin (Syntocinon®; Sandoz, Rueil-Malmaison, France); those who had cesarean section received 5 units immediately after placental removal, 20 units during surgery and 30 units over the first 12 hours following surgery and those who had vaginal delivery received 5 units just after placenta removal and 10 units during the first 2 hours.

Ultrasonographic protocol

Percutaneous ultrasonography was performed twice, at 2 hours and again at 24 hours after delivery, with the woman in dorsolithotomy position. Before the first ultrasonographic examination, each woman had clinical examination to detect abnormal bleeding. Before the second ultrasonographic examination, the operator confirmed that blood transfusion, further surgery or pelvic arterial embolization was not required. All ultrasonographic examinations were performed and interpreted by five board-certified gynecologists, using a commercially available ultrasonographic unit (Logiq-R ultrasound system, General Electric-Medical Systems, France) using a 3.5-MHz curvilinear probe. To limit interobserver variability, 10 ultrasonographic examinations were initially performed by the five observers to define four standard and reproducible ultrasonographic planes. These 10 cases were excluded from the study.

Mid-sagittal (Fig. 1) and/or axial planes of the uterus were used to measure the uterine length (i.e., the distance between the uterine fundus and the internal cervical os), the thickness of the anterior and posterior uterine wall (halfway between the uterine fundus and the cervix), the endometrial thickness and the uterine width (Fig. 2). Presence of free-fluid effusion between the bladder and the uterus and in the Douglas pouch was searched for. Mid-sagittal planes of the pelvis were performed to scrutinize the entire abdominal cavity with parietocolic gutters. Parasagittal plane of Morrison pouch (Fig. 3) was used placing the transducer in the region of the right mid-axillary line in order to visualize the interface between the liver and anterior renal fascia (Gerota fascia). The blood flow of the uterine arteries was also studied on both sides. The color and pulsed Doppler evaluation of the uterine arteries was carried out in the longitudinal plane. The uterine artery was visualized lateral to the cervix. After detection of blood flow and visualization of the waveform of the uterine artery, the uterine artery RI, calculated as (S-D)/S was automatically calculated on four to five consecutive cycles [22]. At least 3 consecutive correctly imaged blood flow velocity waveforms were analyzed, and mean values were calculated and taken as the final result.

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