Ultrasonography of the uterus after normal vaginal delivery

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ABSTRACT

Objective: To define the appearance of the uterus and the uterine cavity, as revealed by ultrasound in normal women following a vaginal delivery.

Methods: This prospective, longitudinal study took place at the Prince Hashem and Prince Ali Military Hospitals, Amman, Jordan from December 2002 to March 2003. Fifty-four women were scanned on postpartum days 1, 7, 14, 28, and 56. Ultrasound examination was performed transabdominally for all women. The involution process of the uterus was assessed by measuring the anteroposterior diameter and uterine cavity. The appearance of the uterine cavity contents was documented. Factors related to the involution process: parity, breast-feeding, smoking and infant's birth weight were also evaluated.

Results: The maximum anteroposterior diameter of the uterus diminished substantially and progressively from 93 mm on day one postpartum to 38.5 mm on day 56. The maximum anteroposterior diameter of the uterine cavity diminished from 15.2 mm on day one to 4.0 mm on day 56. The position of the uterus, its shape and the appearance of its cavity during the normal puerperium were observed. The uterus was most often retroverted and empty in the early puerperium. Fluid and debris in the whole cavity were seen in mid puerperium. In late puerperium, the cavity was empty and appeared as a thin white line. No correlation was found between the involution of the uterus and parity, breast-feeding and the infant's birth weight.

Conclusion: Transabdominal sonography is suitable for examination of the uterus during the early puerperium period. The uterine body and position, as well as the cavity, are easy to examine by ultrasound. Accumulation of fluid and debris in the uterine cavity is a common and insignificant finding of the involuting uterus.

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Puerperium is the period of 6-8 weeks following delivery when the uterus, which weights more than one kg soon after delivery, undergoes physiological involution and returns to the non-pregnant state. The involution process of the uterus as a main characteristic of the puerperium was previously assessed by palpation of fundal height, which can be difficult in obese women and in women with uterine myoma.[1] The uterus was one of the first organs to be examined by ultrasound (US) when it was introduced into clinical practice by Donald et al.[2] In the majority of previously published studies, the examination was most often restricted to the early puerperium.[3,4] There is disagreement concerning the influence of parity, breast-feeding[5-9] or the infant's birth weight[5,7,9] on the involution process. A description of normal ultrasonic change of the uterus in the puerperium is important for US diagnosis of pathological conditions and improves our ability to differentiate puerperal pathology from normal physiological changes. This in turn helps avoid unnecessary invasive procedures. The aim of this study is to describe the uterus and uterine cavity changes after uncomplicated vaginal term delivery and uneventful puerperal course, and to

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review whether the uterine involution process was influenced by parity, infant birth weight and breast-feeding.

Methods. Fifty-four women, who had undergone a normal vaginal delivery of a single term infant, were recruited before discharge from the Prince Hashem (n=29) and Prince Ali (n=25) Military Hospitals, Amman, Jordan. Exclusion criteria included known uterine anomaly and a complicated third stage requiring manual removal of the placenta or curettage. Each patient was informed to attend for a transabdominal US scan on days 1, 7, 14, 28, and 56. At each visit, details, including subjective estimation of vaginal bleeding, method of infant feeding, and information regarding any other postpartum problems, were obtained by verbal questioning. During the course of the study, 3 women were lost for follow-up. Two did not show up for the second and subsequent visits while the third did not return for the third and subsequent visits. The median age of the women was 27 (range, 16-43) years. Twenty-four were primiparous and 30 were multiparous. Thirty-six were breast-feeding, whereas 18 used bottle-feeding. Two women were smokers and 52 were non-smokers. The median birth weight of the infants was 3435 g (range 2630-4320 g). The subjects were asked to attend with a partially full bladder. Each US consisted of visualization of the uterus using a transabdominal approach. Tender compression by the probe was used and the measurements were made. The uterus was assessed in the longitudinal, transverse and coronal sections. In the longitudinal section, the maximum anteroposterior (AP) diameter of the uterus and uterine cavity, perpendicular to the endometrium, were measured. The shape and position of the uterus were recorded, as were the presence of fluid, heterogeneous contents, or gas in the uterine cavity. The quantitative variables were analyzed using the JMP from the SAS statistical package (SAS Institute Inc, Cary, NC, and USA Version 3.2). Comparisons between groups were carried out using the t-test.

Results. **Table 1** summarizes the measurements of the uterus and uterine cavity. **Table 2** summarizes the qualitative parameters of the uterus and uterine cavity. The maximum AP diameter of the uterus decreased from 93.0 mm on day one to 38.5 mm on day 56. The maximum AP diameter of uterine cavity decreased from 15.2 mm on day one to 4.0 mm on day 56. During early puerperium, the cavity was empty in 48 of 54 (89%) women on day one (**Table 2**). The cavity was seen as a continuous white line along the entire uterine cavity from the internal cervical to the top of the fundus. An empty cavity was found during mid puerperium in 8 of 52 (15.3%) women (**Table 2**). **Table 2** also shows that most women had some content in the uterine cavity on days 7 and 14, independent of the cavity status on day one. The content was either fluid, or had a heterogeneous pattern with solid and fluid components, filling the whole cavity. During late puerperium, an empty cavity was found in 46 of 51 (90%) women on day 28 and in 50 of 51 (98%) women on day 56. The cervical area was empty in 10 of 54 women (18%) on day one. Most women, 42 of 54 (78%) had a collection of fluid with mixed echo pattern in the cervical area. On day 7, in the majority of women, the cavity (including the cervical area) contained fluid or debris; however, in just 6 women, the cervical area was empty. An empty cervical area was seen on day 14 in 42 of 51 (82.5%) women and on day 56 in 50 of 51 (98%) women. The normal shape of the early puerperal uterus in the sagittal plane was angulated and the position was retroverted in 51 of 54 women (94.5%) on day one. On day 7, the shape and the position of the uterus had changed. On day 14, the uterus was anteverted in 45 of 51 (88.2%) women. On day 56, the involution process was completed.

In this study, there was no correlation between the different measurements and parity, infants' birth

Table 1 - Uteri and uterine cavity dimensions.

Postpartum day	Uterine anteroposterior diameter (mm)		Cavity anteposterior diameter (mm)	
	Mean ± SD	Range	Mean ± SD	Range
1	93.0 ± 9.4	72.0 - 108.2	15.2 ± 7.9	3.4 - 44.5
7	75.0 ± 7.8	59.0 - 93.0	15.4 ± 8.2	3.2 - 44.0
14	63.7 ± 7.3	51.0 - 85.0	9.3 ± 4.8	2.5 - 22.5
28	48.9 ± 5.6	37.0 - 61.5	5.4 ± 2.7	1.4 - 21.0
56	38.5 ± 5.1	30.0 - 49.5	4.0 ± 2.6	1.0 - 10.0

Table 2 - Qualitative findings in the uteri and uterine cavities.

Postpartum day	N of cases	Findings								Lost to follow up n
		Empty cavity n (%)		Empty cervical area n (%)		Gas hyper-echogenic foci n (%)		Anteverted uterus n (%)		
1	54	48	(89)	10	(18.5)	6	(11)	3	(5.5)	0
7	52	8	(15.3)	6	(11.5)	2	(3.8)	35	(67.3)	2
14	51	6	(11.7)	42	(82.5)	1	(1.9)	45	(88.2)	3
28	51	46	(90)	47	(92)	0	(0)	46	(92)	3
56	51	50	(98)	50	(98)	1	(1.9)	45	(88)	3

weight or breast-feeding. Although the AP diameters of parous women were somewhat larger than those of nulliparous women, the differences were not statistically significant.

Discussion. Since its introduction into obstetric practice, US has made non-invasive investigation of the uterus possible.[2] However, most studies were cross-sectional and old compound scanners were used.[6,9,10] A recently published study by Sekki and Kirkinen was restricted to the early puerperium. In a report by Tekay and Jouppila, attention was focused on puerperal hemodynamic changes.[11] There are also conflicting data on the best indicator of the involution process. Length[3,6,7,9,11] width,[8,9,12] AP diameter[6,9,13] and the area of the uterus have been used, as well as thickness of the uterine wall.[12,13] We chose a longitudinal study where each woman was examined on 5 different occasions throughout the entire puerperium. In the early puerperium, the transabdominal approach is recommended. A large uterus cannot be imaged properly using transvaginal probe. Therefore, we preferred to use the transabdominal approach during all examination, even on day 56 postpartum, when the uterus lies in the true pelvis and is markedly decreased in size. On day one postpartum, the uterus has an angulated form. It lies in a slight retroverted position and arches over the sacral promontory. This position of the uterus is probably due to a heavy corpus, a hypotonic lower segment in combination with the supine position of the women. Between days 7-14, the shape of the uterus is oval. It rotates at approximately 100-180 degrees along the internal os towards an anteverted position, which can be due to a decrease in size of the uterus, contraction and the formation of a firm isthmus. In 12% of our cases, the uterus remained in a retroverted position. In our study, the AP diameter of the uterus diminished substantially and progressively during the puerperium and reached non-pregnant dimensions between 4-8 weeks postpartum. These findings are similar to previous reports.[13,18] In our opinion, the maximum AP diameter in the longitudinal section seems to be a suitable measurement, which to estimate the involution process. It is easy to obtain and is only marginally subjected to distortion. However, Defoort et al[6] concluded that the AP diameter is not an appropriate parameter for assessing the involution process. In the first scanning session, the uterus is very thin; probably due to the lifesaving contraction of the myometrium. The thickness of this line depends on the amount of retained decidua. More or less, deciduous can be retained[17,18] and, after normal deliveries, the variation in sonographic appearance of the cavity can be seen as a demonstration of these physiological variations in retained deciduous. The bright thin line seen on US might possibly represent cases in which only the basal decidual layer is retained, whereas the thicker and more irregular line might represent cases due to retention of the spongy decidual layer or fragments of membranes. In the early puerperium, it is rare to find fluid or an echogenic mass in the cavity. A mixed echo pattern with fluid and solid components was only seen in the cervical area, probably reflecting collection of blood clots and parts of membranes. This is usually expelled and was not seen on the following visits. Our results recently agree with published findings.[4,11] On days 7 and 14, uterine cavity diameters are increased most probably due to the presence of a necrotic decidual cast, which separate the uterine walls, reflecting a normal healing process and an abundant shedding of lochia. This finding was seen in most women even when the cavity was empty in the immediate puerperium. On days 28-56 the cavity is seen as a very thin white line from the fundus to the internal os. This reflects the completed involution of the uterus and the hypo-estrogenic state of the puerperium. Our results concerning cavity dynamics during the puerperium are in accordance with

histological studies of the puerperium uterus published by Andrew et al.[18] They also agree with a recent report by Tekay and Jouppila.[11] Ultrasound appearance of gas is seen as an intensive hypoechogenic focus, equivalent in echogenicity to bowel gas, which can be mistaken for reverberation artifact.[14] Previous studies have suggested a correlation between gas and infection caused by *Escherichia coli* and *Clostridium perfringens*.[12,13] In this study, gas is occasionally seen in the uterine cavity after normal vaginal delivery and always disappeared within 1-2 weeks. The presence of hypoechogenic dots in the cavity need not necessarily be caused by gas. A small amount of retained membranes possibly undergoes regressive changes and might be the cause of hypoechogenic foci especially during the later part of the puerperium. In spite of the great variation of the normal US appearance of the puerperal uterus, some findings are representative for early, middle and late puerperium. Accumulation of fluid and debris in the uterine cavity is a common and insignificant finding of the involuting uterus. This fluid is located in the cervical area in the early puerperium and in the whole uterine cavity in mid puerperium. In the early puerperium, the cavity, apart from the cervix, is most often seen on US as a thin white line. The same image is typical for the late puerperium.

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