Preliminary Report

Received: November 1, 1988

Accepted: December 12, 1988

Gynecol Obstet Invest 1989;27:217-218

Transvaginal Doppler Color Flow Mapping (With 1 color plate)

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Key Words

Transvaginal scanning

Doppler ultrasound

Color flow mapping

Abstract

Transvaginal Doppler color flow mapping was performed on 8 Japanese women (normal, 1; menopause, 2; uterine myoma, 1; endometriosis, 2; pregnant, 2). In all 8, bilateral uterine arteries and branches could be clearly identified in shades of blue and/or red. The color flows were abundant in the pregnant women. Transvaginal Doppler color flow mapping is expected to be an important diagnostic tool for assessing uterine arterial blood flows in physiologic and pathologic conditions of the pelvis.

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real-time two-dimensional Doppler mode, the flow directed toward the transducer was displayed in shades of red, the flow directed away from the transducer was in shades of blue and the maximal velocity of the flow that exceeded the Nyquist limits was presented as color aliasing.

Pulse repetition frequencies of this apparatus were from 4 to 26 kHz. Blood flow velocities were displayed within a 30–80° sector at depths ranging from 4 to 22 cm. This apparatus

Introduction

With recent advances in Doppler ultrasound equipment, numerous reports on the assessment of uterine arterial blood flow velocity waveform have been done with pulsed (PW) or continuous wave (CW) Doppler ultrasound [1–3]. Transabdominal Doppler color flow mapping (DCFM) has also been done in nonpregnant or pregnant women and patients with gynecologic diseases [4–7]. However, to our knowledge, there has been no report of transvaginal DCFM in the female pelvis. We report here our preliminary findings of transvaginal DCFM, in various clinical conditions.

Materials and Methods

Transvaginal DCFM was performed on 8 Japanese women (normal, 1; menopause, 2; uterine myoma, 1; endometriosis, 2; pregnant, 2) at Shimane Medical University Hospital. Permission for the study was obtained from each patient.

Fig. 1. Special probe used in the study, a Whole view, b Leading edge of the probe.

The apparatus used was an Aloka SSD-870 with a special probe for the use of transesophageal scanning (Aloka UST-5228S-5, 5 MHz transducer; fig. 1.). The probe was 70 cm in length and 9 mm in diameter and the tip was 12X9 mm. This probe is flexible and bends 120° anteriorly and 90° posteriorly about 5 cm from the tip by means of a manual controller. The imaging plane of the ultrasound was vertical and perpendicular to the axis of the probe. In the

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allows for simultaneous real-time imaging and PW Doppler tracing. In the real-time two-dimensional and PW Doppler modes, velocities can be measured up to 6.2 m/s. Wall filters (100 Hz) were used to eliminate low-frequency signals occurring from noise.

After voiding, the patient was placed in the lithotomy position and the probe was inserted into the posterior fornix of the vagina. Transverse scanning by the real-time two-dimensional Doppler mode was performed and we searched for uterine arterial blood flows located at the lateral sides of the uterus. On the real-time two-dimensional Doppler ultrasonogram, the sampling point on the line of the PW Doppler beam was placed at the region of interest, where the color flow was clearly noted.

Results and Discussion

In normal nonpregnant women, bilateral uterine arteries were clearly noted (fig. 2). Moreover, DCFM revealed thin uterine arteries, even during the menopause. In the case of adenomyosis, DCFM showed increased vascularities of both uterine arteries (fig. 3). Abundant color flows were evident in the pregnant women (fig. 4). Consequently, bilateral uterine arteries and branches could be clearly identified in all 8 women.

Transabdominal DCFM has been done in nonpregnant or pregnant women and patients with gynecologic diseases [4–7] and is especially useful for assessment of tumor vascularities in trophoblastic diseases [8, 9]. However, DCFM and/or blood flow velocity waveform cannot be detected by the transabdominal approach in some patients, for example, in those with uterine cervical cancer [6]. This may be because uterine cervical cancer most often occurs in older women and the uterus is relatively small. Therefore, there are limitations using transabdominal DCFM.

Fleischer et al. [10] reported transvaginal CW Doppler examination without real-time imaging of the vessels and successful examinations could be performed by pattern recognition of each blood flow velocity waveform [3]. However, CW Doppler ultrasound has no range resolution, and blood flow patterns do change with the menstrual cycle and in the presence of pathology [6, 11]. We performed transvaginal DCFM for an exact identification of uterine arteries and branches and to place the sampling point of the PW Doppler mode at the region of interest. Consequently, bilateral uterine arteries and branches could be clearly noted in shades of blue and/or red in all 8 women. Transvaginal DCFM is expected to be an important part of the armamentarium of the gynecologist attempting to assess uterine arterial blood flow in the female pelvis, under physiologic and pathologic conditions.

Acknowledgements

We thank M. Ohara for comments and Aloka Co. Ltd. for use of the transesophageal probe.

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