Singapore Journal of Obstetrics and Gynaecology
March 2001; 32(1): 44-46

Doppler Sonography in Abnormal Uterine Bleeding

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ABSTRACT

Doppler ultrasound is a non-invasive technique for investigating blood flow which has been used for assessing various vascular diseases. Recently it has been used for the vascularity in the uterine and ovarian artery which is believed to be of use in differentiating benign from malignant conditions. The present study has been conducted on 70 patients with abnormal uterine bleeding. Doppler sonography could detect chances of malignancy in a patient with high V_{max} and low resistive index, however it could not distinguish between various benign conditions of endometrium. Changes in uterine and ovarian artery blood flow were observed in different phases of menstrual cycle and it was noted that vascularity increased in midluteal phase.

Keywords: Doppler, Ultrasound, Uterine, Bleeding, Vascularity, Blood flow, Benign, Malignant

INTRODUCTION

The availability of pulsed Doppler ultrasound equipment has made it possible to sample signals at a chosen depth and then to detect flow in any selected deep vessel. Pulsed Doppler combined with real time ultrasound imaging, the so called, Duplex method, allows the precise localization of the deep vessel and the positioning of Doppler sample within it. Various authors have studied the Doppler in different lesions of the endometrium. This investigation is conducted to examine the Doppler flowmetry in various cases of abnormal uterine bleeding.

MATERIAL AND METHODS

A total of 70 patients, with abnormal uterine bleeding were studied by Doppler sonography for vascularity in uterine and ovarian artery. uterine artery is seen just lateral to internal Os of Cervix while ovarian artery is visualized in adenexal area near follicles. The features of increased vascularity in myometrium and endometrium were noted. Specific velocity waveforms were noted which included maximum velocity (V_{max}) and resistive index. The results were finally compared with biopsy which was taken as a gold standard. Fifteen normal women were recruited as controls in the various phases of menstrual cycle.

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RESULTS

The results are shown in Table 1. As shown in this table, in the control group we could note some increase in vascularity in luteal phase. Mean V_{max} was 0.472 and Resistive index 0.680. The vascularity was found low in postmenstrual phase. The results were not very encouraging in other benign conditions like polyp, hyperplasia or atrophy and specific vascular pattern could be found. In cases of malignancy there was definite increase in blood flow. Mean V_{max}. was 0.588 in the uterine and 0.542 in the ovarian artery. Resistive index was 0.682 in uterine whereas it did not indicate any gross decrease in ovarian arteries. The diagnosis in all these cases was confirmed by histopathology of endometrium obtained by endometrial biopsy aspiration.

TABLE 1
Doppler findings in 70 cases compared with 15 normal controls

	Uterine artery		Ovarian artery	
	V_{max} (cm/sec)	RI	V_{max} (cm/sec)	RI
I. Controls				
1. Postmenstrual (n = 5)	0.392	0.720	0.296	0.790
2. Luteal (n = 5)	0.472	0.680	0.487	0.831
3. Premenstrual (n = 5)	0.466	0.710	0.412	0.812
II. Endometrial polyp	0.455	0.748	0.339	0.764
III. Hyperplasia	0.428	0.757	0.357	0.738
IV. Atrophic	0.473	0.747	0.493	0.735
V. Malignancy	0.588	0.682	0.542	0.740

DISCUSSION

Doppler ultrasound is a non-invasive technique for investigating blood flow, which has an established clinical role in assessment of vascular disease. Taylor et al.[1], calculated results using a percutaneous full bladder technique and these were validated by comparison with use of ultrasound probe applied directly to the arteries at laparotomy. The ovarian arteries demonstrated qualitatively and quantitatively distinct flow patterns compared with the internal and external iliac artery. From recorded waveforms, a pulsatility index (PI) reflecting vascular impedance was calculated. The PI was found to be lower, indicating increased blood flow, in the artery supplying to ovary carrying the dominant follicle or corpus luteum. Serial studies suggest that this change occurs at an early stage of menstrual cycle, possibly before the dominant follicle can be recognized by its size or increased hormone production, Tan et al., (1996)[2] examined the hemodynamic changes in the uterine and intra ovarian vessels during the normal menstrual cycle and to relate the vascular changes to hormonal index values. On the side with dominant follicle, follicular and ovarian stromal peak systolic blood flow velocity rose significantly during the menstrual cycle with no significant change in pulsatility index. The changes in blood flow velocity correlated significantly with changes in serum FSH, LH and progesterone concentrations. There was no significant change in the contralateral side. There was a decline in uterine artery resistance during the mid luteal phase which may reflect optimal vascularity for implantation of blastocyst.

Slad Kevicius et al, (1994)[3] compared the results of endometrial thickness with Doppler velocimetry of the uterine arteries to discriminate endometrial status in women with postmenopausal bleeding. They found endometrial thickness had better sensitivity and specificity to discriminate between benign and malignant or normal and pathologic endometrium. Aleem et al., (1995)[4] worked on Transvaginal color and pulsed Doppler sonography of endometrium: a possible role in reducing number of dilation and curettage procedure. They did a prospective study on 42 postmenopausal patients with pathological endometrium. These patients underwent TVS for endometrial thickness (cut-off value of 8 mm), rates of visualization and density of uterine, myometrial (peritumoral) and endometrial (intratumoral) vessels were used to assess and correlate with endometrium pathology. Resistive index and pulsatility index values of these studied vessels of endometrial carcinoma were significantly lower than those for endometrial hyperplasia. In 80% of cases of endometrial carcinoma, dense vascularity was found in myometrium. Hata K et al., (1996)[5] raised the question whether intratumoral blood flow in endometrial cancer differs with individual tumor characteristics. They saw that there was no significant differences among peak systolic value and resistive Index value for each stage. There was no significant difference among peak systolic value and RI value for each histological diagnosis. Endometrial thickness was less in early stage disease. Thus they suggested that intratumoral blood flow analysis in endometrial cancer could not predict the tumor staging and histological diagnosis.

Flam (1995)[6] studied the value of uterine artery Doppler in endometrial cancer. The subjects and control did not differ in blod flow measurements. There was no correlation between severity of disease and flow velocimetry values. These results indicated that Doppler

velocimetry of uterine artery is not a valuable tool in discriminating between benign and malignant endometrium.

All these 70 patients underwent color Doppler sonography for uterine and ovarian artery. In control group, we could notice increase in vascularity in luteal phase, where mean Vmax was 0.472 cm/sec and resistive index 0.680. our findings correlated with those of Tan et al., (1996)[2], who also found decline in uterine artery resistance in mid luteal phase. On comparing the blood flow pattern of malignant pathology with benign cases, it was seen that flow increased in malignancy as evident by mean Vmax of 0.588 cm/sec and resistive index of 0.542. However results of Doppler were quite varied and it could not be suggested as screening tool for malignancy. But it has a good role in supplementing the diagnosis after TVS has been performed for visualizing endometrial thickness.

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