Color Doppler Sonohysterography of Endometrial Polyps and Submucosal Fibroids

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Objective. To describe the typical sonographic findings and clinical applications of color Doppler sonohysterography and to correlate the vascularity of lesions seen on color Doppler sonohysterography to microvessel density and the presence of vessels greater than 0.5 mm. Methods. Color Doppler sonohysterography was performed on 25 women with abnormal uterine bleeding. The vascularity (number of vessels >0.5 mm) and their configuration seen on color Doppler sonohysterography were compared with those obtained on the excised specimen. Microvessel density and histologic features were correlated to the visualization of vessels greater than 0.5 mm and their arrangement on color Doppler sonography. Results. The color Doppler sonographic findings in 18 polyps, 3 submucosal fibroids, and 1 clot showed distinct vascularity patterns. Polyps typically contained a single feeding vessel, whereas fibroids had several vessels, which arose from the inner myometrium. Lesions with higher microvessel density tended to have more vessels greater than 0.5 mm as depicted on color Doppler sonography. Conclusions. Color Doppler sonohysterography may be useful in distinguishing polyps from submucosal fibroids based on the vascularity of the lesions. The number of vessels seen on color Doppler sonography approximates microvessel density within the lesions. Key words: color Doppler sonography; endometrial polyps; sonohysterography; submucosal fibroids; vascularity.

Color Doppler sonohysterography (SHG) has become a standard technique in the evaluation of endometrial polyps, intracavitary submucosal fibroids, and adhesions. Color Doppler sonography (CDS) can reveal the relative vascularity of these lesions. Several studies have shown a correlation between the microvessel density (MVD) and malignant potential.

The purpose of this report is to describe the combined use of CDS performed during SHG and its correlation to MVD obtained from the excised specimen.

Material and Methods

Twenty-five patients ranging from 19 to 77 years of age (average, 49 years) underwent SHG for the evaluation of suspected endometrial or myometrial lesions. Color Doppler SHG (CD-SHG) was performed using a Toshiba 8000 scanner (Toshiba America Medical Systems, Tustin, CA) with a tightly curved array 8-MHz transvaginal probe.
To measure the size of the depicted vessels, images were magnified on a picture archiving and communications system (Agfa Corp, Ridgefield Park, NJ), and the vessel’s diameter was measured with electronic calipers. The number and arrangement of vessels greater than 0.5 mm apparent on CD-SHG were noted and compared with MVD and the presence of vessels greater than 0.5 mm in the removed tissue.

Specimens were vascular stained, and the presence or absence of vessels greater than 0.5 mm was noted, as well as the microvessel count. The histologic features and microvessel density of each specimen obtained from biopsy or curettage were determined by using hematoxylin-eosin and vascular stains. The number of microvessels per high-power field (HPF) was quantitated by an automated counter. Tumor vessel size and microvessel density were quantitated by CD31 immunostaining with the use of 4-µm paraffin-embedded sections and a standard automated immunostaining technique. Endogenous peroxidase activity was quenched by incubation of the sections in 3% hydrogen peroxide in methanol for 5 minutes. Sections were then steamed in a citrate buffer for 35 minutes. Subsequent steps including incubation of sections with a mouse monoclonal anti-CD31 primary antibody (JC/70A clone; DakoCytomation, Glostrup, Denmark), washing, and incubation with an antimouse biotinylated secondary antibody were done by an automated technique with a DakoCytomation Autostainer and LSAB2 reagent kit per standard operating procedures supplied by the manufacturer. Sections were counterstained with Gills hematoxylin, dehydrated through graded xylene, and mounted under glass coverslips.

Microvessel density was determined in a blinded manner by acquisition of digital images and the use of a BIOQUANT image analysis system (BIOQUANT Image Analysis Corporation, Nashville, TN). At least 3 fields of the lesions were imaged with a Nikon D1 digital camera (Nikon Instruments Inc, Melville, NY) using a ×4 objective (12 mm²), and microvessel density was determined on 5 or 6 1-mm² fields per specimen in coded images by a blinded observer selectively highlighting and counting CD31-labeled microvessels in specified areas using the thresholding tools available in the software.

**Results**

Of the 25 patients studied, 18 had endometrial polyps, 3 had intracavitary submucosal fibroids, and 1 had a clot. Three had either secretory or proliferative endometria. Of the 18 with polyps, 3 had vessels greater than 0.5 mm; all were large polyps (>10 mm; Figs. 1 and 2). Microvessel counts ranged from 6 to 102 per HPF and were greater in the larger polyps (>10 mm). Multiple vessels were seen on CDS in the 3 patients with a pedunculated submucosal fibroid, whereas no flow was seen within the clot (Fig. 3). The microvessel density in lesions with vessels greater than 0.5 mm on CDS had a greater average MVD (60 per HPF) than in those without visualized vessels (15 per HPF; \( P = .02 \)).
Discussion

Color Doppler sonohysterography may be helpful in distinguishing an endometrial polyp, which usually has a single feeding vessel, from an intracavitary submucosal fibroid, which usually has several vessels arising from the inner myometrium (Figs. 1–3). It may also be helpful in identifying the extent of myometrial involvement of fibroids. Color Doppler sonohysterography may also be useful in distinguishing a focal area of endometrial thickening from a polyp, because a polyp typically contains a single feeding vessel that can be depicted on CDS.

Admittedly, we had no cases of endometrial carcinoma, a condition that could potentially be associated with intraperitoneal spread of tumor cells. However, CD-SHG may be useful in the assessment of myometrial involvement in endometrial cancer, because the inner interface of the lesion is so well depicted. As we described in a recent article, endometrial carcinoma tended to have more vessels on CDS than benign lesions.

The correlation of CDS to microvessel density is at best imprecise, reflecting the difference between assessment of microvessel density seen under a microscope and those macroscopic vessels greater than 0.5 mm seen with CDS. In general, the greater the MVD, the more likely it was to visualize macroscopic vessels (>0.5 mm) on CDS. Depiction of the macroscopic vessels and their arrangement on CDS can be used to distinguish typical polyps with characteristic single feeding vessels from submucosal fibroids that typically have multiple feeding vessels that arise from the inner myometrium. The observation that the average MVD in lesions with visualized vessels was greater (60 per HPF) than the average MVD in lesions without vessels greater than 0.5 mm (15 per HPF) confirms the notion that CDS findings may correlate to microvessel density. Admittedly, larger studies will be needed before the precise correlation of microvessel density to CDS findings is completely ascertained.
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References

