

## Editorial

# Ultrasound and Doppler in Gynecological Cancers

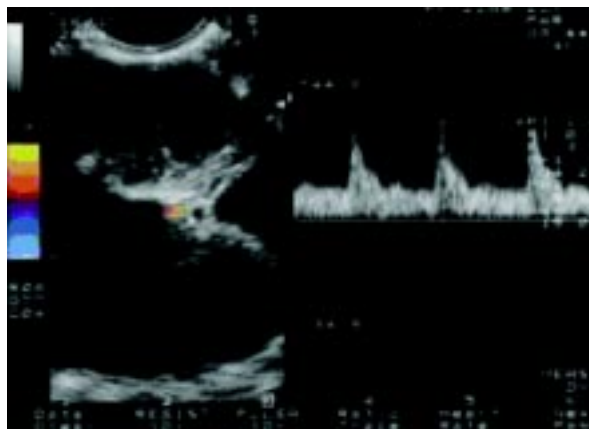
The scope of ultrasound in gynecology is vast. It is virtually an extension of the clinical examination in most gynecological conditions due to its accessibility, relatively low cost and risk, and high patient acceptance. Its applications in women with cancer are expanding rapidly. Ultrasound is used for screening (endometrium, ovary), diagnosis (evaluation of the adnexal mass) and follow-up of therapy for detection of recurrences. Transabdominal and transvaginal ultrasound are both useful in evaluation of women with gynecological cancer. The transabdominal route is mandatory for fully assessing large masses extending outside the pelvis and for evaluating the upper abdomen. The transvaginal route is preferable for most other situations where smaller masses and the pelvic structures are to be visualized. Color Doppler is an additional modality which can be used for differentiating benign and malignant disease. Malignancy is characterized by a rapid cell proliferation and tissue generation. This is accompanied by the formation of new blood vessels which support this growth. The neoangiogenesis is characterized by a lack of muscular media, chaotic arrangement, arterio-venous shunts and low resistance flows. These characteristics can be assessed by Doppler and could be considered as corroborative evidence of malignancy.

Despite the advances in surgery and chemotherapy, the 5-year survival rate of women with epithelial ovarian cancers has not changed much over the years. This is because most ovarian cancers are detected in late stages of the disease due to a lack of specific symptoms. The application of ultrasound as a screening tool for ovarian malignancy is based on its ability to detect tumors which are asymptomatic and not clinically palpable. Smaller cancers are likely to be less widespread and offer the best prospects of improving therapeutic results. In the early days, ultrasound was used alone and was not considered a useful tool for screening. Early studies were hampered by poor sensitivity and specificity. 67 laparotomies were required to detect one early stage

ovarian cancer.<sup>1</sup> There have been numerous technical and methodological refinements to sonography over the last decade. Characterization of ovarian and adnexal masses has been achieved with much greater clarity. The ultrasound features of a malignant growth have been described as bilaterality, large size (> 5 cm), multiple locules, papillary excrescences or solid areas, presence of ascites or metastasis. The addition of Doppler and serum marker such as CA-125 has been used as a multimodality screening strategy. A risk of malignancy index (RMI) is a useful tool for the preoperative assessment of adnexal masses.<sup>2</sup> A recently concluded prospective study evaluated 202 638 postmenopausal women randomized to no screening, ultrasound only screening and multimodality screening. The sensitivity (89.5%) and specificity (99.8%) of the multimodality approach were superior to the other groups in detecting early ovarian cancer. It was estimated that only 3 laparotomies would be needed to detect one early stage ovarian cancer.<sup>3</sup> This represents a significant improvement from earlier studies and is an indicator of the potential of a multimodality screening approach for ovarian cancer in postmenopausal women. Color



**Figure 1.** Color Doppler blood flow showing a low resistance index (RI = 0.27) in a malignant ovarian tumor.



**Figure 2.** Color Doppler blood flow showing a high resistance index (RI = 0.7) in a benign ovarian tumor (serous cystadenoma).

Doppler has been studied in its role in detecting vascular flow patterns and characterizing the resistance to blood flow in ovarian tumors. Malignant growths are characterized by neoangiogenesis and blood vessels with a poorly developed muscularis. The blood flow in these vessels is marked by low impedance and correspondingly, the resistance index is low (RI < 0.3) as in Figure 1. In contrast, benign ovarian tumors and normal ovarian blood flow is characterized by a high RI (Figure 2).<sup>4</sup>

Screening for endometrial cancer is currently based on a risk factor approach. Postmenopausal bleeding is the prime indicator for the risk of endometrial cancer and transvaginal ultrasound is the first step in the triage for these women. Endometrial thickness has been extensively studied as a predictor of endometrial malignancy. Metanalysis have shown that when the endometrial thickness is less than 5 mm, the risk of endometrial malignancy is about 1 in 1000. In such cases, endometrial sampling and histopathology can be avoided. The significance of thick endometrium in non-bleeding postmenopausal women has not been validated and is not an automatic criteria for endometrial sampling.<sup>5</sup> Other ultrasound markers of malignancy are the disturbance of the interface between the endometrium and myometrium and presence of irregular, vascular mass lesions inside endometrial cavity. Color Doppler is useful as an adjunct in diagnosing endometrial cancer. The subendometrial blood flow and the blood flow in thickened and polypoidal endometrium shows low resistance patterns in endometrial malignancy and the RI is usually less than 0.3. Saline infusion sonography is useful in detecting polyps and

intracavitary masses. Preoperative assesment with ultrasound results matches the result of a CT or MRI assessment.

Conventionally, ultrasound and Doppler have no role in diagnosis of cervical cancer. Ultrasound has limited value in predicting parametrial and nodal spread of cervical cancer. It does not compare favorably to other imaging techniques such as CT or MRI. New ultrasound modalities such as 3D ultrasound and volume analysis are being studied as prognostic markers and are under evaluation.

The battle of malignancy is fought at the basement membrane. An early diagnosis is the key to improving survival. Ultrasound and Doppler are being widely studied for their potential to screen for ovarian and endometrial cancer to increase early detection and should be considered as a part of the annual gynecological visit. The ability to guide clinical and preoperative decision-making is an additional benefit. Its application in other malignant conditions is finding increasing acceptance and clinical application.

## References

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