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Picture of the Month

HDlive imaging of a serous borderline ovarian tumor

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Approximately 15–20% of ovarian epithelial neoplasms are borderline ovarian tumors (BOTs)[1]. In younger women, these tumors typically manifest as low-stage disease and, if diagnosed early, patients have a good prognosis. Accurate preoperative diagnosis of BOTs is useful for optimal surgical excision, especially in patients who desire preservation of fertility, and is also essential for planning appropriate management[2].

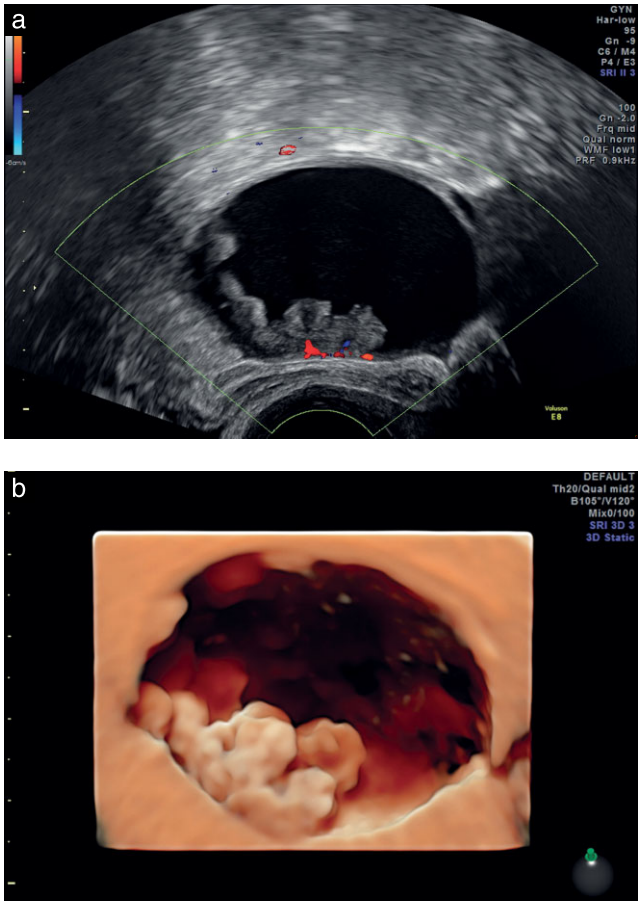

Figure 1 Two-dimensional (a) and HDlive (b) ultrasound images of a serous borderline ovarian tumor in a 25-year-old woman. The papillae within the tumor are particularly clearly seen using HDlive.

At present, about 7% of adnexal masses that require surgical removal cannot be classified as benign or borderline/malignant by experienced ultrasound examiners using subjective assessment[3]. It is particularly important to distinguish between benign tumors and BOTs in women of childbearing age, for whom conservative treatment is desirable.

Although two-dimensional (2D) gray-scale sonography is the primary imaging modality used to evaluate any suspected ovarian tumor, color Doppler ultrasound may provide additional information regarding the vascular pattern of the tumor. To diagnose BOTs, three-dimensional (3D) ultrasound and 3D power Doppler could provide additional information[4]. Virtual spherical tissue sampling using 3D ultrasound power Doppler angiography to enhance the differentiation between normal and abnormal ovaries is another newer technique that may have potential[5].

Exacoustos *et al.*[6] analyzed a series of 33 cases of BOT and concluded that the most common diagnostic feature on ultrasound imaging is the presence of papillae within the cyst. However, papillae can also be

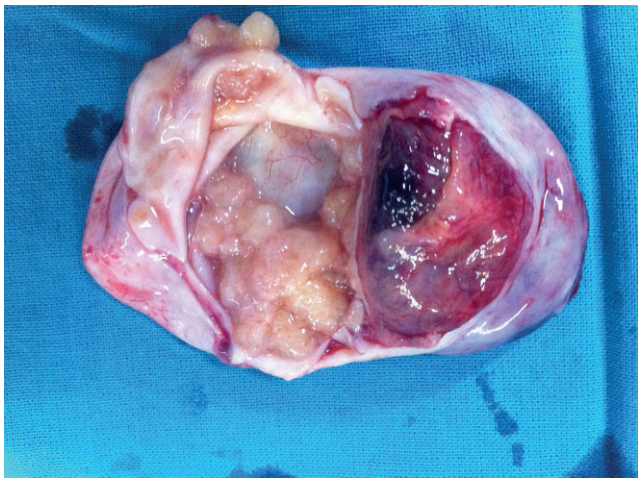

Figure 2 Macroscopic appearance of the excised serous borderline ovarian tumor.

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observed in benign ovarian tumors, such as cystadenomas or cystadenofibromas. In these cases, color Doppler examination could be helpful, although avascular papillae are not always associated with benign tumors and vice versa[6]. Observing the sonographic appearance of papillae (i.e. whether they are smooth, regular or irregular) is useful for preoperative diagnosis. In benign tumors, papillae tend to be smoother and more regular, but in BOTs, papillae are irregular, sometimes with a 'sea anemone'-like pattern[7].

We present a case of a serous BOT in a 25-year-old patient. We examined the tumor using 2D sonography and 3D HDlive (GE Medical Systems, Zipf, Austria). Using 2D sonography, we observed a 5.5-cm unilateral ovarian tumor with papillae inside (Figure 1a). HDlive provided improved visualization of the tumor content (Figure 1b). The HDlive technology, developed specifically for obstetric use because it provides a natural and realistic appearance of the fetus, uses an adjustable virtual light source, allowing the operator to create lighting and shadowing effects and thereby increasing depth perception. In this case, HDlive proved to be useful for clearly viewing the papillary projections within the tumor and the extent of these projections. We observed that the HDlive image was similar to the macroscopic image of the specimen (Figure 2). HDlive enabled a complete inspection of the inner surface of the tumor and a clearer evaluation of the papillae and the septum.

It can be difficult to differentiate between benign and borderline/invasive ovarian tumors using subjective assessment of gray-scale and Doppler ultrasound imaging. We believe that the use of HDlive imaging in addition to other methods may aid classification. Distinguishing between these two types of tumor is important, particularly for young patients who desire preservation of their fertility.

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