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SHORT COMMUNICATION

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Enhanced sonographic depiction of the distal fallopian tube: preliminary findings using a new volumetric technique

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Keywords

Volumetric sonography; Fallopian tubes; Distal fallopian tubes

This short communication describes new sonographic techniques which may enhance depiction of the distal fallopian tube (DFT). We believe this new technique may provide enhanced detection of lesions in the DFT over that now used including Doppler, contrast enhanced transvaginal sonography.

Ovarian cancer is the deadliest of the gynecologic malignancies. The most common form of epithelial ovarian cancer is serous carcinoma. Due to the lack of effective screening, most patients are not diagnosed until presenting with advanced stage disease. To date, ultrasound screening studies have focused on the ovary [1]. However, the current data suggests that many high-grade serous carcinomas may arise from the distal fallopian tube (DFT) rather than the ovary [2, 3]. This short communication describes new sonographic techniques which may enhance depiction of the DFT.

With the meticulous technique, it has been reported that 2D transvaginal sonography can be used to depict the Fallopian tube in most patients (77–83%) [4]. This involves careful dynamic imaging using the fundal endometrium as the proximal end and the ovary as a landmark for the distal segment. However, this technique is somewhat operator (sonographer) dependent and relies on patient cooperation and anatomic factors.

Volumetric (3D) transvaginal sonography can further refine depiction of the Fallopian tube. Recent enhancements of the sonographic depiction of the DFT with contrast enhanced volumetric (3D) transvaginal sonography have further refined prior transvaginal sonography (TVS) techniques such as color Doppler sonography and 3D volumetric imaging (Figs. 1,2). Color Doppler sonography can identify tumor neovascularity associated with tubal tumors (Fig. 1).

Abnormalities that arise from the tube can be distinguished from those that involve the ovary using 3D volumetric imaging (Fig. 1A,B). Amongst these discriminators are sonographic recognition of endosalpingeal folds arising from the wall of a dilated abnormal tube (Fig. 1B).

In an attempt to refine sonographic depiction of the DFT, our group has developed a volumetric, contrast enhanced technique which can accurately depict the tubal lumen. This involves intraluminal instillation of microbubble contrast with post processing of the acquired volume using commercially available software. Our project is intended a proof of concept and awaits further clinical validation.

The procedure begins with 3D volumetric depiction of the Fallopian tube, followed by post processing with Qlab (Philips Healthcare, Bothell, WA, USA). Once the volumetric data is collected, it is imported as a MATlab file and further refined using 3DSlicer. The post processing technique begins with determination of the central axis of the tube. This is followed by serial cross section analysis of the circularity at the lumen as it correlates with serial sections obtained with the SEE-FIM protocol (Serial Extensively Examining the Fimrated of the end of the tube (Fig. 3).

It is hoped that as this technique becomes refined, lesions in the DFT can be detected. Volumetric techniques could also be used to localize lesions that are identified with labelled microbubbles. We are hopeful that this sonographic technique will translate into an effective screening modality for ovarian cancer, at least those arising in the DFT.

Availability of data and materials

Not applicable.

Author contributions

AF—designed the research study, wrote the manuscript, read and approved manuscript. JM—performed research, read and approved manuscript. MAC, LP, RA and BG—read and approved manuscript.

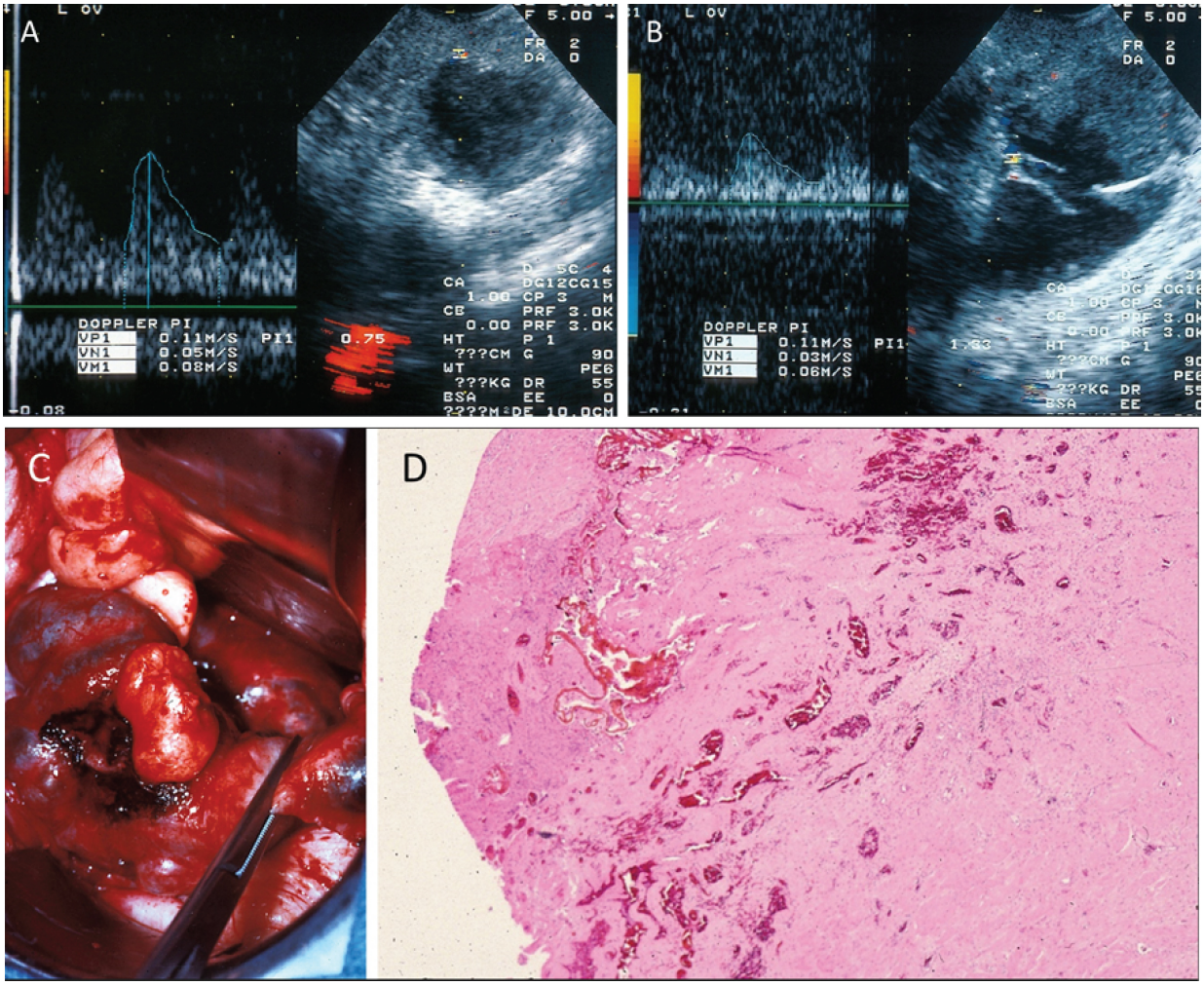

Figure 1. Color Doppler TVS of Type II Ovarian Epithelial Cancer arising in the distal fallopian tube. (A) Mass within the distal fallopian tube in short axis. The fluid filled tube can be recognized by the presence of endosalpingeal folds. (B) Low impedence flow is seen tumor vessels within the tubal tumor. Gross (C) and microscopic (D) pathology showing tumor vessels.

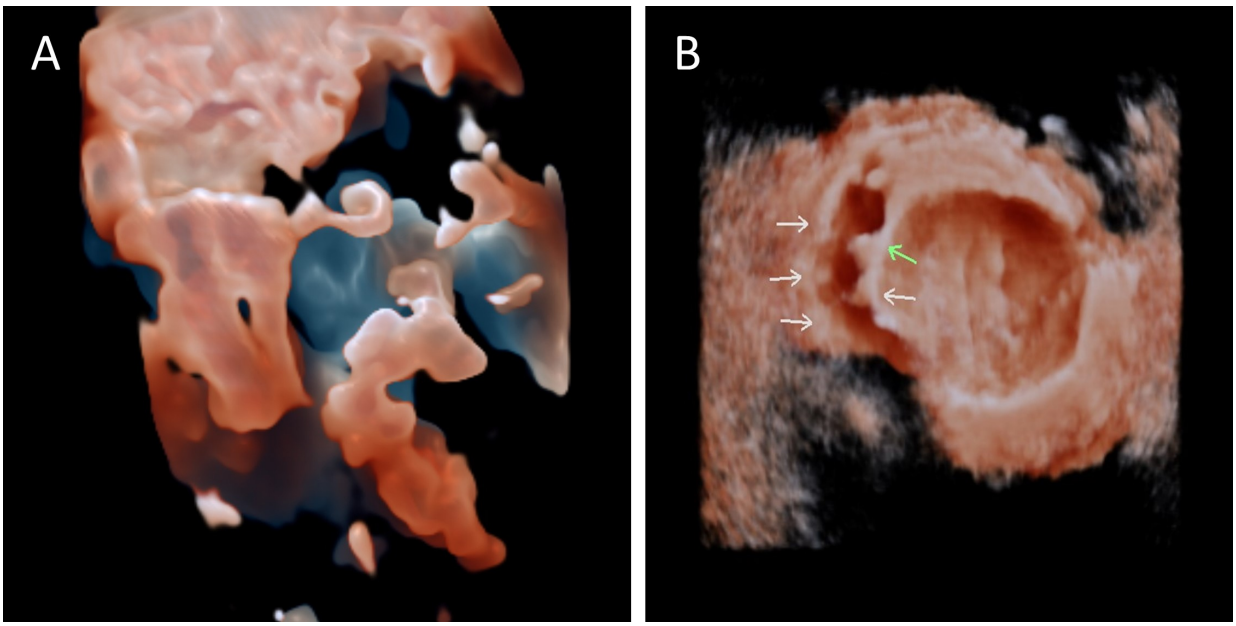

Figure 2. 3D TVS of the fallopian tube. (A) Using surface rendition mode. (B) 3D TVS of sactosalpinx using "see through" rendition (arrows = endosalpingeal folds).

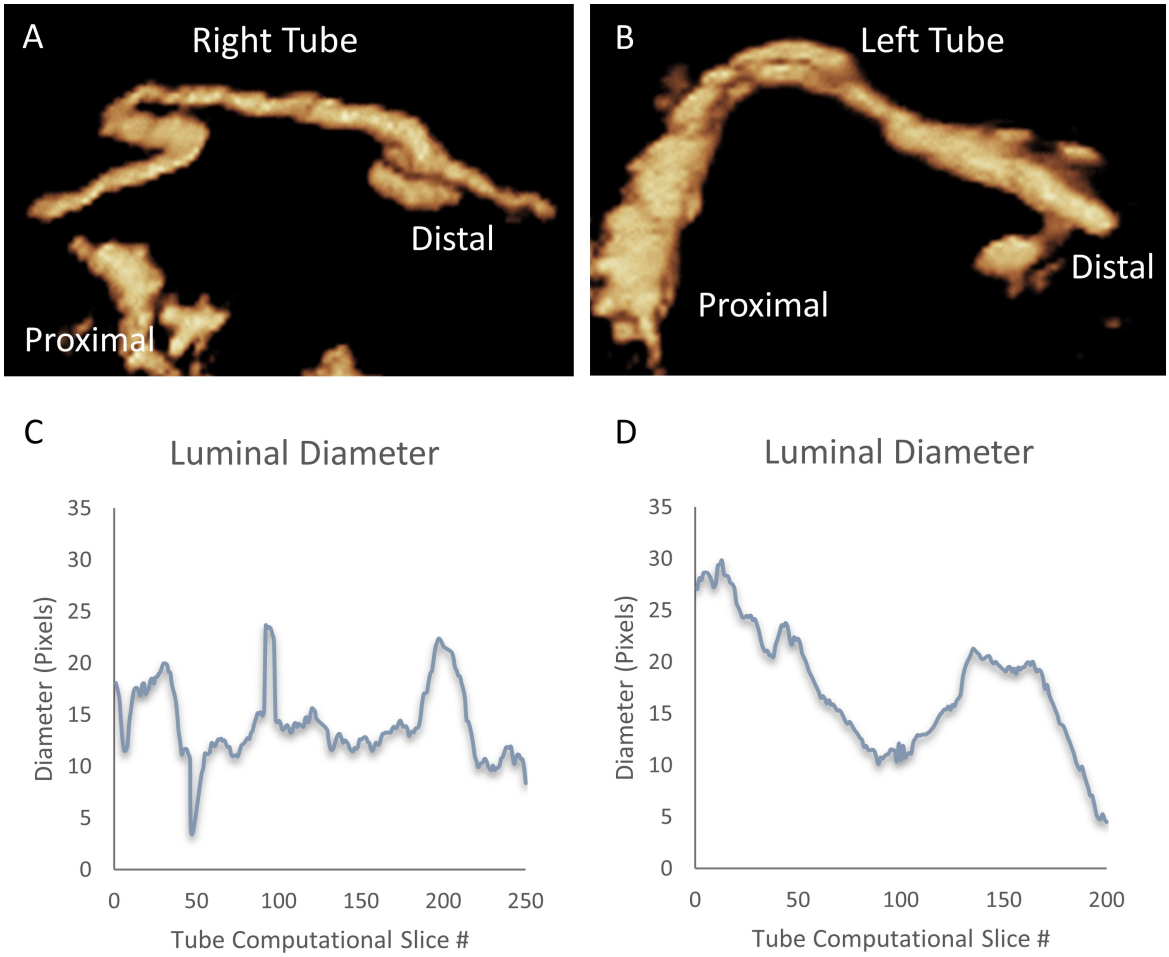

Figure 3. Volumetric images of the tubes (A,B) with calculation of luminal dimension (C,D) from proximal to distal segments.

Ethics approval and consent to participate

IRB Approval protocol 202296. Informed consent was used as noted by IRB approval.

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Conflict of interest

The authors declare no conflicts of interests.

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