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Technical Note

3D ultrasound imaging of the human corpus luteum☆

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ABSTRACT

The aim of this article was to present the extent to which the state-of-the art ultrasonographic imaging can be used to visualize the features of the human corpus luteum (CL). In the late 1970s, the first ultrasonographic images of human CLs were published. The advent of transvaginal, high-resolution transducers has greatly improved the quality of imaging as did the subsequent introduction of color Doppler and 3D ultrasonography. In the present technical note, the examples of the various technical and imaging modalities used to examine the human CLs are shown. CL is a short-lived structure with a highly variable morphological appearance and the 3D ultrasonographic technique is an ideal tool to perform standardized measurements on the CL. The introduction of new imaging techniques in clinical reproductive medicine can only be successful if operators are properly trained.

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1. Introduction

Ultrasonographic imaging using transvaginal probes plays a leading role in monitoring the patients undergoing ovarian stimulation in infertility therapies: most protocols demand an ultrasonographic assessment of the patient's ovaries and endometrium prior to the commencement of medication [1]. During the stimulated cycles, follicular and endometrial development are monitored at regular intervals and the optimal timing for human chorionic gonadotropin (hCG) administration, based largely on the assessment of follicular volume, is determined [2]. Similarly, the monitoring of unstimulated cycles, either for intercourse timing, insemination or "natural" cycle IVF (IVF performed using mature oocytes retrieved from dominant follicles in a natural cycle) all rely heavily on transvaginal ultrasound [3,4].

While the developing pre-ovulatory follicles, either "natural" or "stimulated", are at the centre of clinical interest, the ultrasonographic morphology of the human corpus luteum has received comparatively less attention [5]. Knowledge of the morphology of the corpus luteum has, since Fraenkel's time, been obtained from surgical and autopsy specimens, and prior to the advent of ultrasound a coherent morphologic continuum was established [6]: in the hours following ovulation, serous exudate permeates the ovary and the wall

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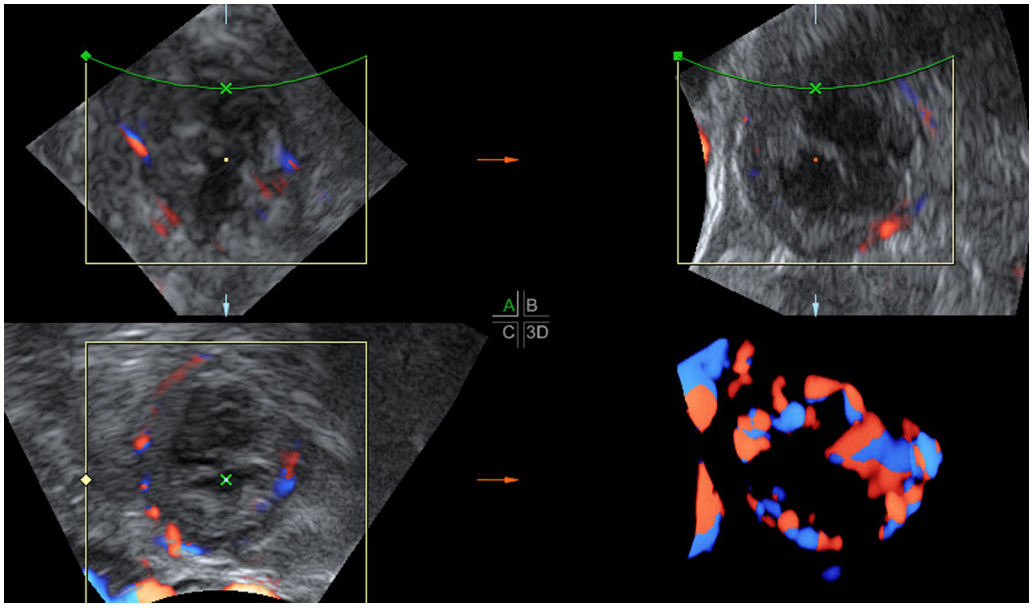

Fig. 1 – Peripheral vascularization of the corpus luteum or a circular pattern called the ''ring of fire'' that can be demonstrated on the 3D color Doppler images.

of the former follicle shrinks, becoming thicker and more vascularized. The first ultrasonographic images of post-ovulatory ovaries were published in the late 1970s using a transabdominal approach [7]. With the advent of transvaginal B-mode ultrasonographic, even before the introduction of color Doppler and 3D ultrasonographic techniques, the wide variability in the appearance of the corpus luteum was demonstrated, and novel sonoanatomical criteria for a CL

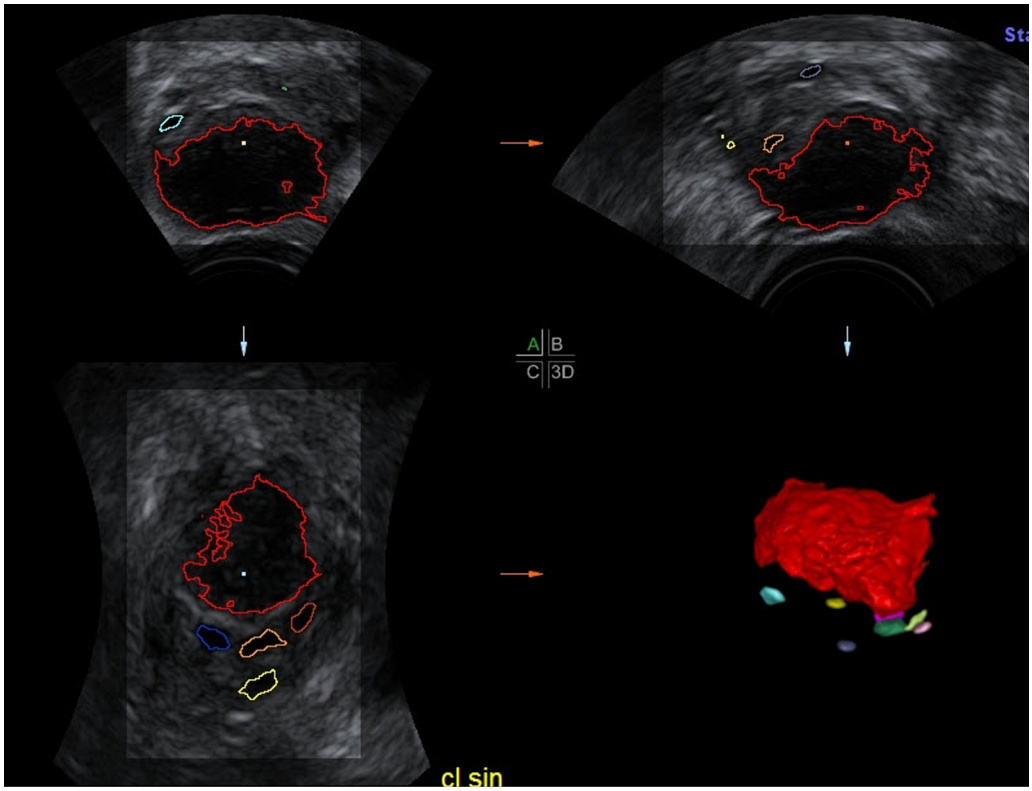

Fig. 2 – 3D image of the central fluid-filled structure using the Sono-AVC™ mode that automatically tracks and calculates the volume of the fluid-filled part.

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