

FEMALE PELVIS – OVARIES

1) Other Names:

- Adnexa – structure or tissue next to or near another related structure; the ovaries and fallopian tubes are adnexal of the uterus (Hagan-Ansert, p.873, Key Terms).

2) Definition/Location:

- The ovaries produce the reproductive cell, the **ovum**, and two known hormones: **estrogen**, secreted by the follicles, and **progesterone**, secreted by the **corpus luteum**. These steroidal hormones are responsible for producing and maintaining secondary gender characteristics, preparing the uterus for implantation of a fertilized ovum, and development of the mammary glands in the female.
- The ovaries are almond-shaped structures (Hagan-Ansert, p.865, 2/1/1).
- The ovaries are the only structures within the abdominopelvic cavity that are *not* covered by visceral peritoneum.
- The **germinal epithelium** is a single layer of epithelial cells lining the outer surface of the ovary. The **tunica albuginea** is a fibrous connective tissue capsule found beneath the epithelial layer (Curry-Tempkin, p. 262, 1/2/3).
- The ovarian **stroma**, or body of the ovary, consists of the **peripheral cortex** and the **central medulla**. The cortex constitutes the bulk of ovarian tissue and is the site of oogenesis. The medulla contains the ovarian vasculature, lymphatics, and nerves supported by fibrous connective tissue (Curry-Tempkin, p.262, 2/2/2).
- Ovarian arteries have a double supply of blood. The primary blood supply to the ovaries is from the ovarian arteries, which arise from the lateral aspect of the abdominal aorta, below the renal arteries. The ovarian artery anastomoses with the uterine artery, providing additional blood to the artery (Hagan-Ansert, p.865, 2/1/5).
- The ovaries typically lie posterolateral to the uterus within the adnexa (Curry-Tempkin, p.251, 2/4/1).
- Ovarian position is variable, however they will never move anterior to the uterus or broad ligaments (Curry-Tempkin, p.252, 1/1/1).
- The ovaries are usually located medial to the external iliac vessels and anterior to the internal iliac vessels and ureter (Hagan-Ansert, p.865, 2/1/4).
- The ovaries are suspended medially by the **ovarian ligaments**, originating bilaterally at the cornua of the uterus, and laterally by the **suspensory (infundibulopelvic) ligament**, extending from the infundibulum of the fallopian tube and ovary to the sidewall of the pelvis. The ovary is also attached to the posterior aspect of the **broad ligament** via the **mesovarium** (Hagan-Ansert, p.866, 2/1/1).

3) Ultrasound Appearance:

- The ovaries are midgray or medium-level echoes with even texture that is equal to or more echogenic than the normal uterus. Uterine follicles are seen as round or oval anechoic structures along the ovarian periphery (Tempkin, p.185, Sonographic Appearance).
- Generally the ovary presents sonographically with a hypoechoic periphery representing the tunica and a low-gray echogenic center representing the stroma (Curry-Tempkin, p.283, 2/1/3).
- Just prior to ovulation, the granulosa layer separates from the theca layer, resulting in a low-gray hypoechoic ring. Also at this time, the cumulus oophorus of the secondary follicle can occasionally be seen as a thin hyperechoic crescent along the wall of the follicular antrum (Curry-Tempkin, p.286, 1/1/2).
- Following ovulation, the **corpus luteum** appears irregular in shape and contains internal echoes due to hemorrhage and blood clot. The internal echoes vary in appearance from multiple, fine, bright septations to diffuse, low-level echoes. The blood clot may become completely anechoic over time, at which point the corpus luteum resembles the sonographic appearance of a mature follicle.
- Eventually, the corpus luteum regresses leaving a small amount of scar tissue in the ovary, called the **corpus albicans**, which appears as a hyperechoic focus within the ovarian stroma (Curry-Tempkin, p.286, 2/1/2).

4) Normal Size Ranges:

- Ovarian size varies during the life span depending on age, menstrual status, pregnancy status, body habitus, and menstrual cycle phase (Curry-Tempkin, p. 262, 2/3/1).
- Normal measurements during reproductive years range from **2.5 to 5 cm** in length, **0.6 to 2.2 cm** in anteroposterior thickness or height, and **1.5 to 3 cm** in width (Curry-Tempkin, p.263, 1/1/2).
- Ovarian volume may also be used as a measure of normal size. In women between 15 and 55 years of age, normal ovarian volume is 6.8 ml (5.8 ml in Hagan-Ansert, p.865, Table 35-2). Ovarian volume is only marginally affected by cyclic changes. The lowest volumes can be observed during the luteal phase and highest during the preovulatory phase (Curry-Tempkin, p. 263, 1/2/1).

5) Pertinent Lab Data:

- **Estrogen/Progesterone:** These hormones are produced by the ovary during the normal menstrual cycle. Serum concentrations of these hormones can be useful in evaluating ovulatory function (Curry-Tempkin, p.293, Laboratory Values).

6) Patient Prep:

- The sonographer should first verify patient information and then obtain a complete clinical history (Hagan-Ansert, p.874, 2/1/1).
- The sonographer should then carefully explain the examination to the patient. If both the TA and EV (TV) examinations are going to be performed the patient should be informed that the pelvic ultrasound will be performed in two parts,

with the TA approach first and the EV approach second. The sonographer should explain that the patient will be allowed to empty her bladder after the first part of the examination is completed (Hagan-Ansert, p.874, 2/3/1).

➤ **Transabdominal (TA):**

- The patient should be placed in the **supine** position (Tempkin, p.186, Patient Position).
- 32-40 oz. of clear fluid should be ingested one hour before the exam and finished within a 15-20 min time period (Tempkin, p.186, Patient Prep).
- If for any reason the patient cannot have fluids, sterile water can be used to fill the bladder through a Foley catheter (Tempkin, p.186, Patient Prep).

➤ **Endovaginal (EV):**

- The urinary bladder should be empty (Tempkin, p.201, Patient Prep).
- The **lithotomy** position is optimal for patient position (Tempkin, p.201, Patient Prep).
- Another option is positioning the patient at the end of the exam table or stretcher with the hips elevated by a pillow or foam cushion (Tempkin, p.201, Patient Prep).
- The transducer may be inserted by the patient, sonographer, or physician (Tempkin, p.201, Patient Prep).

7) Transducer (Probe) Frequency:

- **TA:** (Tempkin, p.186, Transducer)
 - **3.0 MHz or 3.5 MHz**
 - 5.0 MHz for thin patients
- **EV:** (Tempkin, p.201, Transducer)
 - **5.0 MHz to 7.5 MHz**
 - Apply gel to the end of the transducer, and then cover it with a condom or sheath. Make sure there are no air bubbles at the tip, and then apply additional gel to the outside of the condom before insertion. If infertility is a consideration, then water or nonspermicidal gel may be used.

8) Protocol:

- **TA:** (Tempkin, p.197, Required Images)
 - Long axis images of the right and left ovaries measuring length and height, with and without calipers.
 - Transverse images of the right and left ovaries measuring width, with and without calipers.
- **EV:** (Tempkin, p.210, Required Images)
 - Transverse images of the right and left ovaries measuring ovarian width, with and without calipers.
 - Long axis image of the right ovary measuring ovarian length and height, with and without calipers.

9) Image References:

- Hagan-Ansert, p.867, fig. 35-17
- Hagan-Ansert, p.879, fig. 36-7/8
- Hagan-Ansert, p.885, fig. 36-15/16
- Hagan-Ansert, p.879, fig. 36-40
- Curry-Tempkin, p.251, fig. 16-5
- Curry-Tempkin, p.252, fig. 16-6
- Curry-Tempkin, p.264, fig. 16-20
- Curry-Tempkin, p.283, fig. 16-46
- Curry-Tempkin, p.286, fig. 16-47
- Curry-Tempkin, p.287, fig. 16-51
- Curry-Tempkin, p.288, fig. 16-52

10) References:

- Curry, R.A. and Tempkin, B.B. (2004). Sonography: Introduction to normal structures and function (2nd ed.). St. Louis, MO: Saunders.
- Hagan-Ansert, S.L. (2006). Textbook of diagnostic ultrasonography (6th ed.)(Vol.1). St. Louis, MO: Mosby.
- Tempkin, B.B. (1999). Ultrasound scanning: Principles and protocols (2nd ed.). Philadelphia, PA: Saunders.