



Ultrasonography / Échographie

Imaging the Endometrium: A Pictorial Essay

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Abstract

Female gynaecologic conditions arising from the endometrium are common and depend on a woman's age, her menstrual history, and the use of medications such as hormone replacement and tamoxifen. Both benign and malignant conditions affect the endometrium. Benign conditions must be distinguished from malignant and premalignant conditions. The most commonly used imaging modality for evaluating the endometrium is pelvic ultrasound with transabdominal and transvaginal techniques. Additional imaging methods include hysterosonography and magnetic resonance imaging. This pictorial essay will review the normal and abnormal appearance of the endometrium and diagnostic algorithms to evaluate abnormal vaginal bleeding and abnormal endometrial thickness.

Résumé

Les affections gynécologiques d'origine endométriale sont courantes. Leur nature varie selon l'âge et les antécédents menstruels de la femme, et selon qu'elle a pris ou non des médicaments comme ceux administrés dans le cadre d'une hormonothérapie substitutive ou d'un traitement par tamoxifène. Les affections qui touchent l'endomètre peuvent être bénignes ou malignes. Il convient donc de bien distinguer les affections bénignes des affections malignes et précancéreuses. L'échographie du bassin (avec recours à des techniques transabdominales et transvaginales) est la modalité d'imagerie la plus souvent utilisée pour évaluer l'endomètre. D'autres méthodes d'imagerie peuvent également être employées, notamment l'hystéro-échographie et l'imagerie par résonance magnétique. Dans cet essai illustré, nous examinerons les caractéristiques visuelles normales et anormales de l'endomètre et les algorithmes de diagnostic servant à évaluer les saignements vaginaux anormaux et l'épaississement anormal de l'endomètre.

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Key Words: Endometrium; Hysterosonogram, endometrial cancer; Endometrial hyperplasia; Endometrial polyp; Retained products of conception

Female gynaecologic conditions arising from the endometrium are common and depend on a women's age, her menstrual history, and the use of medications such as hormone replacement and tamoxifen. Both benign and malignant conditions affect the endometrium. Benign conditions must be differentiated from malignant and premalignant conditions. The most commonly used imaging modality for evaluating the endometrium is pelvic ultrasound (US) with transabdominal and transvaginal techniques. Additional imaging methods include hysterosonography and magnetic resonance imaging (MRI). This pictorial essay will review the normal and abnormal appearance of the endometrium

and diagnostic algorithms to evaluate abnormal vaginal bleeding and abnormal endometrial thickness.

Normal Endometrium

Ultrasound is the first-line imaging test to evaluate the endometrium. The normal endometrium is composed of 2 layers and the combined thickness of the 2 layers depends on where a woman is in her menstrual cycle (Figures 1-3) [1]. The best way to measure the endometrial thickness is on a midsagittal transvaginal image. Immediately following menses, the endometrium is a thin echogenic line measuring 1-4 mm (Figure 1). In the first half of the menstrual cycle, the endometrium is in the proliferative phase and measures 4-8 mm. At the time of ovulation, the central functional layer of endometrium is relatively hypoechoic, giving a trilaminar appearance with 3 echogenic lines formed by the 2 basal layers of hyperechoic endometrium and the collapsed

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Figure 1. A 39-year-old premenopausal woman with normal endometrium immediately following menses. Transvaginal sagittal ultrasound shows endometrium as a thin echogenic line that measures 3 mm (normal 1-4 mm; calipers).



Figure 3. A 39-year-old premenopausal woman with normal endometrium in the secretory phase. Transvaginal sagittal ultrasound shows endometrium measures 15 mm (calipers; typically up to 14 mm). Endometrium is echogenic due to mucus and glycogen in the endometrial cells.

endometrial cavity (Figure 2). In the latter half of the menstrual cycle after ovulation, the endometrium is in the secretory phase and is uniformly echogenic measuring up to 14 mm due to cells rich in glycogen and mucus (Figure 3) [1,2]. Menopause is defined as the absence of menses for greater than 12 months and typically occurs in women over 50 years of age [3]. The normal endometrium in a postmenopausal woman measures less than 5 mm (Figure 4A).

When there is fluid in the endometrial canal, the 2 layers of endometrium are measured separately and added together (Figure 5) [1]. Some postmenopausal women are on hormone replacement and receive estrogen and progesterone that induces cyclical bleeding. It is important to measure their endometrium 4-5 days after the start of menses when it should measure less than 5 mm [1,4].

Endometrial Hyperplasia, Polyps, and Cancer

Abnormal vaginal bleeding may occur in premenopausal and postmenopausal women. In premenopausal women, the most common causes are hormonal disturbances, fibroids, or adenomyosis. In postmenopausal women, causes include an atrophic endometrium, endometrial hyperplasia, endometrial cancer, endometrial polyps, and submucosal fibroids [5]. The most common cause of postmenopausal bleeding is an atrophic endometrium that is diagnosed when the endometrium measures less than 5 mm [1,6] (Figure 4A). Occasionally, an atrophic endometrium may contain cystic areas due to cystic dilatation of glands that may increase the thickness of the endometrium (Figure 4B) [7]. Endometrial hyperplasia is a premalignant condition. Both endometrial hyperplasia and cancer are due to unopposed estrogen that may be due to endogenous or exogenous sources, tamoxifen, obesity, chronic hypertension, or diabetes [8]. In a woman with postmenopausal bleeding, the endometrium is abnormal if it measures 5 mm or greater and this warrants endometrial biopsy (Figure 6) [1,4]. In asymptomatic postmenopausal women without vaginal bleeding, the endometrium is abnormal if it measures 9 mm or greater, and this warrants endometrial biopsy [9]. Endometrial cancer is the most common gynaecologic cancer and 90% of cases occur in

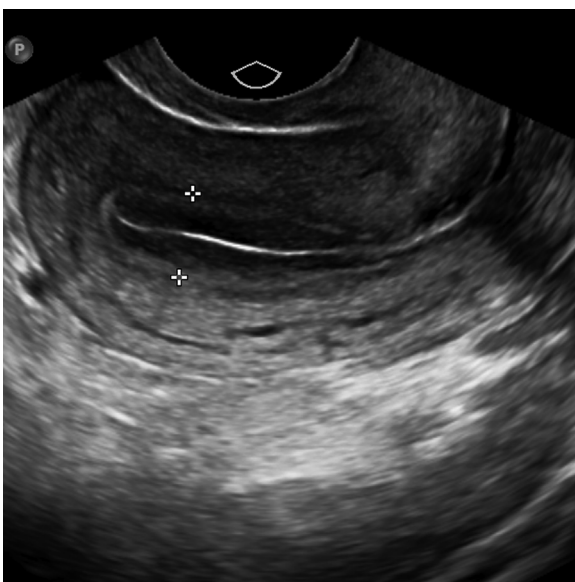


Figure 2. A 19-year-old female with normal endometrium in periovulatory phase. Transvaginal sagittal ultrasound shows endometrium measures 9 mm (calipers; typically 4-8 mm in the first half of the menstrual cycle). There is a trilaminar appearance. Central functional layer of endometrium is relatively hypoechoic.

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