



## Ultrasound in the Evaluation of Abnormal Vaginal Bleeding

- Bleeding in post-menopausal women is abnormal and is the most common presenting symptom for endometrial cancer
- Nearly all endometrial cancer (96%) is associated with a thickened endometrium (>4mm in post-menopausal women), which can be measured by transvaginal ultrasonography
- Saline infusion sonohysterography is a sensitive technique for the detection of focal lesions but does not provide histological data
- Gynecologists recommend that the imaging work-up of abnormal bleeding in post-menopausal women should always be supplemented with histological information

Although most abnormal vaginal bleeding is caused by hormone imbalance, it can be indicative of disease including polyps, myomas, endometrial hyperplasia, and cancers of the cervix and endometrium. In post-menopausal women, the greatest concern is endometrial cancer, which is now the most common gynecological cancer. Therefore, it is important to determine the cause of all cases of post-menopausal vaginal bleeding. More than 90% of the cases of endometrial cancer occur in women over 50 and this disease accounts for approximately 10% of the cases of vaginal bleeding in post-menopausal women.

### Post-Menopausal Bleeding

#### **Transvaginal Ultrasound (TVUS)**

The first step in evaluation post-menopausal bleeding may be a TVUS or an endometrial biopsy. Although TVUS is the least sensitive and specific examination for the diagnosis of cancer, it is more sensitive than biopsy for the detection of other abnormalities, such as polyps and fibroids, that are more commonly the cause of bleeding. It is also the least invasive method and results in little or no discomfort for most patients. Endometrial cancer causes the endometrium to thicken, which appears as a thickened hyperechoic stripe in transvaginal US images. The thickness of the endometrial stripe can be measured accurately and it has been estimated that 96% of post-menopausal women with endometrial cancer will have an endometrial stripe greater than 4 mm. At this threshold the false positive rate is 50%. TVUS can also



Transvaginal ultrasound of a postmenopausal woman with vaginal bleeding shows an abnormally thickened endometrium. Endometrial biopsy revealed atrophic endometrium.

show if the endometrial lining is very thin. If so, the bleeding may be due to endometrial atrophy.

Women who are being treated with tamoxifen are at increased risk of developing endometrial cancer but TVUS can be misleading in these patients. Tamoxifen can cause sub-endometrial cyst development, which makes the endometrium appear thickened in transvaginal sonograms. However, the sub-endometrial cystic tissue can be differentiated from the endometrium itself in saline infusion sonohysterograms.

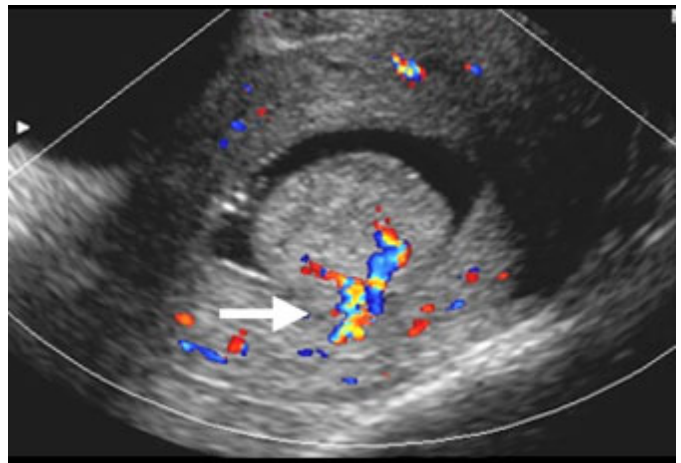
Causes of Vaginal Bleeding in Post-Menopausal Women	
Polyps	30%
Sub-mucosal fibroids	30%
Endometrial atrophy	8%
Hyperplasia	4-8%
Endometrial carcinoma	10%

### Endometrial Biopsy (EMB)

Gynecologists recommend that EMB be selected as an initial screening test for the evaluation of post-menopausal bleeding. Alternatively, it can be performed if the thickness of the endometrial stripe is >4 mm in post-menopausal women and >16 mm in pre-menopausal women. In addition, it should be performed if the endometrial stripe is <4 mm in post-menopausal women and no cause for bleeding has been identified by TVUS (or TVUS and saline infusion sonohysterography) because there is a small risk (1.2%) of endometrial cancer in these women.

### Saline Infusion Sonohysterography (SIS)

Saline infusion sonohysterography (SIS) is a very sensitive ultrasound technique for detecting focal lesions because a small volume of saline (<20 ml) is used to distend the uterine cavity in order to improve visualization of the endometrial surface. SIS is a minimally invasive alternative to hysteroscopy and is appropriate for further evaluation of patients in whom a focal abnormality is suspected from TVUS as well as patients in whom no cause for the bleeding has been identified after biopsy and TVUS. In addition, SIS may



Sonohysterography reveals an endometrial polyp originating from the posterior wall of the uterine fundus. Color doppler demonstrates the vascular stalk (arrow). The polyp was resected hysteroscopically.

be useful when a thickened endometrium has been identified by TVUS because SIS can differentiate between diffuse and focal thickening.

It should be pointed out that if the cause of bleeding cannot be identified after SIS and EMB and if bleeding persists in a post-menopausal patient, it is possible that the results from ultrasound imaging and biopsy are false negatives. Therefore, the patient should be referred for hysteroscopy and endometrial biopsy even if her endometrial stripe is <4 mm. If the hysteroscopy-guided biopsy is negative, the post-test probability of endometrial cancer is 0.5%.

Techniques for the Evaluation of Abnormal Vaginal Bleeding		
	Advantages	Disadvantages
<b>Transvaginal Ultrasound (TVUS)</b>	Minimal patient discomfort post-test probability of endometrial cancer is 1.2% if endometrium <4 mm	If endometrium is thickened, need biopsy to confirm diagnosis
<b>Endometrial Biopsy (EMB)</b>	Provides histological diagnosis of cancer	May fail due to cervical stenosis May fail to provide sufficient tissue for histology 11% False negative rate
<b>Saline Infusion Sonohysterography (SIS)</b>	Surveys entire uterus More sensitive than TVUS for detecting focal abnormalities of endometrium May detect focal thickening of endometrium More sensitive than hysteroscopy for detecting fibroids	May cause cramping sensation Treatment not possible Positive findings require histological confirmation
<b>Hysteroscopy</b>	Can biopsy and/or remove focal lesions More sensitive than SIS for polyp detection	Patients describe procedure as markedly unpleasant View may be obscured

**Sensitivity, Specificity, Positive and Negative Predictive Values  
for Endometrial Cancer in Post-Menopausal Women**

	<b>Sensitivity</b>	<b>Specificity</b>	<b>PPV</b>	<b>NPV</b>
<b>Transvaginal Ultrasound (TVU)</b>	67%	56%	7%	97%
<b>Endometrial Biopsy (EMB) (blind) *</b>	87%	98.5%	82%	99.1%
<b>Saline Infusion Sonohysterography (SIS)</b>	89%	46%	16%	97%
<b>Hysteroscopy and Biopsy</b>	86%	99.2%	100%	99.5%

\*Numbers include inadequate samples as negative

(Clark, TJ, Mann, CH et al. 2002; Critchley, HO, Warner, P et al. 2004; Clark, TJ, Voit, D et al. 2002)

## Menorrhagia

SIS is also appropriate for the evaluation of ovulating women with menorrhagia. In these women, the examination should be performed within the first week following the end of menstruation. At this point in the menstrual cycle the endometrium is in the proliferative stage and is relatively thin. Therefore, abnormalities are less likely to be obscured. SIS is contraindicated if the patient is pregnant, has a pelvic infection, or has unexplained pelvic tenderness.

## The Saline Infusion Sonohysterography Procedure

SIS is generally a well-tolerated procedure although some women experience mild to moderate cramping either during the insertion of the catheter into the cervix or during the infusion of saline into the uterus. Therefore, patients should be advised to take medication that they use for normal menstrual cramps approximately one hour prior to the examination. If the patient is allergic to latex products, it is important to provide that information in advance of the examination because it is necessary to prepare somewhat differently to accommodate these patients.

SIS takes approximately one hour and is performed by a radiologist experienced in this technique with the assistance of an ultrasound technologist. First, a TVUS evaluation is performed to image the uterus, endometrium, and ovaries. Then a speculum is introduced into the vagina, the cervix is cleaned and a small balloon catheter (3 mm) is inserted through the vagina into the center of the cervix using sterile technique. Once in place, the balloon is inflated to secure it in position and the speculum withdrawn. The

TVUS device is then reinserted and approximately 10-20 ml of sterile saline is gently infused into the uterus while real-time images are observed. The entire uterine cavity is surveyed and representative images acquired. This phase of the examination lasts 10-15 minutes. In some cases, women experience cramping during the first 24 hours following SIS. If this occurs, they should continue to take medication for menstrual cramps.

## Scheduling

Transvaginal ultrasound may be performed at Mass General West Imaging in Waltham, in Chelsea, and on the main MGH campus. However, saline infusion sonohysterography is only performed on the main campus. Appointments at all locations can be scheduled by calling 617-724-XRAY(9729). In addition, transvaginal (pelvic) ultrasound but not sonohysterography can be ordered through the web-based Radiology Order Entry system, <http://mghroe/>.

## Further Information

For further questions on ultrasound, please contact [Susanna Lee, M.D., Ph.D.](#), Assistant Radiologist in the Abdominal Imaging and Intervention Division, at 617-726-8396. In addition, further information on the evaluation of abnormal vaginal bleeding can be found at the [MGH Primary Care Office Insite](#) website.

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