Methods of Endometrial Assessment.

Introduction

Approximately one–third of all gynaecological consultations are r elated to abnormal vaginal bleeding, and this proportion rises to 7 0% in the peri- and postmenopausal years. Most gynaecologists a gree that abnormal vaginal bleeding after the age of 40 years requ ires further evaluation to exclude the presence of endometrial pol yps, hyperplasia, fibroids or carcinoma. Younger women may als o need endometrial investigations if abnormal bleeding does not r apidly resolve with the oral contraceptive pill or prostaglandin sy nthetase inhibitors. In certain conditions, such as the polycystic o vary syndrome in which endometrial hyperplasia is more common , endometrial assessment may be necessary if abnormal bleeding i s a presenting feature, or unusual sonographic endometrial appear ances are discovered.

Traditionally, the standard method of assessing the endometrium has been with dilatation of the cervix and curettage of the uterine cavity under general anaesthesia. The frequency of this procedure varies worldwide. For example, the annual rate in 1989 in the Uni

ted States was 10/10,000 women, whereas in England it was 71.1/10,000 women. Presumably, this difference is due to more outpatient procedures being performed as technology in this field advances and reduction in costs is achieved by the avoidance of inpatient investigation.

In this review article we have attempted to summarise the relevant information relating to the use of several methods of assessing the endometrium. A literature search using the MEDLINE database was performed using the MeSH headings: *transvaginal ultrasound*, *hysteroscopy*, *endometrial biopsy and endometrial cytology*. Reference lists of the articles identified were hand searched to provide additional publications. A total of 142 citations were found using these methods.

Methods of endometrial assessment

1. Outpatient endometrial biopsy

Most endometrial biopsies can be performed in outpatients and have the advantage of being simple, quick, safe, inexpensive, convenient and avoiding the need for anaesthesia. Furthermore, the devices used are disposable and this may have economic advantages. Many of these devices have depth markings which allow the operator to record uterine length.

The two most commonly used devices are the Pipelle (Unimar, Connecticut, USA) and the Vabra aspiration biopsy (Berkeley Medevices, Berkeley, California, USA). Other less commonly used curettes include the Z-sampler (Cory Brothers, London, UK), Karman cannula and syringe (International Projects Assistance Services, North Carolina, USA), Accurette (Axcan, Plattsburg, New York), Tis-U-Trap (Milex Products, Illinois, USA), Novak curette (Milt

ex, Inc, Lake Success, New York, USA), Explora (Milex, Chicag o, Illinois) and Gynocheck (Roussel, Paris, France).

The Pipelle sampler is a flexible polypropylene suction cannula th at has an outer sheath of 23.5 cm in length and 3.1 mm in diamete r. There is a distal aperture (2.4 mm in diameter) in the side of the cannula through which the endometrial specimen is aspirated. Th e device is inserted through the cervical canal to the uterine fundu s. In some situations the cervix has to be immobilised with tenacu lum forceps to enable insertion of the curette. In postmenopausal women cervical stenosis may exist which prevents the Pipelle fro m passing through the canal and results in bending of the cannula. This problem can usually be overcome by placing sponge holdin g forceps onto the Pipelle cannula, approximately 3 cm from the d istal end. This manoeuvre prevents the device from bending and a llows entry through a narrow cervical canal. Once the device is wi thin the uterine cavity a piston within the sheath is withdrawn to c reate a vacuum inside the uterus. The cannula is then rotated throu gh 360° while being with drawn. The endometrial sample is colle cted within the lumen of the cannula. Finally, the distal 0.5 cm of the Pipelle is cutoff and the plunger is pushed into the cannula to expel the specimen into a collecting vessel.

The Pipelle device obtains an adequate endometrial specimen in 8 4% of postmenopausal women and 91% of pre- and postmenopau sal women .However, in one study the Pipelle accurately diagnos ed only 67% of endometrial cancers; the false negative biopsies w ere in women with small, well-differentiated tumours. All the wo men in this study had undergone dilatation and curettage before th e Pipelle biopsy was performed and this may have affected the res ults. These results do not agree with another study which reported a 98% detection rate for endometrial cancer in postmenopausal w omen. Because only a small proportion of women in these studies subsequently underwent hysterectomy it is impossible to know pr

ecisely the number of endometrial polyps that were missed with t he Pipelle, although the device may sample part of a polyp. It has been claimed that failure to obtain an endometrial specimen is ass urance that no significant intrauterine pathology is present, as lon g as the device is correctly positioned within the uterine cavity
.
The Vabra curette is a stainless steel cannula 24 cm in length and 3 mm in diameter with a chamber for collection of the specimen a t one end. Plastic cannulae are also available but have two entry h oles for collection of the tissue. The attached plastic chamber, whi ch contains a tissue trap, is connected to an electrically powered v acuum pump. The device is inserted into the uterine cavity, rotate d and withdrawn to obtain endometrial tissue. The Vabra aspirator is reliable in obtaining endometrial specimens in 91% of cases a nd detects 95% of malignant intrauterine patholog..

Approximately 4% and 42% of the endometrium is sampled by th e Pipelle and Vabra devices, respectively. The area not sampled is therefore greater with the Pipelle than the Vabra but the discomfo rt from the procedure is greater with the Vabra. This may be relat ed to the suction pump used with the Vabra. The discomfort from the Vabra can be reduced by the administration of nonsteroidal an ti-inflammatory drugs given orally one hour before the procedure.

In the investigation of infertility there is a risk of causing a miscar riage when an endometrial biopsy is performed in the luteal phase of the cycle and an undiagnosed early pregnancy is present; but t he available evidence suggests that this risk is small.
The Explora device and the Karman cannula provide adequate en dometrial samples for laboratory assessment in 87% and 82% of women, respectively.

The Accurette sampler has success rates of between 76% and 97

%, but in one study, the Gynocheck sampler provided adequate endometrial specimens in only 24% of cases. The Novak curette and Z-sampler provide sufficient endometrium for analysis in approximately 95% of samples but when postmenopausal women alone are evaluated this proportion is 75%
; the Novak correctly detects 91 % of uterine malignancies, while the Z-sampler detects 94%.
There are several limitations to all of these methods. The most important is that they are ‘blind’ procedures and thus not all of the endometrial surface will be sampled. Both the Pipelle and Vabra curettes may miss endometrial polyps (as may formal dilatation and curettage performed under a general anaesthetic). If a satisfactory outpatient biopsy has been performed but abnormal uterine bleeding continues, ultrasound or hysteroscopic assessment of the endometrium and uterine cavity should be considered. This is particularly important for postmenopausal women with persistent bleeding.

Table 1 summarises the performance of outpatient endometrial biopsy devices in pre- and postmenopausal women.

Table 1. Performance of different types of outpatient endometrial sampling devices. Values are given as ratio of samples obtained: total number of samples taken (%).

	Adequacy of sample obtained		Rate of detection of carcinoma of the endometrium*	
Endometrial biopsy device	Values	Reference	Values	Reference
Pipelle				
Postmenopausal	74:88 (84)	Ben-Baruch et al.[2]	25:37 (67)	Ferry et al[6]
Pre- and postmenopausal	154:170 (91)	Ben-Baruch et al.[2]	39:40 (98)	Stovall et al.[7]
Vabra				
Postmenopausal	31:35 (88)	Goldberg et al.[16]	40:42 (95)	Grimes[8]
Pre- and postmenopausal	51:56 (91)	Kaunitz et al.[3]		
Explore				
Postmenopausal	12:17 (70)	Lipscomb et al.[13]	11:16 (69)	Kufahl et al.[15]
Pre- and postmenopausal	158:181 (87)	Kufahl et al.[15]		
Accurette				
Postmenopausal	30:35 (85)	Goldberg et al.[16]	No data	
Pre- and postmenopausal	78:83 (97)	Kovacs et al.[17]		
Z-sampler				
Postmenopausal	167:226 (74)	Larson & Broste[20]	66:70 (94)	Larson et al.[19]
Premenopausal	171:181 (95)	Larson & Broste[20]		
Novak				
Postmenopausal	171:226 (76)	Larson et al.[19]	64:70 (91)	Larson et al.[19]
Premenopausal	173:181 (96)	Larson et al.[19]		
Gynockeck				
Premenopausal	24:99 (24)	Sheehan et al.[18]	No data	
Karman				
Pre- and postmenopausal	40:49 (82)	Suarez et al.[14]	3:3 (100)	Suarez et al.[14]

Some specialists advocate a routine endometrial biopsy in all women before starting HRT as the incidence of endometrial hyperplasia and carcinoma has been reported to be as much as 5% and 0.13%, respecti vely.

However, a more recent study involving nearly 3000 peri- and postm enopausal women found that the pre-treatment rate of endometrial hy perplasia was 0.6% and 0.07% for adenocarcinoma.

2. Ultrasound

Ultrasound, preferably transvaginal, is used to assess endometrial thic kness, endometrial and myometrial consistency, and abnormalities of endometrial morphology. Transvaginal ultrasonography is preferable to pelvic ultrasonography because of the better quality of its images. This is achieved because of its higher frequency which allows greater image resolution at the expense of decreased depth of penetration. T he proximity of the vaginal vault to the endometrium allows vaginal t ransducers of the higher frequency to be used. All the values of endo metrial thickness discussed in this paper are measurements of the dou ble-layer.

Although transvaginal ultrasound is widely utilized there are several l imitations to its use. Firstly, there have been very few well conducted studies examining the accuracy of transvaginal ultrasound. Two smal l studies, using pelvic ultrasonography, have shown that endometrial thickness values agreed with histopathological measurements . How ever, in neither of these studies is it clear whether the ultrasound and

direct endometrial thickness measurements were performed independently. Several studies attempting to verify the validity of transvaginal ultrasound were also flawed by the lack of independence of the measurements as well as the use of hysteroscopy as a ‘gold’ standard rather than histopathology

This limitation is particularly relevant when submucous fibroids are suspected with transvaginal ultrasound and then attempts to confirm their presence are made solely by direct hysteroscopic visualization without histopathological confirmation.

Homogeneity, echoes of low intensity, and the presence of a linear central echo is associated with the absence of endometrial pathology; whereas heterogeneity and echoes of high intensity usually imply the presence of endometrial abnormalities.

Ultrasonic appearances of endometrial carcinoma include an average endometrial thickness of 20 mm hypoechoic areas and a heterogeneous appearance.

Ultrasound may also be useful in assessing cystic changes in rapidly growing fibroids to determine the risk of malignant change.

Endometrial polyps may appear as cystic spaces on ultrasound examination, but the endometrium may also appear hyperechoic

In postmenopausal women not receiving hormone replacement therapy, the double-layer endometrial thickness is less than 5 mm and values above this should lead to investigation to exclude the presence of intrauterine pathology. Although several studies suggest that women with postmenopausal bleeding and endometrial thickness of less than 5 mm need no further investigations, there are reports of endometrial cancer occurring where endometrial thickness is less than 5 mm.

A large multicentre Italian study examined endometrial thickness in 930 women with postmenopausal bleeding who were not receiving hormone-replacement therapy: an endometrial thickness of <4 mm had a negative predictive value of 99% in the detection of malignancy. In addition, a meta-analysis of 35 studies examining transvaginal ultrasound measurements and endometrial abnormalities showed that using

an endometrial thickness of 5 mm the sensitivity for detecting any en dometrial disease was 92%, and the sensitivity for detecting cancer w as 96%.

These results were confirmed in postmenopausal women taking com bined oestrogen and progestogen preparations.

In this study the positive predictive value for serious endometrial pat hology was 9%, and in perimenopausal women it has been suggested that the limit of endometrial thickness requiring further investigation should be 7 mm.

One recommendation sets the limit of endometrial thickness in perim enopausal women at 5 mm, if the transvaginal ultrasound examinatio n is performed on the fifth day of the menstrual cycles.

Detection of endometrial polyps, submuc ous fibroids, and adenomyosis

Ultrasound detection of endometrial polyps, particularly in premenop ausal women, using measurements of endometrial thickness, is unreli able.

This is because the normal range for endometrial thickness overlaps with that seen in women with endometrial polyps.When an endometri al polyp is suspected it may be better to perform an ultrasound exami nation during the proliferative phase when the endometrium appears hypoechogenic compared with a hyperechogenic polyp.

Some studies, however, suggest that about 90% of polyps can be iden tified by transvaginal ultrasonography although sometimes these can not be distinguished from submucous fibroids.

Endometrial polyps appear as contour defects which are completely s urrounded by endometrium, while submucous fibroids have myometr ium on one side and endometrium on the other.

Other data for postmenopausal women suggest that 58% of polyps ar e correctly identified by transvaginal ultrasound

Where the polyp is missed the endometrial thickness is often greater than 4mm.

Transvaginal ultrasonography has been reported to detect 99%–100 % of submucous fibroids.

Mean endometrial thickness values for women with endometrial polyps, hyperplasia and carcinoma are shown in Table 2.

Table 2. Endometrial thickness values (transvaginal) in normal postmenopausal women and associated endometrial pathology (Smith-Bindman et al.) Values are given as mean (SD).

Endometrial condition	Endometrial thickness (mm)
Normal	4 (1)
Endometrial polyp	10 (3)
Endometrial hyperplasia	14 (4)
Endometrial carcinoma	20 (6)

Fluid in the endometrial cavity of postmenopausal women taking hormone replacement therapy was previously thought to be an important sign of underlying malignancy but is now thought not to be so. When fluid is found then hysteroscopic assessment and endometrial biopsy should be performed if the endometrial thickness exceeds 5 mm. Other pathology that can be seen with transvaginal ultrasonography includes adenomyosis , but in most women this diagnosis is obtained only after hysterectomy and subsequent histopathological examination. Three-dimensional ultrasound has been used in women with postmenopausal bleeding. At present, data are sparse and more research with this technology is required.

Colour flow Doppler and the endometrium

Some studies suggest that colour flow Doppler may assist in the diagnosis of endometrial carcinoma, since blood flow is increased in malignant lesions. Increased blood flow has also been reported in benign conditions and so this technique is unlikely to replace ultrasound or hysteroscopy with endometrial biopsy.

Sonohysterography

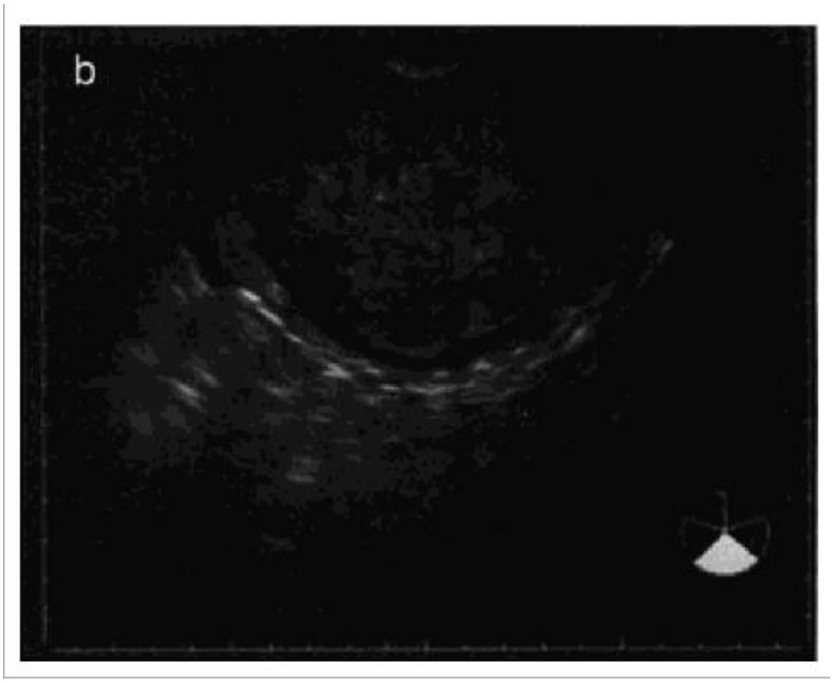
This technique involves advancing a saline-primed catheter such as one used for intrauterine insemination techniques, or a paediatric feeding tube, into the uterus until its tip is level with the internal os. Between 5 and 15 mL of saline are then infused into the uterus under continuous real-time sonographic observation. An interface between the fluid and an endometrial mass can then be defined more clearly. Sonohysterography allows the detection of polyps and submucous fibroids (Fig. 1), and can distinguish between these pathologies

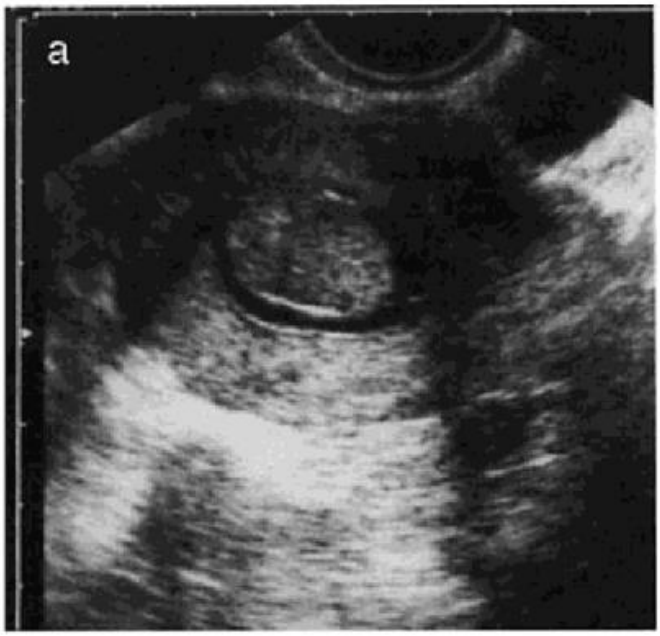
Some data suggest that sonohysterography is superior to ultrasonography in the detection of submucous fibroids and is more accurate in determining the size of submucous fibroids
. If submucous fibroids are suspected on ultrasonography then sonohysterography allows better visualisation of the endometrial cavity and reduces the need for invasive investigations, such as hysteroscopy. Intrauterine synechiae and uterine malformations can be visualized with sonohysterography and this information assists the treatment of women with infertility and recurrent miscarriage.
Sonohysterography has similar rates of detection of structural pathology as hysteroscopy and is well tolerated.
Other uses of sonohysterography are the detection of residual tropho

blastic tissue where it is better than ultrasound, reducing the need for repeat evacuation of the uterus.

Three-dimensional ultrasonography with sonohysterography seems to improve visualisation of the endometrial cavity.

but information on this combined technique is limited. The disadvantages of sonohysterography include a risk of intrauterine infection and spread of malignant endometrial cells into the peritoneal cavity at the time of the saline instillation. Pelvic infection has not so far been reported, but it may be wise to consider administration of antibiotics to women with a history of pelvic inflammatory disease or those thought to be at risk. The risk of a significant quantity of malignant cells entering the peritoneal cavity is theoretically low for only small volumes of saline are used under low pressure. Other disadvantages include the problem of saline leakage and subsequent loss of distension of the uterine cavity; this can be reduced by using a catheter with a self-retaining balloon.





Sonohysterographic appearances of (a) endometrial polyp; (b) submucous fibroid.

Effects of hormone replacement therapy on the endometrium

Sequential forms of hormone replacement therapy increase endometrial thickness; average measurements are from 5–8.5 mm. With continuous combined hormone replacement therapy endometrial thicknesses are 4.5–7 mm–still above the mean for atrophic endometrium.

With tibolone endometrial thickness is less than 5mm. Table 3 summarises measurements of endometrial thickness in women receiving sequential hormone replacement therapy, continuous combined hormone replacement therapy, tibolone and tamoxifen.

Table 3. Effects of sex steroids on endometrial thickness in postmenopausal women. Values are given as mean (range).

Sex steroid	Endometrial thickness(mm)	Reference
Tamoxifen	13.1 (2.7–23.5	Cohen et al. [139]
Oestrogen alone*	11.7 (1–26)	Langer et al. [50]
Oestrogen + cyclical progestogen†	6.4 (2–15)	Langer et al. [50]
Oestrogen + continuous progestogen‡	4.5 (1–17)	Langer et al. [50]
Tibolone	3.2 (2.5–3.9)	Botsis et al. [97]

* 0.625mg conjugated equine oestrogen.

† 0.625mg conjugated equine oestrogen + 10 mg medroxyprogesterone acetate for 12 days per calendar month.

‡ 0.625mg conjugated equine oestrogen + 2.5mg medroxyprogesterone acetate daily.

3. Hysteroscopy

This allows the whole surface area of the endometrium to be visualis ed. Hysteroscopy can detect small polyps or submucous fibroids whic h have been missed by endometrial biopsy procedures, ultrasonograp hy, or ‘blind’ curettage.

The procedure can be performed under local anaesthesia–‘office’ hy steroscopy
or general anaesthesia, and this will depend, to some extent, on the ex perience of the operator, the facilities available and preference of the woman. With ‘office’ hysteroscopy, carbon dioxide is used to distend the uterine cavity and this usually allows good visibility provided tha t there is no blood or mucus in the cavity to create bubbles that obscu re the image and prolong the procedure.

A flow rate of carbon dioxide of 100 mL/min at a pressure of 150 m mHg are the maximum safe levels. Gas embolism is more likely to oc cur with air because of its low plasma solubility and thus it should be avoided.

Carbon dioxide distension can be used with either the flexible or rigi

d hysteroscope. Recently single flow flexible hysteroscopes have bec ome available and are suited to outpatient procedures because their di ameter is 3.6 mm, compared with 4–5mm single or continuous flow h ysteroscopes. This reduces the need for anaesthesia and cervical dilat ation.

These hysteroscopes use carbon dioxide or low viscosity fluids for di stension of the uterine cavity. Flexible hysteroscopes are useful for tu bal cannulation and other procedures in which uterine anatomy is dist orted in a manner which prevents access by rigid hysteroscopes.

High-viscosity fluids, such as Dextran 70, and low-viscosity fluids, s uch as 1.5% glycine or normal saline, are also used to distend the uter ine cavity. Their main advantage is the ability to flush the uterine cav ity of blood, mucus and endometrial ‘debris’.

There are two types of rigid hysteroscope: single and continuous flow . The single flow hysteroscope has only one channel for the passage o f fluid, whereas the continuous flow hysteroscope has two channels, i nflow and outflow. Small endometria1 biopsies are possible with the continuous flow hysteroscope using the outflow channel to introduce the forceps.

Although many endometrial abnormalities have characteristic hystero scopic appearances, such as endometrial hyperplasia and carcinoma, endometrial biopsy must always be performed. Hysteroscopy should not be carried out if the woman is pregnant or has acute pelvic inflam matory disease, which may progress to peritonitis if gas or fluid force s infected tissue through the Fallopian tubes

In women with a history of pelvic inflammatory disease or ectopic pr egnancy antibiotic prophylaxis should be considered before hysterosc opy with saline is performed.

The major restriction to the more widespread use of outpatient diagno stic hysteroscopy would seem to be the cost, which, including light s ource, optics, insufflator and camera,

Furthermore, observer agreement studies have not been performed to justify the use of hysteroscopy. As a result many diagnostic features of endometrial pathology, particularly fibroids, are made entirely on

a subjective basis. Studies examining this problem are few because o nly a small number of women undergoing hysteroscopy subsequently undergo hysterectomy soon afterwards to provide histological confir mation of uterine pathology.

4. Dilatation and curettage

This procedure was first introduced by Recamier in 1843 to scrape of f uterine ‘fungosities’ and has long been considered the accepted stan dard of endometrial assessment. However, dilatation and curettage ha s limitations and complications. It is performed in a ‘blind’ fashion so that not all of the endometrium is sampled. Histological examination of 50 uteri obtained at hysterectomy immediately after dilatation and curettage showed that in 60% of cases less than half and in 16% less than a quarter of the surface area of the endometrium had been sampl ed.

It is well recognized that small polyps and submucous fibroids may b e missed.

Adequate sampling is reported in approximately 75% of womenn but in up to 10% abnormal pathology may be missed.

Uterine perforation occurs in 6–13 per 1000, haemorrhage in 4 per 1 000 and infection in 3–5 per 1000 dilatations and curettages.

Overenthusiastic curettage may cause intrauterine synechiae. Damag e to the cervix may also occur. Other disadvantages of dilatation and curettage are the expense, the requirement for general anaesthesia an d the inconvenience to the woman.

5. Endometrial cytology

This method of endometrial assessment is not commonly used in sym ptomatic women but has been considered as a screening test for endo metrial cancer in asymptomatic women.

It has not yet been established as a reliable test. The methods for coll ecting samples are simple, relatively painless and cheap. The interpre tation of the smears, however, is not straightforward because it is tim e-consuming and requires experienced cytologists to make an accurat e diagnosis. Malignant cells can be detected in 98% of cases of carcin oma of the endometrium, but the diagnosis of hyperplasia is much m ore difficult

Endometrial cytological samples may be obtained by three methods: washing, by aspiration and using endometrial brushes. Devices used t o obtain endometrial samples include the Gravlee Jet Wash (Becton Dickinson, AG, Basel, Switzerland), the Endocyte system (Laborato ire CCD, Paris, France), the Endo–Pap instrument (Sherwood Medic al Laboratories, St Louis, Missouri, USA), the Endoscann or Gynosc ann (Pedema, AG, 6300 Zug, Switzerland)
the Isaacs sampler (Kendall Research Center, Barrington, Illinois, US A), the Vakutage (Warner-Chilcott, Moms Plains, New Jersey, USA) , the MiMark endometrial cell sampler (Simpson-Boyse Inc, Baltimo re, Maryland, USA), paediatric Foley catheters , and the Pipelle de C ornier aspiration device. The Vakutage system detects 93% of endom etrial malignancies and 89% of endometrial hyperplasias
. In one study of 541 post-menopausal women, the Endocyte system detected every endometrial malignancy but only 64% of endometrial hyperplasias. Results for the Gynoscann were similar: 87.5% of endo metrial malignancies were detected but only 56% of endometrial hyp erplasia.

The performance of these endometrial cytology collection devices is summarised in Table 4

Table 4. Performance of different types of outpatient endometrial cytology devices. Values are given as ratio of samples obtained:total number of samples taken (%).

	Adequacy of specimen		Success rate of histologically confirmed malignancies		Rate of detection of endometrial hyperplasias	
Sampling device	Values	Reference	Values	Reference	Values	Reference
Gravlee						
Premenopausal	61:63 (97)	Iversen & Segadal [140]	23:24 (96)	Iversen & Segadal [140]	3:3 (100)	Vassilakos et al. [112]
Postmenopausal	119:137 (88)	Iversen & Segadal [140]				
Isaacs						
Premenopausal	53:57 (93)	Iversen & Segadal [140]	21:21 (100)	Iversen & Segadal [140]	9:12 (75)	Segadal & Iversen [130]
Postmenopausal	129:143 (90)	Iversen & Segadal [140]				
Endoscann						
Premenopausal	53:53 (100)	Iversen & Segadal [140]	21:23 (91)	Iversen & Segadal [140]	0:6 (0)	Hansen et al. [119]
Postmenopausal	134:147 (92)	Iversen & Segadal [140]				
Endopapa						
Pre- and postmenopausal	558:587 (88)	Palermo [116]	30:30 (100)	Palermo [116]	10:31 (32)	Palermo [116]
MiMark						
Pre- and postmenopausal	514:587 (92)	Wren & Osborn [141]	1:1 (100)	Wren & Osborn [141]	3:3 (100)	Wren & Osborn [141]
Gynoscann						
Pre- and postmenopausal	169:181 (93)	Kufahl et al. [15]	8:16 (50)	Kufahl et al. [15]	3:16 (19)	Kufahl et al. [15]
Endocyte						
Postmenopausal	72:874 (92)	Byrne [142]	12:12 (100)	Byrne [142]	5:13 (38)	Byrne [142]
Vakutage						
Pre- and postmenopausal	647:840 (77)	Bibbo et al. [121]	94:104 (92)	Bibbo et al. [121]	81:90 (90)	Bibbo et al. [121]
Pipelle						
Postmenopausal	203:232 (88)	Roberts et al. [124]	5:5 (100)	Roberts et al. [124]	18:18 (100)	Roberts et al. [124]

Endometrial cytology may also be used to assess aspects of endometrial function such as luteal phase development and to provide samples for measurement of endometrial proteins such as placental protein 14 (PP14). The latter is rarely required for clinical purposes and is currently used in research.

6. Magnetic resonance imaging

Magnetic resonance imaging can be used to obtain measurements of endometrial thickness and to diagnose uterine pathology including fibroids, Asherman's syndrome , adenomyosis and congenital uterine anomalies.

Magnetic resonance imaging has been used as an adjunct in the staging of endometrial carcinoma.

The assessment of the growth, degeneration and early malignant change in leiomyomata has been performed in a small number of women, but further studies in all these areas are needed before the place of magnetic resonance imaging is established. The value of magnetic resonance imaging may be limited by its expense and its time-consuming nature, compared with other methods of assessing the endometrium?

Summary

Imaging, especially ultrasonography, plays a key role in screening an

d diagnostic triage. Transvaginal US is often the first imaging test un dertaken for evaluation of the uterus in women with AUB. Endovagi nal sonography is used to identify mural abnormalities, such as fibroi ds and adenomyosis, and to screen for thickened endometria, which r equire non-focal biopsy to detect cancer or hyperplasia.

SHG is a powerful tool for evaluating the endometrial cavity for foca l abnormalities such as endometrial polyps or submucosal fibroids. T he pre-menopausal assessment of the endometrium is relatively less a ccurate with ultrasound compared to the evaluation and predictability in postmenopausal bleeding episodes. A sono HYS -guided approach allows accurate detection of focal lesions. Data confirm that SIS is a safe, cost-effective, easy tool for endometrial investigation,[39,40] an d may be included in any standard protocol flow-chart for the manag ement of AUB.

HYS and directed biopsy is the ‘gold standard’ approach for most acc urate evaluation of the endometrium to rule out andometrial Ca. The HYS procedure should be performed in early proliferative phase. A si ngle stop approach, especially in high-risk women (Obesity, diabetes, family history of endometrial, ovarian or breast cancer) as well as in women with endometrial hyperplasia (>4 mm in postmenopausal blee ding and less so with >12 mm in pre-menopausal AUB) of combinin g the office HYS, directed biopsy in the presence of a